

MISO System Design Approach

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MISO Project Scope & Timeline

SCOPE: PMU Deployment Focus

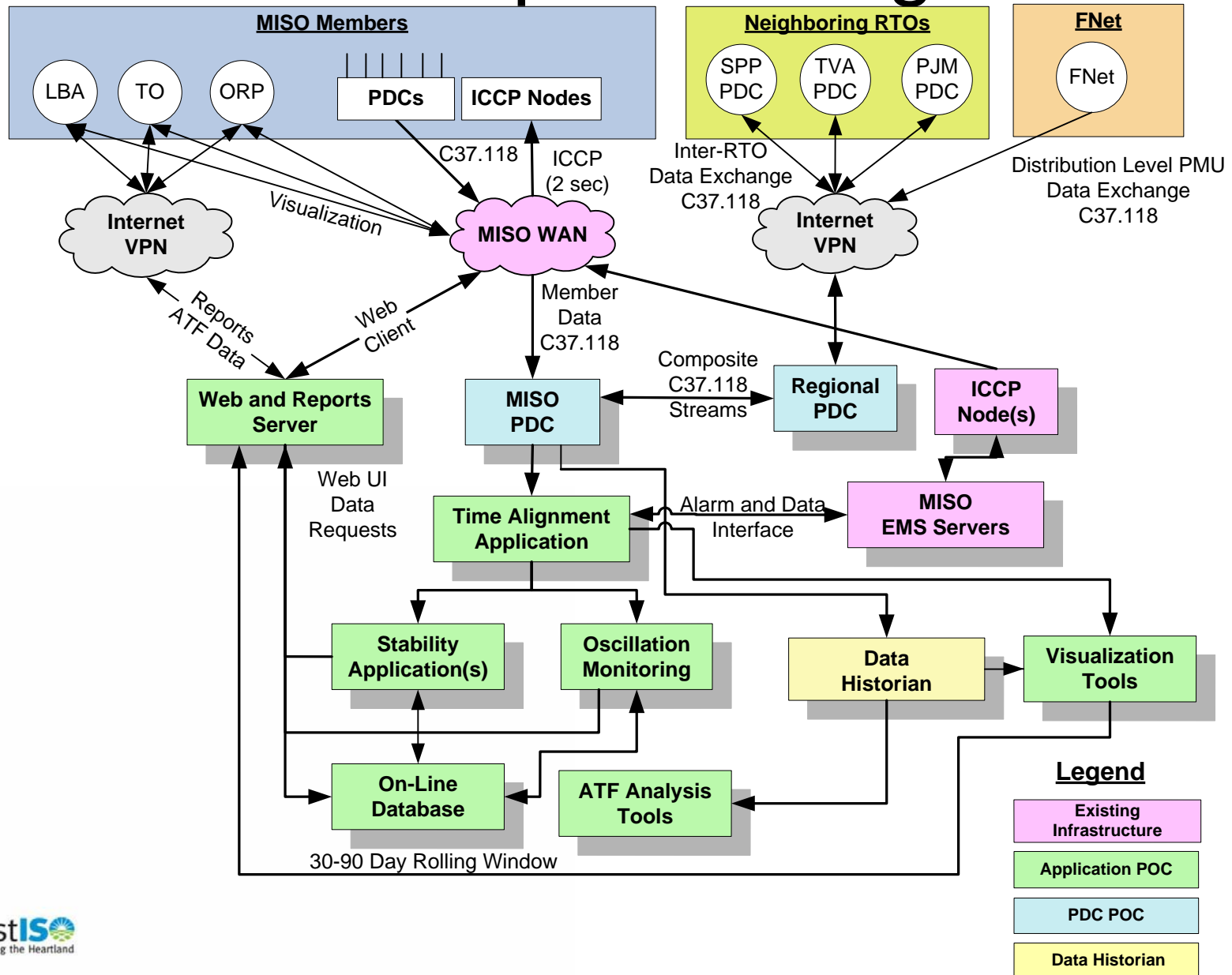
Timeline:

- **Phase I** – 6 months. 15-20 PMUs, Initial MISO and Regional PDC implementation, vendor selection and finalization
- **Phase II** – 12 months. Add 50 – 100 PMUs, Full PDC implementation, hardware and application integration testing, Data capture reporting and monitoring testing
- **Phase III** – 18 months. Add 40 – 80 PMUs, full integration into production operations, Inter-RTO connectivity, Business Continuity Implementation

Approach Summary

- Flexible Design and Integration architecture
 - Utilize open standards/protocols where available
 - Leverage existing vendor capabilities
 - Custom develop as last resort
- Supports Remote Member Needs:
 - Visualization and Application Results
 - ATF data requests
 - Aggregated 2 second phasor data via ICCP
- Envision Multi-Vendor solution
- First 6 months focused on PDC and Application POCs
 - Focused on evaluating existing and near-term available vendor functionality.
 - Develop hands on experience with vendor capabilities
 - Finalizes vendor selection
 - Based on Simulated PDC data exchanges and volumes.

Conceptual Design



Key Interface Technologies

- C37.118 - 2005
 - In bound from Member PDC
 - MISO to Regional PDC
 - Possible Historian
- Areva EMS
 - Alarm – Customized
 - Data – ISD or ICCP
- Historian
 - PDC -> C37.118 or custom
 - Visualization -> Vendor supplied API or Custom
 - Application -> Vendor Supplied API or OPC
- Inter-Application
 - Vendor Supplied APIs
 - Database
 - Custom

PDC Criteria

- Infrastructure Attributes

- Scalability/expandability
 - Horizontal (cluster servers)
 - Vertical (add more CPUs)
- Performance
- High Availability (auto local f/o)
- Local/Site Redundancy
- Security
 - Logging and audit tracking/reporting
 - Encryption / Authentication options

- Supportability

- Bulk Configuration model update
- Incremental Model update
- PDC Interoperability
- Coordinated measurement naming
- On-line model updates
- Remote support capabilities
- Robust application error recovery

- Functionality

- Real-Time Time Alignment
- Basic SCADA Capability
 - Alarming
 - Multiple Source
 - Calculated Point Capability
- Interface capability
 - Data Historian
 - OAG/EMS (bi-directional)
 - TVA Forward Feed
 - Documented/Open API
- Data Error Recovery
 - Abort/restart
 - Link Re-establishment
 - Error logging and Notification
- C37.118 2005 Compatibility
- Data Volume verification
- Remote PMU/PDC Emulation capability

PDC Performance/Capacity

- Performance
 - 30 samples/sec data collection
 - Expandable to 60 samples/sec
 - RT time alignment at minimum 10 samples/sec
- Max 50% existing CPU utilization
- Multi Threaded Design
 - Utilizes available CPUs
- Expansion Approach Verification
 - Horizontal vs. Vertical
- Capacity (Phase 2/3)
 - 50 remote PDC
 - 150-200 Remote PMU
 - 10K max point collection at 30 samples/sec
 - 100% growth within HW
- Expandable
 - 100 Remote PDCs
 - 200-300 Remote PMUs
 - 25 K points @ 30hz

Application Criteria

General Functional

- Visualization/Situational Awareness
 - Graphical Representation
 - Data Summarization
 - Customizable Displays
 - Remote UI Support
- EMS Alarm Processor Integration
- Oscillation detection and alarming
- Stability monitoring and detection
- Model Validation
- Dynamic modeling
- Support RT and ATF Analysis
- Historical Replay
- Customizable Reports

Support

- Manageability
- On-Line model update and edit
- Open API to accommodate additional vendors
- Key Interfaces
 - EMS
 - PDC
 - Data Historian
- HA / Redundancy
- Restart/retry on abort
- Logging/Monitoring
- Product maturity & market share
- Product enhancement/upgrade

Questions ?