



A Smart Grid Interoperability Maturity Model Rating System

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Agenda

- Why an Interoperability Maturity Model and Rating System
- The Smart Grid Interoperability Maturity Model
- Framework for Assessing Maturity Level
- Conclusions

The Need for a SGIMM Rating System

- Model for assessing the likelihood of “successful” interoperability projects
 - Success is defined as ease of achieving interoperable system using components from different vendors
 - Standardized tools for data collection and rating
- Tool for self-assessment and improvement
- Value for executives, regulators and investors in making investment decisions
 - Likelihood proposed projects will meet or exceed goals

Takeaways

- Work already done as the basis for a model and rating system.
- Well-developed set of interoperability goals implicit in work done.
 - Measure interoperability maturity of an organization against them.
- A five-level maturity model is proposed.
- Prior work can be used to develop Rating System.
- Lots of work to be done to implement.

Why and What

- DOE requiring Smart Grid Interoperability Maturity Rating System as part of Regional Demonstration Projects
- GWAC has started work to produce such a model
- This paper proposes a Smart Grid Interoperability Maturity Model (SGIMM) and Rating System
 - Based on work by GWAC, SEI, NIST and NEHTA
 - Intended to be predictive

SGIMM Concept

- Simple 5 Level Maturity Model
 - Simple in concept
 - Relatively easy to apply
- Leverages work already done
 - NEHTA IMM
 - GWAC Interoperability Framework and Decision-Maker's Checklist
 - SEI-SGMM
 - NIST Smart Grid Standards Roadmap
 - Connectivity Week Papers
- Basic Interoperability Goals
 - Derived from GWAC Stack and NEHTA IMM

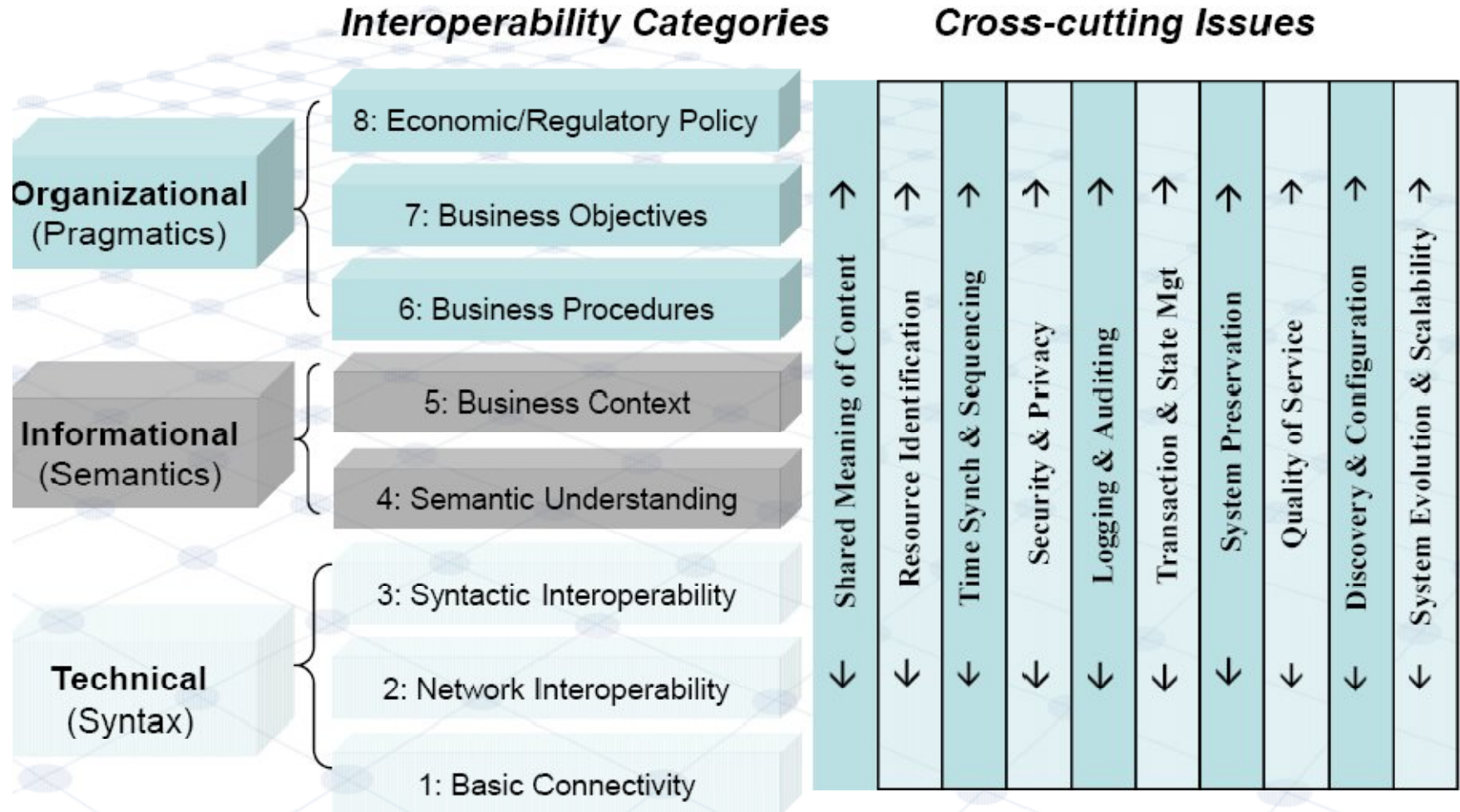
SGIMM Concept (Contd)

- Basic Interoperability Characteristics
 - Derived from GWAC Stack
- Use of prior work for specific ratings
 - Elements from GWAC Stack, SEI-SGMM, etc., each contribute to rating system
- Detailed work required to complete rating system

Maturity Rating Framework

- GWAC stack defines maturity goals and characteristics
- SGIMM Model – defines characteristics of each level
- Definition of metrics for each goal and level
- Extract specific measurement methods and ratings from existing resources – GWAC, SEI, etc

Context-setting Framework



Smart Grid Interoperability Goals

- Improvement in economics, efficiency and performance of the delivery of electrical service to customers.
- Demonstrated maturity in all 8 levels of the GWAC stack.
- Technical system architecture/design supports GWAC stack goals.
- Business system architecture/design supports GWAC stack goals.
- Organizational support – i.e., disciplined adherence open industry standards; insistence on multiple, interchangeable solutions.
- Security as an integral and demonstrated feature of every system interface.
- Evolutionary capabilities: support for legacy systems, prior and future versions.
- Separation of key functions for interoperability.

Interoperability Characteristics

- Exchanges between two entities:
 - Exchange of meaningful, actionable information
 - Shared understanding of the exchanged information
 - Agreed expectation for the response to the information exchange
 - Quality of service, reliability and security in the exchange and the responses.
- Scalability of the interoperable systems.
- Distributed, de-centralized decision-making.
- Separation of data exchanged from the communications networks employed.
- Common information models.
- Alignment of operational business objectives and processes.
 - Common business definitions and rules.
- Alignment of strategic and tactical objectives.
- Operation within societal, political and regulatory context.

The SGIMM Model

Level	Title	Description
5	Plug and Play	Technologies do not require specialized engineering efforts or expertise to implement components from competing vendors/technologies. All components based on open interoperability standards and certified. Robust maintenance and update processes are planned including feedback to SDOs to improve the standards.
4	Certified, Minor but Planned Integration Efforts	Minimal known integration activities. Projects are implemented mostly on plan with requisite interoperability quality. Maintenance lifecycle and update process planned but some issues expected. Most components conform to adopted or de facto standards and are certified conformant and interoperable. Some testing not adequate. All goals not achieved.
3	Emerging Interoperability	Moderate integration effort. Some interoperability surprises. Some update processes planned but challenges expected. Most projects use standards (at least 50%) with well-developed interoperability verification regimes. Vendors claim standards compliance – can sometimes (>50%) demonstrate compliance.
2	Initial Interoperability	Major integration effort on projects. Interoperability surprises - budget and schedule overruns. Systems rarely plug compatible with other systems. Minimal planned update processes. Some standards internally adopted (less than 50%). Rarely see interchangeable solutions.
1	Non-Interoperable	Unique, custom-developed systems or products. Require significant custom engineering to integrate with other components. Few if any internally adopted standards and inconsistent adherence. Interoperability is difficult to achieve and very expensive to maintain.

Goals and Metrics

Goal	Level 5 Status
Improve economics	Consistent, measurable results. Goals attained
GWAC Levels 1-8	All levels fully implemented
Technical system architecture	Consistently implemented
Business system architecture	Consistently implemented
Organizational support	Documented in consistent supporting policies
Security	Documented in consistent supporting policies
Evolution	Documented in consistent supporting policies
Functional separation	Evident in system architectures and design

Use of GWAC Stack in Rating

Goal: Level 4: Semantic	Characteristics	Metrics	Rating
Interpretation of message information for action	Common definitions used by each partner	Conformance to industry accepted semantic definitions	Lowest where all definitions proprietary
Coordinated updates and changes to definitions	Industry repository or other mechanism for coordination of changes	Lag in adopting updates	Lowest where no update process exists
Interpretation of multiple standard semantic definitions	Support for any relevant industry standard	Comparison of relevant adopted standards to supported ones	Lowest where no standards adhered to
Support for development of specific industry standards	Active in named standards SDO relevant to organization	Support activity	Lowest where no active support exhibited

Decision-Maker's Checklist

Example: Goal 3

"Technical system architecture and design that supports the technical goals of the Interoperability Framework"

Relevant Decision-Maker's Checklist Example Questions

- Does a typical project design specify the points of interface and the protocols to be used at such interfaces between systems?
- Do projects typically specify an "open" architecture such that any vendor can have access to the architectural requirements?
- Has the utility adopted requirements for meeting specific open interoperability standards?
- Where national standards are not yet adopted – e.g., ADR – how does the utility support adoption of a standard?
- When specifying standards, how does the utility deal with optional and proprietary extensions that could render a product non-operable with other products?
- When requesting proposals for grid components does the utility look for at least two competing and comparable solutions that claim to meet the same standards?
- How does a utility validate claims of conformance to specified open standards

SEI-SGMM and SGIMM Rating

Example: SGIMM goal area 5, Organizational Support, is addressed by specific SEI-SGMM Assessment Survey questions :

- SMR-1.1 Has a smart grid vision been defined within your organization?
 - No
 - Within a single function
 - Across multiple functions (encompasses and is communicated across functions)
 - Across the enterprise (encompasses and is communicated across the enterprise)
- SMR-1.3 Has experimentation on smart grid components, tools, and techniques been given support within your organization?
 - No
 - Not specifically for smart grid vision (any amount)
 - Very little, targeted for smart grid
 - Moderate amount, targeted for smart grid

NIST Roadmap and SGIMM

- Map adopted standards to the GWAC Interoperability Framework
 - Develop checklist of standards that should be adopted and enforced at different levels of the Framework.
- For example, OpenADR, OpenHAN and ZigBee/HomePlug Smart Energy Profile would all be considered standards at the Framework Category 4; Semantic Understanding.
- The degree of adoption and enforcement indicates level of interoperability maturity

Next Steps

The next tasks for the SGIMM include:

- Develop specific rating questions for each maturity level.
- Establish process for gathering measurement information.
- Establish the actual rating system – what does the information mean in predicting ease of interoperability?
- Understand how the model can be applied.
- Pilot to demonstrate the system achieves useful results.

Key Conclusions

- Work already done as the basis for a model and rating system.
- Well-developed set of interoperability goals already in place.
 - Measure interoperability maturity of an organization against them.
- A five-level maturity model rating outline is proposed.
 - The method for leveraging prior work by GWAC, SEI and NIST is outlined and demonstrated.
- Additional work to establish
 - Details of the rating system,
 - Methodology for ratings utilities
 - Test value of such ratings.