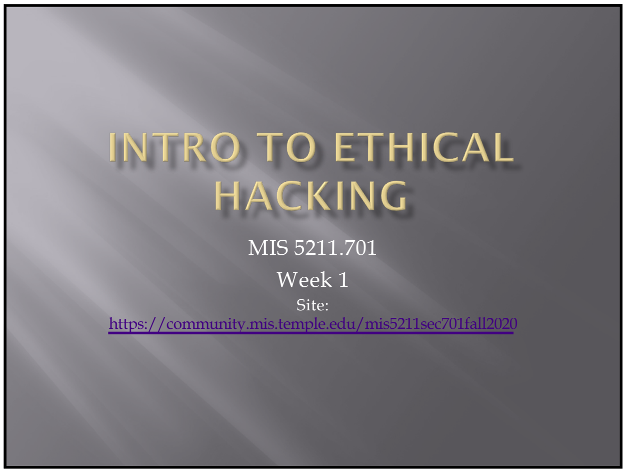

INTRO TO ETHICAL HACKING

MIS 5211.701

Week 1

Site:

https://community.mis.temple.edu/mis5211sec701fall2020

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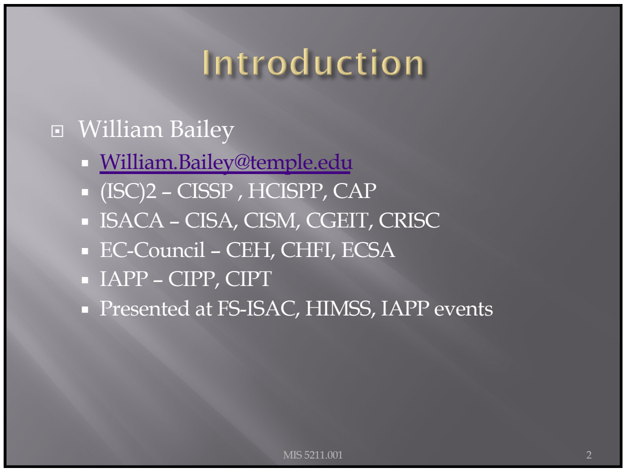

Introduction

- William Bailey
  - William.Bailey@temple.edu
  - (ISC)2 – CISSP , HCISPP, CAP
  - ISACA – CISA, CISM, CGEIT, CRISC
  - EC-Council – CEH, CHFI, ECSA
  - IAPP – CIPP, CIPT
  - Presented at FS-ISAC, HIMSS, IAPP events

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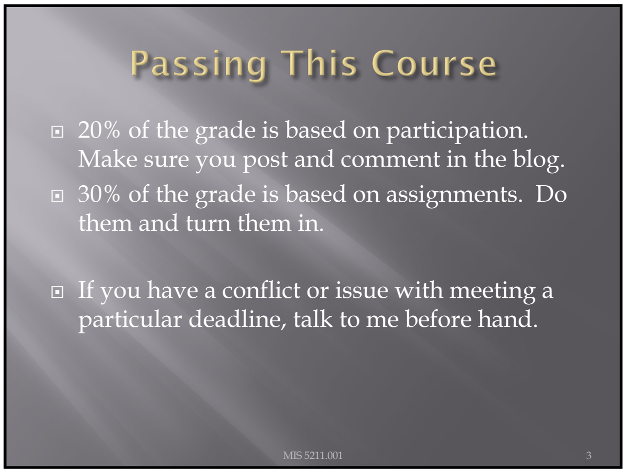

Passing This Course

- 20% of the grade is based on participation. Make sure you post and comment in the blog.
- 30% of the grade is based on assignments. Do them and turn them in.
- If you have a conflict or issue with meeting a particular deadline, talk to me before hand.

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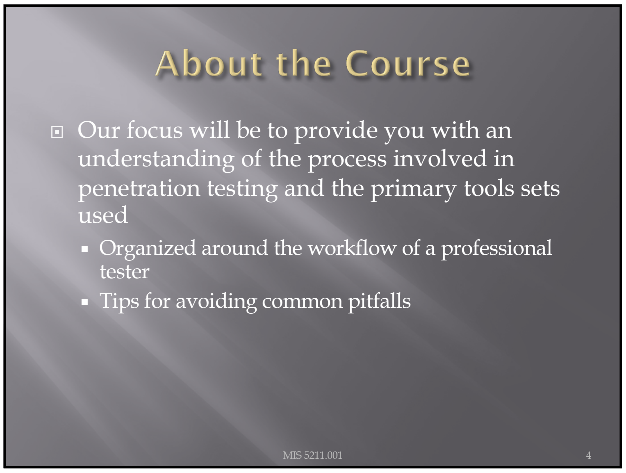

About the Course

- Our focus will be to provide you with an understanding of the process involved in penetration testing and the primary tools sets used
  - Organized around the workflow of a professional tester
  - Tips for avoiding common pitfalls

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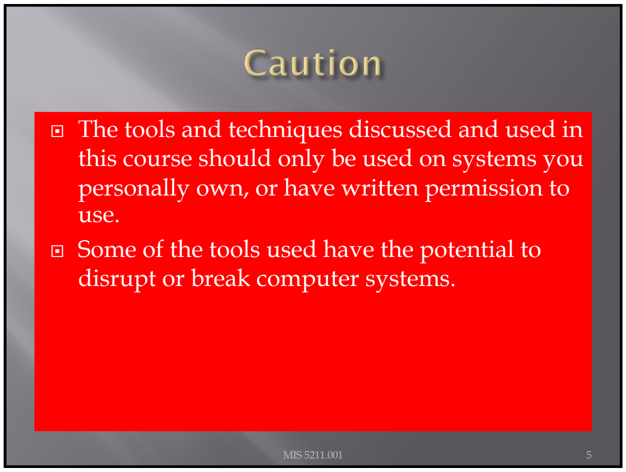

Caution

- The tools and techniques discussed and used in this course should only be used on systems you personally own, or have written permission to use.
- Some of the tools used have the potential to disrupt or break computer systems.

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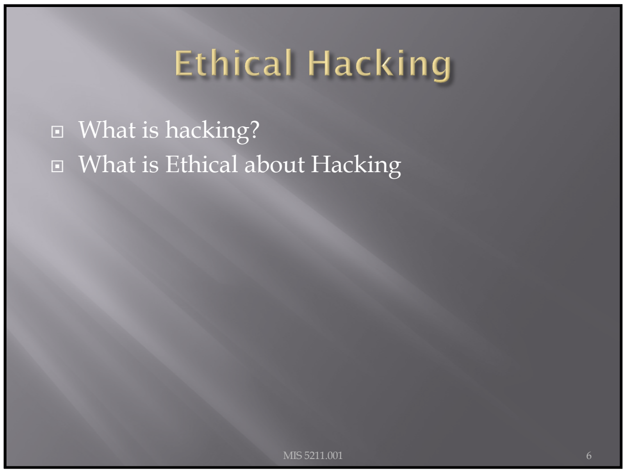

Ethical Hacking

- What is hacking?
- What is Ethical about Hacking

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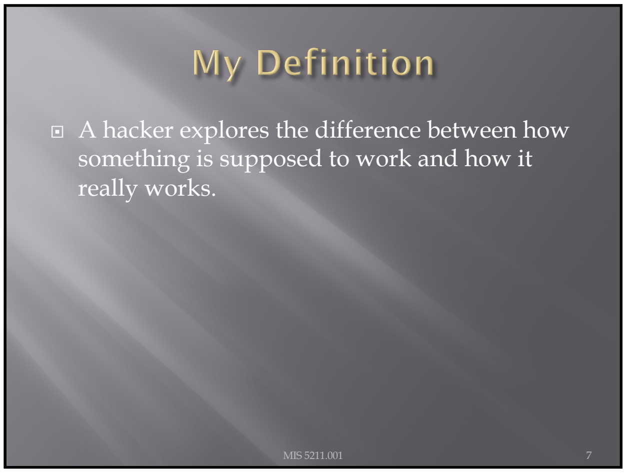

My Definition

- A hacker explores the difference between how something is supposed to work and how it really works.

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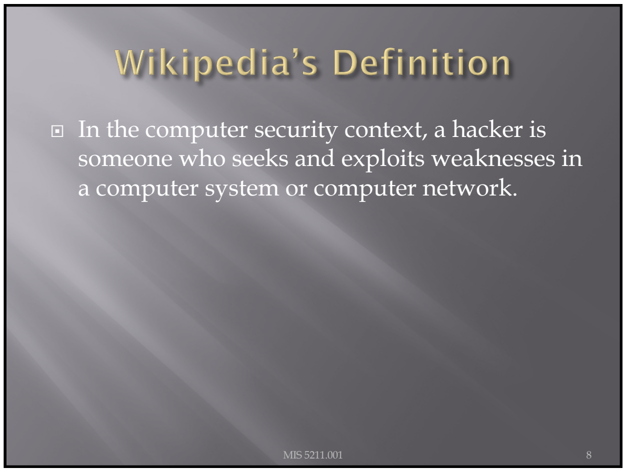

Wikipedia's Definition

- In the computer security context, a hacker is someone who seeks and exploits weaknesses in a computer system or computer network.

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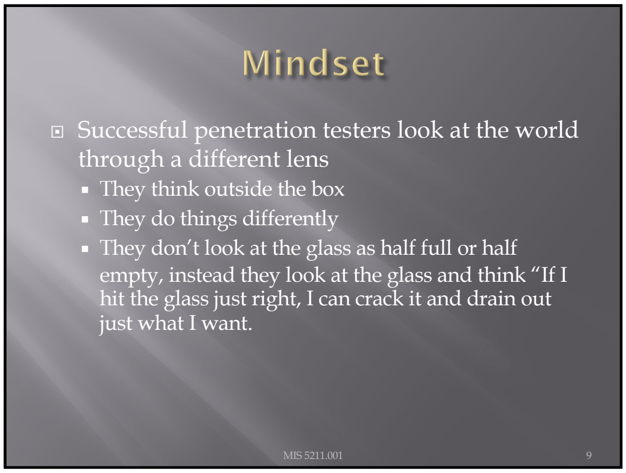

Mindset

- Successful penetration testers look at the world through a different lens
  - They think outside the box
  - They do things differently
  - They don't look at the glass as half full or half empty, instead they look at the glass and think "If I hit the glass just right, I can crack it and drain out just what I want.

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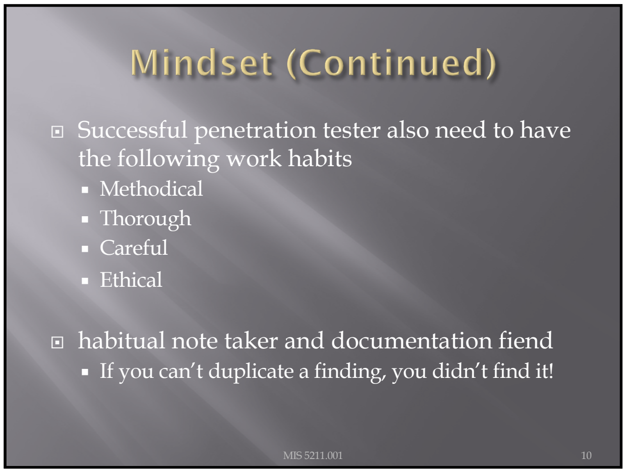

Mindset (Continued)

- Successful penetration tester also need to have the following work habits
  - Methodical
  - Thorough
  - Careful
  - Ethical
- habitual note taker and documentation fiend
  - If you can't duplicate a finding, you didn't find it!

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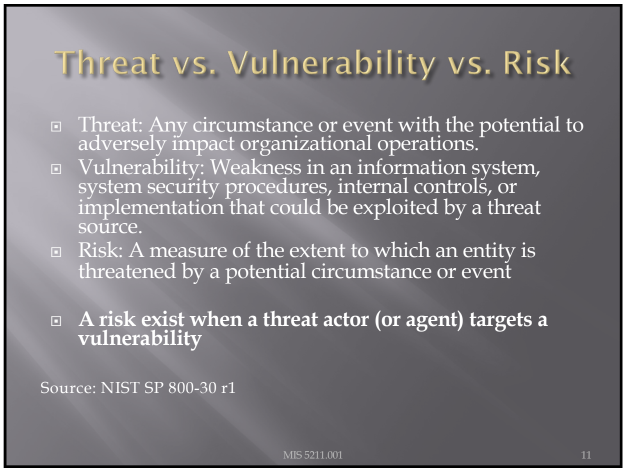

Threat vs. Vulnerability vs. Risk

- Threat: Any circumstance or event with the potential to adversely impact organizational operations.
- Vulnerability: Weakness in an information system, system security procedures, internal controls, or implementation that could be exploited by a threat source.
- Risk: A measure of the extent to which an entity is threatened by a potential circumstance or event
- **A risk exist when a threat actor (or agent) targets a vulnerability**

Source: NIST SP 800-30 r1

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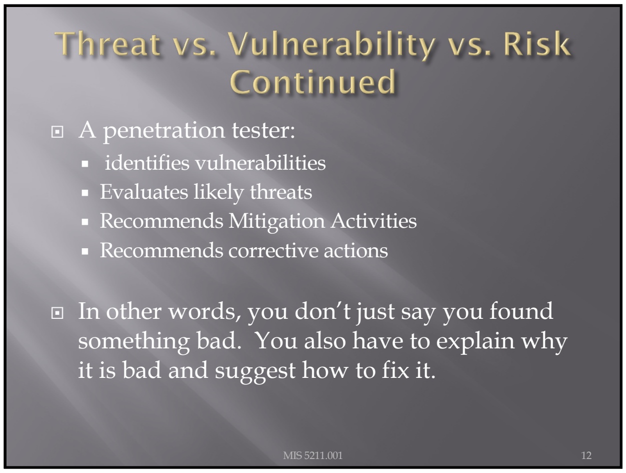

Threat vs. Vulnerability vs. Risk Continued

- A penetration tester:
  - identifies vulnerabilities
  - Evaluates likely threats
  - Recommends Mitigation Activities
  - Recommends corrective actions
- In other words, you don't just say you found something bad. You also have to explain why it is bad and suggest how to fix it.

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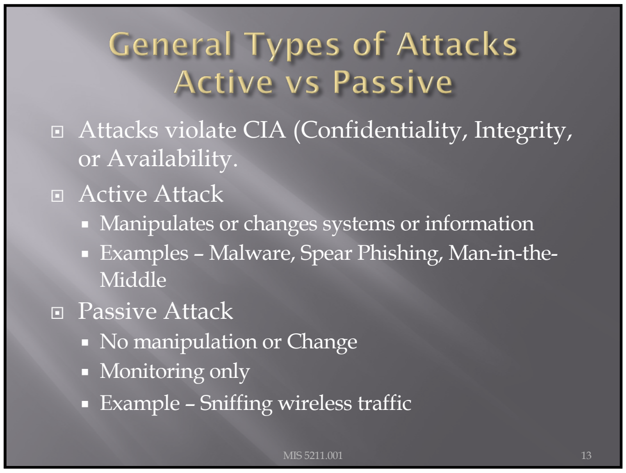

General Types of Attacks Active vs Passive

- Attacks violate CIA (Confidentiality, Integrity, or Availability.
- Active Attack
  - Manipulates or changes systems or information
  - Examples – Malware, Spear Phishing, Man-in-the-Middle
- Passive Attack
  - No manipulation or Change
  - Monitoring only
  - Example – Sniffing wireless traffic

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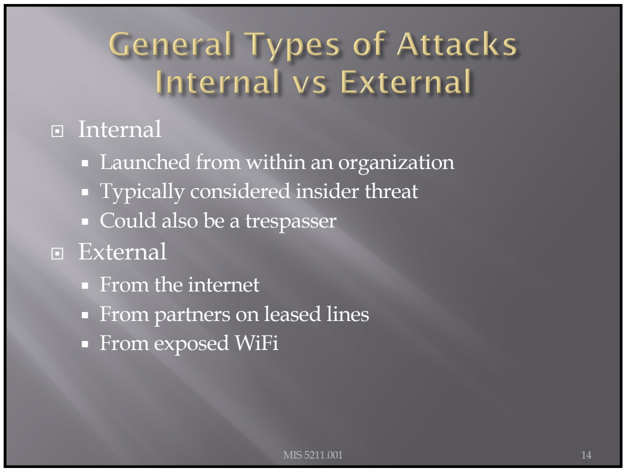

General Types of Attacks Internal vs External

- Internal
  - Launched from within an organization
  - Typically considered insider threat
  - Could also be a trespasser
- External
  - From the internet
  - From partners on leased lines
  - From exposed WiFi

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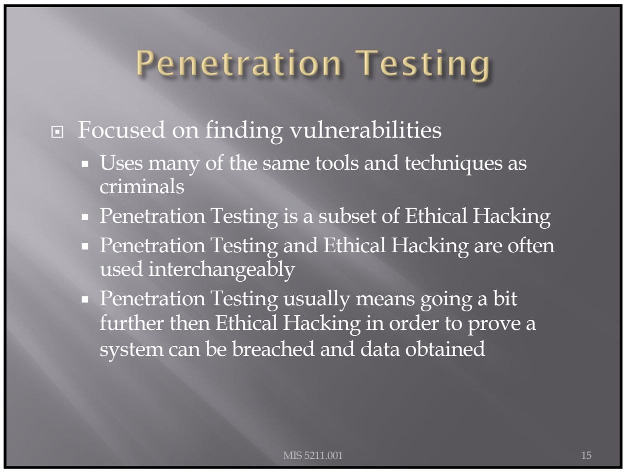

Penetration Testing

- Focused on finding vulnerabilities
  - Uses many of the same tools and techniques as criminals
  - Penetration Testing is a subset of Ethical Hacking
  - Penetration Testing and Ethical Hacking are often used interchangeably
  - Penetration Testing usually means going a bit further then Ethical Hacking in order to prove a system can be breached and data obtained

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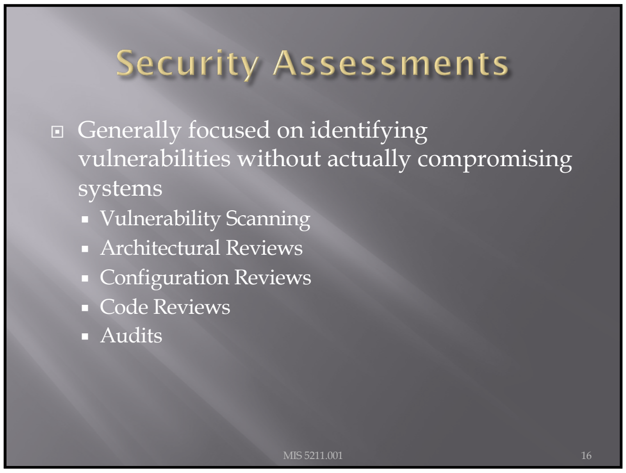

Security Assessments

- Generally focused on identifying vulnerabilities without actually compromising systems
  - Vulnerability Scanning
  - Architectural Reviews
  - Configuration Reviews
  - Code Reviews
  - Audits

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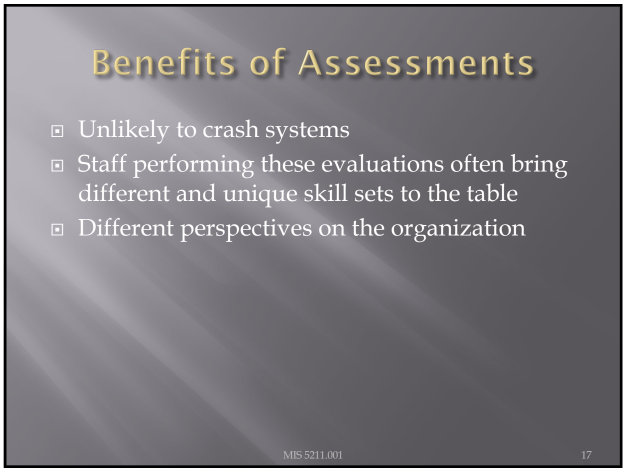

Benefits of Assessments

- Unlikely to crash systems
- Staff performing these evaluations often bring different and unique skill sets to the table
- Different perspectives on the organization

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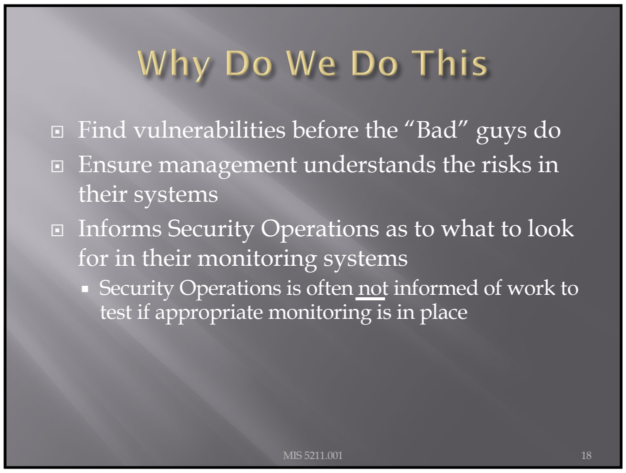

Why Do We Do This

- Find vulnerabilities before the "Bad" guys do
- Ensure management understands the risks in their systems
- Informs Security Operations as to what to look for in their monitoring systems
  - Security Operations is often not informed of work to test if appropriate monitoring is in place

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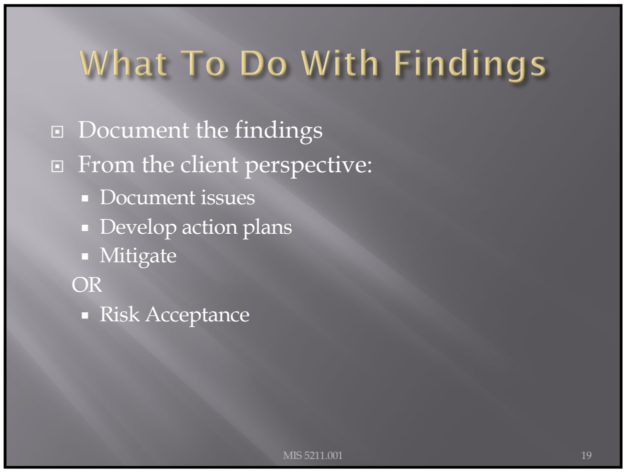

What To Do With Findings

- Document the findings
- From the client perspective:
  - Document issues
  - Develop action plans
  - Mitigate

  OR
  - Risk Acceptance

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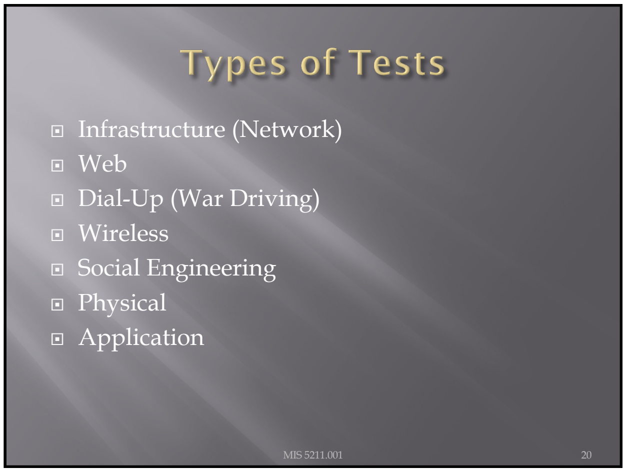

Types of Tests

- Infrastructure (Network)
- Web
- Dial-Up (War Driving)
- Wireless
- Social Engineering
- Physical
- Application

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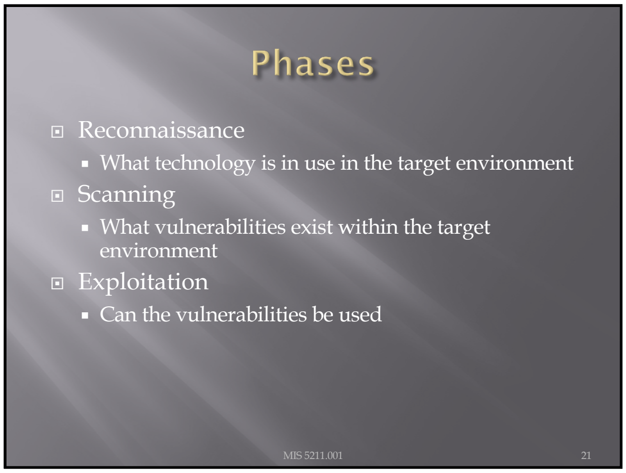

Phases

- Reconnaissance
  - What technology is in use in the target environment
- Scanning
  - What vulnerabilities exist within the target environment
- Exploitation
  - Can the vulnerabilities be used

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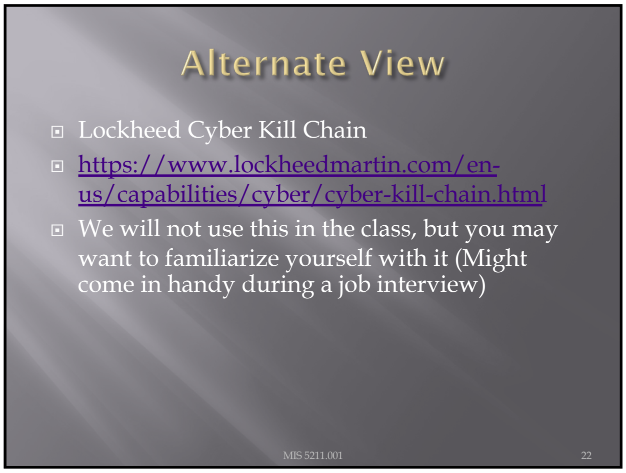

Alternate View

- Lockheed Cyber Kill Chain
- https://www.lockheedmartin.com/en-us/capabilities/cyber/cyber-kill-chain.html
- We will not use this in the class, but you may want to familiarize yourself with it (Might come in handy during a job interview)

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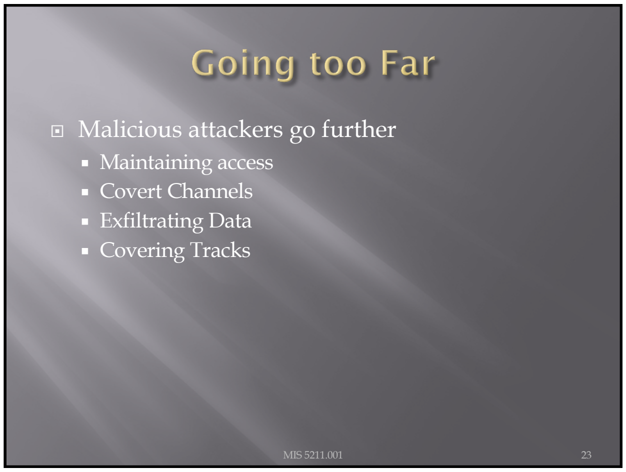

Going too Far

- Malicious attackers go further
  - Maintaining access
  - Covert Channels
  - Exfiltrating Data
  - Covering Tracks

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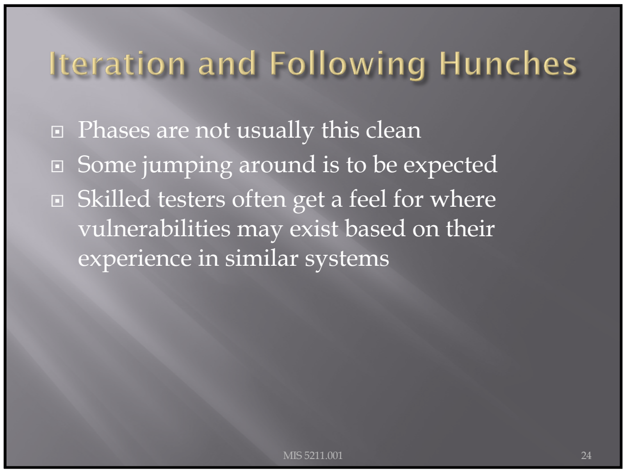

Iteration and Following Hunches

- Phases are not usually this clean
- Some jumping around is to be expected
- Skilled testers often get a feel for where vulnerabilities may exist based on their experience in similar systems

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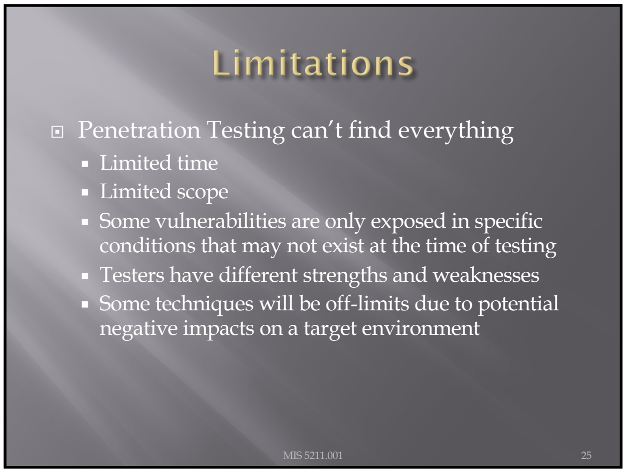

Limitations

- Penetration Testing can’t find everything
  - Limited time
  - Limited scope
  - Some vulnerabilities are only exposed in specific conditions that may not exist at the time of testing
  - Testers have different strengths and weaknesses
  - Some techniques will be off-limits due to potential negative impacts on a target environment

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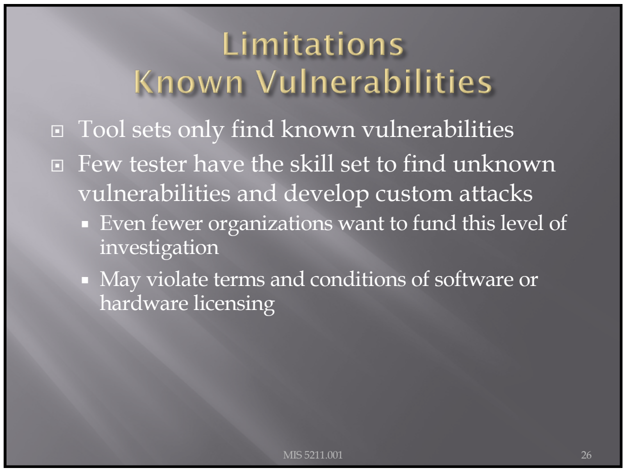

Limitations
Known Vulnerabilities

- Tool sets only find known vulnerabilities
- Few tester have the skill set to find unknown vulnerabilities and develop custom attacks
  - Even fewer organizations want to fund this level of investigation
  - May violate terms and conditions of software or hardware licensing

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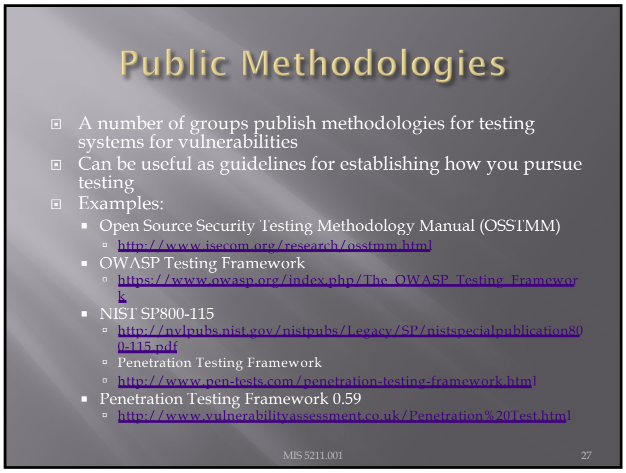

Public Methodologies

- A number of groups publish methodologies for testing systems for vulnerabilities
- Can be useful as guidelines for establishing how you pursue testing
- Examples:
  - Open Source Security Testing Methodology Manual (OSSTMM)
    - http://www.isecom.org/research/osstmm.html
  - OWASP Testing Framework
    - https://www.owasp.org/index.php/The_OWASP_Testing_Framework
  - NIST SP800-115
    - http://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-115.pdf
    - Penetration Testing Framework
    - http://www.pen-tests.com/penetration-testing-framework.html
  - Penetration Testing Framework 0.59
    - http://www.vulnerabilityassessment.co.uk/Penetration%20Test.html

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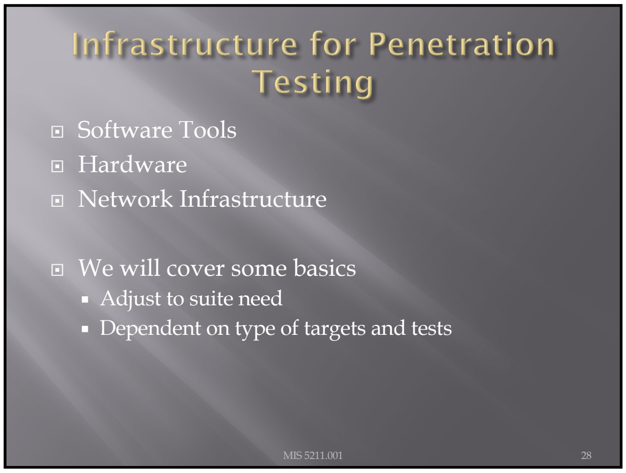

Infrastructure for Penetration Testing

- Software Tools
- Hardware
- Network Infrastructure

- We will cover some basics
  - Adjust to suite need
  - Dependent on type of targets and tests

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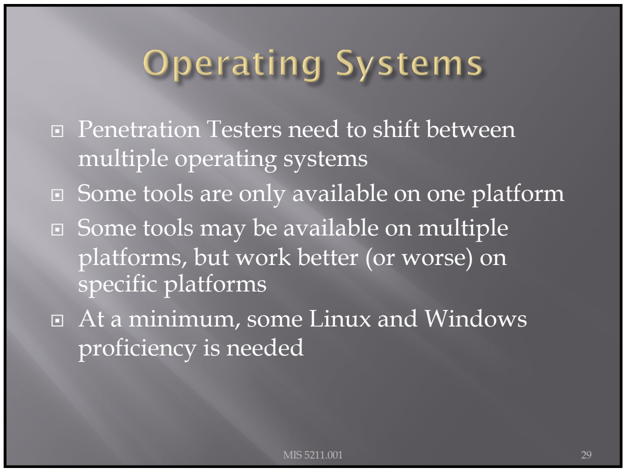

Operating Systems

- Penetration Testers need to shift between multiple operating systems
- Some tools are only available on one platform
- Some tools may be available on multiple platforms, but work better (or worse) on specific platforms
- At a minimum, some Linux and Windows proficiency is needed

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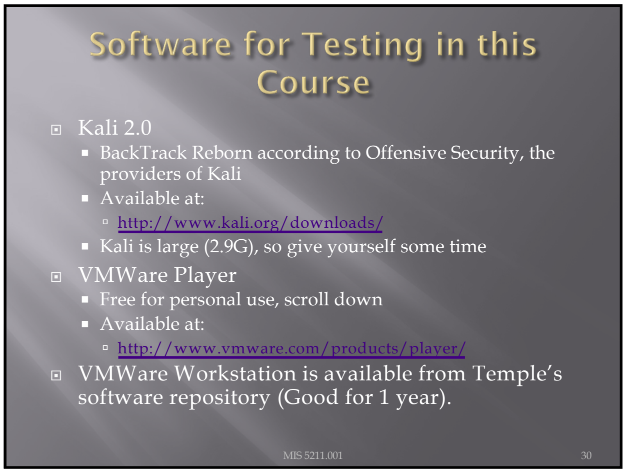

Software for Testing in this Course

- Kali 2.0
  - BackTrack Reborn according to Offensive Security, the providers of Kali
  - Available at:
    - http://www.kali.org/downloads/
  - Kali is large (2.9G), so give yourself some time
- VMWare Player
  - Free for personal use, scroll down
  - Available at:
    - http://www.vmware.com/products/player/
- VMWare Workstation is available from Temple's software repository (Good for 1 year).

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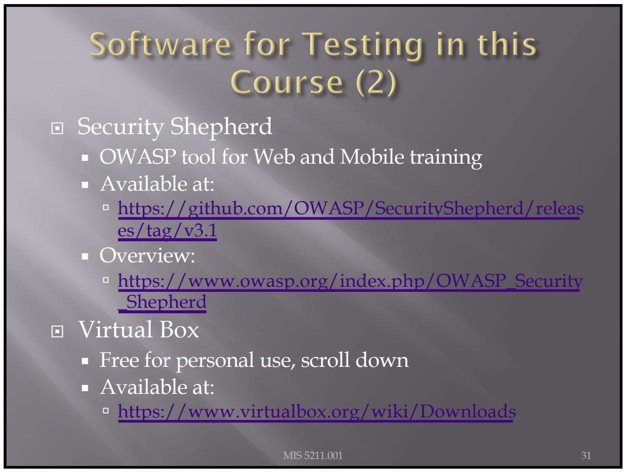

Software for Testing in this Course (2)

- Security Shepherd
  - OWASP tool for Web and Mobile training
  - Available at:
    - https://github.com/OWASP/SecurityShepherd/releases/tag/v3.1
  - Overview:
    - https://www.owasp.org/index.php/OWASP_Security_Shepherd
- Virtual Box
  - Free for personal use, scroll down
  - Available at:
    - https://www.virtualbox.org/wiki/Downloads

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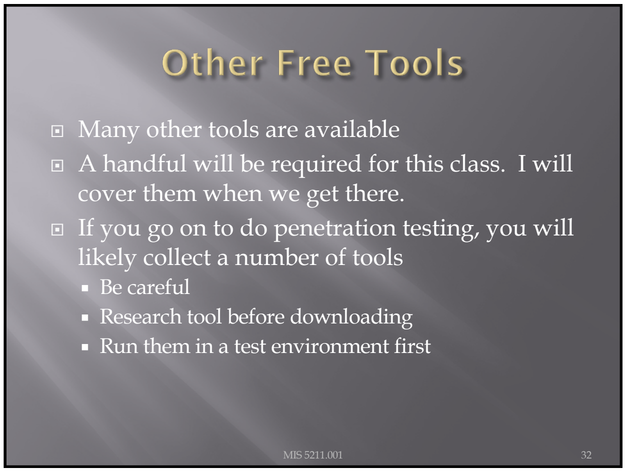

Other Free Tools

- Many other tools are available
- A handful will be required for this class. I will cover them when we get there.
- If you go on to do penetration testing, you will likely collect a number of tools
  - Be careful
  - Research tool before downloading
  - Run them in a test environment first

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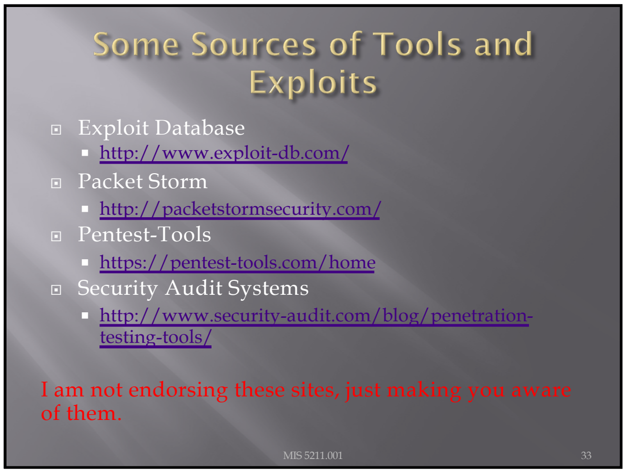

Some Sources of Tools and Exploits

- Exploit Database
  - http://www.exploit-db.com/
- Packet Storm
  - http://packetstormsecurity.com/
- Pentest-Tools
  - https://pentest-tools.com/home
- Security Audit Systems
  - http://www.security-audit.com/blog/penetration-testing-tools/

I am not endorsing these sites, just making you aware of them.

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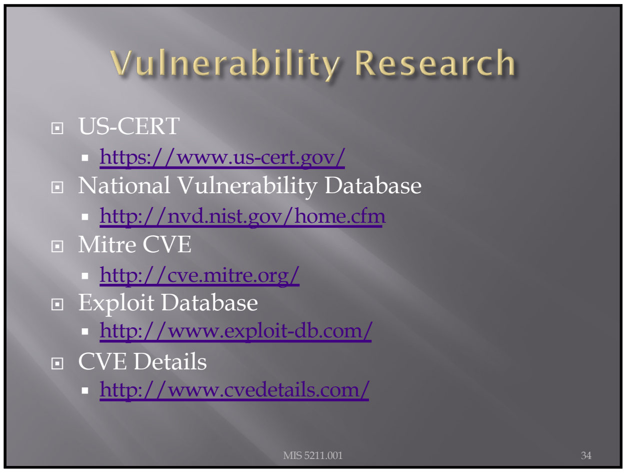

Vulnerability Research

- US-CERT
  - https://www.us-cert.gov/
- National Vulnerability Database
  - http://nvd.nist.gov/home.cfm
- Mitre CVE
  - http://cve.mitre.org/
- Exploit Database
  - http://www.exploit-db.com/
- CVE Details
  - http://www.cvedetails.com/

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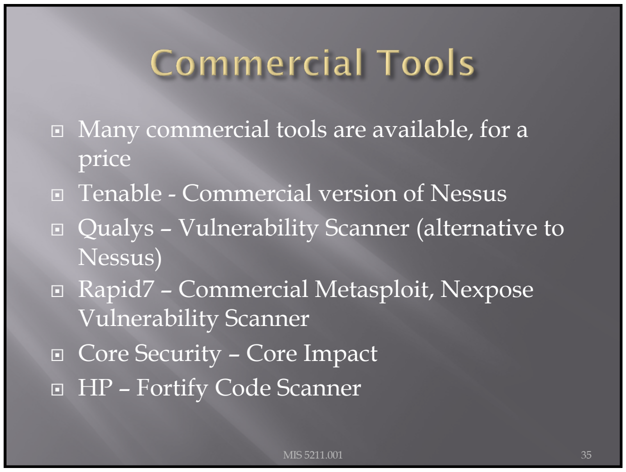

Commercial Tools

- Many commercial tools are available, for a price
- Tenable - Commercial version of Nessus
- Qualys – Vulnerability Scanner (alternative to Nessus)
- Rapid7 – Commercial Metasploit, Nexpose Vulnerability Scanner
- Core Security – Core Impact
- HP – Fortify Code Scanner

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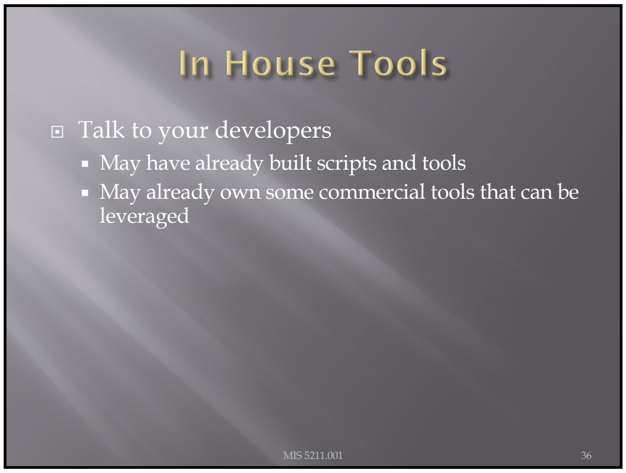

In House Tools

- Talk to your developers
  - May have already built scripts and tools
  - May already own some commercial tools that can be leveraged

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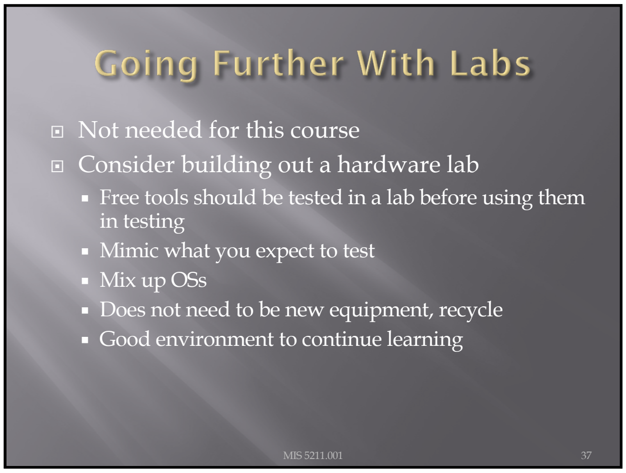

Going Further With Labs

- Not needed for this course
- Consider building out a hardware lab
  - Free tools should be tested in a lab before using them in testing
  - Mimic what you expect to test
  - Mix up OSs
  - Does not need to be new equipment, recycle
  - Good environment to continue learning

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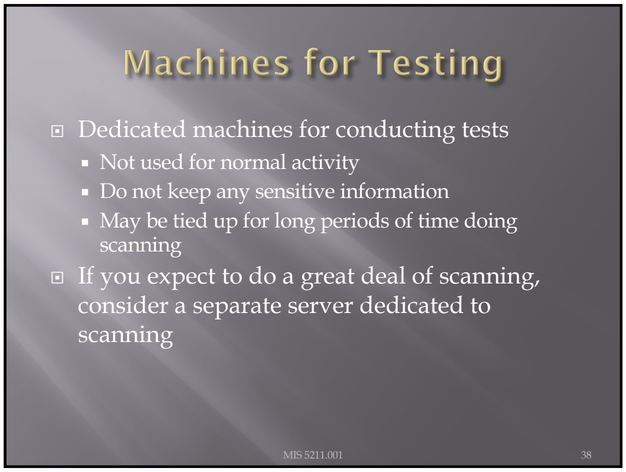

Machines for Testing

- Dedicated machines for conducting tests
  - Not used for normal activity
  - Do not keep any sensitive information
  - May be tied up for long periods of time doing scanning
- If you expect to do a great deal of scanning, consider a separate server dedicated to scanning

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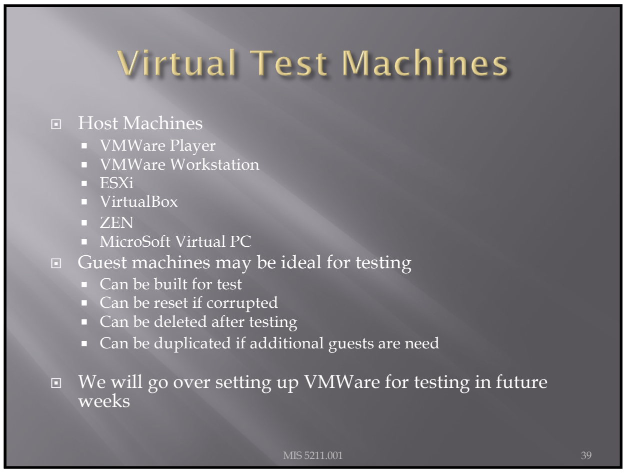

Virtual Test Machines

- Host Machines
  - VMWare Player
  - VMWare Workstation
  - ESXi
  - VirtualBox
  - ZEN
  - MicroSoft Virtual PC
- Guest machines may be ideal for testing
  - Can be built for test
  - Can be reset if corrupted
  - Can be deleted after testing
  - Can be duplicated if additional guests are need
- We will go over setting up VMWare for testing in future weeks

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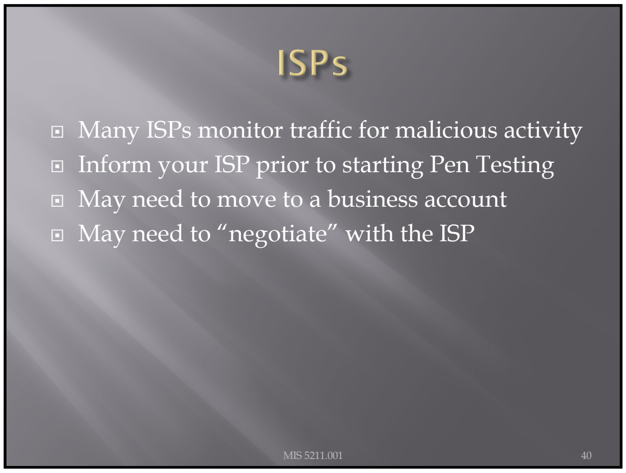

ISPs

- Many ISPs monitor traffic for malicious activity
- Inform your ISP prior to starting Pen Testing
- May need to move to a business account
- May need to "negotiate" with the ISP

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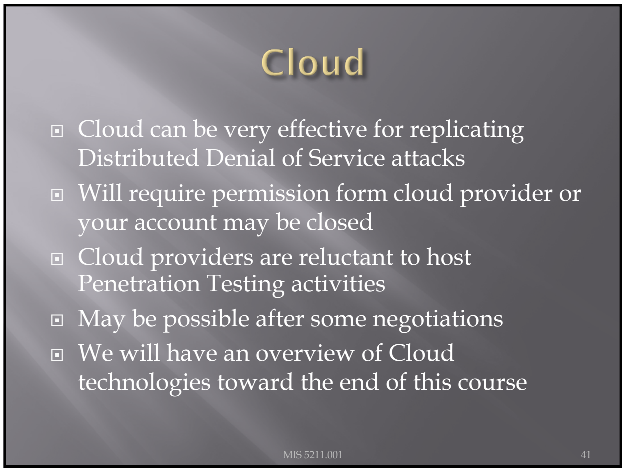

Cloud

- Cloud can be very effective for replicating Distributed Denial of Service attacks
- Will require permission form cloud provider or your account may be closed
- Cloud providers are reluctant to host Penetration Testing activities
- May be possible after some negotiations
- We will have an overview of Cloud technologies toward the end of this course

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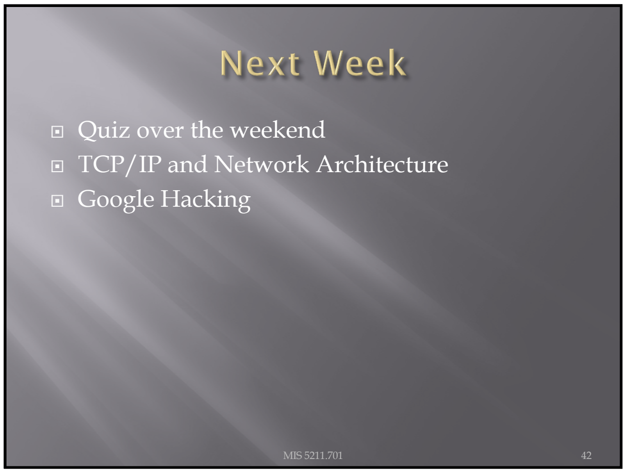

Next Week

- Quiz over the weekend
- TCP/IP and Network Architecture
- Google Hacking

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Questions

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