



GridWise™ Interoperability Workshop

April 11-12, 2007

Proceedings Summary

Prepared: May 17, 2007



Message of Appreciation

For two days, 45 recognized experts in the integration of complex automation systems wrestled with challenging questions concerning issues, impediments, and directions to improve the interoperability of all elements of our vast electric system. Even though the workshop topics were demanding, one could sense the interest and personal devotion the participants brought to addressing these concerns. Under their cheery demeanor, one can imagine the scars they carry from system integration experiences that did not go smoothly. However, as they survived those experiences with the spirit to make things connect better in the future, so they enthusiastically contributed excellent ideas on how we can engage and grow a community to improve interoperation and enable a smarter electric system.

For their time, interest, and desire to help we sincerely thank them.

Jack McGowan, Chair, GridWise Architecture Council

Steve Widergren, Administrator, GridWise Architecture Council

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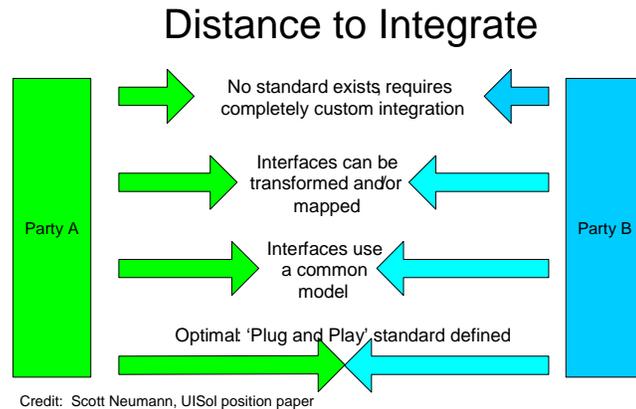
1 Overview



On April 11 and 12, 2007, the GridWise Architecture Council (GWAC)¹ held a workshop with 45 experts in complex software system integration and interoperability representing various aspects of the electric system including reliability coordinators, electric power company automation, buildings automation, and industrial systems automation, as well as the information technology and communications that enable this automation. This document summarizes the valuable ideas collected from the breakout sessions held during the Interoperability Workshop.

The meeting participants provided this information during the 2-day workshop. In preparation to the meeting, the participants were asked to “test drive” the organization put forth in an interoperability context-setting framework draft document² and to submit position papers about the framework and system interoperability issues. Nineteen thought-provoking position papers and test drive scenarios were submitted. This material contributed to the lively meeting discussions and recommendations for framework document improvement.

A position paper by attendee Scott Neumann offered the concept of “distance to integrate” (see adjoining figure). The idea is to reduce the distance to integrate through the development of agreements in various areas related to integration. This starts with defining interfaces, developing common models, and in the limit, the parties conduct business with little or no integration effort (plug and play). Many situations may always require some level of integration; however, advancements that reduce the integration effort can have great benefit.



The GWAC mission is to enable all elements of the electric system to interact by improving interoperability (distance to integrate) between automation elements, but thirteen council members will not make this happen alone. Change in something as vast as the electric system requires the development of a community that grasps the vision, understands the impediments, and organizes efforts to take action.



As a step in the direction of enabling interoperability, the GWAC drafted a context-setting framework document to organize concepts and terminology so that interoperability issues can be identified and debated, improvements to address issues articulated, and actions prioritized and coordinated across the electric power community. In Day 1 of the workshop, participants discussed this document to determine how to improve it as a foundation toward advancing interoperation of

¹ Information about the GridWise Architecture Council can be found at www.gridwiseac.org.

² The Interoperability Context-Setting Framework draft document can be found at http://www.gridwiseac.org/pdfs/interopframework_v05%20070129.pdf

elements within the electric system. The consensus was that the document provides a reasonable context for discussing interoperability issues. Nevertheless, good ideas for improvement were generated and recommendations were given for related or follow-on material to fulfill additional needs.

On Day 2 of our workshop, the challenge was to consider how to engage all relevant parties to improve the integration of emerging automation systems related to the electric system. The GWAC proposes to host a symposium to articulate interoperability issues and begin the process of identifying actions (small and large) that will move us in the right direction. The framework is to be used as a guiding map that may help in organizing a symposium. In response to this challenge, the participants grappled with these questions: What should this event look like? Who should attend? How shall it be organized? Who will participate to plan and lead aspects of it?

Not only did the participants come up with insightful ideas, but several attendees demonstrated leadership and interest to contribute to such a forum. The excellent ideas generated are summarized here, and will provide good guidance for the planning of such a forum.

2 Framework Document

Overall, the context-setting framework appears sound and communicates to an audience of people knowledgeable in system integration of information technology and the interoperation of complex systems of many components.

Workshop participants provided excellent recommendations on clarifications, modifications, and extensions to the current draft framework document.

*The framework is sound...
but there's room for improvement*

2.1 Workshop Feedback on the Framework

The following sections describe the major recommendations to improve the document and the need to address other audiences with a broader scope.

2.1.1 Overall Structure and Tenets

Even though one breakout group emphasized the overall structure of the document, all groups generated feedback that was relevant to the document's context, its structure, and underlying tenets.

Context

The framework document targets a relatively narrow audience "familiar with the issues surrounding the integration of large, networked software systems." Workshop discussions revealed the need to provide greater context for this document within the scope of GridWise Architecture Council concerns and plans. Relevant comments include the following:

- How does the framework document fit within a series of steps to improve interoperability? What is the big picture and how do the framework document, the workshop, symposiums, and other material fit within it?
- How will the document be distributed to the appropriate audience beyond the workshop?
- Given the need to reach out to a broader audience, how does this document help gain the support and acceptance of the broader base of stakeholders?
- Who is to provide a roadmap or guide if not the GridWise Architecture Council?
- What is GridWise and what role does GWAC have in the overall GridWise program?

Extending the Framework

Companion documents and extensions of the base framework material will be necessary to reach targeted audiences, especially given the broad backgrounds of the groups to engage. Related to this

topic are questions concerning how the document concepts will be used in the future. Examples suggested include the following:

- Educate colleagues about the framework and terminology,
- Develop and use a common language around interoperability,
- Describe a project of interest using the framework organizational concepts,
- Seek proposals for ways to apply the framework, such as assisting in the development of business cases,
- Recast the framework material as a living repository to allow users to populate it with issues (perhaps a Wiki knowledgebase),
- Develop measurable criteria and tools to review project conformance to framework concepts.
- Given the electric system as a critical infrastructure to our society, consider using organizational aspects of the framework to address threats by aligning policy, business objectives, processes, information, and technology to enhance system robustness (response to threats) and situational awareness (understanding system state for coordinating across the electric system and other critical infrastructures).

In each case, the audience who will be using the material needs to be considered carefully.

Document Reorganization

Several recommendations were made to improve the communications flow within the document by reorganizing the sections.

- Move the philosophical tenets section after the Introduction. Also, consider expanding the scope of the title to be able to include subsections to discuss interoperability aspects such as interactions and dynamics with physical systems, degrees of interoperability (distance to integrate ideas), and quality of interoperability.
- Recast the Section on Example Scenarios to introduce scenarios and summarize key points relevant to illustrate aspects of the framework, but move the details to an addendum. New scenarios (including ones developed by participants to the workshop) should also be added. See the section below on Example Scenarios for more suggestions.



Ambiguous or Missing Items

Some important aspects associated with interoperability should be addressed more explicitly. These topics are summarized below:

- Explain the framework's relationship with standards. The lack of explanation creates confusion for the reader as references to standards are made in examples throughout the document.
- Discuss the tension between the ability to interoperate with security and privacy concerns.
- The definition of interoperability should include notions such as interchangeability or substitutability, the distance to integrate, and local versus systemic behavior interoperability issues.
- Clarify the use of the word "system" in the framework as it may apply to process systems, physical systems, information systems, infrastructure systems, etc.

- To manage scalability, heterogeneity, and flexibility contrast interface definitions that support multiple business contexts with those that are domain or process specific. Understanding and exposing a component's fundamental utility can identify a point of interoperability applicable in multiple scenarios and make it more adaptive to future scenarios. For example, a building interface could support the same electric energy schedule interface that could be used in an agreement with a distribution electricity aggregator or a micro-grid energy management coordinator.
- The growth of intelligent, collaborating elements in the electric system marks a transformation requiring a new form of governance that combines electricity with information (E+I). This requires alignment with other governance domains (transportation, environment, etc.) to insure structural consistency as well as reuse of information (sharing of information to ensure overarching situational awareness).
- The notion of authority is missing in the framework. Who decides quality of service or performance metrics and who enforces them? Authorities are also needed for things like creating and operating registries.
- The governance of the framework itself (Section 6 of the framework document) needs to be completed. It should address recommendations to make this a living document, such as instituting something like a controlled Wiki.

To expound on the framework's relationship with standards, many points were offered for consideration:

- What should our community expect from standards? Help guide people by providing a realistic context about standards. For example, just because it is a standard does not mean you should use it.
- The standards landscape is confusing, especially when one looks across the various industry sectors that involve electricity. There are too many standards but not enough relevant standards going across a wide range of domains.
- Valuable standards are practical to use for implementers and they have relevance over a long duration. To ensure practicality and critical mass adoption, the right people and organizations need to be involved in their creation and they should enable creativity and variation to occur outside the (simple) boundaries of their specification.
- A section on standards could be added to the introduction or under the Tenets section. It should be explicit in saying that standards are not specified; only used as examples. The framework document should be in alignment with the Interoperability Constitution, in that its purpose is not to create new standards. Creating standards is the work of standards organizations.

2.1.2 High Level Categorization

Discussions arising from the section on High Level Categorization generated significant points for other sections of the document; however, much of the content and structure was acceptable to the participants.

Category Groupings

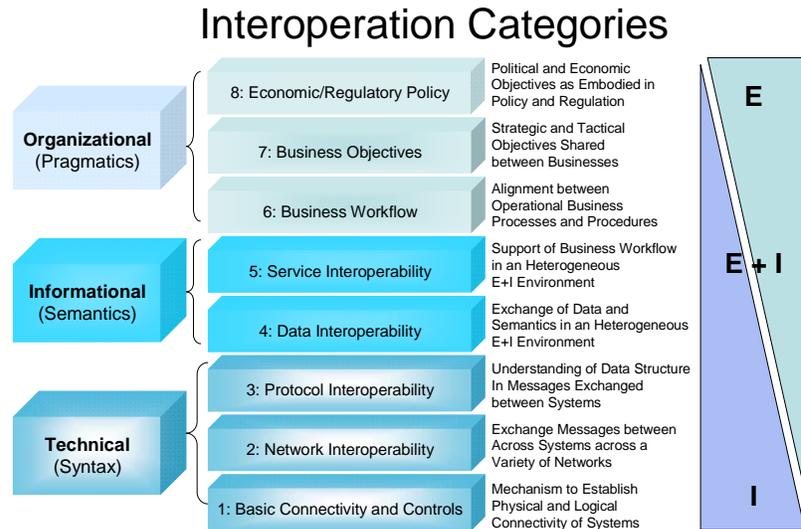
The organizational, informational, and technical groupings of categories posed little issue for the workshop participants. However, participants appreciated the perspective that Dr. Talk provided to introduce the framework interoperability categories. A further description of these groupings was proposed to provide further clarification:

- Organizational: pragmatic – why
- Informational: semantic – what



- Technical: syntax – how

In addition, participants appreciated the perspective of seeing the upper layers as dealing with the business of electric energy (E) while the lower layers concentrate on information technology (I). A combination of these aspects is occurs as one moves through the informational categories of the framework.



Technical Aspects

The Network Interoperability category should consider communications network management aspects. Some more detail in this area would allow better mapping to relevant aspects of network interoperability in the cross-cutting issues section.

Informational Aspects

The category that generates the most confusion is Business Context. The present description focuses on tailoring the semantic aspect of an information model relevant to the business procedure enabled across the interface. The current Business Context layer does not establish enough guidance/structure to bridge between Semantic Understanding and Business Procedures layers. In addition to the semantic context, there is also a need to address the functional context. The Business Context layer needs to define an abstract application model that can be used to define how the Business Procedures above it are captured.

The recommendation is to revise the current text under Business Context with some parallel language that addresses the Business Context impact on the functions and services derived from the Business Procedures layer. Besides referring to the OWL standard, business process integration standards should also be considered for reference. An example is the ebXML standard, which appears in the UN/CEFACT Core Components work. A new title should also be considered.

Organizational Aspects

Several topics related to aligning organizational concerns to improve interoperability were suggested as further work. Aspects of these items could appear in other areas of the framework document or in additional work efforts.

- Just as businesses negotiate contracts to trade goods and services, collaboration agreements between parties need to be reached by a similar negotiation process. Contracting is streamlined by following conventions proposed and adopted in commercial code in all states. What would need to be done to define a taxonomy of processes and

procedures that would provide some uniformity to defining informational exchange between organizations?

- Develop organizational constraints material. This could provide examples of linkages of cross-cutting issues to organizational categories. Point to include follow:
 - A methodology for categorizing public and private data so that it can be or should not be shared.
 - A taxonomy of threats (not just security, physical, storms, political) to be used in the new grid architecture and evaluate these threats in categories like liability, legality, insurability, and reinsurance.
 - A way to encourage adoption of interoperability principles, concepts, and standards by first movers by mitigating or educating their expectation of risk exposure.

2.1.3 Cross-Cutting Issues



The Cross-cutting Issues section was a good area for discussion as it attempts to cover the areas of interoperability implementation concerns in a comprehensive fashion. Multiple breakout teams described the desire to tie these issues to the interoperability categories, and thus better integrate these sections in the document. Recommendations for improving this section include the following:

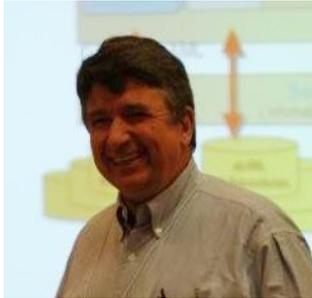
- Add a matrix to the document that shows the linkages between interoperability categories and the cross-cutting issues.
- Each cross-cutting issue topic needs more detail to articulate the issues and provide examples. Drilling down into each of these areas might be able to be accomplished through a call for papers process.
- Some points dealt with communications network management. The framework document needs to clarify where communications network concerns fit within its structure. For example, a suggestion was made to replace the Performance / Reliability / Scalability topic with "Quality of Service." This topic would include issues associated with communications network management. Consideration should be given to moving scalability issues to the System Evolution topic.
- The Discovery & Configuration topic needs to include topology issues.
- Consider a new cross-cutting topic: "Data Management." This could cover issues such as data backup and recovery as well as data integrity, precision, freshness, and availability.
- The System Preservation topic should consider issues associated with managing unintended consequences.
- The Security and Privacy section should consider issues associated with managing public and private data so appropriate stewardship of the data is put in place. This is a linkage with the organizational layers of the framework.

2.1.4 Example Scenarios

Participants noted that the length of the example scenarios distracts the reader from the remaining sections of the document. In addition, the document should include more scenarios that clarify other aspects of the framework. Recommendations from the breakout discussions are high lighted below:



- Summarize the main points of the scenarios in the body of the framework document, but move full scenario descriptions to an appendix.
- Add other scenarios. Suggestions include adding scenarios that emphasize the interactions between multiple domains (electricity service provider, building system, manufacturing system, electricity market, etc.). The idea of a “master” scenario was offered. Besides clarifying the framework, it could be the start for a high-level landscape of electricity stakeholders and technologies, and could bridge to future work.

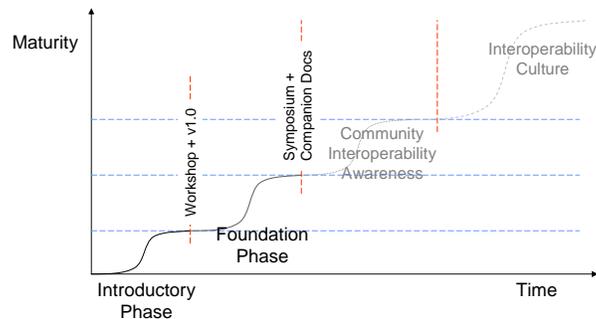


- The Meg A. Watts scenario was characterized as exemplifying a more traditional, single purpose interface approach that emphasizes central control strategies rather than the distributed control philosophy expressed in the Tenets section and supported by the Interoperability Constitution.
- Add scenarios with examples of existing open standards, at the Business Context and Business Procedures categories of the framework. Examples recommended include ICAL (as a standard for exchanging scheduling information), BPEL (as a standard for transmitting process decisions), SAML, XAML, or others of the Web Services Security suite (as a standard for authorizing processes and charges).

2.2 Framework Actions

The feedback from the workshop provides a number of actionable recommendations to immediately improve the framework document as well as suggestions for material and activities that would supplement and perhaps eventually supplant the framework document. The diagram below presents a concept of the framework in a foundation phase, much as it is documented now. Future steps to support community awareness and the development of an interoperability culture will require changes to this document and the addition of other material

Framework Progression



2.2.1 Framework v1.0

The following recommendations are proposed to be addressed in a revision of the framework document for completion in the near-term. Though more work is needed, this will create a document that reflects a number of good ideas from the workshop and will help with the engagement of other people in interoperability discussions and events, such as the symposium.

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- Add a short preface that defines the GridWise program and the GWAC's role in this program. This should include a list of prerequisite reading.
- The Executive Summary and Introduction should differentiate the purpose of the framework from the purpose of the framework document and avoid using references to "the document". Move references to the workshop to the "Background" subsection.
- Provide greater context for the place of the framework in a larger scheme of material and activities. Elaborate this sentence on page 5: "This is the first of a series of documents to describe an interoperability framework and articulate interoperability issues to enable discussion with participants at all levels." Provide examples of desired outcomes of the framework.
- Implement the document structure changes described in the "Document Reorganization" area of Section 2.1.1 above.
- Update the Introduction or Philosophical Tenets sections to address the items described in the "Ambiguous or Missing Items" area of Section 2.1.1 above.
- Update the introductory area of High Level Categorization to clarify the major subdivisions into technical, informational, and organizational layers (see the Category Groupings area in Section 2.1.2 above).
- Review the High Level Categorization and Cross-cutting Issues sections to address where communications network management issues are handled.
- Review and update the Business Context and Business Procedures categories to clarify the need to address the functional and service aspects of a collaboration agreement.
- Provide context information in the Cross-Cutting Issues introductory section to explain that more detail is to be provided for each topic as part of future efforts.
- Consider renaming the Performance / Reliability / Scalability cross-cutting issue topics with "Quality of Service" and consider moving the scalability aspects to the System Evolution topic.
- Update the Discovery & Configuration cross-cutting issue topic to include topology issues.
- Update the Security & Privacy cross-cutting issue topic to consider issues associated with data privacy stewardship and its linkage with organizational categories.
- Consider including the example scenarios prepared by participants in the workshop, including scenarios that would high light the use of standards at the Business Context and Business Procedures layers to help clarify confusion in these categories.
- Update the framework document section on Governance to provide some more detail; however, establishing the governance of the document will be an item for future work.

2.2.2 Future Versions and Related Materials

Many comments and recommendations will require more time to address and will result in subsequent versions or new and different material. These include the following points:

- A variety of audiences need to be engaged for different purposes. This will require material that speaks in style and terminology that addresses each audience's areas of interest. For example, The GWAC Policy Team has developed an interoperability checklist for policy and business decision-makers. Companion documents may provide guidance regarding standards to integrators on which standards to use, or to standards developers on adhering to interoperability principles. Consideration should be given to creating educational material, templates for describing projects using framework concepts, and metrics for measuring and testing. See following diagram.

3 Interoperability Symposium

The framework document discussions on Day 1 confirmed from the need to engage the greater electricity community to take actionable steps to advance interoperability concerns. Given this need, the workshop participants were presented with the challenge of what should such an engagement look like and how should it be carried out. As a starting context, the a few logistical targets were pre-defined.

- Size: 200-300 attendees
- Date: late October or early November, 2007
- Duration: 2 to 3 days
- Location: reasonable accessibility in the continental United States



3.1 Workshop Ideas for a Symposium

Each breakout team developed their thoughts for the purpose, structure, challenges, and steps needed to successfully engage all relevant parties in a symposium to improve interoperability. The excellent ideas were captured in the detailed presentation material from all the teams and contribute to this summary.

Objective Statements

- Assemble ideas and resources in functional/business areas for actionable steps to improve interoperability. Define concrete improvements in interoperability between electric system and various target groups (building and industrial automation, renewable resources, etc.)
- Grow the interoperability community. Change will occur from a community of participants with the will and power to affect change. This is a major step on a growth curve: GWAC ⇒ Interoperability Workshop ⇒ Symposium ⇒ The World!
- Emphasize a visionary tone. Vision can align diverse stakeholder directions and build a consensus around a picture of the future electricity community.

Audience

The audience must be multi-dimensional:

- Consumers, electric service providers, producers, distributors, wholesale and retail
- Business, technical, economic/regulatory policy
- Suppliers of solutions and tools
- Advocacy and standards bodies

- International (issues and solutions go beyond North America)

Challenges

To attract attendees, they must clearly understand the value proposition of the symposium. The value proposition can be articulated through answers to these questions:

- What business compelling opportunities are facilitated by interoperability? For example, business drivers for change include legislative initiatives that can result in mandates to improve system integration and open new value streams.
- What are the benefits of attendance for each of the audience targets? Structure the symposium to reinforce the value proposition for the targeted groups.
- With a multi-dimensional audience, how can people be assured that their segment will have a fair voice? Openness, balance, and equal opportunity need to be represented in the program.

The value of framework to facilitate community discussion and advance interoperability needs to be clearly communicated. The role of the GWAC and other sponsoring groups and initiatives needs to be explained in the context of the greater community. For example, the role of the GWAC in relationship to various standards advocacy groups needs to be clarified. Who will decide interoperability directions for the electricity community?

Symposium Structure

The interoperability context-setting framework can be used as an organizing tool to add structure to the symposium.

The basic structure for the symposium rises out of ideas for tracks and sessions within tracks. Participants felt there should be at least two tracks: one technology oriented and one business oriented. A third track is possible. It might engage policy makers, regulators, and consumer advocates.

Session format ideas included tutorials, paper presentations, panel sessions, roundtables, “birds of a feather”, and breakout groups for developing actionable steps forward.

Ideas for tracks and sessions follow:

- Business Track: What business opportunities can be facilitated by interoperability? Session ideas include,
 - What is the business services vision of the future electric system and the role for interoperability?
 - CEO visionary case studies and opportunities
 - Business Scenarios
 - New Age of Governance for Critical Infrastructures: How to align an information-rich electricity (E+) infrastructure with other critical domains (transportation, environment, etc.) to ensure the nation’s security.
 - Current Business Constraints and Barriers
 - Benefits – for each audience segment
 - Regulatory Barriers Removed
 - New Eco Niches
 - Playing in Real-time Markets
 - How to Secure Today’s Investments for the Future



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- Technical Track: What are the challenges to enabling interoperability? The framework cross cutting issues section can be used to help organize sessions. This may be a good area for a call for papers. Ideas include,
 - Applying the Framework
 - Privacy and Security
 - The Tension between Security versus Interoperability
 - Semantic Modeling: ontologies for automation systems
 - Quality of Service: Reliability, Performance, and Scalability
 - Configuration and Discovery
 - System Preservation
 - How to Obtain Real-time Infrastructures
 - Mission Critical and Non-Mission Critical: What they are and when/how to mix them (and when not to mix them)
 - Tools for System of Systems Engineering (in a heterogeneous world)
 - Methods for Specification and Documentation
 - CIO / CTO case studies on interoperability across multiple domains
 - Identification of Enabling Technologies
 - Coping with Migration, Evolution, Revolution
 - Application/Service Scenarios: Interoperable interfaces for demand response: renewable resource integration, etc.
 - The Benefits of Standardization: Understanding and leveraging the standards community
 - Understanding the Risks of an Interconnected Grid: Unintended consequences, non-determinism, etc.
 - Issues of Sensing and Measurement: Current capabilities may not match our assumptions
 - Metrics: How do we measure interoperability progress? Should compliance tests against established criteria be available someday?

Call for Papers

A call for papers would allow champions of ideas to articulate their points and give them visibility in a symposium session. Such calls can be organized around the cross-cutting issues to articulate each topic in the framework. They could also be targeted to support a limited number of paper sessions (chosen from the ideas above, especially in the technical areas). They can encourage practicing system integration contributions from industry or academic input with an emphasis on future directions that will improve interoperability. A symposium proceedings document with quality papers could be developed into a special issue with potential international relevance.

The call for papers process needs to be defined. It should be an open process with opportunity to participate from across the identified community. The papers should have a peer review.

Educational Tutorials

A tutorial could be provided about the scope and purpose of the framework. Other tutorials could be targets to look at interfaces between different communities. For example, interoperable interfaces established between the building automation sector and the electric power sector, or interoperability

between industrial controls sector in distributed resources (such as distributed generation) and the electric power sector.

Other Symposium Possibilities

Other ideas were offered by workshop participants that could contribute to organizing a symposium.

- Online forums
- Demonstrations / exposition

3.2 Symposium Actions

Immediately after the workshop, the leads and facilitators gathered to review the meeting discussions and recommendations concerning a symposium. From this discussion, the initial structure for a symposium began to emerge.

The objectives, targeted attendance figures, audience, duration, and targeted dates have been captured in the previous section. The framework document will be helpful as an organizing tool for the forum as well as help outline ideas for a call-for-papers. The agenda for the meeting follows something like that depicted below.

Day 1		Day 2		Day 3	
Biz	Tech	Biz	Tech	Biz	Tech
		Opening Plenary		Technical Interop	
		Operational Interop		Roadmap Plenary	
Registration					
Tutorials		Informational Interop			
Welcome Reception		Dinner and Networking			

The meeting is proposed to start in the afternoon of the first day with tutorials related to interoperability in the electric system. Examples include, a briefing on the context-setting framework, interoperable interface efforts being advanced in standard and trade organizations, and complex system of systems methodology. People arriving later on the Day 1 would have a chance to meet other attendees at a welcome reception.

On Day 2, the symposium would start with an opening plenary of keynote addresses and a possible panel session. After that, the attendees would have the option of attending sessions in at least 2, but no more than 3 parallel tracks. The

track differentiator being business/decision-maker oriented and technical oriented. During these sessions, breakout periods would be scheduled for attendees to discuss and propose actionable steps to improve some aspect of interoperability. The objective is to promote active participation where individuals and organizations can come forward as champions to address an interoperability issue of interest with plans for next steps and future engagements.

The tracks would come to a close by noon on Day 3 and the meeting would conclude with a plenary to recap the symposium and present a path forward for action and continued engagement for improving interoperability. Examples of for this session include observations and concluding remarks, announcements of initiatives, proposals to develop interoperability checklists, tools, scenarios, business plans, or technical reports that clarify integration issues and enable emerging smart grid functionality.

The following steps are being taken regarding the symposium:

- Assemble a symposium planning committee to include representation from the workshop as well as the Architecture Council.
- Set the name, dates, and location for the symposium and make a public announcement through press releases and articles.
- Draft the tracks for the symposium. These tracks should support panel discussions and presentations from all audience sectors.

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- Develop a plan for a call for symposium papers that support targeted symposium tracks and name champions for papers session organization and peer review of the papers.
- Communicate the purpose and place of the symposium in a larger context for advancing interoperation that enables the interaction of all elements of the electric system. This includes the relationship of the symposium with the framework, and other supportive material and efforts.
- Engage workshop participants and representatives from targeted audience sectors to lead symposium sessions and become active contributors.

Subsequent to the symposium, submitted papers may be assembled in a selected journal or special edition. Actionable directions will be captured for the GWAC, champions, and other interested parties to develop into plans for advancement.

Appendix A: Participants

Ron Ambrosio, IBM
Colin Bester, Site Controls
Joe Bucciero, KEMA
Thomas J. Burke, OPC Foundation
Ritchie Carroll, TVA
Sunil Cherian, Spirae
Leon Ciccarello, Broadband Energy Network
Francis Cleveland, Xanthus Consulting
Phil Cleveland, Comverge, Inc.
Dave Cohen, Infotility
Toby Considine, University of North Carolina
Rik Drummond, Drummond Group
Adrian Gheorghe, Old Dominion University
Ian Gorton, PNNL
Erich Gunther, EnerNex
Dave Hardin, Invensys
Jeff Harding, ABB
Brent Hodges, ZigBee Alliance
David Holmberg, NIST
Ken Huber, PJM
Joseph Hughes, EPRI
Marco Janssen, UTInnovation
Ranata Johnson, PNNL
Walt Johnson, CAISO
Patrick Kennedy, OSIsoft Inc.
Olga Kuchar, PNNL
Jim Luth, OPC Foundation
Jack Mc Gowan, Energy Control Inc.
Kelly McNair, TXU
Terry Mohn, Sempra Energy
Scott Neumann, UISol
Mia Paget, PNNL
Farrokh Rahimi, OATI
Ben Rankin, EnerNex
Russell Robertson, TVA
Greg Robinson, Extensible Solutions
Terry Saxton, Extensible Solutions
Richard Schomberg, EDF
Larry Silverman, LightMedia Corp.
Andreas Tolk, Old Dominion University
Kevin Walsh, SAP America Inc.
Joe Weiss, Applied Control Solutions
Chuck Wells, OSIsoft Inc.
Steve Widergren, PNNL
Thomas Yeh, ConnectedEnergy

Appendix B: Workshop Agenda

Wednesday, 11 April 2007

7:30 am	Registration
8:30 am	Welcome: Jack Mc Gowan, Chair, GridWise Architecture Council Keynote: TXU's "Smart Grid" Perspectives - Kelly McNair, Dir. of Information Mgmt, TXU ED Workshop Briefing: Steve Widergren and Andreas Tolk, Workshop Co-Chairs Test Scenarios: Toby Considine and David Holmberg
10:30 am	Framework Breakout Sessions Raise document issues and proposed improvements Themes (inspired by the document organization) <ul style="list-style-type: none">- Technical interoperability- Informational interoperability- Organizational interoperability- Cross-cutting issues- Overall framework structure and philosophical tenets
12:00 pm	Working Lunch
1:00 pm	Resume Framework Breakouts
4:30 pm	Group Review for Quick Summary
5:00 pm	Adjourn Breakout Meetings for the day
6:00 pm	Reception and Networking

Thursday, 12 April 2007

8:00 am	Welcome Back and Breakout Presentation Results
9:00 am	Summary, General Discussion and Instructions for Next Breakout Sessions
10:00 am	Interoperability Next Steps Breakout Sessions <ul style="list-style-type: none">- 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 <ul style="list-style-type: none">- 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

Appendix C: Workshop Proceedings Material

The following material from the workshop is available for review and download:

1. The GridWise™ Interoperability Workshop April 11-12, 2007 Proceedings Summary (this document)
2. Position papers and example scenarios using the framework authored by workshop participants
3. Briefing presentations and summary presentations from breakout sessions on day 1 and day 2 of the workshop.
 - a. Briefing presentations include the keynote address from Kelly McNair of TXU Electric Delivery as well as the introductory and concluding slides from Andreas Tolk and Steve Widergren
 - b. Day 1 presentations are organized by framework document topics: overarching issues, organizational issues, informational issues, technical issues, and cross-cutting issues.
 - c. Day 2 presentations are organized by breakout group addressing interoperability community engagement and symposium organization.
4. Photographs from the meeting are also included. See yourself and colleagues in thoughtful poses!