The Western Interconnection Synchrophasor Program (WISP)

Smart Grid Investment Grant

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Program overview recap

- WISP is an interconnection-wide synchrophasor system expected to enable smart grid functionality.
- WISP will deploy:
  - Upgraded or replacement Phasor Measurement Units (PMUs)
  - New PMUs
  - Phasor Data Concentrators (PDCs)
  - Historical data archival systems at WECC RCOs
  - Wide Area Network architecture to connect entities

Program overview recap *(cont.)*

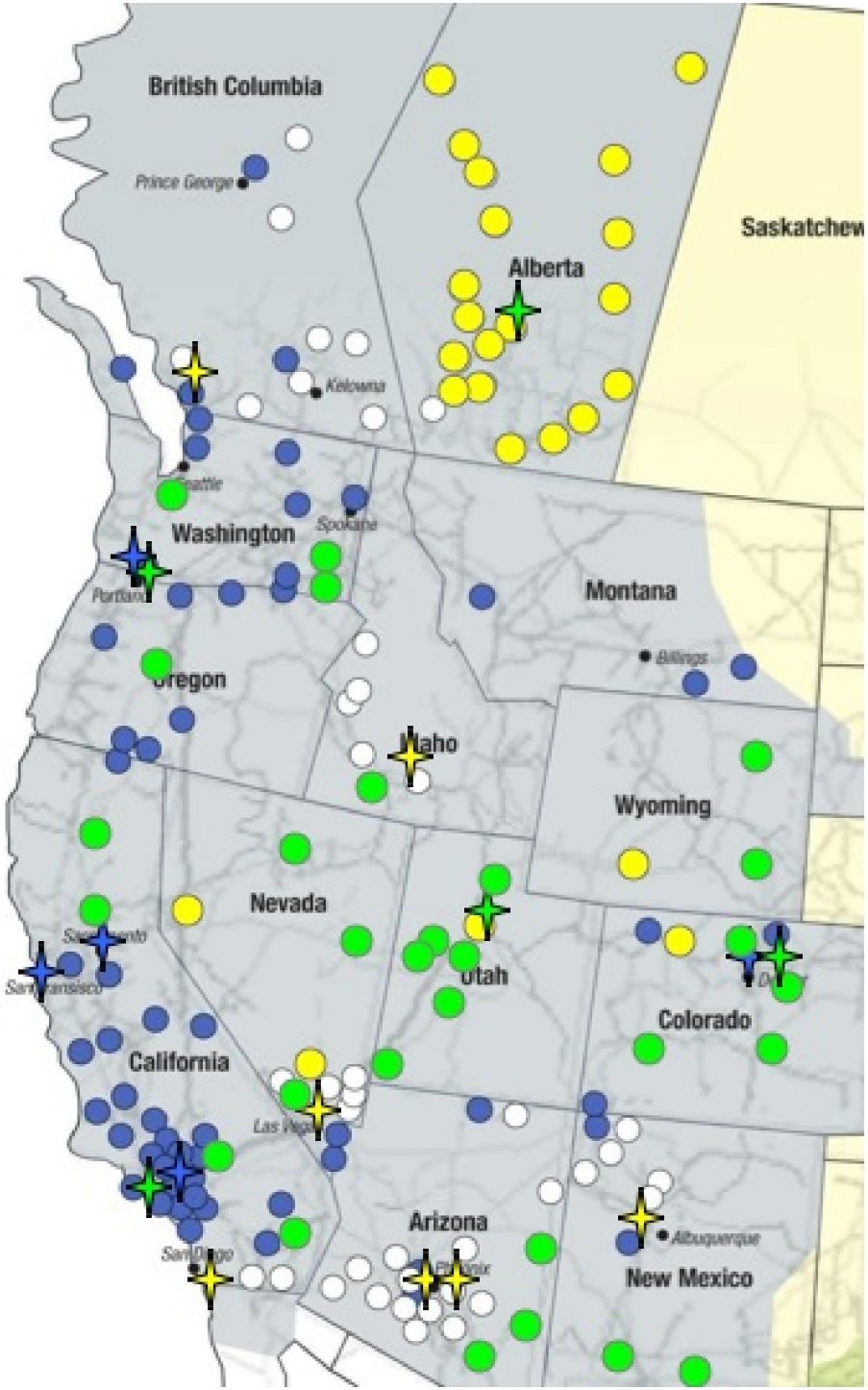
- Real-time and off-line applications for:
  - Situational awareness for operators and reliability coordinators
  - Event and system performance analysis for operations and planning engineers
  - Model validation and improvement
- NASPInet demonstration

What is unique about this project

- It is interconnection-wide in scope
- It is the largest of the Smart Grid Investment Grant projects in the Electric Transmission Category (10 total)
- It has both public and private partner entities
- It will deploy visualization of power system oscillations (a particular vulnerability in the West) and will provide decision support for mitigation
- It will demonstrate NASPInet
- It will deploy two regional control schemes

Partner entities

- Cost Share Partners in WISP grant
  - Bonneville Power Administration
  - California ISO/California Energy Commission
  - Idaho Power Corporation
  - NV Energy
  - Pacific Gas & Electric
  - PacifiCorp
  - Salt River Project
  - Southern California Edison
  - WECC

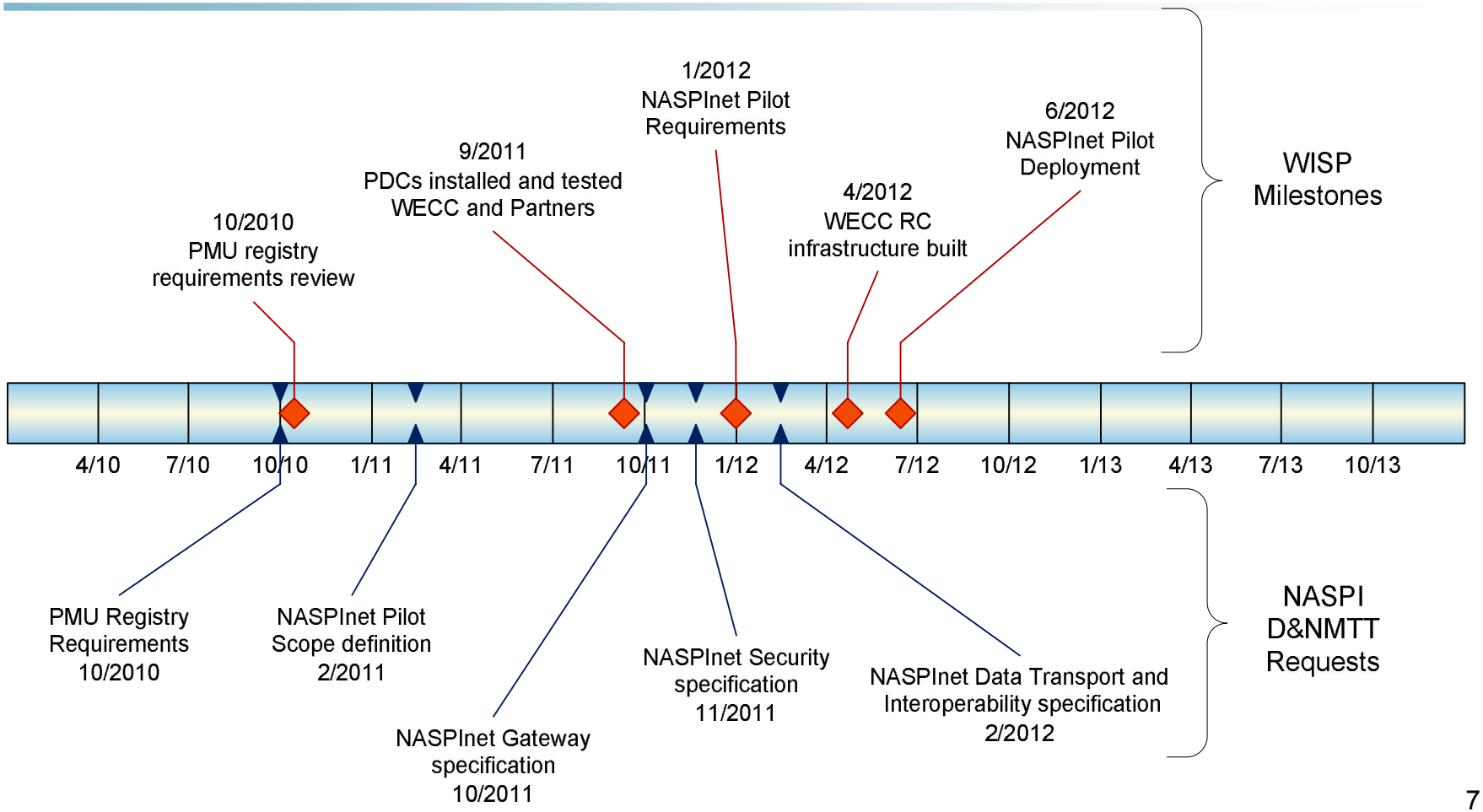


Phasor Measurement Units (PMU) in the Western Interconnection

Legend

- Phasor Data Concentrator (PDC)
- Networked PMU – Multiple PDC
- Networked PMU – Single PDC
- PMU Not Networked
- Desirable future PMU
- Desirable future PDC
- Networked PDC

WISP Timeline



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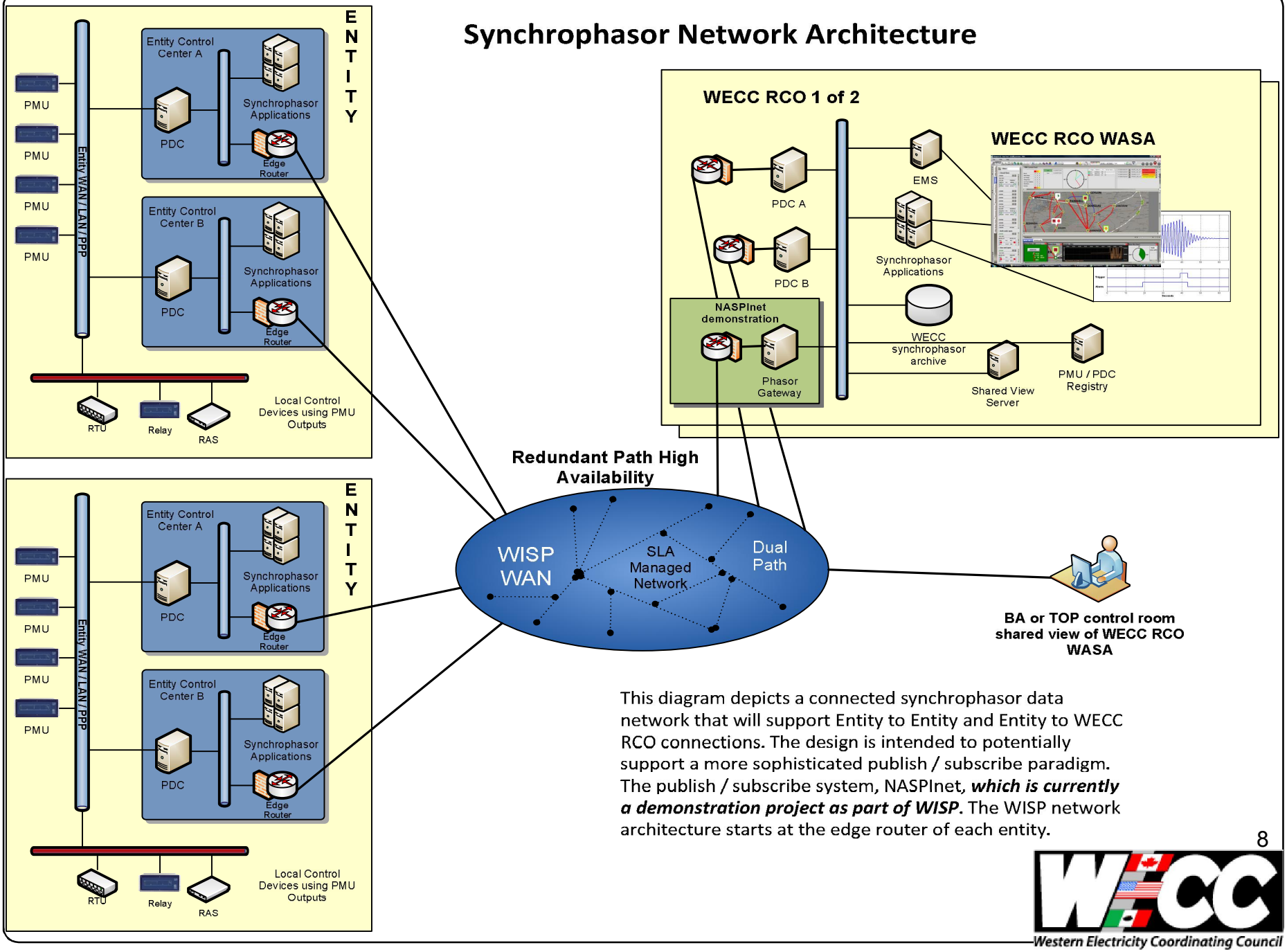
Synchrophasor Network Architecture



This diagram depicts a connected synchrophasor data network that will support Entity to Entity and Entity to WECC RCO connections. The design is intended to potentially support a more sophisticated publish / subscribe paradigm. The publish / subscribe system, NASPInet, ***which is currently a demonstration project as part of WISP***. The WISP network architecture starts at the edge router of each entity.

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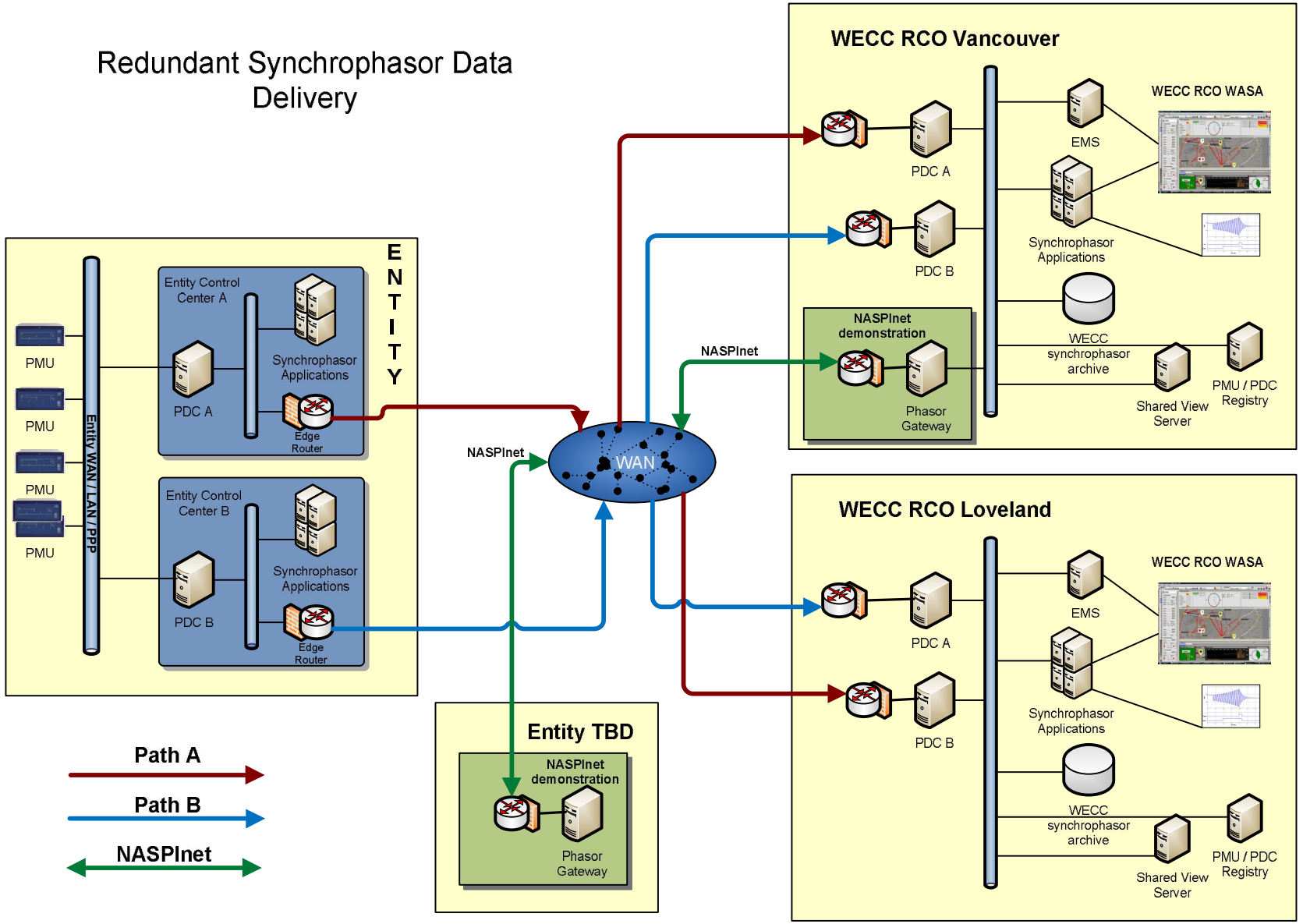
Redundant Synchrophasor Data Delivery



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Redundant Data

- Each WECC RCO will receive two streams of identical synchrophasor data
- From Entity Control Center A data will stream to WECC RCO Vancouver PDC-A and to WECC RCO Loveland PDC-B
- From Entity Control Center B data will stream to WECC RCO Vancouver PDC-B and to WECC RCO Loveland PDC-A
  - *Entities with a single control center will have two PDCs and Edge Routers in the same control center*

Phasor Gateway & NASPInet

- Inter Project Data Exchange
- Name / Directory services
- Security services
  - Must be able to selective block access to individual data sources
- Data services
- Integration
- Scope of the NASPInet demonstration needs to be defined

Registry (PMU / PDC / ???)

- Promote and Collaboration
- Existing Technologies
- How does it interact with Wide Area BES Model (CIM)
- Measurement Equipment Centric vs. Signal Centric
- What is the interaction with the Phasor Gateway
- Common Registry data exchange format
- Other Meta Data
  - Multiple PDC parents
  - How measurements relate to the BES e.g. Path calculations
  - What else needs to be captured here