Secure Operations Framework

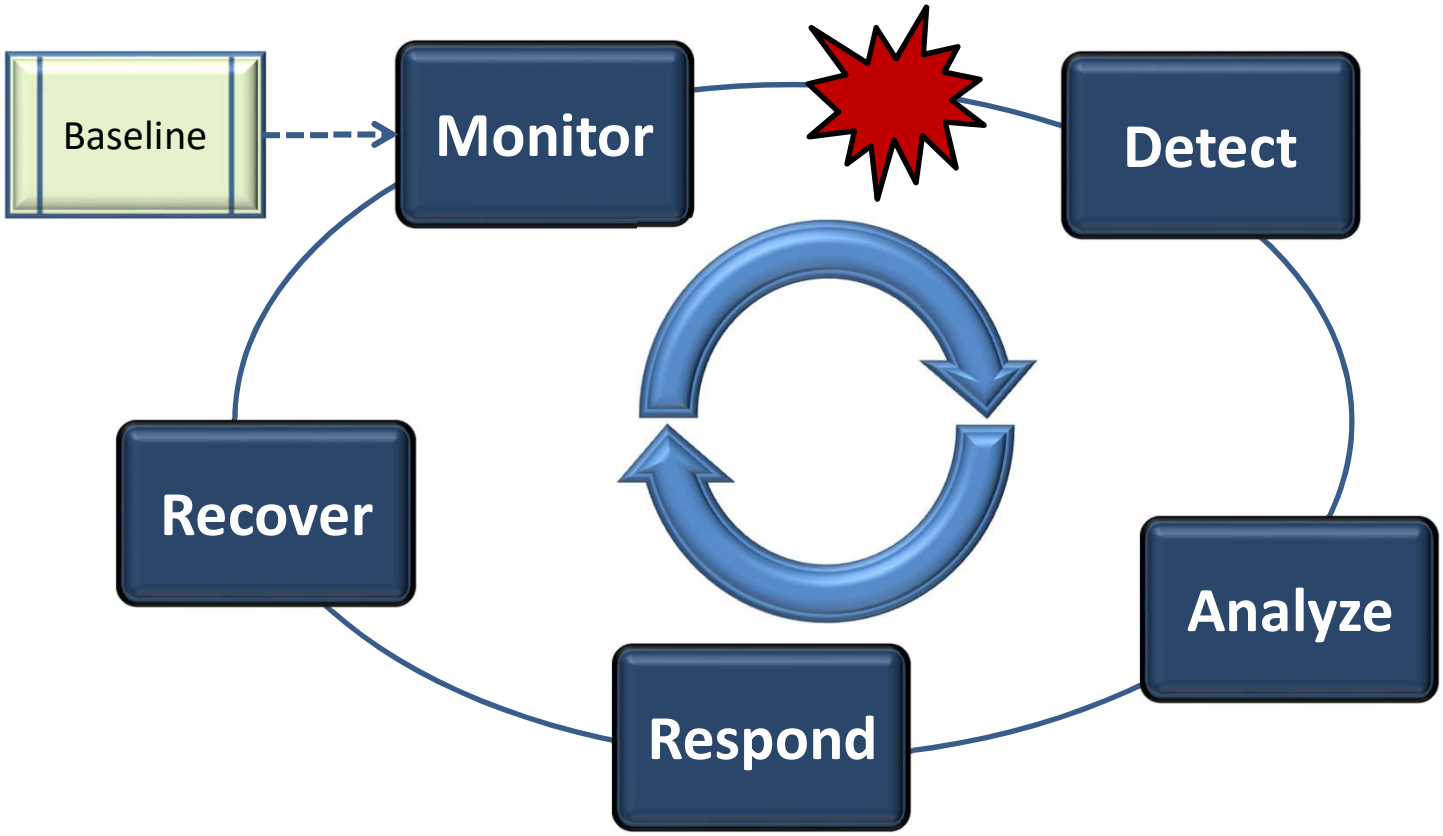
Based on SROC class given by Hervey Allen, Chris Evans, and Phil Regnauld 2009 Santiago, Chile

Overview

- The Secure Operations Framework
- Establishing a Baseline
- Monitoring & Detecting Attacks
- Analyzing Attacks
- Responding to & Recovering from Attacks
- Prioritizing Actions

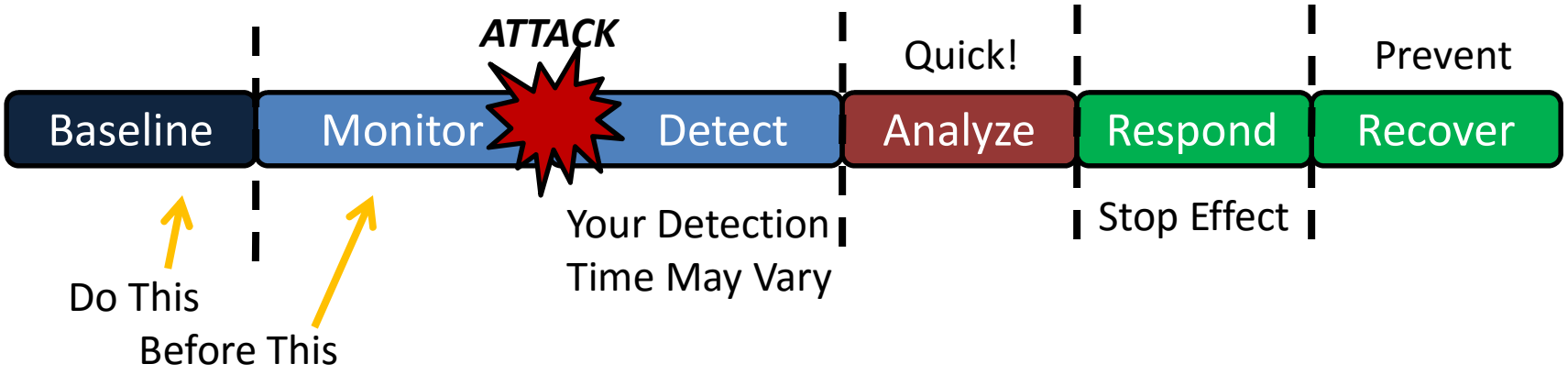
Secure Operations Framework

- A Process for Conducting Secure Operations Within Your Registry



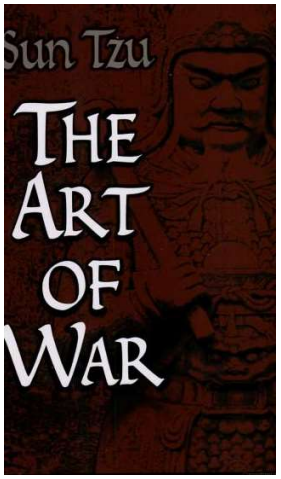
Secure Operations Framework

- Viewed as a Timeline:



Establishing a Baseline

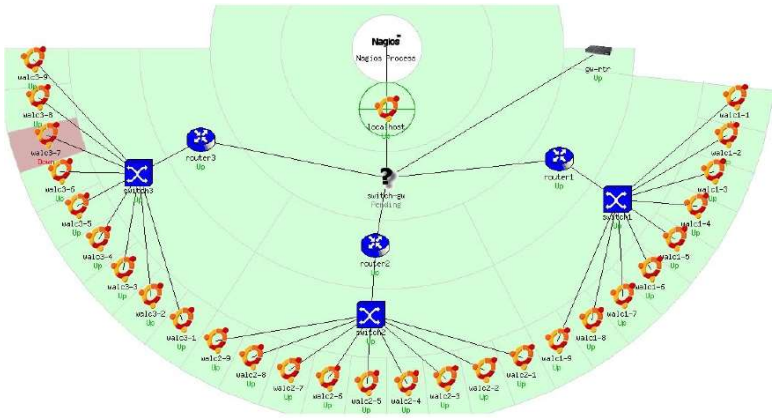
"If you **know the enemy** and **know yourself** you need not fear the results of a hundred battles"

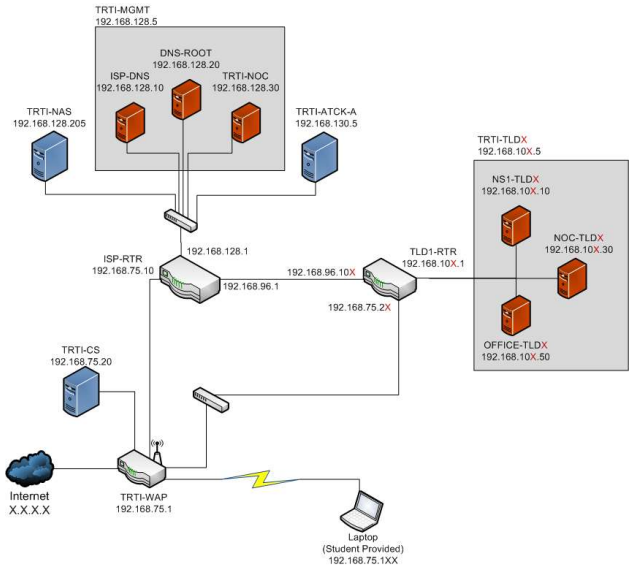


- Secure Operations BEGIN with an understanding of your network -> a Baseline!
- To Establish a Baseline – You Need to Understand:
  - Architecture
  - Traffic
  - People
  - Processes
  - Vulnerabilities

Establishing a Baseline

- Architecture Baseline
  - Hosts, Services, Ports, Connections, Addresses
- This is frequently a network architecture diagram, but could be a text document, or part of your network monitoring solution





Establishing a Baseline

- Architecture Baseline
  - Document your host configurations, operating systems, applications, versions, etc
- Ideally you want something you can reference quickly during attack analysis…
  - e.g. Can you quickly answer the question:

"Is my web server vulnerable to the latest Apache vulnerability?"

Establishing a Baseline

- Architecture Baseline Tools
  - Visio
  - Paper / Pencil!
  - NAGIOS, OpenNMS, HP Openview, etc
- Lots of tools available – the hardest part is actually doing it!

Establishing a Baseline

- Traffic Baseline
  - What kind, how much, source / destination, and usual time
- This is more difficult to capture but is critical to determining if something is expected or not

Establishing a Baseline

- External Traffic Baseline
  - How much traffic (packets per second, megabits per second, etc) is “normal” on your external links?
  - What kind of traffic to external servers (e.g. do you normally have SSH connections to your DNS servers?)
- Internal Traffic Baseline
  - Which hosts or applications communicate?
  - What protocols do they use?
  - How much traffic do they produce?
  - When do they do it?

Establishing a Baseline

- Traffic Baseline
  - Again, ideally, you will have this information readily available during the analysis phase
  - For example, can you easily answer the question:

"Is a SSH connection to my DNS server at 0330 on a Saturday normal?"

Establishing a Baseline

- Traffic Baseline Tools
  - NetFlow
  - Wireshark
  - Tcpdump
  - Iperf, dnsperf
- Again, lots of tools available, the hard part is not only capturing the baseline traffic, but putting it into a format you can reference
  - Graphing and statistical analysis tools can help here!
    - SmokePing, NetFlow Analyzer

Establishing a Baseline

- People Baseline
  - How do your customers interact with your network?
    - Web application for processing registration?
    - Do you typically see people login at 0330?
  - How do your administrators interact with your network?
    - What hosts do they connect to, what protocols do they use, when do they do it?
  - How do your local users interact with your network?
    - What hosts are they _supposed_ to be on, what hosts do they communicate with, when?
  - How do your external users interact with your network?
    - What servers do they connect to, what protocols?

Establishing a Baseline

- People Baseline
  - Again, ideally, you will have this information readily available during the analysis phase
  - For example, can you easily answer the question:

"Should User Jane be Connecting to Users Bob's Computer at 0330 on Saturday?"

Establishing a Baseline

- People Baseline "Tools"
  - Personnel Interviews
    - How does Bob usually do his job via the network?
  - Administration & User Policies
    - Set policy to guide your administrators and users in what they should and should not do
  - Understand Your Customers
    - How do you interact with your customers?
    - How do your customers interact with you?

Establishing a Baseline

- Processes Baseline
  - Processes typically fuse people and technology
  - Even though the people and technology may not have issues, the processes that pull them together might
  - Processes can be:
    - Business oriented (e.g. processing user registration updates)
    - Operational (e.g. responding to a DDoS attack)

- What processes do you have that interact with your network at one point or another?

Establishing a Baseline

- Process Baseline
  - Creating a baseline of your processes requires an understanding of what you do and how you do it!
  - Again, information should be readily accessible:
    - Can you easily answer this question:

"A new vulnerability was found in our database – what do we need to stop doing until it is patched?"

Establishing a Baseline

- Process Baseline "Tools"
  - Understand your critical business functions and what's required to provide those functions
  - Walkthroughs & Reviews
  - Personnel Interviews & Surveys
  - See the "Attack & Contingency Planning Course"

Establishing a Baseline

- Vulnerability Baseline
  - Vulnerabilities in Operating Systems & Applications
  - Vulnerabilities in Your Business or Operational Processes
    - Processing registrations, responding to cyber attacks, etc
  - Vulnerabilities in Your People
    - Susceptible to phishing scams

- The procedural or people vulnerabilities are often easier to take advantage of:
  - e.g. do you require validation for updating registrations? Why hack the name server or registry database, when a simple “update” form would work?

Establishing a Baseline

Know Your Enemy…

- Vulnerability Baseline
  - To determine technical vulnerabilities, use automated tools
  - To determine procedural vulnerabilities, think like a “bad guy”
- You MUST make the risk decision on fixing vulnerabilities
  - You may determine that a vulnerability is an acceptable risk!
- Better that you KNOW about vulnerabilities than not
- Again, quick reference during analysis is critical:
  - e.g. Can you quickly answer the question:

“Can this attack take advantage of the vulnerability in our automated registry processing systems?”

Establishing a Baseline

- Vulnerability Baseline Tools
  - Nessus, LanGuard, SuperScan, Retina
  - Process Walkthroughs
    - Take each of your critical processes and step through them attempting to identify weaknesses
  - Network Defense Exercises
    - Test your network operators to determine how effective they are responding to cyber attacks
    - Can your operators see attacks, can they analyze and respond quickly?

Establishing a Baseline

- Other Sources of Baseline Information:

Senior Management

Business Area Managers & Process Owners

Technicians & Support Staff

- Important assets
- Perceived threats
- Security requirements
- Current security practices
- Organizational vulnerabilities

How Can Your Network Fail?

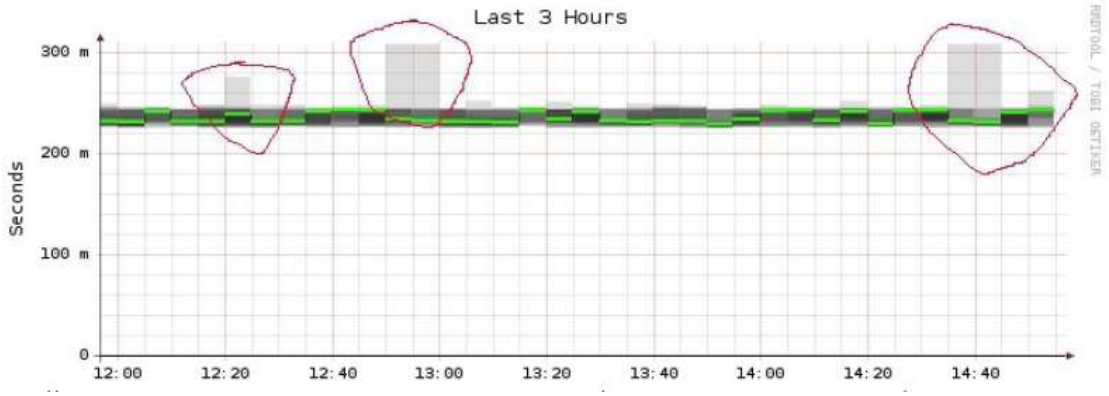
Monitoring & Detecting Attacks

Once You Have a Baseline –
You Can Differentiate “Normal” From “Trouble”

- Regardless of the monitoring tools you use, you ***_MUST_*** have a baseline to compare it to, otherwise, you are fighting blind

Monitoring & Detecting Attacks

- Monitoring is the notion of having insight into your network and viewing its current (and past) status and performance
- Detecting attacks requires monitoring your network and a comparison of what you see to what is expected



Monitoring & Detecting Attacks

- Network monitoring is best accomplished with automated tools – but can be done manually (not recommended!)
- You must install, configure and operate monitoring tools on your network - without them, how do you know something is happening?
  - Yes - phone calls from customers are a monitoring tool!
- There are many, many tools out there – the challenge is to find those that:
  1) Capture the right data
  2) Shows that data to you effectively
  3) Allows your operation to detect and respond to attacks
  - Personal preference plays a critical part in this – if you're not comfortable with a tool – there's probably another one!

Monitoring & Detecting Attacks

- The tools presented in this course, while not the only ones out there, are recommended for their particular task
- These tools were selected to give you the most “bang for the buck”
- Your particular operation may require something else
  - YOU must spend due diligence in selecting the right tools for your situation

Analyzing Attacks

- Analyzing an attack is the notion of gaining an understanding of what's going on and the extent of the attack
  - What critical business functions are affected
  - What hosts, applications, or services are affected
  - Who is doing it
  - What type of attack is it?
  - How is it being done?
- Arm yourself with the information necessary to develop an effective response to the problem

Responding to Attacks

- Based on your analysis from the previous step, take action!
- You DO have choices here:
  - Stop the attack -> Stops the effect
  - Stop the effect, but not the attack
  - Ride it out and suffer the effects
- Which strategy you chose depends on your response capabilities, your priorities, and your plan!

Responding to Attacks

- Your Plan? – You ***_DO_*** Have a Plan Right?
- Establishing basic actions prior to an attack will allow you to focus on response actions, not the determination of what to do…
- Your contingency response plans should include how to respond to cyber attacks!
  - See Attack & Contingency Response Planning

Responding to Attacks

- This course focuses on the technical response to attacks – but don't forget your customers, the media, and the public!

- Part of an effective response strategy must incorporate crisis communication procedures
  - Consider Communicating:
    - Fact of the disruption or status update
    - Basic steps being taken
    - Estimated impact or down time
  - See the Attack and Contingency Planning Workshop

Responding to Attacks

- The toughest job might be handling the media!

Recovering From Attacks

- Recovery steps are those taken after the attack is over, or at least the effects mitigated
  - Are there any lasting effects which need to be handled?
  - How would you prevent this from happening again?
  - What would you do differently next time?
- May make you reconsider risk decisions
  - Do we need to shut down that service permanently?
  - Do we need a new firewall?
  - Do we need to train our administrators to respond?

Prioritizing Actions

- Understand your critical business functions
- Understand the big picture of what's going on
- Take action based on responding and recovering what's most important to your business
  - Avoid "Building a $10,000 fence around a stack of quarters"

Balancing Ops & Security

How Many of Your IT Positions are Dedicated to Security?

- You Need to Balance Daily Ops & Security
- A Recommendation – Make Security Part of Ops
- How Much Security you Do Depends on Your Situation?
  - Security is necessary – but is a black hole and will take *everything* you can give to it!
  - Tune your sensors to provide only the amount of information that you can handle – most sensors default to "overwhelm"
- Security Budgeting
  - Convince management of the risk through monitoring & analysis
  - Security takes a constant investment – roll this into your network admin costs when it comes to budget time

QUESTIONS?

- Do you have any questions about …
  - Cyber Threats
  - Motivations
  - Remediation Strategies