



Virtualized Power System Applications and Hardware-In- The-Loop Testing

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With Live Demo!

About Tesco Automation



Design & Test IEC 61850 Protection, Automation, and Control (PAC) systems for end users



IEC 61850 standards development



IEC 61850 in-depth training



Forefront on the application of Virtualized PAC systems



System Modeling with Hardware-In-The-Loop (HIL) testing

Contents

What does
Digitalization
Look Like?



Testing:
The What and
The How



Live Demonstration!



What does Digitalization Look Like



- IEC 61850
 - International standard defining communication protocols for Intelligent Electronic Devices
 - Standardized framework for interoperability
 - Machine-Readable Standard
 - Foundation for telemetry, protection-speed signals, and digitized streams of sensor information

Enables the Shift from Hardware to Software

What does Digitalization Look Like



-
- vPAC Alliance – Virtual Protection Automation and Control Alliance
 - Established to advocate for standards that promote flexible, manageable, and interoperable platforms within the energy sector
 - Focuses on advancing the adoption of virtualization within substations

Enables the Software to Scale

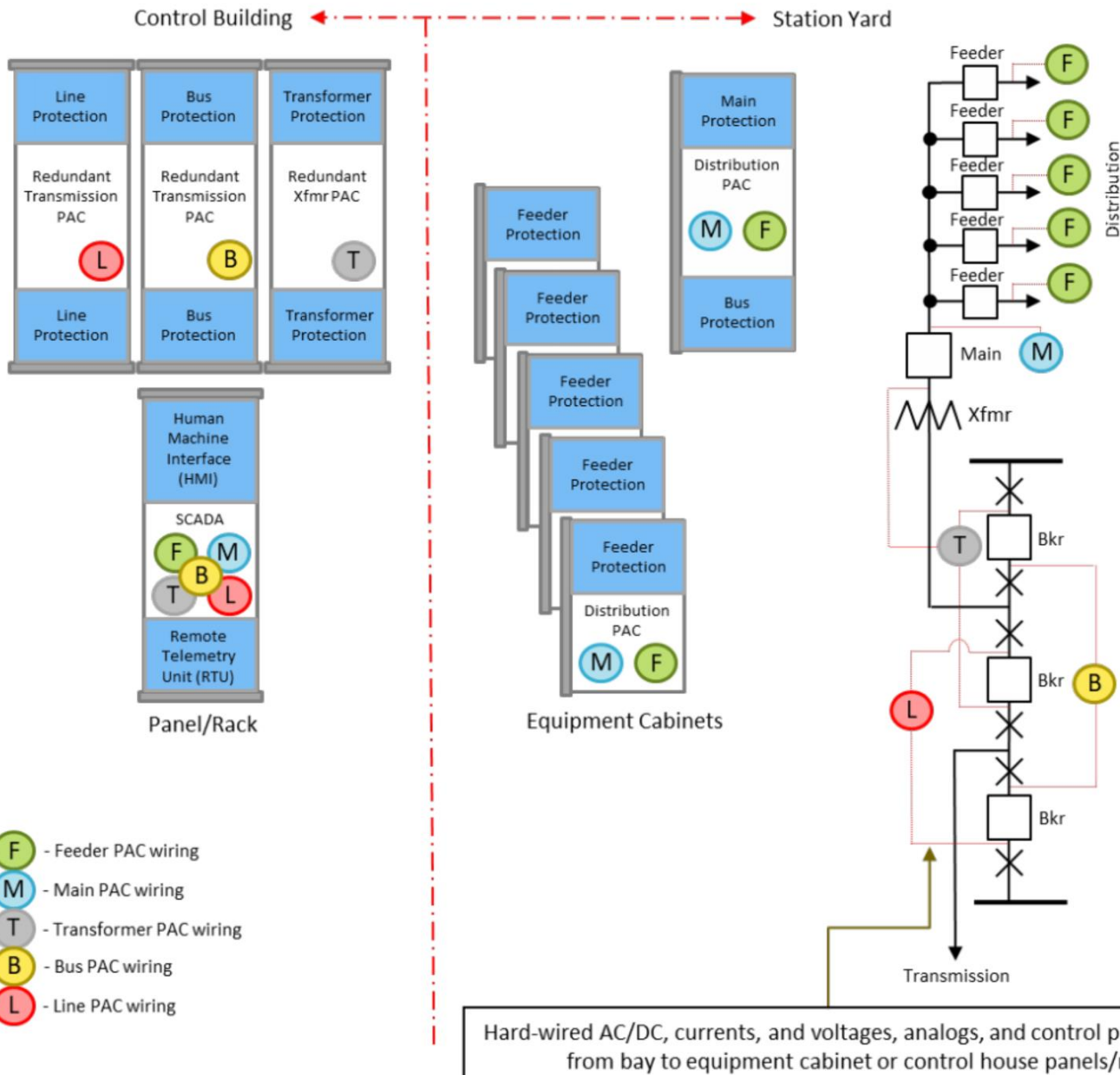
Take all of
this (and
more)...



...Place it on this

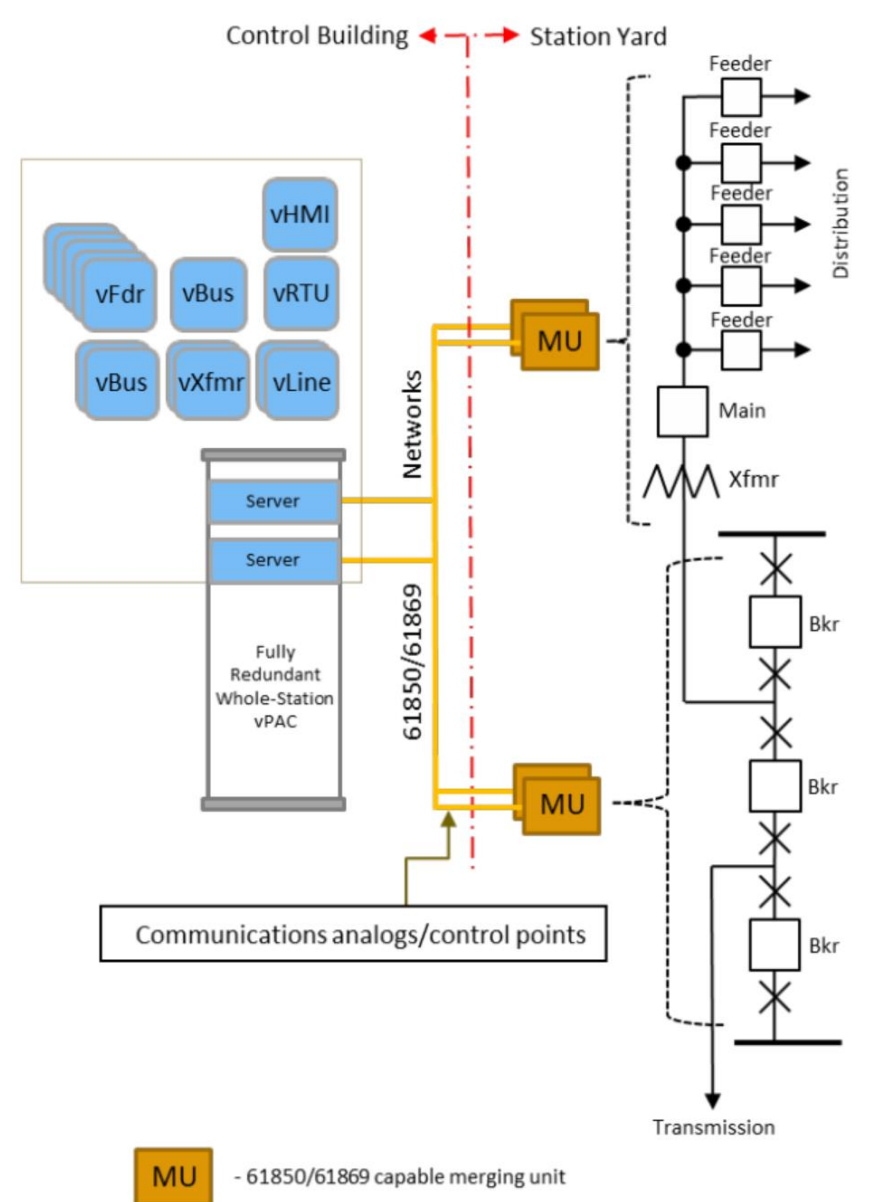


Traditional



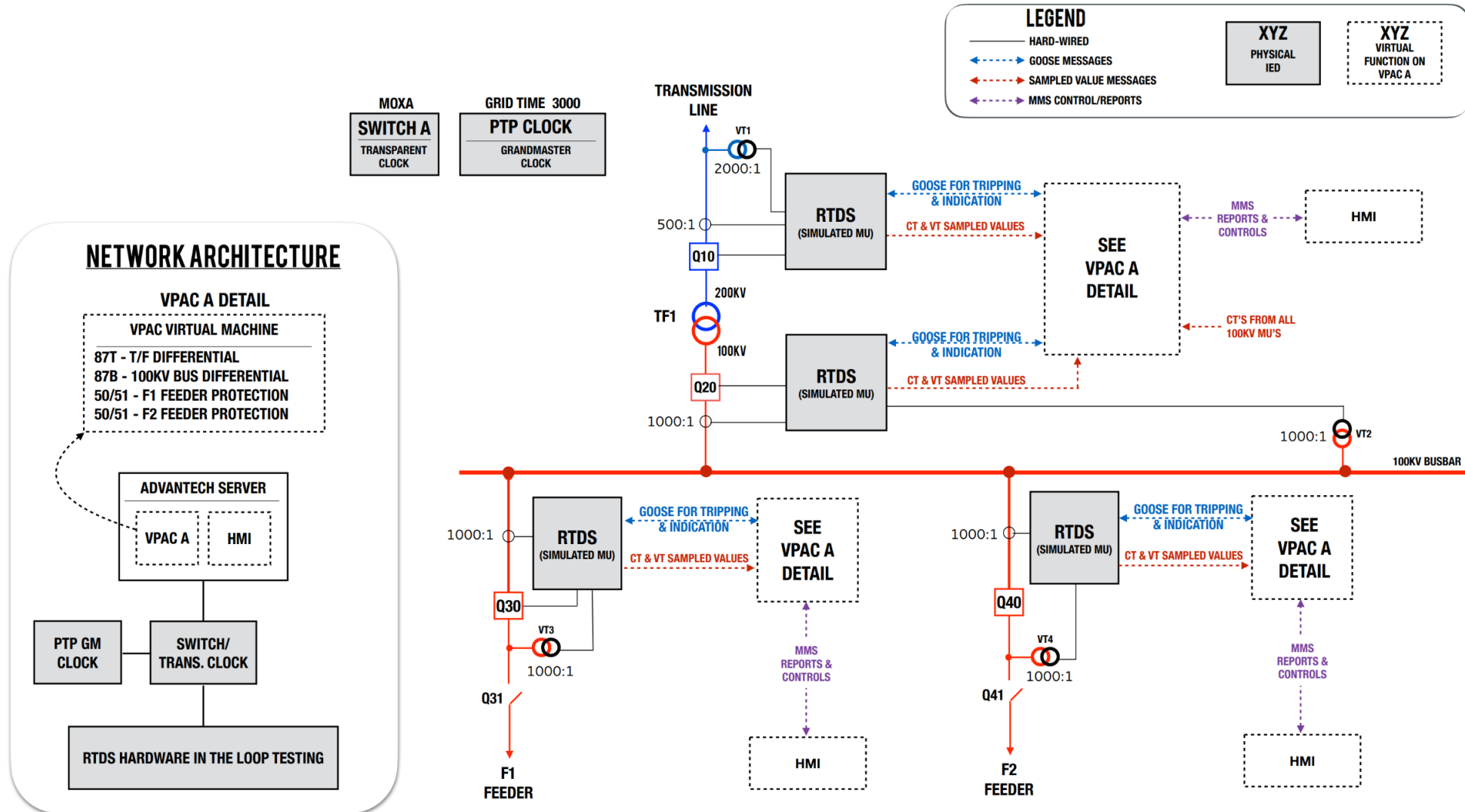
Hard-wired AC/DC, currents, and voltages, analogs, and control points from bay to equipment cabinet or control house panels/racks

vPAC



Virtualized Power System Testing: The What and The How

Tesco VPAC Demonstration System



Hardware Setup

- GPS Clock providing PTP time source
- Server configured with 24 core Intel Xeon processor, 128GB RAM
- Real Time Simulator with Network Interfaces for Sampled Value streams
- Network Switch with 28 ports



Hardware Setup

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Software Setup

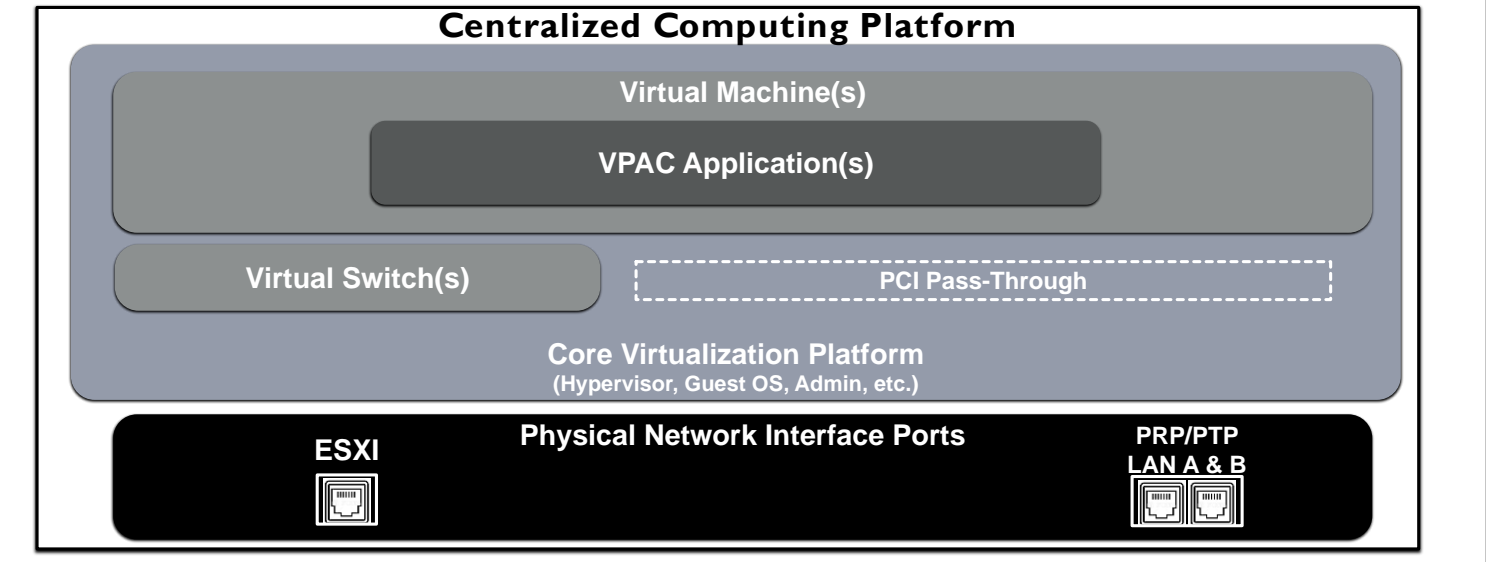
Server Side - DUT

- VMWare ESXi Hypervisor
- ABB SSC600 Centralized Protection Platform as a VM
- Windows VM for management and configuration

Test Side

- Test Computer running RTDS RSCAD
- Web browser for interface to SSC600

Virtualization Layers

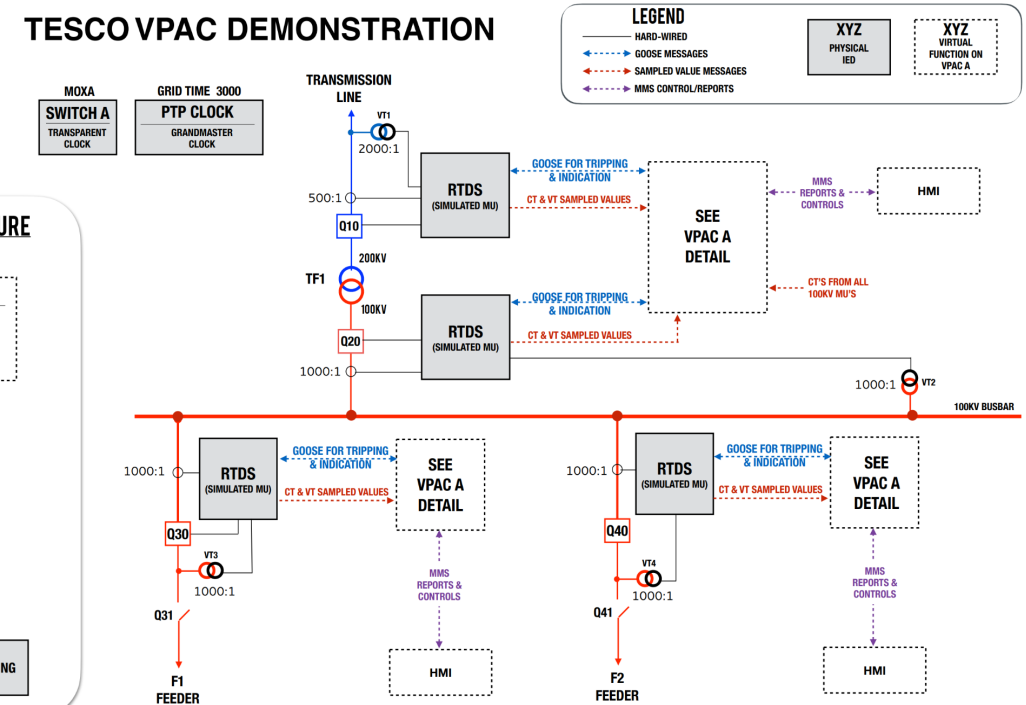
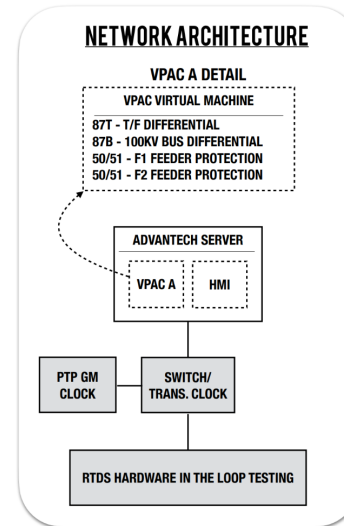


Real-Time HIL Testing

- Simulate
 - Physical Primary system
 - Secondary systems like MU
- Output
 - Bus voltages and line currents
 - Status of the breaker
- Receive
 - Trip and reclose

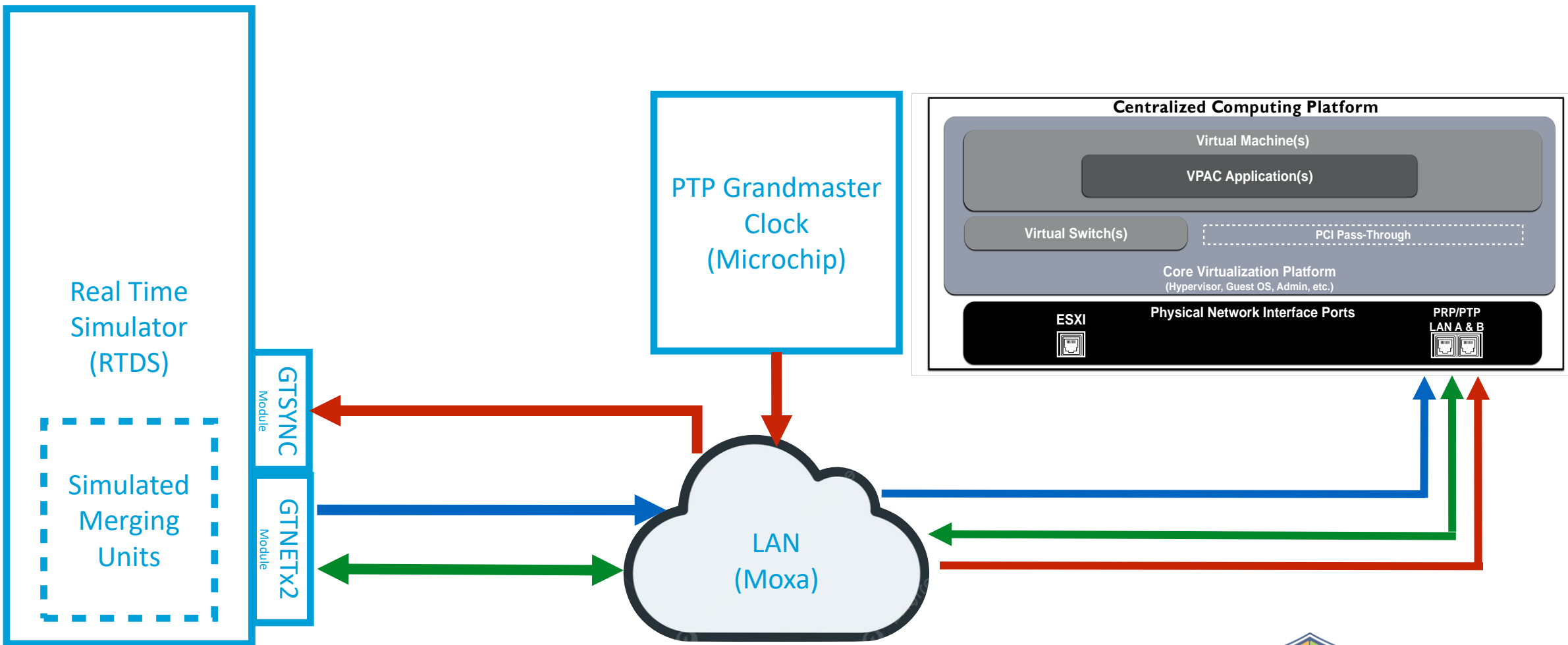


TESCO VPAC DEMONSTRATION



Testing Virtualized Power Systems With HIL

- GOOSE
- SV
- PTP Time Sync



Benefits of Real-Time HIL testing

Pros:

- Effectiveness
 - Operational - Creates more precise simulations/faults
 - Performance - Test more at once
 - Minimizing configuration error
- Efficiency
 - Operations - Consistency of repeating tests
 - SCL Based Configuration - Scripting & Future Model Extensions (Data Driven Testing)
- Scalable
 - Sample Value Publishing Capabilities
 - Test individual positions, substations, and/or complete systems
- Flexible
 - Test with and without MU/IEDs

Cons:

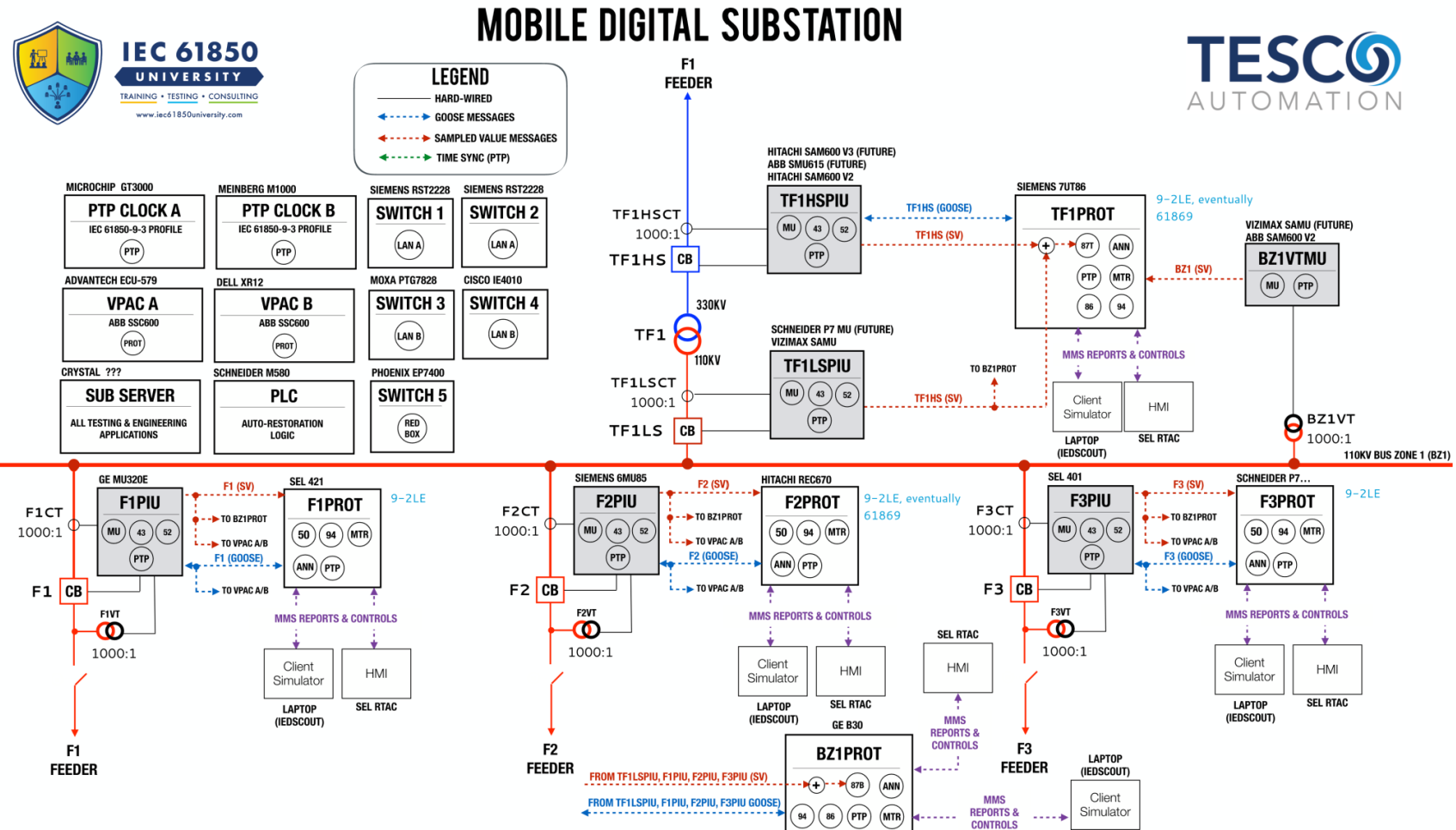
- Expensive
- Requires accurate model
- Centralized
- Less Rugged
- New Skill Sets Required

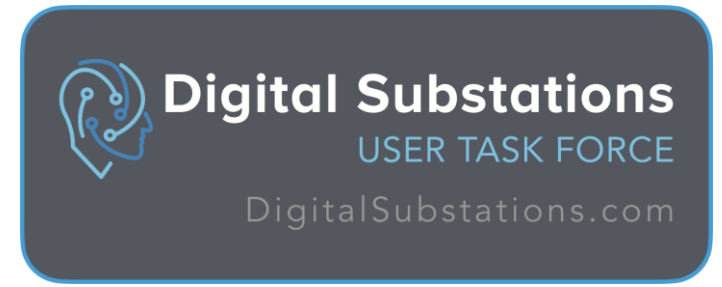


Demo

Announcing Updated IEC 61850 Course!

- Open to the public
- Held in Berkeley, CA
- October 21-25
- Covers IEC 61850 Fundamentals and Hands on Configuration of the latest product releases from all major vendors
- www.61850university.com





Questions?