ISACA WEBINARS

Securing Hybrid Environments

David Broggy,
Senior Solutions Architect, Trustwave

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TODAY'S SPEAKER



David Broggy

Senior Solutions Architect,Trustwave

I've worked in cybersecurity since Y2K

WHO AM I

I work with the following Cyber Security categories/technologies:

- SIEM – Splunk, QRadar, Azure Sentinel
- SOAR – XSOAR, Microsoft Logic Apps, Phantom
- EDR – Defender, Carbon Black, XDR, Cybereason, Crowdstrike
- Cloud – Azure/AWS/GCP (in that order)
- Red/Blue/Purple team events – attack simulations.
- CASB
- DLP
- Information Protection
- IoT (layer 2 detections)
- Zero Trust
- MITRE ATT&CK/SHIELD/D3FEND



OUR FOCUS TODAY:

- Core components (“Building Blocks”) for network security architectures
- Popular security frameworks and standards (light overview)
- Important implementation topics for some core security tools
- Subjects/tips that have affected the security postures of my clients
- High-level view on tips/tools/technologies



WHAT IS A HYBRID COMPUTING ARCHITECTURE?

Simply put:

A computing environment that uses a mix of on-premises, private and third-party services with orchestration between these platforms.

“Where, and when, work gets done will be determined by what makes the most sense to drive the highest levels of productivity and engagement.” ~Gartner



HYBRID SECURITY CONCERNS

The rush to cloud-everything is causing security holes, challenges, misconfigurations and outages	Privacy will be a mess, with user revolts, new laws, confusion and self-regulation failing	Identity and multi-factor authentication (MFA) will take center stage	Tons of high-profile Internet of Thing (IoT) hacks
Ransomware will continue to worsen	Teleworking setups will force organizations to confront hybrid environments and unsustainable security architectures	Attackers will quickly normalize newly disclosed vulnerabilities, leaving users with a narrow window for patching	Exposed APIs will be the next favored attack vector for enterprise breaches



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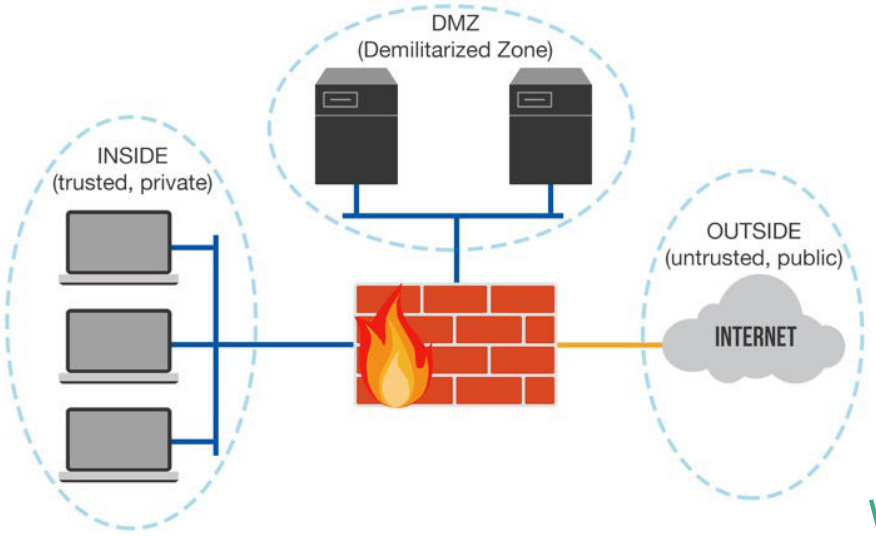
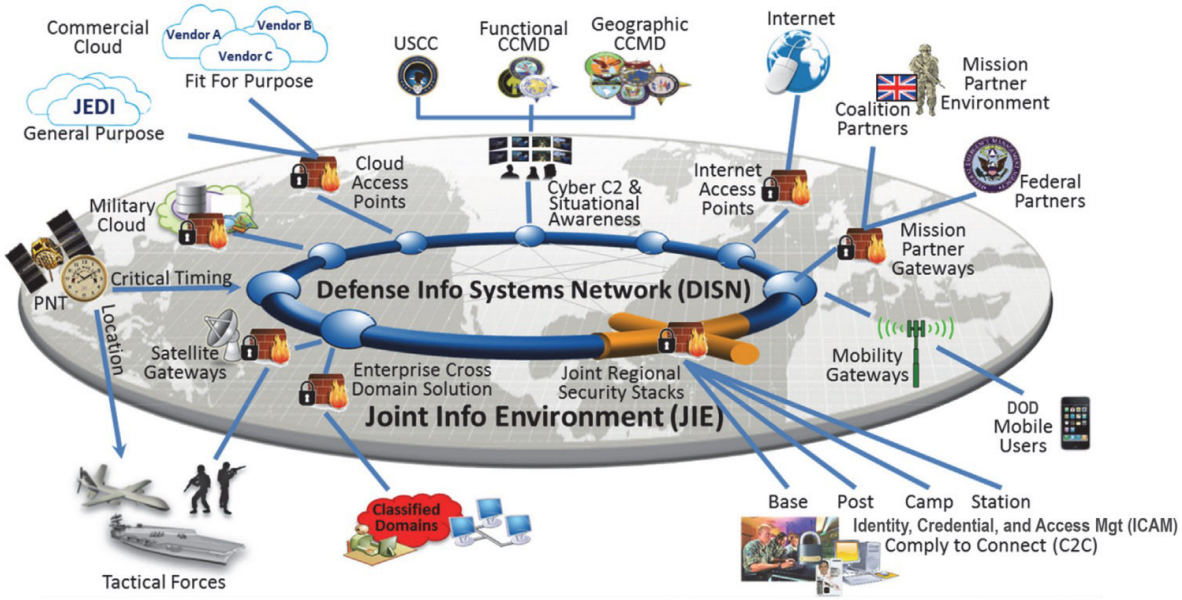
HYBRID SECURITY ARCHITECTURE – WHAT DOES IT LOOK LIKE?

Old – not much choice for hybrid

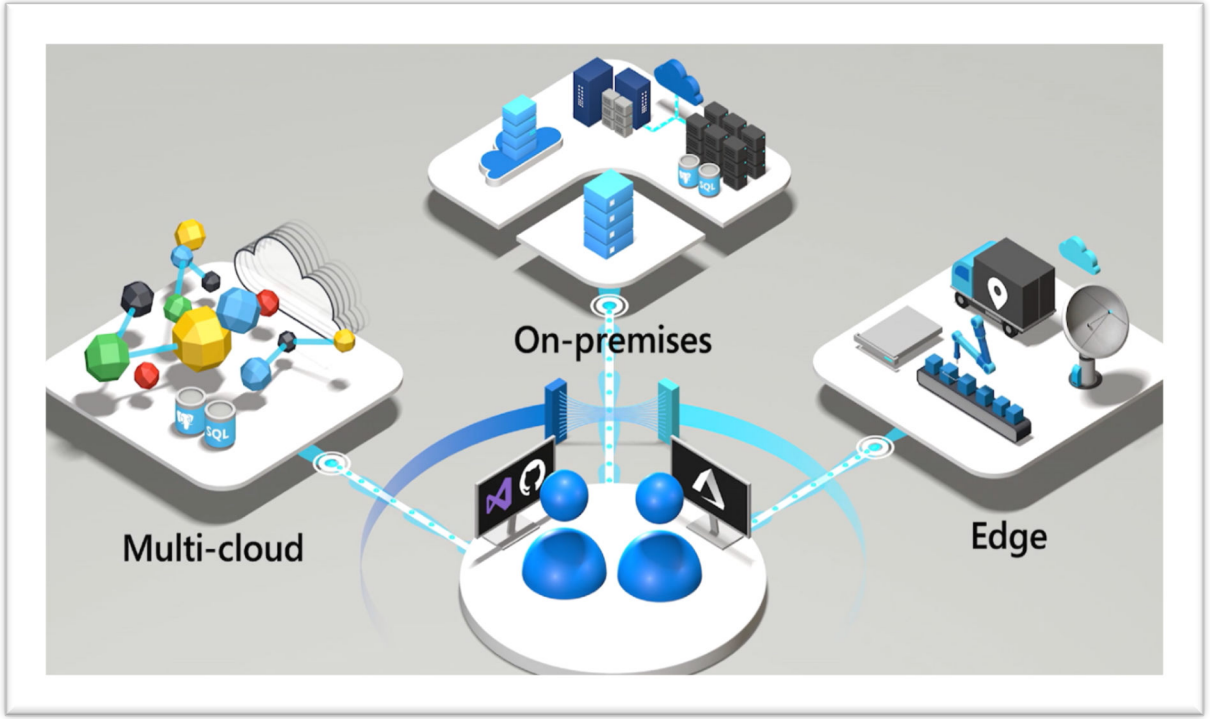


New – overwhelming choice for hybrid



HYBRID NETWORK ARCHITECTURE – SIMPLE MODEL

- Physical and Logical domains.
- Centralized Management



CREATING/TRANSFORMING A CYBERSECURITY ARCHITECTURE

- Design a high-level plan
- Retrain existing staff & add new hires with the needed experience
- Software and hardware changes
- Development new processes and tools
- Lots and lots of hours and change processes



Today, we'll be focusing on the planning, processes and technology

TOPICS SUMMARY

- Standards, Frameworks and Architectures
- Modern Cyber Security Defenses
- Cloud Security Topics
- Practical Cyber Security Solutions
- Closing Summary
- References



STANDARDS, FRAMEWORKS & ARCHITECTURES

- Zero Trust Architecture
- MITRE Security Framework
- Data Logging/Alerting Framework
- Cyber Maturity Reference Model
- Cyber Maturity Templates

STANDARDS, FRAMEWORKS & ARCHITECTURES

- Standards are a great way to provide a well-structured checklist to ensure you're not missing obvious protections for your organization.
- Frameworks are often a high-level approach to a standard
- Architectures define the specific components of a concept or technology.
- Use all 3 depending on the requirement.
- One approach:
  - Start with a framework
  - Build out an architecture
  - Use a standard to settle compliance needs and fill in gaps.

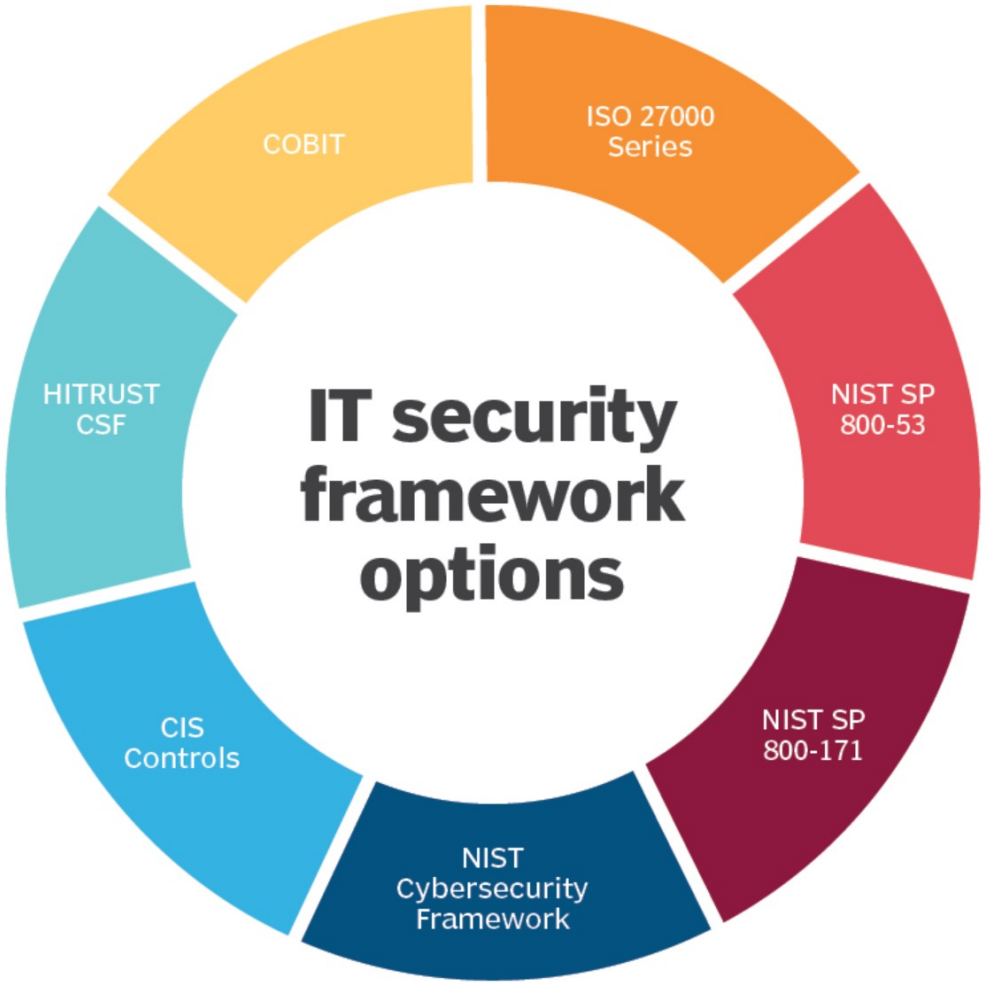
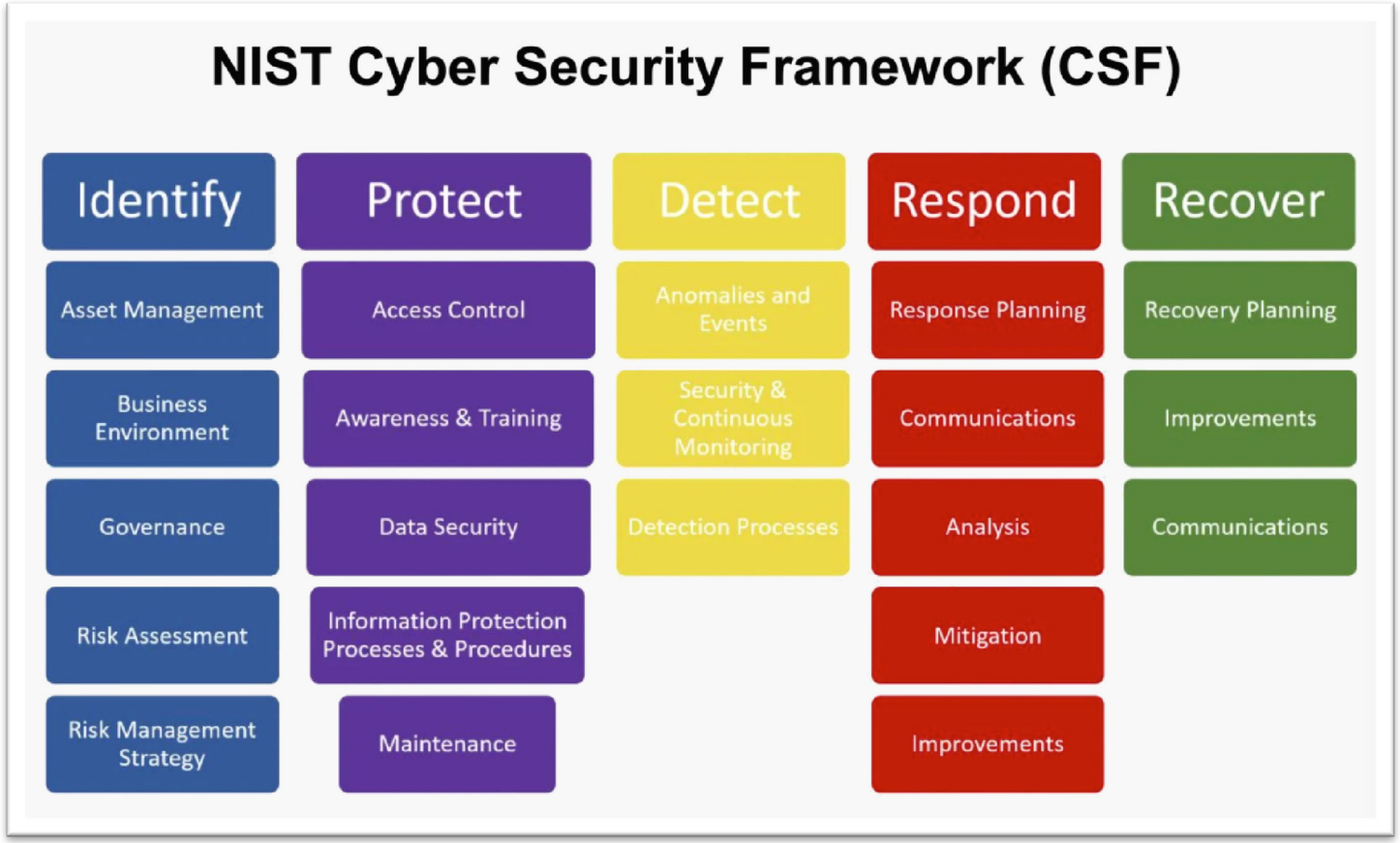


Image reference:
https://searchsecurity.techtarget.com/tip/IT-security-frameworks-and-standards-Choosing-the-right-one

STANDARDS, FRAMEWORKS & ARCHITECTURES



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STANDARDIZATIONS AND BEST PRACTICES

Standards are terrific but can be overwhelming.

Problem: There are several Cyber Security standards, which one should I choose?

Solution:

If you MUST comply to a standard because of your industry, start there. eg.

- PCI – Payment Card Industry
- FedRAMP – US Gov.

Otherwise, consider NIST 800-53, ISO 27001, SOC2, CIS

Find a good reference and start reading:

https://securityscorecard.com/blog/top-cybersecurity-frameworks-to-consider

FRAMEWORKS

I’m a fan...

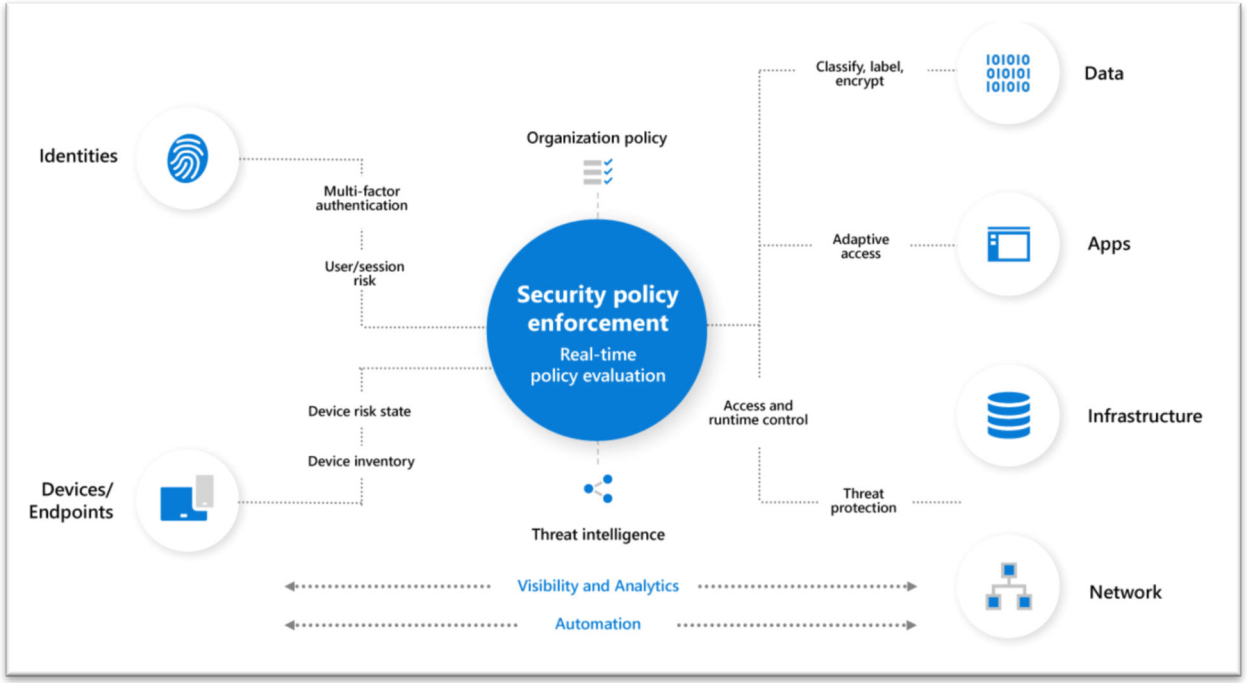
Examples:

- Zero Trust
- MITRE ATT&CK
- Data Logging and Alerting (my own framework)
- Cyber Resilience

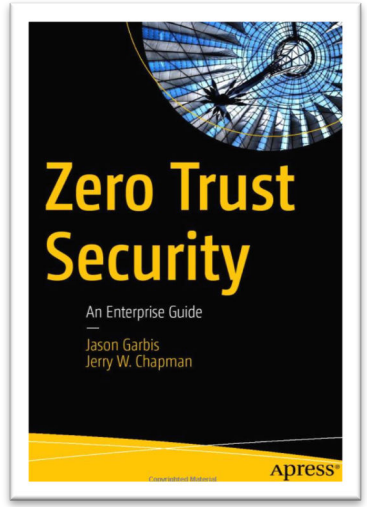


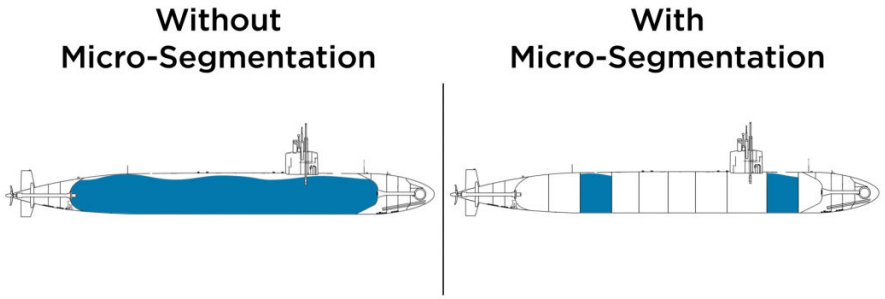
ZERO TRUST FRAMEWORK

- Begin mapping user access and roles to resources/objects
- Question what controls/tools are used to manage that access
- Identify easy places to start, like segmentation, VPN



"Never trust, always verify."





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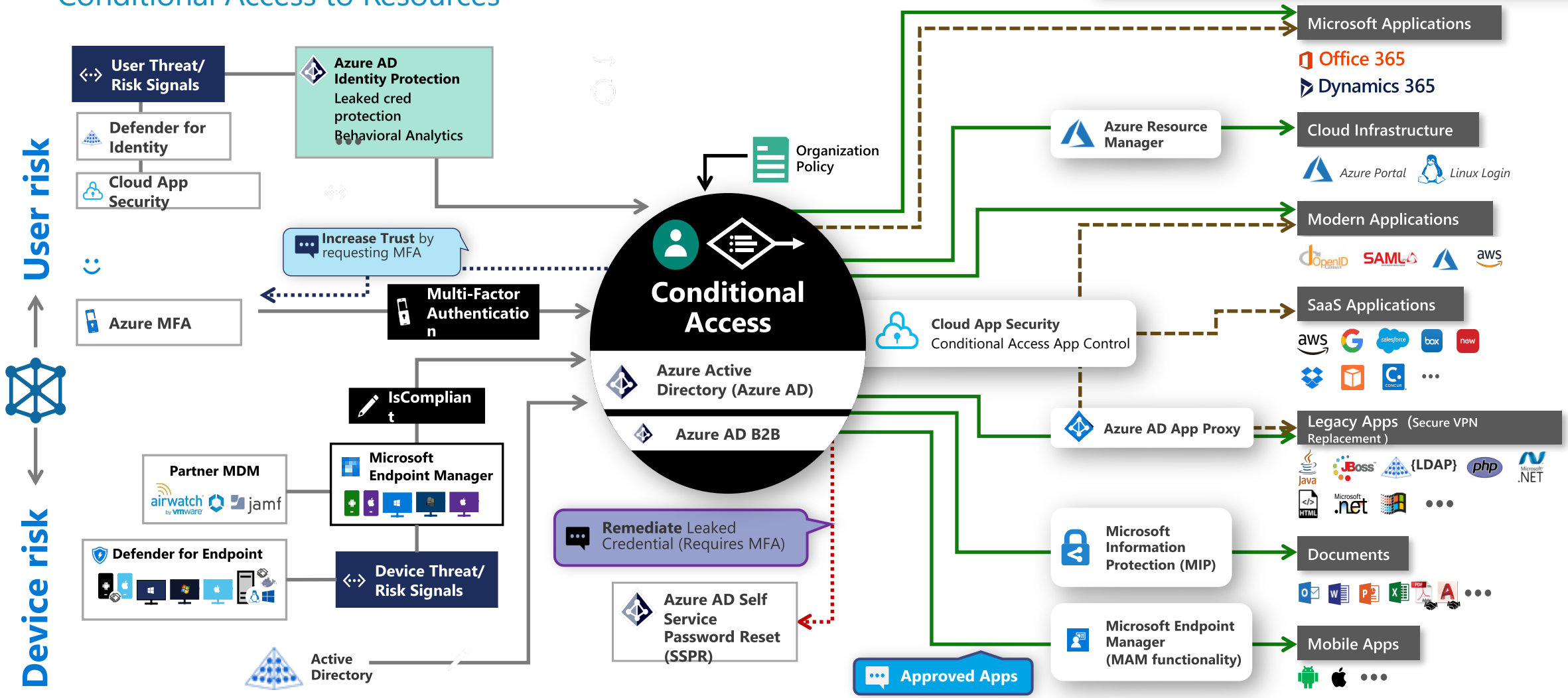
Zero Trust Access Control

Conditional Access to Resources



MITRE SECURITY FRAMEWORK

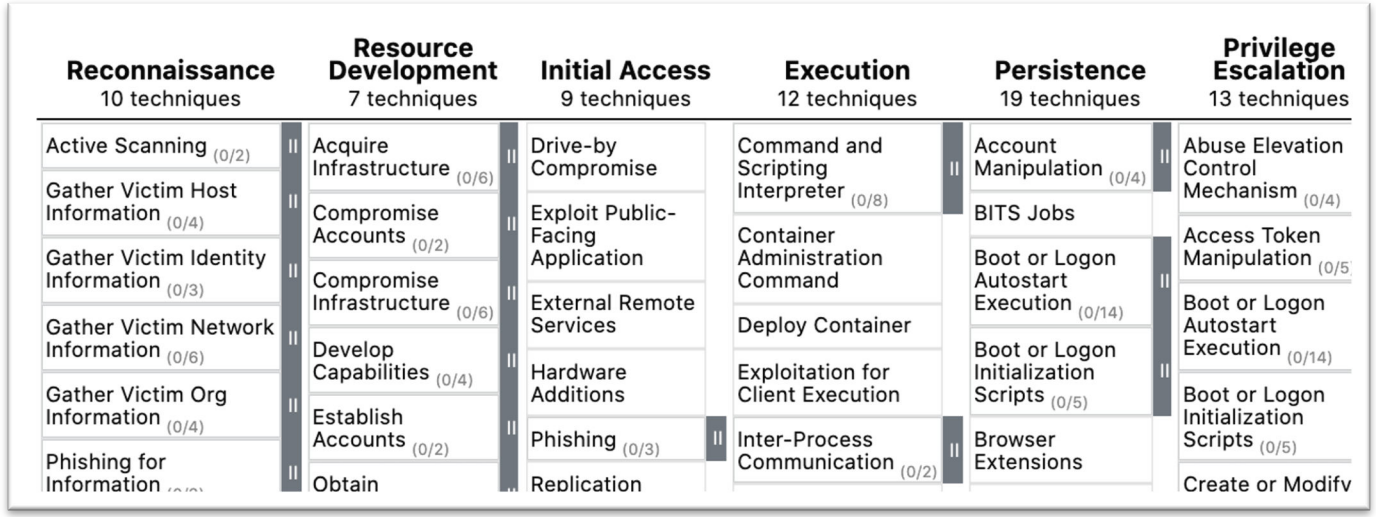
What is the MITRE Security Framework?

A matrix of tactics and techniques used by threat hunters, red teamers, and defenders to better classify attacks and assess an organization's risk.

The MITRE ATT&CK master list:

[Enterprise techniques]

[Attack navigator]



Reconnaissance 10 techniques	Resource Development 7 techniques	Initial Access 9 techniques	Execution 12 techniques	Persistence 19 techniques	Privilege Escalation 13 techniques
Active Scanning (0/2)	Acquire Infrastructure (0/6)	Drive-by Compromise	Command and Scripting Interpreter (0/8)	Account Manipulation (0/4)	Abuse Elevation Control Mechanism (0/4)
Gather Victim Host Information (0/4)	Compromise Accounts (0/2)	Exploit Public-Facing Application	Container Administration Command	BITS Jobs	Access Token Manipulation (0/5
Gather Victim Identity Information (0/3)	Compromise Infrastructure (0/6)	External Remote Services	Deploy Container	Boot or Logon Autostart Execution (0/14)	Boot or Logon Autostart Execution (0/14)
Gather Victim Network Information (0/6)	Develop Capabilities (0/4)	Hardware Additions	Exploitation for Client Execution	Boot or Logon Initialization Scripts (0/5)	Boot or Logon Initialization Scripts (0/5)
Gather Victim Org Information (0/4)	Establish Accounts (0/2)	Phishing (0/3)	Inter-Process Communication (0/2)	Browser Extensions	Create or Modify
Phishing for Information	Obtain	Replication			

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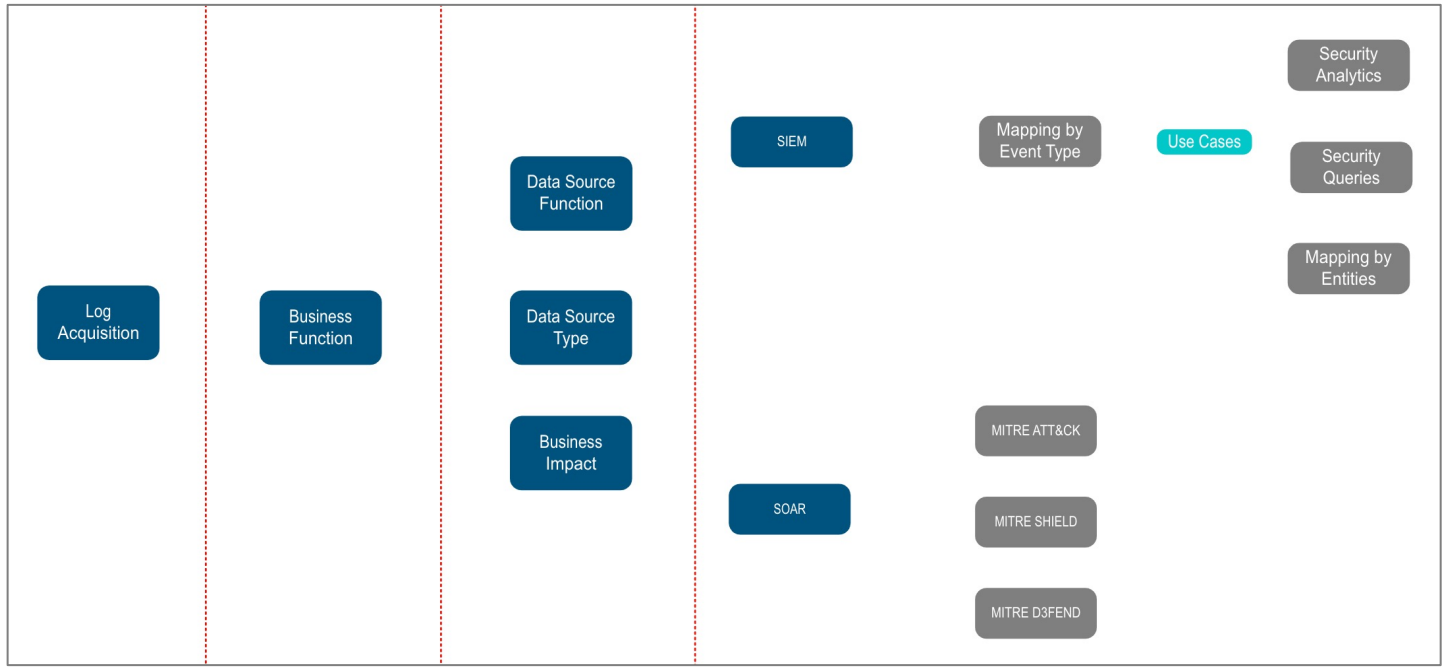
DATA LOGGING/ALERTING FRAMEWORK

Proper implementation of SIEM/SOAR uses a well-structured logging/alerting framework

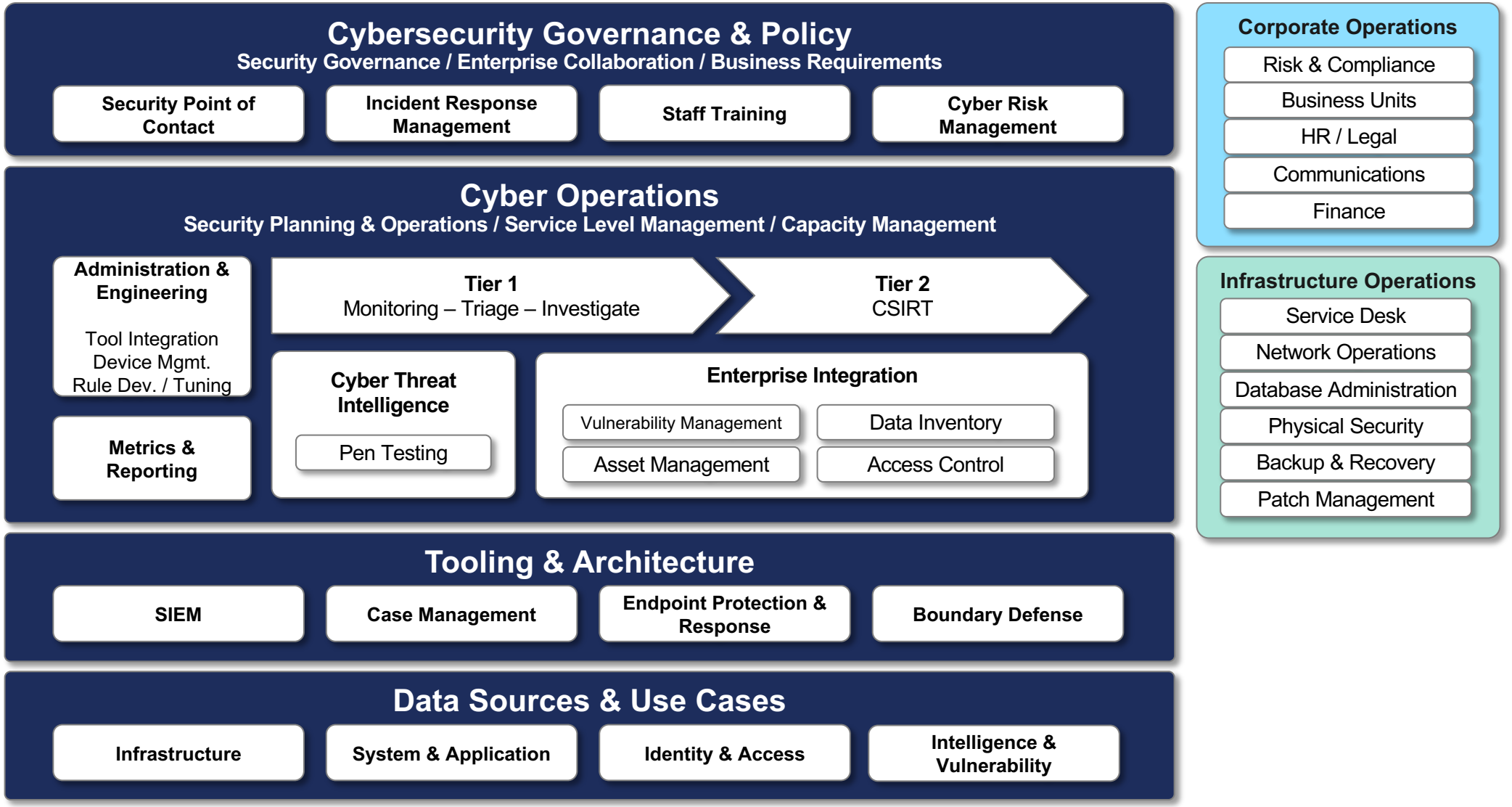


Framework topics

- Architecture
- Data Type Acquisition Summary
- Data Custodians
- Onboarding Tracking Sheet
- Data Source Acquisition (and gap analysis)
- Acquisition Form
- Syslog Facility
- Critical Assets
- Critical Apps
- Configuration
- Collection Tools
- Log Source Types
- Defender Asset Export
- Assets
- TI Feeds



CYBER MATURITY REFERENCE MODEL



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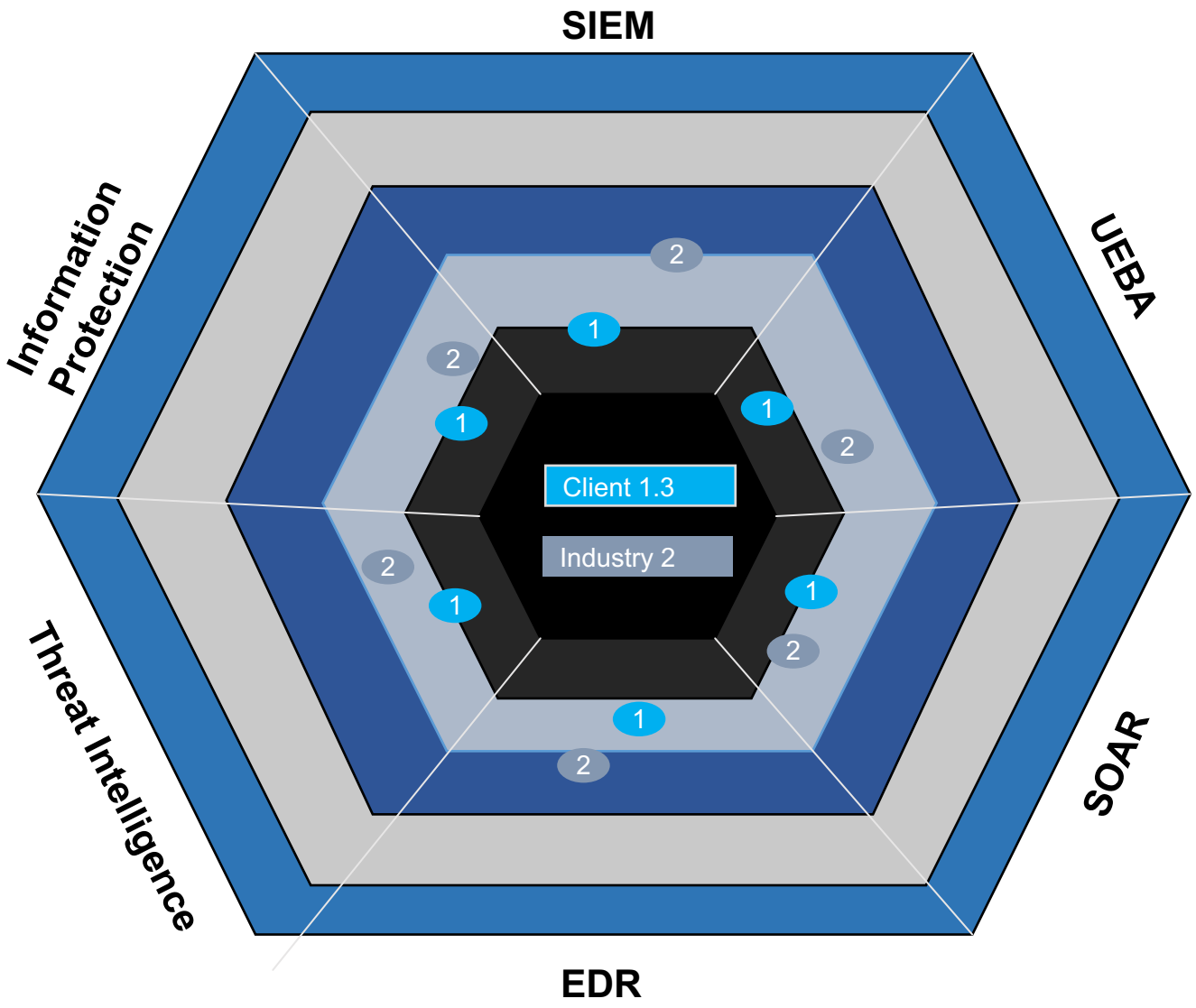
CYBER MATURITY TEMPLATES



- Tooling and Architecture
- Data Sources & Use Cases
- SOC IR Process & Playbooks
- Cyber Operations
- Metrics and Reporting
- Governance
  - Use Case Framework
  - Cost Models
  - Sponsorship

Example Maturity Template: Technology & Architecture



- Technology & Architecture
  - SIEM
  - Information Protection
  - SOAR
  - EDR
  - Threat Intelligence
  - Big Data

CORE DOMAIN RISK

No centralized logging system to capture and alert on logs.

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QUESTION

**What Security Standards,
Frameworks and Architectures do you use? (choose 1 or more)**

- NIST Cybersecurity Framework
- ISO 27001 and ISO 27002
- SOC2
- NERC-CIP
- HIPAA
- GDPR
- FISMA





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MODERN SECURITY DEFENSES (TOOLING & ARCHITECTURE)

- SIEM
- SOAR
- EDR/XDR
- Threat Intelligence
- CSPM
- Cloud Defense Tools - Example

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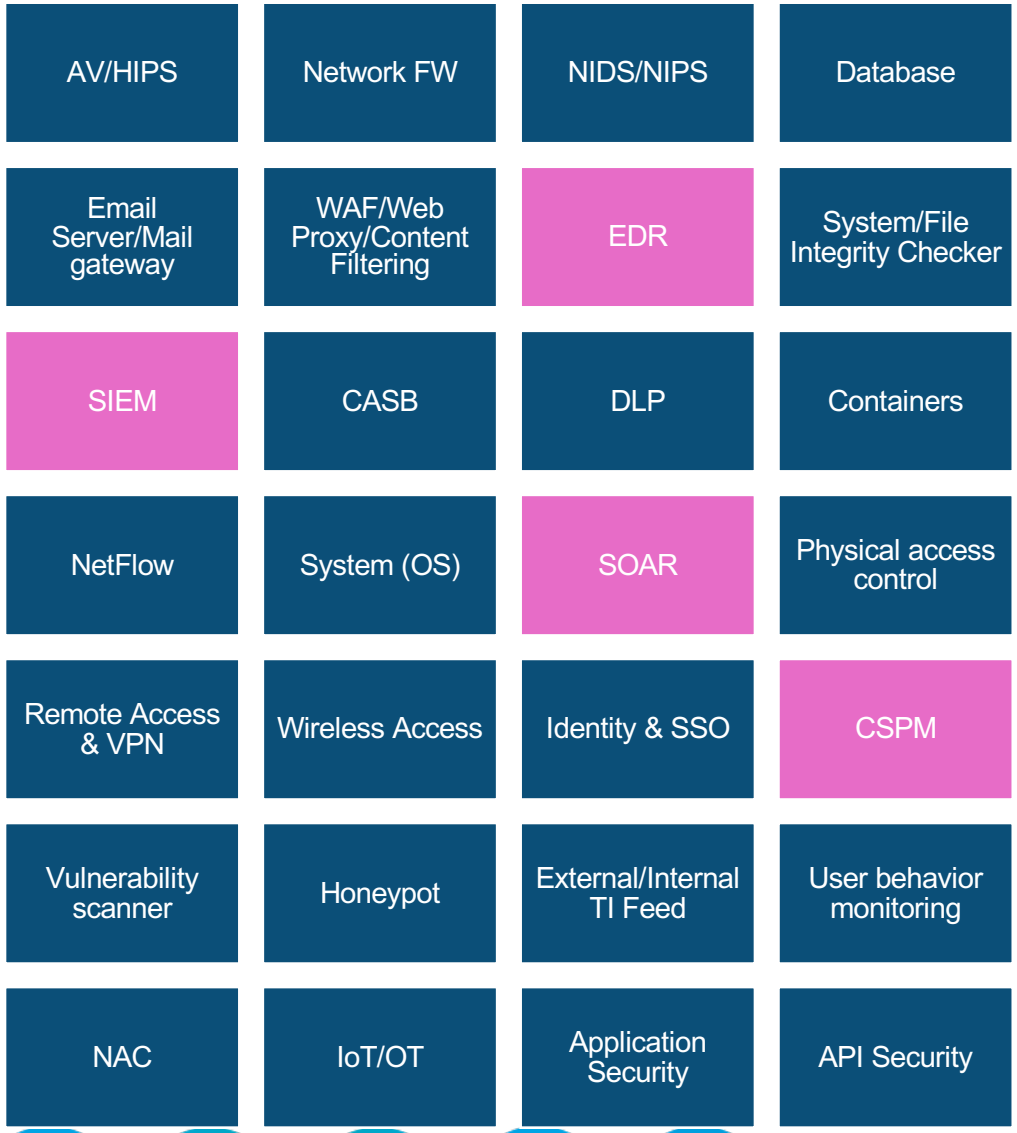
MODERN SECURITY DEFENSES

- This section will focus on the tooling section of the Cybersecurity Framework.
- You should have a basic understanding of the different security defenses.
- Use a list of defenses like this to identify gaps in your security posture.
- Some of these defenses will be discussed next.



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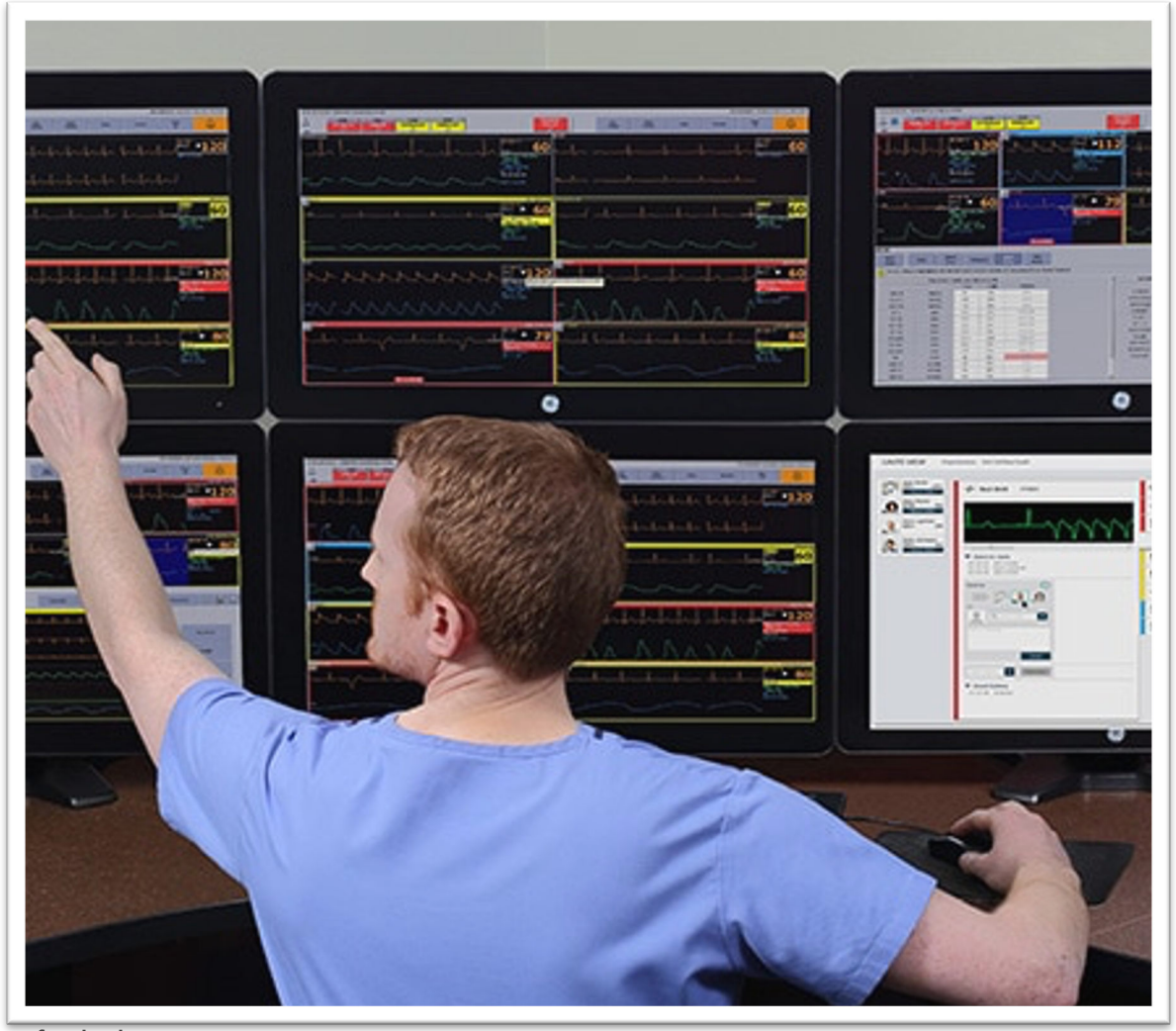
SIEM

- Heart of most Security Centers
- High Level Getting Started:
  - Connect log sources
  - Configure correlations/analytics (use cases)
  - TEST, TEST, TEST!

  (simulate attacks and verify detections)
- Adding SOAR can be very powerful



ref: gehealcare.com

SOAR

- SOAR is all about good “playbooks” – the logic you build for an automation.
- Think top-down:
  - Identify good SOC workflows
    - Learn from your SOC team how they investigate incidents
    - Create playbooks that match that workflow

    e.g., if an alert contains a username, investigate the user’s past activity
  - Create logic flow that performs ‘auto investigations’, based on ‘entities’ in the incident like username, source IP



EDR/XDR

Endpoint Detection and Response

Evolved significantly over the past few years.

Be sure SIEM can detect when EDR is down, or you'll be blind

Can work great with additional security tools like NIDS and CASB

- Hey, that's XDR! – Cross Platform Detection and Response

Microsoft Defender suite is a good example

- EDR shares logs with CASB, so CASB can recognize 'shadow IT' (unsanctioned web apps).



THREAT INTELLIGENCE

Used by SIEM, EDR, CASB, WAF, Proxy, Email, etc.

- Can help identify KBAs – Known Bad Actors
- Example values include:

  email addresses

  IP addresses

  Domain URLs

OSINT – Open-Source Intelligence

- Formerly thought of as free threat feeds but includes any open-source tools used to collect threat intelligence.

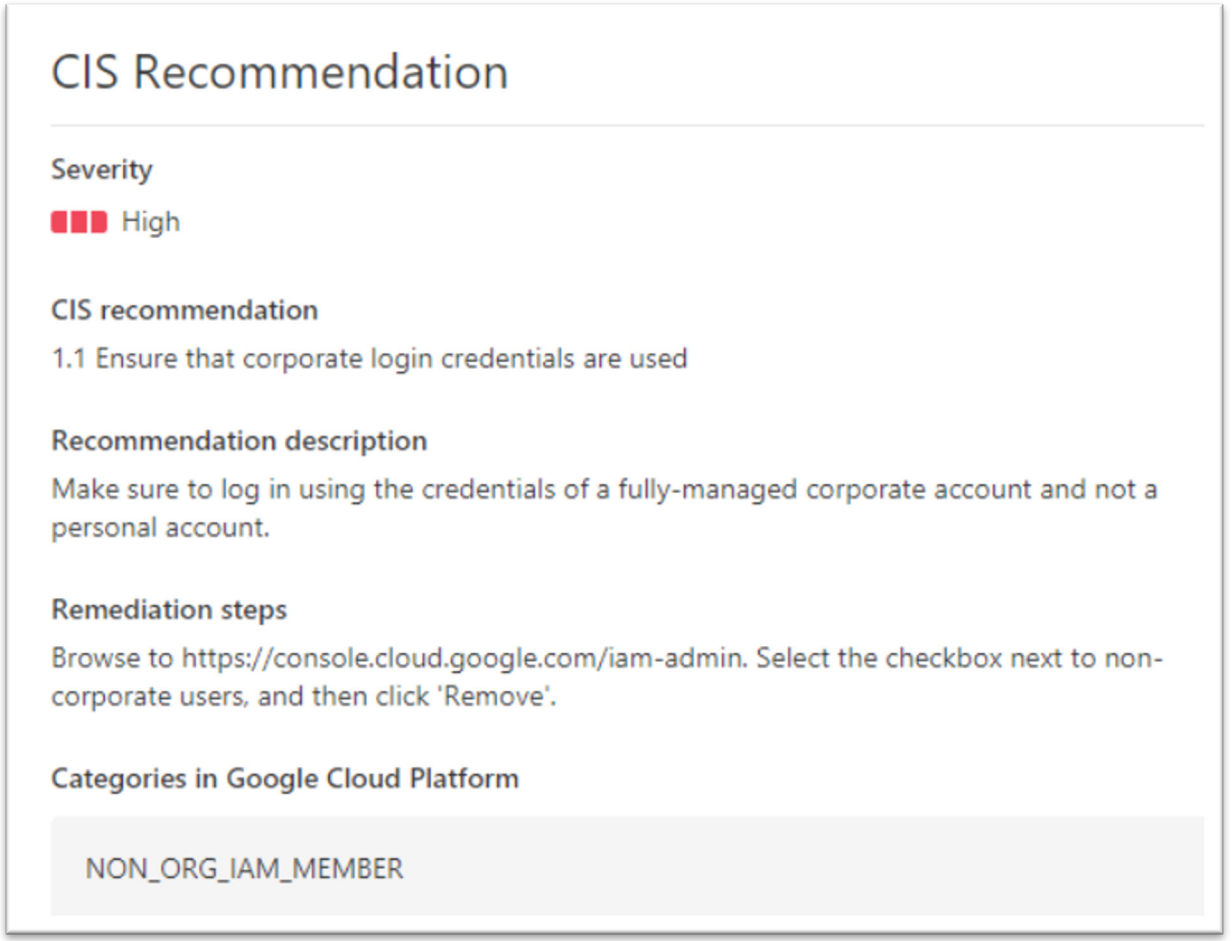
Commercial Threat Intelligence tools: Recorded Future, VirusTotal



CSPM

Cloud Security Posture Management

- Continuously audits the cloud for security risks and misconfigurations
- Uses an API and scripts/checks.
- May also ‘score’ 3rd party web sites as well as your own private cloud.
- Many good CSPM vendors to choose from.



CLOUD DEFENSIVE TOOLS - EXAMPLE

Know these tools:

Azure Sentinel (SIEM/SOAR)

Defender Suite:

- Defender for Endpoint (ASR – Attack Surface Reduction)
- Defender for Identity
- Defender for O365 (phishing)
- Defender for OT/IOT

Cloud App Security (MCAS)

Microsoft Information Protection – especially useful with OneDrive.



QUESTION

What would you consider your top defensive security tools? (choose 1 or more)

- SIEM
- SOAR
- EDR
- IDS, IPS
- CASB, CSPM
- Identity Protection





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CLOUD SECURITY TOPICS

- Example Kill Chain Evaluation using Cloud tools
- Migrating to the Cloud - Benefits and Challenges
- Security Tools Built for the Cloud
- Hybrid Architectures – Considering the best of both
- Cloud Adoption Frameworks
- A Cloud Security Example: Microsoft’s Azure Security Architecture

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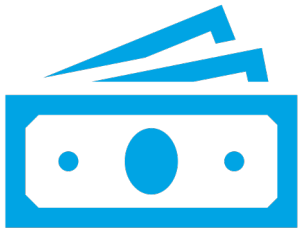
GET TO THE CLOUD!



Many opportunities to show cost effectiveness



So many features provided by cloud vendors to help secure your environment, including:

Conditional Access

Conditional Resource Creation

eg. ARM templates

SIEM - much easier to manage, often much faster

SOAR – adds automation to a variety of tasks

CSPM – Cloud Security Posture Management

Automate configuration checks using CSPM

CLOUD MIGRATIONS – BENEFITS VS DISADVANTAGES

On-Premise Advantages	Cloud Advantages	On-Premise Disadvantages	Cloud Disadvantages
Lowest Total Cost of Ownership Over A Period of (3) Years or More	Offers the Highest Level of Convenience – No Upgrades or Hardware; Access from anywhere	Requires Upfront Investment	Highest Total Cost of Ownership Over A Period of (3) Years or More
Offers the Greatest Amount of Flexibility and Ease of Integration; Personalization; Customizations possible	No Software, Hardware or Upgrades	May Require An Investment in Hardware & Software (OS and Database Licensing)	May Require A Pre-Payment Upfront Potential Integration Challenges Less flexible for customizations (if any allowed)
Investment Can Be Capitalized and Depreciated	Speed to Deployment	Potential Longer Implementation Cycle	Limited Ability to Capitalize the Investment
Data Secured within Client's Environment (i.e. behind Client Firewall)	Cloud Provider Responsible for Hardware and Software Maintenance, Security and SAS70 II Certification	On-going IT Support Required (Periodic Application and Server Maintenance)	Potential for Disruption of Service if Internet Outages Occur, Vendor M&A Activity or Goes Out of Business



SECURITY TOOLS BUILT FOR CLOUD

XDR is arguably possible because of cloud

Moving to cloud brings new defense opportunities like information protection

CASB is XDR dependent

- The more information it has access to, the better it works
- Feeding CASB with data like access logs and EDR is recommended
- This is easier to do when all security products all cloud-central or vendor-central

Information Protection –

If all data is in the cloud, IP tools can detect suspicious activity related to that sensitive data.



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HYBRID ARCHITECTURES – CONSIDERING THE BEST OF BOTH

VMs on-prem may be more cost effective

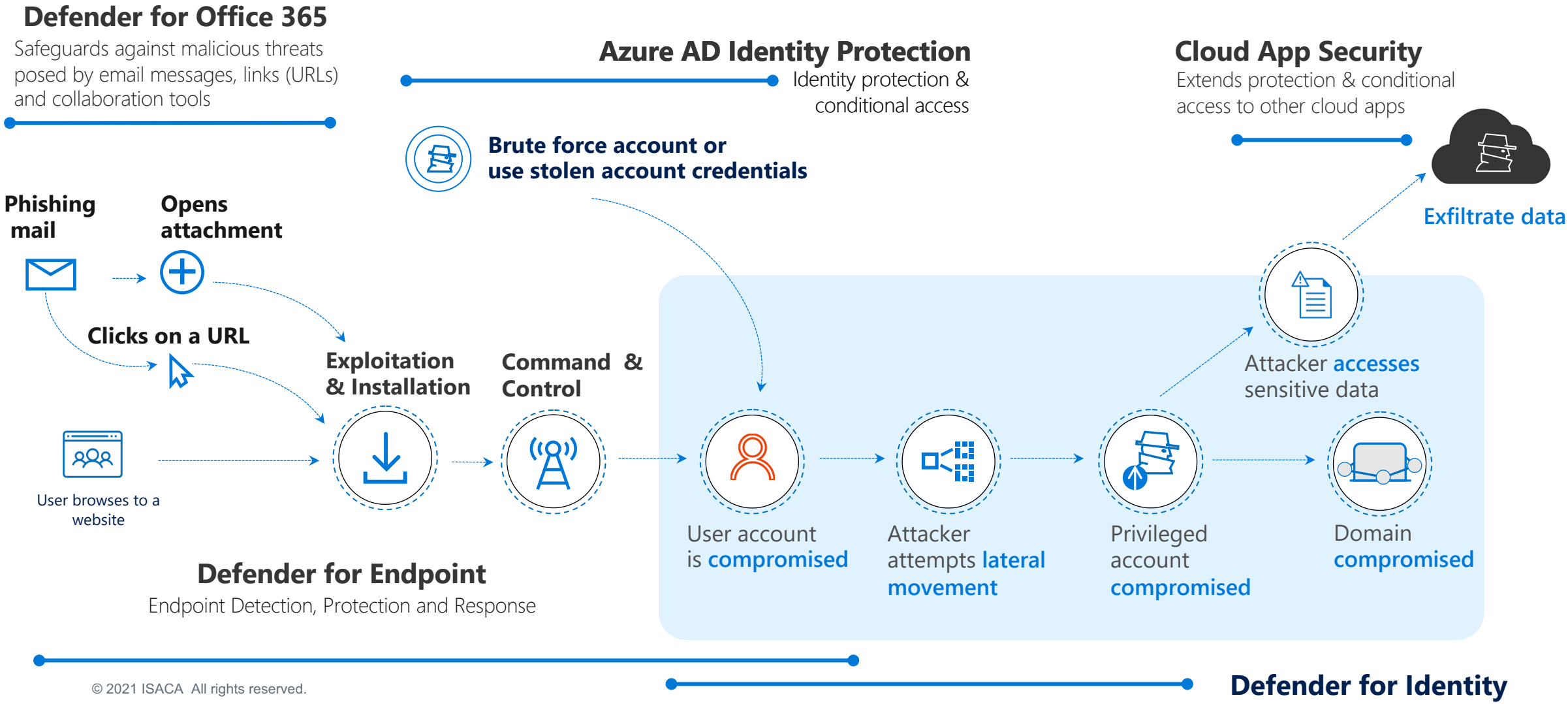
- Plan for more resiliency to match cloud benefits

Cloud SaaS may be more attractive than IaaS

- Security tools from cloud vendors are very price competitive



EXAMPLE KILL CHAIN DETECTED USING CLOUD TOOLS



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CLOUD ADOPTION FRAMEWORKS

Cloud vendors can help with the transition to cloud:



Microsoft



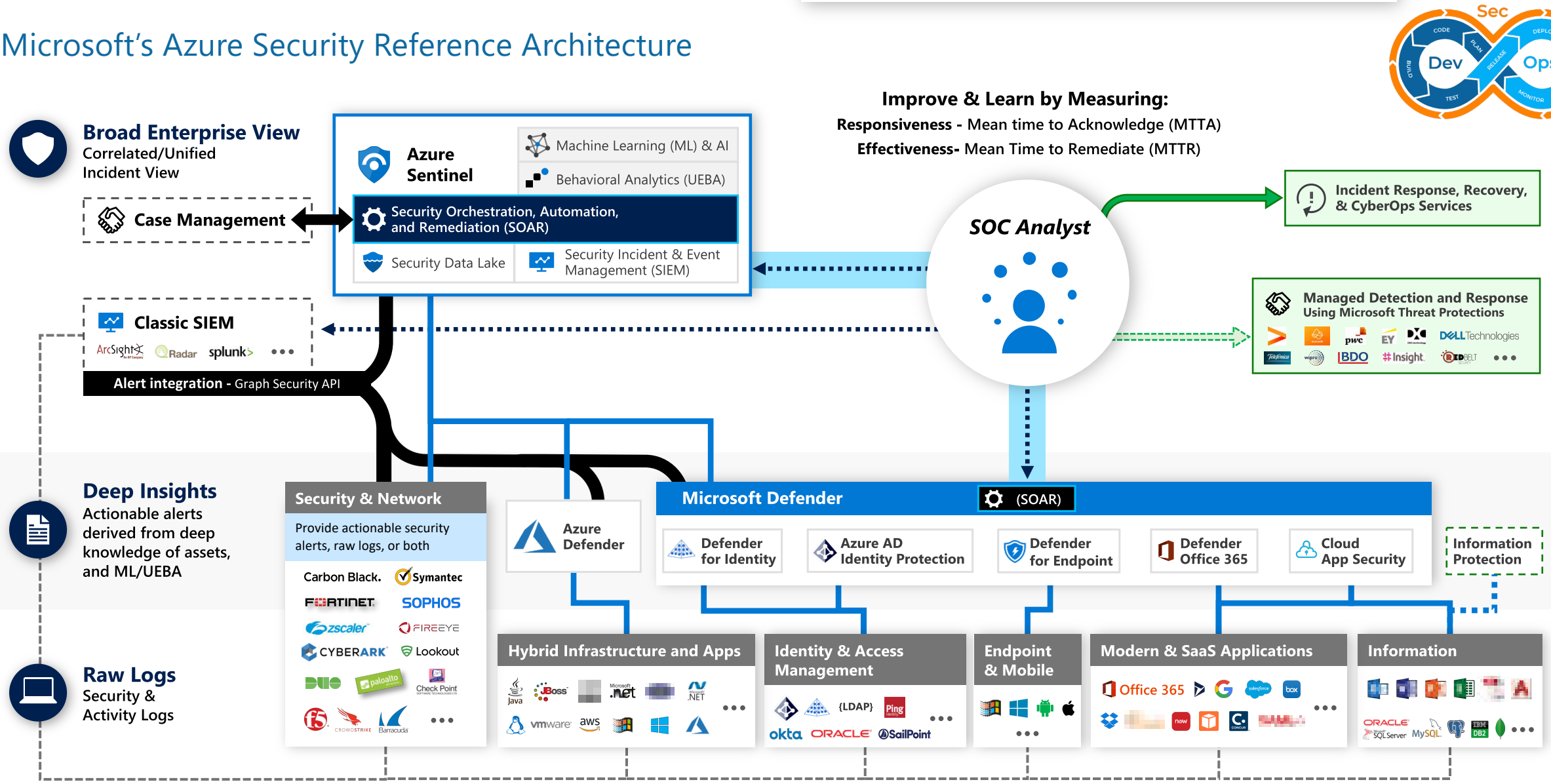
AWS



Google

A CLOUD SECURITY EXAMPLE

Microsoft's Azure Security Reference Architecture



PRACTICAL CYBER SECURITY SOLUTIONS

- Data Source Gap Analysis
- Use Case Catalog
- Asset and Identity Management
- Testing Lab/Attack Simulations
  - Building a Test Lab
  - Attack Simulation Tools

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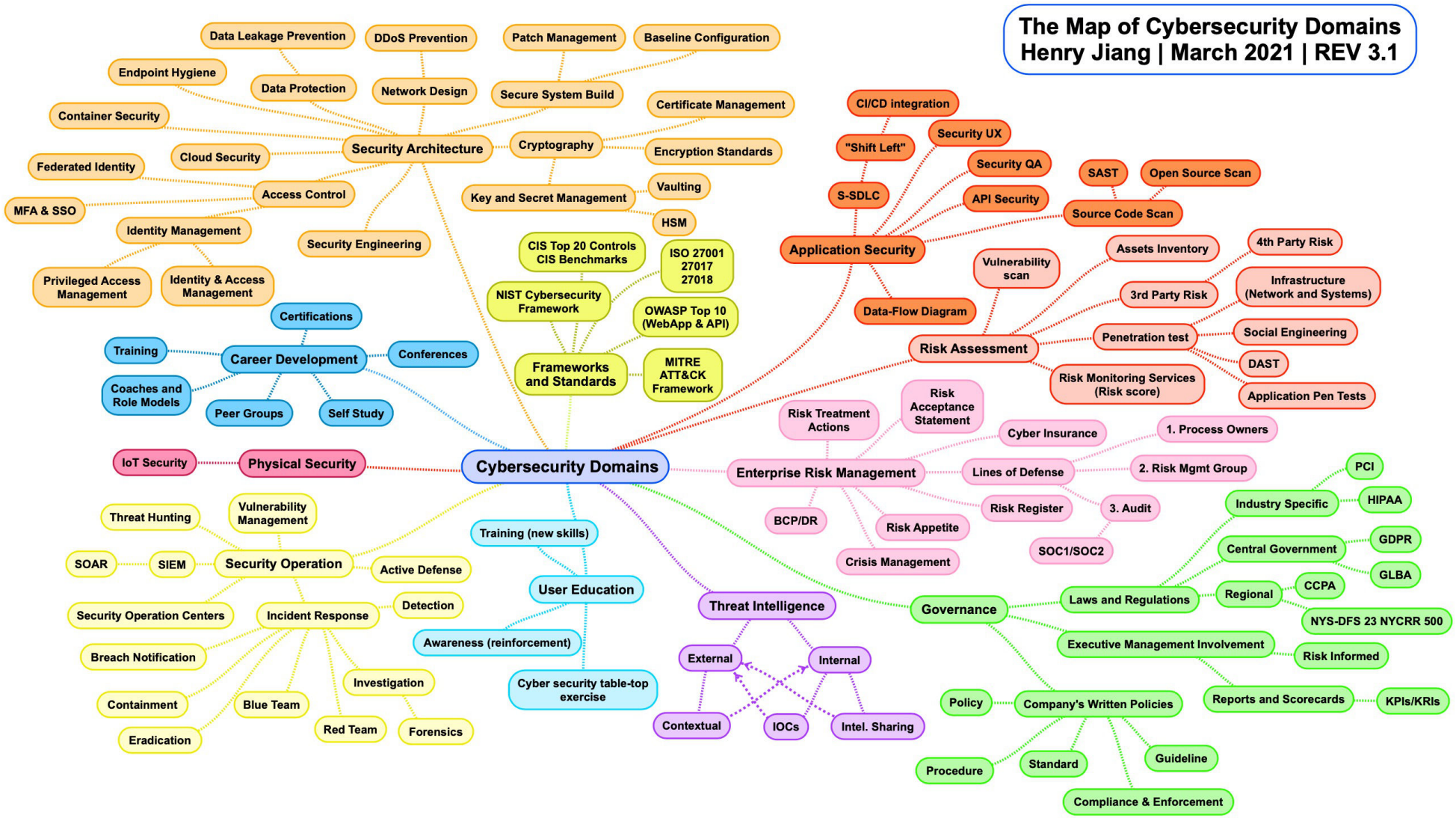
DATA SOURCE GAP ANALYSIS – BY TECHNOLOGY

Category	Data Source Type	Current State	Use Case Recommendations	Category Observations & Recommendations
Network & Security	AV/HIPS		Malware	
	Network FW		Early detection, connections to bad destinations	
	NIDS/NIPS		XSS injection, vulnerability detection	
	Database		Unauthorized use	
	Email Server/Mail gateway		Phishing, data exfiltration	
	WAF/Web Proxy/Content Filtering		Blacklisted web sites, malicious files	
	EDR		Advanced threats - full kill chain detection	
	System/File Integrity Checker		Unauthorized file changes	
	SIEM		Full kill chain detection	
	CASB		Unauthorized access, data loss, performance issues	
	DLP		Data exfiltration	
	EDR		Advanced threats - full kill chain detection	
System & Apps	NetFlow		Unauthorized traffic/ports, unusual traffic	
	System (OS)		Unauthorized privileged access/changes, errors	
	Virtual		Unauthorized privileged access/changes, errors	
Identity & Access	Physical access control		Unauthorized/abnormal access	
	Remote Access & VPN		Login from suspicious location	
	Wireless Access		Rogue access point	
	Identity & SSO		Unauthorized privileged access	
	NAC		Unauthorized connection	
Threat & Vulnerability	Vulnerability scanner		Identified exploits, attacks on known vulnerabilities	
	Honeypot		Preemptive attacks	
	External/Internal TI Feed		External/internal attacks from known bad sites	
	User behavior monitoring		Unusual user behavior	



DATA SOURCE GAP ANALYSIS – BY DOMAIN



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USE CASE CATALOG

- Use Cases can apply to any technology, but often discussed with SIEM.
- Critical planning tool for any security infrastructure
- Dependent on the available analytics.
- Should be considered a living document, requiring regular review/updates.

SIEM Use Cases				
Use Case Category	**Activity**	**Use Case Title**	**Alert/Report**	**Logs Required**
Identification & Authentication	**Logon Activity**	SSH Login Failure Anomaly	ALERT	Authentication
		Password Spray	ALERT	Authentication
		Monthly Report - Failed Logins (Type 3) by User	ALERT	Authentication
		Multiple Failed Authentications - User Does Not Exist	ALERT	Authentication
		Multiple Failed Authentications	ALERT	Authentication
		Failed login attemps with unusual usernames	ALERT	Authentication
		Okta High Rate of Denies by User	ALERT	Authentication
		Attempted Login to Disabled Account	ALERT	Authentication
		Cisco:ASA - Potential Management Account Bruteforce	ALERT	Authentication
	VPN Activity	High rate of VPN failures - overall count	ALERT	VPN
		High rate of VPN failures - for a single user	ALERT	VPN
		VPN - Account Logged in from Multiple Remote Locations	ALERT	VPN
		VPN - Account Login From Suspicious Country	ALERT	VPN
Authorization & Access Control	**User Account Activity**	Okta Activty Search by User	ALERT	Okta
		Cloud Services - GCP – New Service Account	ALERT	GCP
		Linux - Multiple Failed Password Change Attempts	REPORT	linux
		Linux - Multiple Sudo Failures	ALERT	linux
		Cisco:ASA - New User Account Added	REPORT	Cisco ASA
		Cisco:ASA - unauthorized user access	ALERT	Cisco ASA
		Group Created by Non-Security Admin (Local/Global/Universal)	ALERT	Windows
		Interactive Use of a non-admin Service Account	REPORT	Windows
		Suspicious Access Change to Admin Account	REPORT	Windows
		User Account Created by Non-Security Admin	ALERT	Windows
		Unauthorized Users logging in to DCs with Special Privileges	ALERT	Windows
		User Added to Admin Group (Local/Global/Universal)	ALERT	Windows
		_TW Unusual Cisco ASA Traffic across zones	REPORT	Cisco ASA



ASSET AND IDENTITY MANAGEMENT

- Often ignored
- Very challenging to triage alerts without good asset and identity management
- Many great vendors to choose from



TESTING LAB/ATTACK SIMULATIONS

Attack Simulations

- Mix of cloud and on-prem Virtual machines
- Much cheaper to build a Hypervisor server than to pay for cloud hours, but you may need both in order to practice various attack scenarios
- Create basic attack scenarios (eg. using atomic red team), add defenses, and practice with both common detections and threat hunting procedures based on entities and MITRE APTs

Attack Simulation Tools

- Great way to test security posture
- Start with free tools like Atomic Red Team, Caldera
- Paid tools: Mandiant/fireeye, Red Canary, Azure Defender



BUILDING A TEST LAB

Include both on-prem and cloud-based resources

- eg. vsphere for on-prem – cheaper than cloud since reliability needs are low.

Get feedback from all levels – Management*, Architects, Devops, Operations

- Share ideas via mindmap, visio, etc.

Tell a story – Pick a ‘threat group’ and plan an attack around that scenario.

- eg. Red Team Ops with Cobalt Strike – MANY threat groups are using this.
- The pdf below maps threat groups by industry – eg. healthcare, financial, etc:
  - https://www.thaicert.or.th/downloads/files/A_Threat_Actor_Encyclopedia.pdf

Plan attack simulations and make it fun.

Purple Team and share the results.

- Make Purple teaming part of your Incident Response procedures.

Get an Azure/AWS/GCP license! cheaper than you think.

Look for pre-built attack labs – eg. github

Rent a lab



CONTINUOUS TESTING

TEST,TEST, TEST!!! – A good testing process is crucial for SIEM

Automated testing can be a great complement to a testing process

Vulnerability scanners	Attack simulation tools	SOAR	CSPM



QUESTION

What additional topics would you consider important to your security solution? (choose 1 or more)

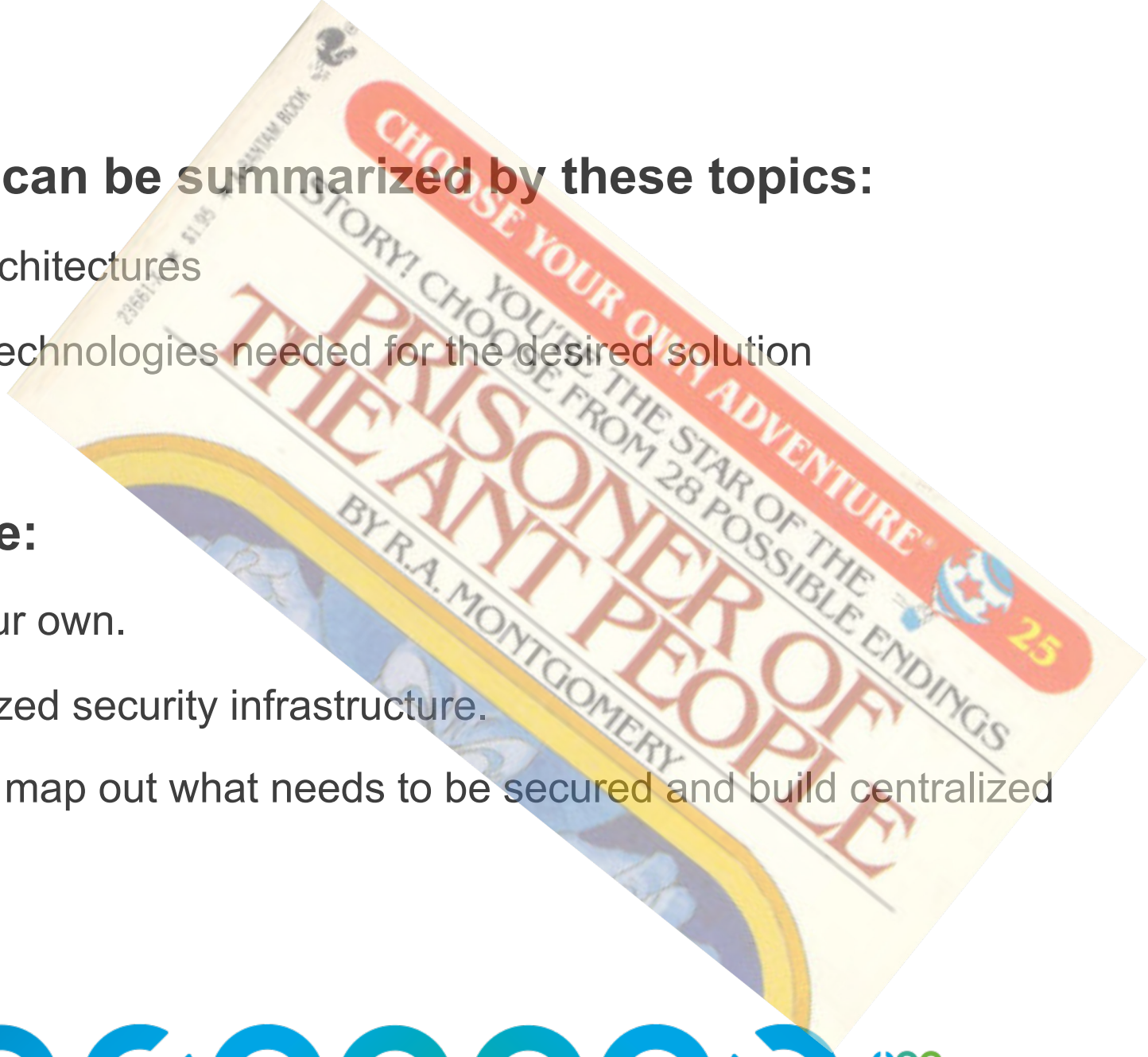
- Security ‘diagnostics’ – identifying scope requirements for each security domain.
- Building cyber security frameworks and architectures
- Red/blue/purple teaming
- Threat hunting
- Identity access controls
- Attack simulations for specific security domains
- Risk Assessments
- Vulnerability scans
- Security Governance
- Threat Intelligence
- Triage and Incident Response
- Finding/qualifying cyber security staff



SUMMARY

Securing a hybrid environment can be summarized by these topics:

- Start with Standards, Frameworks, Architectures
- Build out the people, processes and technologies needed for the desired solution



Another more direct perspective:

- Choose your frameworks or make your own.
- Work towards a cloud-based, centralized security infrastructure.
- Consider Zero Trust concepts to both map out what needs to be secured and build centralized policy-based access controls.

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QUESTIONS?



REFERENCES AND RECOMMENDED LINKS

Note: review the comments in the above slides for several more reference links

Short bios for the world's top 10 hackers

AWS: A Cloud Guru

Google Cloud

Azure Architecture with John Savill

Azure Architecture with Matt Soseman

SOC Maturity Framework with Matt Soseman

CSPM
https://www.paloaltonetworks.com/prisma/cloud/cloud-security-posture-management
https://www.netskope.com/products/public-cloud-security
https://docs.microsoft.com/en-us/azure/governance/policy/overview
https://azure.microsoft.com/en-us/resources/videos/azure-friday-cloud-security-posture-management-cspm-with-azure-security-center/
https://azure.microsoft.com/en-in/blog/new-azure-blueprint-simplifies-compliance-with-nist-sp-800-53/
https://docs.microsoft.com/en-us/cloud-app-security/tutorial-cloud-platform-security



RECOMMENDED READING

- Cyber Strategy: Risk-Driven Security and Resiliency
- Hacking Exposed 7: Network Security Secrets and Solutions
- Hacking: The Art of Exploitation, 2nd Edition
- Hands on Hacking: Become an Expert at Next Gen Penetration Testing and Purple Teaming
- How to Hack Like a GHOST: A detailed account of a breach to remember (Hacking the planet Book 8)
- How to Hack Like a GOD: Master the secrets of hacking through real life scenarios (Hacking the planet Book 2)
- How to Hack Like a LEGEND: A hacker’s tale breaking into a secretive offshore company (Hacking the planet Book 7)
- Hunting Cyber Criminals: A Hacker's Guide to Online Intelligence Gathering Tools and Techniques
- Learn Azure Sentinel: Integrate Azure security with artificial intelligence to build secure cloud systems
- Linux Basics for Hackers: Getting Started with Networking, Scripting, and Security in Kali
- Metasploit: The Penetration Tester's Guide
- Microsoft 365 Compliance: A Practical Guide to Managing Risk
- Microsoft Azure Security Infrastructure (IT Best Practices - Microsoft Press)
- Microsoft Azure Sentinel: Planning and implementing Microsoft’s cloud-native SIEM solution (IT Best Practices - Microsoft Press)
- PTFM: Purple Team Field Manual
- Pentesting Azure Applications: The Definitive Guide to Testing and Securing Deployments
- Red Team Development and Operations: A practical guide
- The Hacker Playbook 3: Practical Guide To Penetration Testing
- The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws
- Web Application Defender's Cookbook: Battling Hackers and Protecting Users
- Zero Trust Security: An Enterprise Guide



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