RSAConference2019
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Making Security Automation Real

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What will we talk about today?

- How currently available network security solutions have failed to scale to protect complex multi-vendor networks
- How we propose to automate security:
  - For all endpoint types
  - For all enterprise networks
  - In support of network analytics and continuous monitoring

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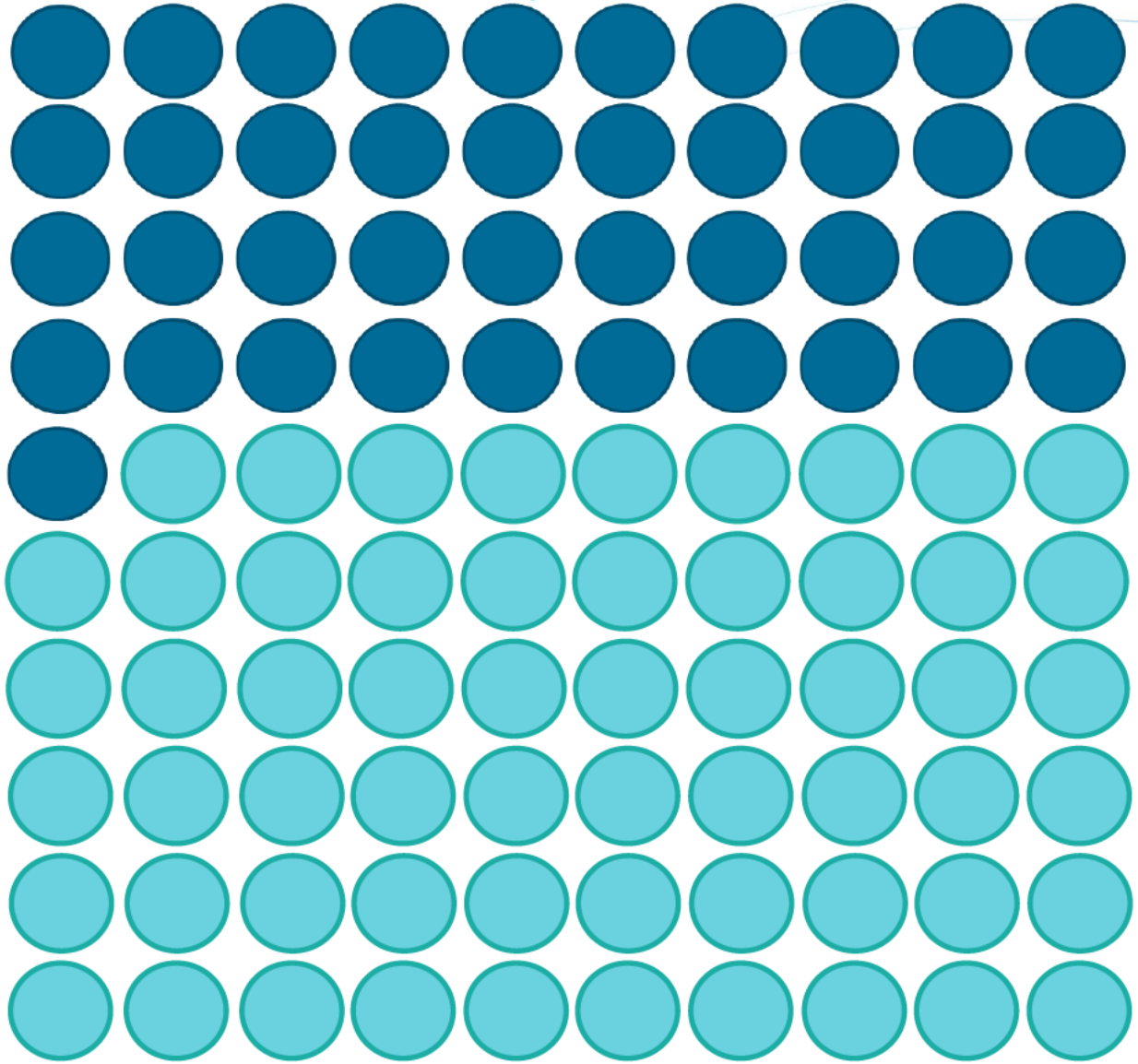
Why does security automation matter?

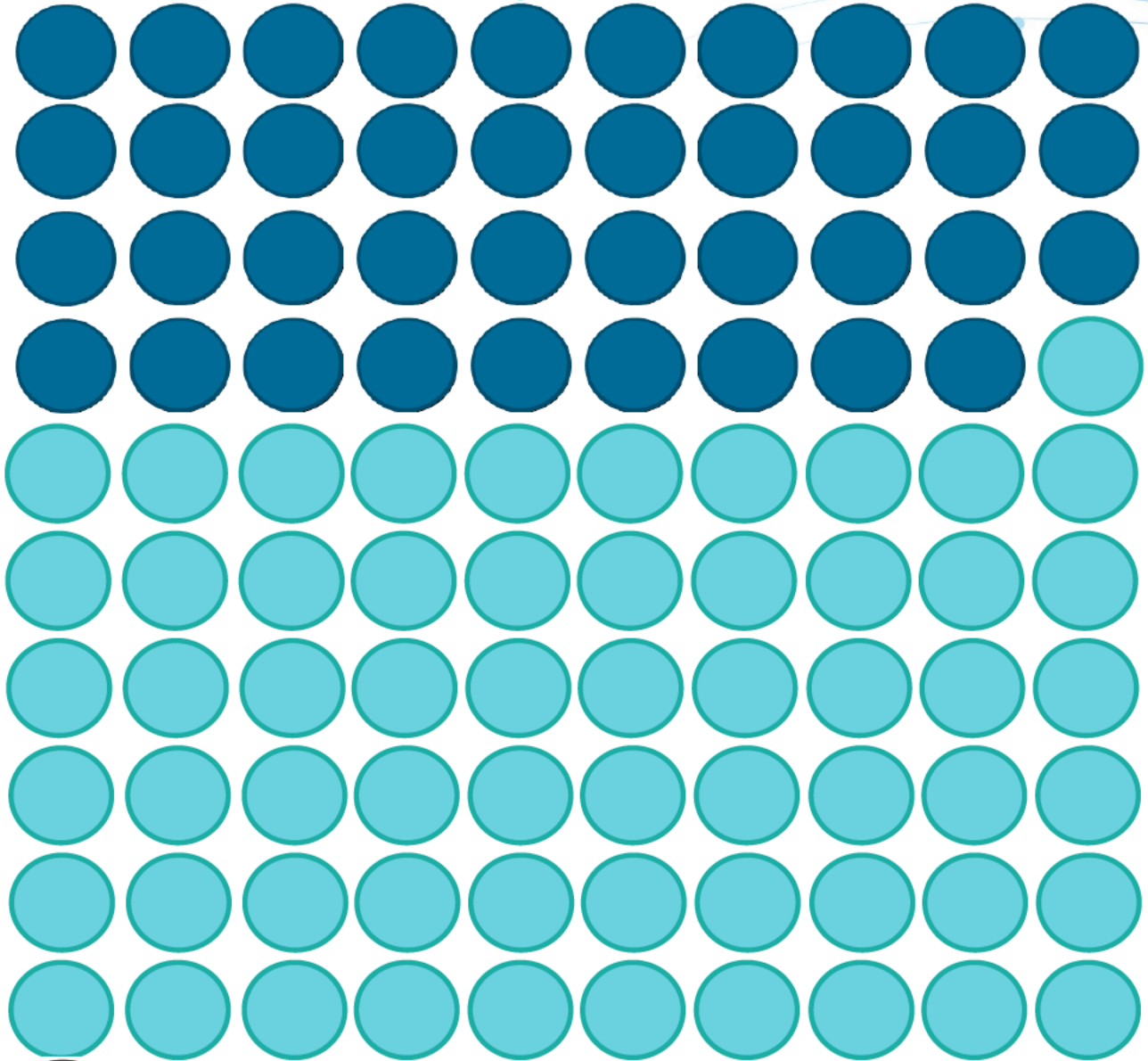
These attacks were made possible by:

- Known vulnerabilities left unremediated and
- Poor network monitoring



41% Cannot Locate Key Network Assets

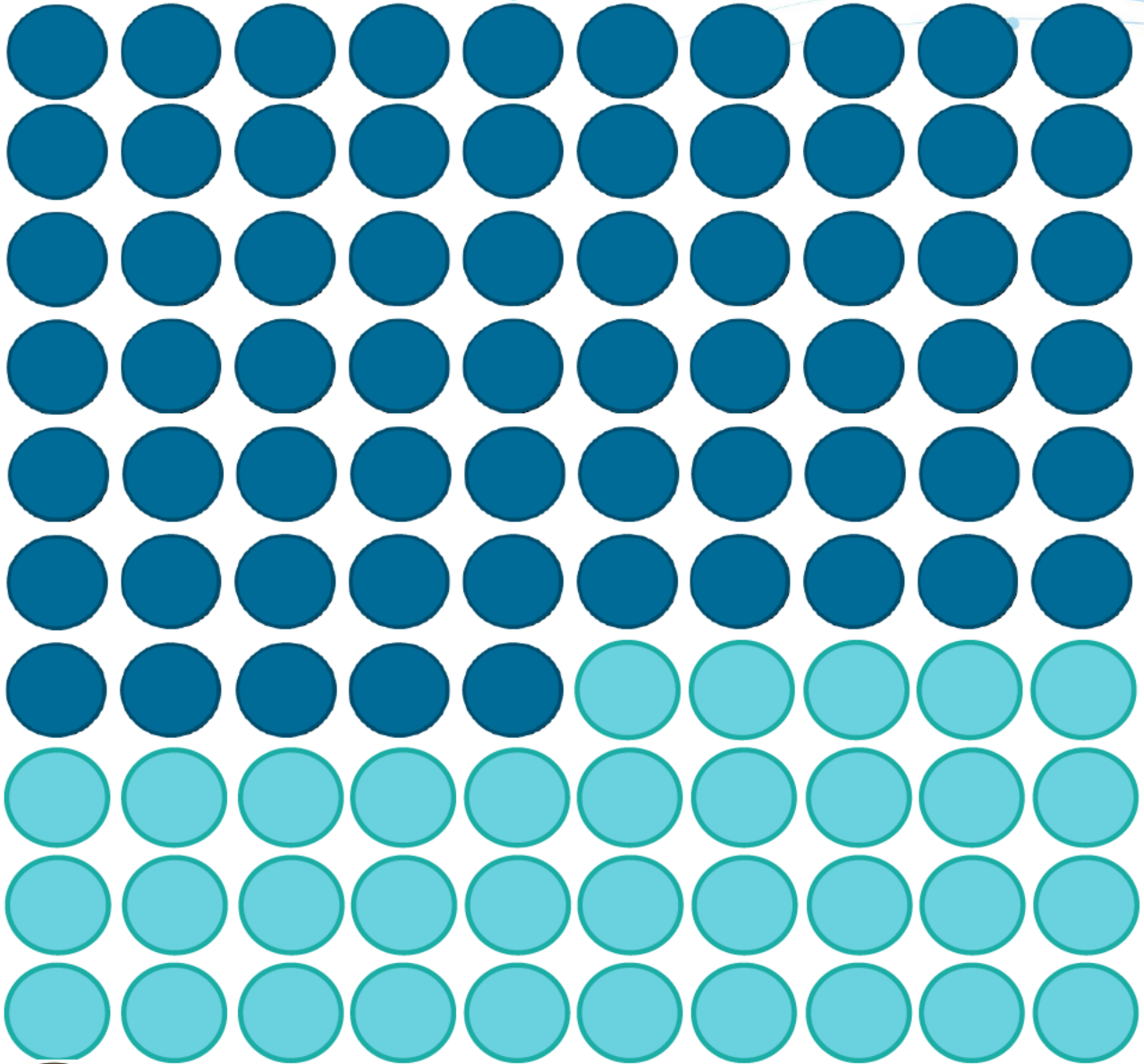
"The State of Cybersecurity from the Federal Government Perspective", (ISC)[2]



39% Don't Know What Their Key Assets Are

"The State of Cybersecurity from the Federal Government Perspective", (ISC)²

NIST National Institute of Standards and Technology U.S. Department of Commerce

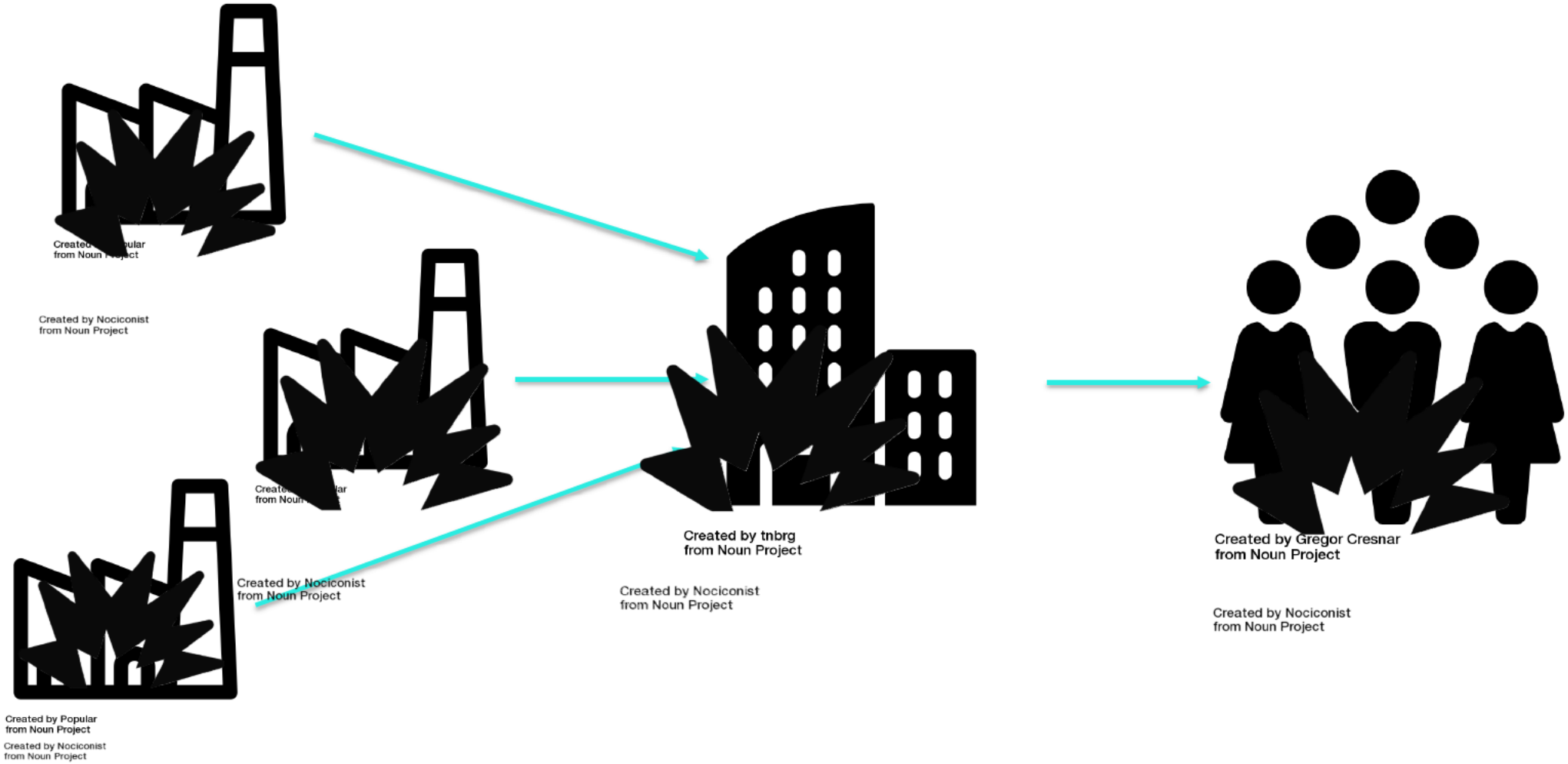


65% Said Federal Gov't Can't Respond Effectively to Attacks

"The State of Cybersecurity from the Federal Government Perspective", (ISC)²

NIST National Institute of Standards and Technology U.S. Department of Commerce

Attacks Cause Collateral Damage



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How is security automated?

CIS Top 20

1- Device Inventory

2- Software Inventory

3- Secure Configurations (Mobile, Workstations)

4- Vulnerability Assessment

5- Admin Privileges

6- Audit Logs

7- Email/Browser Protections

8- Malware Defense

9- Port Control

10- Data Recovery

11- Secure Configurations (Network Devices)

12- Boundary Defenses

13- Data Protection

14- Controlled Access

15- Wireless Access

16- Account Monitoring

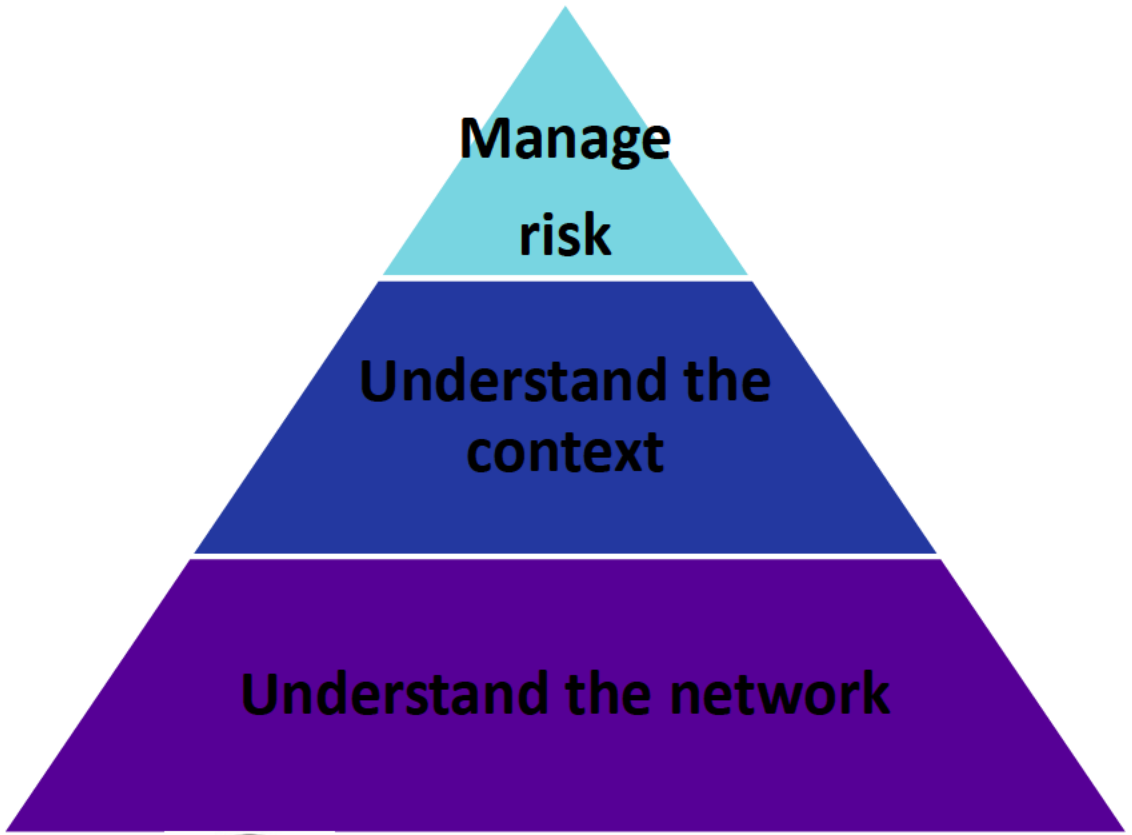
17- Security Skills Assessment

18- Application Software Security

19- Incident Response

20- Penetration Testing

Security Automation in Three Simple Steps



- Step 3: Understand how to manage risk
  - Knowing what to patch, uninstall, harden
- Step 2: Understand the context
  - Understand what vulnerabilities apply to assets
- Step 1: Understand the network
  - Focus on hardware and software asset management

NIST National Institute of Standards and Technology U.S. Department of Commerce

How can we perform these steps?

Action Items

- Things you can do right now
- Improve security automation capabilities
- Can be integrated with security automation solutions you have right now

Proposals

- Currently available, but not yet widespread
- Standards-based, open-source implementations
- Represent the next generation of security automation technologies

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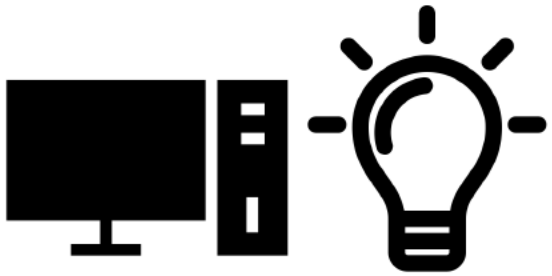
Step 1: Understand the Network

What is an Endpoint?



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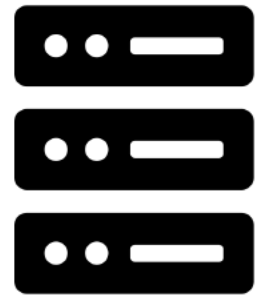

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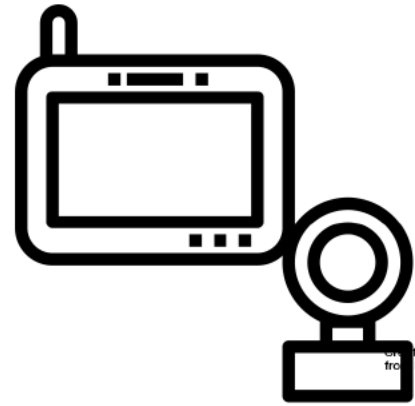

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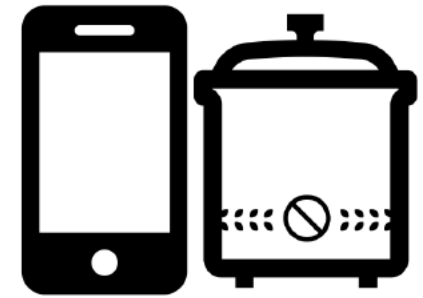

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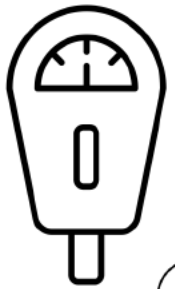

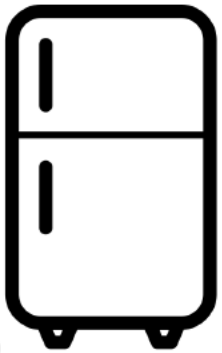

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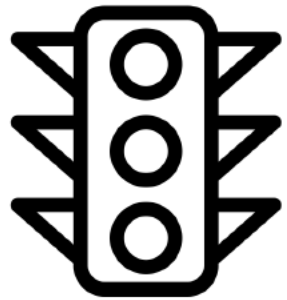

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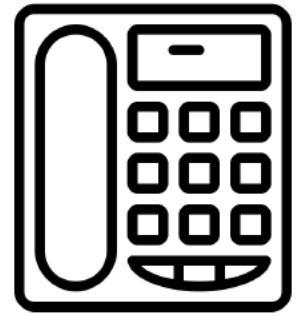

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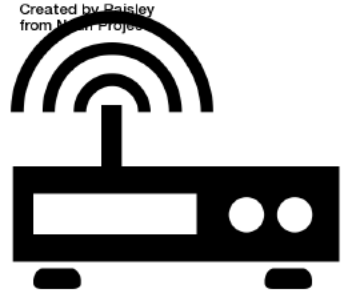

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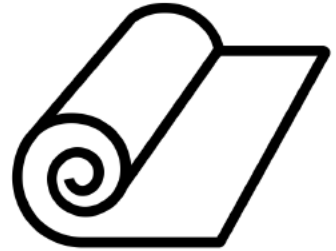

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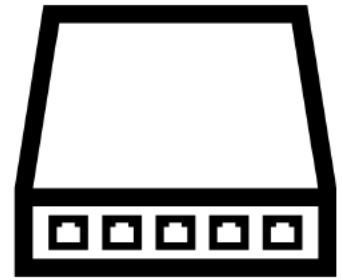

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Addressing management of a diverse set of assets

Attacks are shifting beyond classical IT assets to supply chain partners and operational technology (OT) environments

- Asset diversity makes a single solution impossible
- Standardized methods are needed that enable a best-fit approach

There are some existing, concrete approaches that can help address this problem.

Action Item #1- Use SWID Tags to Identify Software Assets

- International standard defined in ISO/IEC 19770-2
- Two key aspects:
  - Structured format for software description and metadata
    - Simple structure with minimum required fields
    - Can support a wide range of metadata: publisher, file manifest, etc.
  - Lifecycle process to align presence of a tag with presence of a software product on an endpoint
    - Add tag when software installed; revise tag when software updated; delete tag when software uninstalled
    - Discovery of endpoint tags is a simple way to develop a rough software inventory

Action Item #2: Correlate Device Identities

Devices have many identifiers. . .

- Easily changed and/or Mutable Identifiers
  - MAC Address
  - IP Address
- Semi-mutable Identifiers
  - FQDN
  - Software certificates
  - Agent-based identifiers
- Permanent Identifiers
  - Identifiers secured by cryptographic hardware modules
  - Serial numbers

That are used differently for various services. . .

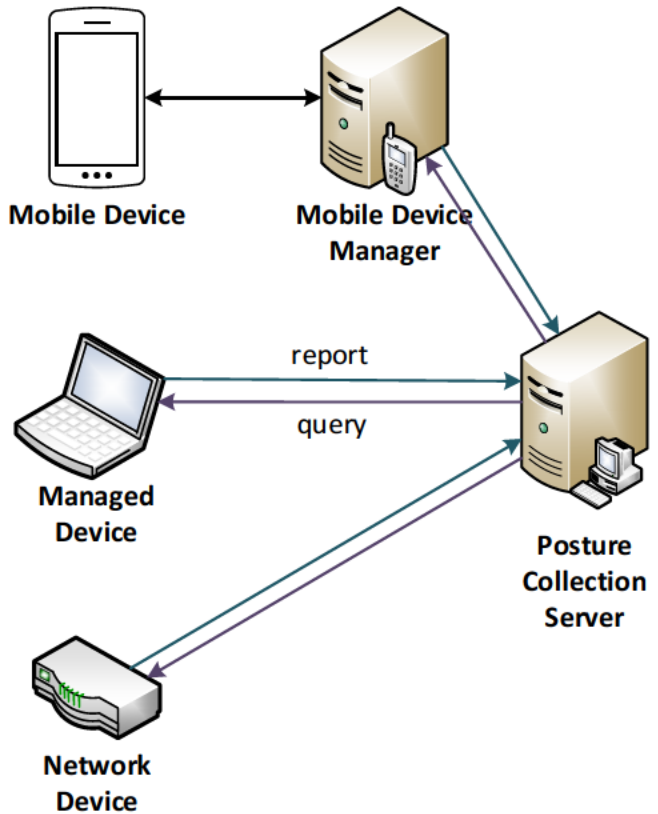
- Behavior Monitoring
- Compliance testing
- Provisioning
- User Services

Proposal #1: Collect Event-Driven Posture Information from All Endpoint Types

Methods of Posture Collection

- Collect software load from all types of devices
- Report posture changes as they occur
- Leverage other posture managers (e.g., MDM)
- Query additional information on an as-needed basis

Proposed Architecture for Posture Collection



Proposal #2- Use SWIMA to Maintain Situational Awareness

- Software Inventory Message and Attributes (SWIMA) for PA-TNC (RFC 8412)
  - An extension of the Network Endpoint Assessment (NEA, RFC 5209 et al.)
- Supports collection of software inventory information from endpoints to a central server
- Key features
  - Supports both server queries and event-based reporting by endpoints
  - Flexible and extensible support for inventory reporting formats
  - Can report full inventory or change events relative to a point in time
- Result in a way to collect and efficiently maintain timely information about endpoint software inventories that is easily added to any NEA implementation
- Open source implementation in strongSwan

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Step 2: Understand the context

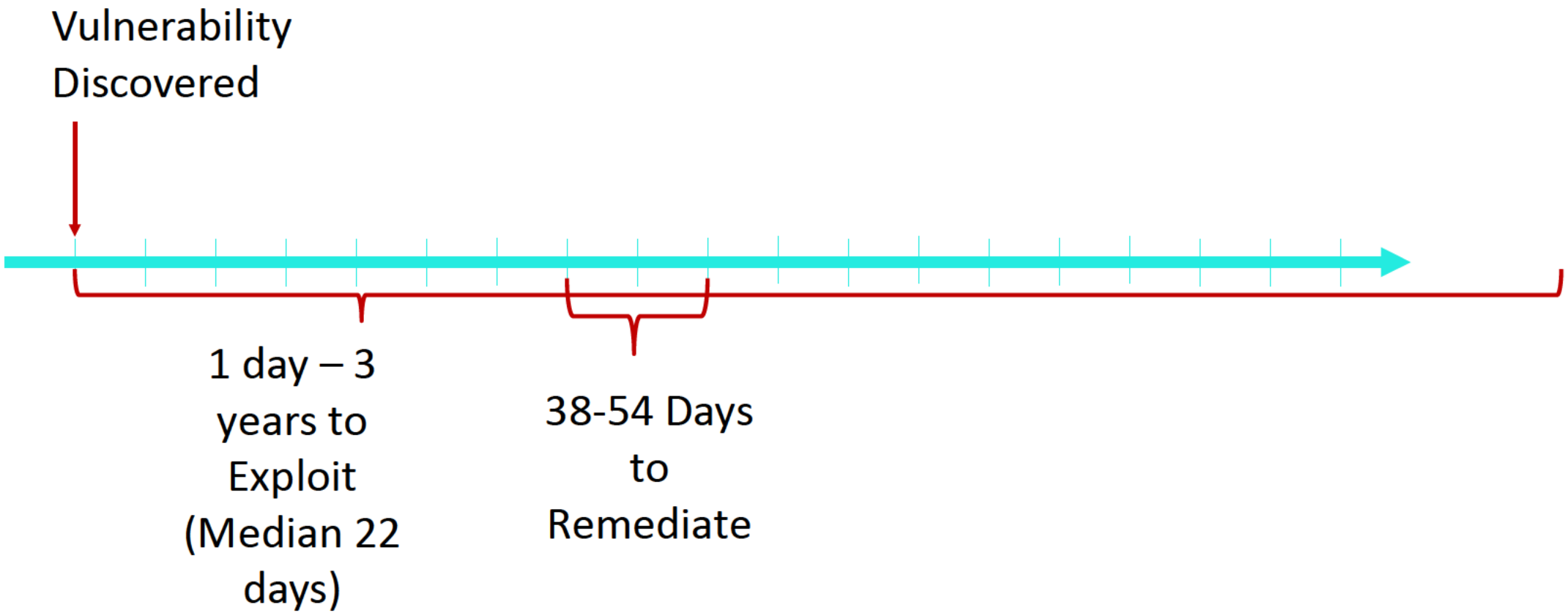
57% of breach victims were breached due to an unpatched known vulnerability

"Today's State of Vulnerability Response: Patch Work Demands Attention", Ponemon Institute for ServiceNow,

34% knew they were vulnerable before they were breached

"Today's State of Vulnerability Response: Patch Work Demands Attention", Ponemon Institute for ServiceNow,

Vulnerability Discovery, Exploitation and Remediation

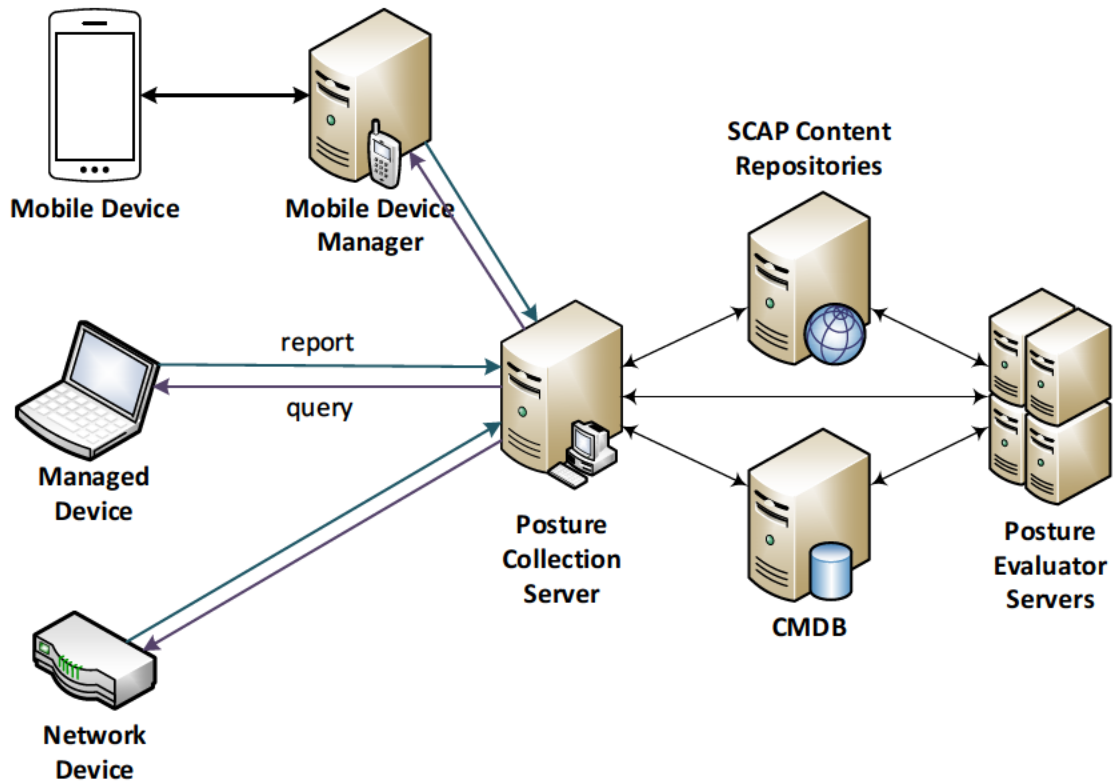


Proposal #3: Share Network Posture Information Across Analytics and Use Cases

Supported Use Cases

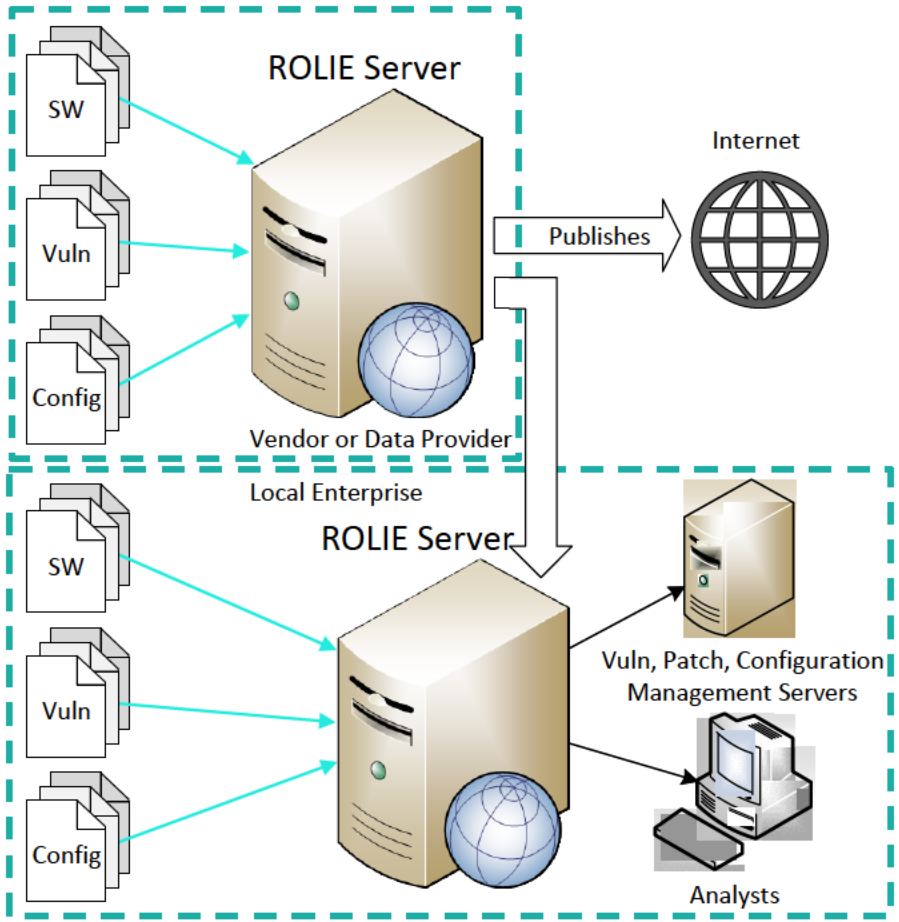
- Configuration Manager
- Vulnerability Manager
- Behavior Monitor
- License Manager
- Comply-to-Connect
- Information Sharing
- Automated Courses of Action

A Security Automation Architecture



ROLIE and its Use Cases

- Resource-Oriented Lightweight Information Exchange (ROLIE) (RFC 8322) provides a data format and transport protocol for publishing, organizing, and sharing computer security information
- ROLIE allows published data to be accessed by 3rd parties, using optional authentication, supporting information sharing
- ROLIE can serve information supporting a number of use cases at the same time, including:
  - Software metadata (e.g., SWID Tags)
  - Vulnerability Information (e.g., CVE)
  - Configuration Setting Checklists (e.g., SCAP)
- ROLIE Servers discover each other and publish/receive information between them, accelerating information sharing between parties
- Allows organizations to maintain their own information collections
- Analysts and tooling use this information to automate security and management of devices



Proposal #4- Leverage ROLIE to Provide Context to Network Posture Information

- Standardized data format and protocol for storing, retrieving, receiving and sending security automation information
  - Provides tagging and categorization metadata that facilitates searching
- Allows software product maintainers to publish their own security automation information, including:
  - SWID Tags
  - CVE-based vulnerability data
  - SCAP-based configuration setting checklists
- Being implemented in the National Vulnerability Database to publish CVE-based vulnerability data and configuration setting checklists

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Step 3: Understand managing risk

Action Item #3: Leverage vulnerability information

Development

Identify and manage vulnerable components / libraries

Acquisition

Understand risks in the supply chain and from service providers

Deployment

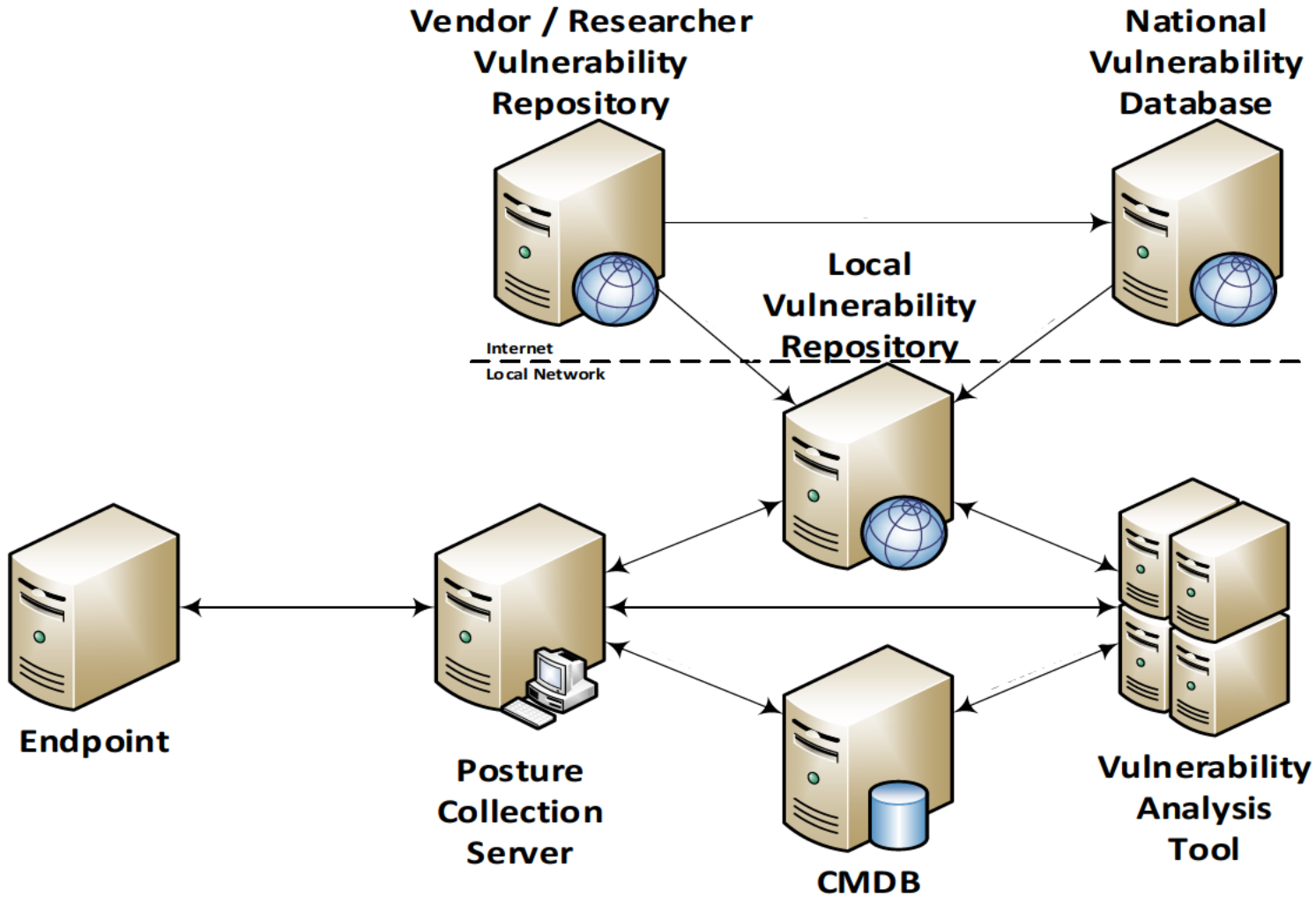
Assess vulnerabilities on the network

Managing Vulnerabilities During Software Development and Maintenance

- Reuse of software accelerates software development
- Open source software is used in 96% of commercial applications
- DevOpsSec vs SecDevOps - Vulnerable dependencies introduce risks that need to be managed during development
- SWID Tags provide information on software dependencies (e.g., identifiers, versions, hashes)

Vulnerability Information and Supply Chain Risk Management

Vulnerability Management on the Network



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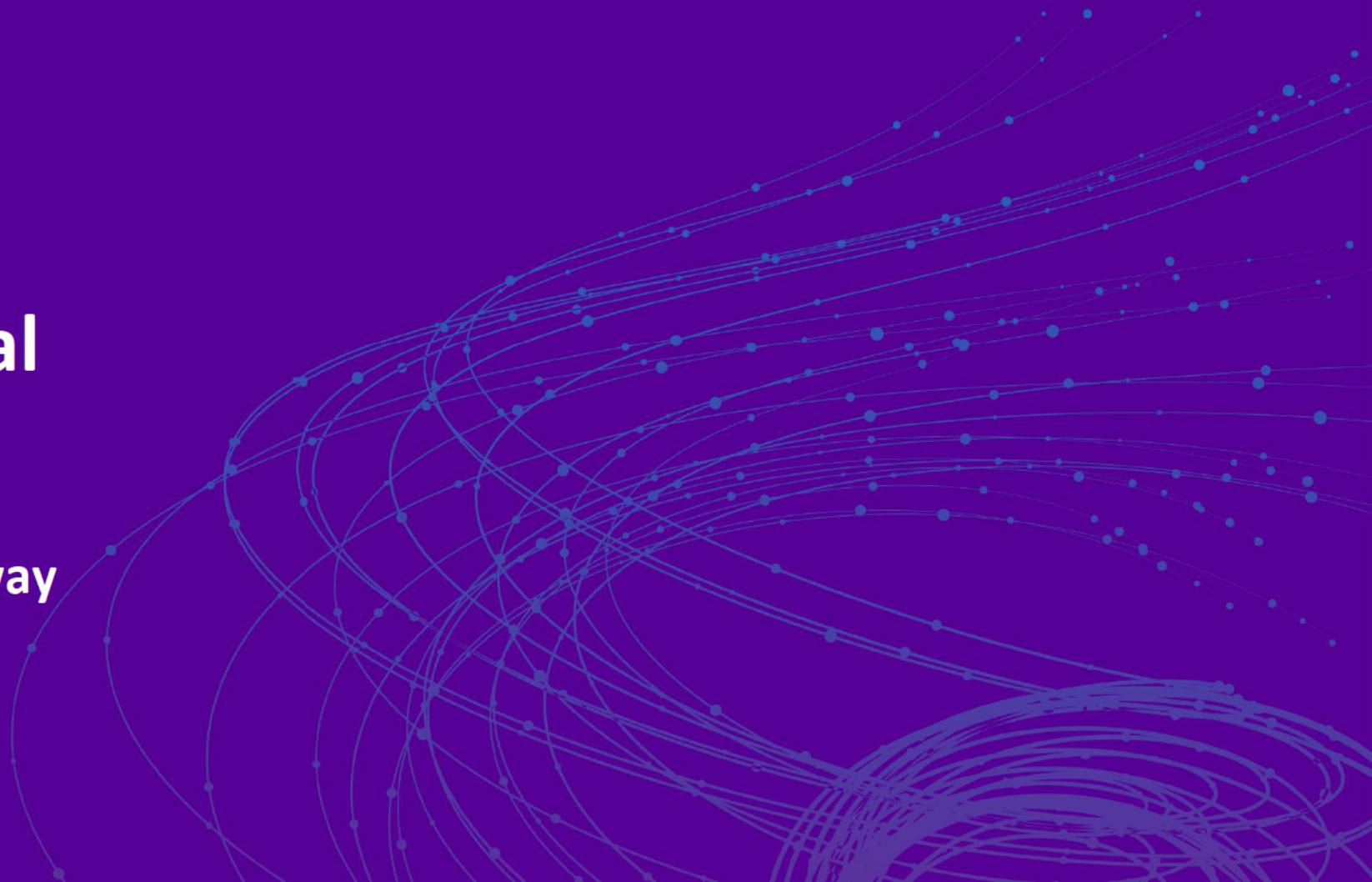
Making it real

Or keeping it that way



Standardized Security Automation

- For all endpoint types
- For all enterprise networks
- In support of network analytics and continuous monitoring

Putting Software Asset Management Standards into Practice

- For users:
  - Use the SWID tags that you already have
  - Ask your software providers for SWID tags
- For Software Creators:
  - Provide SWID tags with your software
  - Use SWID tags as a part of your SecDevOps process
- For tool developers
  - Implement SWIMA for software inventory
  - Make use of SWID tag information in analytics

Security Content Automation Protocol (SCAP) 2.0 Update

- Incorporates standardized transport protocols
- Incorporates standardized schema, beginning with Software Identification (SWID) tags
- Makes this data available to network analytics to automate security functions

Join us at https://scap.nist.gov/community.html

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Applying what you have learned

Apply What You Have Learned Today

- Next week you should:
  - Identify gaps in your software inventory
- In the first three months following this presentation you should:
  - Talk to your software providers about providing SWID tags
  - Use SWID Tags to address software asset management requirements and for vulnerability management
  - Collaborate with us on the further development of SCAP v2
- Within six months you should:
  - Provide SWID tags for software your organization produces as a part of SecDevOps and Supply Chain Risk Management practices

Security Content Automation Protocol (SCAP) 2.0 Update

Join us at https://scap.nist.gov/community.html

Resources

Consensus Standards Groups

- Managed Client Data Model and Protocols
  - Internet Engineering Task Force (IETF) Network Endpoint Assessment (NEA) https://datatracker.ietf.org/wg/nea
  - IETF Security Automation and Continuous Monitoring (SACM) http://datatracker.ietf.org/wg/sacm
- Unmanaged Clients Data Model and Protocols
  - Trusted Computing Group (TCG) www.trustedcomputinggroup.org
- Sharing Context
  - IETF Managed Incident Lightweight Exchange (MILE) https://datatracker.ietf.org/wg/mile

Whitepapers and Specifications

- SCAP v2 Whitepaper https://doi.org/10.6028/NIST.CSWP.09102018
- Guidelines for the Creation of Interoperable Software Identification (SWID) Tags https://doi.org/10.6028/NIST.IR.8060
- Resource Oriented Lightweight Information Exchange (ROLIE) Protocol https://doi.org/10.17487/RFC8322
- Software Inventory Message and Attributes (SWIMA) for PA-TNC https://doi.org/10.17487/RFC8412