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A SNIA Event

Zero Trust or Bust

Thomas Rivera, CISSP, CIPP/US, CDPSE
Cybersecurity & Privacy Professional
VMware Carbon Black

Co-chair, SNIA – Data Protection & Privacy Committee (DPPC)
Chair, IEEE – Zero Trust Security Working Group
Secretary, INCITS Technical Committee Cybersecurity & Privacy (CS1)
Secretary, IEEE Cybersecurity & Privacy Standards Committee (CPSC)

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Zero Trust: Defined

- Zero Trust is:
  - A collection of security methodologies that work together to enforce access
  - With the view that your network has already been compromised
  - Using contextual information from:
    - Identity
    - Security
    - IT Infrastructure
    - Risk and Analytics tools
  - Enabling dynamic/continuous/granular enforcement of security policies

Zero Trust: History

2003/2004	..	2009	..	2014	..	2017	2018	2019	2020	2021

Jericho Forum - ”Outside is the new inside”

Forrester - Zero Trust Research by Jon Kindervag

The Forrester Wave™: Zero Trust eXtended (ZTX)

Google’s BeyondCorp

Gartner’s 2017 CARTA framework

Jericho Forum™

Conclusion

De-perimeterization has happened, is happening, and is inevitable; central protection is decreasing in effectiveness:

- It will happen in your corporate lifetime.
- Therefore, you need to plan for it and should have a roadmap of how to get there.
- The Jericho Forum has a generic roadmap to assist in the planning.

BeyondCorp

BeyondCorp is an implementation, by Google, of zero-trust computer security concepts creating a zero trust network. It was created in 2009 in response to an APT attack. An open source implementation inspired by Google's research paper on an access proxy is known as "transcend". Wikipedia

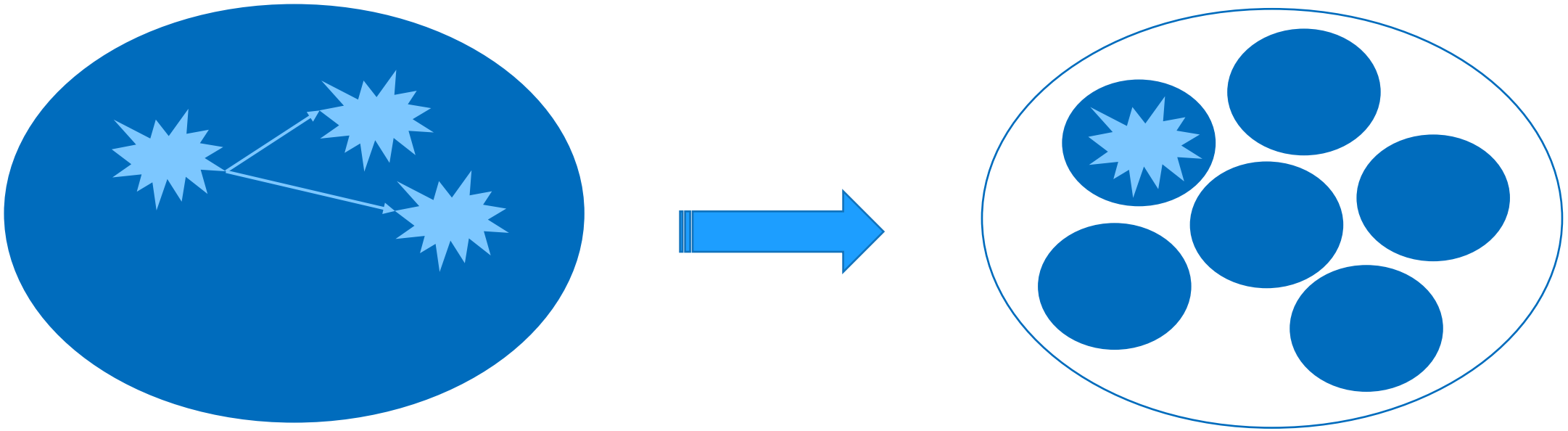
Zero Trust: Characteristics

- Zero Trust includes the following characteristics:
  - Consistent security strategy of users accessing data that resides in any form – from anywhere
  - Assumes a “never trust and always verify” stance for data access and/or services
  - Continuous authorization regardless of the originating request location
  - Increased visibility and analytics across the entire network

Zero Trust: Assertions

- Zero Trust includes the following assertions:
  - The **network is always** assumed to be **hostile**
  - External & internal **threats exist** in the environment **at all times**
  - **Network locality** is **not sufficient** for **deciding trust**
  - Every **device**, **user**, **network**, **application**, & **data** flow is **authenticated** and **authorized**
  - **Policies** must be **dynamic & calculated** from **as many data sources as possible**

Zero Trust Assumes Compromise



- So, compartmentalization is necessary

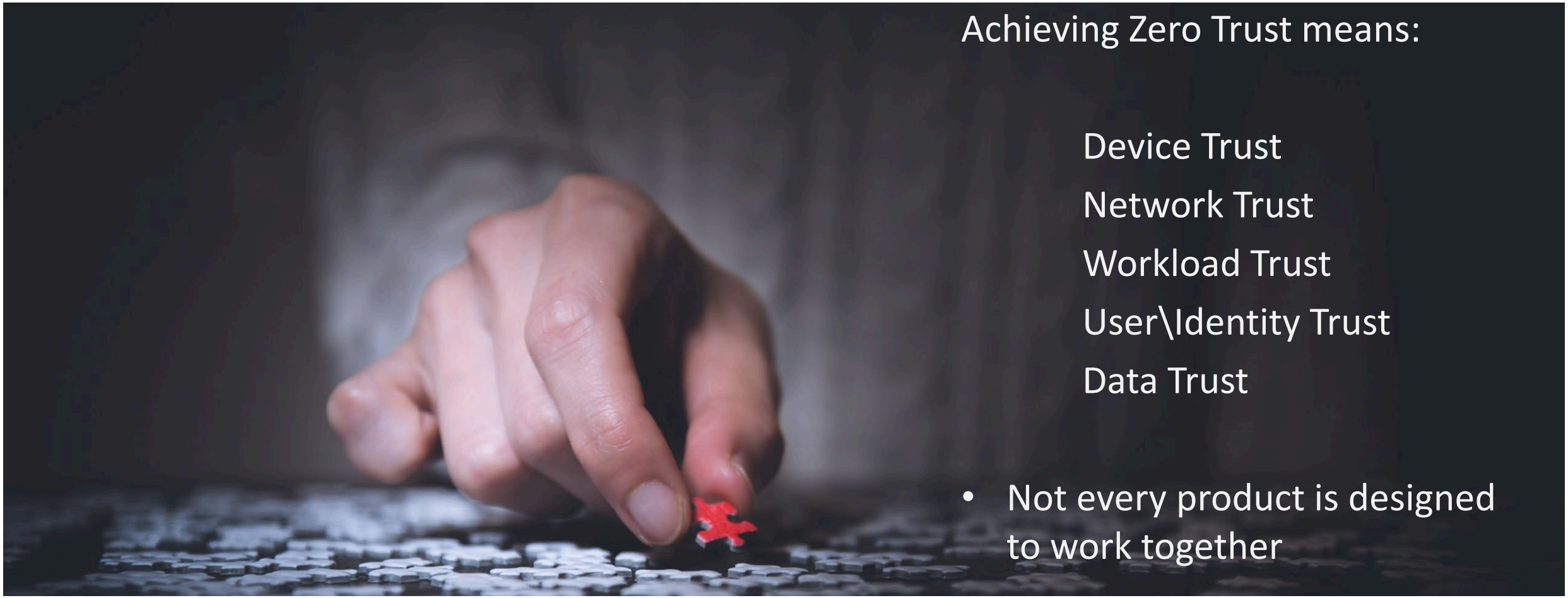
Complete Compartmentalization is not very Useful

- So, Zero Trust applies compartment-specific policies, continuously

Least Privilege	Requires knowing all “subjects”
Least Functionality	Requires knowing all “objects”
Least Accessibility (crypt)	Requires knowing access needs
Least Exposure (posture)	Requires assessing device/service/platform integrity
Coherence (peer, temporal)	Requires knowing intended, expected and observed behavior, at that specific time

…

What Zero Trust Means Now



Achieving Zero Trust means:

Device Trust

Network Trust

Workload Trust

User\Identity Trust

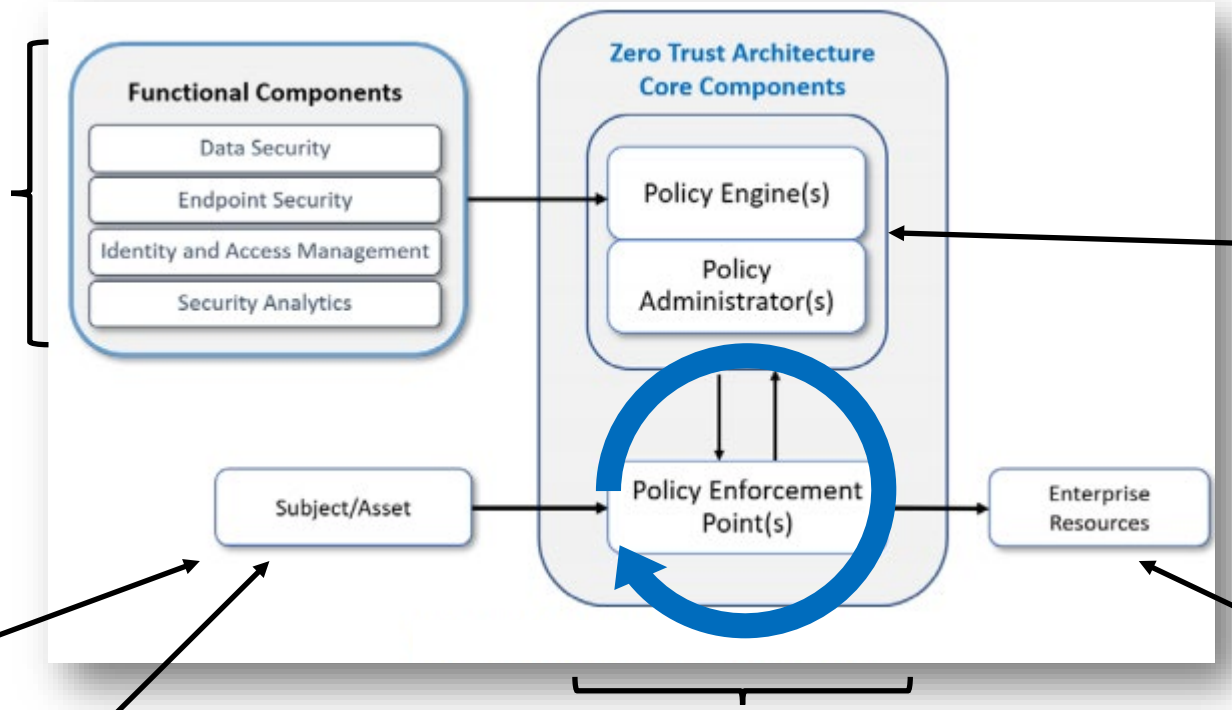
Data Trust

- Not every product is designed to work together

High-Level Zero Trust Implementation Architecture

Required Zero Trust Solution Telemetry

- Aligned on same Subject, Object and associated Transactions (Business; Not CVSS Risk)



Zero Trust Policy Statements

(e.g. Open Policy Agent, …)

Subjects

- Users, Roles
- Service Accounts
- Identity Records
- …

Assets

- Servers, Desktops
- Laptops, Tablets, Phones
- IoT Devices

Continuous Inline Zero Trust Enforcement

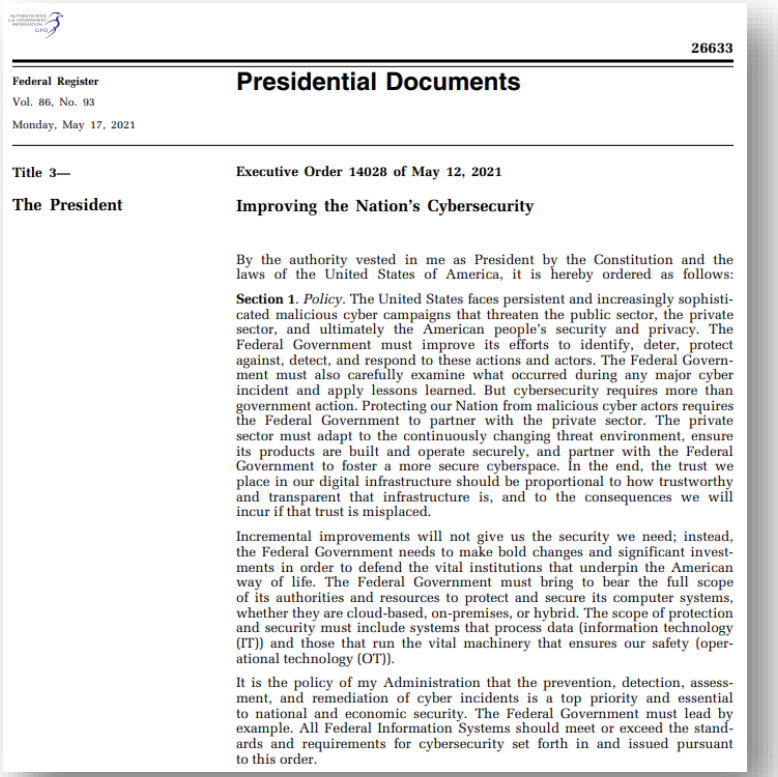
- Logically Adjacent to Resources (Objects)
- Authoritative Controls and Independent Verification

Resources

- Applications
- Services
- Micro-services/Containers (NSA)
- (on Prem, Hosted, Cloud and Edge)

Zero Trust – Why it Matters

- US Presidential Executive Order
  - EO # 14028 (Date: May 12, 2021)
  - Applies to companies doing business with the U.S. government



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Federal Register
Vol. 86, No. 93
Monday, May 17, 2021

Presidential Documents

Title 3—
The President

Executive Order 14028 of May 12, 2021

Improving the Nation's Cybersecurity

By the authority vested in me as President by the Constitution and the laws of the United States of America, it is hereby ordered as follows:

Section 1. *Policy*. The United States faces persistent and increasingly sophisticated malicious cyber campaigns that threaten the public sector, the private sector, and ultimately the American people's security and privacy. The Federal Government must improve its efforts to identify, deter, protect against, detect, and respond to these actions and actors. The Federal Government must also carefully examine what occurred during any major cyber incident and apply lessons learned. But cybersecurity requires more than government action. Protecting our Nation from malicious cyber actors requires the Federal Government to partner with the private sector. The private sector must adapt to the continuously changing threat environment, ensure its products are built and operate securely, and partner with the Federal Government to foster a more secure cyberspace. In the end, the trust we place in our digital infrastructure should be proportional to how trustworthy and transparent that infrastructure is, and to the consequences we will incur if that trust is misplaced.

Incremental improvements will not give us the security we need; instead, the Federal Government needs to make bold changes and significant investments in order to defend the vital institutions that underpin the American way of life. The Federal Government must bring to bear the full scope of its authorities and resources to protect and secure its computer systems, whether they are cloud-based, on-premises, or hybrid. The scope of protection and security must include systems that process data (information technology (IT)) and those that run the vital machinery that ensures our safety (operational technology (OT)).

It is the policy of my Administration that the prevention, detection, assessment, and remediation of cyber incidents is a top priority and essential to national and economic security. The Federal Government must lead by example. All Federal Information Systems should meet or exceed the standards and requirements for cybersecurity set forth in and issued pursuant to this order.

- Attempt to minimize any one failure from any given attack
  - Supply Chain
  - Developers
    - Insider threats
    - May change developer process, as well as product changes
    - There may be a need for confirming that the product you are developing is “zero-trust ready”

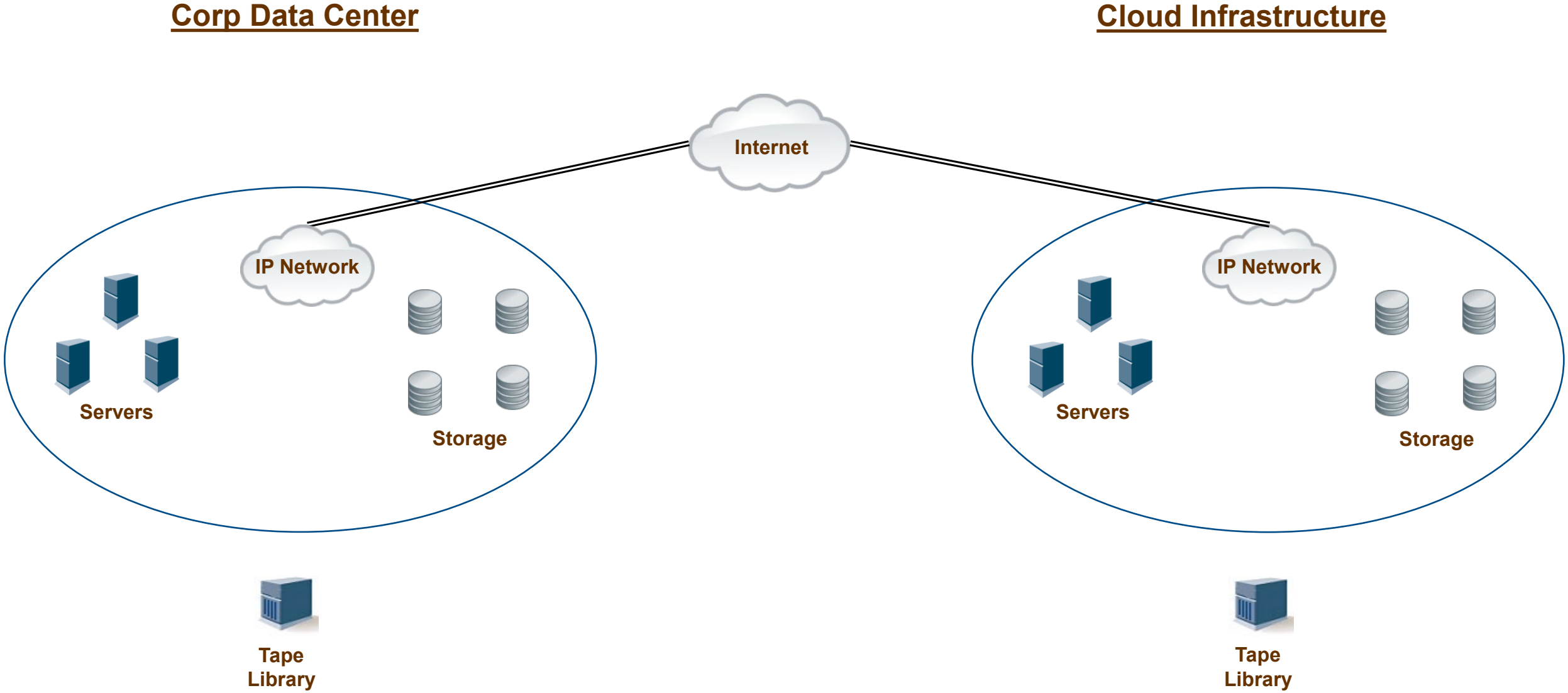
How Zero Trust relates to Storage

- Compartmentalization – Controls can be implemented at the
  - Drive level
    - Firmware level
  - Storage system level
  - Server level (where the storage is consumed)
- The idea of “implicit trust” completely goes away
- Controlling access to Data is Critical
  - Identification: Ensure users identify themselves
  - Authentication: Ensure the users verify who they say they are
  - Authorization: Ensure users are authorized to perform a given action on a specific resource
  - Access Control: Ensure users are only granted access for a given action on a specific resource

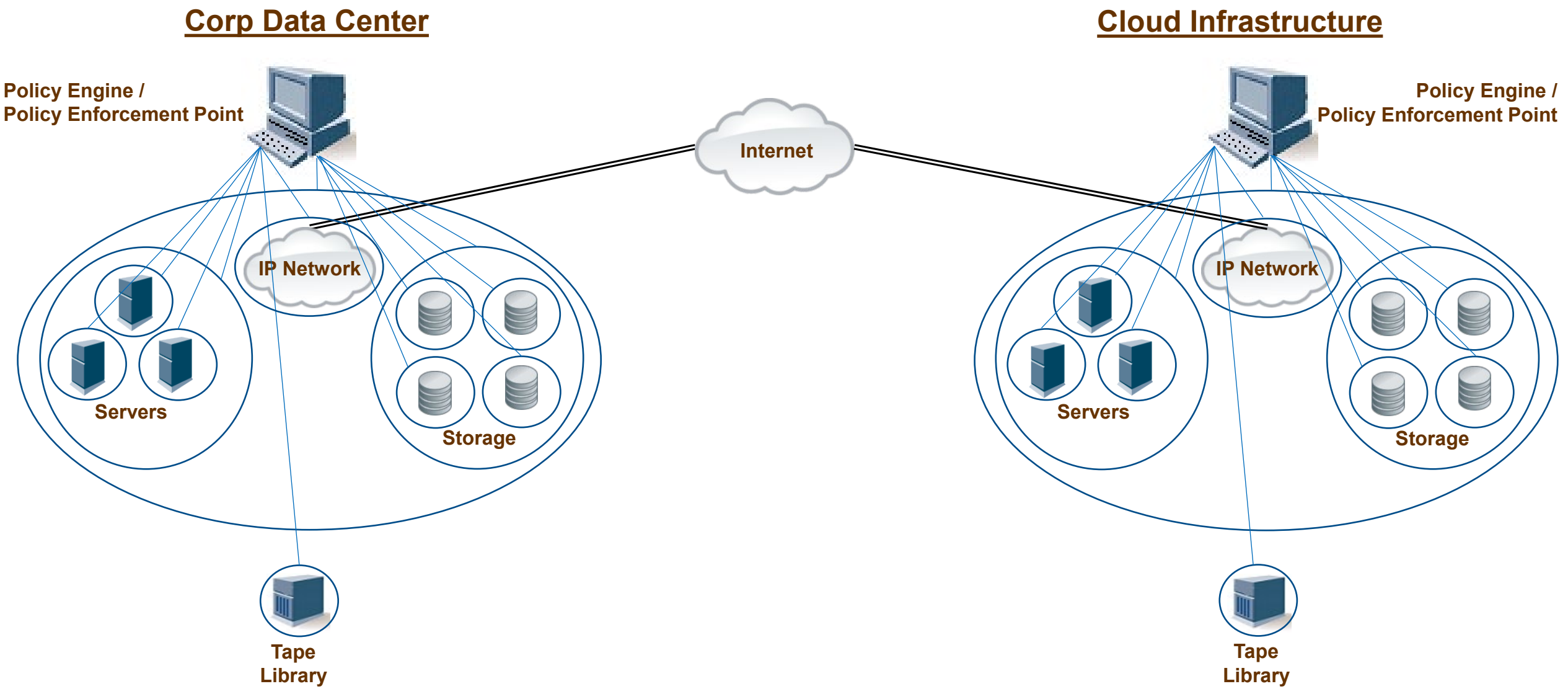
How Zero Trust relates to Storage (Cont.)

- The specific “trust” policies are critical for how it relates to the Zero Trust Policy Engine(s)
  - Real-time Policy Engine and Policy Enforcement Points (PEPs)
  - Involves continuous monitoring
    - Feedback loop, which is actively making decisions on access to resources
    - With access limitations based on when, where, etc.
- Controlling access to Data and Storage Management Plane
  - This changes dramatically based on data structure, e.g., block, file, object, etc.
- Where the Enforcement Point actions take place may impact I/O (core functionality)

Typical IT Infrastructure (Example)



Same IT Infrastructure Utilizing Zero Trust (Example)



Zero Trust Reference Architectures (Examples)

- NIST SP 800-207 https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-207.pdf
- DOD Zero Trust Reference Architecture
  https://dodcio.defense.gov/Portals/0/Documents/Library/(U)ZT_RA_v1.1(U)_Mar21.pdf
- CISA Zero Trust Maturity Model https://www.cisa.gov/publication/zero-trust-maturity-model
- NSA Embracing a Zero Trust Security Model https://media.defense.gov/2021/Feb/25/2002588479/-1/-1/0/CSI_EMBRACING_ZT_SECURITY_MODEL_UOO115131-21.PDF
- UK NCSC Zero Trust Architecture https://www.ncsc.gov.uk/blog-post/zero-trust-architecture-design-principles
- EU NIS2 Zero Trust (ENISA) https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/689333/EPRS_BRI(2021)689333_EN.pdf
- White House (US) Executive Order 14028: “Improving the Nation’s Cybersecurity”
  https://www.whitehouse.gov/briefing-room/presidential-actions/2021/05/12/executive-order-on-improving-the-nations-cybersecurity/

Zero Trust: Summary

- Zero Trust is a journey – not a destination
- There are multiple Zero Trust architectures, frameworks and guidance documents to help guide in the planning and implementation
- Phased approach is usually best when planning implementation
- At all stages of the application lifecycle, ensure that access is granted only on an allow-list basis—in other words, access is only granted if explicitly allowed
- Security vendor interoperability will be one of the keys to implementation success
- The various pieces needed implement zero trust for storage is not specified yet
  - The current major focus is on the U.S. government

Thank You !

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