# Alliance Scope and Goals

Scope

- Promote development and usage of standard base approach for substation digitalization
  - Create Specification, Drive Market Adoption and Ecosystem Development
  - Use POC and Pilots as development tools to learn and refine specifications
  - Collaborate with Standards organizations

Goals

- Specification for Unified Edge for Substations
  - Edge Architecture including Hardware, SDI, Security and edge-to-Control center
  - Standardized compute hardware and Interfaces
  - Standardized application interface(API)
- Promote Market Adoption
  - Marketing Programs to promote concept to utilities and ecosystem
  - Webinars and presence at various trade shows
- Defining Ecosystem Partner R&R
  - Function base committees to drive ecosystem

vPAC Organizational Structure
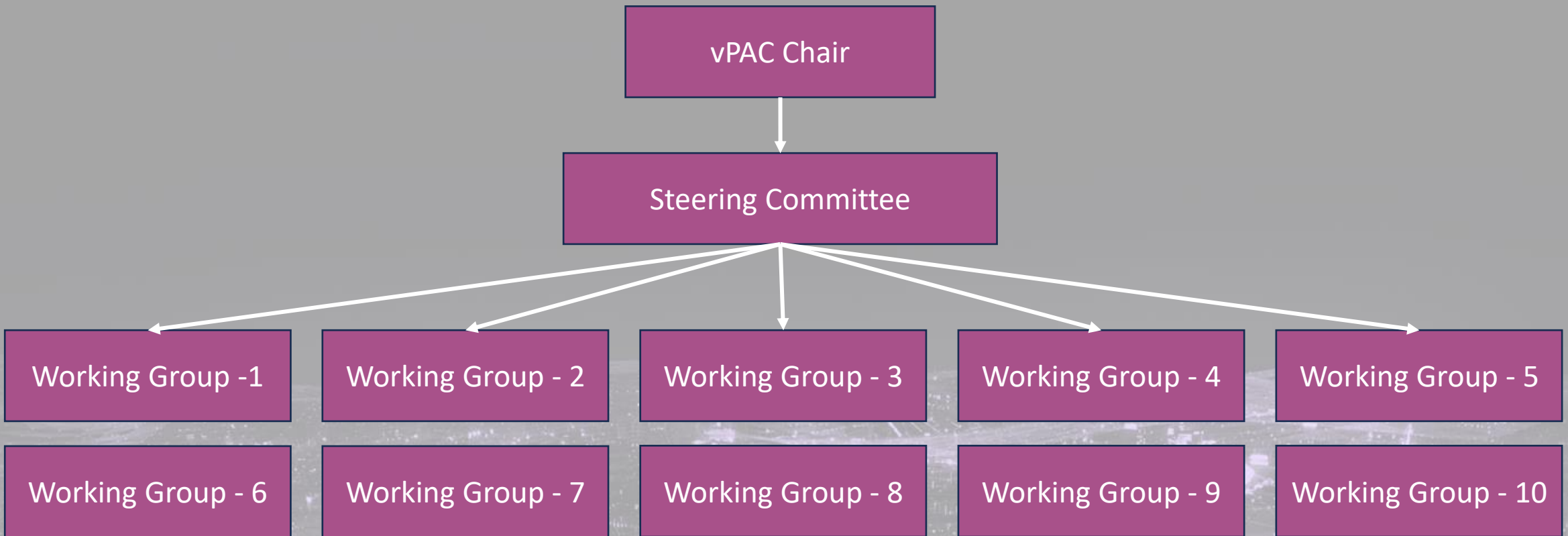
vPAC Alliance

"The vPAC (virtual Protection, Automation and Control) Alliance is a coalition of utilities and industry partners with a common desire to drive a standards-based, open, interoperable, and secure software-defined architecture to host PAC solutions for power system substations"

▪ This presentation is designed to educate utilities and the broader smart grid ecosystem on the:

      - technology of software-defined architecture in substations

      - scope and goals of the vPAC Alliance

      - benefits, responsibilities and criteria for joining

vPAC Chair: Brant Heap, Manager, PAC Strategy, Salt River Project
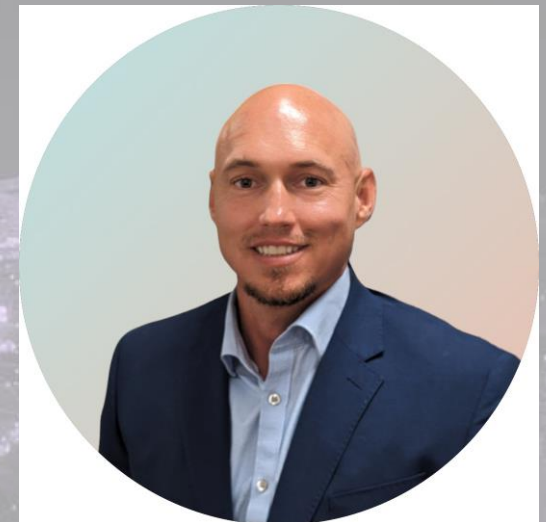
vPAC Alliance Members List

Working Groups

- Applications Chair — Zeus Xioco, SCE
- Architecture Chair — Kevin Ludwig, B&V
- Cybersecurity, Chair — Mike Carbary, SRP
- Hardware Chair — Dean Samara-Rubio, Intel
- Life Cycle Management Chair — Christopher Pritchard, Omicron
- Marketing Chair — Prithpal Khajuria, Intel
- Software Chair — Anthony Sivesind, SRP
- Systems Chair — TBD
- Workforce & Change Management Chair — TBD

Member Criteria

1. Customer: The member should be responsible for running grid operations such as DSO, TSO and Power Generation.

2. Expertise: The member should possess expertise in Protection, Automation & Control and have a proven track record of providing products or services to utilities.

3. Innovation: The member should be committed to innovation and be willing to invest in research and development to ensure the alliance remains competitive.

4. Resources: The member should be able to contribute products, infrastructure, subject matter expertise and human resource to the success of the alliance.

5. Commitment: The member should be committed to the long-term success of the alliance and be willing to invest time, resources, and effort into its growth and development.

6. Compatibility: The member should share the same values, vision, and goals as the other members of the alliance, and should be willing to work collaboratively towards achieving those goals.
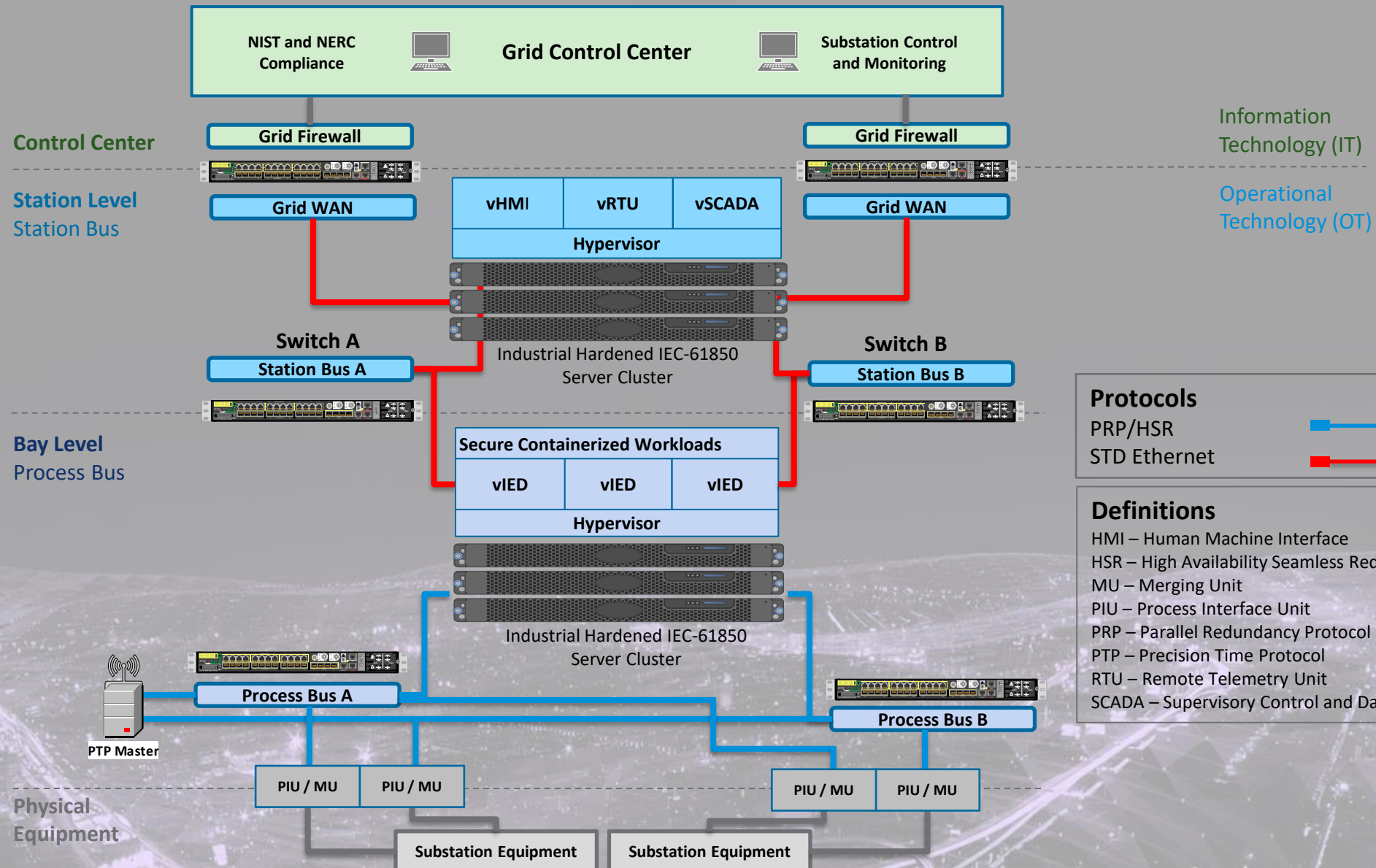
Infrastructure

VIM – Virtual Infrastructure Manager

VUE – Virtual Utility Edge

VUF – Virtual Utility Function

VIM – Virtual infrastructure manager
(Management Platform)

VUE - VIRTUAL UTILITY EDGE

VUF VUF VUF VUF VUF

VUE - VIRTUAL UTILITY EDGE

VUF VUF VUF VUF VUF

VUE – VIRTUAL UTILITY EDGE

VUF VUF VUF VUF VUF
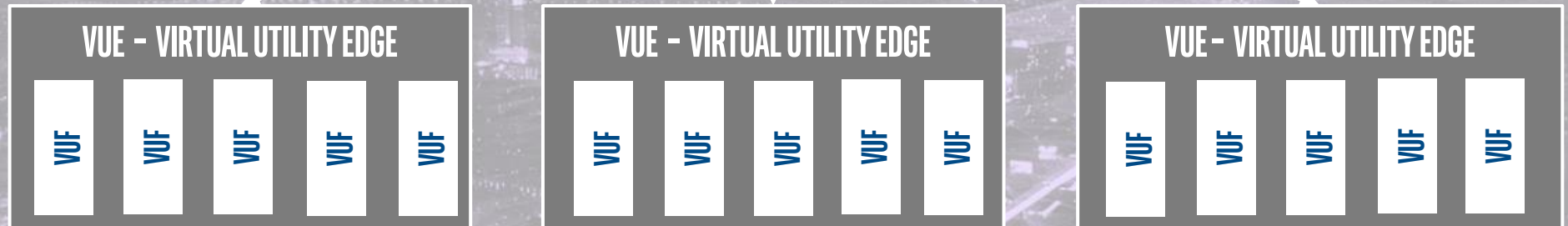
vPAC- Architecture

vPAC Workloads

Automation & Control Work Loads

Distributed ADMS@eDge
Edge Analytics & Asset Monitoring
Security Firewall and Anomaly Detection
Business Intelligence & Autonomous Control
RTU and HMI
Asset Health Monitoring
Frequency and Voltage Regulation
Transformer Tap Position Monitoring
Load Curtailment and Balancing
Capacitor Bank Controller
Fault Detection & Event Recorder
Transformer Monitoring w/ Infra-red Cameras
Phasor Measurement Unit (PMU)
Protocol Translation & Data Aggregation
Analytics using ML

Standardized Rugged Hardware

IEC 61850 – 3 Class 2

SDI

— Virtualization Software Stack

OT Applications

— RTU/SCADA Software
— HMI Software
— Phasor Measurement Unit(PMU)
— Asset Health Monitoring & Analytics
— Automation Controllers
— Event Recorder & Anomaly Detection

IT Applications

— vFirewall, vRouter, vSwitch, Security

## Maximize Utilization of Renewables

Protection & Control Work Loads

Linear Protection
Distance Protection
Differential Protection
Feeder Protection
Transformer Protection
Motor Protection
Generation Protection
Bus Protection
CapBank Protection
Asset Health Management
Analytics using ML
Advanced Restoration Schemes
Fault Type Classifications
Event Correlation

P&C Virtualization
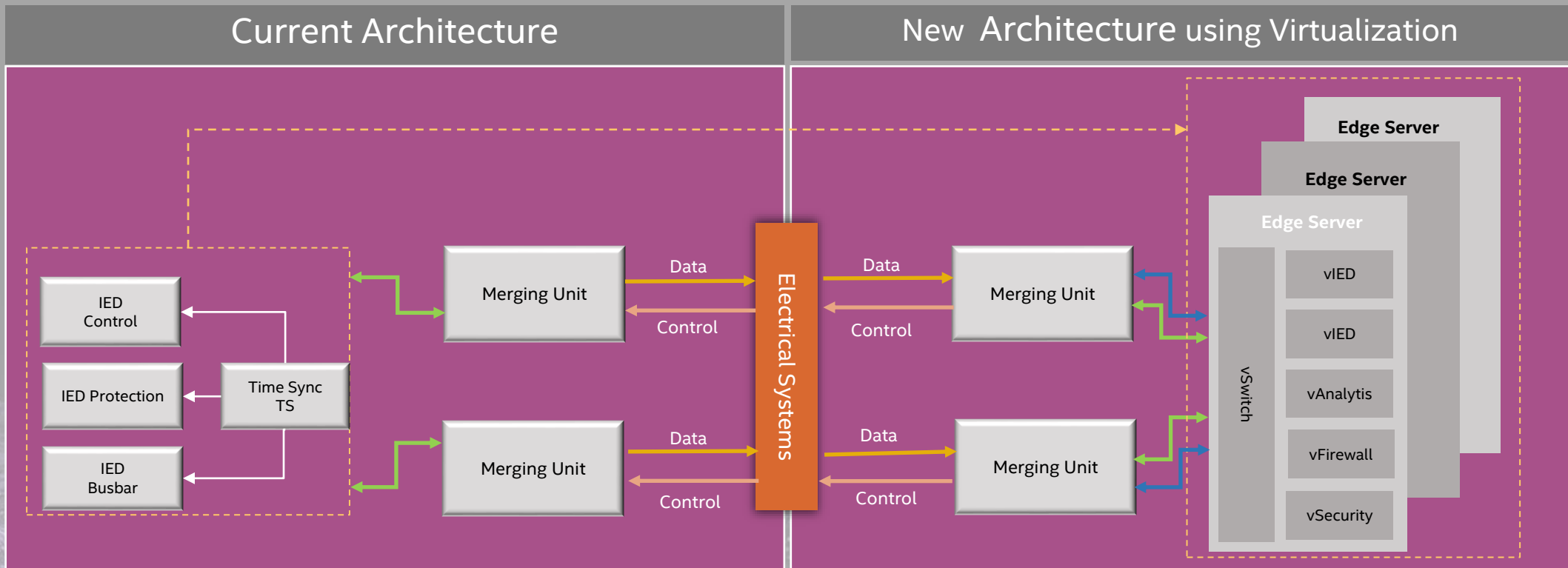
Platform (Edge-To-Cloud)
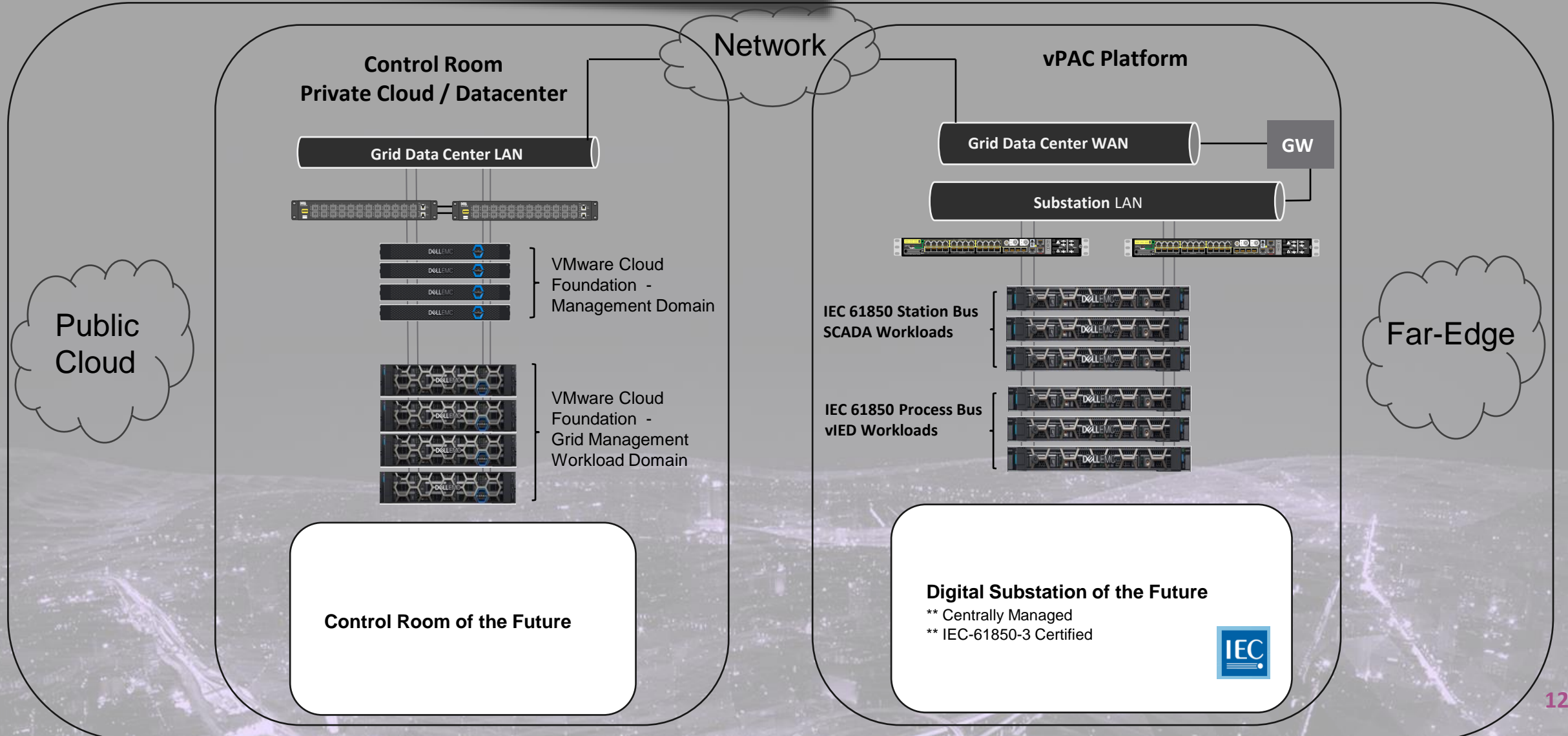
Thank You

Backup

Digitalization with Virtualization

vPAC alliance

Substation in 2024

Future Substation

IED
IED
IED
IED
IED
Firewall
Security
Router

Rugged Servers
(IEC – 61850 – 3 class 2 & ANSI 1613)

Partition	Isolation	Encapsulation	Hardware Independence

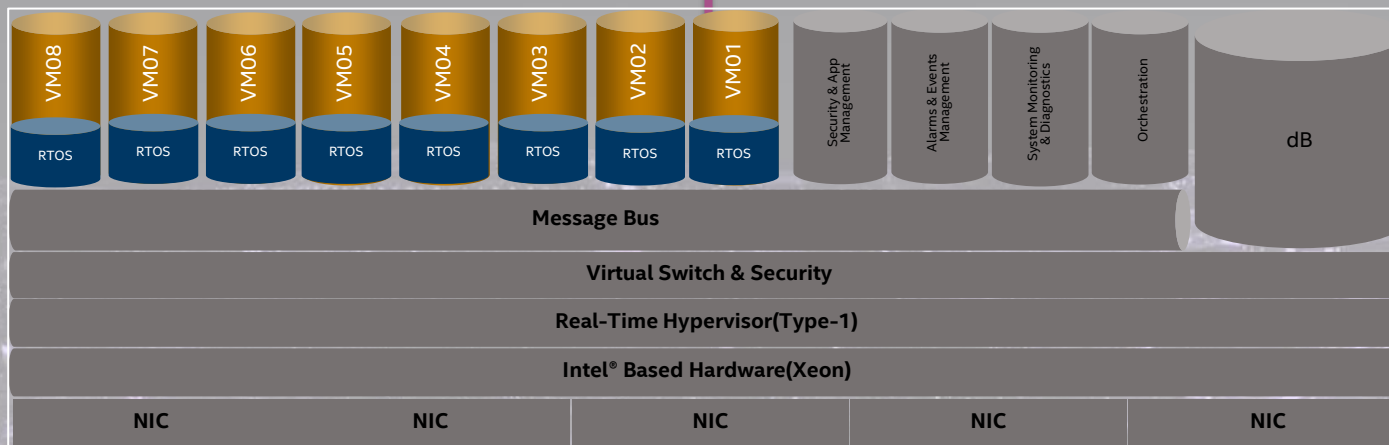| Standardize Hardware Platform	Improve Reliability, Safety and Security	Reduce Capital Investment	Reduce Operation and Maintenance Cost

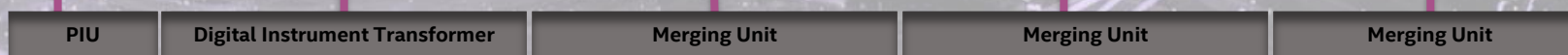| Reduction in Devices	Reduction in O&M Cost

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vPAC System
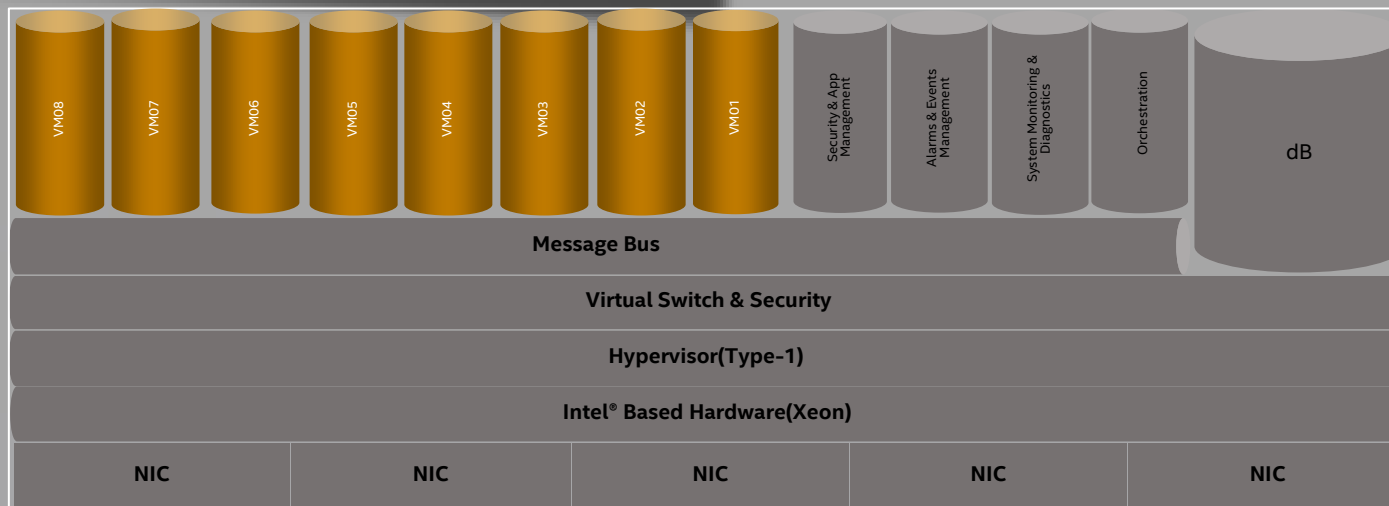
Virtualized Automation & Control

Virtualized Protection & Control System

Station Bus

Process Bus

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Leveraging Virtualization Technology

Grid Control Center

vCenter · vSphere · vPAC Mgmt · vSAN Witness

Control Center

Grid Firewall — Grid Firewall

Information Technology (IT)

Station/Bay Level
Station/Process Bus

Grid WAN — Grid WAN

Operational Technology (OT)

vPAC	vPAC Mgmt	Cyber-security
vPAC	SCADA	Network Mgmt

Hypervisor

Industrial-Hardened IEC61850-3 Server Cluster

PTP Clock

Station/Process Bus LAN A (PRP)

Station/Process Bus LAN B (PRP)

Physical Equipment

MU · MU — MU · MU

Substation HV Apparatus — Substation HV Apparatus

Protocols
PRP/HSR
STD Ethernet

Common Acronyms
HMI – Human Machine Interface
HSR – High Availability Seamless Redundancy
HV – High Voltage
MU – Merging Unit
vPAC – virtual Protection, Automation, and Control
PRP – Parallel Redundancy Protocol
PTP – Precision Time Protocol, IEC 61850-9-3
RTU – Remote Telemetry Unit