Assessment of Existing Synchrophasor Networks

NASPInet 2.0
Purpose

• Learn from implementation experiences

• Assess possible need for specification revision
  – what was useful; what was not

• Consider:
  – emerging technologies
  – emerging use cases
  – new/revised systemic issues and priorities

• Guidance, not binding specification
Original Specification Set

- Data Bus Technical Specifications for North American Synchrophasor Initiative Network

- Phasor Gateway Technical Specifications for North American Synchrophasor Initiative Network
Specification Analysis

• Data bus specification
  – 155 specifications
  – 6 categories
  – 83 sub-categories

• Gateway specification
  – 234 specifications
  – 8 categories
  – 76 sub-categories

• Three additional large categories of general considerations
Implementation Analysis Process

- **Databus Spec**
  - 155 specifications
  - 6 categories
  - 83 sub-categories

- **Gateway Spec**
  - 234 specifications
  - 8 categories
  - 76 sub-categories

**Aggregate**
- Data bus Structure
- System Integration
- Sizing, Performance, Availability
- Security
- Gen’l Sys a dmin, Ops, and Func Specs
- Network Structure
- Open Standards Usage

**Analysis Criteria**

**Available implementation descriptions**
- Seven prototype structures

**Analysis**
Analysis Process Detail

• NASPInet specifications were aggregated into five groups:
  – Data bus Structure and Communications – basic architecture and operational modes
  – System Integration – mechanisms for connecting devices and systems to perform complete functions
  – Sizing, Performance, and Availability - design capacity for handling expected data volumes; ability of the network to carry out data transport well in terms of network available bandwidth, latency, jitter, and packet loss; percentage of up time and reachability of input and output ports in a network
  – Security – ability of the network to protect data integrity, privacy, and confidentiality; ability to control access to the network, ability to maintain device, network, and application integrity; ability to resist intrusion and to detect and mitigate intrusions when they happen
  – General/Sys Admin/Ops and Functional Specification – generic capabilities and best practices in the design, deployment, and operation of networks

• Network core and edge structure added

• Use of advanced open standard protocols added
Source Materials for Analysis

- NASPI Working Group SGIG Update presentations
- NASPI Work Group presentations
- NASPI Work Group Success Story presentations
- NASPI Reliability Coordinator Data Quality Survey (March 2016)
- NASPI 2014 Survey of Synchrophasor System Networks – Results and Findings (July 2015)
- Various presentations from utilities
Next Steps for Analysis report

• Review – DNMTT?
• Revisions as needed
• Report release
New Specification Development

NASPInet 2.0
NASPIInet 2.0 Document

• Will again be guidance and framework
• Update of original specification in light of experience
  – streamlining of the material
• Additional considerations:
  – emerging technologies
  – forward-looking use cases
    • wider area closed loop protection and control
    • adaptive protection
  – new/revised systemic issues and priorities
    • more focus on cyber security
NASPInet 2.0 ToC Draft

• Background and Purpose
• Scope
• Key Architectural Principles
• Core Requirements
• Problem Domain Reference Model
• Architectural Specifications and Recommendations
• Guidance on Newer/Emerging Technologies
• Appendices (as needed)
Core Requirement Categories

- scalability
- latency minimization
- reliability/(min packet loss)
- cybersecurity
- performance
- functional flexibility
- data persistence

- open standards usage/conformance
- data sharing
- data rates
- availability
- extensibility
- service classes
- governance
Problem Domain Reference Model

• Describes the problem environment
• Emerging trends & systemic issues
• Regulatory/public policy issues
• Key constraints & barriers
  – example: geographic constraints
• Entity-relationship (industry structure) model(s)
• Logical/data flow model(s)
Specification & recommendations

• Function class definitions (capabilities)
• Component class definitions (devices and systems)
• Communication networks
  – structures/topologies (intra-utility, WAN)
  – protocols, operating modes
  – network provisioning/monitoring/management: AAA; ZTD, FCAPS
  – QoS management
  – timing distribution
  – network level cyber security
• Systems- structures and interfaces; system level security
• Standards
Newer/Emerging Technologies
(compared to original spec time frame)

• Software Defined Networking
• Cloud Services
• Network Virtualization
• Distribution level synchrophasor measurement
Next Steps

• Inputs from DNMTT and elsewhere
• Draft document
• Review process
• Finalization
Thank You

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