Welcome to the Interoperability Workshop

Dallas, Texas
11 April 2007
Opening Session

• Welcome
  – Jack McGowan, Chair GWAC
• Keynote
  – Kelly McNair, Dir. Information Mgmt, TXU ED
• Introductions
• Workshop Briefing
  – Andreas Tolk, Old Dominion University
  – Steve Widergren, PNNL
GridWise™ Architecture Council

Interoperability Workshop Briefing
Topics

• Why are we holding this workshop?
• A context-setting framework
• Our agenda
• Test drive scenarios
  – Toby Considine, University of No. Carolina
    • Lots-O-Alarms home security & green energy
  – David Holmberg, NIST
    • Commercial buildings & real-time electricity pricing
Electricity: Our Society’s Energy Fabric

Markets

$\text{MW}$

Generation

Manufacturing

Buildings

Homes
Becoming Interconnected
Frequency in Ontario and New York during Breakup

Niagara Generation Stays with Western NY

Frequency Separation
Interior Ontario and Northern New York

Northwest Ontario Stays with Manitoba

Beck Re-Separates from Interior Ontario System

Beck and St Lawrence Stay Separated from Interior Ontario But Connected to New York State

Beck Reconnects to Interior Ontario System

Beck and St Lawrence Separate from Interior Ontario System

Seconds from 16:10:00

One Minute
GWAC Mission - Interoperability

Interoperable Software - Expected Impact:
- Reduces integration cost
- Reduces cost to operate
- Reduces capital IT cost
- Reduces installation cost
- Reduces upgrade cost
- Better security management
- More choice in products
- More price points & features

All items provide compounding benefits
Interoperability – Integration at Arm’s Length

- Exchange of actionable information
  - between two or more systems
  - across organizational boundaries
- Shared meaning of the exchanged information
- Agreed expectation with consequences for the response to the information exchange
- Requisite quality of service in information exchange
  - reliability, fidelity, security
**Distance to Integrate**

- No standard exists, requires completely custom integration
- Interfaces can be transformed and/or mapped
- Interfaces use a common model
- Optimal: ‘Plug and Play’ standard defined

Credit: Scott Neumann, UISol position paper
Interoperability Path Forward

- Engage organizations w/ a stake
- Develop shared understanding
- Classify collaboration needs at organizational boundaries
- Debate Issues, Prioritize action
- Measure progress, refine direction
Standards Organizations: a Tangled Web

Official International Standards Bodies
- ISO
- IEC
- ITU
- W3C
- OMG
- OASIS
- UN/CEFACT
- DISA (DoD)
- ASHRAE
- NIST
- NERC
- NRECA
- IEEE
- NEMA
- IPC
- AHSAM
- ATIS
- BICSI
- CABA
- CANENA
- CEC
- CEN
- CEA
- CEN
- CEAS
- CIGRE
- FIATECH
- EAN
- EAI
- EMAS
- ETSI
- OPC

Regional SDOs
- ACMA
- ANS
- ASHRAE
- ATIS
- BICSI
- CANENA
- CEN
- CEA
- CIGRE
- FIATECH
- EAN
- EAI
- EMAS
- ETSI
- OPC

National SDOs
- ANSI
- NIST
- NRECA
- NFPA
- UL
- IPC
- AHSAM
- ATIS
- BICSI
- CANENA
- CEN
- CEA
- CIGRE
- FIATECH
- EAN
- EAI
- EMAS
- ETSI
- OPC

User Groups
- DISA (DoD)
- ASHRAE
- NIST
- NERC
- NRECA
- NFPA
- UL
- IPC

Private Companies
- DISA (DoD)
- ASHRAE
- NIST
- NERC
- NRECA
- NFPA
- UL
- IPC

Non-accredited International SDOs
- CIGRE
- FIATECH
- ETSI
- OPC

Non-accredited National SDOs
- ANSI
- NIST
- NRECA
- NFPA
- UL
- IPC

Non-accredited International SDOs
- CIGRE
- FIATECH
- ETSI
- OPC

Non-accredited National SDOs
- ANSI
- NIST
- NRECA
- NFPA
- UL
- IPC

ACMA
- ANSI
- NIST
- NRECA
- NFPA
- UL
- IPC

ANSI accredited International SDOs
- ANSI
- NIST
- NRECA
- NFPA
- UL
- IPC

ANSI accredited National SDOs
- ANSI
- NIST
- NRECA
- NFPA
- UL
- IPC
The Framework:
Context for Interoperability Dialog
Interoperability Framework

• Organizing concepts
  – Taxonomy, definitions, levels, tenets
• Attempts to simplify the complex
  – Warning – it’s still complex
• Aids communication between community members
  – Careful – semantics remain a stumbling block
• Provides perspective from selected viewpoints
• Reveals points where agreement simplifies integration
• Focus plight of integrator, not component developer
What do we mean by “Framework”?

- **Framework** organizes concepts and provides context for discussion of detailed technical aspects of interoperability
- **Model** identifies a particular problem space and defines a technology independent analysis of requirements
- **Design** maps model requirements into a particular family of solutions
  - Uses standards and technical approaches
- **Solution** manifests a design into a particular developer software technology
  - Ensures adherence to designs, models, and frameworks.

Borrowed from NEHTA: Australian National E-Health Transition Authority
Framework Inspirations

NEHTA Interop Framework

Layers of Coalition Interoperability

- Political Objectives
- Harmonized Strategy/Doctrines
- Aligned Operations
- Aligned Procedures
- Knowledge/Awareness
- Information Interoperability
- Data/Object Model Interoperability
- Protocol Interoperability
- Physical Interoperability

A. Tolk, *Beyond Technical Interoperability*, 8th CCRTS, National Defense University, Jun 03
Interoperability Context-Setting Framework

Interoperability Categories

Organizational
- 8: Economic/Regulatory Policy
- 7: Business Objectives
- 6: Business Procedures

Informational
- 5: Business Context
- 4: Semantic Understanding
- 3: Syntactic Interoperability

Technical
- 2: Network Interoperability
- 1: Basic Connectivity

Cross-cutting Issues
- Shared Meaning of Content
- Resource Identification
- Time Synch & Sequencing
- Security & Privacy
- Logging & Auditing
- Transaction & State Mgt
- System Preservation
- Performance/Reliability/Scalability
- Discovery & Configuration
- System Evolution

Interoperability Categories

1: Basic Connectivity
3: Syntactic Interoperability
4: Semantic Understanding
5: Business Context
6: Business Procedures
7: Business Objectives
8: Economic/Regulatory Policy
System Integration Tenets

• Agreement at the interface
  – Create an interaction contract
  – Terms and conditions, consequences for failure to perform…

• Boundary of authority
  – Respect privacy of internal aspects on either side of the interface (technology choice and processes) – Principle B01

• Decision making in very large networks
  – Decentralized/autonomous decision-making
  – Multi-agent v. hierarchical approach
  – Addresses scalability, evolutionary change, and eases component integration
Multiple Audiences

- Interoperability Framework Document
  - Experts familiar with large system integration and interoperability issues
  - Does not replace enterprise architecture frameworks (e.g., DoDAF, TOGAF, Zachman, etc.)
    - Layers and crosscutting issues support various views / approaches

- Other targeted material
  - Audiences: designers, business decision-makers, policymakers, across various industry sectors
    - Checklists (tests/reminders)
    - White papers
  - Cross-cutting issue papers
Some already identified Challenges

White Paper Contributions and Discussions
How many Standards are enough?

- Do we need standards?
- Are there upper and lower bounds?
- Do we need meta-standards and mapping to applicable standards?
- Should standards be mandated or recommended?
- When does an accepted solution become a standard and who owns the standard?
- How do we ensure that standards doesn’t hinder progress?
How do we migrate?

• Architecture view
  – From the As-is-Architecture migrating to the To-Be-Architecture
  – What Architecture Frameworks are applicable
    • DoDAF derivates (ATAM)
    • TOGAF
    • OPM (D. Dori)
    • SysML
• How to connect organizational procedures with technical solutions?
Verification and Validation

- Are we doing the right thing?
- Are we doing the thing right?
- What are our Measures of Merit on the various levels and overall?
- How do we ensure quality on the various levels and overall?
Securing the Critical Infrastructure

- **System internal challenges**
  - Non-linear complex system (chaos and catastrophe theory)
  - Redundancies and alternatives

- **System external challenges**
  - Natural disasters (hurricane, flooding, …)
  - Hacker and Terror attacks

- **Political challenges**
  - International collaborations
  - How does the Grid behave at the border?
The Workshop
Workshop Desired Outcomes

Objective: Consensus building forum for the preparation of community involvement to improve integration of emerging automation systems related to all elements of the electric system.

- Consensus on interoperability framework paper
  - Actions to improve the paper
  - Develop credibility to framework paper
- Champions for articulating and addressing interoperability issues
- Leaders for a follow-on symposium
Workshop Sessions Wed.

10:30 am  Framework Breakout Sessions
   Raise document issues and proposed improvements
   Themes (inspired by the document organization)
   - Technical interoperability
   - Informational interoperability
   - Organizational interoperability
   - Cross-cutting issues
   - Overall framework structure & philosophical tenets

12:00 pm  Lunch

1:00 pm   Resume Framework Breakouts

4:30 pm   Assembly for Quick Summary

5:00 pm   Adjourn Breakout Meetings for the day

6:00 pm   Reception and Networking
### Workshop Sessions Thurs.

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 am</td>
<td>Welcome Back and Breakout Presentation Results</td>
</tr>
<tr>
<td>9:00 am</td>
<td>Summary, General Discussion and Instructions for Next Breakout Sessions</td>
</tr>
</tbody>
</table>
| 10:00 am | Interoperability Next Steps Breakout Sessions  
  - Resolve open issues for framework document  
  - Address focus questions concerning impediments and actions to improve interoperability |
| 12:00 pm | Working Lunch                                                                                                                             |
| 1:00 pm | Resume Next Steps Breakouts  
  - Address focus questions: a symposium to engage the electricity community in articulating interoperability issues, proposing actions to improve the situation, other events/activities |
| 2:30 pm | Group Review on Breakout Results                                                                                                         |
| 4:30 pm | Meeting adjourns                                                                                                                          |
Test Drive Scenarios