

Cyber Operations:
Cyber Defense

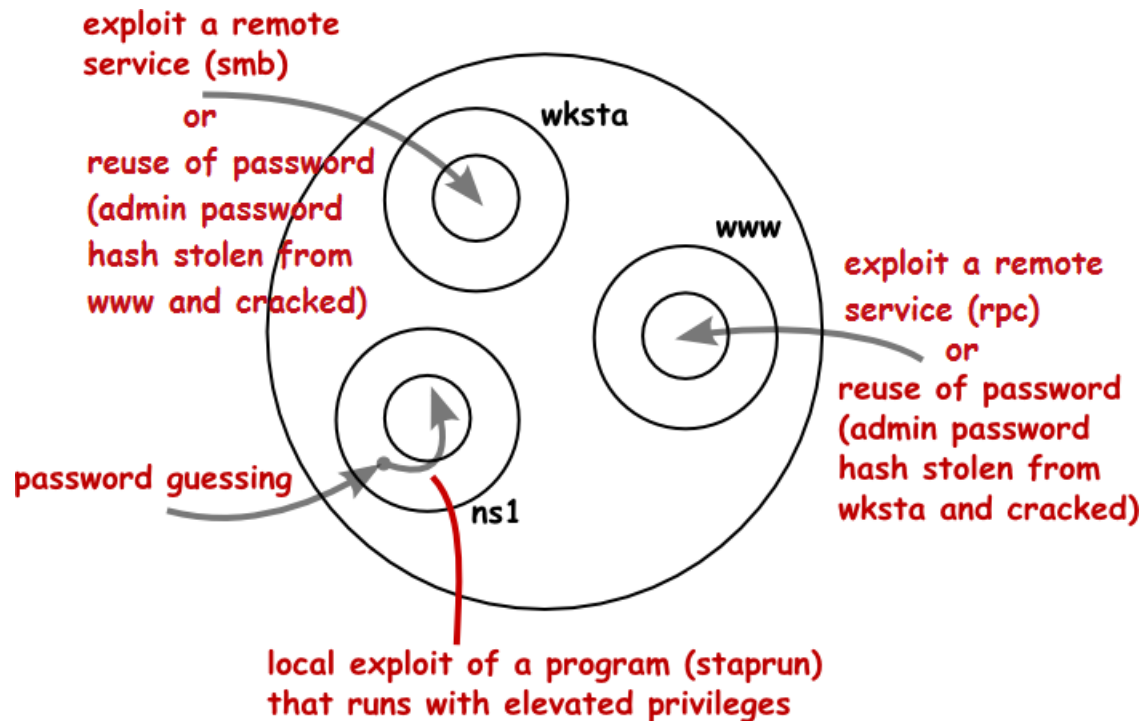
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Cyber Attack Lab

- Lets go back and do Part1!

Cyber Attack Lab Debrief

- Thoughts... lessons learned...



- Please turn in completed lab worksheets.

Learning Targets

- Describe the principles of Defensive Cyber Operations (DCO).
- Describe best practices of Defensive Cyber Operations (DCO).
- Explain what a zero-day vulnerability is.
- Explain what and how principles and best practices can be used to mitigate risks of Offensive Cyber Operations (OCO).

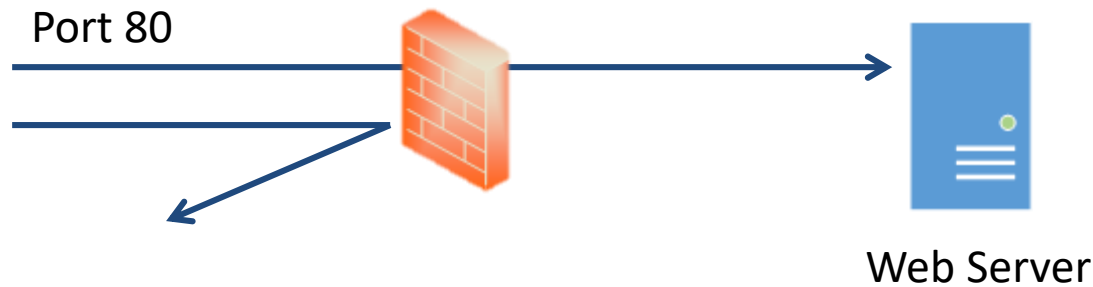
GENERAL PRINCIPLES

General Principles

- Least Privileges
- Defense in Depth
- Vigilance

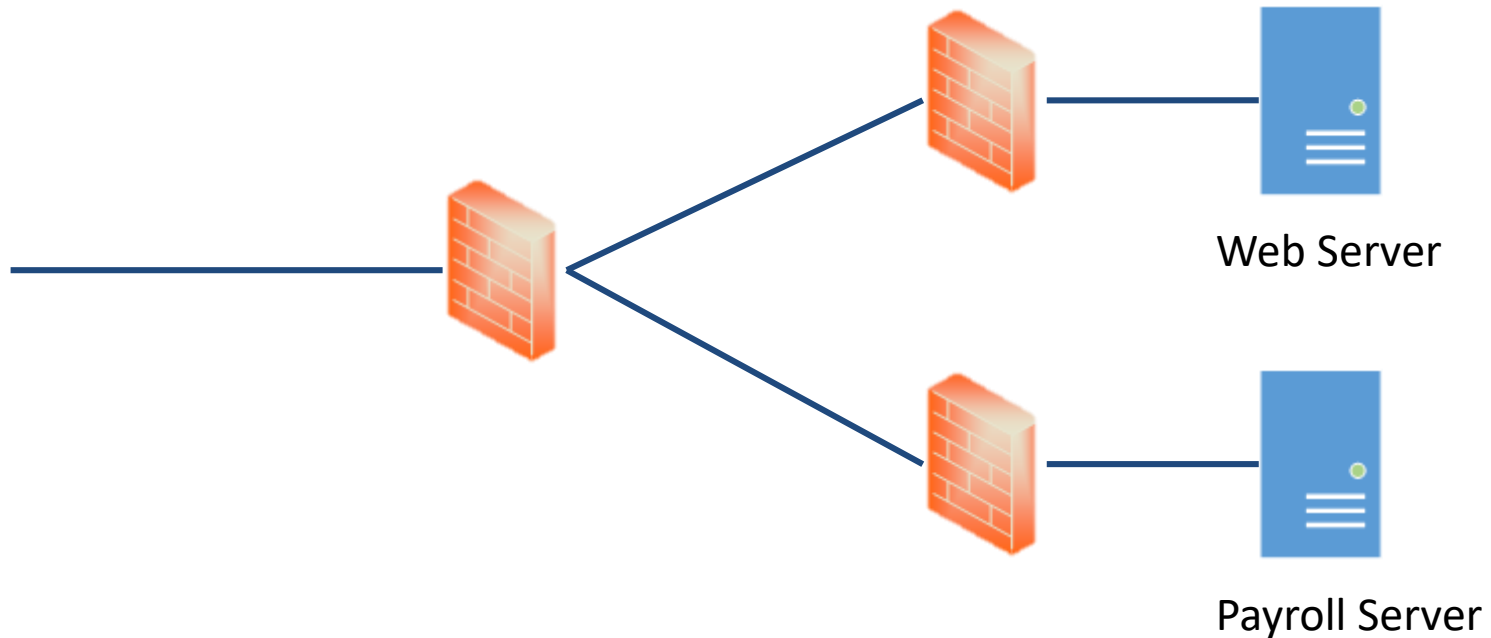
Least Privilege

- Give users and programs the privileges and access they need, and no more



Defense in Depth

- Provide multiple layers of defense



Defense in Depth – Really the best approach...?

- **Sony** – Partial loss of \$ 343,750,000 for 1 month of lost services alone. There are currently 55 Lawsuits so far in the U.S. as well as the damage to reputation and brand.
- **RSA** – According to a report in The Washington Post, the cost of the RSA hack which compromised the security of RSA's SecurID products was \$66 million.
- **IMF** – The New York Times recently reported "highly confidential information about the fiscal condition of many nations" contain "political dynamite" that could affect global markets..."
- **Citigroup** – "Citigroup has been forced to reveal that a recent hack of its network exposed the financial data of more than 360,000 customers"
- **ManTech** – "...the members (Anonymous) posted a 390 MB download that appeared to contain reports related to NATO, the US Army and personnel files."
- **U.S. Military's Predator Drones** – the response to the persistent key logger on the armed drones was "We keep wiping it off, and it keeps coming back," a source told the technology magazine. "We think it's benign. But we just don't know." (The Australian, 2011)
- **Uber, Target, OPM, Lockheed Martin**, etc, etc, etc...

"There are only two types of companies:
those that have been hacked,
and those that will be."

Robert Mueller
FBI Director, 2012



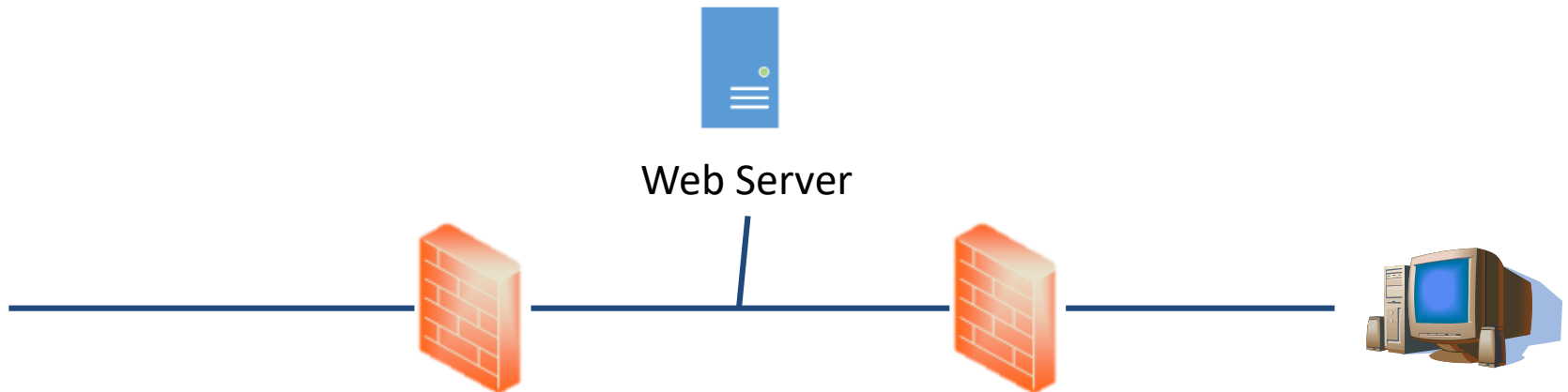
Vigilance

- Maintain awareness of activity on systems
 - Review log files
 - Deploy intrusion detection/prevention systems
 - SIEM
 - security information and event management

BEST PRACTICES

Best Practices

- Remove unnecessary accounts and services
 - Remove unnecessary services
 - Remove old accounts
- Use a demilitarized zone



Best Practices

- Sandbox Services
 - Run services in a protected environment
- Minimize what executes with elevated privileges
 - Processes that run as Administrator
 - People with Administrator/root
- Keep and monitor logs
- Monitor inbound **and outbound** traffic
 - Source/destination
 - Volume
- Keep Systems Patched

Zero-Days

- The period of time from when a vulnerability is known, and when a patch for that vulnerability is available.
- A *zero-day* is a vulnerability that attackers can exploit, but **no patch exists** to correct the vulnerability.
- Since, no patch exists for a zero-day, keeping systems patched **will not mitigate** the risk of zero-day exploits.

DEFENSE TECHNIQUES

Defense Against

Denial of Service Attacks

- Block IP address generating traffic
- Add more servers and or bandwidth
 - Geographic separation

Defense Against

Remote Exploitation

- Keep software up to date (patch)
- Disable unnecessary services
- Use firewalls, DMZ's, and NAT
- Use host based firewalls

Defense Against

Password Guessing

- Use strong passwords
 - Long
 - Drawn from a large character set
 - Unusual
 - Not a dictionary word
- Don't reuse passwords
- Change default passwords

Defense Against

Privilege Escalation

- Prevent password cracking
 - Secure the password file
 - Require strong passwords
 - Store only hashes
- Local Exploitation
 - Patch software
 - Minimize process privilege
 - Eliminate unnecessary software

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Resources

IAD's Top 10 Information Assurance Mitigation Strategies

Fundamental aspects of network security involve protection and detection measures can be grouped in four mitigation goal areas. These four mitigation goal areas target critical steps in the intrusion life cycle — creating a technical layered defense approach that supports the ability to "fight through" a contested cyber environment.

- Device Integrity** — maintaining and measuring device health/integrity. Devices often represent the attack surface area or the persistent living-space for the advanced persistent threat (APT).
- Damage Containment** — when intrusions occur, limiting losses of information, systems, and mission capabilities.
- Defense of Accounts** — protecting credentials from misuse and enabling trusted authentication and access.
- Secure and Available Transport** — maintaining the privacy and reliability of data communications.

These goal areas will support current and future cyber defense efforts, helping to set priorities, and contributing to the desired end-state of denying adversaries the ability to operate on our networks and impact our missions. Efforts that can be implemented now are listed below as IAD's Top Mitigations with goal areas indicated in the left margin. By blocking critical points in the attack life cycle, these mitigations are effective against entire classes of attacks, including new unknown variants.

- 1. Application Whitelisting:** Application Whitelisting is a proactive security technique that allows a limited set of approved programs to run, while all other programs and most malware are blocked from running by default. Application Whitelisting enables only the administrators, not the users, to decide which programs are allowed to run.
- 2. Control Administrative Privileges:** Privilege escalation is the act of exploiting a bug, design flaw, or configuration oversight in an operating system or software application to gain elevated access to resources that are restricted from normal users. Network owners should only grant Administrator privileges when absolutely necessary and should take steps to ensure Administrator accounts are not exposed to the internet and other sources of increased risk. More robust protections can be achieved through the use of two-factor authentications for administrators and other privileged accounts.
- 3. Limit Workstation-to-Workstation Communication:** Pass-the-Hash (PTH) is a hacking technique that allows an attacker to authenticate to a remote system by using the underlying hash of a user's password rather than having to know the actual password itself. Hackers generally use hashes from the current machine to springboard to other machines, grabbing higher privileged credentials as they progress. A range of security measures are required to fully mitigate all the facets of Pass-the-Hash. One scalable and highly effective mitigation involves limiting workstation-to-workstation communication, thereby thwarting an attacker's ability to leverage PTH to move laterally within the network.
- 4. Use Anti-Virus File Reputation Services:** Most of today's host security products augment their product's core host controls with intelligence from cloud-hosted threat databases. In order to gain the most complete threat picture, organizations need to leverage these threat intelligence clouds.

Confidence in Cyberspace
November 2013
MIT-014FS-2013

NSA Top 10 Mitigations

THE CRITICAL SECURITY CONTROLS SOLUTION PROVIDERS

SANS Critical Security Controls POSTER
FALL 2014 - 31ST EDITION

CRITICAL SECURITY CONTROLS SOLUTION PROVIDERS and CRITICAL SECURITY CONTROLS FOR EFFECTIVE CYBER DEFENSE

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- accelaps** - Accelerated Cybersecurity
- ALERT** - Alerting Threats and Incidents While Automating the C2C
- LogRhythm** - Combining Security Intelligence and the Cloud Security Center
- intel Security** - Compare the Top 20 Critical Security Controls
- QUALYS** - Quality Top 4
- RAPID** - Use About Rights - The FBI Cyber Center
- Symantec** - Symantec 2014 Government Internet Security Threat Report
- TREND** - The Emerging Threats - The FBI Cyber Center
- tripwire** - The 2014 Top 20 Critical Security Controls

1. INVENTORY OF AUTHORIZED AND UNAUTHORIZED DEVICES

2. INVENTORY OF AUTHORIZED AND UNAUTHORIZED SOFTWARE

3. SECURE CONFIGURATIONS FOR NETWORKS AND SOFTWARE (ON LAPTOPS, WORKSTATIONS, AND SERVERS)

4. CONTINUOUS VULNERABILITY ASSESSMENT AND REMEDIATION

5. MALWARE DEFENSE

6. APPLICATION SOFTWARE SECURITY

7. WIRELESS ACCESS CONTROL

8. DATA RECOVERY CAPABILITY

9. SECURITY SKILLS ASSESSMENT AND APPROPRIATE TRAINING TO FILL GAPS

10. SECURE CONFIGURATIONS FOR ROUTERS, SWITCHES, AND FIREWALLS

11. LIMITATION AND CONTROL OF NETWORK PORTS, PROTOCOLS AND SERVICES

12. CONTROLLED USE OF ADMINISTRATIVE PRIVILEGES

13. BOUNDARY DEFENSE

14. MAINTENANCE, MONITORING, AND ANALYSIS OF AUDIT LOGS

15. CONTROLLED ACCESS BASED ON NEED TO KNOW

16. ACCOUNT MONITORING AND CONTROL

17. DATA PROTECTION

18. INCIDENT RESPONSE AND MANAGEMENT

19. SECURE NETWORK ENGINEERING

20. PENETRATION TESTING AND RED TEAM EXERCISES

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Questions?

- Cyber Defense BB HW due 07:45 Monday
- Read Cyber Domain Case Studies Material
 - Be prepared to discuss on Monday