NASPI North American SynchroPhasor Initiative

Minimal Communications Network Design

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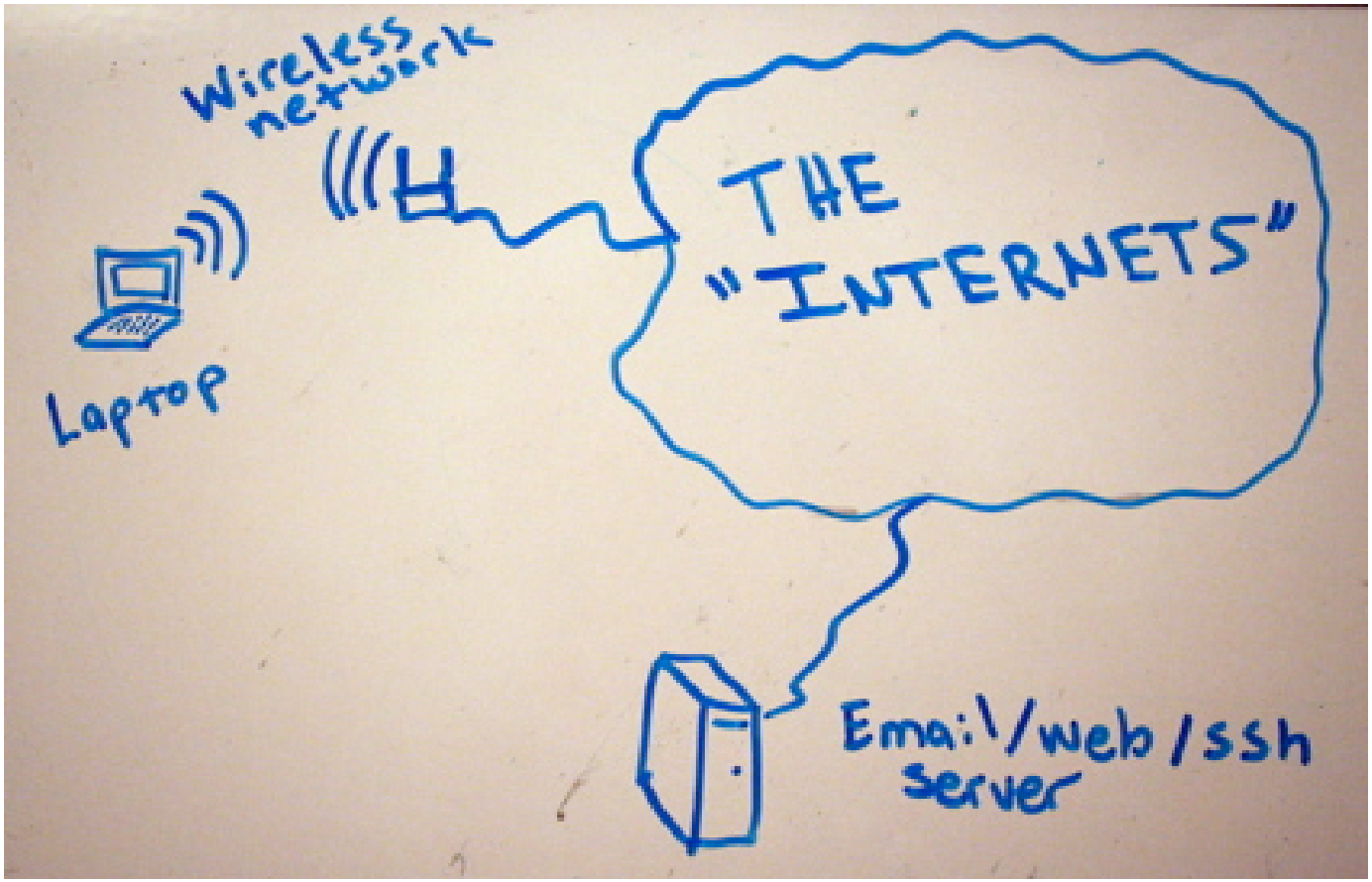
What is Network Design?



What is Network Design?

Not how it looks, It's how it works

- Networks are designed to serve the needs of the organizations that are being connected and specifically the application needs that are to be supported.
  - Security
  - Availability
  - Bandwidth / Scalability
  - Latency (based on application needs)
- Types of connectivity – Interactive vs. streaming data / both?

First Steps

- Gauge Application Needs
  - Latency tolerances
    - Determine the potential sources of latency
  - Security requirements
    - CIA
      - Criticality of the data being transferred
      - Integrity
      - Availability
- Topology choices
  - Hub/Spoke vs. Mesh
  - Bi-Directional / Uni-Directional

Bandwidth

- Bandwidth is defined as the “maximum data transfer rate of a network or Internet connection. It measures how much data can be sent over a specific connection in a given amount of time.[1]

1 http://techterms.com/definition/bandwidth

Bandwidth Calculation

- For synchrophasor data, there are a number of bandwidth calculators that could be useful (check “Google”)
  - Function of the # of signals being transferred each way, sample rate

Latency

- The amount of time it takes a packet of data to move across a network connection.[1]

1 http://techterms.com/definition/bandwidth

Latency

- Needs to be consistently within the tolerance of the applications being supported.
- Because of the high sample rate most synchrophasor devices provide, deterministic networks are favored
- SLAs

Protocol Choice

- For synchrophasor data, C37.118-2005, C37.118-2011, IEC 61850 are the most common choices
- TCP vs. UDP
  - Application needs

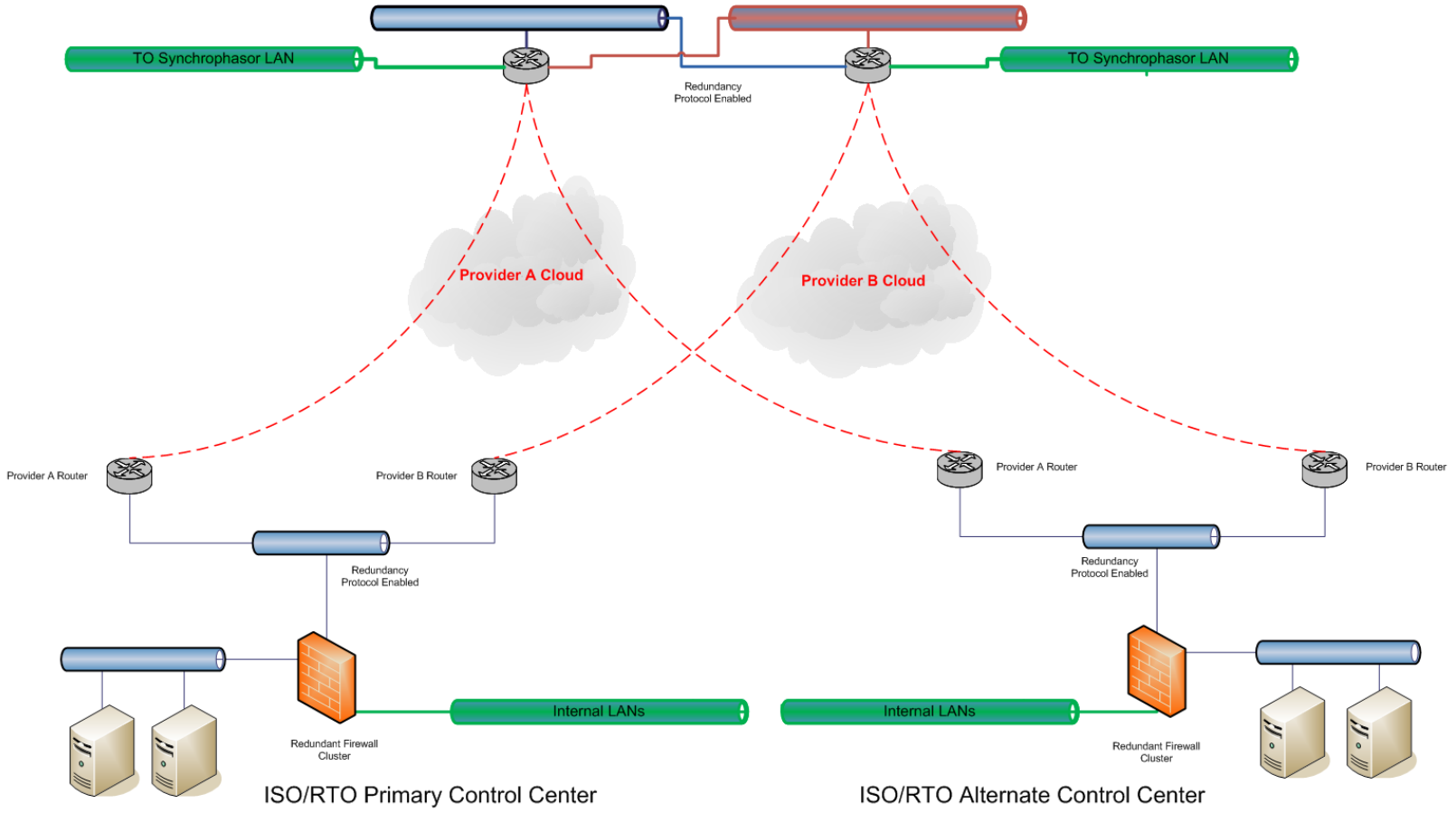
Networking Products in Use

- MPLS (Multiprotocol Label Switching)
- Point-to-Point TDM
- Internet based VPN
- Frame Relay

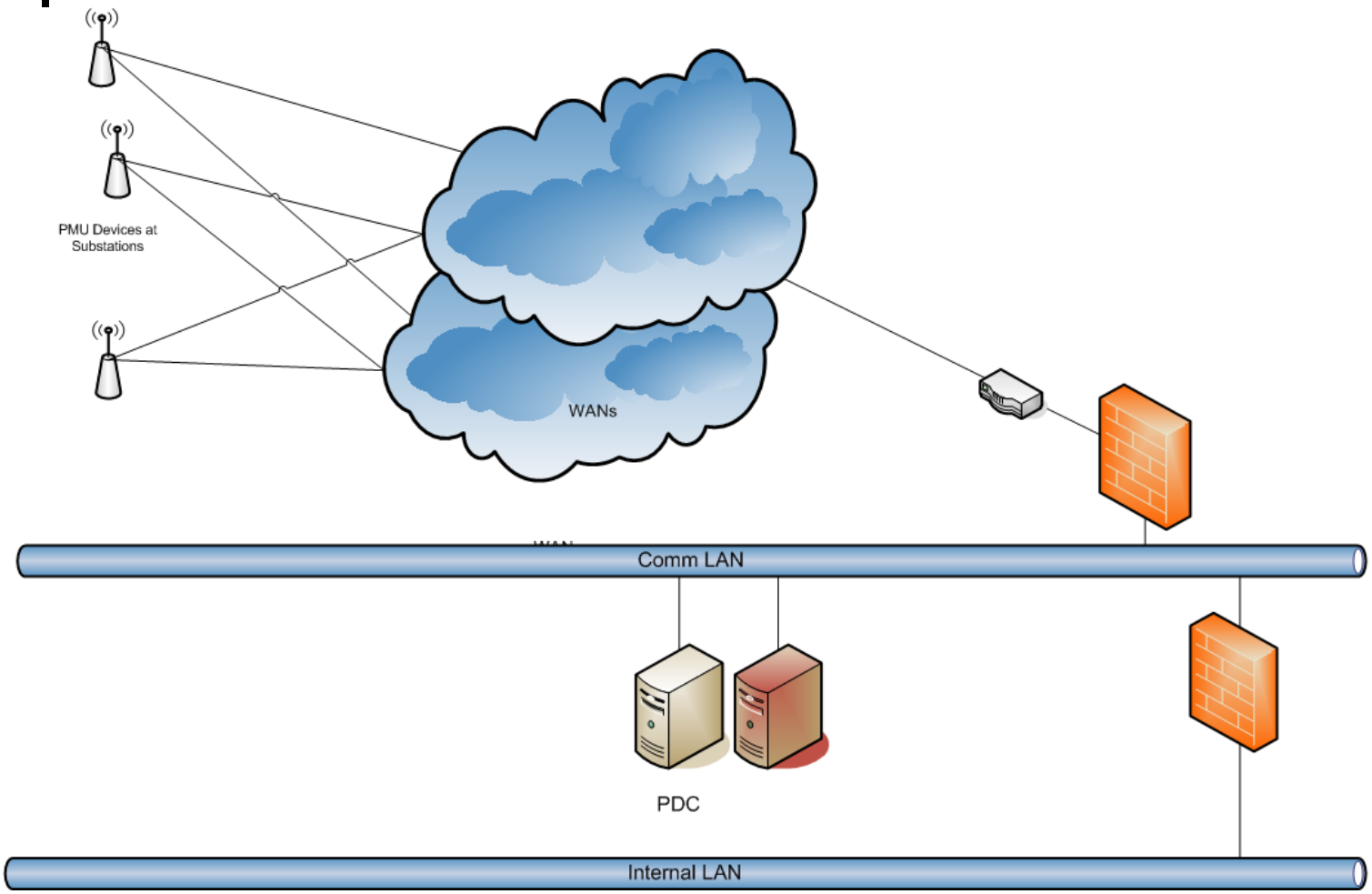
Common Elements in Use

- DNMTT produced 2014 Network Survey Results
- https://www.naspi.org/File.aspx?fileID=1541

Typical Utility Use Case
TO – ISO/RTO WAN



Typical Utility Use Case
Substation to Utility WAN



Questions?

Thank you!

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