NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Hypervisor and Storage System

Project 2016-02 Modifications to the CIP Standards

CIP SDT Members

May 28, 2020

RELIABILITY | RESILIENCE | SECURITY




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Questions

Please use the Q&A feature in WebEx to ask any relevant questions during the presentation. We will be holding questions until the end of the presentation.

Agenda

- Hypervisor
  - What is a Hypervisor
  - Benefits of Hypervisor
  - Challenges for CIP Compliance
  - Changes Made
- Storage
  - What is a storage system
  - Benefits of storage
  - Challenges for CIP Compliance
  - Changes Made
- Hyper-Converged

What is a Hypervisor?

- The Hypervisor is the core software that provides server virtualization.
- Two basic types
  - Bare metal
    - IBM PowerVM
    - VMWare ESXi
    - Xen
    - Microsoft Hyper-V
  - Hosted
    - Virtualbox
    - VMWare workstation

Benefits of a Hypervisor

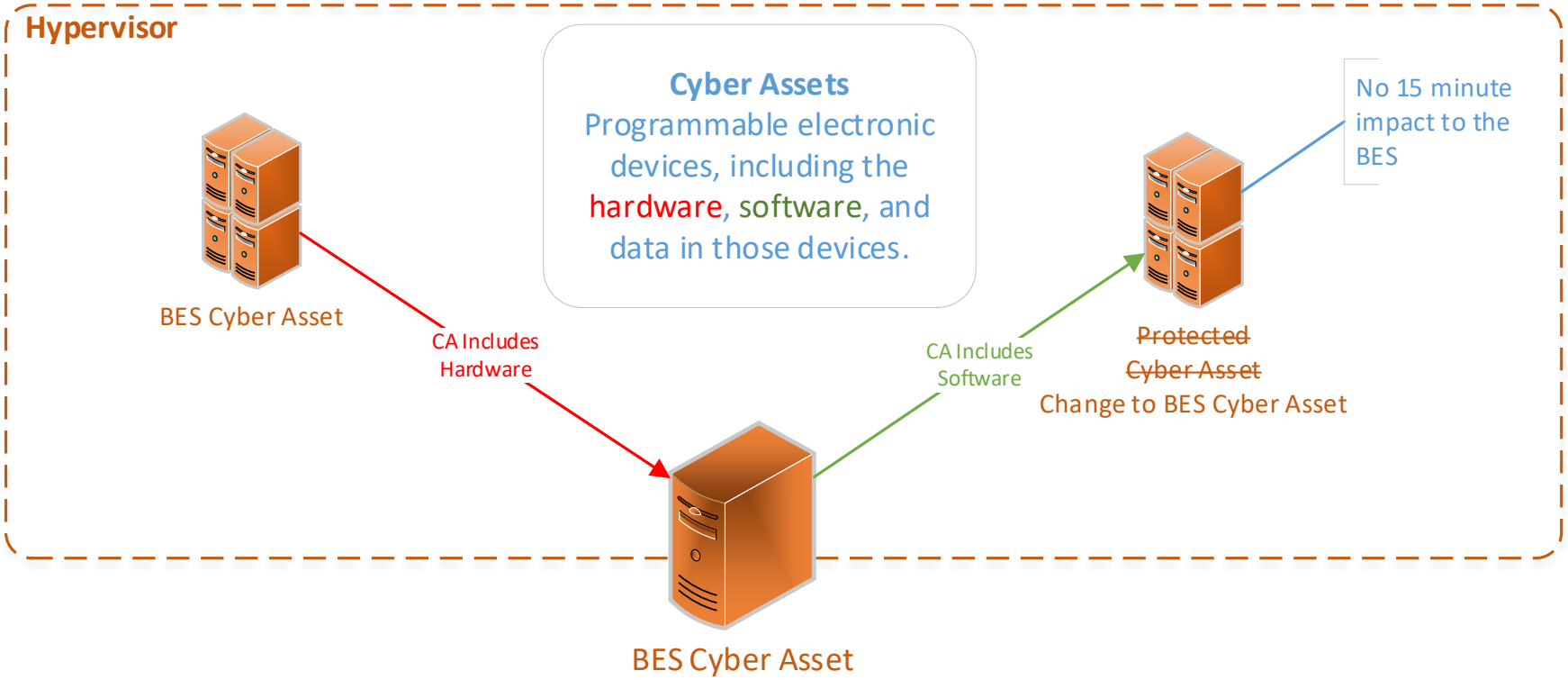
Hypervisors provide many benefits

- Efficiency
- Security
- Disaster Recovery
- Software Mobility
- Separation of the hardware/software Lifecycle

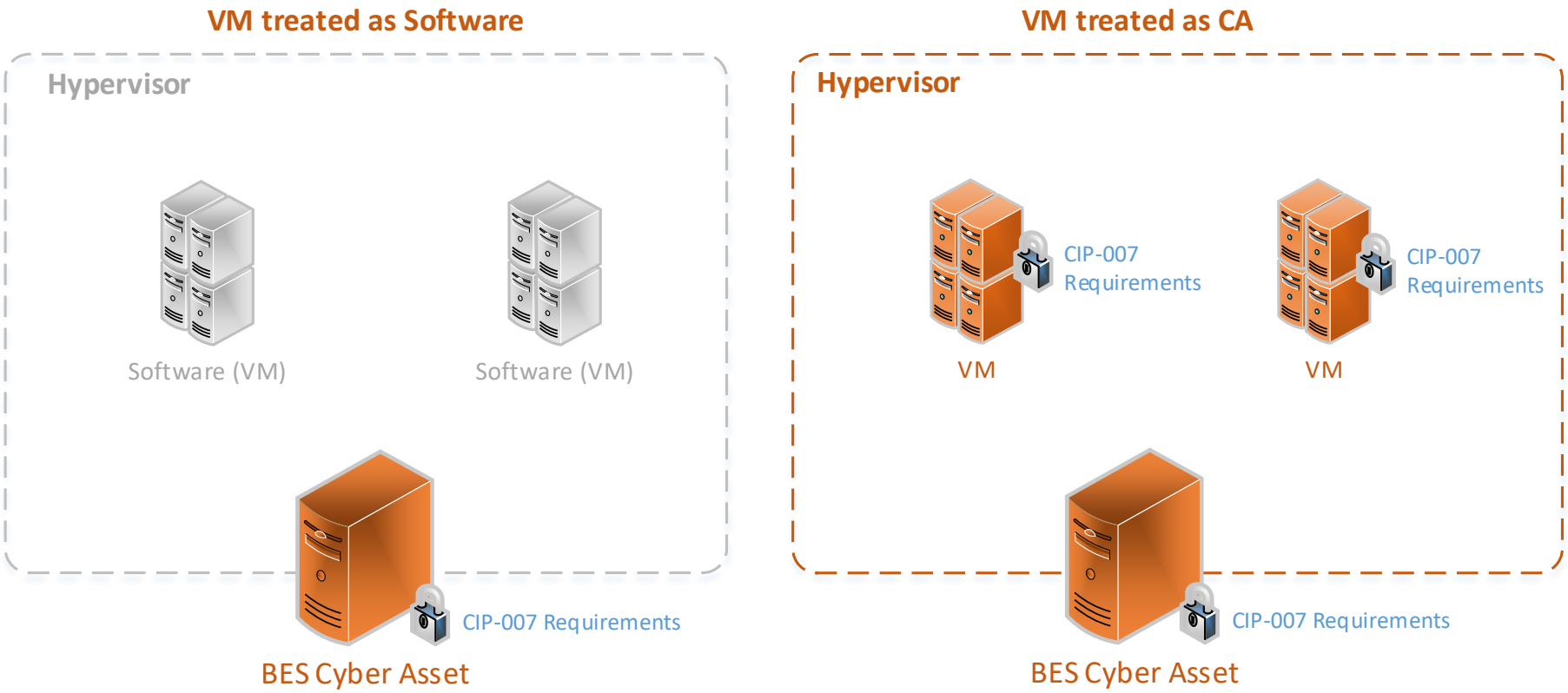
Hypervisor Challenges

- Some of the challenges for CIP Compliance:
  - Definitional Construct
  - Security Gaps

Hypervisor Challenges



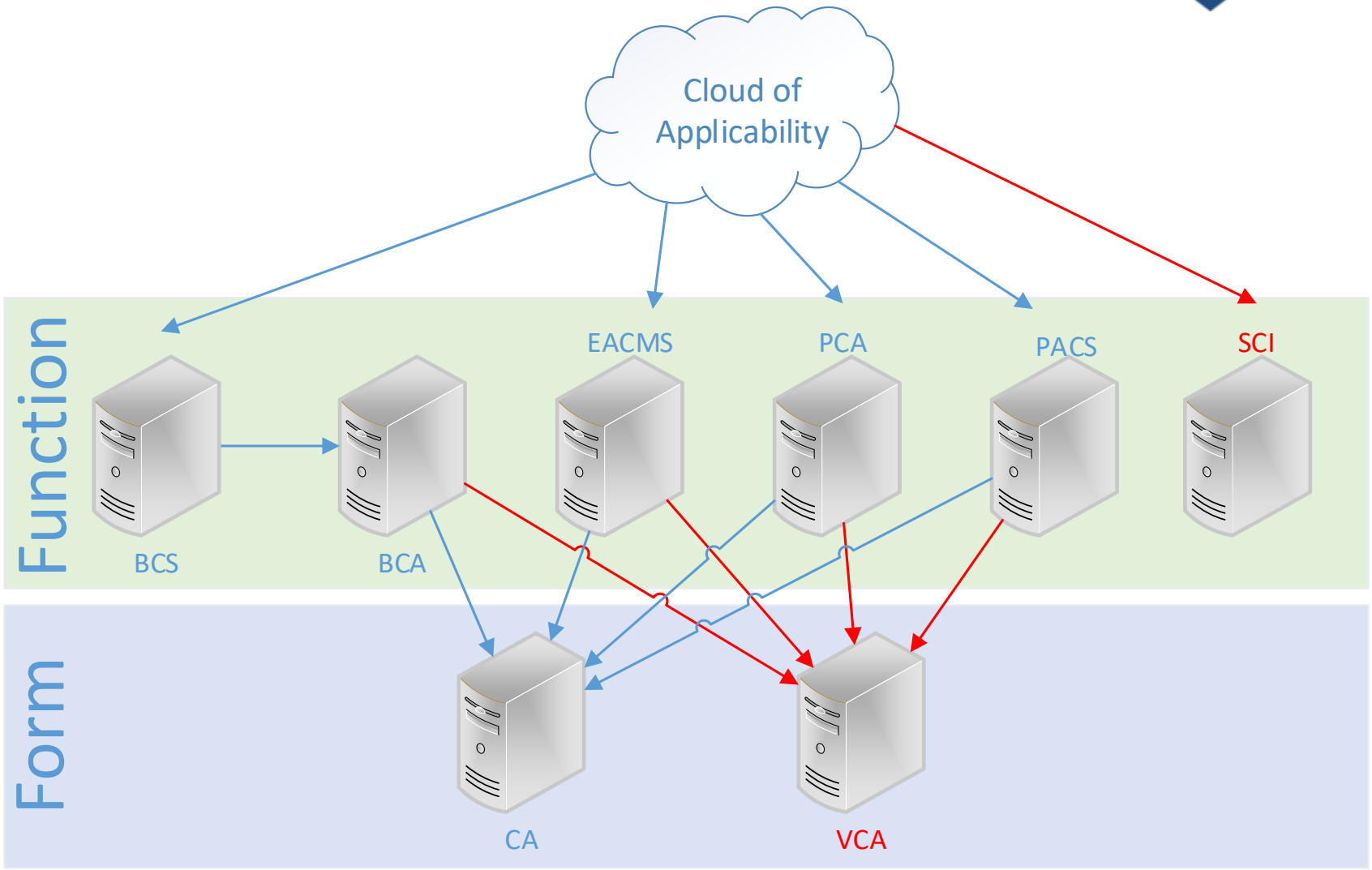
Hypervisor Challenges



Hypervisor Changes

- Some of the changes made to support Hypervisors:
  - **Virtual Cyber Asset (VCA):** A logical instance of an operating system or firmware hosted on Shared Cyber Infrastructure. *(Subject of a future webinar)*
  - **Shared Cyber Infrastructure (SCI) :** One or more programmable electronic devices (excluding Management Modules) and their software that share their computer or storage resources with one or more Virtual Cyber Assets or other Cyber Assets; including Management Systems used to initialize, deploy, or configure the SCI.
  - **SCI applicability Example:**
    - "SCI hosting High or Medium Impact BCS or their associated PACS, EACMS, or PCA."

Hypervisor Changes



Hypervisor Changes

*NEW CIP-005 Requirement R1 Part 1.2 (Applicable to SCI)

- *Affinity – Protect from side-channel attacks by preventing sharing of CPU/Memory*

"1.2.1. Management Systems may only share CPU and memory with other Management Systems and its associated SCI, per system capability.

- *Controlled Communications – Limit communication to management*

1.2.2. Have one or more methods for permitting only needed and controlled communications to and from its Management Interfaces and Management Systems, logically isolating all other communications.

- *Denied Tenant Communication*

1.2.3. Deny communications from BES Cyber Systems and their associated PCAs to the Management Interfaces and Management Systems."

Hypervisor Changes

*NEW CIP-007 Requirement R1 Part 1.3 (Applicable to SCI)

- *Alternative to Ports and Services for Shared Cyber Infrastructure*
- "Enable only services that have been determined to be needed by the Responsible Entity, per system capability."

What is a Storage System

- Resources shared are consumed by another device outside of itself.
- In general, consists of:
  - One or more Storage controllers
    - These can be hardware or software
  - Disks
    - Spinning disks (traditional Hard Drives)
    - Solid State disks (Flash)
- Examples are SAN, NAS, DAS, & Cloud

Benefits of a Storage System

- Some of the benefits realized by the use of storage system:
  - Deduplication
  - Compression
  - Snapshots
  - Centralized management of data
  - Advances capabilities:
    - Continuous Backup
    - Business Continuity
    - Disaster Recovery
    - Cloud extension

Storage System Challenges

- Some of the challenges for CIP compliance:
  - Definitional Construct
  - Where is your data?
  - Security Gaps

- NOTE: Deduplication

Changes made for Storage System

- Some of the Changes made to support Storage Systems:
  - SCI Definition
  - SCI Applicability
  - CIP-005 Requirement R1 Part 1.2
  - CIP-007 Requirement R1 Part 1.3
  - NOTE: CIP-011

Hyper-Converged

- Hyper-converged infrastructure (HCI) is a software-defined IT infrastructure that virtualizes all of the elements of conventional "hardware-defined" systems. It includes:
  - Hypervisor
  - Software-defined storage
  - Virtualized networking (software-defined networking)
- The software defined storage is often local disks within the physical servers. Most hardware vendors have their own flavor of this available now. Some examples of this are:
  - NetApp HCI
  - Cisco Hyperflex
  - Nutanix
  - DellEMC VxRail

Hyper-Converged Challenges

- Because of how the HCI Storage System is designed, separating systems of differing impact may not be possible.
- Where is your data?
- Deduplication

What we Covered

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Q&A Objectives

- Informal Discussion
  - Via the Q&A feature
  - Chat only goes to the host, not panelists
  - Respond to stakeholder questions
- Other
  - Some questions may require future team consideration
  - Please reference slide number, standard section, etc., if applicable
  - Team will address as many questions as possible
  - Webinar and chat comments are not a part of the official project record
  - Questions regarding compliance with existing Reliability Standards should be directed to ERO Enterprise compliance staff, not the Standard Drafting Team.

Questions and Answers