



*Entergy*

Eastern Interconnect Phasor Project  
(EIPP)

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# Entergy EIPP Vendors

- Arbiter Systems



- Phasor Measurement Unit (PMU)

- OSIsoft



- Pi Software running as Phasor Data Concentrator (PDC)

- Cisco Systems

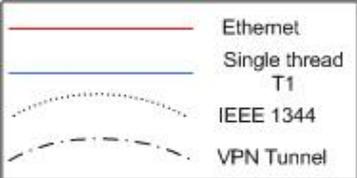


- Virtual Private Network (VPN) provided by Cisco 3030 VPN Concentrator

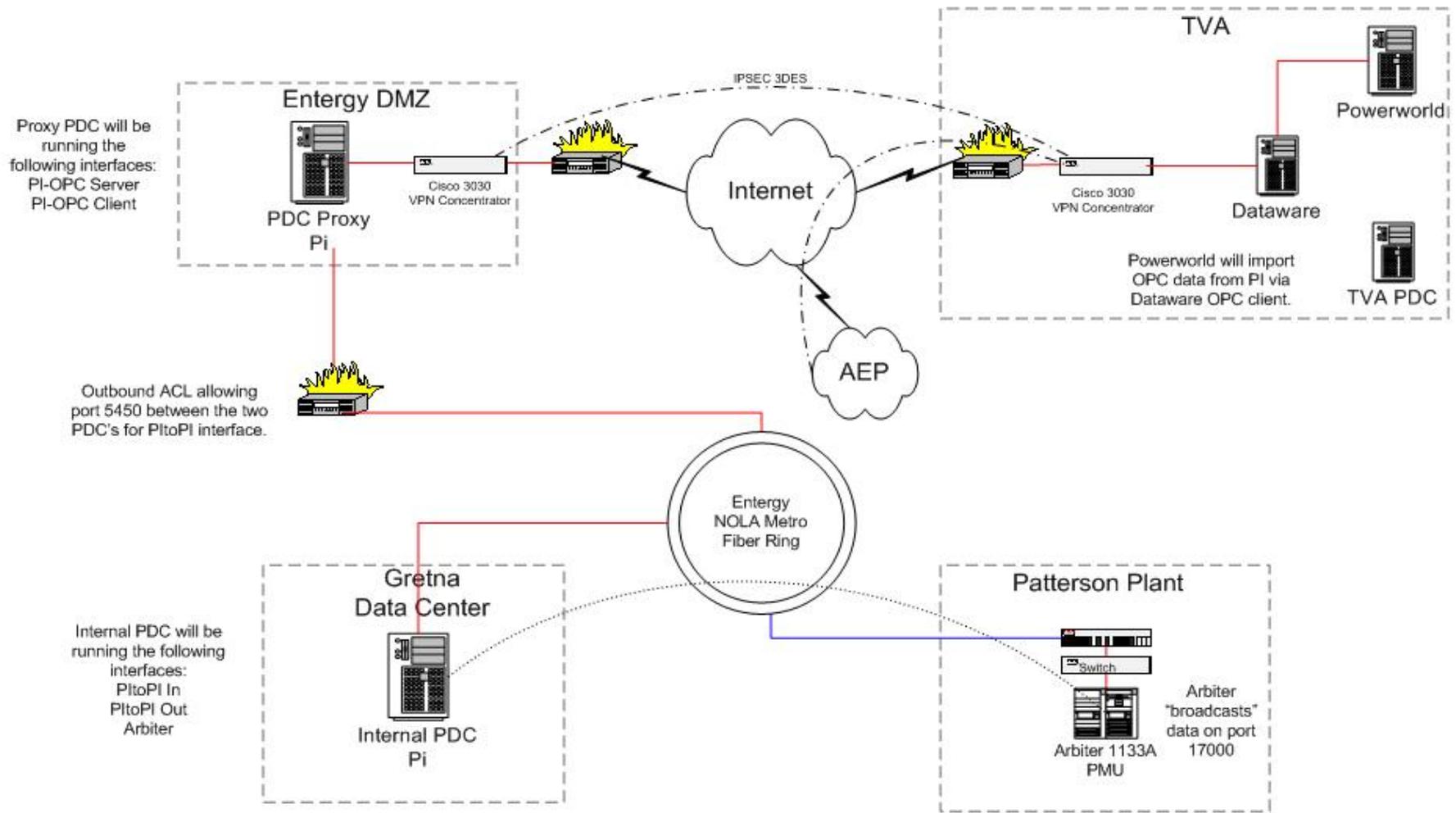
# Data Formats

- IEEE 1344
  - Format for PMU to PDC communications
  - Synchrophasor data standard
- OPC Standard
  - Format for PDC to PDC communications
  - Open Connectivity via Open Standards
    - Uses TCP port 135 for initial connection; then opens dynamic port
  - Client / Server Architecture
  - Based on Microsoft's DCOM technology
    - Distributed Component Object Model
- XML
  - Extensible Markup Language
  - OSIsoft currently developing XML interface for Pi





PMU - Phasor Measurement Unit  
 PDC - Phasor Data Concentrator  
 TVA - Tennessee Valley Authority  
 Pi - OSIssoft's PDC Server



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EIPP (Eastern Interconnect Phasor Project)  
 Phase One Design  
 TVA Demonstration

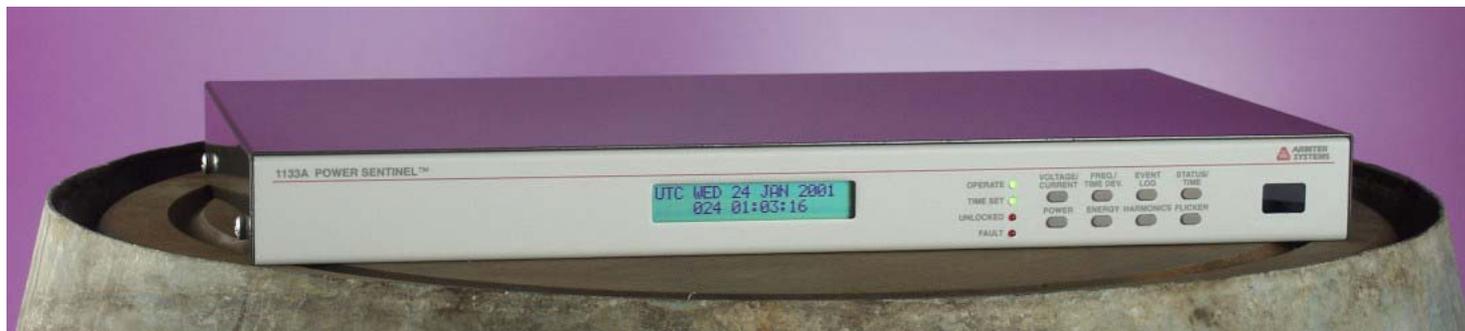
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# Data Security

- No direct polling of our internal network by other utilities
  - This includes internal PDC and PMU's
- Dual PDC's
  - Internal PDC for Entergy's use
  - External/Proxy PDC in DMZ for sharing data with other utilities
    - Internal PDC protected from Denial of Service attacks, etc.
- IPSEC 3DES encrypted VPN to TVA

# PMU

- Phasor Data Measured by Arbiter
  - Model 1133A Power Sentinel
  - Meets IEEE 1344 Standard
  - Samples at 20x / second
  - Phasor data is “broadcast” over port 17000
  - Capable of measuring 1 transmission line



# Entergy Design for PMU to PDC

- Connection to Data Center is dedicated T-1
  - Provisioned over Entergy's existing fiber
  - T-1 is 1.544 Mbps
- Phasor Data is collected by OSI's Pi server
  - Proprietary DB optimized for time-series data
  - Translation layer allows SQL-based app access
  - Located at our data center in Gretna, LA
  - Pi server must poll the Arbiter to receive phasor data

# Internal PDC to Proxy PDC

- Dual server scenario for security
- Internal and Proxy PDC's
  - Internal server is Dell 6300
    - 4x550Mhz, 2GB RAM, running W2k Server
    - Sits behind firewall on Entergy's internal network
  - Proxy server is Dell 2450
    - 2x730MHz, 1GB RAM, running W2k Server
    - Sits in Entergy's DMZ
- Data synchronization takes place via Pi to Pi interface
  - TCP Port 5450
  - 2 interfaces required
    - One for pushing data to the proxy, and one for pulling data
    - Both installed on internal server

# Connectivity Options to TVA

- NERCnet (Frame-relay)
  - Concerns over network performance relating to CIR (Committed Information Rate)
- Leased Lines
  - Only choice for “real-time” visibility
  - Most expensive; Avoid CAISO mistakes
- VPN over the Internet
  - Cheapest and quickest solution
  - Inherent nature of the Internet will make delivery of data “best effort” and subject to frequent latency

# VPN to TVA

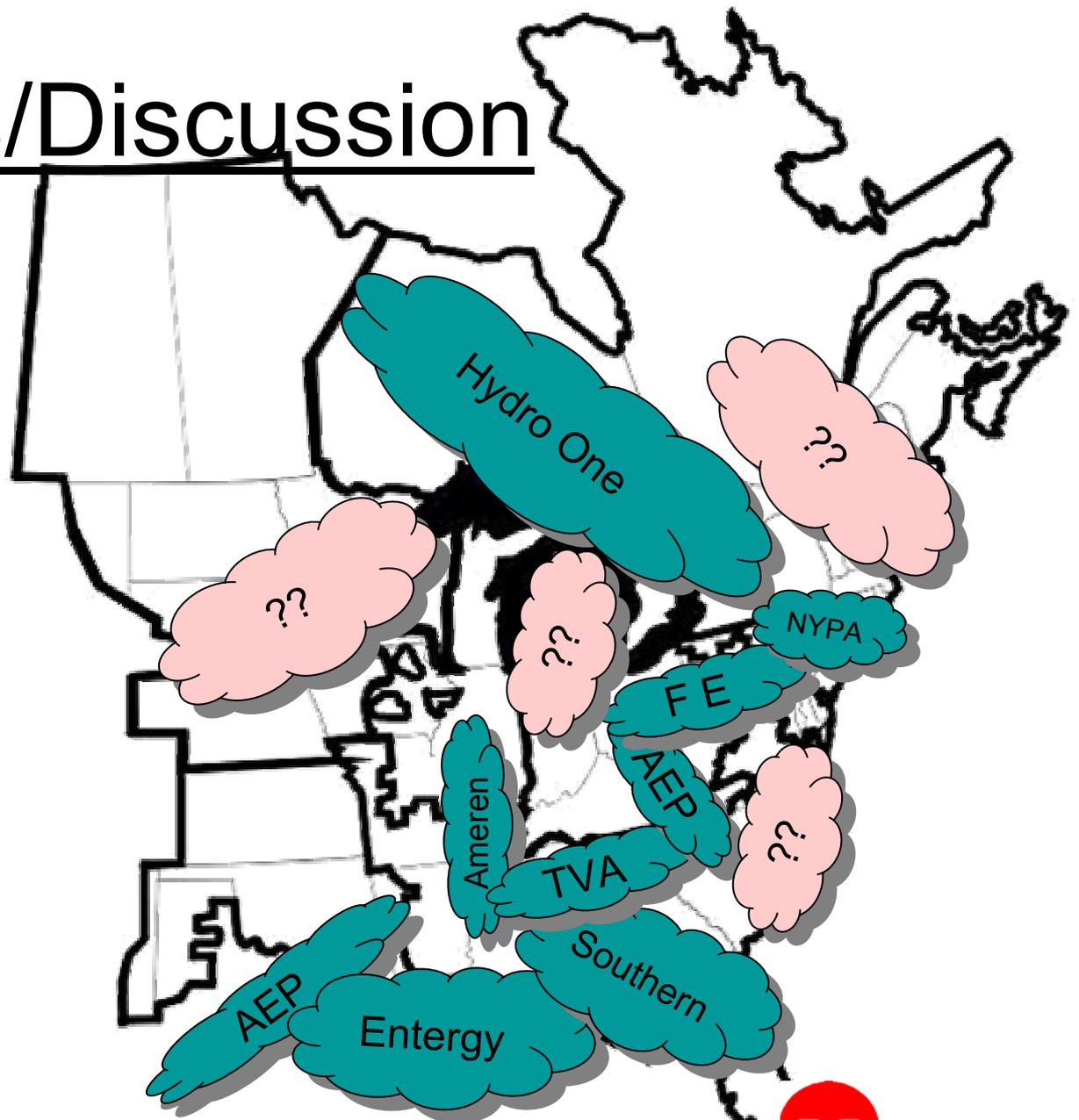
- Connectivity to TVA provided via VPN over the Internet
  - VPN is IPSEC 3DES
  - Endpoints on both sides are Cisco 3030 VPN Concentrators
- Proxy (DMZ) PDC
  - OPC client / server
    - Pi server is running OPC Server & OPC Client (send & receive)
    - Dataware is the OPC client/server app at TVA
  - Powerworld imports the data from Dataware
    - Powerworld is only in production for the demonstration for the Secretary's visit
    - Central PDC will migrate to an undetermined application
      - Data transfer will be facilitated through OPC or flat-file transmission
- Currently TVA only requests phasor data from Entergy; however, Entergy is ready to receive data from TVA.

# Immediate Project Goals

- Additional PMU's to be brought online
  - 17 by EOY
- Re-engineering of our internal design
  - Security concerns
  - Redundancy and reliability
- Design peer to peer network for Phase Two
  - Leased Lines vs. NERC vs. VPN

# Questions/Discussion

Thank  
you very  
much!



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