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Las Vegas, NV September 10-19, 2016

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See page 96 for more details.

48 courses in:

CYBER DEFENSE
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SECURITY MANAGEMENT
APPLICATION SECURITY
ICS SECURITY

"Best training I've attended. Great material that you can apply immediately."

-Nik Whitis, AFG

Featuring

NETWARS TOURNAMENTS

REGISTER AT

www.sans.org/NetworkSecurity-2016

GIAC-Approved Training

Rob Lee

Please accept our invitation to attend **SANS Network Security 2016** from September 10-19. We will be back at Caesars Palace in Las Vegas, where SANS will bring you the best in cybersecurity training, certification, and up-to-the minute research on the most important topics in the industry today. Choose from a vast array of more than 45 courses with a great selection from our cybersecurity, penetration testing, digital forensics and incident response (DFIR), security operations, audit, appsec, security management, legal, and industrial control systems curricula. You'll meet hundreds of like-minded security professionals facing the same challenges and learning together how to implement solutions. SANS Network Security is your best annual networking opportunity!

While the course schedule for Network Security 2016 features a full lineup of SANS classics, we've also rolled out two new courses: ***SEC567: Social Engineering for Penetration Testers*** and ***FOR578: Cyber Threat Intelligence***. At SANS Network Security 2016, you'll get hands-on, immersion training from SANS' world-class instructors and learn what it takes to find evil and stop cybercrime for your organization.

Many of the hottest courses will sell out, so register today! You can select a job-based full course to meet your training needs, as well as select a short skill-based course to maximize your training investment.

As an added value, don't miss ***SANS @Night*** presentations, evening talks with keynote speakers, and a variety of industry receptions and vendor events. Don't forget the ***Core*** and ***DFIR NetWars Tournaments*** scheduled for the evenings of September 15 and 16. The Core NetWars competition is an interactive, Internet-based environment for computer attacks and analyzing defenses. The DFIR NetWars Tournament is an incident simulator packed with a vast amount of forensic and incident response challenges for individual or team-based "firefights." The DFIR NetWars Tournament enables players to learn and sharpen new skills prior to being involved in a real incident. Both of these exciting competitions feature five levels, allowing participants to quickly advance to their level of expertise. Professionals from all skill levels will gain valuable experience from participating.

Have you considered what ***GIAC Certification*** can do for you? It's no secret that employers are looking for certified information security personnel, and they know that GIAC cert holders have strong, hands-on skills. Earn your credentials by signing up for a corresponding GIAC certification attempt when registering for your SANS course.

Can't make it to Network Security this year? You can still be part of the action! Students who register for a ***Simulcast*** course can attend remotely by logging into a virtual classroom and joining the live class.

The cybersecurity industry changes daily—attacks are making the national news and enterprises everywhere are facing increasingly complex challenges. Nothing beats a SANS live training event to bring you face-to-face with the industry leaders who are uniquely equipped to give you the best training available in the industry today. You will be able to use what you learn the day you return to work!

See you in Las Vegas!

Rob Lee
SANS Digital Forensics and Incident Response Lead

Information Security

Information security professionals are responsible for research and analysis of security threats that may affect an organization's assets, products, or technical specifications. These security professionals will dig deeper into technical protocols and specifications related to security threats than most of their peers, identifying strategies to defend against attacks by gaining an intimate knowledge of the threats.

SAMPLE JOB TITLES
- Cybersecurity analyst
- Cybersecurity engineer
- Cybersecurity architect

CORE COURSES

TECHNICAL INTRODUCTORY	CORE	IN-DEPTH
SEC301 Intro to Information Security **GISF**	→ **SEC401** Security Essentials Bootcamp Style **GSEC**	→ **SEC501** Advanced Security Essentials – Enterprise Defender **GCED**

Penetration Testing/Vulnerability Assessment

CORE COURSES
SEC301 (GISF) ▸ SEC401 (GSEC)

→ **SEC504** Hacker Tools, Techniques, Exploits, and Incident Handling **GCIH**

NETWORK & EXPLOITS	WEB	LAB-CENTERED	MOBILE/WIRELESS
SEC560 Network Penetration Testing and Ethical Hacking **GPEN**	**SEC542** Web App Penetration Testing and Ethical Hacking **GWAPT**	**SEC561** Immersive Hands-on Hacking Techniques	**SEC575** Mobile Device Security and Ethical Hacking **GMOB**
↓ **SEC660** Advanced Penetration Testing, Exploit Writing & Ethical Hacking **GXPN**	↓ **SEC642** Advanced Web App Penetration Testing and Ethical Hacking	↓ **SEC562** CyberCity Hands-on Kinetic Cyber Range Exercise	↓ **SEC617** Wireless Ethical Hacking, Penetration Testing & Defenses **GAWN**
↓ **SEC760** Advanced Exploit Development for Penetration Testers			

SPECIALIZATION

SEC573 Python for Penetration Testers **GPYC**

SEC580 Metasploit Kung Fu for Enterprise Pen Testing

Because offense must inform defense, these experts provide enormous value to an organization by applying attack techniques to find security vulnerabilities, analyze their business risk implications, write modern exploits, and recommend mitigations before those vulnerabilities are exploited by real-world attackers.

SAMPLE JOB TITLES
- Penetration tester
- Vulnerability assessor
- Ethical hacker
- Red/Blue team member
- Cyberspace engineer

Risk and Compliance/Auditing/Governance

SEC566 Implementing and Auditing the Critical Security Controls – In-Depth **GCCC**

AUD507 Auditing & Monitoring Networks, Perimeters, and Systems **GSNA**

These experts assess and report risks to the organization by measuring compliance with policies, procedures, and standards. They recommend improvements to make the organization more efficient and profitable through continuous monitoring of risk management.

SAMPLE JOB TITLES
- Auditor
- Compliance officer

Security Operations Center/Intrusion Detection

SAMPLE JOB TITLES
- Intrusion detection analyst
- Security Operations Center analyst/engineer
- CERT member
- Cyber threat analyst

CORE COURSES
SEC301 (GISF) ▸ SEC401 (GSEC)

SEC504
Hacker Tools, Techniques, Exploits, and Incident Handling
GCIH

The Security Operations Center (SOC) is the focal point for safeguarding against cyber-related incidents, monitoring security, and protecting assets of the enterprise network and endpoints. SOC analysts are responsible for enterprise situational awareness and continuous surveillance, including monitoring traffic, blocking unwanted traffic to and from the Internet, and detecting any type of attack. Point solution security technologies are the starting point for hardening the network against possible intrusion attempts.

ENDPOINT MONITORING

SEC501
Advanced Security Essentials – Enterprise Defender
GCED

FOR508
Advanced Digital Forensics and Incident Response
GCFA

NETWORK MONITORING

SEC502
Perimeter Protection In-Depth
GPPA

SEC503
Intrusion Detection In-Depth
GCIA

FOR572
Advanced Network Forensics and Analysis
GNFA

SEC511
Continuous Monitoring and Security Operations
GMON

SEC550
Active Defense, Offensive Countermeasures, and Cyber Deception

THREAT INTELLIGENCE

FOR578
Cyber Threat Intelligence

Network Operations Center, System Admin, Security Architecture

SAMPLE JOB TITLES
- System/IT administrator
- Security administrator
- Security architect/engineer

A Network Operations Center (NOC) is where IT professionals supervise, monitor, and maintain the enterprise network. The NOC is the focal point for network troubleshooting, software distribution and updating, router and system management, performance monitoring, and coordination with affiliated networks. The NOC analysts work hand-in-hand with the Security Operations Center, which safeguards the enterprise and continuously monitors threats against it.

CORE COURSES
SEC301 (GISF) ▸ SEC401 (GSEC) ▸ SEC501 (GCED)

SEC505
Securing Windows and PowerShell Automation
GCWN

SEC506
Securing Linux/Unix
GCUX

SEC566
Implementing and Auditing the Critical Security Controls – In-Depth
GCCC

SEC579
Virtualization and Private Cloud Security

Development – Secure Development

Securing The Human for Developers – STH.Developer
Application Security Awareness Modules

DEV522
Defending Web Applications Security Essentials
GWEB

DEV541
Secure Coding in Java/JEE: Developing Defensible Applications
GSSP-JAVA

DEV544
Secure Coding in .NET: Developing Defensible Applications
GSSP-.NET

The security-savvy software developer leads all developers in creating secure software and implementing secure programming techniques that are free from logical design and technical implementation flaws. This expert is ultimately responsible for ensuring customer software is free from vulnerabilities that can be exploited by an attacker.

SAMPLE JOB TITLES
- Developer
- Software architect
- QA tester
- Development manager

SPECIALIZATION

SEC542
Web App Penetration Testing and Ethical Hacking
GWAPT

SEC642
Advanced Web App Penetration Testing and Ethical Hacking

Industrial Control Systems

ICS-focused courses are designed to equip both security professionals and control system engineers with the knowledge and skills they need to safeguard critical infrastructure.

SAMPLE JOB TITLES
- IT & OT support staff
- IT & OT cybersecurity
- ICS engineer

ICS410
ICS/SCADA Security Essentials
GICSP

ICS515
ICS Active Defense and Incident Response

HOSTED
Assessing and Exploiting Control Systems

HOSTED
Critical Infrastructure and Control System Cybersecurity

Cyber or IT Security Management

FOUNDATIONAL

MGT512 SANS Security Leadership Essentials for Managers with Knowledge Compression™ — GSLC

MGT525 IT Project Management, Effective Communication, and PMP® Exam Prep — GCPM

MGT414 SANS Training Program for CISSP® Certification — GISP

CORE

MGT514 IT Security Strategic Planning, Policy, and Leadership

LEG523 Law of Data Security and Investigations — GLEG

MGT415 A Practical Introduction to Cybersecurity Risk Management

MGT535 Incident Response Team Management

SPECIALIZATION

AUD507 Auditing & Monitoring Networks, Perimeters, and Systems — GSNA

SEC566 Implementing and Auditing the Critical Security Controls — In-Depth — GCCC

MGT433 Securing The Human: How to Build, Maintain & Measure a High-Impact Awareness Program

SAMPLE JOB TITLES

- CISO
- Cybersecurity manager/officer
- Security director

Management of people, processes, and technologies is critical for maintaining proactive enterprise situational awareness and for the ongoing success of continuous monitoring efforts. These managers must have the leadership skills, current knowledge, and best practice examples to make timely and effective decisions that benefit the entire enterprise information infrastructure.

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Incident Response

When the security of a system or network has been compromised, the incident responder is the first-line defense during the breach. The responders not only have to be technically astute, they must be able to handle stress under fire while navigating people, processes, and technology to help respond to and mitigate a security incident.

CORE COURSES SEC301 (GISF) ▸ SEC401 (GSEC)

SEC504 Hacker Tools, Techniques, Exploits, and Incident Handling — GCIH

SPECIALIZATION

FOR526 Memory Forensics In-Depth

MGT535 Incident Response Team Management

NETWORK ANALYSIS

SEC503 Intrusion Detection In-Depth — GCIA

FOR572 Advanced Network Forensics and Analysis — GNFA

ENDPOINT ANALYSIS

FOR408 Windows Forensic Analysis — GCFE

FOR508 Advanced Digital Forensics and Incident Response — GCFA

MALWARE ANALYSIS

FOR610 Reverse-Engineering Malware: Malware Analysis Tools and Techniques — GREM

SAMPLE JOB TITLES

- Security analyst/engineer
- SOC analyst
- Cyber threat analyst
- CERT member
- Malware analyst

Digital Forensic Investigations and Media Exploitation

FOR408 Windows Forensic Analysis — GCFE

SEC504 Hacker Tools, Techniques, Exploits, and Incident Handling — GCIH

FOR508 Advanced Digital Forensics and Incident Response — GCFA

FOR585 Advanced Smartphone Forensics — GASF

FOR518 Mac Forensic Analysis

FOR526 Memory Forensics In-Depth

FOR610 Reverse-Engineering Malware: Malware Analysis Tools and Techniques — GREM

SAMPLE JOB TITLES

- Computer crime investigator
- Law enforcement
- Digital investigations analyst
- Media exploitation analyst
- Information technology litigation consultant
- Insider threat analyst

With today's ever-changing technologies and environments, it is inevitable that every organization will deal with cyber crime, including fraud, insider threats, industrial espionage, and phishing. Government organizations also need skilled personnel to perform media exploitation and recover key intelligence available on adversary systems. To help solve these challenges, organizations are hiring digital forensic professionals and relying on cyber crime law enforcement agents to piece together a comprehensive account of what happened.

Participate in either the CORE or DFIR NetWars Tournament at SANS Network Security 2016 for FREE!

NETWARS

CORE NETWARS TOURNAMENT

DFIR NETWARS TOURNAMENT

CORE NetWars

The CORE NetWars Tournament is a computer and network security challenge designed to test a participant's experience and skills in a safe, controlled environment while having a little fun with your fellow IT security professionals. Many enterprises, government agencies, and military bases are using NetWars to help identify skilled personnel and as part of extensive hands-on training. With CORE NetWars, you'll build a wide variety of skills while having a great time.

Who Should Attend

- Security professionals
- System administrators
- Network administrators
- Ethical hackers
- Penetration testers
- Incident handlers
- Security auditors
- Vulnerability assessment personnel
- Security Operations Center staff

In-Depth, Hands-On InfoSec Skills Embrace the Challenge – CORE NetWars

DFIR NetWars

The DFIR NetWars Tournament is an incident simulator packed with a vast amount of forensic and incident response challenges covering host forensics, network forensics, and malware and memory analysis. It is developed by incident responders and analysts who use these skills daily to stop data breaches and solve crimes. Sharpen your team's skills prior to being involved in a real incident.

Who Should Attend

- Digital forensic analysts
- Forensic examiners
- Reverse-engineering and malware analysts
- Incident responders
- Law enforcement officers, federal agents, or detectives
- Security Operations Center analysts
- Cyber crime investigators
- Media exploitation analysts

Challenge Yourself Before the Enemy Does – DFIR NetWars

Both NetWars competitions will be played over two evenings: September 15-16

Prizes will be awarded at the conclusion of the games.

REGISTRATION IS LIMITED AND IS FREE

for students attending any long course at Network Security 2016 *(NON-STUDENT ENTRANCE FEE IS $1,450).*

Register at www.sans.org/event/network-security-2016/courses

Courses-at-a-Glance

For an up-to-date course list please check the website at www.sans.org/event/network-security-2016/schedule

			SAT 9-10	SUN 9-11	MON 9-12	TUE 9-13	WED 9-14	THU 9-15	FRI 9-16	SAT 9-17	SUN 9-18	MON 9-19
SEC301	Intro to Information Security				PAGE 6							
SEC401	Security Essentials Bootcamp Style	SIMULCAST			PAGE 8							
SEC440	Critical Security Controls: Planning, Implementing, and Auditing		P 82									
SEC501	Advanced Security Essentials – Enterprise Defender				PAGE 10							
SEC503	Intrusion Detection In-Depth				PAGE 12							
SEC504	Hacker Tools, Techniques, Exploits, and Incident Handling	SIMULCAST			PAGE 14							
SEC505	Securing Windows and PowerShell Automation				PAGE 16							
SEC506	Securing Linux/Unix				PAGE 18							
SEC511	Continuous Monitoring and Security Operations				PAGE 20							
SEC542	Web App Penetration Testing and Ethical Hacking	SIMULCAST			PAGE 22							
SEC550	Active Defense, Offensive Countermeasures, and Cyber Deception				PAGE 24							
SEC560	Network Penetration Testing and Ethical Hacking	SIMULCAST			PAGE 26							
SEC562	CyberCity Hands-on Kinetic Cyber Range Exercise				PAGE 25							
SEC566	Implementing and Auditing the Critical Security Controls – In-Depth				PAGE 28							
SEC567	Social Engineering for Penetration Testers **NEW!**		P 82									
SEC573	Python for Penetration Testers				PAGE 30							
SEC575	Mobile Device Security and Ethical Hacking **NEW!**				PAGE 32							
SEC579	Virtualization and Private Cloud Security				PAGE 34							
SEC580	Metasploit Kung Fu for Enterprise Pen Testing	SIMULCAST	P 83									
SEC617	Wireless Ethical Hacking, Penetration Testing, and Defenses				PAGE 36							
SEC642	Advanced Web App Penetration Testing and Ethical Hacking				PAGE 38							
SEC660	Advanced Penetration Testing, Exploit Writing, and Ethical Hacking				PAGE 40							
SEC760	Advanced Exploit Development for Penetration Testers				PAGE 42							
FOR408	Windows Forensic Analysis	SIMULCAST			PAGE 44							
FOR508	Advanced Digital Forensics and Incident Response				PAGE 46							
FOR518	Mac Forensic Analysis				PAGE 48							
FOR526	Memory Forensics In-Depth	SIMULCAST			PAGE 50							
FOR572	Advanced Network Forensics and Analysis				PAGE 52							
FOR578	Cyber Threat Intelligence **NEW!**				PAGE 54							
FOR585	Advanced Smartphone Forensics	SIMULCAST			PAGE 56							
FOR610	Reverse-Engineering Malware: Malware Analysis Tools and Techniques				PAGE 58							
ICS410	ICS/SCADA Security Essentials				PAGE 60							
ICS515	ICS Active Defense and Incident Response				PAGE 62							
MGT305	Technical Communication and Presentation Skills for Security Professionals										P 83	
MGT414	SANS Training Program for CISSP® Certification	SIMULCAST			PAGE 64							
MGT415	A Practical Introduction to Cybersecurity Risk Management		P 84									
MGT433	Securing The Human: How to Build, Maintain, and Measure a High-Impact Awareness Program	SIMULCAST	P 84									
MGT512	SANS Security Leadership Essentials for Managers with Knowledge Compression™				PAGE 66							
MGT514	IT Security Strategic Planning, Policy, and Leadership				PAGE 68							
MGT525	IT Project Management, Effective Communication, and PMP® Exam Prep				PAGE 70							
MGT535	Incident Response Team Management		P 84									
DEV522	Defending Web Applications Security Essentials				PAGE 72							
DEV541	Secure Coding in Java/JEE: Developing Defensible Applications						PAGE 74					
DEV544	Secure Coding in .NET: Developing Defensible Applications		PAGE 76									
LEG523	Law of Data Security and Investigations				PAGE 78							
AUD507	Auditing & Monitoring Networks, Perimeters, and Systems				PAGE 80							
HOSTED	Healthcare Security Essentials **NEW!**										P 85	
HOSTED	Physical Penetration Testing		P 85									
	NetWars Tournaments (CORE & DFIR)							P 2				

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SANS WORLD-CLASS INSTRUCTORS

SANS instructors are real-world practitioners who specialize in the subjects they teach. All instructors undergo rigorous training and testing in order to teach SANS courses. This guarantees that what you learn in class will be up-to-date and relevant to your job. The line-up of instructors for Network Security 2016 includes:

Eric Conrad
Senior Instructor
@eric_conrad

Eric Cornelius
Certified Instructor

Christopher Crowley
Certified Instructor
@CCrowMontance

Sarah Edwards
Certified Instructor
@iamevltwin

Jason Fossen
Faculty Fellow
@JasonFossen

Jeff Frisk
Certified Instructor

Bryce Galbraith
Principal Instructor
@brycegalbraith

Philip Hagen
Certified Instructor
@PhilHagen

G. Mark Hardy
Certified Instructor
@g_mark

Paul A. Henry
Senior Instructor
@phenrycissp

David Hoelzer
Faculty Fellow
@it_audit

Micah Hoffman
Certified Instructor
@WebBreacher

Frank Kim
Certified Instructor
@fykim

Rob Lee
Faculty Fellow
@robtlee
@sansforensics

Robert M. Lee
Certified Instructor
@RobertMLee

James Lyne
Certified Instructor
@jameslyne

Heather Mahalik
Senior Instructor
@HeatherMahalik

Tim Medin
Certified Instructor
@timmedin

Seth Misenar
Senior Instructor
@sethmisenar

Keith Palmgren
Senior Instructor
@kpalmgren

Larry Pesce
Certified Instructor
@haxorthematrix

Hal Pomeranz
Faculty Fellow
@hal_pomeranz

Mike Poor
Senior Instructor
@Mike_Poor

Justin Searle
Certified Instructor
@meeas

Dave Shackleford
Senior Instructor
@daveshackleford

Bryan Simon
Certified Instructor
@BryanOnSecurity

Stephen Sims
Senior Instructor
@Steph3nSims

Ed Skoudis
Faculty Fellow
@edskoudis

Lance Spitzner
Certified Instructor
@lspitzner

John Strand
Senior Instructor
@strandjs

James Tarala
Senior Instructor
@isaudit

Chad Tilbury
Senior Instructor
@chadtilbury

Alissa Torres
Certified Instructor
@sibertor

Johannes Ullrich, PhD
Senior Instructor
@johullrich

Jake Williams
Certified Instructor
@MalwareJake

Benjamin Wright
Senior Instructor
@benjaminwright

Joshua Wright
Senior Instructor
@joswr1ght

Lenny Zeltser
Senior Instructor
@lennyzeltser

For instructor bios, visit:
www.sans.org/event/network-security-2016/instructors/

Mark Bristow
SANS Instructor

Chris Christianson
SANS Instructor

Aaron Cure
SANS Instructor

Gregory Leonard
SANS Instructor

Greg Porter
SANS Instructor

Jonathan Thyer
SANS Instructor

SEC301 Intro to Information Security

SANS

Five-Day Program
Mon, Sep 12- Fri, Sep 16
9:00am - 5:00pm
30 CPEs
Laptop Required
Instructor: Keith Palmgren

www.giac.org/gisf

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

To determine if the SANS SEC301 course is right for you, ask yourself five simple questions:

- Are you new to information security and in need of an introduction to the fundamentals?
- Are you bombarded with complex technical security terms that you don't understand?
- Are you a non-IT security manager who lays awake at night worrying that your company will be the next mega-breach headline story on the 6 o'clock news?
- Do you need to be conversant in basic security concepts, principles, and terms, even if you don't need "deep in the weeds" detail?
- Have you decided to make a career change to take advantage of the job opportunities in information security and need formal training/certification?

If you answer yes to any of these questions, the **SEC301: Intro to Information Security** training course is for you. Jump-start your security knowledge by receiving insight and instruction from real-world security experts on critical introductory topics that are fundamental to information security. This completely revised five-day comprehensive course covers everything from core terminology to the basics of computer networks, security policies, incident response, passwords, and even an introduction to cryptographic principles.

This course is designed for students who have no prior knowledge of security and limited knowledge of technology. The hands-on, step-by-step teaching approach will enable you to grasp all of the information presented even if some of the topics are new to you. You'll learn the fundamentals of information security that will serve as the foundation of your InfoSec skills and knowledge for years to come.

Written by a security professional with over 30 years of experience in both the public and private sectors, SEC301 provides uncompromising real-world insight from start to finish. The course prepares you for the Global Information Security Fundamentals (GISF) certification test, as well as for the next course up the line, **SEC401: Security Essentials Bootcamp Style**. It also delivers on the SANS promise: ***You will be able to use the knowledge and skills you learn in SEC301 as soon as you return to work.***

"I very much appreciate the passion of the instructors. Their knowledge is incredible and the presentation of their knowledge is down-to-earth and helpful. SANS training is far better than privacy-related certification."
-Ron Hoffman, Mutual of Omaha

Keith Palmgren *SANS Senior Instructor*

Keith Palmgren is an IT security professional with over 30 years of experience specializing in the field. He began his career with the U.S. Air Force working with cryptographic keys and codes management. He also worked in what was at the time the newly-formed Air Force computer security department. Following the Air Force, Keith worked as an MIS director for a small company before joining AT&T/Lucent as a Senior Security Architect working on engagements with the DoD and the National Security Agency. Later, as Security Consulting Practice Manager for both Sprint and Netigy, Keith built and ran the security consulting practice. He was responsible for all security consulting world-wide and for leading dozens of security professionals on many consulting engagements across all business spectrums. For the last several years, Keith has run his own company, NetIP, Inc. He divides his time between consulting, training, and freelance writing projects. In his career, Keith has trained over 10,000 IT professionals and authored more than 20 IT security training courses including the SANS SEC301 course. Keith currently holds 10 computer security certifications (CISSP, GSEC, GCIH, GCED, GISF, CEH, Security+, Network+, A+, CTT+). @kpalmgren

301.1 HANDS ON: Security's Foundation

Every good security practitioner and every good security program begins with the same mantra: learn the fundamentals. SEC301 starts by instilling familiarity with core security terms and principles. By the time you leave the classroom after the first day, you will fully understand the Principle of Least Privilege and the Confidentiality, Integrity, and Availability (CIA) Triad, and you'll see why those principles drive all security discussions. You will be conversant in the fundamentals of risk management, security policy, authentication/authorization/accountability, and security awareness training.

301.2 HANDS ON: Computer Numbers and Cryptography

This course day begins with an explanation of how computers handle numbers using decimal, binary, and hexadecimal numbering systems. It also provides an understanding of how computers encode letters using ASCII (American Standard Code for Information Interchange). We then spend the remainder of the day on cryptography – one of the most complex issues faced by security practitioners. It is not a topic you can explain in passing, so we will spend some time on it. Not to worry, we won't take you through the math behind cryptography, but we'll look at basic crypto terminology and processes. What is steganography? What is substitution and transposition? What is a work factor in cryptography and why does it matter? What do we mean by symmetric and asymmetric key cryptography and cryptographic hash, and why do you need to know? How are those concepts used together in the real world to create cryptographic systems?

301.3 HANDS ON: Networking and Network Security

All attacks or exploits have one thing in common: they take something that exists for perfectly valid reasons and misuse it in malicious ways. Always! So as security practitioners, to grasp what is invalid we must first understand what is valid – that is, how things like networks are supposed to work. Only once we have that understanding can we hope to understand the mechanics of malicious misuse of those networks. Day three begins with a nontechnical explanation of how data move across a network. From there we move to fundamental terminology dealing with network types and standards. You'll learn about common network hardware such as hubs, switches, and routers, and you'll finally grasp what is meant by terms like protocol, encapsulation, and tunneling. We'll give a very basic introduction to network addressing and port numbers and then work our way up the Open Systems Interconnection (OSI) protocol stack, introducing more detail only as we proceed to the next layer. In other words, we explain networking starting in non-technical terms and gradually progress to more technical detail as students are ready to take the next step. By the end of our discussions, you'll have a fundamental grasp of any number of critical technical networking acronyms that you've often heard and never quite understood: TCP/IP, IP, TCP, UDP, MAC, ARP, NAT, ICMP, and DNS. We'll close out day three learning how to secure those networks using firewalls, intrusion detection systems, intrusion prevention systems, and others.

301.4 HANDS ON: Host Security

Our fourth day in the classroom is devoted primarily to securing host computers and similar devices. We begin with wireless network security (WiFi and Bluetooth), and mobile device security (i.e., cell phones). We follow that with a brief look at some common attacks. We then move into a discussion of malware and anti-malware technologies. From there we move into several data protection technologies and look at email encryption, secure remote access, secure web access, secure file transfer, and Virtual Private Network technologies. We will then look into the basics of securing endpoint computers via Operating System hardening, patch management, and application security. Of course, we spend some time on the critical topic of backups as well. We end the day with a look at web and browser security, one of the most common attack vectors.

301.5 HANDS ON: Protecting Assets

The final day of our SEC301 journey is all about protecting assets, mostly with a physical security theme but with some logical security included as well. We begin with the "meta security" discipline of operations security that looks at security issues throughout the organization, not just in the IT area. We then introduce the topic of safety and physical security. Students will become familiar with the concepts of data classification and data loss prevention. From there we move to an introductory look at incident response, including business continuity and disaster recovery planning. We'll close out with a brief discussion of social engineering so that students understand what it is and why it's so difficult to defend against.

You Will Be Able To

- Communicate with confidence regarding information security topics, terms, and concepts
- Understand and apply the Principles of Least Privilege
- Understand and apply the Confidentiality, Integrity, and Availability (CIA) Triad
- Build better passwords that are more secure while also being easier to remember and type
- Grasp basic cryptographic principles, processes, procedures, and applications
- Gain an understanding of computer network basics
- Have a fundamental grasp of any number of critical technical networking acronyms: TCP/IP, IP, TCP, UDP, MAC, ARP, NAT, ICMP, and DNS
- Utilize built-in Windows tools to see your network settings
- Recognize and discuss various security technologies including anti-malware, firewalls, and intrusion detection systems
- Determine your "SPAM IQ" to more easily identify SPAM email messages
- Understand physical security issues and how they support cybersecurity
- Have an introductory level of knowledge regarding incident response, business continuity, and disaster recovery planning
- Access a number of websites to better understand password security, encryption, phishing, browser security, etc.

"SEC301 is the perfect blend of technical and practical information for someone new to the field, would recommend to friend!"
-Steve Mecco, Draper

"This course provides fundamental necessities with real-life examples."
-Takaunia Carstarphen, FCA

SEC401

Security Essentials Bootcamp Style

www.sans.org/simulcast

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 7:00pm (Days 1-5)
9:00am - 5:00pm (Day 6)
46 CPEs
Laptop Required
Instructor: Paul A. Henry

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MEETS DoDD 8140 (8570) REQUIREMENTS
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BUNDLE ONDEMAND
WITH THIS COURSE
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Learn the most effective steps to prevent attacks and detect adversaries with actionable techniques that you can directly apply when you get back to work. Learn tips and tricks from the experts so that you can win the battle against the wide range of cyber adversaries that want to harm your environment.

STOP and ask yourself the following questions:

- Do you fully understand why some organizations get compromised and others do not?
- If there were compromised systems on your network, are you confident that you would be able to find them?
- Do you know the effectiveness of each security device and are you certain that they are all configured correctly?
- Are proper security metrics set up and communicated to your executives to drive security decisions?

If you do not know the answers to these questions, SEC401 will provide the information security training you need in a bootcamp-style format that is reinforced with hands-on labs.

ALSO AVAILABLE VIA SIMULCAST

Who Should Attend

- Security professionals who want to fill the gaps in their understanding of technical information security
- Managers who want to understand information security beyond simple terminology and concepts
- Operations personnel who do not have security as their primary job function but need an understanding of security to be effective
- IT engineers and supervisors who need to know how to build a defensible network against attacks
- Administrators responsible for building and maintaining systems that are being targeted by attackers
- Forensic specialists, penetration testers, and auditors who need a solid foundation of security principles to be as effective as possible at their jobs
- Anyone new to information security with some background in information systems and networking

SEC401: Security Essentials Bootcamp Style is focused on teaching you the essential information security skills and techniques you need to protect and secure your organization's critical information assets and business systems. Our course will show you how to prevent your organization's security problems from being headline news in the *Wall Street Journal*!

PREVENTION IS IDEAL BUT DETECTION IS A MUST.

With the rise in advanced persistent threats, it is almost inevitable that organizations will be targeted. Whether the attacker is successful in penetrating an organization's network depends on the effectiveness of the organization's defense. Defending against attacks is an ongoing challenge, with new threats emerging all of the time, including the next generation of threats. Organizations need to understand what really works in cybersecurity. What has worked, and will always work, is taking a risk-based approach to cyber defense. Before your organization spends a dollar of its IT budget or allocates any resources or time to anything in the name of cybersecurity, three questions must be answered:

- What is the risk?
- Is it the highest priority risk?
- What is the most cost-effective way to reduce the risk?

Security is all about making sure you focus on the right areas of defense. In SEC401 you will learn the language and underlying theory of computer and information security. You will gain the essential and effective security knowledge you will need if you are given the responsibility for securing systems and/or organizations. This course meets both of the key promises SANS makes to our students: (1) You will learn up-to-the-minute skills you can put into practice immediately upon returning to work; and (2) You will be taught by the best security instructors in the industry.

Paul A. Henry *SANS Senior Instructor*

Paul Henry is one of the world's foremost global information security and computer forensic experts, with more than 20 years of experience managing security initiatives for Global 2000 enterprises and government organizations worldwide. Paul is a principal at vNet Security, LLC and is keeping a finger on the pulse of network security as the security and forensic analyst at Lumension Security. Throughout his career, Paul has played a key strategic role in launching new network security initiatives to meet our ever-changing threat landscape. He also advises and consults on some of the world's most challenging and high-risk information security projects, including the National Banking System in Saudi Arabia, the Reserve Bank of Australia, the U.S. Department of Defense's Satellite Data Project, and both government as well as telecommunications projects throughout Southeast Asia. Paul is frequently cited by major and trade print publications as an expert on computer forensics, technical security topics, and general security trends and serves as an expert commentator for network broadcast outlets such as FOX, NBC, CNN, and CNBC. In addition, Paul regularly authors thought leadership articles on technical security issues, and his expertise and insight help shape the editorial direction of key security publications, such as the *Information Security Management Handbook*, to which he is a consistent contributor. Paul serves as a featured and keynote speaker at seminars and conferences worldwide, delivering presentations on diverse topics including anti-forensics, network access control, cyber crime, DDoS attack risk mitigation, firewall architectures, security architectures, and managed security services. @phenrycissp

401.1 HANDS ON: Networking Concepts

A key way that attackers gain access to a company's resources is through a network connected to the Internet. A company wants to try to prevent as many attacks as possible, but in cases where it cannot prevent an attack, it must detect it in a timely manner. Therefore, an understanding of how networks and the related protocols like TCP/IP work is critical to being able to analyze network traffic and determine what is hostile. It is just as important to know how to protect against these attacks using devices such as routers and firewalls. These essentials, and more, will be covered during this course day in order to provide a firm foundation for the consecutive days of training.

Topics: Network Fundamentals; IP Concepts; IP Behavior; Virtual Machines

401.2 HANDS ON: Defense In-Depth

To secure an enterprise network, you must have an understanding of the general principles of network security. In this course, you will learn about six key areas of network security. The day starts with information assurance foundations. Students look at both current and historical computer security threats, and how they have impacted confidentiality, integrity, and availability. The first half of the day also covers creating sound security policies and password management, including tools for password strength on both Unix and Windows platforms. The second half of the day is spent on understanding the information warfare threat and the six steps of incident handling. The day draws to a close by looking at attack strategies and how the offense operates.

Topics: Information Assurance Foundations; Computer Security Policies; Contingency and Continuity Planning; Access Control; Password Management; Incident Response; Offensive and Defensive Information Warfare; Attack Strategies and Methods

401.3 HANDS ON: Internet Security Technologies

Military agencies, banks, and retailers offering electronic commerce services, as well as dozens of other types of organizations, are striving to understand the threats they are facing and what they can do to address those threats. On day 3, you will be provided with a roadmap to help you understand the paths available to organizations that are considering deploying or planning to deploy various security devices and tools such as intrusion detection systems and firewalls. When it comes to securing your enterprise, there is no single technology that is going to solve all your security issues. However, by implementing an in-depth defense strategy that includes multiple risk-reducing measures, you can go a long way toward securing your enterprise.

Topics: Firewalls and Perimeters; Honeypots; Host-based Protection; Network-based Intrusion Detection and Prevention; Vulnerability Scanning and Remediation; Web Security

401.4 HANDS ON: Secure Communications

There is no silver bullet when it comes to security. However, there is one technology that would help solve a lot of security issues, though few companies deploy it correctly. This technology is cryptography. Concealing the meaning of a message can prevent unauthorized parties from reading sensitive information. Day 4 looks at various aspects of encryption and how it can be used to secure a company's assets. A related area called steganography, or information hiding, is also covered. The day finishes by looking at using the Critical Security Controls for metrics-based dashboards and performing risk assessment across an organization.

Topics: Cryptography; Steganography; Critical Security Controls; Risk Assessment and Auditing

401.5 HANDS ON: Windows Security

Windows is the most widely-used and hacked operating system on the planet. At the same time, the complexities of Active Directory, PKI, BitLocker, AppLocker, and User Account Control represent both challenges and opportunities. This section will help you quickly master the world of Windows security while showing you the tools that can simplify and automate your work. You will complete the day with a solid grounding in Windows security by looking at automation, auditing, and forensics.

Topics: Security Infrastructure; Service Packs, Patches, and Backups; Permissions and User Rights; Security Policies and Templates; Securing Network Services; Auditing and Automation

401.6 HANDS ON: Unix/Linux Security

While organizations do not have as many Unix/Linux systems, for those that do have them, these systems are often among the most critical systems that need to be protected. Day 6 provides step-by-step guidance to improve the security of any Linux system by combining practical how-to instructions with background information for Linux beginners, as well as security advice and best practices for administrators with all levels of expertise.

Topics: Linux Landscape; Permissions and User Accounts; Linux OS Security; Maintenance, Monitoring, and Auditing Linux; Linux Security Tools

You Will Be Able To

- Design and build a network architecture using VLANs, NAC and 802.1x based on an APT indicator of compromise
- Run Windows command line tools to analyze the system looking for high-risk items
- Run Linux command line tools (ps, ls, netstat, etc.) and basic scripting to automate the running of programs to perform continuous monitoring of various tools
- Install VMWare and create virtual machines to operate a virtual lab to test and evaluate the tools/security of systems
- Create an effective policy that can be enforced within an organization and prepare a checklist to validate security, creating metrics to tie into training and awareness
- Identify visible weaknesses of a system utilizing various tools including dumpsec and OpenVAS, and once vulnerabilities are discovered cover ways to configure the system to be more secure
- Build a network visibility map that can be used for hardening of a network – validating the attack surface and covering ways to reduce it through hardening and patching
- Sniff open protocols like telnet and ftp and determine the content, passwords and vulnerabilities utilizing WireShark
- Apply what you learned directly to your job when you go back to work

"This was my first SANS course – I didn't know what to expect. Now that I've been through a course, I must say, the experience was fantastic!"
-Gary Hughes, Seagate Technology

"Outstanding content, knowledgeable, plus delivery."
-Michael Lonigro, USAA

SEC501

Advanced Security Essentials – Enterprise Defender

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: Bryan Simon

www.giac.org/gced

SANS Technology Institute

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MEETS DoDD 8140 (8570) REQUIREMENTS

www.sans.org/8140

Effective cybersecurity is more important than ever as attacks become stealthier, have a greater financial impact, and cause broad reputational damage. **SEC501: Advanced Security Essentials – Enterprise Defender** builds on a solid foundation of core policies and practices to enable security teams to defend their enterprise.

Who Should Attend

- Incident response and penetration testers
- Security Operations Center engineers and analysts
- Network security professionals
- Anyone who seeks technical in-depth knowledge about implementing comprehensive security solutions

It has been said of security that "prevention is ideal, but detection is a must." However, detection without response has little value. Network security needs to be constantly improved to prevent as many attacks as possible and to swiftly detect and respond appropriately to any breach that does occur. This PREVENT - DETECT - RESPONSE strategy must be in place both externally and internally. As data become more portable and networks continue to be porous, there needs to be an increased focus on data protection. Critical information must be secured regardless of whether it resides on a server, in a robust network architecture, or on a portable device.

"Great instructor with the ability to tie real-world threats to theory and practice."
-Bruce Henkel, Harris Corp.

Despite an organization's best efforts to prevent network attacks and protect its critical data, some attacks will still be successful. Therefore, organizations need to be able to detect attacks in a timely fashion. This is accomplished by understanding the traffic that is flowing on your networks, looking for indications of an attack, and performing penetration testing and vulnerability analysis against your organization to identify problems and issues before a compromise occurs.

Finally, once an attack is detected we must react quickly and effectively and perform the forensics required. Knowledge gained by understanding how the attacker broke in can be fed back into more effective and robust preventive and detective measures, completing the security lifecycle.

"SEC501 is the perfect course to immerse enterprise security staff into essential skills. Failing to attend this course is done at the peril of your organization."
-John N. Johnson, Houston Police Department

Bryan Simon *SANS Certified Instructor*

Bryan Simon is an internationally recognized expert in cybersecurity and has been working in the information technology and security field since 1991. Over the course of his career, Bryan has held various technical and managerial positions in the education, environmental, accounting, and financial services sectors. Bryan speaks on a regular basis at international conferences and with the press on matters of cybersecurity. He has instructed individuals from the FBI, NATO, and the UN in matters of cybersecurity, on two continents. Bryan has specialized expertise in defensive and offensive capabilities. He has received recognition for his work in IT security, and was most recently profiled by McAfee (part of Intel Security) as an IT Hero. Bryan holds 11 GIAC Certifications including GSEC, GCWN, GCIH, GCFA, GPEN, GWAPT, GAWN, GISP, GCIA, GCED, and GCUX. Bryan's scholastic achievements have resulted in the honor of sitting as a current member of the SANS Institute Advisory Board, and in his acceptance into the prestigious SANS Cyber Guardian program. Bryan teaches SEC401: Security Essentials Bootcamp Style, SEC501: Advanced Security Essentials – Enterprise Defender, SEC505: Securing Windows and Powershell Automaton, and SEC511: Continuous Monitoring and Security Operations. @BryanOnSecurity

501.1 HANDS ON: Defensive Network Infrastructure

Protecting a network from attack starts with designing, building, and implementing a robust network infrastructure. Many aspects of implementing a defense-in-depth network are often overlooked because organizations focus on functionality. Achieving the proper balance between business drivers and core protection of information is difficult. On the first day students will learn how to design and implement a functionality-rich, secure network and how to maintain and update it as the threat landscape evolves.

Topics: Introducing Network Infrastructure as Targets for Attack; Implementing the Cisco Gold Standard to Improve Security; Advanced Layer 2 and 3 Controls

501.2 HANDS ON: Packet Analysis

Packet analysis and intrusion detection are at the core of timely detection. Detecting attacks is becoming more difficult as attacks become more stealthy and more difficult to find. Only by understanding the core principles of traffic analysis can one become a skilled analyst and distinguish normal traffic from attack traffic. Security professionals must be able to detect new, advanced zero-day attacks before they compromise a network. Prevention, detection, and reaction must all be closely knit so that once an attack is detected, defensive measures can be adapted, proactive forensics implemented, and the organization can continue to operate.

Topics: Architecture Design & Preparing Filters; Detection Techniques and Measures; Advanced IP Packet Analysis; Intrusion Detection Tools

501.3 HANDS ON: Pentest

An organization must understand the changing threat landscape and compare that against its own vulnerabilities. On day three students will be shown the variety of tests that can be run and how to perform penetration testing in an effective manner. Students will learn about external and internal penetration testing and the methods of black, gray, and white box testing. Penetration testing is critical to identify an organization's exposure points, but students will also learn how to prioritize and fix these vulnerabilities to increase the overall security of an organization.

Topics: Variety of Penetration Testing Methods; Vulnerability Analysis; Key Tools and Techniques; Basic Pen Testing; Advanced Pen Testing

501.4 HANDS ON: First Responder

Any organization connected to the Internet or with employees is going to have attacks launched against it. Security professionals need to understand how to perform incident response, analyze what is occurring, and restore their organization back to a normal state as soon as possible. Day four will equip students with a proven six-step process to follow in response to an attack – prepare, identify, contain, eradicate, recover, and learn from previous incidents. Students will learn how to perform forensic investigations and find indications of an attack. This information will be fed into the incident response process to ensure that the attack is prevented from occurring again in the future.

Topics: Incident Handling Process and Analysis; Forensics and Incident Response

501.5 HANDS ON: Malware

As security professionals continue to build more proactive security measures, attackers' methods will continue to evolve. A common way for attackers to target, control, and break into as many systems as possible is through the use of malware. Therefore it is critical that students understand what type of malware is currently available to attackers as well as the future trends and methods of exploiting systems. With this knowledge students can then learn how to analyze, defend, and detect malware on systems and minimize the impact to the organization.

Topics: Malware; Microsoft Malware; External Tools and Analysis

501.6 HANDS ON: Data Loss Prevention

Cybersecurity is all about managing, controlling, and mitigating risk to critical assets, which in almost every organization are composed of data or information. Perimeters are still important, but we are moving away from a fortress model and moving towards a focus on data. This is based on the fact that information no longer solely resides on servers where properly configured access control lists can limit access and protect our information; it can now be copied to laptops and plugged into networks. Data must be protected no matter where it resides.

Topics: Risk Management; Data Classification; Digital Rights Management; Data Loss Prevention (DLP)

You Will Be Able To

- Identify the threats against network infrastructures and build defensible networks that minimize the impact of attacks
- Use the tools designed to analyze a network to both prevent and detect the adversary
- Decode and analyze packets using various tools to identify anomalies and improve network defenses
- Understand how the adversary compromises networks and how to respond to attacks
- Perform penetration testing against an organization to determine vulnerabilities and points of compromise
- Apply the six-step incident handling process
- Use various tools to identify and remediate malware across your organization
- Create a data classification program and deploy data loss prevention solutions at both a host and network level

"This course was most valuable. The demos and materials combined with the instructor's detailed explanation, experience, and recommendations, gave information I can apply immediately when I return to work."
-Rowley Molina, Altria

"Best course ever taken in InfoSec or any other subject!"
-J. Cofer, DSS

"This has been one of the best courses I have taken, highly job relevant, ground breaking material!"
-Jonathan Copeland, CDSA Dam Neck

SEC503 Intrusion Detection In-Depth

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: Mike Poor

www.giac.org/gcia

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www.sans.org/cyber-guardian

MEETS DoDD 8140 (8570) REQUIREMENTS

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WITH THIS COURSE
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Reports of prominent organizations being hacked and suffering irreparable reputational damage have become all too common. How can you prevent your company from becoming the next victim of a major cyber attack?

Who Should Attend

- Intrusion detection (all levels), system, and security analysts
- Network engineers/administrators
- Hands-on security managers

SEC503: Intrusion Detection In-Depth delivers the technical knowledge, insight, and hands-on training you need to defend your network with confidence. You will learn about the underlying theory of TCP/IP and the most used application protocols, such as HTTP, so that you can intelligently examine network traffic for signs of an intrusion. You will get plenty of practice learning to configure and master different open-source tools like tcpdump, Wireshark, Snort, Bro, and many more. Daily hands-on exercises suitable for all experience levels reinforce the course book material so that you can transfer knowledge to execution. Basic exercises include assistive hints while advanced options provide a more challenging experience for students who may already know the material or who have quickly mastered new material. In addition, most exercises include an "extra credit" stumper question intended to challenge even the most advanced student.

"Today has been brilliant, bringing all of our skills together to achieve the challenge. I wish we could do this every day!" -Hayley Roberts, MOD

Industry expert Mike Poor has created a VMware distribution, Packetrix, specifically for this course. As the name implies, Packetrix contains many of the tricks of the trade to perform packet and traffic analysis. It is supplemented with demonstration "pcaps," which are files that contain network traffic. This allows students to follow along on their laptops with the class material and demonstrations. The pcaps also provide a good library of network traffic to use when reviewing the material, especially for certification.

Preserving the security of your site in today's threat environment is more challenging than ever before. The security landscape is continually changing from what was once only perimeter protection to protecting exposed and mobile systems that are almost always connected and often vulnerable. Security-savvy employees who can help detect and prevent intrusions are therefore in great demand. Our goal in **SEC503: Intrusion Detection In-Depth** is to acquaint you with the core knowledge, tools, and techniques to defend your networks. The training will prepare you to put your new skills and knowledge to work immediately upon returning to a live environment.

Mike Poor *SANS Senior Instructor*

Mike Poor is a founder and senior security analyst for the Washington, DC firm InGuardians, Inc. In the past he has worked for Sourcefire as a research engineer and for SANS leading its intrusion analysis team. As a consultant Mike conducts incident response, breach analysis, penetration tests, vulnerability assessments, security audits, and architecture reviews. His primary job focus, however, is on intrusion detection, response, and mitigation. Mike currently holds the GCIA certification and is an expert in network engineering and systems and network and web administration. Mike is an author of the international best-selling "Snort" series of books from Syngress, a member of the Honeynet Project, and a handler for the SANS Internet Storm Center. @Mike_Poor

503.1 HANDS ON: Fundamentals of Traffic Analysis: PART 1

Day 1 provides a refresher or introduction to TCP/IP, depending on your background, covering the essential foundations such as the TCP/IP communication model, theory of bits, bytes, binary and hexadecimal, an introduction to Wireshark, the IP layer, and both IPv4 and IPv6 and packet fragmentation in both. We describe the layers and analyze traffic not just in theory and function, but from the perspective of an attacker and defender.

Topics: Concepts of TCP/IP; Introduction to Wireshark; Network Access/Link Layer: Layer 2; IP Layer: Layer 3, IPv4, and IPv6

503.2 HANDS ON: Fundamentals of Traffic Analysis: PART 2

Day 2 continues where Day 1 ended in understanding TCP/IP. Two essential tools – Wireshark and tcpdump – are explored to give you the skills to analyze your own traffic. The focus of these tools on Day 2 is filtering traffic of interest in Wireshark using display filters and in tcpdump using Berkeley Packet Filters. We proceed with our exploration of the TCP/IP layers covering TCP, UDP, and ICMP. Once again, we describe the layers and analyze traffic not just in theory and function, but from the perspective of an attacker and defender.

Topics: Wireshark Display Filters; Writing tcpdump Filters; TCP; UDP; ICMP

503.3 HANDS ON: Application Protocols and Traffic Analysis

Day 3 culminates the examination of TCP/IP with an exploration of the application protocol layer. The concentration is on some of the most widely used, and sometimes vulnerable, crucial application protocols – HTTP, SMTP, DNS, and Microsoft communications. Our focus is on traffic analysis, a key skill in intrusion detection.

Topics: Advanced Wireshark; Detection Methods for Application Protocols; Microsoft Protocols; HTTP; SMTP; DNS; IDS/IPS Evasion Theory; Real-World Traffic Analysis

503.4 HANDS ON: Open-Source IDS: Snort and Bro

We take a unique approach of teaching both open-source IDS solutions by presenting them in their operational life-cycle phases from planning to updating. This will offer you a broader view of what is entailed for the production and operation of each of these open-source tools. This is more than just a step-by-step discussion of install, configure, and run the tools. This approach provides a recipe for a successful deliberated deployment, not just a haphazard "download and install the code and hope for the best."

Topics: Operational Lifecycle of Open-Source IDS; Introduction; Snort; Bro; Comparing Snort and Bro to Analyze Same Traffic

503.5 HANDS ON: Network Traffic Forensics and Monitoring

On the penultimate day, you'll become familiar with other tools in the "analyst toolkit" to enhance your analysis skills and give you alternative perspectives of traffic. The open-source network flow tool SiLK is introduced. It offers the capability to summarize network flows to assist in anomaly detection and retrospective analysis, especially at sites where the volume is so prohibitively large that full packet captures cannot be retained for very long, if at all.

Topics: Analyst Toolkit; SiLK; Network Forensics; Network Architecture for Monitoring; Correlation of Indicators; Packet Crafting; Command and Control (C2)

503.6 HANDS ON: IDS Challenge

The week culminates with a fun hands-on exercise that challenges you to find and analyze traffic to a vulnerable honeynet host using many of the same tools you mastered during the week. Students can work alone or in groups with or without workbook guidance. This is a great way to end the week because it reinforces what you've learned by challenging you to think analytically, gives you a sense of accomplishment, and strengthens your confidence to employ what you've learned in the Intrusion Detection In-Depth course in a real-world environment.

You Will Be Able To

- Configure and run open-source Snort and write Snort signatures
- Configure and run open-source Bro to provide a hybrid traffic analysis framework
- Understand TCP/IP component layers to identify normal and abnormal traffic
- Use open-source traffic analysis tools to identify signs of an intrusion
- Comprehend the need to employ network forensics to investigate traffic to identify and investigate a possible intrusion
- Use Wireshark to carve out suspicious file attachments
- Write tcpdump filters to selectively examine a particular traffic trait
- Synthesize disparate log files to widen and augment analysis
- Use the open-source network flow tool SiLK to find network behavior anomalies
- Use your knowledge of network architecture and hardware to customize placement of IDS sensors and sniff traffic off the wire

"SEC503 covers the best processes for intrusion analysis and how to cut out most of the network noise and identify the important traffic. Mike Poor is a rock-star, and I look forward to learning more from him in the future."

-Mike Boya, Warner Bros.

"Mike is beyond excellent. He is a great presenter/instructor and keeps it interesting with real-world examples willing to go above and beyond sessions before and after class. Awesome guy!"

-Stace McRae, Parsons

SEC504

Hacker Tools, Techniques, Exploits, and Incident Handling

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 7:15pm (Day 1)
9:00am - 5:00pm (Days 2-6)
37 CPEs
Laptop Required
Instructor: John Strand

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MEETS DoDD 8140 (8570) REQUIREMENTS

www.sans.org/8140

ALSO AVAILABLE VIA SIMULCAST
www.sans.org/simulcast

The Internet is full of powerful hacking tools and bad guys using them extensively. If your organization has an Internet connection or one or two disgruntled employees (and whose does not!), your computer systems will get attacked. From the five, ten, or even one hundred daily probes against your Internet infrastructure to the malicious insider slowly creeping through your most vital information assets, attackers are targeting your systems with increasing viciousness and stealth. As defenders, it is essential we understand these hacking tools and techniques.

Who Should Attend

- Incident handlers
- Leaders of incident handling teams
- System administrators who are on the front lines defending their systems and responding to attacks
- Other security personnel who are first responders when systems come under attack

"Our organization has incident response pieces all over. This course is valuable in putting the pieces together and improving the plan and, more importantly, the mindset." -Tyler Burwitz, TEEX

This course enables you turn the tables on computer attackers by helping you understand their tactics and strategies in detail, giving you hands-on experience in finding vulnerabilities and discovering intrusions, and equipping you with a comprehensive incident handling plan. It addresses the latest cutting-edge insidious attack vectors, the "oldie-but-goodie" attacks that are still prevalent, and everything in between. Instead of merely teaching a few hack attack tricks, this course provides a time-tested, step-by-step process for responding to computer incidents, and a detailed description of how attackers undermine systems so you can prepare for, detect, and respond to them. In addition, the course explores the legal issues associated with responding to computer attacks, including employee monitoring, working with law enforcement, and handling evidence. Finally, students will participate in a hands-on workshop that focuses on scanning, exploiting, and defending systems. It will enable you to discover the holes in your system before the bad guys do!

"John Strand opened my eyes and helped me understand how to approach the concepts of offensive security and incident handling. He is one of the very best."
-Stephen Ellis, CB&I

The course is particularly well-suited to individuals who lead or are a part of an incident handling team. General security practitioners, system administrators, and security architects will benefit by understanding how to design, build, and operate their systems to prevent, detect, and respond to attacks.

John Strand *SANS Senior Instructor*

Along with SEC504, John Strand also teaches SEC560: Network Penetration Testing and Ethical Hacking; SEC580: Metasploit Kung Fu for Enterprise Pen Testing; and SEC464: Hacker Detection for System Administrators. John is the course author for SEC464 and the co-author for SEC580. When not teaching for SANS, John co-hosts PaulDotCom Security Weekly, the world's largest computer security podcast. He also is the owner of Black Hills Information Security, specializing in penetration testing and security architecture services. He has presented for the FBI, NASA, the NSA, and at DefCon. In his spare time he writes loud rock music and makes various futile attempts at fly fishing. @strandjs

504.1 Incident Handling Step-by-Step and Computer Crime Investigation

The first part of this section looks at the invaluable Incident Handling Step-by-Step model, which was created through a consensus process involving experienced incident handlers from corporations, government agencies, and educational institutes, and has been proven effective in hundreds of organizations. This section is designed to provide students a complete introduction to the incident handling process, using the six steps (preparation, identification, containment, eradication, recovery, and lessons learned) necessary to prepare for and deal with a computer incident. The second part of this section examines from-the-trenches case studies to understand what does and does not work in identifying computer attackers. This section provides valuable information on the steps a systems administrator can take to improve the chances of catching and prosecuting attackers.

Topics: Preparation; Identification; Containment; Eradication; Recovery; Special Actions for Responding to Different Types of Incidents; Incident Record-Keeping; Incident Follow-Up

504.2 HANDS ON: Computer and Network Hacker Exploits – PART 1

Seemingly innocuous data leaking from your network could provide the clue needed by an attacker to blow your systems wide open. This day-long course covers the details associated with reconnaissance and scanning, the first two phases of many computer attacks.

Topics: Reconnaissance; Scanning; Intrusion Detection System Evasion; Hands-on Exercises for a List of Tools

504.3 HANDS ON: Computer and Network Hacker Exploits – PART 2

Computer attackers are ripping our networks and systems apart in novel ways while constantly improving their techniques. This course covers the third step of many hacker attacks – gaining access. Attackers employ a variety of strategies to take over systems from the network level up to the application level. This section covers the attacks in depth, from the details of buffer overflow and format string attack techniques to the latest in session hijacking of supposedly secure protocols.

Topics: Network-Level Attacks; Gathering and Parsing Packets; Operating System and Application-Level Attacks; Netcat: The Attacker's Best Friend; Hands-on Exercises with a List of Tools

504.4 HANDS ON: Computer and Network Hacker Exploits – PART 3

This course starts out by covering one of the attackers' favorite techniques for compromising systems: worms. We will analyze worm developments over the last two years and project these trends into the future to get a feel for the coming Super Worms we will face. Then the course turns to another vital area often exploited by attackers: web applications. Because most organizations' homegrown web applications do not get the security scrutiny of commercial software, attackers exploit these targets using SQL injection, cross-site scripting, session cloning, and a variety of other mechanisms discussed in detail.

Topics: Password Cracking; Web Application Attacks; Denial of Service Attacks; Hands-on Exercises with a List of Tools

504.5 HANDS ON: Computer and Network Hacker Exploits – PART 4

This day-long course covers the fourth and fifth steps of many hacker attacks: maintaining access and covering their tracks. Computer attackers install backdoors, apply Rootkits, and sometimes even manipulate the underlying kernel itself to hide their nefarious deeds. Each of these categories of tools requires specialized defenses to protect the underlying system. In this course, we will analyze the most commonly used malicious code specimens, as well as explore future trends in malware, including BIOS-level and combo malware possibilities.

Topics: Maintaining Access; Covering the Tracks; Putting It All Together; Hands-on Exercises with a List of Tools

504.6 HANDS ON: Hacker Tools Workshop

Over the years, the security industry has become smarter and more effective in stopping hackers. Unfortunately, hacker tools are becoming smarter and more complex. One of the most effective methods to stop the enemy is to actually test the environment with the same tools and tactics an attacker might use against you. This workshop lets you put what you have learned over the past week into practice.

Topics: Hands-on Analysis

You Will Be Able To

- Apply incident handling processes in-depth, including preparation, identification, containment, eradication, and recovery, to protect enterprise environments
- Analyze the structure of common attack techniques in order to evaluate an attacker's spread through a system and network, anticipating and thwarting further attacker activity
- Utilize tools and evidence to determine the kind of malware used in an attack, including rootkits, backdoors, and trojan horses, choosing appropriate defenses and response tactics for each
- Use built-in command-line tools such as Windows tasklist, wmic, and reg as well as Linux netstat, ps, and lsof to detect an attacker's presence on a machine
- Analyze router and system ARP tables along with switch CAM tables to track an attacker's activity through a network and identify a suspect
- Use memory dumps and the Volatility tool to determine an attacker's activities on a machine, the malware installed, and other machines the attacker used as pivot points across the network
- Gain access to a target machine using Metasploit, and then detect the artifacts and impacts of exploitation through process, file, memory, and log analysis
- Analyze a system to see how attackers use the Netcat tool to move files, create backdoors, and build relays through a target environment
- Run the Nmap port scanner and Nessus vulnerability scanner to find openings on target systems, and apply tools such as tcpdump and netstat to detect and analyze the impacts of the scanning activity
- Apply the tcpdump sniffer to analyze network traffic generated by a covert backdoor to determine an attacker's tactics
- Employ the netstat and lsof tools to diagnose specific types of traffic-flooding denial-of-service techniques and choose appropriate response actions based on each attacker's flood technique
- Analyze shell history files to find compromised machines, attacker-controlled accounts, sniffers, and backdoors

SEC505

Securing Windows and PowerShell Automation

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: Jason Fossen

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MEETS DoDD 8140 (8570) REQUIREMENTS

www.sans.org/8140

Who Should Attend

- Security Operations engineers
- Windows endpoint and server administrators
- Anyone who wants to learn PowerShell automation
- Anyone implementing the CIS Critical Security Controls
- Those deploying or managing a Public Key Infrastructure or smart cards
- Anyone who needs to reduce malware infections

Hackers know how to use PowerShell for evil. Do you know how to use it for good? In SEC505 you will learn PowerShell and Windows security hardening at the same time. SecOps requires automation, and Windows automation means PowerShell.

You've run a vulnerability scanner and applied patches – *now what?* A major theme of this course is defensible design: we have to assume that there will be a breach, so we need to build in damage control from the beginning. Whack-a-mole incident response cannot be our only defensive strategy – we'll never win, and we'll never get ahead of the game. By the time your Security Information and Event Manager (SIEM) or monitoring system tells you a Domain Admin account has been compromised, IT'S TOO LATE.

For the assume breach mindset, we must carefully delegate *limited* administrative powers so that the compromise of one administrator account is not a total catastrophe. Managing administrative privileges is a tough problem, so this course devotes an entire day to just this one critical task.

"SEC505 is very well structured and organized and provided me with an in-depth understanding of Windows security." -Rochana Lahiri, BCBSLA

Learning PowerShell is also useful for another kind of security: *job* security. Employers are looking for people with these skills. You don't have to know any PowerShell to attend the course, we will learn it together. About half the labs during the week are PowerShell, while the rest use graphical security tools.

This course is not a vendor show to convince you to buy another security appliance or to install yet another endpoint agent. The idea is to use built-in or free Windows and Active Directory security tools when we can (especially PowerShell and Group Policy) and then purchase commercial products only when absolutely necessary.

If you are an IT manager or CIO, the aim for this course is to have it pay for itself 10 times over within two years, because automation isn't just good for SecOps/DevOps, it can save money, too. Besides, PowerShell is also simply fun to use.

This course is designed for systems engineers, security architects, and the Security Operations (SecOps) team. The focus of the course is on how to automate those Windows-related Critical Security Controls that are the most effective, but also the most difficult to implement, especially in large environments.

This is a fun course and a real eye-opener, even for Windows administrators with years of experience. We don't cover patch management, share permissions, or other such basics – the aim is to go far beyond that. Come have fun learning PowerShell and agile Windows security at the same time!

"I loved SEC505 and when I return to the office, I am recommending it to the rest of my team." -Alex Fox, Federal Home Loan Bank Chicago

Jason Fossen *SANS Faculty Fellow*

Jason Fossen is a principal security consultant at Enclave Consulting LLC, a published author, and a frequent public speaker on Microsoft security issues. He is the sole author of the SANS week-long Securing Windows course (SEC505), maintains the Windows day of Security Essentials (SEC401.5), and has been involved in numerous other SANS projects since 1998. He graduated from the University of Virginia, received his master's degree from the University of Texas at Austin, and holds a number of professional certifications. He currently lives in Dallas, Texas. @JasonFossen

505.1 HANDS ON: PowerShell Automation and Security

Security Operations (SecOps) is about security automation. Today's course covers what you need to know to get started using PowerShell. You don't need to have any prior scripting experience. We will do PowerShell labs throughout the week, so today is not the only PowerShell content. Don't worry, you won't be left behind, the PowerShell labs will walk you through every step. Besides, encrypted PowerShell remoting is just too cool to miss!

Topics: PowerShell Remote Command Execution; Securing PowerShell Itself; Transcription Logging for Forensics; Writing Your Own Scripts and Functions; Flow Control; Parsing and Mining nmap XML Output; Quickly Searching Event Logs

505.2 HANDS ON: Continuous Secure Configuration Enforcement

Running a vulnerability scanner is easy; the hard part is fixing the problems we find, especially in large environments. How do we automate configuration changes across many endpoints and servers? How do we continuously reinforce these configuration changes to make sure they stick? Today's course is about PowerShell Desired State Configuration (DSC), customizing INF security templates, Group Policy execution of PowerShell security scripts, Server Manager scripting for SecOps/DevOps, and Windows service hardening (such as on Server Nano and Server Core).

Topics: PowerShell Desired State Configuration (DSC); Server Manager Scripting; Server Nano and Server Core; Group Policy to Push Security Templates and PowerShell Scripts; Custom INF Security Templates; Empowering the Hunt Team to Fight Back!

505.3 HANDS ON: Windows PKI and Smart Cards

Passwords are obsolete, administrators need smart cards. Together we will walk through the entire set-up and management of a full Windows Public Key Infrastructure (PKI), which is a necessity today. We need certificates for SSL/TLS, IPSec, Virtual Private Networks (VPNs), BitLocker, Encrypting File System (EFS), Voice over IP, secure e-mail, code signing, smart cards, and more. We will use Group Policy for hands-free certificate deployment, and install an Online Certificate Status Protocol (OCSP) web server for revocation checking. With PowerShell scripts, we will audit our trusted root Certification Authorities and remove the fake ones installed by hackers. We will also see how to use PowerShell to manage certificate stores and check file hashes (similar to Tripwire).

Topics: PKI Installation; Deploying Certificates Hands-Free Through Group Policy; PowerShell for PKI; User Credentials Roaming; Private Key Security Best Practices; Removing Hacker Certificates; How to Issue Smart Cards

505.4 HANDS ON: Administrative Compromise and Privilege Management

Just Enough Admin (JEA) is like Linux sudo, but for PowerShell remoting. If we assume that someday our administrators' credentials will be compromised, then how do we build least-privilege and damage control into the network from the beginning? This is not about detection and incident response, it's about defensible design. How do we assign a different Administrator password to every box, and encrypt that password as well? We'll do it with PowerShell. We will also see how to mitigate the harm from pass-the-hash attacks and credentials theft. Finally, we will (almost) empty the Domain Admins group and delegate authority in Active Directory at the Organizational Unit level instead.

Topics: PowerShell Just Enough Admin (JEA); Mitigating Pass-the-Hash Attacks and Security Access Token (SAT) Abuse; Protecting Admin Credentials in Memory; Safely Managing Local Admin Passwords; Active Directory Permissions and Monitoring

505.5 HANDS ON: Endpoint Protection and Pre-Forensics

We must assume that there will be a breach of our networks and design for post-exploitation damage control. In today's course, we will go beyond just patching and anti-virus for endpoint protection. The Enhanced Mitigation Experience Toolkit (EMET) is a benevolent rootkit from Microsoft, not an anti-virus scanner. AppLocker is application whitelisting built into Windows for free. IPSec is not just for VPNs! IPSec can enforce share permissions on listening TCP/UDP ports. Windows Firewall can block the lateral movement of hackers inside the Local Area Network (LAN) and block outbound malware control channels. We will use PowerShell and Group Policy to manage all of the above. Finally, "Pre-Forensics" is what needs to be done today to help the Hunt Team, such as making server baselines to document what is "normal" in order to find what is "abnormal."

Topics: Microsoft EMET Scripting; AppLocker Application Whitelisting; PowerShell Constrained Language Mode; IPSec Port Permissions; Windows Firewall Inside the LAN; Pre-forensics Baselines for an Assumed Breach

505.6 HANDS ON: Defensible Networking and Blue Team WMI

Hackers love Windows Management Instrumentation (WMI), and so should we! SecOps automation uses the WMI service a lot, so today's course has PowerShell for WMI. Beyond WMI, there are several other network services or protocols that we cannot live without, but which are targeted by hackers. To move laterally inside the LAN, hackers go after DNS, Remote Desktop Protocol (RDP), SMB, NTLM, Kerberos, SSL and IPv6. We must assume there will be a breach, so we will learn how to harden, eliminate, or encrypt these protocols, and we will do it with little or no user disruption. We can't keep hackers and malware out entirely, but we can slow them to a crawl and make life hard for them.

Topics: PowerShell WMI Scripting; Common Information Model (CMI) and WMI Classes; WMI Remote Command Execution; DNS Sinkholes for Malware; DNSSEC; SMB Encryption; SSL is Dead, Long Live TLS; RDP Attacks; Disabling IPv6 Tunneling; Kerberos Golden Tickets

You Will Be Able To

- Execute PowerShell commands on remote systems and begin to write your own PowerShell scripts
- Harden PowerShell itself against abuse, and enable transcription logging
- Use Group Policy to execute PowerShell scripts on an almost unlimited number of hosts, while using Group Policy Object permissions, organizational units, and Windows Management Instrumentation (WMI) to target just the systems that need the scripts run
- Use PowerShell Desired State Configuration (DSC) and Server Manager scripting for the sake of SecOps/DevOps automation of server hardening
- Assuming a breach will occur, use Group Policy and PowerShell to grant administrative privileges in a way that reduces the harm if an attack succeeds
- Configure PowerShell remoting to use Just Enough Admin (JEA) policies to create a Windows version of Linux sudo and setuid root
- Configure mitigations against attacks such as pass-the-hash, Kerberos golden tickets, Remote Desktop Protocol (RDP) man-in-the-middle, Security Access Token abuse, and others
- Use PowerShell and Group Policy to manage the Microsoft Enhanced Mitigation Experience Toolkit (EMET), AppLocker whitelisting rules, INF security templates, Windows Firewall rules, IPSec rules, and many other security-related settings
- Install and manage a full Windows Public Key Infrastructure (PKI), including smart cards, certificate auto-enrollment, Online Certificate Status Protocol (OCSP) web responders, and detection of spoofed root Certification Authorities (CAs)
- Harden SSL/TLS, RDP, DNS, and SMB against attacks. This includes deploying DNSSEC, DNS sinkholes for malware, SMB encryption, and TLS cipher suite optimization
- Use PowerShell with the WMI service, such as remote command execution, searching event logs, and doing a remote inventory of user applications

SEC506 Securing Linux/Unix

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: Hal Pomeranz

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SEC506: Securing Linux/Unix provides in-depth coverage of Linux and Unix security issues that includes specific configuration guidance and practical, real-world examples, tips, and tricks. We examine how to mitigate or eliminate general problems that apply to all Unix-like operating systems, including vulnerabilities in the password authentication system, file system, virtual memory system, and applications that commonly run on Linux and Unix.

The course will teach you the skills to use freely available tools to handle security issues, including SSH, AIDE, sudo, lsof, and many others. SANS' practical approach uses hand-on exercises every day to ensure that you will be able to use these tools as soon as you return to work. We will also put these tools to work in a special section that covers simple forensic techniques for investigating compromised systems.

Who Should Attend

- Security professionals looking to learn the basics of securing Unix operating systems
- Experienced administrators looking for in-depth descriptions of attacks on Unix systems and how they can be prevented
- Administrators needing information on how to secure common Internet applications on the Unix platform
- Auditors, incident responders, and InfoSec analysts who need greater visibility into Linux and Unix security tools, procedures, and best practices

Topics

- **Memory Attacks, Buffer Overflows**
- **File System Attacks, Race Conditions**
- **Trojan Horse Programs and Rootkits**
- **Monitoring and Alerting Tools**
- **Unix Logging and Kernel-Level Auditing**
- **Building a Centralized Logging Infrastructure**
- **Network Security Tools**
- **SSH for Secure Administration**
- **Server Lockdown for Linux and Unix**
- **Controlling Root Access with sudo**
- **SELinux and chroot() for Application Security**
- **DNSSEC Deployment and Automation**
- **mod_security and Web Application Firewalls**
- **Secure Configuration of BIND, Sendmail, Apache**
- **Forensic Investigation**

"Best of any course I've ever taken. I love the idea of being able to bring the material home to review."
-Eric Koebelen, Incident Response US

Hal Pomeranz *SANS Faculty Fellow*

Hal Pomeranz is an independent digital forensic investigator who has consulted on cases ranging from intellectual property theft to employee sabotage, organized cybercrime, and malicious software infrastructures. He has worked with law enforcement agencies in the United States and Europe and with global corporations. While equally at home in the Windows or Mac environment, Hal is recognized as an expert in the analysis of Linux and Unix systems. His research on EXT4 file system forensics provided a basis for the development of open-source forensic support for this file system. His EXT3 file recovery tools are used by investigators worldwide. Hal is a SANS Lethal Forensicator, and is the creator of the SANS Linux/Unix Security track (GCUX). He holds the GCFA and GREM certifications and teaches the related courses in the SANS Forensics curriculum. He is a respected author and speaker at industry gatherings worldwide. Hal is a regular contributor to the SANS Computer Forensics blog and co-author of the Command Line Kung Fu blog. @hal_pomeranz

506.1 HANDS ON: Hardening Linux/Unix Systems – PART 1

This course tackles some of the most important techniques for protecting your Linux/Unix systems from external attacks. But it also covers what those attacks are so that you know what you're defending against. This is a full-disclosure course with in-class demos of actual exploits and hands-on exercises to experiment with various examples of malicious software, as well as different techniques for protecting Linux/Unix systems.

Topics: Memory Attacks and Overflows; Vulnerability Minimization; Boot-Time Configuration; Encrypted Access; Host-Based Firewalls

506.2 HANDS ON: Hardening Linux/Unix Systems – PART 2

Continuing our exploration of Linux/Unix security issues, this course focuses in on local exploits and access control issues. What do attackers do once they gain access to your systems? How can you detect their presence? How do you protect against attackers with physical access to your systems? What can you do to protect against mistakes (or malicious activity) by your own users?

Topics: Rootkits and Malicious Software; File Integrity Assessment; Physical Attacks and Defenses; User Access Controls; Root Access Control with sudo; Warning Banners; Kernel Tuning For Security

506.3 HANDS ON: Hardening Linux/Unix Systems – PART 3

Monitoring your systems is critical for maintaining a secure environment. This course digs into the different logging and monitoring tools available in Linux/Unix, and looks at additional tools for creating a centralized monitoring infrastructure such as Syslog-NG. Along the way, the course introduces a number of useful SSH tips and tricks for automating tasks and tunneling different network protocols in a secure fashion.

Topics: Automating Tasks With SSH; AIDE via SSH; Linux/Unix Logging Overview; SSH Tunneling; Centralized Logging with Syslog-NG

506.4 HANDS ON: Application Security – PART 1

This course examines common application security tools and techniques. The SCP-Only Shell will be presented as an example of using an application under chroot() restriction, and as a more secure alternative to file sharing protocols like anonymous FTP. The SELinux application whitelisting mechanism will be examined in depth. Tips for troubleshooting common SELinux problems will be covered and students will learn how to craft new SELinux policies from scratch for new and locally developed applications. Significant hands-on time will be provided for students to practice these concepts.

Topics: chroot() for Application Security; The SCP-Only Shell; SELinux Basics; SELinux and the Reference Policy

506.5 HANDS ON: Application Security – PART 2

This course is a full day of in-depth analysis on how to manage some of the most popular application-level services securely on a Linux/Unix platform. We will tackle the practical issues involved with securing three of the most commonly used Internet servers on Linux and Unix: BIND, Sendmail, and Apache. Beyond basic security configuration information, we will take an in-depth look at topics like DNSSec and Web Application Firewalls with mod_security and the Core Rules.

Topics: BIND; DNSSec; Apache; Web Application Firewalls with mod_security

506.6 HANDS ON: Digital Forensics for Linux/Unix

This hands-on course is designed to be an information-rich introduction devoted to basic forensic principles and techniques for investigating compromised Linux and Unix systems. At a high level, it introduces the critical forensic concepts and tools that every administrator should know and provides a real-world compromise for students to investigate using the tools and strategies discussed in class.

Topics: Tools Throughout; Forensic Preparation and Best Practices; Incident Response and Evidence Acquisition; Media Analysis; Incident Reporting

"This course is painting a big picture of how various system tools can be used together to support security, and I like how the labs are continuing to build upon each other."

-Chris H., U.S. Naval Academy

You Will Be Able To

- Significantly reduce the number of vulnerabilities in the average Linux/Unix system by disabling unnecessary services
- Protect your systems from buffer overflows, denial-of-service, and physical access attacks by leveraging OS configuration settings
- Configure IP Tables and ipfilter host-based firewalls to block attacks from outside
- Deploy SSH to protect administrative sessions, and leverage SSH functionality to securely automate routine administrative tasks
- Use sudo to control and monitor administrative access
- Create a centralized logging infrastructure with Syslog-NG, and deploy log monitoring tools to scan for significant events
- Use SELinux to effectively isolate compromised applications from harming other system services
- Securely configure common Internet-facing applications such as Apache, BIND, and Sendmail
- Investigate compromised Unix/Linux systems with the Sleuthkit, lsof, and other open-source tools
- Understand attacker rootkits and how to detect them with AIDE and rkhunter/chkrootkit

Author Statement

A wise man once said, "How are you going to learn anything if you know everything already?" And yet there seems to be a quiet arrogance in the Unix community that we have figured out all of our security problems, as if to say, "Been there, done that." All I can say is that what keeps me going in the Unix field, and the security industry in particular, is that there is always something new to learn, discover, or invent. In 20 plus years on the job, what I have learned is how much more there is that I can learn. I think this is also true for the students in my courses. I regularly get comments back from students who say things like, "I have been using Unix for 20 years, and I still learned a lot in this class." That is really rewarding.

- Hal Pomeranz

SEC511

Continuous Monitoring and Security Operations

New Extended Bootcamp Hours to Enhance Your Skills

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 7:00pm (Days 1-5)
9:00am - 5:00pm (Day 6)
46 CPEs
Laptop Required
Instructor: Seth Misenar

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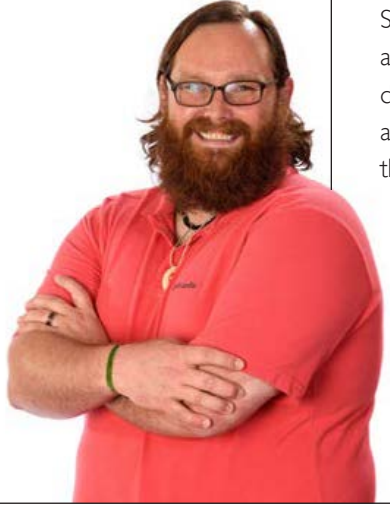

We continue to underestimate the tenacity of our adversaries! Organizations are investing significant time and financial and human resources trying to combat cyber threats and prevent cyber attacks, but despite this tremendous effort organizations are still getting compromised. The traditional perimeter-focused, prevention-dominant approach to security architecture has failed to prevent intrusions. No network is impenetrable, a reality that business executives and security professionals alike have to accept. Prevention is crucial, and we can't lose sight of it as the primary goal. However, a new proactive approach to security is needed to enhance the capabilities of organizations to detect threats that will inevitably slip through their defenses.

Who Should Attend

- Security architects
- Senior security engineers
- Technical security managers
- Security Operations Center (SOC) analysts, engineers, and managers
- CND analysts
- Individuals working to implement Continuous Diagnostics and Mitigation (CDM), Continuous Security Monitoring (CSM), or Network Security Monitoring (NSM)

The underlying challenge for organizations victimized by an attack is timely incident detection. Industry data suggest that most security breaches typically go undiscovered for an average of seven months. Attackers simply have to find one way into most organizations, because they know that the lack of visibility and internal security controls will then allow them to methodically carry out their mission and achieve their goals.

The Defensible Security Architecture, Network Security Monitoring (NSM)/Continuous Diagnostics and Mitigation (CDM)/Continuous Security Monitoring (CSM) taught in this course will best position your organization or Security Operations Center (SOC) to analyze threats and detect anomalies that could indicate cybercriminal behavior. The payoff for this new proactive approach would be early detection of an intrusion, or successfully thwarting the efforts of attackers altogether. The National Institute of Standards and Technology (NIST) developed guidelines described in NIST SP 800-137 for Continuous Monitoring (CM), and this course will greatly increase your understanding and enhance your skills in implementing CM utilizing the NIST framework.

SEC511 will take you on quite a journey. We start by exploring traditional security architecture to assess its current state and the attacks against it. Next, we discuss and discover modern security design that represents a new proactive approach to such architecture that can be easily understood and defended. We then transition to how to actually build the network and endpoint security, and then carefully navigate our way through automation, NSM/CDM/CSM. For timely detection of potential intrusions, the network and systems must be proactively and continuously monitored for any changes in the security posture that might increase the likelihood that attackers will succeed.

Your SEC511 journey will conclude with one last hill to climb! The final day (Day 6) features a Capture-the-Flag competition that challenges you to apply the skills and techniques learned in the course to detect and defend the modern security architecture that has been designed. Course authors Eric Conrad and Seth Misenar have designed the Capture-the-Flag competition to be fun, engaging, comprehensive, and challenging. You will not be disappointed!

Seth Misenar *SANS Senior Instructor*

Seth Misenar is the founder of and now the lead consultant for Jackson, Mississippi-based Context Security, which provides information security thought leadership, independent research, and security training. Seth's background includes network and web application penetration testing, vulnerability assessment, regulatory compliance efforts, security architecture design, and general security consulting. He has previously served as both physical and network security consultant for Fortune 100 companies as well as the Health Insurance Portability and Accountability Act and as information security officer for a state government agency. Prior to becoming a security geek, Seth received a bachelor's degree in philosophy from Millsaps College, where he was twice selected for a Ford Teaching Fellowship. Also, Seth is no stranger to certifications and thus far has achieved credentials that include, but are not limited to, the following: CISSP, GPEN, GWAPT, GSEC, GCIA, GCIH, GCWN, GCFA, and MCSE. @sethmisenar

511.1 HANDS ON: Current State Assessment, SOCs & Security Architecture

We begin with the end in mind by defining the key techniques and principles that will allow us to get there. An effective modern Security Operations Center (SOC) or security architecture must enable an organization's ability to rapidly find intrusions to facilitate containment and response. Both significant knowledge and a commitment and continuous monitoring are required to achieve this goal.

Topics: Current State Assessment, SOCs, and Security Architecture; Modern Security Architecture Principles; Frameworks and Enterprise Security Architecture; Security Architecture – Key Techniques/Practices; Security Operations Center

511.2 HANDS ON: Network Security Architecture

Understanding the problems with the current environment and realizing where we need to get to is far from sufficient: we need a detailed roadmap to bridge the gap between the current and desired state. Day 2 introduces and details the components of our infrastructure that become part of a defensible network security architecture and SOC. We are long past the days when a perimeter firewall and ubiquitous antivirus were sufficient security. There are many pieces and moving parts that make up a modern defensible security architecture.

Topics: SOCs/Security Architecture – Key Infrastructure Devices; Segmented Internal Networks; Defensible Network Security Architecture Principles Applied

511.3 HANDS ON: Network Security Monitoring

Designing a SOC or security architecture that enhances visibility and detective capabilities represents a paradigm shift for most organizations. However, the design is simply the beginning. The most important element of a modern security architecture is the emphasis on detection. The network security architecture presented in days one and two emphasized baking visibility and detective capabilities into the design. Now we must figure out how to look at the data and continuously monitor the enterprise for evidence of compromise or changes that increase the likelihood of compromise.

Topics: Continuous Monitoring Overview; Network Security Monitoring (NSM); Practical NSM Issues; Cornerstone NSM

511.4 HANDS ON: Endpoint Security Architecture

One of the hallmarks of modern attacks is an emphasis on client-side exploitation. The days of breaking into networks via direct frontal assaults on unpatched mail, web, or DNS servers are largely behind us. We must focus on mitigating the risk of compromise of clients. Day four details ways in which endpoint systems can be both more resilient to attack and also enhance detective capabilities.

Topics: Security Architecture – Endpoint Protection; Dangerous Endpoint Applications; Patching

511.5 HANDS ON: Automation and Continuous Security Monitoring

Network Security Monitoring (NSM) is the beginning: we need to not only detect active intrusions and unauthorized actions, but also to know when our systems, networks, and applications are at an increased likelihood for compromise. A strong way to achieve this is through Continuous Security Monitoring (CSM) or Continuous Diagnostics and Mitigation (CDM). Rather than waiting for the results of a quarterly scan or an annual penetration test to determine what needs to be addressed, continuous monitoring proactively and repeatedly assesses and reassesses the current security posture for potential weaknesses that need be addressed.

Topics: CSM Overview; Industry Best Practices; Winning CSM Techniques; Maintaining Situational Awareness; Host, Port and Service Discovery; Vulnerability Scanning; Monitoring Patching; Monitoring Applications; Monitoring Service Logs; Monitoring Change to Devices and Appliances; Leveraging Proxy and Firewall Data; Configuring Centralized Windows Event Log Collection; Monitoring Critical Windows Events; Scripting and Automation

511.6 HANDS ON: Capstone: Design, Detect, and Defend

The course culminates in a team-based Capture-the-Flag challenge that is a full day of hands-on work applying the principles taught throughout the week.

Topics: Security Architecture; Assessing Provided Architecture; Continuous Security Monitoring; Using Tools/Scripts Assessing the Initial State; Quickly/Thoroughly Find All Changes Made

You Will Be Able To

- Analyze a security architecture for deficiencies
- Apply the principles learned in the course to design a defensible security architecture
- Understand the importance of a detection-dominant security architecture and Security Operations Center (SOC)
- Identify the key components of Network Security Monitoring (NSM)/Continuous Diagnostics and Mitigation (CDM)/Continuous Monitoring (CM)
- Determine appropriate security monitoring needs for organizations of all sizes
- Implement robust Network Security Monitoring/Continuous Security Monitoring (NSM/CSM)
- Utilize tools to support implementation of Continuous Monitoring per NIST guidelines SP 800-137
- Determine requisite monitoring capabilities for a SOC environment
- Determine capabilities required to support continuous monitoring of key Critical Security Controls

"I work in net security with a lot of tools. Seth provided a great perspective on the state of cyber defense and how we should be approaching it."
-Kevin South, Navient

"I run SOCs and this course provides a gut check against what we are doing today."
-Tim Housman, General Dynamics IT

SEC542

Web App Penetration Testing and Ethical Hacking

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: Micah Hoffman

www.giac.org/gwapt

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Web applications play a vital role in every modern organization. However, if your organization doesn't properly test and secure its web apps, adversaries can compromise these applications, damage business functionality, and steal data. Unfortunately, many organizations operate under the mistaken impression that a web application security scanner will reliably discover flaws in their systems.

Who Should Attend

- General security practitioners
- Penetration testers
- Ethical hackers
- Web application developers
- Website designers and architects

SEC542 helps students move beyond push-button scanning to professional, thorough, and high-value web application penetration testing.

Customers expect web applications to provide significant functionality and data access. Even beyond the importance of customer-facing web applications, internal web applications increasingly represent the most commonly used business tools within any organization. Unfortunately, there is no "patch Tuesday" for custom web applications. Major industry studies find that web application flaws play a major role in significant breaches and intrusions. Adversaries increasingly focus on these high-value targets either by directly abusing public-facing applications or by focusing on web apps as targets after an initial break-in.

Modern cyber defense requires a realistic and thorough understanding of web application security issues. Anyone can learn to sling a few web hacks, but effective web application penetration testing requires something deeper.

SEC542 enables students to assess a web application's security posture and convincingly demonstrate the impact of inadequate security that plagues most organizations.

Students will come to understand major web application flaws and their exploitation and, most importantly, learn a field-tested and repeatable process to consistently find these flaws and convey what they have learned to their organizations. Even technically gifted security geeks often struggle with helping organizations understand risk in terms relatable to business. Much of the art of penetration testing has less to do with learning how adversaries are breaking in than it does with convincing an organization to take the risk seriously and employ appropriate countermeasures. The goal of SEC542 is to better secure organizations through penetration testing, and not just show off hacking skills. The course will help you demonstrate the true impact of web application flaws through exploitation.

In addition to high-quality course content, SEC542 focuses heavily on in-depth, hands-on labs to ensure that students can immediately apply all they learn.

In addition to more than 30 formal hands-on labs, the course culminates in a web application pen test tournament, powered by the SANS NetWars Cyber Range. This Capture-the-Flag event on the final day brings students into teams to apply their newly acquired command of web application penetration testing techniques in a fun way to hammer home lessons learned.

Micah Hoffman *SANS Certified Instructor*

Micah Hoffman has been working in the information technology field since 1998 supporting federal government, commercial, and internal customers in their efforts to discover and quantify information security weaknesses within their organizations. He leverages years of hands-on, real-world penetration testing and incident response experience to provide excellent solutions to his customers. Micah holds GIAC's GAWN, GWAPT, and GPEN certifications as well as the CISSP. Micah is an active member in the NoVAHackers community, writes Recon-ng modules and enjoys tackling issues with the Python scripting language. When not working, teaching, or learning, Micah can be found hiking or backpacking on the Appalachian Trail or the many park trails in Maryland. @WebBreacher

542.1 HANDS ON: Introduction and Information Gathering

Understanding the attacker's perspective is key to successful web application penetration testing. The course begins by thoroughly examining web technology, including protocols, languages, clients and server architectures, from the attacker's perspective. We will also examine different authentication systems, including Basic, Digest, Forms and Windows Integrated authentication, and discuss how servers use them and attackers abuse them.

Topics: Overview of the Web from a Penetration Tester's Perspective; Exploring the Various Servers and Clients; Discussion of the Various Web Architectures; Discovering How Session State Works; Discussion of the Different Types of Vulnerabilities; Defining a Web Application Test Scope and Process; Defining Types of Penetration Testing; Heartbleed Exploitation; Utilizing the Burp Suite in Web App Penetration Testing

542.2 HANDS ON: Configuration, Identity, and Authentication Testing

The second day starts the actual penetration testing process, beginning with the reconnaissance and mapping phases. Reconnaissance includes gathering publicly available information regarding the target application and organization, identifying the machines that support our target application, and building a profile of each server, including the operating system, specific software and configuration. Our discussion will be augmented by practical, hands-on exercises in which we conduct reconnaissance against an in-class target.

Topics: Discovering the Infrastructure Within the Application; Identifying the Machines and Operating Systems; Secure Sockets Layer (SSL) Configurations and Weaknesses; Exploring Virtual Hosting and Its Impact on Testing; Learning Methods to Identify Load Balancers; Software Configuration Discovery; Exploring External Information Sources; Google Hacking; Learning Tools to Spider a Website; Scripting to Automate Web Requests and Spidering; Brute Forcing Unlinked Files and Directories; Discovering and Exploiting Shellshock

542.3 HANDS ON: Injection

This section continues to explore our methodology with the discovery phase. We will build on the information started the previous day, exploring methods to find and verify vulnerabilities within the application. Students will also begin to explore the interactions between the various vulnerabilities.

Topics: Web App Vulnerabilities and Manual Verification Techniques; Interception Proxies; Zed Attack Proxy (ZAP); Burp Suite; Information Leakage, and Directory Browsing; Username Harvesting; Command Injection; Directory Traversal; SQL Injection; Blind SQL Injection; Local File Inclusion (LFI); Remote-File Inclusion (RFI); JavaScript for the Attacker

542.4 HANDS ON: JavaScript and XSS

On day four, students continue exploring the discovery phase of the methodology. We cover methods to discover key vulnerabilities within web applications, such as Cross-Site Scripting (XSS) and Cross-Site Request Forgery (CSRF/XSRF). Manual discovery methods are employed during hands-on labs.

Topics: Cross-Site Scripting (XSS); Cross-Site Request Forgery (CSRF); Session Flaws; Session Fixation; AJAX; Logic Attacks; Data Binding Attacks; patproxy; Automated Web Application Scanners; w3af; XML and JSON

542.5 HANDS ON: CSRF, Logic Flaws, and Advanced Tools

On the fifth day, we launch actual exploits against real-world applications, building on the previous three steps, expanding our foothold within the application, and extending it to the network on which it resides. As penetration testers, we specifically focus on ways to leverage previously discovered vulnerabilities to gain further access, highlighting the cyclical nature of the four-step attack methodology.

Topics: Exploring Methods to Zombify Browsers; Browser Exploitation Framework (BeEF); Walking Through an Entire Attack Scenario; Exploiting the Various Vulnerabilities Discovered; Leveraging Attacks to Gain Access to the System; How to Pivot Our Attacks Through a Web Application; Understanding Methods of Interacting with a Server Through SQL Injection; Exploiting Applications to Steal Cookies; Executing Commands Through Web Application Vulnerabilities

542.6 HANDS ON: Capture the Flag

On day six, students form teams and compete in a web application penetration testing tournament. This NetWars-powered Capture-the-Flag exercise provides students an opportunity to wield their newly developed or further-honed skills to answer questions, complete missions, and exfiltrate data, applying skills gained throughout the course. The style of challenge and integrated-hint system allows students of various skill levels to both enjoy a game environment and solidify the skills learned in class.

You Will Be Able To

- Apply a detailed, four-step methodology to your web application penetration tests: reconnaissance, mapping, discovery, and exploitation
- Analyze the results from automated web testing tools to validate findings, determine their business impact, and eliminate false positives
- Manually discover key web application flaws
- Use Python to create testing and exploitation scripts during a penetration test
- Discover and exploit SQL Injection flaws to determine true risk to the victim organization
- Create configurations and test payloads within other web attacks
- Fuzz potential inputs for injection attacks
- Explain the impact of exploitation of web application flaws
- Analyze traffic between the client and the server application using tools such as the Zed Attack Proxy and Burp Suite to find security issues within the client-side application code
- Manually discover and exploit Cross-Site Request Forgery (CSRF) attacks
- Use the Browser Exploitation Framework (BeEF) to hook victim browsers, attack client software and the network, and evaluate the potential impact that XSS flaws have within an application
- Perform a complete web penetration test during the Capture the Flag exercise to bring techniques and tools together into a comprehensive test

"The content in SEC542 is very relevant as it features recently discovered vulnerabilities. It also effectively, from my view, caters to various experience levels."
-Malcolm King, Morgan Stanley

"SEC542 is a step-by-step introduction to testing and penetrating web applications – a must for anyone who builds, maintains, or audits web systems."
-Brad Milhorn, i12P LLC

SEC550

Active Defense, Offensive Countermeasures & Cyber Deception

SANS

Five-Day Program
Mon, Sep 12- Fri, Sep 16
9:00am - 5:00pm
30 CPEs
Laptop Required
Instructor: Bryce Galbraith

You Will Learn:

- How to force an attacker to take more moves to attack your network – moves that in turn may increase your ability to detect that attacker
- How to gain better attribution as to who is attacking you and why
- How to gain access to a bad guy's system
- Most importantly, you will find out how to do the above legally

The current threat landscape is shifting. Traditional defenses are failing us. We need to develop new strategies to defend ourselves. Even more importantly, we need to better understand who is attacking us and why. You may be able to immediately implement some of the measures we discuss in this course, while others may take a while. Either way, consider what we discuss as a collection of tools that will be at your disposal when you need them to annoy attackers, determine who is attacking you, and, finally, attack the attackers.

Who Should Attend

- General security practitioners
- Penetration testers
- Ethical hackers
- Web application developers
- Website designers and architects

SEC550: Active Defense, Offensive Countermeasures, and Cyber Deception is based on the Active Defense Harbinger Distribution live Linux environment funded by the Defense Advanced Research Projects Agency (DARPA). This virtual machine is built from the ground up for defenders to quickly implement Active Defenses in their environments. The course is very heavy with hands-on activities – we won't just talk about Active Defenses, we will work through labs that will enable you to quickly and easily implement what you learn in your own working environment.

You Will Be Able To

- Track bad guys with callback Word documents
- Use Honeybadger to track web attackers
- Block attackers from successfully attacking servers with honeyports
- Block web attackers from automatically discovering pages and input fields
- Understand the legal limits and restrictions of Active Defense
- Obfuscate DNS entries
- Create non-attributable Active Defense Servers
- Combine geolocation with existing Java applications
- Create online social media profiles for cyber deception
- Easily create and deploy honeypots

"It's hard to imagine a better instructor than Bryce. He is obviously very skilled and experienced – his teaching skill and personality is a perfect fit."
-Patrick Gustafson, Allianz Life Insurance

What You Will Receive

- A fully functioning Active Defense Harbinger Distribution ready to deploy
- Class books and a DVD with the necessary tools and the OCM virtual machine, which is a fully functional Linux system with the OCM tools installed and ready to go for the class and for the students' work environments

"SEC550 is the next step in the evolution of cyber defense – learning to make the hacker's job harder, track their movement, and get attribution." -Mick Leach, Nationwide

Bryce Galbraith *SANS Principal Instructor*

As a contributing author of the internationally bestselling book *Hacking Exposed: Network Security Secrets & Solutions*, Bryce helped bring the secret world of hacking out of the darkness and into the public eye. Bryce has held security positions at global ISPs and Fortune 500 companies, he was a member of Foundstone's renowned penetration testing team, and he served as a senior instructor and co-author of Foundstone's Ultimate Hacking: Hands-On course series. Bryce is currently the owner of Layered Security, where he provides specialized vulnerability assessment and penetration testing services for clients. He teaches several of the SANS Institute's most popular courses and develops curriculum around current topics. He has taught the art of ethical hacking and countermeasures to thousands of IT professionals from a who's who of top companies, financial institutions, and government agencies around the globe. Bryce is an active member of several security-related organizations, holds several security certifications, and speaks at conferences around the world. @brycegalbraith

SEC562

CyberCity Hands-on Kinetic Cyber Range Exercise

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: Tim Medin

Computers, networks, and programmable logic controllers operate most of the physical infrastructure of our modern world, ranging from electrical power grids, water systems, and traffic systems all the way down to HVAC systems and industrial automation. Increasingly, security professionals need the skills to assess and defend this important infrastructure. In this innovative and cutting-edge course based on the SANS CyberCity kinetic range, you will learn how to analyze and assess the security of control systems and related infrastructure, finding vulnerabilities that could result in significant kinetic impact.

Who Should Attend

- Red and blue team members
- Cyber warriors
- Incident handlers
- Penetration testers
- Ethical hackers
- Other security personnel who are first responders when systems come under attack

The main objectives of CyberCity are to:

- Teach cyber warriors and their leaders the potential kinetic impacts of cyber attacks
- Provide a hands-on, realistic kinetic cyber range with engaging missions to conduct defensive and offensive actions
- Develop capabilities for defending and controlling critical infrastructure components to mitigate or respond to cyber attacks
- Demonstrate to senior leaders and planners the potential impacts of cyber attacks and cyber warfare

NetWars CyberCity

NetWars CyberCity, our most in-depth and ambitious offering, is designed to teach warriors and InfoSec pros that cyber action can have significant kinetic impact in the physical world. As computer technology, networks, and industrial control systems permeate nearly every aspect of modern life, military, government, and commercial organizations have an increasing need for skilled defenders to protect critical infrastructure. We engineered and built CyberCity to help organizations grow these capabilities in their teams.

CyberCity is a 1:87 scale miniaturized physical city that features SCADA-controlled electrical power distribution, as well as water, transit, hospital, bank, retail, and residential infrastructure. CyberCity engages participants to defend the city's components from terrorist cyber attacks, as well as to utilize offensive tactics to retake or maintain control of critical assets.

"Very very very excellent course! I would like to take this course again." -Masashi Fujiwara, Hitachi Ltd

Participants engage in missions, with specific operation orders describing the defensive or offensive goal they need to achieve. On some missions, participants prevent attackers from undermining the CyberCity infrastructure and wreaking havoc, with all the kinetic action captured through streaming video cameras mounted around the physical city. On offensive missions, participants must seize control of CyberCity assets, retaking them from adversaries and using them to achieve a kinetic impact specified in their operation orders. Each mission includes not only a list of goals to be achieved, but also specific sensitive city assets that are out of bounds for the engagement, requiring additional tactical planning to adhere to the rules of engagement.

To achieve mission objectives, participants work as a team, engaging in effective mission planning, devising overall strategies and particular tactics, and exercising detailed technical skills. Furthermore, some participants will be charged as leaders of their teams, helping to build and assess leadership skills, decision-making capabilities, and the ability to brief senior leadership. Multiple realistic defensive and offensive missions test the cyberspace engineers' ability to thwart the best efforts of a well-funded terrorist organization or other cyber attacker trying to control city assets.

Tim Medin *SANS Certified Instructor*

Tim Medin is a senior technical analyst at Counter Hack, a company devoted to the development of information security challenges for education, evaluation, and competition. Through the course of his career, Tim has performed penetration tests on a wide range of organizations and technologies. Prior to Counter Hack, Tim was a Senior Security Consultant for FishNet Security, where most of his focus was on penetration testing. He gained information security experience in a variety of industries, including previous positions in control systems, higher education, financial services, and manufacturing. Tim regularly contributes to the SANS Penetration Testing Blog (pen-testing.sans.org/blog/) and the Command Line Kung Fu Blog (blog.commandlinekungfu.com). He is also project lead for the Laudanum Project, a collection of injectable scripts designed to be used in penetration testing. @timmedin

SEC560

Network Penetration Testing and Ethical Hacking

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 7:15pm (Day 1)
9:00am - 5:00pm (Days 2-6)
37 CPEs
Laptop Required
Instructor: Ed Skoudis

www.giac.org/gpen

www.sans.edu

www.sans.org/cyber-guardian

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

ALSO AVAILABLE VIA SIMULCAST
www.sans.org/simulcast

As a cybersecurity professional, you have a unique responsibility to find and understand your organization's vulnerabilities, and to work diligently to mitigate them before the bad guys pounce. Are you ready? SANS SEC560, our flagship course for penetration testing, fully arms you to address this task head-on.

Who Should Attend

- Security personnel whose job involves assessing networks and systems to find and remediate vulnerabilities
- Penetration testers
- Ethical hackers
- Defenders who want to better understand offensive methodologies, tools, and techniques
- Auditors who need to build deeper technical skills
- Red and blue team members
- Forensics specialists who want to better understand offensive tactics

SEC560 is the must-have course for every well-rounded security professional.

With comprehensive coverage of tools, techniques, and methodologies for network penetration testing, SEC560 truly prepares you to conduct high-value penetration testing projects step-by-step and end-to-end. Every organization needs skilled information security personnel who can find vulnerabilities and mitigate their effects, and this entire course is specially designed to get you ready for that role. The course starts with proper planning, scoping and recon, then dives deep into scanning, target exploitation, password attacks, and web app manipulation, with over 30 detailed hands-on labs throughout. The course is chock full of practical, real-world tips from some of the world's best penetration testers to help you do your job safely, efficiently…and masterfully.

Learn the best ways to test your own systems before the bad guys attack.

SEC560 is designed to get you ready to conduct a full-scale, high-value penetration test – and on the last day of the course you'll do just that. After building your skills in comprehensive and challenging labs over five days, the course culminates with a final full-day, real-world penetration test scenario. You'll conduct an end-to-end pen test, applying knowledge, tools, and principles from throughout the course as you discover and exploit vulnerabilities in a realistic sample target organization, demonstrating the knowledge you've mastered in this course.

You will bring comprehensive penetration testing and ethical hacking know-how back to your organization.

You will learn how to perform detailed reconnaissance, studying a target's infrastructure by mining blogs, search engines, social networking sites, and other Internet and intranet infrastructures. Our hands-on labs will equip you to scan target networks using best-of-breed tools. We won't just cover run-of-the-mill options and configurations, we'll also go over the lesser known but super-useful capabilities of the best pen test toolsets available today. After scanning, you'll learn dozens of methods for exploiting target systems to gain access and measure real business risk. You'll dive deep into post-exploitation, password attacks, and web apps, pivoting through the target environment to model the attacks of real-world bad guys to emphasize the importance of defense in depth.

Ed Skoudis *SANS Faculty Fellow*

Ed Skoudis is the founder of Counter Hack, an innovative organization that designs, builds, and operates popular InfoSec challenges and simulations including CyberCity, NetWars, Cyber Quests, and Cyber Foundations. As director of the CyberCity project, Ed oversees the development of missions that help train cyber warriors in how to defend the kinetic assets of a physical, miniaturized city. Ed's expertise includes hacker attacks and defenses, incident response, and malware analysis, with over 15 years of experience in information security. Ed authored and regularly teaches the SANS courses on network penetration testing (SEC560) and incident response (SEC504), helping over 3,000 information security professionals each year improve their skills and abilities to defend their networks. He has performed numerous security assessments; conducted exhaustive anti-virus, anti-spyware, Virtual Machine, and IPS research; and responded to computer attacks for clients in government, military, financial, high technology, healthcare, and other industries. Previously, Ed served as a security consultant with InGuardians, International Network Services (INS), Global Integrity, Predictive Systems, SAIC, and Bell Communications Research (Bellcore). Ed also blogs about command line tips and penetration testing. @edskoudis

560.1 HANDS ON: Comprehensive Pen Test Planning, Scoping, and Recon

In this section of the course, you will develop the skills needed to conduct a best-of-breed, high-value penetration test. We will go in-depth on how to build penetration testing infrastructure that includes all the hardware, software, network infrastructure, and tools you will need to conduct great penetration tests, with specific low-cost recommendations for your arsenal. We will then cover formulating a pen test scope and rules of engagement that will set you up for success, including a role-play exercise. We'll also dig deep into the reconnaissance portion of a penetration test, covering the latest tools and techniques, including hands-on document metadata analysis to pull sensitive information about a target environment, as well as a lab using Recon-ng to plunder a target's DNS infrastructure for information such as the anti-virus tools the organization relies on.

Topics: The Mindset of the Professional Pen Tester; Building a World-Class Pen Test Infrastructure; Creating Effective Pen Test Scopes and Rules of Engagement; Detailed Recon Using the Latest Tools; Effective Pen Test Reporting to Maximize Impact; Mining Search Engine Results; Document Metadata Extraction and Analysis

560.2 HANDS ON: In-Depth Scanning

We next focus on the vital task of mapping the target environment's attack surface by creating a comprehensive inventory of machines, accounts, and potential vulnerabilities. We will look at some of the most useful scanning tools freely available today and run them in numerous hands-on labs to help hammer home the most effective way to use each tool. We will also conduct a deep dive into some of the most useful tools available to pen testers today for formulating packets: Scapy and Netcat. We finish the day covering vital techniques for false-positive reduction so you can focus your findings on meaningful results and avoid the sting of a false positive. And we will examine the best ways to conduct your scans safely and efficiently.

Topics: Tips for Awesome Scanning; Tcpdump for the Pen Tester; Nmap In-Depth: The Nmap Scripting Engine; Version Scanning with Nmap; Vulnerability Scanning with Nessus; False-Positive Reduction; Packet Manipulation with Scapy; Enumerating Users; Netcat for the Pen Tester; Monitoring Services During a Scan

560.3 HANDS ON: Exploitation

In this section, we look at the many kinds of exploits that penetration testers use to compromise target machines, including client-side exploits, service-side exploits, and local privilege escalation. We'll see how these exploits are packaged in frameworks like Metasploit and its mighty Meterpreter. You'll learn in-depth how to leverage Metasploit and the Meterpreter to compromise target environments. We'll also analyze the topic of anti-virus evasion to bypass the target organization's security measures, as well as methods for pivoting through target environments, all with a focus on determining the true business risk of the target organization.

Topics: Comprehensive Metasploit Coverage with Exploits/Stagers/Stages; Strategies and Tactics for Anti-Virus Evasion; In-Depth Meterpreter Analysis, Hands-On; Implementing Port Forwarding Relays for Merciless Pivots; How to Leverage Shell Access of a Target Environment

560.4 HANDS ON: Post-Exploitation and Merciless Pivoting

Once you've successfully exploited a target environment, penetration testing gets extra exciting as you perform post-exploitation, gathering information from compromised machines and pivoting to other systems in your scope. This section of the course zooms in on pillaging target environments and building formidable hands-on command line skills. We'll cover Windows command line skills in-depth, including PowerShell's awesome abilities for post-exploitation. We'll see how we can leverage malicious services and the incredible WMIC toolset to access and pivot through a target organization. We'll then turn our attention to password guessing attacks, discussing how to avoid account lockout, as well as numerous options for plundering password hashes from target machines including the great Mimikatz Kiwi tool. Finally, we'll look at Metasploit's fantastic features for pivoting, including the msfconsole route command.

Topics: Windows Command Line Kung Fu for Penetration Testers; PowerShell's Amazing Post-Exploitation Capabilities; Password Attack Tips; Account Lockout and Strategies for Avoiding It; Automated Password Guessing with THC-Hydra; Retrieving and Manipulating Hashes from Windows, Linux, and Other Systems; Pivoting through Target Environments; Extracting Hashes and Passwords from Memory with Mimikatz Kiwi

560.5 HANDS ON: In-Depth Password Attacks and Web App Pen Testing

In this section of the course, we'll go even deeper in exploiting one of the weakest aspects of most computing environments: passwords. You'll custom-compile John the Ripper to optimize its performance in cracking passwords. You'll look at the amazingly full-featured Cain tool, running it to crack sniffed Windows authentication messages. We'll see how Rainbow Tables really work to make password cracking much more efficient, all hands-on. And we'll cover powerful "pass-the-hash" attacks, leveraging Metasploit, the Meterpreter, and more. We then turn our attention to web application pen testing, covering the most powerful and common web app attack techniques with hands-on labs for every topic we address. We'll cover finding and exploiting cross-site scripting (XSS), cross-site request forgery (XSRF), command injection, and SQL injection flaws in applications such as online banking, blog sites, and more.

Topics: Password Cracking with John the Ripper; Sniffing and Cracking Windows Authentication Exchanges Using Cain; Using Rainbow Tables to Maximum Effectiveness; Pass-the-Hash Attacks with Metasploit and More; Finding and Exploiting Cross-Site Scripting; Cross-Site Request Forgery; SQL Injection; Leveraging SQL Injection to Perform Command Injection; Maximizing Effectiveness of Command Injection Testing

560.6 HANDS ON: Penetration Test and Capture-the-Flag Workshop

This lively session represents the culmination of the network penetration testing and ethical hacking course. You'll apply all of the skills mastered in the course so far in a full-day, hands-on workshop during which you'll conduct an actual penetration test of a sample target environment. We'll provide the scope and rules of engagement, and you'll work with a team to achieve your goal of finding out whether the target organization's Personally Identifiable Information (PII) is at risk. As a final step in preparing you for conducting penetration tests, you'll make recommendations about remediating the risks you identify.

Topics: Applying Penetration Testing and Ethical Hacking Practices End-to-End; Scanning; Exploitation; Post-Exploitation; Merciless Pivoting; Analyzing Results

You Will Be Able To

- Develop tailored scoping and rules of engagement for penetration testing projects to ensure the work is focused, well defined, and conducted in a safe manner
- Conduct detailed reconnaissance using document metadata, search engines, and other publicly available information sources to build a technical and organizational understanding of the target environment
- Utilize a scanning tool such as Nmap to conduct comprehensive network sweeps, port scans, OS fingerprinting, and version scanning to develop a map of target environments
- Choose and properly execute Nmap Scripting Engine scripts to extract detailed information from target systems
- Configure and launch a vulnerability scanner such as Nessus so that it safely discovers vulnerabilities through both authenticated and unauthenticated scans, and customize the output from such tools to represent the business risk to the organization
- Analyze the output of scanning tools to eliminate false positive reduction with tools including Netcat and Scapy
- Utilize the Windows PowerShell and Linux bash command lines during post-exploitation to plunder target systems for vital information that can further overall penetration test progress, establish pivots for deeper compromise, and help determine business risks
- Configure an exploitation tool such as Metasploit to scan, exploit, and then pivot through a target environment
- Evade anti-virus tools using powerful frameworks designed to hide executables
- Conduct comprehensive password attacks against an environment, including automated password guessing (while avoiding account lockout), traditional password cracking, rainbow table password cracking, and pass-the-hash attacks
- Launch web application vulnerability scanners and then manually exploit Cross-Site Request Forgery, Cross-Site Scripting, Command Injection, and SQL Injection to understand the business risk faced by an organization

"I learned more in one class then in years of self study!"
-Bradley Milhorn, Compucom Inc.

SEC566 Implementing and Auditing the Critical Security Controls – In-Depth

SANS

Five-Day Program
Mon, Sep 12- Fri, Sep 16
9:00am - 5:00pm
30 CPEs
Laptop Required
Instructor: James Tarala

www.giac.org/gccc

SANS Technology Institute
www.sans.edu

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Cybersecurity attacks are increasing and evolving so rapidly that it is more difficult than ever to prevent and defend against them. Does your organization have an effective method in place to detect, thwart, and monitor external and internal threats to prevent security breaches? This course helps you master specific, proven techniques and tools needed to implement and audit the Critical Security Controls as documented by the Center for Internet Security (CIS).

As threats evolve, an organization's security should too. To enable your organization to stay on top of this ever-changing threat scenario, SANS has designed a comprehensive course on how to implement the Critical Security Controls, a prioritized, risk-based approach to security. Designed by private and public sector experts from around the world, the Controls are the best way to block known attacks and mitigate damage from successful attacks. They have been adopted by the U.S. Department of Homeland Security, state governments, universities, and numerous private firms.

Who Should Attend

- Information assurance auditors
- System implementers or administrators
- Network security engineers
- IT administrators
- Department of Defense personnel or contractors
- Staff and clients of federal agencies
- Private sector organizations looking to improve information assurance processes and secure their systems
- Security vendors and consulting groups looking to stay current with frameworks for information assurance
- Alumni of SEC/AUD440, SEC401, SEC501, SANS Audit classes, and MGT512

The Controls are specific guidelines that CISOs, CIOs, IGs, systems administrators, and information security personnel can use to manage and measure the effectiveness of their defenses. They are designed to complement existing standards, frameworks, and compliance schemes by prioritizing the most critical threat and highest payoff defenses, while providing a common baseline for action against risks that we all face.

The Controls are an effective security framework because they are based on actual attacks launched regularly against networks. Priority is given to Controls that (1) mitigate known attacks (2) address a wide variety of attacks, and (3) identify and stop attackers early in the compromise cycle. The British government's Center for the Protection of National Infrastructure describes the Controls as the "baseline of high-priority information security measures and controls that can be applied across an organisation in order to improve its cyber defence."

SANS' in-depth, hands-on training will teach you how to master the specific techniques and tools needed to implement and audit the Critical Controls. It will help security practitioners understand not only how to stop a threat, but why the threat exists, and how to ensure that security measures deployed today will be effective against the next generation of threats.

The course shows security professionals how to implement the Controls in an existing network through cost-effective automation. For auditors, CIOs, and risk officers, the course is the best way to understand how you will measure whether the Controls are effectively implemented.

James Tarala *SANS Senior Instructor*

James Tarala is a principal consultant with Enclave Security and is based in Venice, Florida. He is a regular speaker for the SANS Institute as well as a courseware author and editor for many SANS auditing and security courses. As a consultant, he has spent the past few years developing large enterprise IT security and infrastructure architectures, specifically working with many Microsoft-based directory services, e-mail, terminal services, and wireless technologies. He has also spent a large amount of time consulting with organizations to assist them with their security management, operational practices, and regulatory compliance issues, and he often performs independent security audits and assists internal audit groups in developing their internal audit programs. James completed his undergraduate studies at Philadelphia Biblical University and his graduate work at the University of Maryland. He holds numerous professional certifications. @isaudit

566.1 HANDS ON: Introduction and Overview of the 20 Critical Controls

Day 1 will introduce you to all of the Critical Controls, laying the foundation for the rest of the class. For each Control, we will follow the same outline covering the following information:

- Overview of the Control
- How It Is Compromised
- Defensive Goals
- Quick Wins
- Visibility & Attribution
- Configuration & Hygiene
- Advanced
- Overview of Evaluating the Control
- Core Evaluation Test(s)
- Testing/Reporting Metrics
- Steps for Root Cause Analysis of Failures
- Audit/Evaluation Methodologies
- Evaluation Tools
- Exercise to Illustrate Implementation or Steps for Auditing a Control

In addition, Critical Controls 1 and 2 will be covered in depth.

Topics: Critical Control 1: Inventory of Authorized and Unauthorized Devices
Critical Control 2: Inventory of Authorized and Unauthorized Software

566.2 HANDS ON: Critical Controls 3, 4, 5, and 6

Topics: Critical Control 3: Secure Configurations for Hardware and Software on Laptops, Workstations, and Servers
Critical Control 4: Continuous Vulnerability Assessment and Remediation
Critical Control 5: Controlled Use of Administrative Privileges
Critical Control 6: Maintenance, Monitoring, and Analysis of Audit Logs

566.3 HANDS ON: Critical Controls 7, 8, 9, 10, and 11

Topics: Critical Control 7: Email and Web Browser Protections
Critical Control 8: Malware Defenses
Critical Control 9: Limitation and Control of Network Ports, Protocols, and Services
Critical Control 10: Data Recovery Capability (validated manually)
Critical Control 11: Secure Configurations for Network Devices such as Firewalls, Routers, and Switches

566.4 HANDS ON: Critical Controls 12, 13, 14, and 15

Topics: Critical Control 12: Boundary Defense
Critical Control 13: Data Protection
Critical Control 14: Controlled Access Based on the Need to Know
Critical Control 15: Wireless Device Control

566.5 HANDS ON: Critical Controls 16, 17, 18, 19, and 20

Topics: Critical Control 16: Account Monitoring and Control
Critical Control 17: Security Skills Assessment and Appropriate Training to Fill Gaps (validated manually)
Critical Control 18: Application Software Security
Critical Control 19: Incident Response and Management (validated manually)
Critical Control 20: Penetration Tests and Red Team Exercises

You Will Be Able To

- Apply a security framework based on actual threats that is measurable, scalable, and reliable in stopping known attacks and protecting organizations' important information and systems
- Understand the importance of each Control, how it is compromised if ignored, and explain the defensive goals that result in quick wins and increased visibility of networks and systems
- Identify and utilize tools that implement Controls through automation
- Learn how to create a scoring tool for measuring the effectiveness of each Control
- Employ specific metrics to establish a baseline and measure the effectiveness of the Controls
- Understand how the Critical Controls map to standards such as NIST 800-53, ISO 27002, the Australian Top 35, and more
- Audit each of the Critical Controls with specific, proven templates, checklists, and scripts provided to facilitate the audit process

"The 20 controls presented in the course are requirements found in most regulated industries. I found the format and layout of each control well explained and easy to follow."
-Josh Ellis, Iberdrola USA

"This is a must-do course if you are looking to steer your company through some hefty controls to security."
-Jeff Evenson, AgStar Financial Services

"I'm leaving the class with a great mindset aimed at evaluating the current environment and controls. SEC566 was good information with a great instructor!" -Tom Kozelsky, Nexeo Solution

"I will be recommending that our whole security team take this course." -Matthew Morris, DHS/OBIM

SEC573

Python for Penetration Testers

SANS

Five-Day Program
Mon, Sep 12- Fri, Sep 16
9:00am - 5:00pm
30 CPEs
Laptop Required
Instructor: Jonathan Thyer

www.giac.org/gpyc

www.sans.edu

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

"Excellent class for beginners and advanced alike. It has something for everyone."
-Mike Perez, Disney

Who Should Attend

- Security professionals who want to learn how to develop Python applications
- Penetration testers who want to move from being a consumer of security tools to being the creator of security tools
- Technologists who need custom tools to test their infrastructure and who want to create those tools themselves

Your target has been well hardened. So far, your every attempt to compromise their network has failed. You did find evidence of vulnerability, a break in their defensive posture. Unfortunately, all of your tools have failed to successfully exploit it. Your employers demand results. You want to model the actions of an advanced adversary and take advantage of that discovered flaw your tools can't seem to address. What do you do when off-the-shelf tools fall short? You write your own tool!

SEC573: Python for Penetration Testers will teach you the skills needed not only to tweak or customize tools, but to even develop your own tools from scratch. The course is designed to meet you at your current skill level and appeal to a wide variety of backgrounds. Whether you have absolutely no coding experience or are a skilled Python developer looking to apply your coding skills to penetration testing, this course has something for you.

You cannot become a world-class tool builder by merely listening to lectures, so this course is chock full of hands-on labs. Every day we will teach you the skills you need to develop serious Python programs and show you how to apply those skills in penetration testing engagements.

The course begins with an introduction to SANS pyWars, which is a four-day Capture-the-Flag competition that runs parallel to the course material. It will challenge your existing programming skills and help you develop new skills at your own pace. Experienced programmers can quickly progress to more advanced concepts while novice programmers spend time building a strong foundation.

We then cover the essential skills required to get the most out of the Python language. The essentials workshop labs will teach you the concepts and techniques required to develop your own tools. The workshop focuses on essential programming skills and how to apply them in real-world scenarios, but it also shows you shortcuts that will make even experienced developers more deadly. Once everyone understands the essentials, we apply those skills by developing tools to help you in your next penetration test. You will develop a port-scanning, anti-virus-evading, client-infecting backdoor for placement on target systems, as well as a SQL injection tool to extract data from websites that are immune to off-the-shelf tools. You will learn the concepts required to build a multi-threaded password guessing tool and a packet assembling network reconnaissance tool. The course concludes with a capstone one-day Capture-the-Flag event that complements the pyWars challenge and tests your ability to apply your new tools and coding skills in a penetration testing challenge.

The ability to read, write, and customize software is what distinguishes the good penetration tester from the great one. The best penetration testers can customize existing open-source tools or develop their own tools. Unfortunately, even though organizations serious about security continually emphasize their need for skilled tool builders, many testers do not have these skills. Developing these skills is not beyond your reach. So when you are ready to fully weaponize your penetration testing skillset and build and use your own tools to automate your penetration testing skills, join us for **SEC573: Python for Penetration Testers**.

Jonathan Thyer *SANS Instructor*

Jonathan (Joff) Thyer is a Senior Security Consultant, Researcher, and Penetration tester with Black Hills Information Security. Joff has over 15 years of experience in the IT industry as an enterprise network architect, network security defender, and information security consultant. He has experience with intrusion detection and prevention systems, vulnerability analysis, penetration testing, engineering network infrastructure defense, including Cisco ISE deployment, and software development. Joff has taught Mastering Packet Analysis and mentored SEC503: Intrusion Detection In-Depth and currently teaches SEC573: Python for Penetration Testers for SANS Institute. He is also a co-host on the Security Weekly podcast, which features latest information security news, research, interviews, and technical information. Joff holds a B.Sc. in Mathematics, an M.Sc. in Computer Science, and GIAC penetration testing certifications GPEN, GWAPT, and GXPN.

573.1 HANDS ON: Essentials Workshop – PART 1

The course begins with a brief introduction to Python and the pyWars challenge. We set the stage for students to learn at their own pace in the 100% hands-on pyWars lab environment. More advanced students will take on Python-based challenges, while students who are new to programming will start from the very beginning with Python essentials.

Topics: Variables; Math Operators; Strings; Functions; Modules; Compound Statements; Introspection

573.2 HANDS ON: Essentials Workshop – PART 2

You will never learn to program by staring at Powerpoint slides. The second day continues the hands-on lab-centric approach established on day one. This section continues covering the essentials of the language, including data structures and programming concepts. With the essentials of the language under your belt, the pyWars challenges and the in-class labs start to cover more complex subjects.

Topics: Lists; Loops; Tuples; Dictionaries; The Python Debugger; System Arguments & OptParser; File Operations

573.3 HANDS ON: Pen Testing Applications – PART 1

Day 3 shifts gears. With a core set of skills established, we can begin developing penetration testing tools that you can use in your next engagement. You will develop a backdoor command shell that evades antivirus software and provides you with that critical initial foothold in the target environment. You will then develop a customizable SQL injection tool that you can use to extract all the data from a vulnerable database when off-the-shelf tools fail. Finally, we will discuss how to speed up your code with multi-threading.

Topics: Network Sockets; Exception Handling; Process Execution; Metasploit Integration; Antivirus; IDS Evasion; Introduction to SQL; Blind SQL Injection Techniques; Developing Web Clients; Multi-Threaded Applications; Mutexes and Semaphores; Message Queues; Thread Communications

573.4 HANDS ON: Pen Testing Applications – PART 2

In this section you will develop more tools that will make you a more lethal penetration tester. First, you will develop a custom web-based password guesser. This will teach you how to get the most out of Python's web-based libraries and interact with websites using cookies, proxies, and other features to p0wn the most difficult web-based authentication systems. Then, you'll write a network reconnaissance tool that will demonstrate the power of Python's third-party libraries.

Topics: HTTP Form Password Guessing; Advanced Web Client Techniques; HTTP Proxies/HTTP Cookies; Session Hijacking; TCP Packet Reassembly with Scapy; Extracting Images from TCP Streams; Analyzing Image Metadata

573.5 HANDS ON: Capture the Flag

The Capture-the-Flag event on the final day complements the pyWars challenge and tests your ability to apply your new penetration testing tools and coding skills. Working in teams, students apply the skills they have mastered in a series of penetration testing challenges. Participants will exercise the skills and code they have developed over the previous four days as they exploit vulnerable systems, break encryption cyphers, and remotely execute code on target systems. Test your skills! Prove your might!

"Best class ever! After just 2 days I'm getting comfortable with the nuances of Python. I never thought that would happen."

-Jay Wilson, Navient

"SEC573 gave me exposure to tools and techniques I wouldn't have normally considered, but now are part of my arsenal."

-Allen C., DoD

You Will Be Able To

- Write a backdoor that uses Exception Handling, Sockets, Process execution, and encryption to provide you with your initial foothold in a target environment. The backdoor will include features such as a port scanner to find an open outbound port, the ability to evade antivirus software and network monitoring, and the ability to embed payload from tools such as Metasploit.
- Write a SQL injection tool that uses standard Python libraries to interact with target websites. You will be able to use different SQL attack techniques for extracting data from a vulnerable target system.
- Develop a tool to launch password guessing attacks. While developing this tool you will also make your code run faster by using multi-threading. You will handle a modern authentication system by finding cookies and bypassing CAPTCHAs. You will know how to enhance your program with local application proxies and how to create and use target customized password files.
- Write a network reconnaissance tool that uses SCAPY, cStringsIO and PIL to reassemble TCP packet streams, extract data payloads such as images, display images, extract Metadata such as GPS coordinates and link those images with GPS coordinates to Google maps.

You Will Receive

- A virtual machine with sample code and working examples
- A copy of the book *Violent Python: A Cookbook for Hackers, Forensic Analysts, Penetration Testers and Security Engineers*, which shows how to forge your own weapons using the Python programming language
- MP3 audio files of the complete course lecture

SEC575 Mobile Device Security and Ethical Hacking

NEW!

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: Joshua Wright

www.giac.org/gmob

SANS Technology Institute
www.sans.edu

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

Who Should Attend

- Penetration testers
- Ethical hackers
- Auditors who need to build deeper technical skills
- Security personnel whose job involves assessing, deploying or securing mobile phones and tablets
- Network and system administrators supporting mobile phones and tablets

Imagine an attack surface spread throughout your organization and in the hands of every user. It moves from place to place regularly, stores highly sensitive and critical data, and sports numerous different wireless technologies all ripe for attack. You don't need to imagine any further because this already exists today: mobile devices. These devices are the biggest attack surface in most organizations, yet these same organizations often don't have the skills needed to assess them.

Mobile devices are no longer a convenience technology: they are an essential tool carried or worn by users worldwide, often displacing conventional computers for everyday enterprise data needs. You can see this trend in corporations, hospitals, banks, schools, and retail stores throughout the world. Users rely on mobile devices more today than ever before – we know it, and the bad guys do too.

This course is designed to give you the skills you need to understand the security strengths and weaknesses in Apple iOS, Android, and wearable devices including Apple Watch and Android Wear. With these skills, you will evaluate the security weaknesses of built-in and third-party applications. You'll learn how to bypass platform encryption, and how to manipulate Android apps to circumvent obfuscation techniques. You'll leverage automated and manual mobile application analysis tools to identify deficiencies in mobile app network traffic, file system storage, and inter-app communication channels. You'll safely work with mobile malware samples to understand the data exposure and access threats affecting Android and iOS devices, and you'll exploit lost or stolen devices to harvest sensitive mobile application data.

Understanding and identifying vulnerabilities and threats to mobile devices is a valuable skill, but it must be paired with the ability to communicate the associated risks. Throughout the course, you'll review the ways in which we can effectively communicate threats to key stakeholders. You'll leverage tools including Mobile App Report Cards to characterize threats for management and decision-makers, while identifying sample code and libraries that developers can use to address risks for in-house applications as well.

You'll then use your new skills to apply a mobile device deployment penetration test in a step-by-step fashion. Starting with gaining access to wireless networks to implement man-in-the-middle attacks and finishing with mobile device exploits and data harvesting, you'll examine each step in conducting such a test with hands-on exercises, detailed instructions, and tips and tricks learned from hundreds of successful penetration tests. By building these skills, you'll return to work prepared to conduct your own test, and you'll be better informed about what to look for and how to review an outsourced penetration test.

Mobile device deployments introduce new threats to organizations including advanced malware, data leakage, and the disclosure of enterprise secrets, intellectual property, and personally identifiable information assets to attackers. Further complicating matters, there simply are not enough people with the security skills needed to identify and manage secure mobile phone and tablet deployments. By completing this course, you'll be able to differentiate yourself as being prepared to evaluate the security of mobile devices, effectively assess and identify flaws in mobile applications, and conduct a mobile device penetration test – all critical skills to protect and defend mobile device deployments.

Joshua Wright *SANS Senior Instructor*

Joshua Wright is a senior technical analyst with Counter Hack, a company devoted to the development of information security challenges for education, evaluation, and competition. Through his experiences as a penetration tester, Josh has worked with hundreds of organizations on attacking and defending mobile devices and wireless systems, ethically disclosing significant product and protocol security weaknesses to well-known organizations. As an open-source software advocate, Josh has conducted cutting-edge research resulting in several software tools that are commonly used to evaluate the security of widely deployed technology targeting WiFi, Bluetooth, and ZigBee wireless systems, smart grid deployments, and the Android and Apple iOS mobile device platforms. As the technical lead of the innovative CyberCity, Josh also oversees and manages the development of critical training and educational missions for cyber warriors in the U.S. military, government agencies, and critical infrastructure providers. @joshwright

575.1 HANDS ON: Device Architecture and Common Mobile Threats

The first part of the course looks at the significant threats affecting mobile phone deployments and how organizations are being attacked through these systems. As a critical component of a secure deployment, we'll examine the architectural and implementational differences between Android, Apple, BlackBerry, and Windows Phone systems, including platform software defenses and application permission management. We'll also look at the specific implementation details of popular platform features such as iBeacon, AirDrop, App Verification and more. We'll apply hands-on exercises to interact with mobile device emulator features including low-level access to installed application services.

Topics: Mobile Problems and Opportunities; Mobile Device Platform Analysis; Wearable Platforms: Mobile Device Lab Analysis Tools; Mobile Device Malware Threats

575.2 HANDS ON: Mobile Platform Access and Application Analysis

With an understanding of the threats, architectural components and desired security methods, we can design incident response processes to mitigate the effect of common threat scenarios, including device loss. We'll look at building such a program, while developing our own skills to analyze mobile device data and applications through rooting and jailbreaking, filesystem data analysis, and network activity analysis techniques.

Topics: Static Application Analysis; Unlocking, Rooting, Jailbreaking Mobile Devices; Mobile Phone Data Storage and Filesystem Architecture; Network Activity Monitoring

575.3 HANDS ON: Mobile Application Reverse Engineering

One of the critical decisions you will need to make in supporting a mobile device deployment is to approve or disapprove of unique application requests from end-users in a corporate device deployment. With some analysis skills, we can evaluate applications to determine the type of access and information disclosure threats they represent. In this section we will use automated and manual application assessment tools to evaluate iOS and Android apps. We'll build upon the static application analysis skills covered in day 2 to manipulate application components including Android intents and iOS URL extensions. We'll also learn and practice techniques for manipulating iOS and Android applications: method swizzling on iOS, and disassembly, modification, and reassembly of iOS apps. The day ends with a look at a standard system for evaluating and grading the security of mobile applications in a consistent method through the application report card project.

Topics: Application Report Cards; Automated Application Analysis Systems; Manipulating App Behavior

575.4 HANDS ON: Penetration Testing Mobile Devices – PART 1

An essential component of developing a secure mobile phone deployment is to perform an ethical hacking assessment. Through ethical hacking or penetration testing, we examine the mobile devices and infrastructure from the perspective of an attacker, identifying and exploiting flaws that deliver unauthorized access to data or supporting networks. Through the identification of these flaws we can evaluate the mobile phone deployment risk to the organization with practical, useful risk metrics.

Topics: Fingerprinting Mobile Devices; Wireless Network Probe Mapping; Weak Wireless Attacks; Enterprise Wireless Security Attacks

575.5 HANDS ON: Penetration Testing Mobile Devices – PART 2

Continuing our look at ethical hacking or penetration testing, we turn our focus to exploiting weaknesses on individual mobile devices, including iPhones, iPads, Android phones and tablets, Windows Phones, and BlackBerry devices. We'll also examine platform-specific application weaknesses and look at the growing use of web framework attacks.

Topics: SSL/TLS Attacks; Client Side Injection (CSI) Attacks; Web Framework Attacks; Back-end Application Support Attacks; Network Manipulation Attacks; Sidejacking Attacks

You Will Be Able To

- Use jailbreak tools for Apple iOS and Android systems
- Conduct an analysis of iOS and Android filesystem data to plunder compromised devices and extract sensitive mobile device use information
- Analyze Apple iOS and Android applications with reverse-engineering tools
- Conduct an automated security assessment of mobile applications
- Use wireless network analysis tools to identify and exploit wireless networks used by mobile devices
- Intercept and manipulate mobile device network activity
- Leverage mobile-device-specific exploit frameworks to gain unauthorized access to target devices
- Manipulate the behavior of mobile applications to bypass security restrictions

"Taking this course was a great opportunity to ask an expert all my questions, good broad overview and mobile threats background!"
-Tom G., GovCert UK

"Once again, SANS has exceeded my expectations and successfully re-focused my view of threats and risks. I recommend this course because it is very enlightening."
-Charles Allen, EM Solutions, Inc.

575.6 HANDS ON: Capture the Flag

On the last day of class we'll pull in all the concepts and technology we've covered in the week for a comprehensive Capture-the-Flag (CTF) challenge. During the CTF event, you'll have the option to participate in multiple roles, designing a secure infrastructure for the deployment of mobile phones, monitoring network activity to identify attacks against mobile devices, extracting sensitive data from a compromised iPad, and attacking a variety of mobile phones and related network infrastructure components. In the CTF, you'll use the skills you've built to practically evaluate systems and defend against attackers, simulating the realistic environment you'll be prepared to protect when you get back to the office.

SEC579

Virtualization and Private Cloud Security

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
LAPTOP PROVIDED
Instructor: Dave Shackleford

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

"This is the future of IT and security. Knowledge is power!"
-Joe Marshall, Exelon

One of today's most rapidly evolving and widely deployed technologies is server virtualization. Many organizations are already realizing the cost savings from implementing virtualized servers, and systems administrators love the ease of deployment and management of virtualized systems. There are even security benefits of virtualization: easier business continuity and disaster recovery, single points of control over multiple systems, role-based access, and additional auditing and logging capabilities for large infrastructure.

Who Should Attend

- Security personnel who are tasked with securing virtualization and private cloud infrastructure
- Network and systems administrators who need to understand how to architect, secure, and maintain virtualization and cloud technologies
- Technical auditors and consultants who need to gain a deeper understanding of VMware virtualization from a security and compliance perspective

"SEC579 was one of the best-produced SANS courses I have taken. The blend of ops and security was extremely valuable." -Scott Towery, Visions

With these benefits comes a dark side, however. Virtualization technology is the focus of many new potential threats and exploits and presents new vulnerabilities that must be managed. In addition, there are a vast number of configuration options that security and system administrators need to understand, with an added layer of complexity that has to be managed by operations teams. Virtualization technologies also connect to network infrastructure and storage networks and require careful planning with regard to access controls, user permissions, and traditional security controls.

"Great course! Anyone involved with managing virtual system environments will benefit from taking SEC579." -Randall R., Defense Security Services

In addition, many organizations are evolving virtualized infrastructure into private clouds, internal shared services running on virtualized infrastructure. Security architecture, policies, and processes will need to adapt to work within a cloud infrastructure, and there are many changes that security and operations teams will need to accommodate to ensure assets are protected.

"Dave is an excellent teacher and communicator. He made a highly technical course interesting and the overall experience was thoroughly enjoyable!"
-Wayne Rosen, Adnet Systems, Inc.

Dave Shackleford *SANS Senior Instructor*

Dave Shackleford is the owner and principal consultant of Voodoo Security and a SANS analyst, senior instructor, and course author. He has consulted with hundreds of organizations in the areas of security, regulatory compliance, and network architecture and engineering, and is a VMware vExpert with extensive experience designing and configuring secure virtualized infrastructures. He has previously worked as CSO for Configuresoft, CTO for the Center for Internet Security, and as a security architect, analyst, and manager for several Fortune 500 companies. Dave is the author of the Sybex book *Virtualization Security: Protecting Virtualized Environments*, as well as the coauthor of *Hands-On Information Security* from Course Technology. Recently Dave coauthored the first published course on virtualization security for the SANS Institute. Dave currently serves on the Board of Directors at the SANS Technology Institute and helps lead the Atlanta chapter of the Cloud Security Alliance. @daveshackleford

579.1 HANDS ON: Virtualization Security Architecture and Design

We'll cover the foundations of virtualization infrastructure and clarify the differences between server virtualization, desktop virtualization, application virtualization, and storage virtualization. We'll start with hypervisor platforms, covering the fundamental controls that should be set within VMware ESX and ESXi, Microsoft Hyper-V, and Citrix XenServer. You'll spend time analyzing virtual networks. We'll compare designs for internal networks and DMZs. Virtual switch types will be discussed, along with VLANs and PVLANs. We will cover virtual machine settings, with an emphasis on VMware VMX files.

Topics: Virtualization Components and Architecture Designs; Hypervisor Lockdown Controls for VMware; Microsoft Hyper-V, and Citrix Xen; Virtual Network Design Cases; Virtual Switches and Port Groups; Segmentation Techniques; Virtual Machine Security Configuration Options

579.2 HANDS ON: Virtualization and Private Cloud Infrastructure Security

Today starts with virtualization management. VMware vCenter, Microsoft System Center Virtual Machine Manager (SCVMM), and Citrix XenCenter will be covered. Virtual Desktop Infrastructure (VDI) will be covered with an emphasis on security principles. Specific security-focused use cases for VDI, such as remote access and network access control, will be reviewed. We will take an in-depth look at virtual firewalls. Students will build a virtualized intrusion detection model; integrate promiscuous interfaces and traffic capture methods into virtual networks; and then set up and configure a virtualized IDS sensor. Attention will be paid to host-based IDS, with considerations for multitenant platforms.

579.3 HANDS ON: Virtualization Offense and Defense – PART 1

In this session, we'll delve into the offensive side of security specific to virtualization and cloud technologies. While many key elements of vulnerability management and penetration testing are similar to traditional environments, there are many differences that we will cover. First, we'll cover a number of specific attack scenarios and models that represent the different risks organizations face in their virtual environments. Then we'll go through the entire penetration testing and vulnerability assessment lifecycle, with an emphasis on virtualization tools and technologies. Students will then learn about monitoring traffic and looking for malicious activity within the virtual network, and numerous network-based and host-based tools will be covered and implemented in class. Finally, students will learn about logs and log management in virtual environments.

You Will Be Able To

- Lock down and maintain a secure configuration for all components of a virtualization environment
- Design a secure virtual network architecture
- Evaluate virtual firewalls, intrusion detection and prevention systems, and other security infrastructure
- Evaluate security for private cloud environments
- Perform vulnerability assessments and pen tests in virtual and private cloud environments, and acquire forensic evidence
- Perform audits and risk assessments within a virtual or private cloud environment

"SEC579 is the absolute best virtualization security information available! And it is immediately usable."

-Leonard Lyons, Northrop Grumman

579.4 HANDS ON: Virtualization Offense and Defense – PART 2

This session is all about defense! We'll start off with an analysis of anti-malware techniques. We'll look at traditional antivirus, whitelisting, and other tools and techniques for combating malware, with a specific eye toward virtualization and cloud environments. New commercial offerings in this area will also be discussed to provide context. Most of this session will focus on incident response and forensics in a virtualized or cloud-based infrastructure. We'll walk students through the six-step incident response cycle espoused by NIST and SANS, and highlight exactly how virtualization fits into the big picture. Students will discuss and analyze incidents at each stage, again with a focus on virtualization and cloud. We'll finish the incident response section with processes and procedures organizations can put to use right away to improve their awareness of virtualization-based incidents.

579.5 HANDS ON: Virtualization and Cloud Integration: Policy, Operations, and Compliance

This session will explore how traditional security and IT operations change with the addition of virtualization and cloud technology in the environment. Our first discussion will be a lesson in contrast! First, we'll present an overview of integrating existing security into virtualization. Then, we'll take a vastly different approach and outline how virtualization actually creates new security capabilities and functions! This will really provide a solid grounding for students to understand just what a paradigm shift virtualization is, and how security can benefit from it, while still needing to adapt in many ways.

579.6 HANDS ON: Auditing and Compliance for Virtualization and Cloud

Today's session will start off with a lively discussion on virtualization assessment and audit. You may be asking how will we possibly make a discussion on auditing lively? Trust us! We'll cover the top virtualization configuration and hardening guides from DISA, CIS, Microsoft, and VMware, and talk about the most important and critical things to take away from these to implement. We'll really put our money where our mouth is next – students will learn to implement audit and assessment techniques by scripting with the VI CLI, as well as some Powershell and general shell scripting! Although not intended to be an in-depth class on scripting, some key techniques and ready-made scripts will be discussed to get students prepared for implementing these principles in their environments as soon as they get back to work.

SEC617 Wireless Ethical Hacking, Penetration Testing, and Defenses

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: Larry Pesce

www.giac.org/gawn

www.sans.edu

www.sans.org/cyber-guardian

Despite the security concerns many of us share regarding wireless technology, it is here to stay. In fact, not only is wireless here to stay, it is growing in deployment and utilization with wireless LAN technology and WiFi as well as other applications, including cordless telephones, smart homes, embedded devices, and more. Technologies like ZigBee and Z-Wave offer new methods of connectivity to devices, while other wireless technology, including WiFi, Bluetooth, Bluetooth Low Energy, and DECT, continue their massive growth rate, each introducing its own set of security challenges and attacker opportunities.

Who Should Attend

- Ethical hackers and penetration testers
- Network security staff
- Network and system administrators
- Incident response teams
- Information security policy decision-makers
- Technical auditors
- Information security consultants
- Wireless system engineers
- Embedded wireless system developers

"The detailed cryptographic explanations made it easier to understand how various encryption algorithms work." -Jonathan Wilhoit, Fluor

To be a wireless security expert, you need to have a comprehensive understanding of the technology, threats, exploits, and defensive techniques along with hands-on experience in evaluating and attacking wireless technology. Not limiting your skill-set to WiFi, you'll need to evaluate the threat from other standards-based and proprietary wireless technologies as well. This course takes an in-depth look at the security challenges of many different wireless technologies, exposing you to wireless security threats through the eyes of an attacker. Using readily available and custom-developed tools, you'll navigate your way through the techniques attackers use to exploit WiFi networks, including attacks against WEP, WPA/WPA2, PEAP, TTLS, and other systems. You'll also develop attack techniques leveraging Windows 7 and Mac OS X. We'll examine the commonly overlooked threats associated with Bluetooth, ZigBee, DECT, and proprietary wireless systems. As part of the course, you'll receive the SWAT Toolkit, which will be used in hands-on labs to back up the course content and reinforce wireless ethical hacking techniques.

"I will use this knowledge to apply the best possible security to wireless guest networks where access is mandated to be easy." -Juan Reynoso, Fox

Using assessment and analysis techniques, this course will show you how to identify the threats that expose wireless technology and build on this knowledge to implement defensive techniques that can be used to protect wireless systems.

Larry Pesce *SANS Certified Instructor*

Larry is a Senior Security Analyst with InGuardians after a long stint in security and disaster recovery in healthcare, performing penetration testing, wireless assessments, and hardware hacking. He also diverts a significant portion of his attention to co-hosting the PaulDotCom Security Weekly podcast and likes to tinker with all things electronic and wireless, much to the disappointment of his family, friends, warranties, and his second Leatherman Multi-tool. Larry co-authored Linksys WRT54G Ultimate Hacking and Using Wireshark and Ethereal from Syngress. Larry is an Extra Class Amateur Radio operator (KB1TNF) and enjoys developing hardware and real-world challenges for the Mid-Atlantic Collegiate Cyber Defense Challenge. @haxorthematrix

617.1 HANDS ON: Wireless Data Collection and WiFi MAC Analysis

Students will identify the risks associated with modern wireless deployments as well as the characteristics of physical layer radio frequency systems, including 802.11a/b/g systems. Students will leverage open-source tools for analyzing wireless traffic and mapping wireless deployments.

Topics: Understanding the Wireless Threat; Wireless LAN Organizations and Standards; Using the SANS Wireless Auditing Toolkit; Sniffing Wireless Networks: Tools, Techniques and Implementation; IEEE 802.11 MAC: In-Depth

617.2 HANDS ON: Wireless Tools and Information Analysis

Students will develop an in-depth treatise on the IEEE 802.11 MAC layer and operating characteristics. Using passive and active assessment techniques, students will evaluate deployment and implementation weaknesses, auditing against common implementation requirements including PCI and the DoD Directive 8100.2. Security threats introduced with rogue networks will be examined from a defensive and penetration-testing perspective. Threats present in wireless hotspot networks will also be examined, identifying techniques attackers can use to manipulate guest or commercial hotspot environments.

Topics: Wireless LAN Assessment Techniques; Rogue AP Analysis; Wireless Hotspot Networks; Attacking WEP

617.3 HANDS ON: Client, Crypto, and Enterprise Attacks

Students will continue their assessment of wireless security mechanisms, such as the identification and compromise of static and dynamic WEP networks and the exploitation of weak authentication techniques, including the Cisco LEAP protocol. Next-generation wireless threats will be assessed, including attacks against client systems such as network impersonation attacks and traffic manipulation. Students will evaluate the security and threats associated with common wireless MAN technology, including proprietary and standards-based solutions.

Topics: Cisco LEAP Attacks; Wireless Client Attacks; Attacking WPA2-PSK Networks; Assessing Enterprise WPA2

617.4 HANDS ON: Advanced WiFi Attack Techniques

This section covers the evaluation of modern wireless encryption and authentication systems, identifying the benefits and flaws in WPA/WPA2 networks and common authentication systems. Upper-layer encryption strategies for wireless security using IPSec are evaluated with in-depth coverage of denial-of-service attacks and techniques.

Topics: Deficiencies in TKIP Networks; Leveraging WiFi DoS Attacks; Wireless Fuzzing for Bug Discovery; Bridging the Airgap: Remote WiFi Pentesting; Framework and Post-Exploitation Modules

617.5 HANDS ON: Bluetooth, DECT, and ZigBee Attacks

Advanced wireless testing and vulnerability discovery systems will be covered, including 802.11 fuzzing techniques. A look at other wireless technology, including proprietary systems, cellular technology, and an in-depth coverage of Bluetooth risks, will demonstrate the risks associated with other forms of wireless systems and their impact on organizations.

Topics: DECT Attacks; Exploiting ZigBee; Enterprise Bluetooth Threats; Advanced Bluetooth Threats

617.6 HANDS ON: Wireless Security Strategies and Implementation

The final day of the course evaluates strategies and techniques for protecting wireless systems. Students will examine the benefits and weaknesses of WLAN IDS systems while gaining insight into the design and deployment of a public key infrastructure (PKI). Students will also examine critical secure network design choices, including the selection of an EAP type, selection of an encryption strategy, and the management of client configuration settings.

Topics: WLAN IDS Analyst Techniques; Evaluating Proprietary Wireless Technology; Deploying a Secure Wireless Infrastructure; Configuring and Securing Wireless Clients

You Will Be Able To

- Identify and locate malicious rogue access points using free and low-cost tools
- Conduct a penetration test against low-power wireless including ZigBee to identify control system and related wireless vulnerabilities
- Identify vulnerabilities and bypass authentication mechanisms in Bluetooth networks using Ubertooth, CarWhisperer, and btaptap to collect sensitive information from headsets, wireless keyboards and Bluetooth LAN devices
- Utilize wireless capture tools to extract audio conversations and network traffic from DECT wireless phones to identify information disclosure threats exposing the organization
- Implement an enterprise WPA2 penetration test to exploit vulnerable wireless client systems for credential harvesting
- Utilize wireless fuzzing tools including Metasploit file2air, and Scapy to identify new vulnerabilities in wireless devices

"The labs were great and provided a good means to practice the material. An excellent course for all levels of professionals who are dealing with wireless in their organization. Not knowing this information is like having your head in the sand. Easy to follow, but difficult to master... the instructor has stretched me and my skills this week and I am better for it!"

-John Fruge, B&W Technical Services

"If you're thinking about wireless, take this course. If you're not, take this course."

-Greg Notch, NHL

SEC642

Advanced Web App Penetration Testing and Ethical Hacking

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: Justin Searle

"Best web app class ever!"
-John Cartrett, Torchmark Corporations

"SEC642 helps sharpen the pen testing mindset and to be more creative when performing pen tests."
-Jesper Pettersson, Klarna

This course is designed to teach you the advanced skills and techniques required to test today's web applications. This advanced pen testing course uses a combination of lecture, real-world experiences, and hands-on exercises to educate you in the techniques used to test the security of enterprise applications.

"SEC642 is the perfect course for someone who has a background in web app pen testing, but wants to really gain advanced skills."
-Matthew Sullivan, Webfilings

Who Should Attend

- Web penetration testers
- Security consultants
- Developers
- QA testers
- System administrators
- IT managers
- System architects

We will begin by exploring specific techniques and attacks to which applications are vulnerable. These techniques and attacks use advanced ideas and skills to exploit the system through various controls and protections. This learning will be accomplished through lectures and exercises using real-world applications.

We will then explore encryption as it relates to web applications. You will learn how encryption works as well as techniques to identify the type of encryption in use within the application. Additionally, you will learn methods for exploiting or abusing this encryption, again through lecture and labs.

"I like this training because it is very hands on and not just focused on slides. Very helpful for the real world." -Zach Moreno, Chico Security

The next day of class will focus on how to identify web application firewalls, filtering, and other protection techniques. You will then learn methods to bypass these controls in order to exploit the system. You'll also gain skills in exploiting the control itself to further the evaluation of the security within the application.

Following these general exploits, you will learn techniques that target specific enterprise applications. You will attack systems such as content management and ticketing systems. We will explore the risks and flaws found within these systems and how to better exploit them. This part of the course will also include web services and mobile applications due to their prevalence within modern organizations.

This information-packed advanced pen testing course will wrap up with a full-day Capture-the-Flag event that will target an imaginary organization's web applications and include both Internet and intranet applications of various technologies. This event is designed to allow you to put the pieces together from the previous five days reinforcing the information and learning you will have gained.

Justin Searle *SANS Certified Instructor*

Justin Searle is a Managing Partner of UtiliSec, specializing in Smart Grid security architecture design and penetration testing. Justin led the Smart Grid Security Architecture group in the creation of NIST Interagency Report 7628 and played key roles in the Advanced Security Acceleration Project for the Smart Grid (ASAP-SG). He currently leads the testing group at the National Electric Sector Cybersecurity Organization Resources (NESCOR). Justin has taught courses in hacking techniques, forensics, networking, and intrusion detection for multiple universities, corporations, and security conferences. In addition to electric power industry conferences, Justin frequently presents at top international security conferences such as Black Hat, DEFCON, OWASP, Nullcon, and AusCERT. He co-leads prominent open-source projects including the Samurai Web Testing Framework (SamuraiWTF), the Samurai Security Testing Framework for Utilities (SamuraiSTFU), Middler, Yokoso!, and Laudanum. Justin has an MBA in International Technology and is a CISSP and SANS GIAC Certified Incident Handler (GCIH), Intrusion Analyst (GCIA), and Web Application Penetration Tester (GWAPT). @meeas

642.1 HANDS ON: Advanced Discovery and Exploitation

As applications and their vulnerabilities become more complex, penetration testers have to be able to handle these targets. We will begin the class by exploring how Burp Suite works and more advanced ways to use it within your penetration-testing processes. The exploration of Burp Suite will focus on its ability to work within the traditional web penetration testing methodology and assist in manually discovering the flaws within the target applications.

Topics: Review of the Testing Methodology; Using Burp Suite in a Web Penetration Test; Examining How to Use Burp Intruder to Effectively Fuzz Requests; Exploring Advanced Discovery Techniques for SQL Injection and Other Server-Based Flaws; Learning Advanced Exploitation Techniques

642.2 HANDS ON: Discovery and Exploitation for Specific Applications

We will continue the exploration of advanced discovery and exploitation techniques. We'll start by exploring client-side flaws such as cross-site scripting (XSS) and cross-site request forgery (XSRF). We will explore some of the more advanced methods for discovering these issues. After finding the flaws, you will learn some of the more advanced methods of exploitation, such as scriptless attacks and building web-based worms using XSRF and XSS flaws within an application.

Topics: Discovering XSRF Flaws Within Complex Applications; Learning About DOM-based XSS Flaws and How to Find Them Within Applications; Exploiting XSS Using Scriptless Injections; Bypassing Anti-XSRF Controls Using XSS/XSRF Worms; Attacking SharePoint Installations; How to Modify Your Test Based on the Target Application

You Will Be Able To

- Assess and attack complex modern applications
- Understand the special testing and exploits available against content management systems such as SharePoint and WordPress
- Use techniques to identify and attack encryption within applications
- Identify and bypass web application firewalls and application filtering techniques to exploit the system
- Use exploitation techniques learned in class to perform advanced attacks against web application flaws such as XSS, SQL injection and CSRF

642.3 HANDS ON: Web Application Encryption

Cryptographic weaknesses are common, yet few penetration testers have the skill to investigate, attack and exploit these flaws. When we investigate web application crypto attacks, we typically target the implementation and use of cryptography in modern web applications. Many popular web programming languages or development frameworks make encryption services available to the developer, but do not inherently protect encrypted data from being attacked, or only permit the developer to use cryptography in a weak manner. These implementation mistakes are going to be our focus in this section, as opposed to the exploitation of deficiencies in the cryptographic algorithms themselves. We will also explore the various ways applications use encryption and hashing insecurely. Students will learn techniques ranging from identifying what the encryption technique is to exploiting various flaws within the encryption or hashing.

Topics: Exploring How to Identify the Cryptography in Use; Discovering How to Attack the Encryption Keys; Learning How to Attack Electronic Codebook (ECB) Mode Ciphers; Exploit Cipher Block Chaining (CBC) Bit Flipping

642.4 HANDS ON: Mobile Applications and Web Services

Web applications are no longer limited to the traditional HTML-based interface. Web services and mobile applications have become more common and are regularly being used to attack clients and organizations. As such, it has become very important that penetration testers understand how to evaluate the security of these systems. After finishing up our discussion on cryptography attacks, we will look at how to build a test environment for testing web services used by mobile applications. We will also explore various techniques to discover flaws within the applications and backend systems. These techniques will make use of tools such as Burp Suite and other automated toolsets.

Topics: Attacking CBC Chosen Plaintext; Exploiting CBC with Padding Oracles; Understanding the Mobile Platforms and Architectures; Intercepting Traffic to Web Services and from Mobile Applications; Building a Test Environment; Penetration Testing of Web Services

642.5 HANDS ON: Web Application Firewall and Filter Bypass

Applications today are using more security controls to help prevent attacks. These controls, such as Web Application Firewalls and filtering techniques, make it more difficult for penetration testers during their testing and block many of the automated tools and simple techniques used to discover flaws. On day five you will explore techniques used to map the control and how it is configured to block attacks. You'll be able to map out the rule sets and determine the specifics of how they detect attacks. This mapping will then be used to determine attacks that will bypass the control. You'll use HTML5, UNICODE and other encodings that will enable your discovery techniques to work within the protected application.

Topics: Understanding of Web Application Firewalling and Filtering Techniques; Exploring How to Determine the Rule Sets Protecting the Application; Learning How HTML5 Injections Work; Discovering the Use of UNICODE and Other Encodings

642.6 HANDS ON: Capture the Flag

During day six of the class, you will be placed on a network and given the opportunity to complete an entire penetration test. The goal of this Capture-the-Flag event is for you to explore the techniques, tools, and methodology you learned over the last five days. You'll be able to use these ideas and methods against a realistic extranet and intranet attack. At the end of the day, you will provide a verbal report of the findings and methodology you followed to complete the test. Students will be provided with a virtual machine that contains the Samurai Web Testing Framework web penetration-testing environment. Students will be able to use this both in the class and after leaving and returning to their jobs.

SEC660

Advanced Penetration Testing, Exploit Writing, and Ethical Hacking

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 7:00pm (Days 1-5)
9:00am - 5:00pm (Day 6)
46 CPEs
Laptop Required
Instructor: James Lyne

www.giac.org/gxpn

www.sans.edu

www.sans.org/cyber-guardian

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

Who Should Attend

- Network and systems penetration testers
- Incident handlers
- Application developers
- IDS engineers

This course is designed as a logical progression point for those who have completed **SEC560: Network Penetration Testing and Ethical Hacking**, or for those with existing penetration testing experience. Students with the prerequisite knowledge to take this course will walk through dozens of real-world attacks used by the most seasoned penetration testers. The methodology of a given attack is discussed, followed by exercises in a real-world lab environment to solidify advanced concepts and allow for the immediate application of techniques in the workplace. Each day includes a two-hour evening bootcamp to allow for additional mastery of the techniques discussed and even more hands-on exercises. A sample of topics covered includes weaponizing Python for penetration testers, attacks against network access control (NAC) and VLAN manipulation, network device exploitation, breaking out of Linux and Windows restricted environments, IPv6, Linux privilege escalation and exploit-writing, testing cryptographic implementations, fuzzing, defeating modern OS controls such as ASLR and DEP, return-oriented programming (ROP), Windows exploit-writing, and much more!

Attackers are becoming more clever and their attacks more complex. In order to keep up with the latest attack methods, you need a strong desire to learn, the support of others, and the opportunity to practice and build experience. SEC660 provides attendees with in-depth knowledge of the most prominent and powerful attack vectors and an environment to perform these attacks in numerous hands-on scenarios. This course goes far beyond simple scanning for low-hanging fruit, and shows penetration testers how to model the abilities of an advanced attacker to find significant flaws in a target environment and demonstrate the business risk associated with these flaws.

SEC660 starts off by introducing the advanced penetration concept, and provides an overview to help prepare students for what lies ahead. The focus of day one is on network attacks, an area often left untouched by testers. Topics include accessing, manipulating, and exploiting the network. Attacks are performed against NAC, VLANs, OSPF, 802.1X, CDP, IPv6, VOIP, SSL, ARP, SNMP, and others. Day two starts off with a technical module on performing penetration testing against various cryptographic implementations. The rest of the day is spent on network booting attacks, escaping Linux restricted environments such as chroot, and escaping Windows restricted desktop environments. Day three jumps into an introduction of Python for penetration testing, Scapy for packet crafting, product security testing, network and application fuzzing, and code coverage techniques. Days four and five are spent exploiting programs on the Linux and Windows operating systems. You will learn to identify privileged programs, redirect the execution of code, reverse-engineer programs to locate vulnerable code, obtain code execution for administrative shell access, and defeat modern operating system controls such as ASLR, canaries, and DEP using ROP and other techniques. Local and remote exploits, as well as client-side exploitation techniques, are covered. The final course day is dedicated to numerous penetration testing challenges requiring you to solve complex problems and capture flags.

James Lyne *SANS Certified Instructor*

James is the Director of EMEA at SANS and Director of Technology Strategy at the security firm Sophos. He comes from a background in cryptography but over the years has worked in a wide variety of security problem domains including anti-malware and hacking. James spent many years as a hands-on analyst dealing with deep technical issues and is a self-professed "massive geek." Eventually James escaped dark rooms and learned some social skills, and today he is a keen presenter at conferences and industry events. He has a wide range of experience working in a technical and a strategic capacity from incident response to forensics with some of the world's largest and most paranoid organizations. James participates in industry panels and policy groups, and is a frequently-called-upon expert advisor all over the world. He is a frequent guest lecturer and often appears in the media including national TV. As a young spokesperson for the industry James is extremely passionate about talent development and participates in initiatives to identify and develop new talent. Ask James to show you his best geek party trick. @jameslyne

660.1 HANDS ON: Network Attacks for Penetration Testers

Day one serves as an advanced network attack module, building on knowledge gained from SEC560. The focus will be on obtaining access to the network; manipulating the network to gain an attack position for eavesdropping and attacks, and for exploiting network devices; leveraging weaknesses in network infrastructure; and taking advantage of client frailty.

Topics: Bypassing Network Admission Control; Impersonating Devices with Admission Control Policy Exceptions; Exploiting EAP-MD5 Authentication; IEEE 802.1X Authentication; Custom Network Protocol Manipulation with Ettercap and Custom Filters; Multiple Techniques for Gaining Man-in-the-Middle Network Access; Exploiting OSPF Authentication to Inject Malicious Routing Updates; Using Evilgrade to Attack Software Updates; Overcoming SSL Transport Encryption Security with Sslstrip; Remote Cisco Router Configuration File Retrieval; IPv6 for Penetration Testers

660.2 HANDS ON: Crypto, Network Booting Attacks, and Escaping Restricted Environments

Day two starts by taking a tactical look at techniques penetration testers can use to investigate and exploit common cryptography mistakes. We finish the module with lab exercises that allow you to practice your new-found crypto attack skill set against reproduced real-world application vulnerabilities.

Topics: Pen Testing Cryptographic Implementations; Exploiting CBC Bit Flipping Vulnerabilities; Exploiting Hash Length Extension Vulnerabilities; Delivering Malicious Operating Systems to Devices Using Network Booting and PXE; PowerShell Essentials; Enterprise PowerShell; Post Exploitation with PowerShell and Metasploit; Escaping Software Restrictions; Two-hour Evening Capture-the-Flag Exercise Using PXE, Network Attacks, and Local Privilege Escalation

660.3 HANDS ON: Python, Scapy, and Fuzzing

Day three starts with a focus on how to leverage Python as a penetration tester. It is designed to help people unfamiliar with Python start modifying scripts to add their own functionality while helping seasoned Python scripters improve their skills. Once we leverage the Python skills in creative lab exercises, we move on to leveraging Scapy for custom network targeting and protocol manipulation. Using Scapy, we examine techniques for transmitting and receiving network traffic beyond what canned tools can accomplish, including IPv6.

Topics: Becoming Familiar with Python Types; Leveraging Python Modules for Real-World Pen Tester Tasks; Manipulating Stateful Protocols with Scapy; Using Scapy to Create a Custom Wireless Data Leakage Tool; Product Security Testing; Using Taof for Quick Protocol Mutation Fuzzing; IDAPro; Optimizing Your Fuzzing Time with Smart Target Selection; Automating Target Monitoring While Fuzzing with Sulley; Leveraging Microsoft Word Macros for Fuzzing .docx files; Block-Based Code Coverage Techniques Using Paimei

You Will Be Able To

- Perform fuzz testing to enhance your company's SDL process
- Exploit network devices and assess network application protocols
- Escape from restricted environments on Linux and Windows
- Test cryptographic implementations
- Model the techniques used by attackers to perform 0-day vulnerability discovery and exploit development
- Develop more accurate quantitative and qualitative risk assessments through validation
- Demonstrate the needs and effects of leveraging modern exploit mitigation controls
- Reverse-engineer vulnerable code to write custom exploits

"The SEC660 course was hands-on, packed with content, and current to today's technology!"

-Michael Horken, Rockwell Automation

660.4 HANDS ON: Exploiting Linux for Penetration Testers

Day four begins by walking through memory from an exploitation perspective as well as introducing x86 assembler and linking and loading. Processor registers are directly manipulated by testers and must be intimately understood. Disassembly is a critical piece of testing and will be used throughout the remainder of the course. We will take a look at the Linux OS from an exploitation perspective and discuss the topic of privilege escalation.

Topics: Stack and Dynamic Memory Management and Allocation on the Linux OS; Disassembling a Binary and Analyzing x86 Assembly Code; Performing Symbol Resolution on the Linux OS; Identifying Vulnerable Programs; Code Execution Redirection and Memory Leaks; Return-Oriented Programming (ROP); Identifying and Analyzing Stack-Based Overflows on the Linux OS; Performing Return-to-libc (ret2libc) Attacks on the Stack; Defeating Stack Protection on the Linux OS; Defeating ASLR on the Linux OS

660.5 HANDS ON: Exploiting Windows for Penetration Testers

On day five we start with covering the OS security features (ALSR, DEP, etc.) added to the Windows OS over the years, as well as Windows-specific constructs, such as the process environment block (PEB), structured exception handling (SEH), thread information block (TIB), and the Windows API. Differences between Linux and Windows will be covered. These topics are critical in assessing Windows-based applications. We then focus on stack-based attacks against programs running on the Windows OS.

Topics: The State of Windows OS Protections on Windows 7, 8, 10, Server 2008 and 2012; Understanding Common Windows Constructs; Stack Exploitation on Windows; Defeating OS Protections Added to Windows; Creating a Metasploit Module; Advanced Stack-Smashing on Windows; Return-Oriented Programming (ROP); Windows 7 and 8; Porting Metasploit Modules; Client-side Exploitation; Windows and Linux Shellcode

660.6 HANDS ON: Capture-the-Flag Challenge

This day will serve as a real-world challenge for students, requiring them to utilize skills learned throughout the course, think outside the box, and solve simple-to-complex problems. In this offensive exercise, challenges range from local privilege escalation to remote exploitation on both Linux and Windows systems, as well as networking attacks and other challenges related to the course material.

SEC760 Advanced Exploit Development for Penetration Testers

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 7:00pm (Days 1-5)
9:00am - 5:00pm (Day 6)
46 CPEs
Laptop Required
Instructor: Stephen Sims

What You Will Receive

- Various preconfigured *NIX virtual machines
- Various tools on a course USB that are required for use in class
- Access to the in-class Virtual Training Lab with many in-depth labs
- Access to recorded course audio to help hammer home important network penetration testing lessons

Vulnerabilities in modern operating systems such as Microsoft Windows 7/8, Server 2012, and the latest Linux distributions are often very complex and subtle. Yet these vulnerabilities could expose organizations to significant attacks, undermining their defenses when attacked by very skilled adversaries. Few security professionals have the skillset to discover let alone even understand at a fundamental level why the vulnerability exists and how to write an exploit to compromise it. Conversely, attackers must maintain this skillset regardless of the increased complexity. **SEC760: Advanced Exploit Development for Penetration Testers** teaches the skills required to reverse-engineer 32- and 64-bit applications, perform remote user application and kernel debugging, analyze patches for one-day exploits, and write complex exploits, such as use-after-free attacks, against modern software and operating systems.

Who Should Attend

- Senior network and system penetration testers
- Secure application developers (C & C++)
- Reverse-engineering professionals
- Senior incident handlers
- Senior threat analysts
- Vulnerability researchers
- Security researchers

"SEC760 is a kind of training we could not get anywhere else. It is not a theory, we got to implement and to exploit everything we learned."
-Jenny Kitaichit, Intel

Some of the skills you will learn in SEC760 include:

- How to write modern exploits against the Windows 7/8/10 operating systems
- How to perform complex attacks such as use-after-free, Kernel exploit techniques, one-day exploitation through patch analysis, and other advanced topics
- The importance of utilizing a Security Development Lifecycle (SDL) or Secure SDLC, along with Threat Modeling
- How to effectively utilize various debuggers and plug-ins to improve vulnerability research and speed
- How to deal with modern exploit mitigation controls aimed at thwarting success and defeating determination

"No one can teach the material as clearly as Steve does. He is awesome."
Wally Strzelec, Texas A&M University

Not sure if you are ready for SEC760?

Take this 10 question quiz: **www.sans.org/sec760/quiz**

Stephen Sims *SANS Senior Instructor*

Stephen Sims is an industry expert with over 15 years of experience in information technology and security. Stephen currently works out of San Francisco as a consultant performing reverse engineering, exploit development, threat modeling, and penetration testing. Stephen has an master's of science degree in information assurance from Norwich University. He is the author of SANS' only 700-level course, SEC760: Advanced Exploit Development for Penetration Testers, which concentrates on complex heap overflows, patch diffing, and client-side exploits. Stephen is also the lead author of SEC660: Advanced Penetration Testing, Exploits, and Ethical Hacking. He holds the GIAC Security Expert (GSE) certification as well as the CISSP, CISA, Immunity NOP, and many other certifications. In his spare time Stephen enjoys snowboarding and writing music. @Steph3nSims

760.1 HANDS ON: Threat Modeling, Reversing and Debugging with IDA

Many penetration testers, incident handlers, developers, and other related professionals lack reverse-engineering and debugging skills. This is a different skill than reverse-engineering malicious software. As part of the Security Development Lifecycle (SDL) and Secure-SDLC, developers and exploit writers should have experience using IDA Pro to debug and reverse their code when finding bugs or when identifying potential risks after static code analysis or fuzzing.

Topics: Security Development Lifecycle (SDL); Threat Modeling; Why IDA Is the #1 Tool for Reverse Engineering; IDA Navigation; IDA Python and the IDA IDC; IDA Plug-ins and Extensibility; Local Application Debugging with IDA; Remote Application Debugging with IDA

760.2 HANDS ON: Advanced Linux Exploitaiton

The ability to progress into more advanced reversing and exploitation requires an expert-level understanding of basic software vulnerabilities, such as those covered in SEC660. Heap overflows serve as a rite of passage into modern exploitation techniques. This day is aimed at bridging this gap of knowledge in order to inspire thinking in a more abstract manner, necessary for continuing further with the course. Linux can sometimes be an easier operating system to learn these techniques, serving as a productive gateway into Windows.

Topics: Linux Heap Management, Constructs, and Environment; Navigating the Heap; Abusing Macros such as unlink() and frontlink(); Function Pointer Overwrites; Format String Exploitation; Abusing Custom Doubly-Linked Lists; Defeating Linux Exploit Mitigation Controls; Using IDA for Linux Application Exploitation; Using Format String Bugs for ASLR Bypass

760.3 HANDS ON: Patch Diffing, One-Day Exploits, and Return-Oriented Shellcode

Attackers often download patches as soon as they are distributed by vendors such as Microsoft in order to find newly patched vulnerabilities. Vulnerabilities are usually disclosed privately, or even discovered in-house, allowing the vendor to more silently patch the vulnerability. This also allows the vendor to release limited or even no details at all about a patched vulnerability. Attackers are well aware of this and quickly work to find the patched vulnerability in order to take control of unpatched systems. This technique is also performed by incident handlers, IDS administrators and vendors, vulnerability and penetration testing framework companies, government entities, and others. You will use the material covered in this day to identify bugs patched by vendors and take them through to exploitation.

Topics: The Microsoft Patch Management Process and Patch Tuesday; Obtaining Patches and Patch Extraction; Binary Diffing with BinDiff, patchdiff2, turbodiff, and darungrim3; Visualizing Code Changes and Identifying Fixes; Reversing 32-bit and 64-bit Applications and Modules; Triggering Patched Vulnerabilities; Writing One-Day Exploits; Handling Modern Exploit Mitigation Controls; Using ROP to Compiled Shellcode on the Fly (Return-Oriented Shellcode)

You Will Be Able To

- Discover zero-day vulnerabilities in programs running on fully-patched modern operating systems
- Create exploits to take advantage of vulnerabilities through a detailed penetration testing process
- Use the advanced features of IDA Pro and write your own IDC and IDA Python scripts
- Perform remote debugging of Linux and Windows applications
- Understand and exploit Linux heap overflows
- Write return-oriented shellcode
- Perform patch diffing against programs, libraries, and drivers to find patched vulnerabilities
- Perform Windows heap overflows and use-after-free attacks
- Use precision heap sprays to improve exploitability
- Perform Windows Kernel debugging up through Windows 8 64-bit
- Jump into Windows kernel exploitation

760.4 HANDS ON: Windows Kernel Debugging and Exploitation

The Windows Kernel is very complex and intimidating. This day aims to help you understand the Windows kernel and the various exploit mitigations added into recent versions. You will perform kernel debugging on various versions of the Windows OS, such as Windows 7 and 8, and learn to deal with its inherent complexities. Exercises will be performed to analyze vulnerabilities, look at exploitation techniques, and get a working exploit.

Topics: Understanding the Windows Kernel; Navigating the Windows Kernel; Modern Kernel Protections; Debugging the Windows Kernel; WinDbg; Analyzing Kernel Vulnerabilities and Kernel Vulnerability Types; Kernel Exploitation Techniques; Token Stealing and HAL Dispatch Table Overwrites

760.5 HANDS ON: Windows Heap Overflows and Client-Side Exploitation

The focus of this section is primarily on Windows browser and client-side exploitation. You will learn to analyze C++ vftable overflows, one of the most common mechanisms used to compromise a modern Windows system. Many of these vulnerabilities are discovered in the browser, so browser techniques will also be taught, including modern heap spraying to deal with IE 8/9/10 and other browsers such as FireFox and Chrome. You will work towards writing exploits in the Use-After-Free/Dangling Pointer vulnerability class.

Topics: Windows Heap Management, Constructs, and Environment; Understanding the Low Fragmentation Heap (LFH); Browser-based and Client-side Exploitation; Remedial Heap Spraying; Understanding C++ vftable/vtable Behavior; Modern Heap Spraying to Determine Address Predictability; Use-after-free Attacks and Dangling Pointers; Using Custom Flash Objects to Bypass ASLR; Defeating ASLR, DEP, and Other Common Exploit Mitigation Controls

760.6 HANDS ON: Capture-the-Flag Challenge

Day 6 will serve as a Capture-the-Flag event with different types of challenges taken from material taught throughout the week.

FOR408 Windows Forensic Analysis

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: Chad Tilbury

www.giac.org/gcfe

www.sans.edu

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

DFIR
digital-forensics.sans.org

ALSO AVAILABLE VIA SIMULCAST
www.sans.org/simulcast

Who Should Attend

- Information technology professionals
- Incident response team members
- Law enforcement officers, federal agents, and detectives
- Media exploitation analysts
- Anyone interested in a deep understanding of Windows forensics

All organizations must prepare for cyber crime occurring on their computer systems and within their networks. Demand has never been higher for analysts who can investigate crimes like fraud, insider threats, industrial espionage, employee misuse, and computer intrusions. Government agencies increasingly require trained media exploitation specialists to recover key intelligence from Windows systems. To help solve these cases, SANS is training a new cadre of the world's best digital forensic professionals, incident responders, and media exploitation masters capable of piecing together what happened on computer systems second by second.

FOR408: Windows Forensic Analysis focuses on building in-depth digital forensics knowledge of the Microsoft Windows operating systems. You can't protect what you don't understand, and understanding forensic capabilities and artifacts is a core component of information security. You'll learn to recover, analyze, and authenticate forensic data on Windows systems. You'll understand how to track detailed user activity on your network and how to organize findings for use in incident response, internal investigations, and civil/criminal litigation. You'll be able to use your new skills to validate security tools, enhance vulnerability assessments, identify insider threats, track hackers, and improve security policies. Whether you know it or not, Windows is silently recording an unimaginable amount of data about you and your users. FOR408 teaches you how to mine this mountain of data.

Proper analysis requires real data for students to examine. The completely updated FOR408 course trains digital forensic analysts through a series of new hands-on laboratory exercises that incorporate evidence found on the latest Microsoft technologies (Windows 7/8/10, Office and Office365, cloud storage, Sharepoint, Exchange, Outlook). Students leave the course armed with the latest tools and techniques and prepared to investigate even the most complicated systems they might encounter. Nothing is left out – attendees learn to analyze everything from legacy Windows XP systems to just-discovered Windows 10 artifacts.

FOR408 is continually updated. This course utilizes a brand-new intellectual property theft and corporate espionage case that took over six months to create. You work in the real world and your training should include real practice data. Our development team used incidents from their own experiences and investigations and created an incredibly rich and detailed scenario designed to immerse students in a true investigation. The case demonstrates the latest artifacts and technologies an investigator might encounter while analyzing Windows systems. The incredibly detailed step-by-step workbook details the tools and techniques that each investigator should follow to solve a forensic case.

MASTER WINDOWS FORENSICS – YOU CAN'T PROTECT WHAT YOU DON'T KNOW ABOUT

Chad Tilbury *SANS Senior Instructor*

Chad Tilbury has been responding to computer intrusions and conducting forensic investigations since 1998. His extensive law enforcement and international experience stems from working with a broad cross-section of Fortune 500 companies and government agencies around the world. During his service as a Special Agent with the U.S. Air Force Office of Special Investigations, he investigated and conducted computer forensics for a variety of crimes, including hacking, abduction, espionage, identity theft, and multi-million dollar fraud cases. He has led international forensic teams and was selected to provide computer forensic support to the United Nations Weapons Inspection Team. Chad has worked as a computer security engineer and forensic lead for a major defense contractor and as the Vice President of Worldwide Internet Enforcement for the Motion Picture Association of America. In that role, he managed Internet anti-piracy operations for the seven major Hollywood studios in over 60 countries. Chad is a graduate of the U.S. Air Force Academy and holds a bachelor and masters of science degrees in computer science as well as GCFA, GCIH, GREM, and ENCE certifications. He is currently a consultant specializing in incident response, corporate espionage, and computer forensics. @chadtilbury

408.1 HANDS ON: Windows Digital Forensics and Advanced Data Triage

The Windows forensics course starts with an examination of digital forensics in today's interconnected environments and discusses challenges associated with mobile devices, tablets, cloud storage, and modern Windows operating systems. We will discuss how modern hard drives, such as Solid State Devices (SSD), can affect the digital forensics acquisition process and how analysts need to adapt to overcome the introduction of these new technologies.

Topics: Windows Operating System Components; Core Forensic Principles; Live Response and Triage-Based Acquisition Techniques; Acquisition Review with Write Blocker; Advanced Acquisition Challenges; Windows Image Mounting and Examination; NTFS File System Overview; Document and File Metadata; File Carving; Custom Carving Signatures; Memory, Pagefile, and Unallocated Space Analysis

408.2 HANDS ON: CORE WINDOWS FORENSICS PART 1 – Windows Registry Forensics and Analysis

Our journey continues with the Windows Registry, where the digital forensic investigator will learn how to discover critical user and system information pertinent to almost any investigation. Each examiner will learn how to navigate and examine the Registry to obtain user-profile data and system data. The course teaches forensic investigators how to prove that a specific user performed key word searches, ran specific programs, opened and saved files, perused folders, and used removable devices.

Topics: Registry Basics; Profile Users and Groups; Core System Information; User Forensic Data; Tools Utilized

408.3 HANDS ON: CORE WINDOWS FORENSICS PART 2 – USB Devices, Shell Items, and Key Word Searching

Being able to show the first and last time a file was opened is a critical analysis skill. Utilizing shortcut (LNK) and jumplist databases, we are able to easily pinpoint which file was opened and when. We will demonstrate how to examine the pagefile, system memory, and unallocated space – all difficult-to-access locations that can offer the critical data for your case.

Topics: Shell Item Forensics; USB and Bring Your Own Device (BYOD); Key Word Searching and Forensics Suites (AccessData's FTK, Guidance Software's EnCase)

408.4 HANDS ON: CORE WINDOWS FORENSICS PART 3 – Email, Key Additional Artifacts, and Event Logs

This section discusses what types of information can be relevant to an investigation, where to find email files, and how to use forensic tools to facilitate the analysis process. We will find that the analysis process is similar across different types of email stores, but the real work takes place in the preparation – finding and extracting the email files from a variety of different sources. The last part of the section will arm each investigator with the core knowledge and capability to maintain this crucial skill for many years to come.

Topics: Email Forensics; Forensicating Additional Windows OS Artifacts; Windows Event Log Analysis

408.5 HANDS ON: CORE WINDOWS FORENSICS PART 4 – Web Browser Forensics: Firefox, Internet Explorer, and Chrome

Throughout the section, investigators will use their skills in real hands-on cases, exploring evidence created by Chrome, Firefox, and Internet Explorer along with Windows Operating System artifacts.

Topics: Browser Forensics: History, Cache, Searches, Downloads, Understanding of Browser Timestamps, Internet Explorer; Firefox; Chrome; Examination of Browser Artifacts; Tools Used

408.6 HANDS ON: Windows Forensic Challenge

This complex case will involve an investigation into one of the most recent versions of the Windows Operating System. The evidence is real and provides the most realistic training opportunity currently available. Solving the case will require that students use all of the skills gained from each of the previous sections.

Topics: Digital Forensic Case; Mock Trial

"I have been doing forensic investigations for several years, but would highly recommend this course (FOR408) for both new and old forensic investigations."

-Robert Galarza, JP Morgan Chase

You Will Be Able To

- Perform proper Windows forensic analysis by applying key techniques focusing on Windows 7/8/10
- Use full-scale forensic tools and analysis methods to detail nearly every action a suspect accomplished on a Windows system, including who placed an artifact on the system and how, program execution, file/folder opening, geo-location, browser history, profile USB device usage, and more
- Uncover the exact time that a specific user last executed a program through Registry and Windows artifact analysis, and understand how this information can be used to prove intent in cases such as intellectual property theft, hacker-breached systems, and traditional crimes
- Determine the number of times files have been opened by a suspect through browser forensics, shortcut file analysis (LNK), e-mail analysis, and Windows Registry parsing
- Use automated analysis techniques via AccessData's Forensic ToolKit (FTK), Nuix, and Internet Evidence Finder (IEF)
- Identify keywords searched by a specific user on a Windows system in order to pinpoint the files and information the suspect was interested in finding and accomplish detailed damage assessments
- Use Windows shellbags analysis tools to articulate every folder and directory that a user opened up while browsing local, removable, and network drives
- Determine each time a unique and specific USB device was attached to the Windows system, the files and folders that were accessed on it, and who plugged it in by parsing key Windows artifacts such as the Registry and log files
- Use event log analysis techniques to determine when and how users logged into a Windows system, whether via a remote session, at the keyboard, or simply by unlocking a screensaver
- Determine where a crime was committed using registry data to pinpoint the geo-location of a system by examining connected networks and wireless access points
- Use free browser forensic tools to perform detailed web browser analysis, parse raw SQLite and ESE databases, and leverage session recovery artifacts and flash cookies to identify the web activity of suspects, even if privacy cleaners and in-private browsing are used

FOR508 Advanced Digital Forensics and Incident Response

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: Rob Lee

www.giac.org/gcfa

www.sans.edu

www.sans.org/cyber-guardian

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www.sans.org/ondemand

MEETS DoDD 8140 (8570) REQUIREMENTS
www.sans.org/8140

DFIR
digital-forensics.sans.org

DAY 0: A 3-letter government agency contacts you to say critical information was stolen through a targeted attack on your organization. They won't tell how they know, but they identify several breached systems within your enterprise. An advanced persistent threat adversary, aka an APT, is likely involved – the most sophisticated threat you are likely to face in your efforts to defend your systems and data.

FOR508: Advanced Digital Forensics and Incident Response will help you determine:

- How the breach occurred
- How systems were affected and compromised
- What attackers took or changed
- How to contain and mitigate the incident

Over 80% of all breach victims learn of a compromise from third-party notifications, not from internal security teams. In most cases, adversaries have been rummaging through your network undetected for months or even years.

"FOR508 has been the best DFIR course I've taken so far. All the material is recent and it shows a lot of time went into the material." -Louise Cheung, Stroz Friedberg

Incident response tactics and procedures have evolved rapidly over the past several years. Data breaches and intrusions are growing more complex. Adversaries are no longer compromising one or two systems in your enterprise; they are compromising hundreds. Your team can no longer afford antiquated incident response techniques that fail to properly identify compromised systems, provide ineffective containment of the breach, and ultimately fail to rapidly remediate the incident.

This in-depth incident response course provides responders with advanced skills to hunt down, counter, and recover from a wide range of threats within enterprise networks, including APT adversaries, organized crime syndicates, and hactivism. Constantly updated, FOR508 addresses today's incidents by providing hands-on incident response tactics and techniques that elite responders are successfully using in real-world breach cases.

"So far this is the best course I've taken in 20 years." -Mauricio Bellido Jr., USG

GATHER YOUR INCIDENT RESPONSE TEAM – IT'S TIME TO GO HUNTING!

Who Should Attend

- System administrators
- Incident response team members
- Experienced digital forensic analysts
- Federal agents and law enforcement
- Red team members, penetration testers, and exploit developers
- Security Operations Center (SOC) personnel and information security practitioners
- SANS FOR408 and SEC504 graduates

Rob Lee *SANS Faculty Fellow*

Rob Lee is an entrepreneur and consultant in the Washington, DC area and currently the Curriculum Lead and author for digital forensic and incident response training at the SANS Institute in addition to owning his own firm. Rob has more than 15 years' experience in computer forensics, vulnerability and exploit development, intrusion detection/prevention, and incident response. Rob graduated from the U.S. Air Force Academy and earned his MBA from Georgetown University. He served in the U.S. Air Force as a member of the 609th Information Warfare Squadron (IWS), the first U.S. military operational unit focused on information warfare. Later, he was a member of the Air Force Office of Special Investigations (AFOSI) where he led crime investigations and an incident response team. Over the next seven years, he worked directly with a variety of government agencies in the law enforcement, U.S. Department of Defense, and intelligence communities as the technical lead for vulnerability discovery and exploit development teams, lead for a cyber-forensics branch, and lead for a computer forensic and security software development team. Most recently, Rob was a Director for MANDIANT, a commercial firm focusing on responding to advanced adversaries such as the APT. Rob co-authored the book *Know Your Enemy, 2nd Edition.* Rob is also co-author of the MANDIANT threat intelligence report "M-Trends: The Advanced Persistent Threat." @robtlee & @sansforensics

508.1 HANDS ON: Advanced Incident Response and Digital Forensics

Incident responders should be armed with the latest tools, memory analysis techniques, and enterprise scanning methodologies in order to identify, track and contain advanced adversaries and remediate incidents. Incident response and forensic analysts must be able to scale their examinations from the traditional one analyst per system toward one analyst per 1,000 or more systems. Enterprise scanning techniques are now a requirement to track targeted attacks by APT groups or crime syndicate groups that propagate through thousands of systems.

Topics: Real Incident Response Tactics; Threat and Adversary Intelligence; Remote and Enterprise IR System Analysis; Windows Live Incident Response

508.2 HANDS ON: Memory Forensics in Incident Response

Now a critical component of many incident response teams that detect advanced threats in their organization, memory forensics has come a long way in just a few years. It can be extraordinarily effective at finding evidence of worms, rootkits, and advanced malware used by an APT group of attackers. Memory analysis traditionally was solely the domain of Windows internals experts, but the recent development of new tools makes it accessible today to anyone, especially incident responders. Better interfaces, documentation, and built-in detection heuristics have greatly leveled the playing field. This section will introduce some of the newest free tools available and give you a solid foundation in adding core and advanced memory forensic skills to your incident response and forensics capabilities.

Topics: Memory Acquisition; Memory Forensics Analysis Process; Memory Forensics Examinations; Memory Analysis Tools

508.3 HANDS ON: Timeline Analysis

Learn advanced incident response techniques uncovered via timeline analysis directly from the developers who pioneered timeline analysis tradecraft. Temporal data are located everywhere on a computer system. File system modified/access/creation/change times, log files, network data, registry data, and Internet history files all contain time data that can be correlated into critical analysis to successfully solve cases. Pioneered by Rob Lee in 2001, timeline analysis has become a critical incident response and forensics technique to solve complex cases. New timeline analysis frameworks provide the means to conduct simultaneous examinations of a multitude of time-based artifacts. Analysis that once took days now takes minutes.

Topics: Timeline Analysis Overview; Filesystem Timeline Creation and Analysis; Windows Time Rules (File Copies vs. File Moves); Filesystem Timeline Creation Using Sleuthkit and fls; Super Timeline Creation and Analysis; Super Timeline Artifact Rules; Timeline Creation with log2timeline; Super Timeline Analysis; Memory Analysis Timeline Creation

508.4 HANDS ON: Deep Dive Forensic Analysis and Anti-Forensics Detection

In digital forensics, many tools simply require a few mouse clicks to automatically recover data. However, this "push button" mentality has led to many inaccurate results in the past few years. It is also very difficult to identify a skilled attacker solely using antiquated and slow commercial toolsets. This section will free you from relying on "push button" forensic techniques by showing you how the engines of digital forensic tools really work. To understand how to carve out data, it is best to understand how to do it by hand and then show how automated tools should be able to recover the same data.

Topics: Advanced "Evidence of Execution" Artifacts; Windows 7/8 Server 2008/2012 Shadow Volume Copy Analysis; Deep Dive Malware and Anti-Forensic Detection; File-Based Data Carving; NTFS Filesystem Analysis; Anti-Forensic Detection Methodologies

508.5 HANDS ON: Threat Hunting

Over the years, we have observed that many incident responders have a challenging time finding malware without pre-built indicators of compromise or threat intelligence gathered prior to a breach. This is especially true in APT group intrusions. This advanced session will demonstrate techniques used by first responders to identify malware or forensic artifacts when very little information exists about their capabilities or hidden locations. We will discuss techniques to help funnel possibilities down to the candidates most likely to be evil malware trying to hide on the system. The section concludes with a step-by-step approach to handling some of the most difficult types of investigations.

Topics: Adversary and Malware Hunting; Methodology to Analyze and Solve Challenging Cases

508.6 HANDS ON: APT Intrusion Incident Response Challenge

This incredibly rich and realistic enterprise intrusion exercise is based on a real-world advanced persistent threat (APT) group. It brings together techniques learned earlier in the week and tests your newly acquired skills in a case that simulates an attack by an advanced adversary. The challenge brings it all together using a real intrusion into a complete Windows enterprise environment. You will be asked to uncover how the systems were compromised in the initial intrusion, find other systems the adversary moved to laterally, and identify intellectual property stolen via data exfiltration. You will walk out of the course with hands-on experience investigating realistic attacks, curated by a cadre of instructors with decades of experience fighting advanced threats from attackers ranging from nation-states to financial crime syndicates and hactivist groups.

You Will Be Able To

- Apply incident response processes, threat intelligence, and digital forensics to investigate breached enterprise environments from advanced persistent threat (APT) groups, organized crime syndicates, or hackivists
- Discover every system compromised in your enterprise utilizing incident response tools such as F-Response and digital forensic analysis capabilities in the SIFT Workstation to identify APT beachhead and spear phishing attack mechanisms, lateral movement, and data exfiltration techniques
- Use the SIFT Workstation's capabilities, and perform forensic analysis and incident response on any remote enterprise hard drive or system memory without having to image the system first, allowing for immediate response and scalable analysis to take place across the enterprise
- Use system memory and the Volatility toolset to discover active malware on a system, determine how the malware was placed there, and recover it to help develop key threat intelligence to perform proper scoping activities during incident response
- Detect advanced capabilities such as Stuxnet, TDSS, or APT command and control malware immediately through memory analysis using Redline's Malware Rating Index (MRI) to quickly ascertain the threat to your organization and aid in scoping the true extent of the data breach
- Track the exact footprints of an attacker crossing multiple systems and observe data the attacker has collected to exfiltrate as you track your adversary's movements in your network via timeline analysis using the log2timeline toolset
- Begin recovery and remediation of the compromise via the use of Indicators of Compromise (IOC), Threat Intelligence, and IR/Forensics key scanning techniques to identify active malware and all enterprise systems affected by the breach
- Perform filesystem surgery using the sleuthkit tool to discover how filesystems work and uncover powerful forensic artifacts such as NTFS $I30 directory file indexes, journal parsing, and detailed Master File Table analysis
- Use volume shadow snapshot examinations, XP restore point analysis, and NTFS examination tools in the SIFT Workstation, and recover artifacts hidden by anti-forensic techniques such as timestomping, file wiping, rootkit hiding, and privacy cleaning
- Discover an adversary's persistent mechanisms to allow malware to continue to run on a system after a reboot using command-line tools such as autorunsc, psexec, jobparser, group policy, triage-ir, and IOCFinder

FOR518 Mac Forensic Analysis

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: Sarah Edwards

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

DFIR
digital-forensics.sans.org

"Sarah is an incredible instructor – her knowledge far surpasses anything I've ever experienced, especially regarding the file system."
-Ben Keck, Ciena

Digital forensic investigators have traditionally dealt with Windows machines, but what if they find themselves in front of a new Apple Mac or iDevice? The increasing popularity of Apple devices can be seen everywhere, from coffee shops to corporate boardrooms, yet most investigators are familiar with Windows-only machines.

"This course gives a top-to-bottom approach to forensic thinking that is quite needed in the profession."
-Naveel Koya, AC-DAC Trivandrum

Times and trends change and forensic investigators and analysts need to change with them. The new **FOR518: Mac Forensic Analysis** course provides the tools and techniques necessary to take on any Mac case without hesitation. The intense hands-on forensic analysis skills taught in the course will enable Windows-based investigators to broaden their analysis capabilities and have the confidence and knowledge to comfortably analyze any Mac or iOS system.

Who Should Attend

- Experienced digital forensic analysts who want to solidify and expand their understanding of file system forensics and advanced Mac analysis
- Law enforcement officers, federal agents, or detectives who want to master advanced computer forensics and expand their investigative skill set
- Media exploitation analysts who need to know where to find the critical data they need from a Mac system
- Incident response team members who are responding to complex security incidents/intrusions from sophisticated adversaries and need to know what to do when examining a compromised system
- Information security professionals who want to become knowledgeable with Mac OS X and iOS system internals
- SANS FOR408, FOR508, FOR526, FOR610, FOR585 alumni looking to round out their forensic skills

FOR518: Mac Forensic Analysis will teach you:

- **Mac Fundamentals:** How to analyze and parse the Hierarchical File System (HFS+) by hand and recognize the specific domains of the logical file system and Mac-specific file types.
- **User Activity:** How to understand and profile users through their data files and preference configurations.
- **Advanced Analysis and Correlation:** How to determine how a system has been used or compromised by using the system and user data files in correlation with system log files.
- **Mac Technologies:** How to understand and analyze many Mac-specific technologies, including Time Machine, Spotlight, iCloud, Versions, FileVault, AirDrop, and FaceTime.

"Pound for pound, dollar for dollar, there is no other forensic training I have seen, from FTK to EnCase to anything private, that holds a candle to what was presented in this course."
-Kevin J. Ripa, Computer Evidence Recovery, Inc.

FOR518: Mac Forensic Analysis aims to form a well-rounded investigator by introducing Mac forensics into a Windows-based forensics world. This course focuses on topics such as the HFS+ file system, Mac-specific data files, tracking user activity, system configuration, analysis and correlation of Mac logs, Mac applications, and Mac exclusive technologies. A computer forensic analyst who successfully completes the course will have the skills needed to take on a Mac forensics case.

FORENSICATE DIFFERENTLY!

Sarah Edwards *SANS Certified Instructor*
Sarah is a senior digital forensic analyst who has worked with various federal law enforcement agencies. She has performed a variety of investigations including computer intrusions, criminal cases, counter-intelligence, counter-narcotics, and counter-terrorism. Sarah's research and analytical interests include Mac forensics, mobile device forensics, digital profiling, and malware reverse engineering. Sarah has presented at the following industry conferences; Shmoocon, CEIC, BsidesNOLA, TechnoSecurity, HTCIA, and the SANS DFIR Summit. She has a bachelor of science degree in information technology from Rochester Institute of Technology and a master's degree in information assurance from Capitol College. @iamevltwin

518.1 HANDS ON: Mac Essentials and the HFS+ File System

This section introduces the student to Mac system fundamentals such as acquisition, the Hierarchical File System (HFS+), timestamps, and logical file system structure. Acquisition fundamentals are the same with Mac systems, but there are a few Mac-specific tips and tricks that can be used to successfully and easily collect Mac systems for analysis. The building blocks of Mac Forensics start with a thorough understanding of the HFS+. Utilizing a hex editor, the student will learn the basic principles of the primary file system implemented on Mac OS X systems. Students comfortable with Windows forensic analysis can easily learn the slight differences on a Mac system: the data are the same, only the format differs.

Topics: Mac Fundamentals; Mac Acquisition; Incident Response; HFS+ File System; Volumes; Mac Basics

518.2 HANDS ON: User Domain File Analysis

The logical Mac file system is made up of four domains; User, Local, System, and Network. The User Domain contains most of the user-related items of forensic interest. This domain consists of user preferences and configurations, e-mail, Internet history, and user-specific application data. This section contains a wide array of information that can be used to profile and understand how individuals use their computers.

Topics: User Home Directory; User Account Information; User Data Analysis; Internet & E-mail; Instant Messaging; Native Mac Applications

518.3 HANDS ON: System and Local Domain File Analysis

The System and Local Domains contain system-specific information such as application installation, system settings and preferences, and system logs. This section details basic system information, GUI preferences, and system application data. A basic analysis of system logs can give a good understanding of how a system was used or abused. Timeline analysis tells the story of how the system was used. Each entry in a log file has a specific meaning and may be able to tell how the user interacted with the computer. The log entries can be correlated with other data found on the system to create an in-depth timeline that can be used to solve cases quickly and efficiently. Analysis tools and techniques will be used to correlate the data and help the student put the story back together in a coherent and meaningful way.

Topics: System Information; System Applications; Log Analysis; Timeline Analysis & Correlation

518.4 HANDS ON: Advanced Analysis Topics

Mac systems implement some technologies that are available only to those with Mac devices. These include data backup with Time Machine, Versions, and iCloud; extensive file metadata with Extended Attributes and Spotlight; and disk encryption with FileVault. Other advanced topics include data hidden in encrypted containers, Mac intrusion and malware analysis, Mac Server, and Mac memory analysis.

Topics: Extended Attributes; Time Machine; Spotlight; Cracking Passwords & Encrypted Containers; iCloud; Document Versions; Malware & Antivirus; Memory Acquisition & Analysis; Portable OS X Artifacts; Mac OS X Server

518.5 HANDS ON: iOS Forensics

From iPods to iPhones to iPads, it seems everyone has at least one of these devices. Apple iDevices are seen in the hands of millions of people. Much of what goes on in our lives is often stored on them. Forensic analysis of these iOS devices can provide an investigator with an incredible amount of information. Data on these iOS devices will be explored to teach the student what key files exist on them and what advanced analysis techniques can be used to exploit them for investigations.

Topics: History of iOS Devices; iOS Acquisition; iOS Analytical Tool Overview; iOS Artifacts Recovered from OS X Systems; iOS File System; iOS Artifacts & Areas of Evidentiary Value; Third-Party Applications

518.6 HANDS ON: The Mac Forensics Challenge

Students will put their new Mac forensics skills to the test by completing the following tasks:

- In-Depth HFS+ File System Examination
- File System Timeline Analysis
- Advanced Computer Forensics Methodology
- Mac Memory Analysis
- File System Data Analysis
- Metadata Analysis
- Recovering Key Mac Files
- Volume and Disk Image Analysis
- Analysis of Mac Technologies including Time Machine, Spotlight, and FileVault
- Advanced Log Analysis and Correlation
- iDevice Analysis and iOS Artifacts

You Will Be Able To

- Parse the HFS+ file system by hand, using only a cheat sheet and a hex editor
- Determine the importance of each file system domain
- Conduct temporal analysis of a system by correlating data files and log analysis
- Profile individuals' usage of the system, including how often they used it, what applications they frequented, and their personal system preferences
- Determine remote or local data backups, disk images, or other attached devices
- Find encrypted containers and FileVault volumes, understand keychain data, and crack Mac passwords
- Analyze and understand Mac metadata and their importance in the Spotlight database, Time Machine, and Extended Attributes
- Develop a thorough knowledge of the Safari Web Browser and Apple Mail applications
- Identify communication with other users and systems through iChat, Messages, FaceTime, Remote Login, Screen Sharing, and AirDrop
- Conduct an intrusion analysis of a Mac for signs of compromise or malware infection
- Acquire and analyze memory from Mac systems
- Acquire iOS and analyze devices in-depth

"Very comprehensive in-depth coverage of the course topic. Excellent reference materials as a takeaway."

-Jennifer Barnes, Indiana State Police

FOR526

Memory Forensics In-Depth

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: Alissa Torres

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

DFIR
digital-forensics.sans.org

"Thank you for all the content and I can't wait to do the exercises and the challenges again."
-Nick Christian, TBI

ALSO AVAILABLE VIA SIMULCAST
www.sans.org/simulcast

Digital Forensics and Incident Response (DFIR) professionals need Windows memory forensics training to be at the top of their game. Investigators who do not look at volatile memory are leaving evidence at the crime scene. RAM content holds evidence of user actions, as well as evil processes and furtive behaviors implemented by malicious code. It is this evidence that often proves to be the smoking gun that unravels the story of what happened on a system.

Who Should Attend

- Incident response team members
- Experienced digital forensic analysts
- Red team members, penetration testers, and exploit developers
- Law enforcement officers, federal agents, or detectives
- SANS FOR508 and SEC504 graduates
- Forensics investigators

FOR526: Memory Forensics In-Depth provides the critical skills necessary for digital forensics examiners and incident responders to successfully perform live system memory triage and analyze captured memory images. The course uses the most effective freeware and open-source tools in the industry today and provides an in-depth understanding of how these tools work. FOR526 is a critical course for any serious DFIR investigator who wants to tackle advanced forensics, trusted insider, and incident response cases.

MALWARE CAN HIDE, BUT IT MUST RUN

In today's forensics cases, it is just as critical to understand memory structures as it is to understand disk and registry structures. Having in-depth knowledge of Windows memory internals allows the examiner to access target data specific to the needs of the case at hand. For those investigating platforms other than Windows, this course also introduces OSX and Linux memory forensics acquisition and analysis using hands-on lab exercises.

There is an arms race between analysts and attackers. Modern malware and post-exploitation modules increasingly employ self-defense techniques that include more sophisticated rootkit and anti-memory analysis mechanisms that destroy or subvert volatile data. Examiners must have a deeper understanding of memory internals in order to discern the intentions of attackers or rogue trusted insiders. FOR526 draws on best practices and recommendations from experts in the field to guide DFIR professionals through acquisition, validation, and memory analysis with real-world and malware-laden memory images.

FOR526:Memory Forensics In-Depth will teach you:

- **Proper Memory Acquisition:** Demonstrate targeted memory capture ensuring data integrity and combating anti-acquisition techniques
- **How to Find Evil in Memory:** Detect rogue, hidden, and injected processes, kernel-level rootkits, Dynamic Link Libraries (DLL) hijacking, process hollowing, and sophisticated persistence mechanisms
- **Effective Step-by-Step Memory Analysis Techniques:** Use process timelining, high-low level analysis, and walking the Virtual Address Descriptors (VAD) tree to spot anomalous behavior
- **Best Practice Techniques:** Learn when to implement triage, live system analysis, and alternative acquisition techniques and how to devise custom parsing scripts for targeted memory analysis

Alissa Torres *SANS Certified Instructor*

Alissa specializes in advanced computer forensics and incident response. Her industry experience includes serving in the trenches as part of the Mandiant Computer Incident Response Team (MCIRT) as an incident handler and working on a internal security team as a digital forensic investigator. She has extensive experience in information security, spanning government, academic, and corporate environments and holds a bachelor's degree from the University of Virginia and a master's degree from the University of Maryland in Information Technology. Alissa has taught at the Defense Cyber Investigations Training Academy (DCITA), delivering incident response and network basics to security professionals entering the forensics community. She has presented at various industry conferences and numerous B-Sides events. In addition to being a GIAC Certified Forensic Analyst (GCFA), she holds the GCFE, GPEN, CISSP, EnCE, CFCE, MCT and CTT+ certifications. @sibertor

526.1 HANDS ON: Foundations in Memory Analysis and Acquisition

Simply put, memory analysis has become a ***required skill*** for all incident responders and digital forensics examiners. Regardless of the type of investigation, system memory and its contents often expose the first piece of the evidential thread that, when pulled, unravels the whole picture of what happened on the target system. Where is the malware? How did the machine get infected? Where did the attacker move laterally? Or what did the disgruntled employee do on the system? What lies in physical memory can provide answers to all of these questions and more.

Topics: Why Memory Forensics?; Investigative Methodologies; The Ubuntu SIFT and Windows 8.1 Workstations; The Volatility Framework; System Architectures; Triage versus Full Memory Acquisition; Physical Memory Acquisition

526.2 HANDS ON: Unstructured Analysis and Process Exploration

Structured memory analysis using tools that identify and interpret operating system structures is certainly powerful. However, many remnants of previously allocated memory remain available for analysis, and they cannot be parsed through structure identification. What tools are best for processing fragmented data? Unstructured analysis tools! They neither know nor care about operating system structures. Instead, they examine data, extracting findings using pattern matching. You will learn how to use Bulk Extractor to parse memory images and extract investigative leads such as email addresses, network packets, and more.

Topics: Unstructured Memory Analysis; Page File Analysis; Exploring Process Structures; List Walking and Scanning; Pool Memory; Exploring Process Relationships; Exploring DLLs; Kernel Objects

526.3 HANDS ON: Investigating the User via Memory Artifacts

An incident responder (IR) is often asked to triage a system because of a network intrusion detection system alert. The Security Operations Center makes the call and requires more information due to outbound network traffic from an endpoint and the IR team is asked to respond. In this section, we cover how to enumerate active and terminated TCP connections – selecting the right plugin for the job based on the OS version.

Topics: Network Connections; Virtual Address Descriptors; Detecting Injected Code; Analyzing the Registry via Memory Analysis; User Artifacts in Memory

526.4 HANDS ON: Internal Memory Structures

Day 4 focuses on introducing some internal memory structures (such as drivers), Windows memory table structures, and extraction techniques for portable executables. As we come to the final steps in our investigative methodology, "Spotting Rootkit Behaviors" and "Extracting Suspicious Binaries," it is important to emphasize again the rootkit paradox. The more malicious code attempts to hide itself, the more abnormal and seemingly suspicious it appears. We will use this concept to evaluate some of the most common structures in Windows memory for hooking, the IDTs and SSDTs.

Topics: Interrupt Descriptor Tables; System Service Descriptor Tables; Drivers; Direct Kernel Object Manipulation; Module Extraction; Hibernation Files; Crash Dump Files

526.5 HANDS ON: Memory Analysis on Platforms Other than Windows

Windows systems may be the most prevalent platform encountered by forensic examiners today, but most enterprises are not homogeneous. Forensic examiners and incident responders are best served by having the skills to analyze the memory of multiple platforms, including Linux and Mac – that is, platforms other than Windows.

Topics: Linux Memory Acquisition and Analysis; Mac Memory Acquisition and Analysis

526.6 HANDS ON: Memory Analysis Challenges

This final section provides students with a direct memory forensics challenge that makes use of the SANS NetWars Tournament platform. Your memory analysis skills are put to the test with a variety of hands-on scenarios involving hibernation files, Crash Dump files, and raw memory images, reinforcing techniques covered in the first five sections of the course. These challenges strengthen students' ability to respond to typical and atypical memory forensics challenges from all types of cases, from investigating the user to isolating the malware. By applying the techniques learned earlier in the course, students consolidate their knowledge and can shore up skill areas where they feel they need additional practice.

Topics: Malware and Rootkit Behavior Detection; Persistence Mechanism Identification; Code Injection Analysis; User Activity Reconstruction; Linux Memory Image Parsing; Mac OSX Memory Image Parsing; Windows Hibernation File Conversion and Analysis; Windows Crash Dump Analysis (Using Windows Debugger)

What You Will Receive

- SIFT Workstation 3
  This course extensively uses the SIFT Workstation 3 to teach incident responders and forensic analysts how to respond to and investigate sophisticated attacks. SIFT contains hundreds of free and open-source tools, easily matching any modern forensic and incident response commercial tool suite.
  - Ubuntu LTS base
  - 64 bit-based system
  - Better memory utilization
  - Auto-DFIR package update and customizations
  - Latest forensic tools and techniques
  - VMware Appliance ready to tackle forensics
  - Cross-compatibility between Linux and Windows
  - Expanded filesystem support (NTFS, HFS, EXFAT, and more)
- Windows 8.1 Workstation with license
  - 64 bit-based system
  - A licensed virtual machine loaded with the latest forensic tools
  - VMware Appliance ready to tackle forensics
- 32 GB Course USB 3.0
  - USB loaded with memory captures, SIFT workstation 3, tools, and documentation
- SANS Memory Forensics Exercise Workbook
  - Exercise book is over 200 pages long with detailed step-by-step instructions and examples to help you become a master incident responder
- SANS DFIR cheat sheets to help use the tools
- MP3 audio files of the complete course lecture

"This course is totally awesome, relevant, and eye opening. I want to learn more every day."

-Matthew Britton, Blue Cross Blue Shield of Louisiana

FOR572 Advanced Network Forensics and Analysis

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: Philip Hagen

www.giac.org/gnfa

www.sans.edu

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

DFIR
digital-forensics.sans.org

Who Should Attend

- Incident response team members and forensicators
- Law enforcement officers, federal agents, and detectives
- Information security managers
- Network defenders
- IT professionals
- Network engineers
- Anyone interested in computer network intrusions and investigations
- Security Operations Center personnel and information security practitioners

Forensic casework that does not include a network component is a rarity in today's environment. Performing disk forensics will always be a critical and foundational skill for this career, but overlookingthe network component of today's computing architecture is akin to ignoring security camera footage of a crime as it was committed. Whether you handle an intrusion incident, data theft case, or employee misuse scenario, the network often has an unparalleled view of the incident. Its evidence can provide the proof necessary to show intent, or even definitively prove that a crime actually occurred.

FOR572: Advanced Network Forensics and Analysis was built from the ground up to cover the most critical skills needed to mount efficient and effective post-incident response investigations. We focus on the knowledge necessary to expand the forensic mindset from residual data on the storage media from a system or device to the transient communications that occurred in the past or continue to occur. Even if the most skilled remote attacker compromised a system with an undetectable exploit, the system still has to communicate over the network. Without command-and-control and data extraction channels, the value of a compromised computer system drops to almost zero. Put another way: ***Bad guys are talking – we'll teach you to listen.***

"FOR572 was an excellent course that kept my attention and it will be immediately useful when I get back to work." -John Ives, UC Berkeley

This course covers the tools, technology, and processes required to integrate network evidence sources into your investigations, with a focus on efficiency and effectiveness. You will leave this week with a well-stocked toolbox and the knowledge to use it on your first day back on the job. We will cover the full spectrum of network evidence, including high-level NetFlow analysis, low-level pcap exploration, ancillary network log examination, and more. We cover how to leverage existing infrastructure devices that may contain months or years of valuable evidence, as well as how to place new collection platforms while an incident is already under way.

Whether you are a consultant responding to a client's site, a law enforcement professional assisting victims of cyber crime and seeking prosecution of those responsible, or an on-staff forensic practitioner, this course offers hands-on experience with real-world scenarios that will help take your work to the next level. Previous SANS security curriculum students and other network defenders will benefit from the FOR572 perspective on security operations as they take on more incident response and investigative responsibilities. SANS forensics alumni from FOR408 and FOR508 can take their existing knowledge and apply it directly to the network-based attacks that occur daily. In FOR572, we solve the same caliber of real-world problems without any convenient hard drive or memory images.

The hands-on exercises in this class cover a wide range of tools, including the venerable tcpdump and Wireshark for packet capture and analysis; commercial tools from Splunk, NetworkMiner, and SolarWinds; and open-source tools including nfdump, tcpxtract, ELSA, and more. Through all of these exercises, your shell scripting abilities will come in handy to make easy work of ripping through hundreds and thousands of data records.

Philip Hagen *SANS Certified Instructor*

Philip Hagen has been working in the information security field since 1998, running the full spectrum including deep technical tasks, management of an entire computer forensic services portfolio, and executive responsibilities. Currently, Phil is an Evangelist at Red Canary, where he engages with current and future customers of Red Canary's managed threat detection service to ensure their use of the service is best aligned for success in the face of existing and future threats. Phil started his security career while attending the U.S. Air Force Academy, with research covering both the academic and practical sides of security. He served in the Air Force as a communications officer at Beale AFB and the Pentagon. In 2003, Phil became a government contractor, providing technical services for various IT and information security projects. These included systems that demanded 24x7x365 functionality. He later managed a team of 85 computer forensic professionals in the national security sector. He provided forensic consulting services for law enforcement, government, and commercial clients prior to joining the Red Canary team. Phil is the course lead and co-author of FOR572: Advanced Network Forensics and Analysis. @PhilHagen

572.1 HANDS ON: Off the Disk and Onto the Wire

Network data can be preserved, but only if captured directly from the wire. Whether tactical or strategic, packet capture methods are quite basic. You will re-acquaint yourself with tcpdump and Wireshark, the most common tools used to capture and analyze network packets, respectively. However, since long-term full-packet capture is still uncommon in most environments, many artifacts that can tell us about what happened on the wire in the past come from devices that manage network functions. You will learn about what kinds of devices can provide valuable evidence and at what level of granularity. We will walk through collecting evidence from one of the most common sources of network evidence, a web proxy server, then you'll go hands-on to find and extract stolen data from the proxy yourself. The Linux SIFT virtual machine, which has been specifically loaded with a set of network forensic tools, will be your primary toolkit for the week.

Topics: Web Proxy Server Examination, Payload Reconstruction, Foundational Network Forensics Tools: tcpdump and Wireshark, Network Evidence Types and Sources, Network Architectural Challenges and Opportunities, Packet Capture Applications and Data

572.2 HANDS ON: NetFlow Analysis, Commercial Tools, and Visualization

In this section, you will learn what data items NetFlow can provide, and the various means of collecting those items. As with many such monitoring technologies, both commercial and open-source solutions exist to query and examine NetFlow data. We will review both categories and discuss the benefits and drawbacks of each. In the same vein, presenting concise findings from extremely large data sources is an important skill. A network forensicator should be able to aggregate and visually present findings, especially when faced with a years-long compromise incident. Expressing findings supported with visualizations can provide a much clearer picture than words alone.

Topics: NetFlow Analysis and Collection; Open-Source Flow Tools, Commercial Network Forensics; Visualization Techniques and Tools; Dynamic Host Configuration Protocol (DHCP) and Domain Name Service (DNS)

572.3 HANDS ON: Network Protocols and Wireless Investigations

This section covers some of the most common and fundamental network protocols that you will likely face during an investigation. We will cover a broad range of protocols including the Dynamic Host Configuration Protocol, which glues together layers two and three on the OSI model, and Microsoft's Remote Procedure Call protocol, which provides all manners of file, print, name resolution, authentication, and other services.

Topics: Hypertext Transfer Protocol (HTTP); Network Time Protocol (NTP); File Transfer Protocol (FTP); Wireless Network Forensics; Simple Mail Transfer Protocol (SMTP); Microsoft Protocols

572.4 HANDS ON: Logging, OPSEC, and Footprint

In this section, you will learn about various logging mechanisms available to both endpoint and network transport devices. You will also learn how to consolidate log data from multiple sources, providing a broad corpus of evidence in one location. As the volume of log data increases, so does the need to consider automated analytic tools. You will learn various solutions that accomplish this, from tactical to enterprise-scale.

Topics: Syslog; Microsoft Eventing; HTTP Server Logs; Firewall and Intrusion Detection Systems; Log Data Collection, Aggregation, and Analysis; Investigation OPSEC and Footprint Considerations

You Will Be Able To

- Extract files from network packet captures and proxy cache files, allowing follow-on malware analysis or definitive data loss determination
- Use historical NetFlow data to identify relevant past network occurrences, allowing accurate incident scoping
- Reverse-engineer custom network protocols to identify an attacker's command-and-control abilities and actions
- Decrypt captured SSL traffic to identify attackers' actions and what data they extracted from the victim
- Use data from typical network protocols to increase the fidelity of the investigation's findings
- Identify opportunities to collect additional evidence based on the existing systems and platforms within a network architecture
- Examine traffic using common network protocols to identify patterns of activity or specific actions that warrant further investigation
- Incorporate log data into a comprehensive analytic process, filling knowledge gaps that may be far in the past
- Learn how attackers leverage man-in-the-middle tools to intercept seemingly secure communications
- Examine proprietary network protocols to determine what actions occurred on the endpoint systems
- Analyze wireless network traffic to find evidence of malicious activity
- Use visualization tools and techniques to distill vast, complex data sources into management-friendly reports
- Learn how to modify configuration on typical network devices such as firewalls and intrusion detection systems to increase the intelligence value of their logs and alerts during an investigation
- Apply the knowledge you acquire during the week in a full-day capstone exercise, modeled after real-world nation-state intrusions

572.5 HANDS ON: Encryption, Protocol Reversing, and Automation

Encryption is frequently cited as the most significant hurdle to effective network forensics, and for good reason. When properly implemented, encryption can be a brick wall in between an investigator and critical answers. However, technical and implementation weaknesses can be used to our advantage. Even in the absence of these weaknesses, the right analytic approach to encrypted network traffic can still yield valuable information about the content. We will discuss the basics of encryption and how to approach it during an investigation. The section will also cover flow analysis to characterize encrypted conversations.

Topics: Dealing with Encoding and Encryption; Man-in-the-Middle; Encrypted Traffic Flow Analysis; Secure HTTP (HTTPS) and Secure Sockets Layer (SSL); Network Protocol Reverse Engineering; Automated Tools and Libraries

572.6 HANDS ON: Network Forensics Capstone Challenge

This section will combine all of what you have learned during this week. In groups, you will examine network evidence from a real-world compromise by an advanced attacker. Each group will independently analyze data, form and develop hypotheses, and present findings. No evidence from endpoint systems is available – only the network and its infrastructure.

Topics: Network Forensic Case

FOR578 Cyber Threat Intelligence

SANS

NEW!

Five-Day Program
Mon, Sep 12- Fri, Sep 16
9:00am - 5:00pm
30 CPEs
Laptop Required
Instructor: Jake Williams

DFIR
digital-forensics.sans.org

"Jake Williams is very good. Enjoyed all the real-life stories/situations and awareness."
-Riaz Ahmed, ITT

Make no mistake: current computer network defense and incident response contain a strong element of intelligence and counterintelligence that analysts must understand and leverage in order to defend their computers, networks, and proprietary data.

FOR578: Cyber Threat Intelligence will help network defenders and incident responders:

- Construct and exploit threat intelligence to detect, respond, and defeat advanced persistent threats (APTs)
- Fully analyze successful and unsuccessful intrusions by advanced attackers
- Piece together intrusion campaigns, threat actors, and nation-state organizations
- Manage, share, and receive intelligence on APT adversary groups
- Generate intelligence from their own data sources and share it accordingly
- Identify, extract, and leverage intelligence from APT intrusions
- Expand upon existing intelligence to build profiles of adversary groups
- Leverage intelligence to better defend against and respond to future intrusions.

Who Should Attend

- Incident response team members
- Experienced digital forensic analysts
- Security Operations Center personnel and information security practitioners
- Federal agents and law enforcement officials
- SANS FOR408, FOR572, FOR508, or FOR610 graduates looking to take their skills to the next level

Conventional network defenses such as intrusion detection systems and anti-virus tools focus on the vulnerability component of risk, and traditional incident response methodology pre-supposes a successful intrusion. However, the evolving sophistication of computer network intrusions has rendered these approaches insufficient to address the threats faced by modern networked organizations. Today's adversaries accomplish their goals using advanced tools and techniques designed to circumvent most conventional computer network defense mechanisms, go undetected during the intrusion, and then remain undetected on networks over long periods of time.

The collection, classification, and exploitation of knowledge about adversaries – collectively known as **cyber threat intelligence** – gives network defenders information superiority that can be used to reduce the adversary's likelihood of success with each subsequent intrusion attempt. Responders need accurate, timely, and detailed information to monitor new and evolving attacks, as well as methods to exploit this information to put in place an improved defensive posture. Threat intelligence thus represents a force multiplier for organizations looking to update their response and detection programs to deal with increasingly sophisticated advanced persistent threats.

During a targeted attack, an organization needs a top-notch and cutting-edge incident response armed with the critical intelligence necessary to understand how adversaries operate and to combat the threat. **FOR578: Cyber Threat Intelligence** will train you and your team to determine, scope, and select resilient courses of action in response to such intrusions and data breaches.

THERE IS NO TEACHER BUT THE ENEMY!

Jake Williams *SANS Certified Instructor*

Jake Williams is a Principal Consultant at Rendition Infosec. He has more than a decade of experience in secure network design, penetration testing, incident response, forensics, and malware reverse engineering. Before founding Rendition Infosec, Jake worked with various cleared government agencies in information security roles. He is well versed in cloud forensics and previously developed a cloud forensics course for a U.S. government client. Jake regularly responds to cyber intrusions by state-sponsored actors in the financial, defense, aerospace, and healthcare sectors using cutting-edge forensics and incident response techniques. He often develops custom tools to deal with specific incidents and malware reversing challenges. Additionally, Jake performs exploit development and has privately disclosed a multitude of zero day exploits to vendors and clients. He found vulnerabilities in one of the state counterparts to healthcare.gov and recently exploited antivirus software to perform privilege escalation. Jake developed Dropsmack, a pentesting tool (okay, malware) that performs command and control and data exfiltration over cloud file sharing services. Jake also developed an anti-forensics tool for memory forensics, Attention Deficit Disorder (ADD). This tool demonstrated weaknesses in memory forensics techniques. @MalwareJake

578.1 HANDS ON: Cyber Threat Intelligence for Intrusions

A key facilitator of cyber threat intelligence (CTI) is to use a common lexicon that defines its most basic elements and ideas. This section introduces students to fundamental CTI concepts and models, beginning with an understanding of broader intelligence analysis tradecraft. The section introduces and defines CTI through conventional lectures, class participation, and exercises from the students' lab book.

Topics: Course Introduction; Current Threat Landscape; Classic Intelligence Analysis; Intelligence in Computer Network Defense; Diamond Model; Kill Chain Introduction and Background; Kill Chain Phases in Detail; Analytical Aspects of the Kill Chain; Courses of Action Matrix; Indicator Lifecycle; Indicator Maturity Model; Decision-making in Intelligence Exploitation; Additional, Alternate, and Emergent Models

578.2 HANDS ON: Kill Chain for Computer Network Defense

One of the most commonly used and basic models covered in the first section is the "kill chain," which is the series of steps an adversary must accomplish to be successful. This section will use the kill chain as a guide to collect intelligence on the sophisticated adversary involved in a multi-phase intrusion, from initial discovery of command-and-control to completion of analysis of the event. The section also draws on other models introduced in Section 1, such as the Courses of Action Matrix, to show students their proper role in analyzing a successful intrusion as they methodically work their way toward being able to define a full campaign using the concepts introduced here.

Topics: Scenario-based Kill Chain Analysis: Web Drive-by; Application of Courses of Action for Computer Network Defense; Analytical Completeness Guided by Kill Chain Analysis; Multi-Stage Intrusions and Kill Chain Sequencing; Second Scenario-based Kill Chain Analysis: Webserver Intrusion; Historical Unsuccessful Intrusion Attempt: Phishing Attempt; Completing the Picture with Available Intelligence

578.3 HANDS ON: Campaigns and Open-Source Pivoting

An intrusion is but a single attempt by an adversary to gain access to a system for some intended purpose. Dedicated adversaries, intent on exploiting systems that support specific organizations, people, or technologies, will not let one failed attempt deter them from their ultimate goal. Their sustained campaign will likely consist of multiple intrusions over an extended period of time, each with its individual kill chain, against organizations you monitor and defend as well as others beyond your visible spectrum. In this section, students learn what campaigns are, why they are important, and how to define them. From this baseline intelligence, gaps and collection opportunities are identified for fulfillment via open-source resources and methods. Common types and implementations of open-source data repositories, as well as their use, are explored in-depth through classroom discussion and exercises. These resources can produce an enormous volume of intelligence about intrusions, which may contain obscure patterns that further elucidate campaigns or actors. Tools and techniques to expose these patterns within the data through higher-order analysis will be demonstrated in narrative and exercise form. The application of the resulting intelligence will be articulated for correlation, courses of action, campaign assembly, and more.

Topics: Abbreviated History of Threats in Cyberspace; Cross-Incident Correlation; Campaign Definitions; Distinguishing Correlative and Actionable Intelligence; Pitfalls in Correlating Intrusions; Interpreting Campaign Intersections; Pivoting, Hunting, and External Intelligence Exploitation; Exploratory Techniques for Campaign Analysis

578.4 HANDS ON: Organizations, Nation-States, and Higher-Order Analysis

Behind campaigns are people, and just like network defenders and intelligence analysts, these intruders have roles within organizations, employers, bosses, customers, and colleagues. This section will explore in more depth the characteristics of the organizational entities behind intrusions, and how these characteristics are projected through intrusions. Cognitive biases common in the cyber threat intelligence (CTI) domain are discussed. Analysis of Competing Hypotheses is then presented as a formal method for mitigating bias in intelligence assessments in general, then for nation-states and (separately) campaign attribution. Intent, opportunity, and capability are revisited from Section 1 in greater detail, particularly as they pertain to nation-state actors. The role and significance of nation-state attribution in CTI analysis is discussed as a general concept, with examples from contemporaneous nation-state threats. Finally, an abridged history of threats in cyberspace that marked inflection points particularly significant for the CTI domain is provided.

Topics: Formulating Conclusions; Cognitive Biases & Analysis of Competing Hypotheses (ACH); Nation-State Attribution; Understanding Threats and Their Actions at the Strategic and Operational Level; Abridged History of Threats in Cyberspace Influencing the CTI Domain

578.5 HANDS ON: Collecting, Sharing, and Actuating Intelligence

Intrusions consist of an enormous amount of information that, once refined, represents intelligence. In this section, students will learn effective ways to manage intelligence, collaborate with their peers, and empower their security teams. Campaigns consist of intrusions spanning months and sometimes even years, each with its own details linking its constituent intrusions. Collecting this intelligence is critical to making it actionable for defense, and appropriately sharing it with internal and peer organization security teams makes it possible to identify the resilient characteristics of adversaries and discover new campaigns. Intrusions will span organizations, and sometimes even spread across industries. External intelligence is key to keep up to date on the latest movements and tactics of adversaries, even if they are not (yet!) targeting you.

Topics: Intelligence-Sharing Purposes and Considerations; Extracting Tactical Threat Intelligence; Indicators of Compromise (IOC) Formats; Open-Source Intelligence Collection (OSINT); Commercial and Open-Source CTI Solutions; Intelligence Knowledge Management; Internal Threat Intel Sharing; Peer Collaboration; Report Writing

FOR585

Advanced Smartphone Forensics

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: Heather Mahalik

NEW! GASF

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Mobile devices are often a key factor in criminal cases, intrusions, IP theft, security threats, and more. Understanding how to leverage the data from the device in a correct manner can make or break your case and your future as an expert. **FOR585: Advanced Smartphone Forensics** will teach you those skills.

Every time the smartphone "thinks" or makes a suggestion, the data are saved. It's easy to get mixed up in what the forensic tools are reporting. Smartphone forensics is more than pressing the "find evidence" button and getting answers. Your team cannot afford to rely solely on the tools in your lab. You have to understand how to use them correctly to guide your investigation, instead of just letting the tool report what it believes happened on the device. It is impossible for commercial tools to parse everything from smartphones and understand how the data were put on the device. Examining and interpreting the data is your job, and this course will provide you and your organization with the capability to find and extract the correct evidence from smartphones with confidence.

This in-depth smartphone forensics course provides examiners and investigators with advanced skills to detect, decode, decrypt, and correctly interpret evidence recovered from mobile devices. The course features 17 hands-on labs that allow students to analyze different datasets from smart devices and leverage the best forensic tools and custom scripts to learn how smartphone data hide and can be easily misinterpreted by forensic tools. Each lab is designed to teach you a lesson that can be applied to other smartphones. You will gain experience with the different data formats on multiple platforms and learn how the data are stored and encoded on each type of smart device. The labs will open your eyes to what you are missing by relying 100% on your forensic tools.

FOR585 is continuously updated to keep up with the latest malware, smartphone operating systems, third-party applications, and encryption. This intensive six-day course offers the most unique and current instruction available, and it will arm you with mobile device forensic knowledge you can apply immediately to cases you're working on the day you finish the course.

Smartphone technologies are constantly changing, and most forensic professionals are unfamiliar with the data formats for each technology. Take your skills to the next level: it's time for the good guys to get smarter and for the bad guys to know that their texts and apps can and will be used against them!

SMARTPHONE DATA CAN'T HIDE FOREVER – IT'S TIME TO OUTSMART THE MOBILE DEVICE!

Who Should Attend

- Experienced digital forensic analysts who want to extend their knowledge and experience to forensic analysis of mobile devices, especially smartphones
- Media exploitation analysts who need to master Tactical Exploitation or Document and Media Exploitation (DOMEX) operations on smartphones and mobile devices by learning how individuals used their smartphones, who they communicated with, and what files they accessed
- Information security professionals who respond to data breach incidents and intrusions
- Incident response teams tasked with identifying the role that smartphones played in a breach
- Law enforcement officers, federal agents, and detectives who want to master smartphone forensics and expand their investigative skills beyond traditional host-based digital forensics
- IT auditors who want to learn how smartphones can expose sensitive information
- SANS SEC575, FOR408, FOR518, and FOR508 graduates looking to take their skills to the next level

Heather Mahalik *SANS Senior Instructor*

Heather Mahalik is a project manager for Ocean's Edge, where she uses her experience to manage projects focused on wireless cybersecurity and mobile application development. Heather has over 12 years of experience in digital forensics, vulnerability discovery of mobile devices, application reverse engineering and manual decoding. She is currently the course lead for FOR585: Advanced Smartphone Forensics. Previously, Heather headed the mobile device team for Basis Technology, where she led the mobile device exploitation efforts in support of the U.S. government. She also worked as a forensic examiner at Stroz Friedberg and the U.S. State Department Computer Investigations and Forensics Lab, where she focused her efforts on high-profile cases. Heather co-authored *Practical Mobile Forensics* and various white papers, and has presented at leading conferences and instructed classes focused on Mac forensics, mobile device forensics, and computer forensics to practitioners in the field. Heather blogs and hosts work from the digital forensics community at www.smarterforensics.com. @HeatherMahalik

585.1 HANDS ON: Smartphone Overview and Malware Forensics

Although smartphone forensics concepts are similar to those of digital forensics, smartphone file system structures require specialized decoding skills to correctly interpret the data acquired from the device. On the first course day students will apply what they already know to smartphone forensics handling, device capabilities, acquisition methods and data encoding concepts of smartphone components. Students will also become familiar with the forensics tools required to complete comprehensive examinations of smartphone data structures. Malware affects a plethora of smartphone devices. This section will examine various types of malware, how it exists on smartphones and how to identify it. Most commercial tools help you identify malware, but none of them will allow you to tear down the malware to the level we cover in class. Up to five labs will be conducted on this first day alone!

Topics: The SIFT Workstation; Malware and Spyware Forensics; Introduction to Smartphones; Smartphone Handling; Forensic Acquisition of Smartphones; Smartphone Forensics Tool Overview; JTAG Forensics; Smartphone Components

585.2 HANDS ON: Android Forensics

Android devices are among the most widely used smartphones in the world, which means they will surely be part of an investigation that will come across your desk. Android devices contain substantial amounts of data that can be decoded and interpreted into useful information. However, without honing the appropriate skills for bypassing locked Androids and correctly interpreting the data stored on them, you will be unprepared for the rapidly evolving world of smartphone forensics.

Topics: Android Forensics Overview; Handling Locked Android Devices; Android File System Structures; Android Evidentiary Locations; Traces of User Activity on Android Devices

585.3 HANDS ON: iOS Forensics

Apple iOS devices contain substantial amounts of data (including deleted records) that can be decoded and interpreted into useful information. Proper handling and parsing skills are needed for bypassing locked iOS devices and correctly interpreting the data. Without iOS instruction, you will be unprepared to deal with the iOS device that will likely be a major component in a forensic investigation.

Topics: iOS Forensics Overview and Acquisition; iOS File System Structures; iOS Evidentiary Locations; Handling Locked iOS Devices; Traces of User Activity on iOS Devices

585.4 HANDS ON: Backup File and BlackBerry Forensics

We realize that not everyone examines BlackBerry devices. However, this section highlights pieces of evidence that can be found on multiple smartphones. Most importantly, we cover encrypted data on SD cards and how those data need to be acquired and examined. BlackBerry smartphones are designed to protect user privacy, but techniques taught in this section will enable the investigator to go beyond what the tools decode and manually recover data residing in database files of BlackBerry device file systems. Backup smartphone images are commonly found on external media and the cloud, and may be the only forensic acquisition method for newer iOS devices that are locked. Learning how to access and parse data from encrypted backup files may be the only lead to smartphone data relating to your investigation.

Topics: Backup File Forensics Overview; Common File Formats For Smartphone Backups; Creating and Parsing Backup Files; Evidentiary Locations on Backup Files; Locked Backup Files; Blackberry Forensics Overview; BlackBerry File System, Evidentiary Locations and Forensic Analysis

You Will Be Able To

- Understand where key evidence is located on a smartphone
- Determine how the data got onto the smartphone
- Recover deleted mobile device data that most forensic tools miss
- Decode evidence stored in third-party applications
- Detect, decompile, and analyze mobile malware and spyware
- Handle locked or encrypted devices, applications, and containers

A smartphone lands on your desk and you are tasked with determining if the user was at a specific location at a specific date and time. You rely on your forensic tools to dump and parse the data. The tools show location information tying the device to the place of interest. Are you ready to prove the user was at that location? Do you know how to take this further to place the subject at the location of interest at that specific date and time? Tread carefully, because the user may not have done what the tools are showing!

"This class exceeded my expectations. The material is cutting edge!"
-Kevin McNamara,
San Diego Police Dept.

585.5 HANDS ON: Third-Party Application and Other Smartphone Device Forensics

This day starts with third-party applications across all smartphones and is designed to teach students how to leverage third-party application data and preference files to support an investigation. Next, other smartphones not afforded a full day of instruction are discussed and labs for each are provided. Given the prevalence of other types of smartphones around the world, it is critical for examiners to develop a foundation of understanding about data storage on multiple devices. You must acquire skills for handling and parsing data from uncommon smartphone devices. This course day will prepare you to deal with "misfit" smartphone devices and provide you with advanced methods for decoding data stored in third-party applications across all smartphones. The day ends with the students challenging themselves using tools and methods learned throughout the week to recover user data from a wiped Windows Phone.

Topics: Third-Party Applications on Smartphones Overview; Third-Party Application Locations on Smartphones; Decoding Third-Party Application Data on Smartphones; Knock-off Phone Forensics; Nokia (Symbian) Forensics; Windows Phone/Mobile Forensics

585.6 HANDS ON: Smartphone Forensics Capstone Exercise

This final course day will test all that you have learned during the course. Working in small groups, students will examine three smartphone devices and solve a scenario relating to a real-world smartphone forensic investigation. Each group will independently analyze the three smartphones, manually decode data, answer specific questions, form an investigation hypothesis, develop a report, and present findings.

FOR610

Reverse-Engineering Malware: Malware Analysis Tools and Techniques

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: Lenny Zeltser

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www.sans.edu

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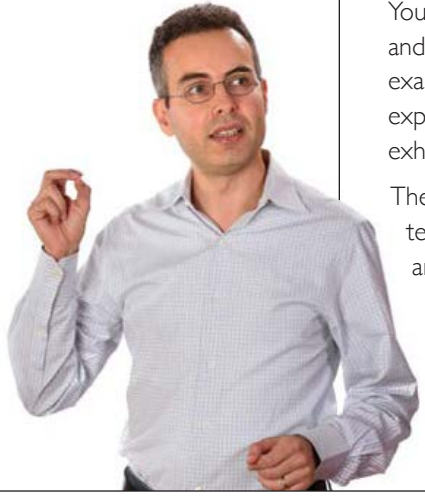

This popular malware analysis course helps forensic investigators, incident responders, security engineers and IT administrators acquire practical skills for examining malicious programs that target and infect Windows systems. Understanding the capabilities of malware is critical to an organization's ability to derive the threat intelligence it needs to respond to information security incidents and fortify defenses. The course builds a strong foundation for analyzing malicious software using a variety of system and network monitoring utilities, a disassembler, a debugger and other tools useful for turning malware inside-out.

Who Should Attend

- Individuals who have dealt with incidents involving malware and want to learn how to understand key aspects of malicious programs
- Technologists who have informally experimented with aspects of malware analysis prior to the course and are looking to formalize and expand their expertise in this area
- Forensic investigators and IT practitioners looking to expand their skillsets and learn how to play a pivotal role in the incident response process

The course begins by covering fundamental aspects of malware analysis. You will learn how to set up an inexpensive and flexible laboratory to understand the inner workings of malicious software and uncover characteristics of real-world malware samples. Then you will learn to examine the specimens' behavioral patterns and code. The course continues by discussing essential x86 assembly language concepts. You will examine malicious code to understand its key components and execution flow. Additionally, you will learn to identify common malware characteristics by looking at suspicious Windows API patterns employed by bots, rootkits, keyloggers, downloaders, and other types of malware.

"This is a highly valuable course that equips one with the necessary skill to start on malware reverse engineering." -Kelvin Heng, DSTA

This course will teach you how to handle self-defending malware. You'll learn how to bypass the protection offered by packers, and other anti-analysis methods. In addition, given the frequent use of browser malware for targeting systems, you will learn practical approaches to analyzing malicious browser scripts and deobfuscating JavaScript and VBScript to understand the nature of the attack.

You will also learn how to analyze malicious documents that take the form of Microsoft Office and Adobe PDF files. Such documents act as a common infection vector and may need to be examined when dealing with large-scale infections as well as targeted attacks. The course also explores memory forensics approaches to examining malicious software, especially useful if it exhibits rootkit characteristics.

The course culminates with a series of Capture-the-Flag challenges designed to reinforce the techniques learned in class and provide additional opportunities to learn practical malware analysis skills in a fun setting.

Hands-on workshop exercises are a critical aspect of this course and allow you to apply malware analysis techniques by examining malware in a lab that you control. When performing the exercises, you will study the supplied specimens' behavioral patterns and examine key portions of their code. To support these activities, you will receive pre-built Windows and Linux virtual machines that include tools for examining and interacting with malware.

Lenny Zeltser *SANS Senior Instructor*

Lenny Zeltser is a seasoned business leader with extensive experience in information technology and security. As a product management director at NCR Corporation, he focuses on safeguarding IT infrastructure of small and midsize businesses world-wide. Before NCR, Lenny led the enterprise security consulting practice at a major IT hosting provider. In addition, Lenny is a member of the Board of Directors at SANS Technology Institute and a volunteer incident handler at the Internet Storm Center. Lenny's expertise is strongest at the intersection of business, technology and information security practices and includes incident response, cloud services and product management. He frequently speaks at conferences, writes articles and has co-authored books on network security and malicious software defenses. Lenny is one of the few individuals in the world who've earned the prestigious GIAC Security Expert designation. He has an a master's degree in business administration from MIT Sloan and a computer science degree from the University of Pennsylvania. @lennyzeltser

610.1 HANDS ON: Malware Analysis Fundamentals

Section one lays the groundwork for malware analysis by presenting the key tools and techniques useful for examining malicious programs. You will learn how to save time by exploring Windows malware in two phases. Behavioral analysis focuses on the program's interactions with its environment, such as the registry, the network, and the file system. Code analysis focuses on the specimen's code and makes use of a disassembler and debugger tools such as IDA Pro and OllyDbg. You will learn how to set up a flexible laboratory to perform such analysis in a controlled manner, and set up such a lab on your laptop using the supplied Windows and Linux (REMnux) virtual machines. You will then learn how to use the key analysis tools by examining a malware sample in your lab – with guidance and explanations from the instructor – to reinforce the concepts discussed throughout the day.

Topics: Assembling a Toolkit for Effective Malware Analysis; Examining Static Properties of Suspicious Programs; Performing Behavioral Analysis of Malicious Windows Executables; Performing Static and Dynamic Code Analysis of Malicious Windows Executables; Contributing Insights to the Organization's Larger Incident Response Effort

610.2 HANDS ON: Malicious Code Analysis

Section two focuses on examining malicious Windows executables at the assembly level. You will discover approaches for studying inner workings of a specimen by looking at it through a disassembler and, at times, with the help of a debugger. The section begins with an overview of key code-reversing concepts and presents a primer on essential x86 Intel assembly concepts, such as instructions, function calls, variables, and jumps. You will also learn how to examine common assembly constructs, such as functions, loops, and conditional statements. The remaining part of the section discusses how malware implements common characteristics, such as keylogging and DLL injection, at the assembly level. You will learn how to recognize such characteristics in suspicious Windows executable files.

Topics: Core Concepts for Analyzing Malware at the Code Level; x86 Intel Assembly Language Primer for Malware Analysts; Identifying Key x86 Assembly Logic Structures with a Disassembler; Patterns of Common Malware Characteristics at the Windows API Level (DLL Injection, Function Hooking, Keylogging, Communicating over HTTP, etc.)

610.3 HANDS ON: In-Depth Malware Analysis

Section three builds upon the approaches to behavioral and code analysis introduced earlier in the course, exploring techniques for uncovering additional aspects of the functionality of malicious programs. You will learn about packers and the techniques that may help analysts bypass their defenses. Additionally, you will understand how to redirect network traffic in the lab to better interact with malware to understand its capabilities. You will also learn how to examine malicious websites and deobfuscate browser scripts, which often play a pivotal role in malware attacks.

Topics: Recognizing Packed Malware; Automated Malware Unpacking Tools and Approaches; Manual Unpacking of Using OllyDbg, Process Dumping Tools and Imports-Rebuilding Utilities; Intercepting Network Connections in the Malware Lab; Interacting with Malicious Websites to Examine their Nature; Deobfuscating Browser Scripts Using Debuggers and Runtime Interpreters; JavaScript Analysis Complications

You Will Be Able To

- Build an isolated, controlled laboratory environment for analyzing code and behavior of malicious programs
- Employ network and system-monitoring tools to examine how malware interacts with the file system, registry, network, and other processes in a Windows environment
- Uncover and analyze malicious JavaScript and VBScript components of web pages, which are often used by exploit kits for drive-by attacks
- Control relevant aspects of the malicious program's behavior through network traffic interception and code patching to perform effective malware analysis
- Use a disassembler and a debugger to examine the inner-workings of malicious Windows executables
- Bypass a variety of packers and other defensive mechanisms designed by malware authors to misdirect, confuse and otherwise slow down the analyst
- Recognize and understand common assembly-level patterns in malicious code, such as DLL injection and anti-analysis measures
- Derive Indicators of Compromise (IOCs) from malicious executables to perform incident response triage
- Utilize practical memory forensics techniques to examine capabilities of rootkits and other malicious program types

610.4 HANDS ON: Self-Defending Malware

Section four focuses on the techniques malware authors commonly employ to protect malicious software from being examined, often with the help of packers. You will learn how to recognize and bypass anti-analysis measures, such as tool detection, string obfuscation, unusual jumps, breakpoint detection and so on. We will also discuss the role that shellcode plays in the context of malware analysis and learn how to examine this aspect of attacks. As with the other topics covered throughout the course, you will be able to experiment with such techniques during hands-on exercises.

Topics: Bypassing Anti-Analysis Defenses; Recovering Concealed Malicious Code and Data; Unpacking More Sophisticated Packers to Locate the Original Entry Point (OEP); Identifying and Disabling Methods Employed by Malware to Detect Analysts' Tools; Analyzing Shellcode to Assist with the Examination of Malicious Documents and other Artifacts

610.5 HANDS ON: Malicious Documents and Memory Forensics

Section five starts by exploring common patterns of assembly instructions often used to gain initial access to the victim's computer. Next, we will learn how to analyze malicious Microsoft Office documents, covering tools such as OfficeMalScanner and exploring steps for analyzing malicious PDF documents with practical tools and techniques. Another major topic covered in this section is the reversing of malicious Windows executables using memory forensics techniques. We will explore this topic with the help of tools such as the Volatility Framework and associated plug-ins. The discussion of memory forensics will bring us deeper into the world of user and kernel-mode rootkits and allow us to use context of the infection to analyze malware more efficiently.

Topics: Analyzing Malicious Microsoft Office (Word, Excel, PowerPoint) Documents; Analyzing Malicious Adobe PDF Documents; Analyzing Memory to Assess Malware Characteristics and Reconstruct Infection Artifacts; Using Memory Forensics to Analyze Rootkit Infections

610.6 HANDS ON: Malware Analysis Tournament

Section six assigns students to the role of a malware reverse engineer working as a member of an incident response and malware analysis team. Students are presented with a variety of hands-on challenges involving real-world malware in the context of a fun tournament. These challenges further a student's ability to respond to typical malware-reversing tasks in an instructor-led lab environment and offer additional learning opportunities. Moreover, the challenges are designed to reinforce skills covered in the first five sections of the course, making use of the hugely popular SANS NetWars tournament platform. By applying the techniques learned earlier in the course, students solidify their knowledge and can shore up skill areas where they feel they need additional practice. The students who score the highest in the malware reverse-engineering challenge will be awarded the coveted SANS' Digital Forensics Lethal Forensicator coin. Game on!

Topics: Behavioral Malware Analysis; Dynamic Malware Analysis (Using a Debugger); Static Malware Analysis (Using a Disassembler); JavaScript Deobfuscation; PDF Document Analysis; Office Document Analysis; Memory Analysis

ICS410

ICS/SCADA Security Essentials

SANS

Five-Day Program
Mon, Sep 12- Fri, Sep 16
9:00am - 5:00pm
30 CPEs
Laptop Required
Instructor: Eric Cornelius

www.giac.org/gicsp

www.sans.edu

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

SANS has joined forces with industry leaders to equip security professionals and control system engineers with the cybersecurity skills they need to defend national critical infrastructure. **ICS410: ICS/SCADA Security Essentials** provides a foundational set of standardized skills and knowledge for industrial cybersecurity professionals. The course is designed to ensure that the workforce involved in supporting and defending industrial control systems is trained to keep the operational environment safe, secure, and resilient against current and emerging cyber threats.

Who Should Attend

The course is designed for the range of individuals who work in, interact with, or can affect industrial control system environments, including asset owners, vendors, integrators, and other third parties. These personnel primarily come from four domains:

- IT (includes operational technology support)
- IT security (includes operational technology security)
- Engineering
- Corporate, industry, and professional standards

The course will provide you with:

- An understanding of industrial control system components, purposes, deployments, significant drivers, and constraints
- Hands-on lab learning experiences to control system attack surfaces, methods, and tools
- Control system approaches to system and network defense architectures and techniques
- Incident-response skills in a control system environment
- Governance models and resources for industrial cybersecurity professionals

When examining the greatest risks and needs in critical infrastructure sectors, the course authors looked carefully at the core security principles necessary for the range of tasks involved in supporting control systems on a daily basis. While other courses are available for higher-level security practitioners who need to develop specific skills such as industrial control system penetration testing, vulnerability analysis, malware analysis, forensics, secure coding, and red team training, most of these courses do not focus on the people who operate, manage, design, implement, monitor, and integrate critical infrastructure production control systems.

With the dynamic nature of industrial control systems, many engineers do not fully understand the features and risks of many devices. In addition, IT support personnel who provide the communications paths and network defenses do not always grasp the systems' operational drivers and constraints. This course is designed to help traditional IT personnel fully understand the design principles underlying control systems and how to support those systems in a manner that ensures availability and integrity. In parallel, the course addresses the need for control system engineers and operators to better understand the important role they play in cybersecurity. This starts by ensuring that a control system is designed and engineered with cybersecurity built into it, and that cybersecurity has the same level of focus as system reliability throughout the system lifecycle.

When these different groups of professionals complete this course, they will have developed an appreciation, understanding, and common language that will enable them to work together to secure their industrial control system environments. The course will help develop cyber-secure-aware engineering practices and real-time control system IT/OT support carried out by professionals who understand the physical effects of actions in the cyber world.

Eric Cornelius *SANS Certified Instructor*

Eric Cornelius is the Director of Critical Infrastructure and Industrial Control Systems (ICS) at Cylance, Inc. where he is responsible for thought leadership, architecture, and consulting. Eric brings a wealth of ICS knowledge and his leadership keeps organizations safe, secure, and resilient against advanced attackers. Previously, Eric served as the Deputy Director and Chief Technical Analyst for the Control Systems Security Program at the U.S. Department of Homeland Security. Eric earned a bachelor's degree from the New Mexico Institute of Mining and Technology, where he was the recipient of many scholarships and awards including the National Science Foundation's Scholarship for Service. Eric went on to work at the Army Research Laboratory's Survivability/Lethality Analysis Directorate, where he worked to secure field deployable combat technologies. It was at ARL that Eric became interested in non-traditional computing systems, an interest that ultimately led him to the Idaho National Laboratory where he participated in deep-dive vulnerability assessments of a wide range of ICS systems. Eric is the co-author of "Recommended Practice: Creating Cyber Forensics Plans for Control Systems" as part of the DHS National Cyber Security Division's 2008 Control Systems Security Program and is also a frequent speaker and instructor at ICS events across the globe.

410.1 ICS Overview

Students will develop and reinforce a common language and understanding of Industrial Control System (ICS) cybersecurity as well as the important considerations that come with cyber-to-physical operations within these environments. Each student will receive programmable logic controller (PLC) hardware to keep. The PLC contains physical inputs and outputs that will be programmed in class and mapped to an operator interface, or HMI, also created in class. This improved hardware-enabled approach provides the necessary cyber-to-physical knowledge that allows students to better understand important ICS operational drivers and constraints that require specific safety protection, communications needs, system management approaches, and cybersecurity implementations. Essential terms, architectures, methodologies, and devices are all covered to build a common language for students from a variety of different roles.

Topics: Global Industrial Cybersecurity Professional (GICSP) Overview; Overview of ICS; Field Components; Programming Controllers; Supervisory Components; Types of ICS Systems; IT & ICS Differences; Physical Security; ICS Network Architecture

410.2 ICS Attack Surface

If you know the adversary's approaches to attacking an ICS environment, you will be better prepared to defend that environment. Numerous attack vectors exist within an ICS environment. Some are similar to traditional IT systems, while others are more specific to ICS. During Day 2, defenders will develop a better understanding of where these specific attack vectors exist, as well as the tools to use to discover vulnerabilities and exploit them. Each student will use a vulnerable target virtual machine to further understand attacks targeting the types of web servers used on many ICS devices for management purposes. Simulators will be configured to allow students to conduct attacks against unauthenticated ICS protocols. A variety of data samples are used to examine additional attack vectors on remote devices.

Topics: ICS Attack Surface; Attacks on HMIs and UIs; Attacks on Control Servers; Attacks on Network Communications; Attacks on Remote Devices

410.3 Defending ICS Servers and Workstations

Students will learn essential ICS-related server and workstation operating system capabilities, implementation approaches, and system management practices. Students will receive and work with both Windows- and Linux-based virtual machines in order to understand how to monitor and harden these hosts from attack. Students will examine concepts that benefit ICS systems such as system hardening, log management, monitoring, alerting, and audit approaches, then look at some of the more common applications and databases used in ICS environments across multiple industries.

Topics: Windows in ICS; Linux/Unix in ICS; Updates and Patching; Processes and Services; Configuration Hardening; Endpoint Defenses; Automation and Auditing; Log Management; Databases and Historians

410.4 Defending ICS Networks and Devices

With an understanding of the ICS environment, the attack vectors that exist, and the defender-specific capabilities available on servers, workstations, and applications, students will now learn network-specific defense approaches. We'll first examine common IT protocols and network components used within ICS environments, then discuss ICS-specific protocols and devices. Technologies used to defend ICS networks will be reviewed along with implementation approaches. Students will interact with ICS traffic and develop skills to analyze it, then work through a number of tools to further explore a series of staged adversary actions conducted in a lab environment.

Topics: Network Fundamentals; Ethernet; TCP/IP Protocol Suite; ICS Protocols over TCP/IP; Enforcement Zone Devices; Honeypots; Wireless in Control Systems; Network Capture Forensics; Field and Plant Floor Equipment; Cryptography Fundamentals

410.5 ICS Security Governance

Students will learn about the various models, methodologies, and industry-specific regulations that are used to govern what must be done to protect critical ICS systems. Key business processes that consider risk assessments, disaster recovery, business impact analysis, and contingency planning will be examined from the perspective of ICS environments. On this final course day, students will work together on an incident response exercise that places them squarely in an ICS environment that is under attack. This exercise ties together key aspects of what has been learned throughout the course and presents students with a scenario to review with their peers. Specific incident-response roles and responsibilities are considered, and actions available to defenders throughout the incident response cycle are explored. Students will leave with a variety of resources for multiple industries and will be well prepared to pursue the GICSP, an important ICS-focused professional certification.

Topics: Information Assurance Foundations; Security Policies; Contingency and Continuity Planning; Risk Assessment and Auditing; Attack Tree Analysis; Password Management; Incident Handling; Incident Response;

You Will Be Able To

- Run Windows command line tools to analyze the system looking for high-risk items
- Run Linux command line tools (ps, ls, netstat, ect) and basic scripting to automate the running of programs to perform continuous monitoring of various tools
- Install VMWare and create virtual machines to create a virtual lab to test and evaluate tools/security of systems
- Better understand various industrial control systems and their purpose, application, function, and dependencies on network IP and industrial communications
- Work with operating systems (system administration concepts for Unix/Linux and/or Windows operating systems)
- Work with network infrastructure design (network architecture concepts, including topology, protocols, and components)
- Better understand the systems' security lifecycle
- Better understand information assurance principles and tenets (confidentiality, integrity, availability, authentication, non-repudiation)
- Use your skills in computer network defense (detecting host and network-based intrusions via intrusion detection technologies)
- Implement incident response and handling methodologies

"Great introduction into ICS landscape and associated security concerns. The ICS material presented will provide immediate value relative to helping secure my company."
-Mike Poulos, Coca-Cola Enterprises

"The material was applicable and eye opening to the possible vulnerabilities."
-Anthony Addeo, Exelon Limerick

ICS515

ICS Active Defense and Incident Response

SANS

Five-Day Program
Mon, Sep 12- Fri, Sep 16
9:00am - 5:00pm
30 CPEs
Laptop Required
Instructors: Robert M. Lee, Mark Bristow

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

"Very powerful tools and concepts!"
-Randy Wagner, Basin Electric

ICS515: ICS Active Defense and Incident Response will help you deconstruct ICS cyber attacks, leverage an active defense to identify and counter threats in your ICS, and use incident response procedures to maintain the safety and reliability of operations. This course will empower students to understand their networked industrial control system environment, monitor it for threats, perform incident response against identified threats, and learn from interactions with the adversary to enhance network security. This process of monitoring, responding to, and learning from threats internal to the network is known as active defense. An active defense is the approach needed to counter advanced adversaries targeting ICS, as has been seen with malware such as Stuxnet, Havex, and BlackEnergy2. Students can expect to come out of this course with the ability to deconstruct targeted ICS attacks and fight these adversaries and others. The course uses a hands-on approach and real-world malware to break down cyber attacks on ICS from start to finish. Students will gain a practical and technical understanding of leveraging active defense concepts such as using threat intelligence, performing network security monitoring, and utilizing malware analysis and incident response to ensure the safety and reliability of operations. The strategy and technical skills presented in this course serve as a basis for ICS organizations looking to show that defense is do-able.

Who Should Attend

- ICS incident response team leads and members
- ICS and operations technology security personnel
- IT security professionals
- Security Operations Center (SOC) team leads and analysts
- ICS red team and penetration testers
- Active defenders

You Will Be Able To

- Examine ICS networks and identify the assets and their data flows in order to understand the network baseline information needed to identify advanced threats
- Use active defense concepts such as threat intelligence consumption, network security monitoring, malware analysis, and incident response to safeguard the ICS
- Build your own Programmable Logic Controller using a CYBATIworks Kit and keep it after the class ends
- Gain hands-on experience with samples of Havex, BlackEnergy2, and Stuxnet through engaging labs while de-constructing these threats and others
- Leverage technical tools such as Shodan, Security Onion, TCPDump, NetworkMiner, Foremost, Wireshark, Snort, Bro, SGUIL, ELSA, Volatility, Redline, FTK Imager, PDF analyzers, malware sandboxes, and more
- Create indicators of compromise (IOCs) in OpenIOC and YARA while understanding sharing standards such as STIX and TAXII
- Take advantage of models such as the Sliding Scale of Cybersecurity, the Active Cyber Defense Cycle, and the ICS Cyber Kill Chain to extract information from threats and use it to encourage the long-term success of ICS network security

Robert M. Lee *SANS Certified Instructor*

Robert M. Lee is the CEO and founder of the critical infrastructure cybersecurity company Dragos Security LLC, where he has a passion for control system traffic analysis, incident response, and threat intelligence research. He is the course author of SANS ICS515: Active Defense and Incident Response and the co-author of SANS FOR578: Cyber Threat Intelligence. Robert is also a non-resident National Cyber Security Fellow at New America focusing on policy issues relating to the cybersecurity of critical infrastructure and a PhD candidate at Kings College London. For his research and focus areas, he was named one of Passcode's Influencers and awarded EnergySec's 2015 Cyber Security Professional of the Year. Robert obtained his start in cybersecurity in the U.S. Air Force, where he served as a Cyber Warfare Operations Officer. He has performed defense, intelligence, and attack missions in various government organizations, and he established a first-of-its-kind ICS/SCADA cyber threat intelligence and intrusion analysis mission. Robert routinely writes articles in publications such as *Control Engineering* and the *Christian Science Monitor's Passcode* and speaks at conferences around the world. He is also the author of *SCADA and Me* and the weekly web-comic (www.LittleBobbyComic.com) @RobertMLee

515.1 Threat Intelligence

Industrial control system (ICS) security professionals must be able to leverage internal and external threat intelligence to critically analyze threats, extract indicators of compromise (IOCs), and guide security teams to find threats in the environment. Today you will learn how threat intelligence is generated, how to critically analyze reports, and the basic tenets of active defense functions. Students will become better analysts and critical thinkers by learning skills useful in day-to-day operations, regardless of their jobs and roles. This day features four hands-on labs that include building a Programmable Logic Controller (PLC), identifying information available about assets online through Shodan, completing an analysis of competing hypotheses, and ingesting threat intelligence reports to guide their practices over the rest of the labs in the course.

Topics: Case Study: Havex; Introduction to ICS Active Defense and Incident Response; Intelligence Life Cycle and Threat Intelligence; ICS Information Attack Surface; External ICS Threat Intelligence; Internal ICS Threat Intelligence; Sharing and Consuming ICS Threat Intelligence

515.2 Asset Identification and Network Security Monitoring

Understanding the networked environment is the only way to fully defend it: you cannot defend what you do not know. This course section will teach students to use tools such as Wireshark, TCPdump, SGUIL, ELSA, CyberLens, Bro, NetworkMiner, and Snort to map their ICS network, collect data, detect threats, and analyze threats to drive incident response procedures. During this section, students will be introduced to the lab network and an advanced persistent threat (APT) that is present on it. Drawing on threat intelligence from the previous course section, students will have to discover, identify, and analyze the threat using their new active defense skills to guide incident responders to the affected Human Machine Interface (HMI).

Topics: Case Study: BlackEnergy2; ICS Asset and Network Visibility; Identifying and Reducing the Threat Landscape; ICS Network Security Monitoring – Collection; ICS Network Security Monitoring – Detection; ICS Network Security Monitoring – Analysis

515.3 Incident Response

The ability to prepare for and perform ICS incident response is vital to the safety and reliability of control systems. ICS incident response is a core concept in an ICS active defense and requires that analysts safely acquire digital evidence while scoping the environment for threats and their impact on operations. ICS incident response is a young field with many challenges, but students in this section will learn effective tactics and tools to collect and preserve forensic-quality data. Students will then use this data to perform timely forensic analysis and create IOCs. In the previous section's labs, APT malware was identified in the network. In this section, the labs will focus on identifying which system is impacted and gathering a sample of the threat that can be analyzed.

Topics: Case Study: Stuxnet; Incident Response and Digital Forensics Overview; Preparing an ICS Incident Response Team; Evidence Acquisition; Sources of Forensic Data in ICS Networks; Time-Critical Analysis; Maintaining and Restoring Operations

515.4 Threat and Environment Manipulation

Understanding the threat is key to discovering its capabilities and its potential to affect the ICS. The information extracted from threats through processes such as malware analysis is also critical to being able to make the necessary changes to the environment to reduce the effectiveness of the threat. The information obtained is vital to an ICS active defense, which requires internal data collection to create and share threat intelligence. In this section, students will learn how to analyze initial attack vectors such as spearphishing emails, perform timely malware analysis techniques, analyze memory images, and create Indicators of Compromise in YARA. The previous section's labs identified the infected HMI and gathered a sample of the APT malware. In this section's labs, students will analyze the malware, extract information, and develop YARA rules to complete the active defense model introduced in the class and maintain operations.

Topics: Case Study: German Steelworks; ICS Threat and Environment Manipulation Goals and Considerations; Establishing a Safe Working Environment; Analyzing Acquired Evidence; Memory Forensics; Malware Analysis Methodologies; Case Study: BlackEnergy2 Automated Analysis; Indicators of Compromise; Environment Manipulation

515.5 Active Defense and Incident Response Challenge

This section focuses on reinforcing the strategy, methodologies, skillsets, and tools introduced in the first four sections of the course. This entirely hands-on section will present students with two different scenarios. The first involves data collected from an intrusion into SANS Cyber City. The second involves data collected from a Distributed Control System (DCS) infected with malware. This section will truly challenge students to utilize their ICS active defense and incident response skills and test themselves.

Topics:

Scenario One: Identify the assets and map the ICS networks; Perform ICS network security monitoring to identify the abnormalities; Execute ICS incident response procedures into the SANS Cyber City data files; Analyze the malicious capability and determine if the threat is an insider threat or a targeted external threat

Scenario Two: Identify the software and information present on the DCS; Leverage ICS active defense concepts to identify the real-world malware; Determine the impact on operations and remediation needs

What You Will Receive

- 64Gb USB packed with ICS lab data such as packet captures and memory images
  - Protocol samples of OPC, ModbusTCP, DNP3, BACnet, ISO-TSAP, and more
  - System files from infected DCS and HMI systems
- A fully functioning CYBATIworks Mini-kit that students will keep following the class
  - A Raspberry PI that functions as a PLC
  - Physical components and attachments for I/O
  - Commercial control system demonstration software from Rex Controls
  - Commercial control system demonstration software from PeakHMI
  - Commercial control system demonstration software from CyberLens
- Samples of Stuxnet, Havex, and BlackEnergy2 in a safe Virtual Machine environment
- CYBATI Virtual Machine tailored for continued ICS education
- REMnux Virtual Machine for malware analysis
- Security Onion Virtual Machine for monitoring the network and detecting threats

MGT414

SANS Training Program for CISSP® Certification

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 7:00pm (Day 1)
8:00am - 7:00pm (Days 2-5)
8:00am - 5:00pm (Day 6)
46 CPEs
Laptop NOT Needed
Instructor: Eric Conrad

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www.sans.org/simulcast

SANS MGT414: SANS Training Program for CISSP® Certification is an accelerated review course that has been specifically updated to prepare you to pass the 2016 version of the CISSP® exam.

Course authors Eric Conrad and Seth Misenar have revised MGT414 to take into account the 2016 updates to the CISSP® exam and prepare students to navigate all types of questions included in the new version.

"I think the course material and the instructor are very relevant for the task of getting a CISSP. The overall academic exercise is solid."
-Aaron Lewter, Availity

MGT414 focuses solely on the eight domains of knowledge as determined by (ISC)² that form a critical part of the CISSP® exam. Each domain of knowledge is dissected into its critical components, and those components are then discussed in terms of their relationship with one another and with other areas of information security.

"This is a great way to refresh and review my knowledge before sitting for the CISSP exam. This course not only focused on the material at hand, but portrayed it with real-life examples that made it easy to relate to! One of the best classes and experiences I have had."
-Glenn C., Leidos

Take advantage of SANS' CISSP® Get Certified Program currently being offered.
www.sans.org/cissp

Who Should Attend

- Security professionals who are interested in understanding the concepts covered on the CISSP® exam as determined by (ISC)²
- Managers who want to understand the critical areas of network security
- System, security, and network administrators who want to understand the pragmatic applications of the CISSP® eight domains
- Security professionals and managers looking for practical ways the eight domains of knowledge can be applied to their current job

Obtaining Your CISSP® Certification Consists of:

- Fulfilling minimum requirements for professional work experience
- Completing the Candidate Agreement
- Review of your résumé
- Passing the CISSP® 250 multiple-choice question exam with a scaled score of 700 points or greater
- Submitting a properly completed and executed Endorsement Form
- Periodic audit of CPEs to maintain the credential

Eric Conrad *SANS Senior Instructor*

Eric Conrad is lead author of the book *The CISSP Study Guide*. Eric's career began in 1991 as a UNIX systems administrator for a small oceanographic communications company. He gained information security experience in a variety of industries, including research, education, power, Internet, and healthcare. He is now president of Backshore Communications, a company focusing on intrusion detection, incident handling, information warfare, and penetration testing. He is a graduate of the SANS Technology Institute with a master of science degree in information security engineering. In addition to the CISSP, he holds the prestigious GIAC Security Expert (GSE) certification as well as the GIAC GPEN, GCIH, GCIA, GCFA, GAWN, and GSEC certifications. Eric also blogs about information security at ericconrad.com. @eric_conrad

414.1 Introduction; Security and Risk Management

On the first day of training for the CISSP® exam, MGT414 introduces the specific requirements needed to obtain certification. The 2016 exam update will be discussed in detail. We will cover the general security principles needed to understand the eight domains of knowledge, with specific examples for each domain. The first of the eight domains, Security and Risk Management, is discussed using real-world scenarios to illustrate the critical points.

Topics: Overview of CISSP® Certification; Introductory Material; Overview of the 8 Domains; Domain 1: Security and Risk Management

414.2 Asset Security and Security Engineering (PART 1)

Understanding asset security is critical to building a solid information security program. The Asset Security domain, the initial focus of today's course section, describes data classification programs, including those used by both governments and the military as well as the private sector. We will also discuss ownership, covering owners ranging from business/mission owners to data and system owners. We will examine data retention and destruction in detail, including secure methods for purging data from electronic media. We then turn to the first part of the Security Engineering domain, including new topics for the 2016 exam such as the Internet of Things, Trusted Platform Modules, Cloud Security, and much more.

Topics: Domain 2: Asset Security; Domain 3: Security Engineering (Part 1)

You Will Be Able To

- Understand the eight domains of knowledge that are covered on the CISSP® exam
- Analyze questions on the exam and be able to select the correct answer
- Apply the knowledge and testing skills learned in class to pass the CISSP® exam
- Understand and explain all of the concepts covered in the eight domains of knowledge
- Apply the skills learned across the eight domains to solve security problems when you return to work

414.3 Security Engineering (PART 2); Communication and Network Security

This section continues the discussion of the Security Engineering domain, including a deep dive into cryptography. The focus is on real-world implementation of core cryptographic concepts, including the three types of cryptography: symmetric, asymmetric, and hashing. Salts are discussed, as well as rainbow tables. We will round out Domain 3 with a look at physical security before turning to Domain 4, Communication and Network Security. The discussion will cover a range of protocols and technologies, from the Open Systems Interconnection (OSI) model to storage area networks.

Topics: Domain 3: Security Engineering (Part 2); Domain 4: Communication and Network Security

414.4 Identity and Access Management

Controlling access to data and systems is one of the primary objectives of information security. Domain 5, Identity and Access Management, strikes at the heart of access control by focusing on identification, authentication, and authorization of accounts. Password-based authentication represents a continued weakness, so Domain 5 stresses multi-factor authentication, biometrics, and secure credential management. The 2016 CISSP® exam underscores the increased role of external users and service providers, and mastery of Domain 5 requires an understanding of federated identity, SSO, SAML, and third-party identity and authorization services like Oauth and OpenID.

Topics: Domain 5: Identity and Access Management

414.5 Security Assessment and Testing; Security Operations

This course section covers Domain 6 (Security Assessment) and Domain 7 (Security Operations). Security Assessment covers types of security tests, testing strategies, and security processes. Security Operations covers investigatory issues, including eDiscovery, logging and monitoring, and provisioning. We will discuss cutting-edge technologies such as cloud, and we'll wrap up day five with a deep dive into disaster recovery.

Topics: Domain 6: Security Assessment; Domain 7: Security Operations

414.6 Software Development Security

Domain 8 (Software Development Security) describes the requirements for secure software. Security should be "baked in" as part of network design from day one, since it is always less effective when it is added later to a poor design. We will discuss classic development models, including waterfall and spiral methodologies. We will then turn to more modern models, including agile software development methodologies. New content for the 2016 CISSP® exam update will be discussed, including DevOps. We will wrap up this course section by discussing security vulnerabilities, secure coding strategies, and testing methodologies.

Topics: Domain 8: Software Development Security

MGT512

SANS Security Leadership Essentials for Managers with Knowledge Compression™

SANS

Five-Day Program
Mon, Sep 12- Fri, Sep 16
9:00am - 6:00pm (Days 1-4)
9:00am - 4:00pm (Day 5)
33 CPEs
Laptop NOT Needed
Instructor: G. Mark Hardy

www.giac.org/gslc

www.sans.edu

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

MEETS DoDD 8140 (8570) REQUIREMENTS
www.sans.org/8140

This completely updated course is designed to empower advancing managers who want to get up to speed quickly on information security issues and terminology. You won't just learn about security, you will learn how to *manage* security. Lecture sections are intense; the most common student comment is that it's like drinking from a fire hose. The diligent manager will learn vital, up-to-date knowledge and skills required to supervise the security component of any information technology project. Additionally, the course has been engineered to incorporate the NIST Special Publication 800 (series) guidance so that it can be particularly useful to U.S. government managers and supporting contractors.

Who Should Attend

- All newly appointed information security officers
- Technically-skilled administrators who have recently been given leadership responsibilities
- Seasoned managers who want to understand what their technical people are telling them

Essential security topics covered in this management track include network fundamentals and applications, power, cooling and safety, architectural approaches to defense in depth, cyber attacks, vulnerability assessment and management, security policies, contingency and continuity planning, awareness management, risk management analysis, incident handling, web application security, and offensive and defensive information warfare, culminating with our management practicum. The material uses Knowledge Compression,™ special charts, and other proprietary SANS techniques to help convey the key points of critical slides and keep the information flow rate at a pace senior executives demand every teaching hour of the course. The course has been evaluated and approved by CompTIA's CAQC program for Security+ 2008 to ensure that managers and their direct reports have a common baseline for security terminology and concepts. You will be able to put what you learn into practice the day you get back into the office.

Knowledge Compression™

Maximize your learning potential!

Knowledge Compression™ is an optional add-on feature to a SANS class that aims to maximize the absorption and long-term retention of large amounts of data over a relatively short period of time. Through the use of specialized training materials, in-class reviews, examinations and test-taking instruction, Knowledge Compression™ ensures students have a solid understanding of the information presented to them. By attending classes that feature this advanced training product, you will experience some of the most intense and rewarding training programs SANS has to offer, in ways that you never thought possible!

G. Mark Hardy *SANS Certified Instructor*

G. Mark Hardy is founder and president of the National Security Corporation. He has been providing cybersecurity expertise to government, military, and commercial clients for over 30 years, and is an internationally recognized expert who has spoken at over 250 events world-wide. He serves on the Advisory Board of CyberWATCH, an Information Assurance/Information Security Advanced Technology Education Center of the National Science Foundation. A retired U.S. Navy Captain, he was privileged to serve in command nine times, including responsibility for leadership training for 70,000 sailors. He also served as wartime Director, Joint Operations Center for U.S. Pacific Command, and Assistant Director of Technology and Information Management for Naval Logistics in the Pentagon, with responsibility for InfoSec, Public Key Infrastructure, and Internet Security. Captain Hardy was awarded the Defense Superior Service Medal, the Legion of Merit, five Meritorious Service Medals, and 24 other medals and decorations. A graduate of Northwestern University, he holds a BS in Computer Science, BA in Mathematics, Masters in Business Administration, and a Masters in Strategic Studies, and holds the GSLC, CISSP, CISM, and CISA certifications. @g_mark

512.1 Managing the Enterprise, Planning, Network, and Physical Plant

The course starts with a whirlwind tour of the information an effective IT security manager must know to function in today's environment. We will cover safety, physical security, and how networks and the related protocols like TCP/IP work, and equip you to review network designs for performance, security, vulnerability scanning, and return on investment. You will learn more about secure IT operations in a single day than you ever thought possible.

Topics: Budget Awareness and Project Management; The Network Infrastructure; Computer and Network Addressing; IP Terminology and Concepts; Vulnerability Management; Managing Physical Safety, Security, and the Procurement Process

512.2 IP Concepts, Attacks Against the Enterprise, and Defense-in-Depth

You will learn about information assurance foundations, which are presented in the context of both current and historical computer security threats, and how they have impacted confidentiality, integrity, and availability. You will also learn the methods of the attack and the importance of managing attack surface.

Topics: Attacks Against the Enterprise; Defense in Depth; Managing Security Policy; Access Control and Password Management

512.3 Secure Communications

This course section examines various cryptographic tools and technologies and how they can be used to secure a company's assets. A related area called steganography, or information hiding, is also covered. Learn how malware and viruses often employ cryptographic techniques in an attempt to evade detection. We will learn about managing privacy issues in communications and investigate web application security.

Topics: Cryptography; Wireless Network Security; Steganography; Managing Privacy; Web Communications and Security; Operations Security, Defensive and Offensive Methods

You Will Be Able To

- Establish a minimum standard for IT security knowledge, skills, and abilities. In a nutshell, this course covers all of the non-operating system topics that are in MGT512, though not to the same depth. The goal is to enable managers and auditors to speak the same language as system, security, and network administrators.
- Establish a minimum standard for IT management knowledge, skills, and abilities. I keep running into managers who don't know TCP/IP, and that is OK; but then they don't know how to calculate total cost of ownership (TCO), leaving me quietly wondering what they do know.
- Save the up-and-coming generation of senior and rapidly advancing managers a world of pain by sharing the things we wish someone had shared with us. As the saying goes, it is OK to make mistakes, just make new ones.

512.4 The Value of Information

On this day we consider the most valuable resource an organization has: its information. You will learn about intellectual property, incident handling, and how to identify and better protect the information that is the real value of your organization. We will then formally consider how to apply everything we have learned, as well as practice briefing management on our risk architecture.

Topics: Managing Intellectual Property; Incident Handling Foundations; Information Warfare; Disaster Recovery/Contingency Planning; Managing Ethics; IT Risk Management

512.5 Management Practicum

On the fifth and final day, we pull it all together and apply the technical knowledge to the art of management. The management practicum covers a number of specific applications and topics concerning information security. We'll explore proven techniques for successful and effective management, empowering you to immediately apply what you have learned your first day back at the office.

Topics: The Mission; Globalization; IT Business and Program Growth; Security and Organizational Structure; Total Cost of Ownership; Negotiations; Fraud; Legal Liability; Technical People

Security Leaders and Managers earn the highest salaries (well into six figures) in information security and are near the top of IT. Needless to say, to work at that compensation level, excellence is demanded. These days, security managers are expected to have domain expertise as well as the classic project management, risk assessment, and policy review and development skills.

"MGT512 has great info for newly assigned managers to cybersecurity."
-Kerry T., U.S. Army Corps of Engineers

"MGT512 is one of the most valuable courses I've taken with SANS. It really did help bridge the gap from security practitioner to security orchestrator. Truly a gift!"
-John Madick, Epiq Systems, Inc.

MGT514

IT Security Strategic Planning, Policy, and Leadership

SANS

Five-Day Program
Mon, Sep 12- Fri, Sep 16
9:00am - 5:00pm
30 CPEs
Laptop NOT Needed
Instructor: Frank Kim

SANS Technology Institute
www.sans.edu

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

"I loved the enthusiasm and life experience that was brought into class."
-SANS SCOTTSDALE 2015 STUDENT

As security professionals we have seen the landscape change. Cybersecurity is now more vital and relevant to the growth of your organization than ever before. As a result, information security teams have more visibility, more budget, and more opportunity. However, with this increased responsibility comes more scrutiny.

This course teaches security professionals how to do three things:

Who Should Attend

- CISOs
- Information security officers
- Security directors
- Security managers
- Aspiring security leaders
- Other security personnel who have team lead or management responsibilities

Develop Strategic Plans

Strategic planning is hard for people in IT and IT security because we spend so much time responding and reacting. We almost never get to practice until we get promoted to a senior position and then we are not equipped with the skills we need to run with the pack. Learn how to develop strategic plans that resonate with other IT and business leaders.

Create Effective Information Security Policy

Policy is a manager's opportunity to express expectations for the workforce, set the boundaries of acceptable behavior, and empower people to do what they ought to be doing. It is easy to get wrong. Have you ever seen a policy and your response was, "No way, I am not going to do that?" Policy must be aligned with an organization's culture. We will break down the steps to policy development so that you have the ability to develop and assess policy to successfully guide your organization.

Develop Management and Leadership Skills

Leadership is a capability that must be learned, exercised and developed to better ensure organizational success. Strong leadership is brought about primarily through selfless devotion to the organization and staff, tireless effort in setting the example, and the vision to see and effectively use available resources toward the end goal. Effective leadership entails persuading team members to accomplish their objectives while removing obstacles and maintaining the well-being of the team in support of the organization's mission. Learn to utilize management tools and frameworks to better lead, inspire, and motivate your teams.

How the Course Works

Using case studies from Harvard Business School, team-based exercises, and discussions that put students in real-world scenarios, students will participate in activities that they can then carry out with their own team members when they return to work.

The next generation of security leadership must bridge the gap between security staff and senior leadership by strategically planning how to build and run effective security programs. After taking this course you will have the fundamental skills to create strategic plans that protect your company, enable key innovations, and work effectively with your business partners.

Frank Kim *SANS Certified Instructor*

As CISO at the SANS Institute, Frank leads the security risk function for the most trusted source of computer security training, certification, and research in the world. He also helps shape, develop, and support the next generation of security leaders by teaching, developing courseware, and leading the management and software security curricula. Prior to the SANS Institute, Frank was Executive Director of Cyber Security at Kaiser Permanente with accountability for delivering innovative security solutions to meet the unique needs of the nation's largest not-for-profit health plan and integrated health care provider with annual revenue of $55 billion, 9.5 million members, and 175,000 employees. In recognition of his work, Frank was a two-time recipient of the CIO Achievement Award for business enabling thought leadership. Frank holds degrees from the University of California at Berkeley and is the author of popular SANS courseware on strategic planning, leadership, and application security. @fykim

514.1 Strategic Planning Foundations

Creating security strategic plans requires a fundamental understanding of the business and a deep understanding of the threat landscape.

Topics: Vision & Mission Statements; Stakeholder Management; PEST Analysis; Porter's Five Forces; Threat Actors; Asset Analysis; Threat Analysis

514.2 Strategic Roadmap Development

With a firm understanding of business drivers as well as the threats facing the organization, you will develop a plan to analyze the current situation, identify the target situation, perform gap analysis, and develop a prioritized roadmap. In other words, you will be able to determine 1) what you do today, 2) what you should be doing in the future, 3) what you don't do, and 4) what you should do first. With this plan in place you will learn how to build and execute your plan by developing a business case, defining metrics for success, and effectively marketing your security program.

Topics: Historical Analysis; Values and Culture; SWOT Analysis; Vision and Innovation; Security Framework; Gap Analysis; Roadmap Development; Business Case Development; Metrics and Dashboards; Marketing and Executive Communications

514.3 Security Policy Development and Assessment

Policy is one of the key tools that security leaders have to influence and guide the organization. Security managers must understand how to review, write, assess, and support security policy and procedure. Using an instructional delivery methodology that balances lecture, exercises, and in-class discussion, this course section will teach techniques to create successful policy that users will read and follow and business leaders will accept. Learn key elements of policy, including positive and negative tone, consistency of policy bullets, how to balance the level of specificity to the problem at hand, the role of policy, awareness and training, and the SMART approach to policy development and assessment.

Topics: Purpose of Policy; Policy Gap Analysis; Policy Development; Policy Review; Awareness and Training

514.4 Leadership and Management Competencies

Learn the critical skills you need to lead, motivate, and inspire your teams to achieve the goal. By establishing a minimum standard for the knowledge, skills, and abilities required to develop leadership you will understand how to motivate employees and develop from a manager into a leader.

Topics: Leadership Building Blocks; Creating and Developing Teams; Coaching and Mentoring; Customer Service Focus; Conflict Resolution; Effective Communication; Leading Through Change; Relationship Building; Motivation and Self-Direction; Teamwork; Leadership Development

514.5 Strategic Planning Workshop

Using the case study method, students will work through real-world scenarios by applying the skills and knowledge learned throughout the course. Case studies are taken directly from Harvard Business School, the pioneer of the case-study method, and focus specifically on information security management and leadership competencies. The Strategic Planning Workshop serves as a capstone exercise for the course, allowing students to synthesize and apply concepts, management tools, and methodologies learned in class.

Topics: Creating a Security Plan for the CEO; Understanding Business Priorities; Enabling Business Innovation; Working with BYOD; Effective Communication; Stakeholder Management

You Will Be Able To

- Develop security strategic plans that incorporate business and organizational drivers
- Develop and assess information security policy
- Use management and leadership techniques to motivate and inspire your teams

"The instructor not only provided relevant content, he delivered it in an engaging way."
-Brian Cook, SANS 2015 student

"Really good case studies and examples which prompted useful class discussion."
-Alexis Brownings, CERT-UK

"This is a great foundational course as we realize the importance of bringing a business perspective to security."
-Nairobi Kim, Wells Fargo

MGT525

IT Project Management, Effective Communication, and PMP® Exam Prep

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop NOT Needed
Instructor: Jeff Frisk

www.giac.org/gcpm

www.sans.edu

SANS MGT525: IT Project Management, Effective Communication, and PMP® Exam Prep is offered by The SANS Institute, a PMI® Registered Education Provider (R.E.P.). R.E.P.s provide the training necessary to earn and maintain the Project Management Professional (PMP)® and other professional credentials.

This course has been recently updated to fully prepare you for the 2016 PMP® exam changes. During this class you will learn how to improve your project planning methodology and project task scheduling to get the most out of your critical IT resources. We will utilize project case studies that highlight information technology services as deliverables. MGT525 follows the basic project management structure from the *PMBOK® Guide – Fifth Edition* and also provides specific techniques for success with information assurance initiatives. Throughout the week, we will cover all aspects of IT project management from initiating and planning projects through managing cost, time, and quality while your project is active, to completing, closing, and documenting as your project finishes. A copy of the *PMBOK® Guide – Fifth Edition* is provided to all participants. You can reference the *PMBOK® Guide* and use your course material along with the knowledge you gain in class to prepare for the 2016 updated Project Management Professional (PMP)® Exam and the GIAC Certified Project Manager Exam.

Who Should Attend

- Individuals interested in preparing for the Project Management Professional (PMP)® Exam
- Security professionals who are interested in understanding the concepts of IT project management
- Managers who want to understand the critical areas of making projects successful
- Individuals working with time, cost, quality, and risk-sensitive projects and applications
- Anyone who would like to utilize effective communication techniques and proven methods to relate better to people
- Anyone in a key or lead engineering/ design position who works regularly with project management staff

"Best way to prepare top project managers for the real world and certification!"
-Rob Ashworth, Barling Bay

The project management process is broken down into core process groups that can be applied across multiple areas of any project, in any industry. Although our primary focus is the application to the InfoSec industry, our approach is transferable to any projects that create and maintain services as well as general product development. We cover in-depth how cost, time, quality, and risks affect the services we provide to others. We will also address practical human resource management as well as effective communication and conflict resolution. You will learn specific tools to bridge the communications gap between managers and technical staff.

PMP, PMBOK and the PMI Registered Education Provider logo are registered marks of the Project Management Institute, Inc.

Jeff Frisk *SANS Certified Instructor*

Jeff Frisk currently serves as the director of the GIAC certification program and is a member of the SANS Technology Institute Curriculum Committee. Jeff is a PMP® credential holder and a GIAC GSEC credential holder. He also is the course author for MGT525. He has worked on many projects for SANS and GIAC, including courseware, certification, and exam development. Jeff has an engineering degree from the Rochester Institute of Technology and more than 15 years of IT project management experience with computer systems, high-tech consumer products, and business development initiatives. Jeff has held various positions including managing operations, product development, and electronic systems/computer engineering. He has many years of international and high-tech business experience working with both big and small companies to develop computer hardware/software products and services.

525.1 Project Management Structure and Framework

This course offers insight and specific techniques that both beginner and experienced project managers can utilize. The structure and framework section lays out the basic architecture and organization of project management. We will cover the common project management group processes, the difference between projects and operations, project life cycles, and managing project stakeholders.

Topics: Definition of Terms and Process Concepts; Group Processes; Project Life Cycle; Types of Organizations; PDCA Cycle

525.2 Project Charter and Scope Management

During day two, we will go over techniques used to develop the project charter and formally initiate a project. The scope portion defines the important input parameters of project management and gives you the tools to ensure that your project is well defined from the outset. We cover tools and techniques that will help you define your project's deliverables and develop milestones to gauge performance and manage change requests.

Topics: Formally Initiating Projects; Project Charters; Project Scope Development; Work Breakdown Structures; Scope Verification and Control

525.3 Time and Cost Management

Our third day details the time and cost aspects of managing a project. We will cover the importance of correctly defining project activities, project activity sequence, and resource constraints. We will use milestones to set project timelines and task dependencies along with learning methods of resource allocation and scheduling. We introduce the difference between resource and product-related costs and go into detail on estimating, budgeting, and controlling costs. You will learn techniques for estimating project cost and rates as well as budgeting and the process for developing a project cost baseline.

Topics: Process Flow; Task Lead and Lag Dependencies; Resource Breakdown Structures; Task Duration Estimating; Critical Path Scheduling; Cost Estimating Tools; Cost vs. Quality; Cost Baselining; Earned Value Analysis and Forecasting

525.4 Communications and Human Resources

During day four, we move into human resource management and building effective communications skills. People are the most valuable asset of any project and we cover methods for identifying, acquiring, developing and managing your project team. Performance appraisal tools are offered as well as conflict management techniques. You will learn management methods to help keep people motivated and provide great leadership. The effective communication portion of the day covers identifying and developing key interpersonal skills. We cover organizational communication and the different levels of communication as well as common communication barriers and tools to overcome these barriers.

Topics: Acquiring and Developing Your Project Team; Organizational Dependencies and Charts; Roles and Responsibilities; Team Building; Conflict Management; Interpersonal Communication Skills; Communication Models and Effective Listening

You Will Be Able To

- Recognize the top failure mechanisms related to IT and InfoSec projects, so that your projects can avoid common pitfalls
- Create a project charter that defines the project sponsor and stakeholder involvement
- Document project requirements and create a requirements traceability matrix to track changes throughout the project lifecycle
- Clearly define the scope of a project in terms of cost, schedule and technical deliverables
- Create a work breakdown structure defining work packages, project deliverables and acceptance criteria
- Develop a detailed project schedule, including critical path tasks and milestones
- Develop a detailed project budget including cost baselines and tracking mechanisms
- Develop planned and earned value metrics for your project deliverables and automate reporting functions
- Effectively manage conflict situations and build communication skills with your project team
- Document project risks in terms of probability and impact, and assign triggers and risk response responsibilities
- Create project earned value baselines and project schedule and cost forecasts

525.5 Quality and Risk Management

On day five you will become familiar with quality planning, assurance, and control methodologies as well as learning the cost-of-quality concept and its parameters. We define quality metrics and cover tools for establishing and benchmarking quality control programs. We go into quality assurance and auditing as well as how to understand and use quality control charts. The risk section goes over known versus unknown risks and how to identify, assess, and categorize risk. We use quantitative risk analysis and modeling techniques so that you can fully understand how specific risks affect your project. You will learn ways to plan for and mitigate risk by reducing your exposure as well as how to take advantage of risks that could have a positive effect on your project.

Topics: Cost of Quality; Quality Metrics; Continual Process Improvement; Quality Baselines; Quality Control; Change Control; Risk Identification; Risk Assessment; Time and Cost Risks; Risk Probability and Impact Matrices; Risk Modeling and Response

525.6 Procurement, Stakeholder Management, and Project Integration

We close out the week with the procurement aspects of project and stakeholder management, and then integrate all of the concepts presented into a solid, broad-reaching approach. We cover different types of contracts and then the make-versus-buy decision process. We go over ways to initiate strong requests for quotations (RFQ) and develop evaluation criteria, then qualify and select the best partners for your project. Stakeholder communication and management strategies are reinforced. The final session integrates everything we have learned by bringing all the topics together with the common process groups. Using a detailed project management methodology, we learn how to finalize the project management plan and then execute and monitor the progress of your project to ensure success.

Topics: Contract Types; Make vs. Buy Analysis; Vendor Weighting Systems; Contract Negotiations; Stakeholder Communication and Stakeholder Management Strategies; Project Execution; Monitoring Your Project's Progress; Finalizing Deliverables; Forecasting and Integrated Change Control

DEV522

Defending Web Applications Security Essentials

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: Johannes Ullrich, Ph.D.

www.giac.org/gweb

www.sans.edu

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

Who Should Attend

- Application developers
- Application security analysts or managers
- Application architects
- Penetration testers who are interested in learning about defensive strategies
- Security professionals who are interested in learning about web application security
- Auditors who need to understand defensive mechanisms in web applications
- Employees of PCI compliant organizations who need to be trained to comply with PCI requirements

This is the course to take if you have to defend web applications!

The quantity and importance of data entrusted to web applications is growing, and defenders need to learn how to secure them. Traditional network defenses, such as firewalls, fail to secure web applications. DEV522 covers the OWASP Top 10 Risks and will help you better understand web application vulnerabilities, thus enabling you to properly defend your organization's web assets.

Mitigation strategies from an infrastructure, architecture, and coding perspective will be discussed alongside real-world applications that have been proven to work. The testing aspect of vulnerabilities will also be covered so that you can ensure your application is tested for the vulnerabilities discussed in class.

To maximize the benefit for a wider range of audiences, the discussions in this course will be programming language agnostic. Focus will be maintained on security strategies rather than coding-level implementation.

"The current security landscape is rapidly changing and the course content is relevant and important to software security and compliance software." -Scott Hoof, Tripwire, Inc.

DEV522: Defending Web Applications Security Essentials is intended for anyone tasked with implementing, managing, or protecting web applications. It is particularly well suited to application security analysts, developers, application architects, pen testers, auditors who are interested in recommending proper mitigations for web security issues, and infrastructure security professionals who have an interest in better defending their web applications.

The course will also cover additional issues the authors have found to be important in their day-to-day web application development practices. The topics that will be covered include:

- Infrastructure security
- Server configuration
- Authentication mechanisms
- Application language configuration
- Application coding errors like SQL injection and cross-site scripting
- Cross-site request forging
- Authentication bypass
- Web services and related flaws
- Web 2.0 and its use of web services
- XPATH and XQUERY languages and injection
- Business logic flaws
- Protective HTTP headers

The course will make heavy use of hands-on exercises and conclude with a large defensive exercise that reinforces the lessons learned throughout the week.

Johannes Ullrich, PhD *SANS Senior Instructor*

As Dean of Research for the SANS Technology Institute, Johannes is currently responsible for the SANS Internet Storm Center (ISC) and the GIAC Gold program. In 2000, he founded DShield.org, which is now the data collection engine behind the ISC. His work with the ISC has been widely recognized, and in 2004, Network World named him one of the 50 most powerful people in the networking industry. Prior to working for SANS, Johannes worked as a lead support engineer for a web development company and as a research physicist. Johannes holds a PhD in physics from SUNY Albany and is based in Jacksonville, Florida. His daily podcast summarizes current security news in a concise format. @johullrich

522.1 HANDS ON: Web Basics and Authentication Security

We begin day one with an overview of recent web application attack and security trends, then follow up by examining the essential technologies that are at play in web applications. You cannot win the battle if you do not understand what you are trying to defend. We arm you with the right information so you can understand how web applications work and the security concepts related to them.

Topics: HTTP Basics; Overview of Web Technologies; Web Application Architecture; Recent Attack Trends; Authentication Vulnerabilities and Defense; Authorization Vulnerabilities and Defense

522.2 HANDS ON: Web Application Common Vulnerabilities and Mitigations

Since the Internet does not guarantee the secrecy of information being transferred, encryption is commonly used to protect the integrity and secrecy of information on the web. This course day covers the security of data in transit or on disk and how encryption can help with securing that information in the context of web application security.

Topics: SSL Vulnerabilities and Testing; Proper Encryption Use in Web Application; Session Vulnerabilities and Testing; Cross-site Request Forgery; Business Logic Flaws; Concurrency; Input-related Flaws and Related Defenses; SQL Injection Vulnerabilities, Testing, and Defense

522.3 HANDS ON: Proactive Defense and Operation Security

Day three begins with a detailed discussion on cross-site scripting and related mitigation and testing strategies, as well as HTTP response splitting. The code in an application may be totally locked down, but if the server setting is insecure, the server running the application can be easily compromised. Locking down the web environment is essential, so we cover this basic concept of defending the platform and host. To enable any detection of intrusion, logging and error handling must be done correctly. We will discuss the correct approach to handling incidents and logs, then dive even further to cover the intrusion detection aspect of web application security. In the afternoon we turn our focus to the proactive defense mechanism so that we are ahead of the bad guys in the game of hack and defend.

Topics: Cross-site Scripting Vulnerability and Defenses; Web Environment Configuration Security; Intrusion Detection in Web Applications; Incident Handling; Honeytoken

522.4 HANDS ON: AJAX and Web Services Security

Day four is dedicated to the security of asynchronous JavaScript and XML (AJAX) and web services, which are currently the most active areas in web application development. Security issues continue to arise as organizations dive head first into insecurely implementing new web technologies without first understanding them. We will cover security issues, mitigation strategies, and general best practices for implementing AJAX and web services. We will also examine real-world attacks and trends to give you a better understanding of exactly what you are protecting against. Discussion focuses on the web services in the morning and AJAX technologies in the afternoon.

Topics: Web Services Overview; Security in Parsing of XML; XML Security; AJAX Technologies Overview; AJAX Attack Trends and Common Attacks; AJAX Defense

522.5 HANDS ON: Cutting-Edge Web Security

Day five focuses on cutting-edge web application technologies and current research areas. Topics such as clickjacking and DNS rebinding are covered. These vulnerabilities are difficult to defend and multiple defense strategies are needed for their defense to be successful. Another topic of discussion is the new generation of single-sign-on solutions such as OpenID. We cover the implications of using these authentication systems and the common "gotchas" to avoid. With the Web2.0 adoption, the use of Java applet, Flash, ActiveX, and Silverlight are on the increase. The security strategies of defending these technologies are discussed so that these client-side technologies can be locked down properly.

Topics: Clickjacking; DNS Rebinding; Flash Security; Java Applet Security; Single-Sign-On Solution and Security; IPv6 Impact on Web Security

522.6 HANDS ON: Capture and Defend the Flag Exercise

Day six starts with an introduction to the secure software development life cycle and how to apply it to web development. But the focus is a large lab that will tie together the lessons learned during the week and reinforce them with hands-on applications. Students will be provided with a virtual machine to implement a complete database-driven dynamic website. In addition, they will use a custom tool to enumerate security vulnerabilities and simulate a vulnerability assessment of the website. Students will then have to decide which vulnerabilities are real and which are false positives, and then mitigate the vulnerabilities. The scanner will score the student as vulnerabilities are eliminated or checked off as false positives. Advanced students will be able to extend this exercise and find vulnerabilities not presented by the scanner. Students will learn through these hands-on exercises how to secure the web application, starting with the operating system, the web server, finding configuration problems in the application language setup, and finding and fixing coding problems in the site.

Topics: Mitigation of Server Configuration Errors; Discovering and Mitigating Coding Problems; Testing Business Logic Issues and Fixing Problems; Web Services Testing and Security Problem Mitigation

You Will Be Able To

- Understand the major risks and common vulnerabilities related to web applications through real-world examples
- Mitigate common security vulnerabilities in web applications using proper coding techniques, software components, configurations, and defensive architecture
- Understand the best practices in various domains of web application security such as authentication, access control, and input validation
- Fulfill the training requirement as stated in PCI DSS 6.5
- Deploy and consume web services (SOAP and REST) in a more secure fashion
- Proactively deploy cutting-edge defensive mechanisms such as the defensive HTTP response headers and Content Security Policy to improve the security of web applications
- Strategically roll out a web application security program in a large environment
- Incorporate advanced web technologies such as HTML5 and AJAX cross-domain requests into applications in a safe and secure manner
- Develop strategies to assess the security posture of multiple web applications

DEV541

Secure Coding in Java/JEE: Developing Defensible Applications

SANS

Four-Day Program
Wed, Sep 14 - Sat, Sep 17
9:00am - 5:00pm
24 CPEs
Laptop Required
Instructor: Gregory Leonard

www.giac.org/gssp-java

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

"This course gave me a thorough understanding of how web app vulnerabilities can actually be exploited, and therefore that needs to be fixed."
-Anna Canning, Cannon IT Services LLC

This secure coding course will teach students how to build secure Java applications and gain the knowledge and skills to keep a website from getting hacked, counter a wide range of application attacks, prevent critical security vulnerabilities that can lead to data loss, and understand the mindset of attackers.

The course teaches you the art of modern web defense for Java applications by focusing on foundational defensive techniques, cutting-edge protection, and Java EE security features you can use in your applications as soon as you return to work. This includes learning how to:

- Identify security defects in your code
- Fix security bugs using secure coding techniques
- Utilize secure HTTP headers to prevent attacks
- Secure your sensitive representational state transfer (REST) services
- Incorporate security into your development process
- Use freely available security tools to test your applications

Who Should Attend

- Developers who want to build more secure applications
- Java Enterprise Edition (JEE) programmers
- Software engineers
- Software architects
- Developers who need to be trained in secure coding techniques to meet PCI compliance
- Application security auditors
- Technical project managers
- Senior software QA specialists
- Penetration testers who want a deeper understanding of target applications or who want to provide more detailed vulnerability remediation options

Great developers have traditionally distinguished themselves by the elegance, effectiveness and reliability of their code. That is still true, but the security of the code now needs to be added to those other qualities. This unique SANS course allows you to hone the skills and knowledge required to prevent your applications from getting hacked.

DEV541: Secure Coding in Java/JEE: Developing Defensible Applications is a comprehensive course covering a wide set of skills and knowledge. It is not a high-level theory course – it is about real-world, hands-on programming. You will examine actual code, work with real tools, build applications and gain confidence in the resources you need to improve the security of Java applications.

Rather than teaching students to use a given set of tools, the course covers concepts of secure programming. This involves looking at a specific piece of code, identifying a security flaw and implementing a fix for flaws found on the OWASP Top 10 and CWE/SANS Top 25 Most Dangerous Programming Errors.

The course culminates in a Secure Development Challenge in which students perform a security review of a real-world open-source application. You will conduct a code review, perform security testing to actually exploit real vulnerabilities, and implement fixes for these issues using the secure coding techniques that you have learned in course.

PCI Compliance

Section 6.5 of the Payment Card Industry (PCI) Data Security Standard (DSS) instructs auditors to verify processes that require training in secure coding techniques for developers. If you are responsible for developing applications that process cardholder data and are therefore required to be PCI compliant then this is the course for you.

Gregory Leonard *SANS Instructor*

Gregory Leonard has over 16 years of experience in software development, with an emphasis on writing large-scale enterprise applications. Greg's responsibilities have included application architecture and security, performing infrastructure design and implementation, security analysis, code reviews, and evaluating performance diagnostics. Greg is currently focusing on overseeing the integration of secure development practices for his company.

541.1 HANDS ON: Data Validation

Improper data validation is the root cause of the most prevalent web application vulnerabilities today. On this first course day students will learn about some of the most prevalent web application vulnerabilities, including cross-site scripting (XSS), cross-site request forgery (CSRF), SQL injection, HTTP response splitting and parameter manipulation. You will see how to find these issues and re-create them in a running application. Then you will use a variety of methods to actually fix the vulnerabilities in your Java code. The course is full of hands-on exercises where you can apply practical data validation techniques to prevent common attacks with defense, ranging from input validation to output encoding and the use of new techniques like Content Security Policy.

Topics: Web Application Attacks; Cross-Site Scripting (XSS); Cross-Site Request Forgery (CSRF); SQL Injection; HTTP Response Splitting; Parameter Manipulation; Directory Traversal; Web Application Proxies; Validation Concerns; Character Encoding; Input Validation; Output Encoding; Blacklisting and Whitelisting; Validation Techniques; Regular Expressions; Servlet Filters; Output Encoding; Content Security Policy; Prepared Statements; CSRF Defense

541.2 HANDS ON: Authentication and Session Management

Broken authentication and session management are common issues that can compromise the integrity of your system. Weak authentication protection can allow an attacker to expose your most sensitive secrets: your data! In this session students will learn about these vulnerabilities and what you can do to design and code stronger authentication protections from the start. You will learn how to use Java Enterprise Edition (EE) container-based authentication and set up basic, form-based and client certificate authentication. You will also learn how to protect data in transit using SSL, and how to securely store passwords at rest. Various authorization attacks will be discussed, as well as unvalidated forwards and redirects. Session management attacks and defenses will also be covered along with Clickjacking and associated defenses.

Topics: Authentication Factors; Authentication Attacks; Java EE Authentication; Basic Authentication; Form-based Authentication; Client Certificates; Using SSL; Secure Password Storage; Authorization; Web and Enterprise JavaBean Access Control; Authorization Attacks; Access Control Bypass; Unvalidated Forwards and Redirects; State Management Attacks; Session Hijacking; Session Fixation; Clickjacking; Using X-Frame-Options

541.3 HANDS ON: Java Platform and API Security

Java is the language of choice for the development of many mission-critical applications. As such, it is vital to understand the security features and implications of using the Java language itself and the Java runtime environment (JRE). Through numerous hands-on exercises you will learn about Java Security Manager, how code privileges are managed, and how to sign jar files. You will also learn about exception handling and the importance of logging. With hands-on exercises you will write code to encrypt data both in transit and at rest using the Java Secure Socket Extension and the Java Cryptography Architecture, as well as integer and double overflows, and about numerous Java language features that you should consider while writing secure code. Organizations continue to expose critical representational state transfer (REST)-based web services that can be consumed by Ajax and mobile applications. You will learn how vulnerabilities like Cross-Site Request Forgery (CSRF) can be used by attackers to hack your JSON services. You will also learn how to develop applications that are resistant to such attacks and about the OAuth protocol for authentication and authorization.

Topics: Java Security Manager; Permissions; Policy File; Jar Signing; Class Security; Error Handling; Exceptions; Using Try/Catch/Finally; Logging; Logging Frameworks; ESAPI Logging; Encryption; Java Secure Sockets Extension (JSSE); Java Cryptography Architecture (JCA); Integer and Double Overflows; Thread Safety; Race Conditions; Web Service (JAX-RS) Security; REST Security; OAuth

541.4 HANDS ON: Secure Development Lifecycle

Using what you have learned about web application vulnerabilities, in this session you will conduct a security review of a real-world open-source application. You will see first hand how to integrate security in your software development life cycle (SDLC) by first conducting a code review of a large, widely used open-source application. Once you have identified various vulnerabilities in the code itself you will perform security testing and actually exploit these weaknesses. Once they have been exploited, you will fix the weaknesses using the secure coding techniques learned in class. The Secure Development Challenge introduces you to what is needed in a Secure SDLC and shows you how to do it first hand!

Topics: Security and the SDLC; Conducting a Secure Code Review; Manual Code Review; Using a Static Analysis Tool; Using FindBugs; Integrating Code Review into the SDLC; Security Testing; Exploiting XSS, CSRF, and SQL Injection; Secure Coding; Fixing Weaknesses in a Running Application

You Will Be Able To

- Use a web application proxy to view and manipulate HTTP requests and responses
- Review and perform basic exploits of common web application vulnerabilities, such as those found among the SANS/CWE Top 25 Most Dangerous Software Errors and the OWASP Top 10:
  - Cross-site scripting (XSS)
  - Cross-site request forgery (CSRF)
  - SQL injection
  - Parameter manipulation
  - Open redirect
  - Session hijacking
  - Clickjacking
  - Authentication and access control bypass
- Mitigate common web application vulnerabilities using secure coding practices and Java libraries, including:
  - Input validation
  - Blacklist and whitelist validation
  - Regular expressions
  - Output encoding
  - Content Security Policy
  - Client-side security headers
- Build applications using:
  - Java Enterprise Edition authentication
  - Basic and form-based authentication
  - Client certificates
  - Secure Sockets Layer/Transport Layer Security (SSL/TLS)
  - Java Secure Sockets Extension
  - Secure password storage techniques
  - Java Cryptography Architecture
  - Security Manager
- Implement a secure software development lifecycle, including code review, static analysis and dynamic analysis techniques.

DEV544

Secure Coding in .NET: Developing Defensible Applications

Four-Day Program
Sat, Sep 10 - Tue, Sep 13
9:00am - 5:00pm
24 CPEs
Laptop Required
Instructor: Aaron Cure

www.giac.org/gssp-net

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

"DEV544 definitely opened my eyes to security vulnerabilities that I have missed in the past."
-Scott Shepski, Pentec Health

ASP.NET and the .NET framework have provided web developers with tools that allow them an unprecedented degree of flexibility and productivity. However, these sophisticated tools make it easier than ever to miss the little details that allow security vulnerabilities to creep into an application. Since ASP.NET 2.0, Microsoft has done a fantastic job of integrating security into the ASP.NET framework, but the responsibility is still on application developers to understand the limitations of the framework and ensure that their own code is secure.

Have you ever wondered if the built-in ASP.NET validation is effective? Have you been concerned that Windows Communication Foundation (WCF) services might be introducing unexamined security issues into your application? Should you feel uneasy relying solely on the security controls built into the ASP.NET framework?

Who Should Attend

- ASP.NET developers who want to build more secure web applications
- .NET framework developers
- Software engineers
- Software architects
- Developers who need to be trained in secure coding techniques to meet PCI compliance
- Application security auditors
- Technical project managers
- Senior software QA specialists
- Penetration testers

"It is shocking to see how much we are missing in our code. I am going back to change the code immediately." -Ruojie Wang, New Jersey Hospital Association

This comprehensive course covers a huge set of skills and knowledge. It is not a high-level theory course. It is about real programming. Students examine actual code, work with real tools, build applications, and gain confidence in the resources they need to improve the security of .NET applications.

Rather than teaching students to use a set of tools, the course teaches students concepts of secure programming. This involves looking at a specific piece of code, identifying a security flaw, and implementing a fix for flaws found on the OWASP Top 10 and CWE/SANS Top 25 Most Dangerous Programming Errors.

The class culminates with a security review of a real-world open-source application. Students will conduct a code review, review a penetration test report, perform security testing to actually exploit real vulnerabilities, and finally, using the secure coding techniques that they have learned in class, implement fixes for these issues.

PCI Compliance

Section 6.5 of the Payment Card Industry (PCI) Data Security Standard (DSS) instructs auditors to verify processes that require training in secure coding techniques for developers. This is the course for you if your application processes cardholder data and you are required to meet PCI compliance.

Aaron Cure *SANS Instructor*

Aaron is a senior security consultant at Cypress Data Defense and a contributing author for the DEV544: Secure Coding in .NET course. After 10 years in the U.S. Army as a Russian Linguist and a Satellite Repair Technician he worked as a database administrator and programmer on the Iridium project, with subsequent positions as a telecommunications consultant, senior programmer, and security consultant. He also has experience developing security tools, performing secure code reviews, vulnerability assessments, and penetration testing, as well as risk assessments, static source code analysis, and security research. Aaron holds the GIAC GSSP-.NET, GWAPT, GMOB, and CISSP certifications and is based in Arvada, CO. Outside the office Aaron enjoys boating, travel, and playing hockey.

544.1 HANDS ON: Data Validation

Improper data validation is the root cause of the most prevalent web application vulnerabilities today. On the first day of this course, students will examine some of the most prevalent web application vulnerabilities, such as XSS, SQL Injection, Open Redirects and Parameter Manipulation. You will learn how to find these issues and how to re-create them in a running application. Then you will use a variety of methods to actually fix these vulnerabilities in your C# code. The course is full of hands-on exercises where you can apply practical data validation techniques to prevent common attacks with defense, including input validation, output encoding and the use of new techniques like Content Security Policy.

Topics: Web Application Attacks; Web Application Proxies; Parameter Manipulation; Cross-Site Scripting (XSS); Open Redirect; Unvalidated Forwards; SQL Injection; HTTP Response Splitting; Input Validation; Indirect Selection; Blacklists; Whitelists; Regular Expressions; Event Validation; Character Encoding; Command Encoding; Content Security Policy; LINQ and Entity Framework

544.2 HANDS ON: Authentication and Session Management

Authentication, authorization, and session management vulnerabilities are commonly exploited by attackers to gain unauthorized access to web applications. In this section, you will learn about various authentication and authorization attacks such as man-in-the-middle, cross-site request forgery, clickjacking, and session hijacking. Then, you will use a variety of techniques to fix these vulnerabilities in an ASP.NET web application.

Topics: Authentication Factors; Authentication Attacks; Authorization Attacks; Password Management; ASP.NET Identity; Forms Authentication and Membership Provider; Race Conditions; Session Identifiers; Man-in-the-middle Attacks; Cross-Site Request Forgery (CSRF); Clickjacking; Session Hijacking; Session Fixation; Session Management; Cookie Security

544.3 HANDS ON: .NET Framework Security

A secure architecture is critical for mission critical .NET applications. You will learn about various built-in .NET security features such as cryptography, password storage, web service security and many other .NET features you should consider while writing secure code. A number of hand-on exercises will guide you through writing a cryptography utility for storing sensitive data and user passwords, protecting data in memory, exploiting a running application using DLL Injection, and much more.

Topics: Cryptography; Password Storage; PCI Compliance; Threading; String Immutability; Numeric Overflow; Risks of Malicious Code; Exception Handling; Auditing and Logging; Web Services

544.4 HANDS ON: Secure Software Development Lifecycle

We will take a look at each phase of the software development lifecycle and discuss how security fits into the process. Using what you have learned about web application vulnerabilities, you will get the opportunity to review code from an open-source application to identify various vulnerabilities. Then, you will perform security testing and actually exploit these weaknesses. Once they have been exploited, you will fix them using the security coding techniques you have learned in class.

Topics: Security Training; Security Requirements; Secure Design; Threat Modeling; Implementation; Static Analysis; Peer Reviews; Secure Code Review; Verification; Dynamic Analysis; Penetration Test Reports; Release; Response

"This is a must-have for all applications and must-know for all developers. I recommend it to my colleagues."
-Praveen Paleti, Western Union Business Solutions

"I do development on a daily basis. This information is extremely valuable! I discovered several areas of my applications where security can be improved."
-Chad Reuss, Meijer

You Will Be Able To

- Use a web application proxy to view and manipulate HTTP requests and responses
- Review and perform basic exploits of common web application vulnerabilities, such as those found among the SANS/CWE Top 25 Most Dangerous Software Errors and the OWASP Top 10:
  - Cross-Site Scripting
  - Parameter Manipulation
  - Open Redirect
  - Unvalidated Forwards
  - SQL Injection
  - Session Hijacking
  - Clickjacking
  - Cross-Site Request Forgery
  - Man-in-the-middle
- Mitigate common web application vulnerabilities using industry best practices in the .NET framework, including:
  - Input Validation
  - Blacklist and Whitelist Validation
  - Regular Expressions
  - Command Encoding
  - Output Encoding
  - Content Security Policy
  - Client-side Security Headers
- Understand built-in ASP .NET security mechanisms, including:
  - AntiForgeryToken
  - Data Annotations
  - Event Validation
  - Request Validation
  - View State
  - Entity Framework
  - ASP.NET Identity
  - Forms Authentication
  - Membership Provider
  - WCF
  - Web API
- Apply industry best practices (NIST, PCI) for cryptography and hashing in the .NET framework.
- Implement a secure software development lifecycle (SDLC) to include threat modeling, static analysis and dynamic analysis.

LEG523

Law of Data Security and Investigations

SANS

Five-Day Program
Mon, Sep 12- Fri, Sep 16
9:00am - 5:00pm
30 CPEs
Laptop NOT Needed
Instructor: Benjamin Wright

www.giac.org/gleg

SANS Technology Institute
www.sans.edu

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

- **EU's invalidation of the Privacy Safe Harbor for transferring data to the United States.**
- **Cyber insurer's lawsuit against hospital to deny coverage after data breach and $4.1 million legal settlement with patients.**
- **Target's and Home Depot's legal and public statements about payment card breaches.**
- **New legal tips on confiscating and interrogating mobile devices.**
- **Lawsuit by credit card issuers against Target's QSA and alleged security vendor, Trustwave.**

Who Should Attend

- Investigators
- Security and IT professionals
- Lawyers
- Paralegals
- Auditors
- Accountants
- Technology managers
- Vendors
- Compliance officers
- Law enforcement
- Privacy officers
- Penetration testers

New law on privacy, e-discovery and data security is creating an urgent need for professionals who can bridge the gap between the legal department and the IT department. SANS LEG523 provides this unique professional training, including skills in the analysis and use of contracts, policies and records management procedures.

This course covers the law of business, contracts, fraud, crime, IT security, liability and policy – all with a focus on electronically stored and transmitted records. It also teaches investigators how to prepare credible, defensible reports, whether for cyber crimes, forensics, incident response, human resource issues or other investigations.

"Outstanding instructor! Keep doing what you are doing."
-Paul Mobley, FIS Global

Each successive day of this five-day course builds upon lessons from the earlier days in order to comprehensively strengthen your ability to help your enterprise (public or private sector) cope with illegal hackers, botnets, malware, phishing, unruly vendors, data leakage, industrial spies, rogue or uncooperative employees, or bad publicity connected with IT security.

Recent updates to the course address hot topics such as legal tips on confiscating and interrogating mobile devices, the retention of business records connected with cloud computing and social networks like Facebook and Twitter, and analysis and response to the risks and opportunities surrounding open-source intelligence gathering.

Over the years this course has adopted an increasingly global perspective. Non-U.S. professionals attend LEG523 because there is no training like it anywhere else in the world. For example, a lawyer from the national tax authority in an African country took the course because electronic filings, evidence and investigations have become so important to her work. International students help the instructor, U.S. attorney Benjamin Wright, constantly revise the course and include more content that crosses borders.

Benjamin Wright *SANS Senior Instructor*

Benjamin Wright is the author of several technology law books, including *Business Law and Computer Security*, published by the SANS Institute. With 26 years in private law practice, he has advised many organizations, large and small, on privacy, e-commerce, computer security, and e-mail discovery and has been quoted in publications around the globe, from the *Wall Street Journal* to the *Sydney Morning Herald*. He is known for spotting and evaluating trends, such as the rise of whistleblowers wielding small video cameras. In 2010, Russian banking authorities tapped him for experience and advice on the law of cyber investigations and electronic payments. @benjaminwright

523.1 Fundamentals of IT Security Law and Policy

The first day is an introduction to law and IT that serves as the foundation for discussions during the rest of the course. We survey the general legal issues that must be addressed in establishing best information security practices, then canvass the many new laws on data security and evaluate information security as a field of growing legal liability. We will cover computer crime and intellectual property laws when a network is compromised, as well as emerging topics such as honeypots and active defenses, i.e., enterprises hacking back against illegal hackers. We will look at the impact of future technologies on law and investigations in order to help students factor in legal concerns when they draft enterprise IT security policies. For example, students will debate what the words of an enterprise policy would mean in a courtroom. The course also dives deep into the legal question of what constitutes a "breach of data security" for purposes of notifying others about it or for other purposes. The course includes a case study on the drafting of policy to comply with the Payment Card Industry Data Security Standard (PCI).

523.2 E-Records, E-Discovery, and Business Law

IT professionals can advance their careers by upgrading their expertise in the hot fields of e-discovery and cyber investigations. Critical facets of those fields come forward in course day two. We will focus on the use of computer records in disputes and litigation, with a view to teaching students how to manage requests to turn over e-records to adversaries (i.e., e-discovery), manage implementation of a "legal hold" over some records to prevent their destruction, and coordinate with legal counsel to develop workable strategies to legal challenges. The course is chock full of actual court case studies dealing with privacy, computer records, digital evidence, electronic contracts, regulatory investigations, and liability for shortfalls in security. The purpose of the case studies is to draw practical lessons that students can take back to their jobs.

523.3 Contracting for Data Security and Other Technology

Day three focuses on the essentials of contract law sensitive to the current legislative requirements for security. Compliance with many of the new data security laws requires contracts. Because IT pulls together the products and services of many vendors, consultants, and outsourcers, enterprises need appropriate contracts to comply with Sarbanes-Oxley, Gramm-Leach-Bliley, Health Insurance Portability and Accountability Act, EU Data Directive, data breach notice laws and other regulations. Contracts covered include agreements for software, consulting, nondisclosure, application services, penetration testing, and private investigation services. Special emphasis is applied to cloud computing issues. Students will also learn how to exploit the surprising power of informal contract records and communications.

523.4 The Law of IT Compliance: How to Conduct Investigations

Information security professionals and cyber investigators operate in a world of ambiguity, rapid change, and legal uncertainty. To address these challenges, this course day presents methods to analyze a situation and then act in a way that is ethical and defensible and reduces risk. Lessons will be invaluable to the effective and credible execution of any kind of investigation, be it internal, government, consultant-related, a security incident, or any other. The lessons also include methods and justifications for maintaining the confidentiality of an investigation. Scattered through the course are numerous descriptions of actual fraud cases involving IT. The purpose is to acquaint the student with the range of modern business crimes, whether committed by executives, employees, suppliers or whole companies. More importantly, the course draws on the law of fraud and corporate misconduct to teach larger and broader lessons about legal compliance, ethical hacking and proper professional conduct in difficult case scenarios. Further, the course teaches how to conduct forensics investigations involving social, mobile and other electronic media.

523.5 Applying Law to Emerging Dangers: Cyber Defense

Knowing some rules of law is not the same as knowing how to deal strategically with real-world legal problems. This day is organized around extended case studies in security law: break-ins, investigations, piracy, extortion, rootkits, phishing, botnets, espionage and defamation. The studies lay out the chronology of events and critique what the good guys did right and what they did wrong. The goal is to learn to apply principles and skills to address incidents in your day-to-day work. The course includes an in-depth review of legal responses to the major security breaches at TJX, Target, and Home Depot, and looks at how to develop a Bring Your Own Device (BYOD) policy for an enterprise and its employees. LEG523 is increasingly global in its coverage, so although this course day centers around U.S. law, non-U.S. law and the roles of government authorities outside the United States will be examined, as well.

You Will Be Able To

- Work better with other professionals at your organization who make decisions about the law of data security and investigations
- Exercise better judgment on how to comply with technology regulations, both in the United States and in other countries
- Evaluate the role and meaning of contracts for technology, including services, software and outsourcing
- Help your organization better explain its conduct to the public and to legal authorities
- Anticipate technology law risks before they get out of control
- Implement practical steps to cope with technology law risk
- Better explain to executives what your organization should do to comply with information security and privacy law
- Better evaluate technologies, such as digital signatures, to comply with the law and serve as evidence
- Make better use of electronic contracting techniques to get the best terms and conditions
- Exercise critical thinking to understand the practical implications of technology laws and industry standards (such as the Payment Card Industry Data Security Standard)

"I have gained many valuable ideas and tools to support and defend my organization and to strengthen security overall. I wish I'd taken LEG523 3-4 years ago."
-Tom S., Case Western Reserve University

AUD507

Auditing & Monitoring Networks, Perimeters, and Systems

SANS

Six-Day Program
Mon, Sep 12- Sat, Sep 17
9:00am - 5:00pm
36 CPEs
Laptop Required
Instructor: David Hoelzer

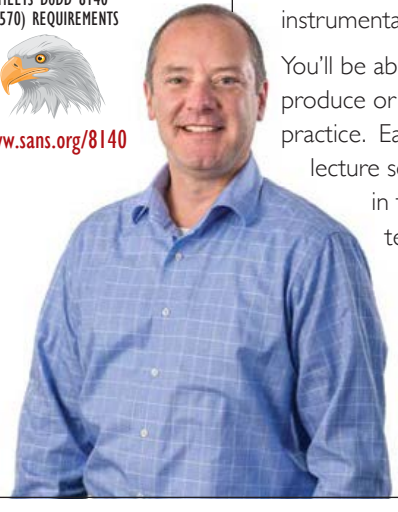
www.giac.org/gsna

www.sans.edu

BUNDLE ONDEMAND
WITH THIS COURSE
www.sans.org/ondemand

MEETS DoDD 8140 (8570) REQUIREMENTS

www.sans.org/8140



Who Should Attend

- Auditors seeking to identify key controls in IT systems
- Audit professionals looking for technical details on auditing
- Managers responsible for overseeing the work of an audit or security team
- Security professionals newly tasked with audit responsibilities
- System and network administrators looking to better understand what an auditor is trying to achieve, how auditors think, and how to better prepare for an audit
- System and network administrators seeking to create strong change control management and detection systems for the enterprise

One of the most significant obstacles facing many auditors today is how exactly to go about auditing the security of an enterprise. What systems really matter? How should the firewall and routers be configured? What settings should be checked on the various systems under scrutiny? Is there a set of processes that can be put into place to allow an auditor to focus on the business processes rather than the security settings? All of these questions and more will be answered by the material covered in this course.

This course is specifically organized to provide a risk-driven method for tackling the enormous task of designing an enterprise security validation program. After covering a variety of high-level audit issues and general audit best practices, the students will have the opportunity to dive deep into the technical how-to for determining the key controls that can be used to provide a level of assurance to an organization. Tips on how to repeatedly verify these controls and techniques for automatic compliance validation are taken from real-world examples.

One of the struggles that IT auditors face today is helping management understand the relationship between the technical controls and the risks to the business that these controls address. In this course these threats and vulnerabilities are explained based on validated information from real-world situations. The instructor will take the time to explain how this can be used to raise the awareness of management and others within the organization to build an understanding of why these controls specifically and auditing in general are important. From these threats and vulnerabilities, we will explain how to build the ongoing compliance monitoring systems and automatically validate defenses through instrumentation and automation of audit checklists.

You'll be able to use what you learn immediately. Five of the six days in the course will either produce or provide you directly with a general checklist that can be customized for your audit practice. Each of these days includes hands-on exercises with a variety of tools discussed during the lecture sections so that you will leave knowing how to verify each and every control described in the class. Each of the five hands-on days gives you the chance to perform a thorough technical audit of the technology being considered by applying the checklists provided in class to sample audit problems in a virtualized environment. Students are invited to bring a Windows XP Professional or higher laptop for use during class. Macintosh computers running OS X may also be used with VMWare Fusion.

A great audit is more than marks on a checklist; it is the understanding of what the underlying controls are, what the best practices are, and why. Sign up for this course and gain the mix of theoretical, hands-on, and practical knowledge to conduct a great audit.

David Hoelzer *SANS Faculty Fellow*

David Hoelzer is the author of more than 20 sections of SANS courseware. He is an expert in a variety of information security fields, having served in most major roles in the IT and security industries over the past 25 years. Recently, David was called upon to serve as an expert witness for the Federal Trade Commission for groundbreaking GLBA Privacy Rule litigation. David has been highly involved in governance at the SANS Technology Institute, serving as a member of the Curriculum Committee as well as Audit Curriculum Lead. As a SANS instructor, David has trained security professionals from agencies such as the NSA and DHHS, Fortune 500 companies, various Department of Defense sites, national laboratories, and many colleges and universities. David is a research fellow for the Center for Cybermedia Research and for the Identity Theft and Financial Fraud Research Operations Center (ITFF/ROC). He also is an adjunct research associate for the UNLV Cybermedia Research Lab and a research fellow with the Internet Forensics Lab. David has written and contributed to more than 15 peer-reviewed books, publications, and journal articles. Currently, he serves as the principal examiner and director of research for Enclave Forensics, a New York/Las Vegas-based incident response and forensics company. He also serves as the chief information security officer for Cyber-Defense, an open-source security software solution provider. In the past, David served as the director of the GIAC Certification program, bringing the GIAC Security Expert certification to life. He holds a bachelor's of science in information technology, Summa Cum Laude, having spent time either attending or consulting for Stony Brook University, Binghamton University, and American Intercontinental University. @it_audit

507.1 Effective Auditing, Risk Assessment, and Reporting

After laying the foundation for the role and function of an auditor in the information security field, this day's material will give you two extremely useful risk assessment methods that are particularly effective for measuring the security of enterprise systems, identifying control gaps and risks, and gaining the knowledge to be able to recommend additional compensating controls to address the risk. Nearly a third of the day is spent covering important audit considerations and questions dealing with virtualization and cloud computing.

Topics: Auditor's Role in Relation to Policy Creation, Policy Conformance, and Incident Handling; Basic Auditing and Assessing Strategies; Risk Assessment; The Six-Step Audit Process; Virtualization and Cloud Computing

507.2 Effective Network and Perimeter Auditing/Monitoring

On this day we will build from the ground up dealing with security controls, proper deployment, and effective auditing continuous monitoring of configuration from Layer 2 all the way up the stack. Students will learn how to identify insecurely configured VLANs, determine perimeter firewall requirements, examine enterprise routers, and much more.

Topics: Secure Layer 2 Configurations; Router and Switch Configuration Security; Firewall Auditing, Validation, and Monitoring; Wireless; Network Population Monitoring; Vulnerability Scanning

507.3 Web Application Auditing

Web applications have consistently been rated for the past several years as one of the top five vulnerabilities that enterprises face. Unlike the other top vulnerabilities, however, enterprises continue to accept this risk, since most modern corporations need an effective web presence to do business today. One of the most important lessons that we are learning as an industry is that installing an application firewall is not enough!

Topics: Identifying Controls Against Information Gathering Attacks; Processing Controls to Prevent Hidden Information Disclosures; Control Validation of the User Sign-on Process; Examining Controls Against User Name Harvesting; Validating Protections Against Password Harvesting; Best Practices for OS and Web Server Configuration; How to Verify Session Tracking and Management Controls; Identification of Controls to Handle Unexpected User Input; Server-side Techniques for Protecting Your Customers and Their Sensitive Data

507.4 Advanced Windows Auditing and Monitoring

Microsoft's business-class system makes up a large part of the typical IT infrastructure. Quite often, these systems are also the most difficult to effectively secure and control because of the enormous number of controls and settings within the operating system. This course day will provide you with the techniques and tools to build an effective long-term audit program for your Microsoft Windows environment. More importantly, during the course a continuous monitoring and reporting system is built out, allowing you to easily and effectively scale the testing discussed within your enterprise when you return home.

Topics: Progressive Construction of a Comprehensive Audit Program; Automating the Audit Process; Windows Security Tips and Tricks; Maintaining a Secure Enterprise

507.5 Advanced Unix Auditing and Monitoring

Students will gain a deeper understanding of the inner workings and fundamentals of the Unix operating system as applied to the major Unix environments in use in business today. Students will have the opportunity to explore, assess and audit Unix systems hands-on. Lectures describe the different audit controls that are available on standard Unix systems, as well as access controls and security models.

Topics: Auditing to Create a Secure Configuration; Auditing to Maintain a Secure Configuration; Auditing to Determine What Went Wrong

507.6 Audit the Flag: A NetWars Experience

This final day of the course presents a capstone experience with additional learning opportunities. Leveraging the well-known NetWars engine, students have the opportunity to connect to a simulated enterprise network environment. Building on the tools and techniques learned throughout the week, each student is challenged to answer a series of questions about the enterprise network, working through various technologies explored during the course.

Topics: Network Devices; Servers; Applications; Workstations

You Will Be Able To

- Understand the different types of controls (e.g., technical vs. non-technical) essential to perform a successful audit
- Conduct a proper risk assessment of a network to identify vulnerabilities and prioritize what will be audited
- Establish a well-secured baseline for computers and networks, constituting a standard against which one can conduct audits
- Perform a network and perimeter audit using a seven-step process
- Audit firewalls to validate that rules/settings are working as designed, blocking traffic as required
- Utilize vulnerability assessment tools effectively to provide management with the continuous remediation information necessary to make informed decisions about risk and resources
- Audit web applications configuration, authentication, and session management to identify vulnerabilities attackers can exploit
- Utilize scripting to build a system to baseline and automatically audit Active Directory and all systems in a Windows domain

"AUD507 provided me additional insight to the technical side of security auditing. Great course and a super instructor!"
-Carlos E., U.S. Army

"AUD507 not only prepares you to perform a comprehensive audit but also provides excellent information to operations for an improved network security posture."
-Rifat I., State Dept FCU

SEC440

Critical Security Controls: Planning, Implementing, and Auditing

Two-Day Course | Sat, Sep 10 - Sun, Sep 11 | 9:00am - 5:00pm | 12 CPEs | Laptop NOT Needed | Instructor: Chris Christianson

This course will help you master specific, proven techniques and tools needed to implement and audit the Critical Security Controls as documented by the Center for Internet Security (CIS). The controls are rapidly becoming accepted as the highest priority list of what must be done and proven before anything else at nearly all serious and sensitive organizations. The controls were selected and defined by the U.S. military, other government agencies (including the NSA, DHS, GAO, and many others), and private organizations that are the most respected experts on how attacks actually work and what can be done to stop them. These entities defined the controls as their consensus for the best way to block known attacks and find and mitigate damage from the attacks that get through. For security professionals, the course enables you to see how to put the controls in place in your existing network through effective and widespread use of cost-effective automation. For auditors, CIOs, and risk officers, the course is the best way to understand how you will measure whether the controls are effectively implemented.

"SEC440 provides an excellent prioritized approach to IT security." -Darrell Bateman, Texas Tech

One of the best features of the course is that it uses offense to inform defense. In other words, you will learn about the actual attacks that you'll be stopping or mitigating. That makes the defenses very real, and it makes you a better security professional.

You will find the full document describing the Critical Security Controls posted at the Center for Internet Security at **www.cisecurity.org/critical-controls.cfm**.

Notice: Please note SEC440 does not contain any labs. Students looking for hands-on labs involving the Critical Controls should take SEC566.

SEC567

Social Engineering for Penetration Testers

NEW!

Two-Day Course | Sat, Sep 10 - Sun, Sep 11 | 9:00am - 5:00pm | 12 CPEs | Laptop Required | Instructor: Dave Shackleford

SEC567: Social Engineering for Penetration Testers provides the blend of knowledge required to add social engineering skills to your penetration testing portfolio. Successful social engineering utilizes psychological principles and technical methods to measure your success and manage the risk. SEC567 covers the principles of persuasion and the psychological foundations required to craft effective attacks and bolsters this with many examples of what works taken from the experiences of both cyber criminals and the authors. On top of these principles, the course offers a number of tools (produced during the authors' engagements over the years and now available in the course) and labs centered around the key technical skills required to measure your social engineering success and report it to your company or client.

Who Should Attend

- Staff or consultant penetration testers looking to increase their testing breadth and effectiveness
- Security defenders looking to enhance their understanding of attack techniques to improve their defenses
- Staff responsible for security awareness and education campaigns who want to understand how cyber criminals persuade their way through their defenses

You'll learn how to perform recon on targets using a wide variety of sites and tools, create and track phishing campaigns, and develop media payloads that effectively demonstrate compromise scenarios. You'll also learn how to conduct pretexting exercises, and we wrap up the course with a fun "Capture the Human" exercise to put what you've learned into practice. This is the perfect course to open up new attack possibilities, better understand the human vulnerability in attacks, and let you practice snares that have proven themselves in tests time and time again.

SEC580

Metasploit Kung Fu for Enterprise Pen Testing

Two-Day Course | Sat, Sep 10 - Sun, Sep 11 | 9:00am - 5:00pm | 12 CPEs | Laptop Required | Instructor: Eric Conrad

sans.org/simulcast

Many enterprises today face regulatory or compliance requirements that mandate regular penetration testing and vulnerability assessments. Commercial tools and services for performing such tests can be expensive. While really solid free tools such as Metasploit are available, many testers do not understand the comprehensive feature sets of such tools and how to apply them in a professional-grade testing methodology. Metasploit was designed to help testers with confirming vulnerabilities using an open-source and easy-to-use framework. This course will help students get the most out of this free tool.

This class will show students how to apply the incredible capabilities of the Metasploit Framework in a comprehensive penetration testing and vulnerability assessment regimen according to a thorough methodology for performing effective tests. Students who complete the course will have a firm understanding of how Metasploit can fit into their penetration testing and day-to-day assessment activities. The course will provide an in-depth understanding of the Metasploit Framework far beyond simply showing attendees how to exploit a remote system. The class will cover exploitation, post-exploitation reconnaissance, token manipulation, spear-phishing attacks, and the rich feature set of the Meterpreter, a customized shell environment specially created for exploiting and analyzing security flaws.

The course will also cover many of the pitfalls that a tester may encounter when using the Metasploit Framework and how to avoid or work around them, making tests more efficient and safe.

"This is one of SANS' best courses. Practical labs are a big part of this course, which is awesome."

-Camilo do Carmo Pinto, Deloitte

MGT305

Technical Communication & Presentation Skills for Security Professionals

One-Day Course | Sun, Sep 18 | 9:00am - 5:00pm | 6 CPEs | Laptop Required | Instructor: David Hoelzer

This course is designed for every IT professional in your organization. In this course we cover the top techniques that will show any attendee how to research and write professional quality reports, and how to create outstanding presentation materials. Attendees will also get a crash course on advanced public speaking skills.

Writing reports is a task that many IT professionals struggle with, sometimes from the perspective of writing the report and other times from the perspective of having to read someone else's report! In the morning material, we cover step by step how to work through the process of identifying critical ideas, how to properly research them, how to develop a strong argument in written form, and how to put it all down on paper. We also discuss some of the most common mistakes that can negatively impact the reception of your work and show how to avoid them. Attendees can expect to see the overall quality of their reports improve significantly as a result of this exercise.

After writing a meaningful report, it is not uncommon to find that we must present the key findings from that report before an audience, whether that audience is our department, upper management, or perhaps even the entire organization. How do you transform an excellent report into a powerful presentation? We will work through a process that serves to either condense a report into a presentation or can even be used to write a presentation from scratch that communicates your important thoughts in a meaningful and interesting way.

SANS Technology Institute

www.sans.edu

MGT415

A Practical Introduction to Cybersecurity Risk Management

Two-Day Course | Sat, Sep 10 - Sun, Sep 11 | 9:00am - 5:00pm | 12 CPEs | Laptop Required | Instructor: James Tarala

In this course students will learn the practical skills necessary to perform regular risk assessments for their organizations. The ability to perform a risk assessment is crucial for organizations hoping to defend their systems. There are simply too many threats, too many potential vulnerabilities, and not enough resources to create an impregnable security infrastructure. Therefore every organization, whether it does so in an organized manner or not, will make priority decisions on how best to defend its valuable data assets. Risk assessment should be the foundational tool used to facilitate thoughtful and purposeful defense strategies.

You Will Learn:

- How to perform a risk assessment step by step
- How to map an organization's business requirements to implemented security controls
- The elements of risk assessment and the data necessary for performing an effective risk assessment
- What in-depth risk management models exist for implementing a deeper risk management program in your organization

MGT433

Securing The Human: How to Build, Maintain, and Measure a High-Impact Awareness Program

Two-Day Course | Sat, Sep 10 - Sun, Sep 11 | 9:00am - 5:00pm | 12 CPEs | Laptop NOT Needed | Instructor: Lance Spitzner

Organizations have invested a tremendous amount of money and resources into securing technology, but little if anything into securing their employees and staff. As a result, people, not technology, have become their weakest link in cybersecurity. The most effective way to secure the human element is to establish a high-impact security awareness program that goes beyond just compliance and changes behaviors. This intense two-day course will teach you the key concepts and skills needed to build, maintain, and measure just such a program. All course content is based on lessons learned from hundreds of security awareness programs from around the world. You will learn not only from your instructor, but from extensive interaction with your peers as well. Please bring example materials from your security awareness program that you can show and share with other students during the course. Finally, through a series of labs and exercises, you will develop your own custom security awareness plan that you can implement as soon as you return to your organization.

www.sans.org/simulcast

SANS Technology Institute

www.sans.edu

MGT535

Incident Response Team Management

Two-Day Course | Sat, Sep 10 - Sun, Sep 11 | 9:00am - 5:00pm | 12 CPEs | Laptop Required | Instructor: Christopher Crowley

This course discusses the often-neglected topic of managing an incident response team. Given the frequency and complexity of today's cyber attacks, incident response is a critical function for organizations because it is their last line of defense.

Detecting and efficiently responding to incidents requires strong management processes, and managing an incident response team requires special skills and knowledge. A background in information security management or security engineering is not sufficient for managing incidents. On the other hand, incident responders with strong technical skills do not necessarily become effective incident response managers. Special training is necessary.

The course has been updated to address current issues such as the advanced persistent threat, incident response in the cloud, and threat intelligence.

You Will Learn:

- Fundamentals of incident response
- How to establish requirements
- How to set up operations
- Communications
- How to make operations work
- Legal and regulatory issues
- Training, education, and awareness

SANS Hosted is a series of courses presented by other educational providers at Network Security 2016 to complement your needs for training outside of our current course offerings.

NEW!

HOSTED

Healthcare Security Essentials

Two-Day Course | Sun, Sep 18 - Mon, Sep 19 | 9:00am - 5:00pm | 12 CPEs | Laptop Required | Instructor: Greg Porter

Healthcare Security Essentials is designed to provide SANS students with an introduction to current and emerging issues in healthcare information security and regulatory compliance. The class provides a foundational set of skills and knowledge for healthcare security professionals by integrating case studies, hands-on labs, and tips for securing and monitoring electronic protected health information. Administrative insights for those managing the many aspects of healthcare security operations will also be discussed. The goal of the course is to present a substantive overview and analysis of relevant information security subject matter that is having a direct and material impact on the U.S. healthcare system.

MODULE 1: **Overview of Healthcare Information Security**
The first module of the class focuses on current threats to healthcare information systems and data. We will examine how and why patient information is being targeted as well as key trends, including, but not limited to, the commercialization of malicious software, medical identity theft, insider threats, mobile device proliferation, cloud computing, and poor operational governance. The module will conclude with a discussion on common sources of healthcare data breaches and practical countermeasures.

MODULE 2: **HIPAA Security 2.0**
Module 2 will provide attendees with an overview of the Health Insurance Portability and Accountability Act Security Rule and its context, with close attention paid to the rules structure, safeguards, and implementation specifications governing electronic protected health information. Students will also examine breach notification requirements and conclude the module by reviewing the security implications of electronic medical records and meaningful use.

MODULE 3: **Risk Analysis & Management**
Module 3 discusses the risk-based guidance framework to help healthcare-based organizations and other custodians of personal health information develop an effective risk assessment program specifically designed to identify risks to the confidentiality, integrity, and availability of ePHI while meeting Office for Civil Rights expectations.

MODULE 4: **Medical Device Security**
The course will conclude by taking the lessons learned from previous modules and attempting to understand their applicability to medical device management. Medical devices, large and small alike, continue to play an essential and growing role in patient care. Today's security professional must understand the risks medical devices may present to wired and/or wireless networks, patient data, and end users and how those risks should be appropriately managed.

HOSTED

Physical Penetration Testing

Two-Day Course | Sat, Sep 10 - Sun, Sep 11 | 9:00am - 5:00pm | 12 CPEs | Laptop NOT Needed | Instructor: The CORE Group

Physical security is an oft-overlooked component of data and system security in the technology world. While frequently forgotten, it is no less critical than timely patches, appropriate password policies, and proper user permissions. You can have the most hardened servers and network, but that doesn't make the slightest difference if someone can gain direct access to a keyboard or, worse yet, march your hardware right out the door.

Those who attend this session will leave with a full awareness of how to best protect buildings and grounds from unauthorized access, as well as how to compromise most existing physical security in order to gain access themselves. Attendees will not only learn how to distinguish good locks and access controls from poor ones, but will also become well-versed in picking and bypassing many of the most common locks used in North America in order to assess their own company's security posture or to augment their career as a penetration tester.

BONUS SESSIONS

Enrich your SANS training experience! Evening talks by our instructors and selected subject-matter experts help you broaden your knowledge, hear from the voices that matter in computer security, and get the most for your training dollar.

KEYNOTE: An Interactive Look at Cyber Crime and Today's Threat Landscape

James Lyne and Stephen Sims

Let's take a journey through the most common attack trends, malicious software, and techniques used by adversaries today. Cyber criminals closely monitor the landscape for changes, actively responding to these changes and remaining one step ahead of our efforts to maintain an acceptable level of security. It is critical for our defenders to keep up with these forever-changing techniques. Surprisingly, the success of cyber-criminals often depends on basic mistakes still made by users. Join James and Stephen as they energetically perform several demonstrations of exploiting both publicly and privately disclosed vulnerabilities involving applications such as Internet Explorer, Microsoft Office, and Skype.

CISO Success Strategies *Frank Kim*

The increased importance and visibility of cybersecurity as a vital component of business growth make it critical that security leaders understand how to connect with senior executives and business leaders. Join Frank Kim, seasoned security leader and CISO, as he explains three things that will make you a more effective security business leader.

Quality Not Quantity: Continuous Monitoring's Deadliest Events

Eric Conrad

Most Security Operations Centers (SOCs) are built for compliance, not security. One well-known retail firm suffered the theft of over a million credit cards, and 60,000 true positive events were reported to its SOC during that missed breach, but they were lost in the noise of millions. If you are bragging about how many events your SOC handles each day, you are doing it wrong. During this talk, we will show you how to focus on quality instead of quantity, and provide an actionable list of the deadliest events that occur during virtually every successful breach.

Running Away from Security: Web App Vulnerabilities and OSINT Collide *Micah Hoffman*

Lately it seems like more and more of our lives are being sucked into the computer world. There are wrist-sensors for tracking our steps, phone apps that plot our workouts on maps, and sites to share our healthy-eating and weight-loss progress. When people sign up for these sites, they usually use pseudonyms or the sites give them a unique numbered ID to keep their information "private." How hard would it be to connect a person's step-counting, diet history, and other info on these health sites to their real lives? Are businesses using these sites for non-fitness purposes? This talk will show weaknesses in several web applications used for health and exercise tracking and reveal [spoiler alert] how trivial it is to find the real people behind the "private" accounts.

How to Commit Card Fraud *G. Mark Hardy*

Well, we're not going to show you how to commit fraud, but we will show you how the bad guys do it and how you can protect yourself and your business. We'll take a look into the "dark web" and see how these big card heists are pulled off, why chip-and-pin won't solve the fraud problem, and why payment technologies like Apple Pay pose new risks. You'll learn the ecosystem of fraud, and how it's become a big business that costs banks and merchants over $16 billion annually. We'll have a mag stripe card reader so you can really see what's in your wallet.

Naked and Afraid Starring Windows 10 Memory

Alissa Torres

We are in a cybersecurity arms race with our PSR (Primitive Survival Rating) as incident responders hinge on our "surthrivability," that is, our ability to effectively and efficiently detect and contain malicious actors inside our environment. Better lean in and advance your memory forensics skills for what is expected to be the most rapidly adopted enterprise Windows version of all time. Find out what is new in Windows 10 memory management and how the memory forensic frameworks are keeping up. With a current adoption rate of 10% and growing, it is only a matter of time before this OS version will make up the majority of your digital forensics and incident response casework. This presentation will provide insight into the significant changes introduced with Windows 10 and how they will affect your investigative process.

Debunking the Complex Password Myth

Keith Palmgren

Perhaps the worst advice you can give a user is "choose a complex password." The result is the impossible-to-remember password requiring the infamous sticky note on the monitor. In addition, that password gets used at a dozen sites at home, AND the very same password gets used at work. The final result ends up being the devastating password compromise. In this one-hour talk, we will look at the technical and non-technical (human nature) issues behind passwords. Attendees will gain a more complete understanding of passwords and receive solid advice on creating more easily remembered AND significantly stronger passwords at work and at home for their users, for themselves and even for their children.

Women's CONNECT Event

Deanna Boyden

Join SANS and ISSA International Women in Security Special Interest Group (WIS SIG) as we partner with local association chapters and groups to foster an evening of connections. Group representatives will be on hand to discuss their groups and activities and the benefits of membership. From Jean Jennings Bartik to Diane Greene, women have always been a driving force in the field of information technology. Their experiences have been filled not only with stories of overcoming challenges but also ones of innovation and inspiration. Join us to hear some of these stories and come share your own. After the discussions, stay and network with other attendees and with the various groups that will be featured at the event.

Using an Open-Source Threat Model for Prioritized Defense *James Tarala*

Threat actors are not magic and there is not an unlimited, unique list of threats for every organization. Enterprises face similar threats from similar threat sources and actors, so why does every organization need to perform completely unique risk assessments and prioritize its control decisions? This presentation will show how specific, community-driven threat models can be used to prioritize an organization's defenses — without all the confusion. James Tarala will present a new, open, community-driven threat model that can be used by any industry to evaluate the risk it faces. Then he will show how to practically use this model to prioritize enterprise defense and map to existing compliance requirements. Whether you work for the Department of Defense or a mom-and-pop retailer, you will be able to use this model to specifically identify a prioritized defense for your organization.

Smartphone and Network Forensics Go Together Like Peas and Carrots

Heather Mahalik and Phil Hagen

There are strong ties between the smartphone and network aspects of the forensics process. In this talk, Heather Mahalik will address the smartphone side of this investigative coin and Phil Hagen will look at things from the network side. As often identified in the forensics process, a comprehensive approach is necessary to conduct a thorough investigation.

Digital Investigations: Leveraging the Multitude of Records

Ben Wright

Owing to advancing technologies like the cloud, smartphones, and the Internet of Things, the quantity of records relevant to any official investigation is expanding beyond imagination. There are SO MANY records in SO MANY places – emails, texts, photos, metadata, backups, social media, travel histories, deleted stuff – that traditional assumptions on how to advance an investigation or resolve a dispute have become obsolete. Today smart investigation teams are able to leverage the massive volume of records in new and surprising ways. The team does not necessarily need access to records in order to take advantage of their existence. This presentation teaches tips and strategies and tells war stories that simply were not applicable 10 years ago. These lessons help investigators and their employers reach more favorable outcomes in Human Resource disputes, potential lawsuits, forensic audits, regulatory inquiries, criminal proceedings and corporate espionage cases.

Inside the Defender's Sanctum

Eric Cornelius and Derek Harp

Join host Derek Harp for a chat with security researcher and industry veteran Eric Cornelius on the highs and lows of protecting systems from malicious actors and human error alike. Learn what keeps this long-time defender moving forward in the face of an ever-changing threat landscape.

Everything They Told Me About Security Was Wrong

John Strand

If you were to believe the vendors and the trade shows, you would think everything was OK with IT security. You would think AV works. You would think plug and play IDS was effective. You would think that Data Loss Prevention would prevent data loss. Why then is it that organizations with very large budgets and staff still get compromised in advanced and persistent ways? Something is very wrong in this industry. Let's talk about it.

Securing Your Kids

Lance Spitzner

Technology is an amazing tool. It allows our kids to access a tremendous amount of information, meet new people, and communicate with friends around the world. In addition, for them to be successful in the 21st century they have to know and understand how to leverage these new tools. However, with all these capabilities come a variety of new risks, risks that as parents you may not understand or even be aware of. In this one-hour presentation we cover the top three risks to kids online and the top steps you can take to protect them.

The Control Things Platform and Its Little Minion

Justin Searle

SamuraiSTFU was a great start to help electric utilities do penetration testing of their DCS and SCADA networks, but it just wasn't enough. SamuraiSTFU has expanded its goals to include all control systems and IoT devices, thus requiring a name change and a complete rebuild of the pentest distribution. Come check out the new Control Things Platform and its new open-source hardware companion, the Control Things Minion!

Analyzing the Cyber Attack on the Ukrainian Power Grid

Robert M. Lee

On December 23, 2015 a cyber attack caused a power outage that affected 230,000 people in Ukraine. The SANS ICS team immediately began investigating and reporting on the case. In this presentation the attack will be broken down with lessons learned and takeaways for organizations to secure their infrastructure.

Security Awareness: Understanding and Managing Your Top Seven Human Risks

Lance Spitzner

A key step to managing your human risk is first identifying and then prioritizing those risks and then focusing on the top ones. After working with hundreds of organizations, Lance Spitzner will discuss what are the seven most common human risks he finds in organizations and what you can do to effectively manage and measure those specific risks. Key points you will learn include.

- Concepts of "cognitive overload" and how every behavior has a cost
- Key elements in a human risk analysis
- Determining the key behaviors that will mitigate your top human risks
- How to effectively communicate and measure those behaviors

Vendor-Sponsored Events

Vendor Expo

Wednesday, September 14 | 12:00pm - 1:30pm & 5:30pm - 7:30pm

Given that virtually everything in security is accomplished with a tool, exposure to those tools is a very important part of the SANS training event learning experience. Leading solution providers will be on hand for a one-day vendor expo, an added bonus to registered training event attendees. Attendees can visit sponsors during the lunch time and evening Vendor Expo hours to receive stamps on the Passport-to-Prizes form. Prize drawings will occur at the Vendor Welcome Reception.

VENDOR-SPONSORED

Lunch

Wednesday, September 14 | 12:00pm - 1:30pm

Join these sponsoring vendors and others on the expo floor for an introduction to leading solutions and services that showcase the best options in information security.

Lunch & Learn Presentations

Throughout SANS Network Security 2016, vendors will provide sponsored lunch presentations where attendees can interact with peers and learn about vendor solutions. Take a break and get up-to-date on security technologies!

Vendor Welcome Reception

Wednesday, September 14 | 5:30pm - 7:30pm

This informal reception allows you to visit exhibits and participate in some exciting activities. This is a great time to mingle with your peers and experience first-hand the latest in information security tools and solutions with interactive demonstrations. Enjoy appetizers and beverages while comparing experiences with other attendees regarding the solutions they are employing to address security threats in their organization.

The Value of SANS Training and *YOU*

EXPLORE

- Read this brochure and note the courses that will enhance your role in your organization
- Use the *Career Roadmap* in this brochure (www.sans.org/media/security-training/roadmap.pdf) to plan your growth in your chosen career path

RELATE

- Consider how security needs in your workplace will be met with the knowledge you'll gain in a SANS course
- Know that the education you receive will make you an expert resource for your team

VALIDATE

- Pursue a GIAC Certification after your training to validate your new expertise
- Add a NetWars challenge to your SANS experience to prove your hands-on skills

SAVE

- Register early to pay less using early-bird specials
- Consider the SANS Voucher Program or bundled course packages to make the most of your training budget

ADD VALUE

- Network with fellow security experts in your industry
- Prepare thoughts and questions before arriving to share with the group
- Attend SANS@Night talks and activities to gain even more knowledge and experience from instructors and peers alike

ALTERNATIVES

- If you cannot attend a live training event in person, attend the courses virtually via SANS Simulcast
- Use SANS OnDemand or vLive to complete the same training online from anywhere in the world, at any time

ACT

- Bring the value of SANS training to your career and organization by registering for a course today, or contact us at 301-654-SANS with further questions

Return on Investment

SANS live training is recognized as the best resource in the world for information security education. With SANS, you gain significant returns on your InfoSec investment. Through our intensive immersion classes, our training is designed to help your staff master the practical steps necessary for defending systems and networks against the most dangerous threats – the ones being actively exploited.

REMEMBER

the SANS promise:

You will be able to apply our information security training the day you get back to the office!

NEW GIAC CERTIFICATIONS!

www.giac.org/gasf

The new **GASF** certification focuses on applying core smartphone forensic analysis concepts and techniques to extract artifacts from mobile devices and their components. Certified individuals will be able to leverage tools, scripts and decoding techniques to parse data and determine how the artifact was placed on the device and how it pertains to the investigation.

SANS TRAINING COURSE: **FOR585: Advanced Smartphone Forensics**

"The new GASF is the first smartphone forensic certification that focuses on analysis and not just tool acquisition provided by commercial vendors. This certification shows that individuals not only understand how to leverage tools to acquire and triage data, but understand how the data was placed on the device, how to parse the data when the commercial tool cannot support it, and most importantly what the artifact represents."

-Heather Mahalik, co-author of SANS FOR585: Advanced Smartphone Forensics

www.giac.org/gpyc

The new **GPYC** certification focuses on applying core programming concepts and techniques to the Python programming language. Certified individuals can create simple Python-based tools to interact with network traffic, create custom executables, test and interact with databases and websites, and parse logs or sets of data.

SANS TRAINING COURSE: **SEC573: Python for Penetration Testers**

Employers need good talent. Veterans need good jobs. SANS VetSuccess Immersion Academy delivers both.

Introducing the SANS VetSuccess Immersion Academy, an intensive, accelerated program that provides the real-world training and certifications needed to fill critical jobs in cybersecurity.

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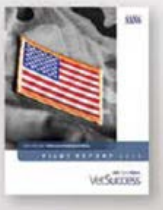
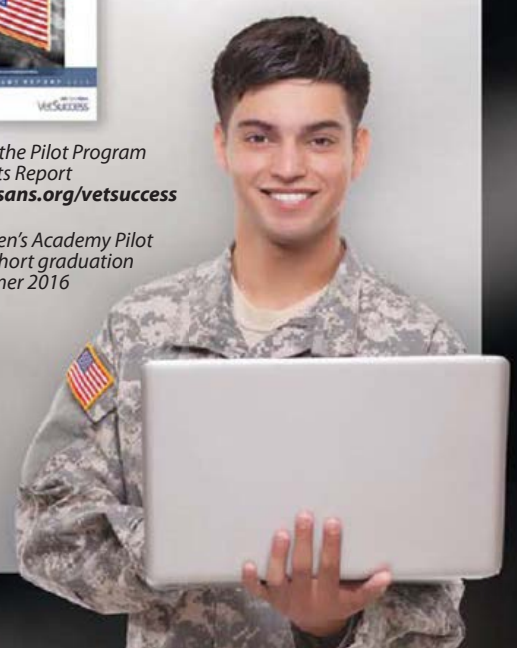
Find out how your organization can benefit from hiring graduates or launching an academy to meet your specific talent needs.

sans.org/cybertalent/immersion-academy
Email: immersionacademy@sans.org



Read the Pilot Program Results Report
Visit sans.org/vetsuccess

Women's Academy Pilot
1st cohort graduation
Summer 2016



VetSuccess

SANS | CyberTalent IMMERSION ACADEMY

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Live Training at Your Office Location

Mentor
www.sans.org/mentor

Live Multi-Week Training with a Mentor

ONLINE TRAINING

OnDemand
www.sans.org/ondemand

Four Months of Self-Paced e-Learning

vLive
www.sans.org/vlive

Live Online, Evening Sessions with Six Months of Archive Access

Simulcast
www.sans.org/simulcast

Online, Daytime Access to a One-Week Live-Event Course

SelfStudy
www.sans.org/selfstudy

Self-Paced Study with Lecture Audio

OnDemand Bundles
www.sans.org/ondemand/bundles

Extend Your Training with an OnDemand Bundle Including Four Months of E-learning

Department of Defense Directive 8140

(DoDD 8140)

www.sans.org/dodd-8140

Department of Defense Directive 8570 has been replaced by the DoD CIO and is now DoDD 8140. DoDD 8570 is now part of a larger initiative that falls under the guidelines of DoDD 8140. DoDD 8140 provides guidance and procedures for the training, certification, and management of all government employees who conduct Information Assurance functions in assigned duty positions. These individuals are required to carry an approved certification for their particular job classification. GIAC certifications are among those required for Technical, Management, CND, and IASAE classifications.

Compliance/Recertification:

To stay compliant with DoDD 8140 requirements, you must maintain your certifications. GIAC certifications are renewable every four years.

Go to www.giac.org to learn more about certification renewal.

DoD Baseline IA Certifications

IAT Level I	IAT Level II	IAT Level III	IAM Level I	IAM Level II	IAM Level III
A+CE Network+CE SSCP	**GSEC** Security+CE SSCP	**GCED** **GCIH** **CISSP** (or Associate) CISA, CASP	**GSLC** CAP Security+CE	**GSLC** **CISSP** (or Associate) CAP, CASP CISM	**GSLC** **CISSP** (or Associate) CISM

Computer Network Defense (CND) Certifications

CND Analyst	CND Infrastructure Support	CND Incident Responder	CND Auditor	CND Service Provider Manager
GCIA **GCIH** CEH	SSCP CEH	**GCIH** **GCFA** CSIH, CEH	**GSNA** CISA CEH	CISSP - ISSMP CISM

Information Assurance System Architecture & Engineering (IASAE) Certifications

IASAE I	IASAE II	IASAE III
CISSP (or Associate) CASP, CSSCP	**CISSP** (or Associate) CASP, CSSLP	CISSP - ISSEP CISSP - ISSAP

Computer Environment (CE) Certifications

GCWN	**GCUX**

SANS Training Courses for DoDD Approved Certifications

SANS TRAINING COURSE		DoDD APPROVED CERT
SEC401	**Security Essentials Bootcamp Style**	**GSEC**
SEC501	**Advanced Security Essentials – Enterprise Defender**	**GCED**
SEC503	**Intrusion Detection In-Depth**	**GCIA**
SEC504	**Hacker Tools, Techniques, Exploits, and Incident Handling**	**GCIH**
SEC505	**Securing Windows and PowerShell Automation**	**GCWN**
SEC506	**Securing Linux/Unix**	**GCUX**
AUD507	**Auditing & Monitoring Networks, Perimeters, and Systems**	**GSNA**
FOR508	**Advanced Digital Forensics and Incident Response**	**GCFA**
MGT414	**SANS Training Program for CISSP® Certification**	**CISSP**
MGT512	**SANS Security Leadership Essentials for Managers with Knowledge Compression™**	**GSLC**

Real Threats
Real Skills
Real Success

Join Today!

SANS CYBER GUARDIAN PROGRAM

This program begins with hands-on core courses that will build and increase your knowledge and skills. These skills will be reinforced by taking and passing the associated GIAC certification exam. After completing the core courses, you will choose a course and certification from either the Red or Blue Team. The program concludes with participants taking and passing the GIAC Security Expert (GSE) certification.

Core Courses

SEC503 (GCIA) | SEC504 (GCIH) | SEC560 (GPEN) | FOR508 (GCFA)

After completing the core courses, students must choose one course and certification from either the Blue or Red Team

Blue Team Courses

SEC502 (GPPA) | **SEC505 (GCWN)** | **SEC506 (GCUX)**

Red Team Courses

SEC542 (GWAPT) | **SEC617 (GAWN)** | **SEC660 (GXPN)**

Contact us at onsite@sans.org to get started!

www.sans.org/cyber-guardian

FUTURE SANS TRAINING EVENTS

Information on all events can be found at www.sans.org/security-training/by-location/all

SANS FIRE 2016

Washington, DC | June 11-18

Training You Can Implement Immediately!

EXCLUSIVE EVENT POWERED BY THE INTERNET STORM CENTER

SANS DFIR

DIGITAL FORENSICS & INCIDENT RESPONSE

SUMMIT & TRAINING

JUNE 23-30 | AUSTIN, TEXAS

San Antonio 2016

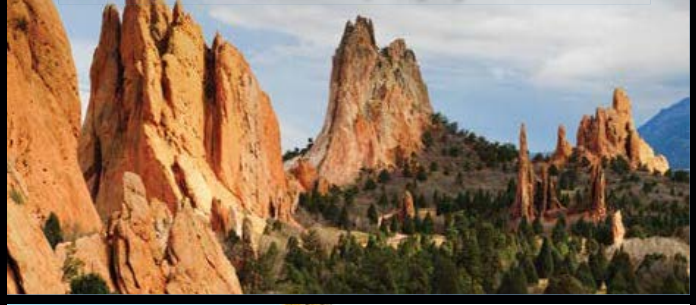
July 18-23

Salt Lake City 2016

Salt Lake City, UT
June 27 - July 2

Rocky Mountain 2016

Denver, CO | July 11-16



ICS Security

SUMMIT & TRAINING 2016

Houston, TX
July 25-30

San Jose 2016

San Jose, CA
July 25-30

Minneapolis 2016

Minneapolis, MN
July 18-23

Security Awareness

SUMMIT & TRAINING 2016

San Francisco, CA
August 1-10

FUTURE SANS TRAINING EVENTS

Information on all events can be found at www.sans.org/security-training/by-location/all

SANS

VOUCHER PROGRAM

The SANS Voucher Program allows an organization to manage its training budget from a single SANS Account, potentially receive bonus funds based on its investment level, and centrally administer its training.

CONTACT

www.sans.org/vouchers

Training Investment & Bonus Funds

To open a Voucher Account, an organization pays an agreed upon training investment. Based on the amount of the training investment, an organization could be eligible to receive bonus funds.

The investment and bonus funds:

- can be applied to **any live or online SANS training course, SANS Summit, GIAC certification, or certification renewal***
- can be increased at any time by making additional investments
- need to be utilized within 12 months, however, the term can be extended by investing additional funds before the end of the 12 month term

Flexibility & Control

The online SANS Admin Tool allows the organization's Program Administrator to manage the account at anytime from anywhere.

With the SANS Admin Tool, the Administrator can:

- approve student enrollment and manage fund usage
- view fund usage in real time
- view students' certification status and test results
- obtain OnDemand course progress by student per course

Getting Started

Complete and submit the form online at **www.sans.org/vouchers** and a SANS representative in your region will contact you within 24 business hours.

Get started today and within as little as one week, we can create your Account and your employees can begin their training.

By creating a Voucher Account, your organization can:

- Simplify the procurement process with a single invoice and payment
- Easily change course attendees if previous plans change
- Lock-in your hard fought training budget and utilize over time
- Control how, where, and for whom funds are spent
- Allow employees to register for training while managing approvals centrally

*Current exceptions are the Partnership Program, Security Awareness Training, and SANS workshops hosted at events and conferences run by other companies.

HOTEL INFORMATION

Training Campus

Caesars Palace

3570 Las Vegas Blvd. South
Las Vegas, NV 89109
www.sans.org/event/network-security-2016/location

The grandest of Las Vegas hotels, Caesars Palace is famous worldwide for its magnificent beauty and impeccable service. This majestic Las Vegas hotel offers a 129,000 square foot casino, 26 restaurants and cafes, sprawling gardens and pools, a world-class spa, and the renowned Colosseum spotlighting world-class stars.

Special Hotel Rates Available

A special early bird discounted rate of $132.30 S/D will be honored based on space availability through July 30, 2016. After this date a special discounted rate of $189.00 S/D will be honored based on space availability through August 21, 2016.

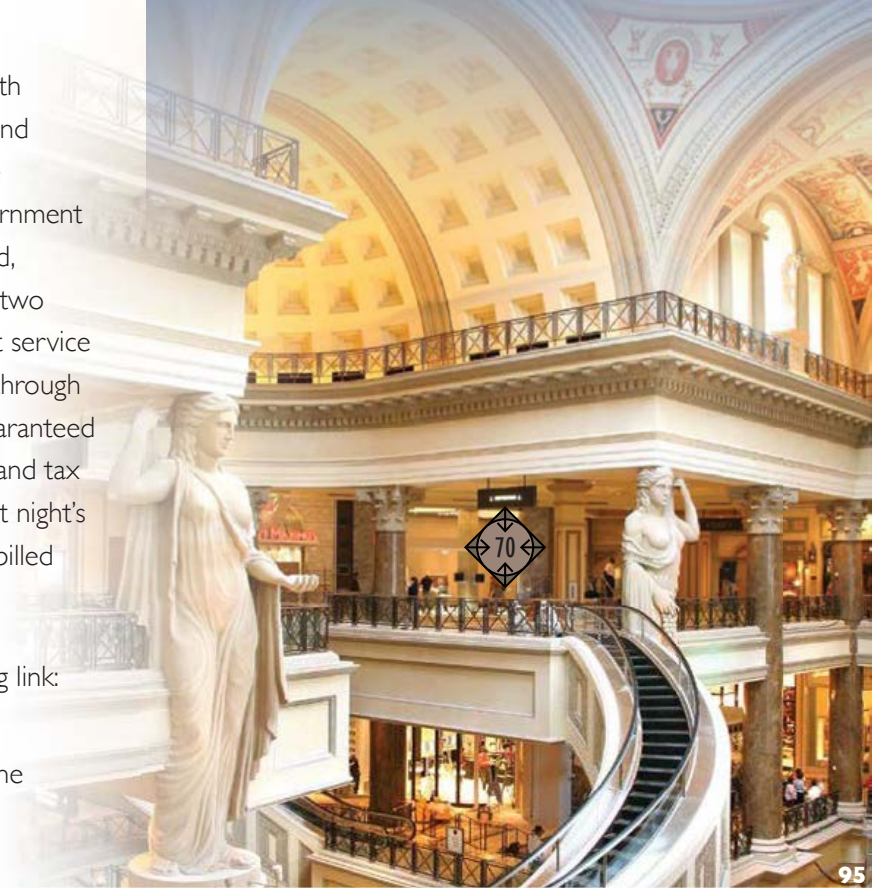
Government per diem rooms are available with proper ID; you will need to call reservations and ask for the SANS government rate or use the weblink provided below and select the "Government Attendee" option. All rates include high-speed, standard Internet service in your guestroom (two device connections per day; premium Internet service available for purchase) and are only available through August 21, 2016. All reservations must be guaranteed with a deposit for the first night's guestroom and tax charge. If guaranteed by a credit card, the first night's guestroom and tax charge, per room, will be billed immediately to the cardholder's account.

To make reservations, use the following link:
https://resweb.passkey.com/go/SCSAN6

You can also call **866-227-5944** and ask for the SANS group rate.

Top 5 reasons to stay at Caesars Palace

1. **All SANS attendees receive complimentary high-speed Internet when booking in the SANS block.**
2. **No need to factor in daily cab fees and the time associated with travel to alternate hotels.**
3. **By staying at Caesars Palace, you gain the opportunity to further network with your industry peers and remain in the center of the activity surrounding the training event.**
4. **SANS schedules morning and evening events at Caesars Palace that you won't want to miss!**
5. **Everything is in one convenient location!**



REGISTRATION INFORMATION

We recommend you register early to ensure you get your first choice of courses.

Register online at www.sans.org/NetworkSecurity-2016

Select your course or courses and indicate whether you plan to test for GIAC certification.

If the course is still open, the secure, online registration server will accept your registration. Sold-out courses will be removed from the online registration. Everyone with Internet access must complete the online registration form. We do not take registrations by phone.

Use code **EarlyBird16** when registering early

Pay Early and Save

	DATE	DISCOUNT	DATE	DISCOUNT
Pay & enter code before	**7-20-16**	**$400.00**	**8-10-16**	**$200.00**

Some restrictions apply.

SANS SIMULCAST

To register for a SANS Network Security 2016 Simulcast course, please visit www.sans.org/event/network-security-2016/attend-remotely

SANS Voucher Program

Expand your training budget!

Extend your fiscal year. The SANS Voucher Program provides flexibility and may earn you bonus funds for training.

www.sans.org/vouchers

Cancellation

You may substitute another person in your place at any time, at no charge, by e-mail: registration@sans.org or fax: 301-951-0140. Cancellation requests without substitution must be submitted in writing, by mail, or fax, and postmarked by **Wednesday, August 24, 2016** – processing fees may apply.

SANS NETWORK SECURITY 2016 REGISTRATION FEES

Register online at www.sans.org/NetworkSecurity-2016

If you don't wish to register online, please call 301-654-SANS (7267) 9:00am-8:00pm (Mon-Fri) EST and we will fax or mail you an order form.

Job-Based Long Courses

		Paid before 7-20-16	Paid before 8-10-16	Paid after 8-10-16	Add GIAC Cert	Add OnDemand	Add NetWars Continuous
☐ SEC301	Intro to Information Security	$4,485	$4,685	$4,885	☐ $659	☐ $659	☐ $1,199
☐ SEC401	Security Essentials Bootcamp Style	$5,220	$5,420	$5,620	☐ $659	☐ $659	☐ $1,199
☐ SEC501	Advanced Security Essentials – Enterprise Defender	$5,220	$5,420	$5,620	☐ $659	☐ $659	☐ $1,199
☐ SEC503	Intrusion Detection In-Depth	$5,220	$5,420	$5,620	☐ $659	☐ $659	☐ $1,199
☐ SEC504	Hacker Tools, Techniques, Exploits, and Incident Handling	$5,220	$5,420	$5,620	☐ $659	☐ $659	☐ $1,199
☐ SEC505	Securing Windows and PowerShell Automation	$5,110	$5,310	$5,510	☐ $659	☐ $659	☐ $1,199
☐ SEC506	Securing Linux/Unix	$5,220	$5,420	$5,620	☐ $659	☐ $659	☐ $1,199
☐ SEC511	Continuous Monitoring and Security Operations	$5,220	$5,420	$5,620	☐ $659	☐ $659	☐ $1,199
☐ SEC542	Web App Penetration Testing and Ethical Hacking	$5,220	$5,420	$5,620	☐ $659	☐ $659	☐ $1,199
☐ SEC550	Active Defense, Offensive Countermeasures and Cyber Deception	$4,485	$4,685	$4,885			☐ $1,199
☐ SEC560	Network Penetration Testing and Ethical Hacking	$5,220	$5,420	$5,620	☐ $659	☐ $659	☐ $1,199
☐ SEC562	CyberCity Hands-on Kinetic Cyber Range Exercise	$6,180	$6,380	$6,580			☐ $1,199
☐ SEC566	Implementing and Auditing the Critical Security Controls – In-Depth	$4,485	$4,685	$4,885	☐ $659	☐ $659	☐ $1,199
☐ SEC573	Python for Penetration Testers	$4,485	$4,685	$4,885	☐ $659		☐ $1,199
☐ SEC575	Mobile Device Security and Ethical Hacking **NEW!**	$5,220	$5,420	$5,620	☐ $659	☐ $659	☐ $1,199
☐ SEC579	Virtualization and Private Cloud Security	$5,220	$5,420	$5,620		☐ $659	☐ $1,199
☐ SEC617	Wireless Ethical Hacking, Penetration Testing, and Defenses	$5,220	$5,420	$5,620	☐ $659		☐ $1,199
☐ SEC642	Advanced Web App Penetration Testing and Ethical Hacking	$5,220	$5,420	$5,620			☐ $1,199
☐ SEC660	Advanced Penetration Testing, Exploit Writing, and Ethical Hacking	$5,220	$5,420	$5,620	☐ $659	☐ $659	☐ $1,199
☐ SEC760	Advanced Exploit Development for Penetration Testers	$5,220	$5,420	$5,620			☐ $1,199
☐ AUD507	Auditing & Monitoring Networks, Perimeters, and Systems	$5,110	$5,310	$5,510	☐ $659	☐ $659	☐ $1,199
☐ DEV522	Defending Web Applications Security Essentials	$5,110	$5,310	$5,510	☐ $659	☐ $659	☐ $1,199
☐ DEV541	Secure Coding in Java/JEE: Developing Defensible Applications	$4,020	$4,220	$4,420	☐ $659	☐ $659	☐ $1,199
☐ DEV544	Secure Coding in .NET: Developing Defensible Applications	$4,020	$4,220	$4,420	☐ $659	☐ $659	☐ $1,199
☐ FOR408	Windows Forensic Analysis	$5,220	$5,420	$5,620	☐ $659	☐ $659	☐ $1,199
☐ FOR508	Advanced Digital Forensics and Incident Response	$5,220	$5,420	$5,620	☐ $659	☐ $659	☐ $1,199
☐ FOR518	Mac Forensic Analysis	$5,220	$5,420	$5,620		☐ $659	☐ $1,199
☐ FOR526	Memory Forensics In-Depth	$5,220	$5,420	$5,620		☐ $659	☐ $1,199
☐ FOR572	Advanced Network Forensics and Analysis	$5,220	$5,420	$5,620	☐ $659	☐ $659	☐ $1,199
☐ FOR578	Cyber Threat Intelligence **NEW!**	$4,695	$4,895	$5,095			☐ $1,199
☐ FOR585	Advanced Smartphone Forensics	$5,220	$5,420	$5,620	☐ $659	☐ $659	☐ $1,199
☐ FOR610	Reverse-Engineering Malware: Malware Analysis Tools and Techniques	$5,220	$5,420	$5,620	☐ $659	☐ $659	☐ $1,199
☐ ICS410	ICS/SCADA Security Essentials	$4,785	$4,985	$5,185	☐ $659	☐ $659	☐ $1,199
☐ ICS515	ICS Active Defense and Incident Response	$5,035	$5,235	$5,435		☐ $659	☐ $1,199
☐ LEG523	Law of Data Security and Investigations	$4,485	$4,685	$4,885	☐ $659	☐ $659	☐ $1,199
☐ MGT414	SANS Training Program for CISSP® Certification	$4,590	$4,790	$4,990	☐ $659	☐ $659	☐ $1,199
☐ MGT512	SANS Security Leadership Essentials for Managers with Knowledge Compression™	$4,865	$5,065	$5,265	☐ $659	☐ $659	☐ $1,199
☐ MGT514	IT Security Strategic Planning, Policy, and Leadership	$4,485	$4,685	$4,885		☐ $659	☐ $1,199
☐ MGT525	IT Project Management, Effective Communication, and PMP® Exam Prep	$4,590	$4,790	$4,990	☐ $659		☐ $1,199

PMP is registered mark of the Project Management Institute, Inc.

Skill-Based Short Courses

		Course fee if taking a 4-6 day course	Course fee
☐ SEC440	Critical Security Controls: Planning, Implementing, and Auditing	$1,450	$2,250
☐ SEC567	Social Engineering for Penetration Testers **NEW!**	$1,350	$2,130
☐ SEC580	Metasploit Kung Fu for Enterprise Pen Testing	$1,350	$2,130
☐ MGT305	Technical Communication and Presentation Skills for Security Professionals	$850	$1,300
☐ MGT415	A Practical Introduction to Cybersecurity Risk Management	$1,350	$2,130
☐ MGT433	Securing The Human: How to Build, Maintain & Measure a High-Impact Awareness Program	$1,350	$2,130
☐ MGT535	Incident Response Team Management	$1,350	$2,130
☐ HOSTED	Healthcare Security Essentials **NEW!**		$2,130
☐ HOSTED	Physical Penetration Testing		$2,000
☐ SPECIAL	CORE NetWars Tournament – Tournament Entrance Fee	FREE	$1,450
☐ SPECIAL	DFIR NetWars Tournament – Tournament Entrance Fee	FREE	$1,450

EARLYBIRD DISCOUNTS

Pay for any long course using the code EARLYBIRD16 at checkout by:
7-20-16 to get $400 OFF / 8-10-16 to get $200 OFF

Open a **SANS Portal Account** today to enjoy these FREE resources:

WEBCASTS

Ask The Expert Webcasts – SANS experts bring current and timely information on relevant topics in IT Security.

Analyst Webcasts – A follow-on to the SANS Analyst Program, Analyst Webcasts provide key information from our whitepapers and surveys.

WhatWorks Webcasts – The SANS WhatWorks webcasts bring powerful customer experiences showing how end users resolved specific IT Security issues.

Tool Talks – Tool Talks are designed to give you a solid understanding of a problem, and how a vendor's commercial tool can be used to solve or mitigate that problem.

NEWSLETTERS

NewsBites – Twice-weekly high-level executive summary of the most important news relevant to cybersecurity professionals

OUCH! – The world's leading monthly free security awareness newsletter designed for the common computer user

@RISK: The Consensus Security Alert – A reliable weekly summary of (1) newly discovered attack vectors, (2) vulnerabilities with active new exploits, (3) how recent attacks worked, and (4) other valuable data

OTHER FREE RESOURCES

- InfoSec Reading Room
- Top 25 Software Errors
- 20 Critical Controls
- Security Policies
- Intrusion Detection FAQ
- Tip of the Day
- Security Posters
- Thought Leaders
- 20 Coolest Careers
- Security Glossary
- SCORE (Security Consensus Operational Readiness Evaluation)

www.sans.org/account

SAVE $400 on SANS Network Security 2016 courses!

Register and pay by 7-20-16 (SAVE $400) or 8-10-16 (SAVE $200) – www.sans.org/NetworkSecurity-2016