Why do we need standards?

Strategic Standards in Advanced Manufacturing:
Theme – Target - Team

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Why Use Standards?

- Avoid re-inventing the wheel
- Learn from industry best practices
- Specify requirements more easily
- Reduce integration costs
- Prevent single vendor “lock-in”
- Vendors share a much larger market
Why should Smart Manufacturing care about standards?

- Standards get adopted by governments and become legal requirements
- Products must be designed, tested and certified to meet those standards
- Standards help to make product performance in the field safer, more predictable and reliable
- The harsher and more numerous these standards are, the costlier the product is and the longer it takes to bring it to market
- The better balanced the standard, the more level the playing field
Making Standards Work

**Items critical to a successful standard:**

- Mature spec
- Involved user group
- Certification process
- Revision process
- Marketing, labeling
- Implementations
- Tool sets
Enter Smart Grid Standards Domains
Standards Lead to Interoperability

Systems Integration & Operation

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<thead>
<tr>
<th>Lack of Standards</th>
<th>Custom Integration</th>
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<td>Interfaces can be Mapped</td>
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<td>Interfaces with Common Models</td>
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<td>Optimal ‘Plug n Play’ Standards</td>
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<th>Design &amp; Install Costs</th>
<th>Operation &amp; Maintenance Costs</th>
<th>Available Workforce</th>
<th>Competitive Innovation</th>
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Interoperability: Foundation for a Smarter Grid

Utility Smart Grid

Media Agnostic

Fiber Optic

Copper Wire

Powerline Carrier

Intelligent Communicating Appliances

Wireless

Ability To Seamlessly Communicate, Exchange Information and Act Upon it
Interoperability Layers and the Model

- **Organizational**: Policy, Business Objectives, Business Procedures
- **Informational**: Business Context, Semantic Understanding
- **Technical**: Syntactic Interoperability, Network Interoperability, Connectivity
- **Cross-Cutting Issues**: Security, Resource Identification, Time Synch, etc.
Why did we create the Interoperability Checklist?

• People don’t understand interoperability
• Decision-makers don’t understand how to recognize and implement interoperability
• Easy is good.  Short and easy is better.
• The more people make decisions affecting the grid with interoperability in mind, the faster we’ll get to a smarter, modern grid.
Conceptual Model and the “First Five”

IEC 61970: CIM Core and Energy Mgmt.

IEC 61850: Substations and more

IEC 61968: CIM Distribution Management

SOURCE: NIST Smart Grid Framework 1.0 Sept 2009
Ideally.....
Reality – Different Targets Abound

- **SEMI F47**
  - Semiconductor Manufacturing
  - European Electrical Equipment >15 Amps
  - IEC 61000-4-34

- **CBEMA/ITIC**
  - Semiconductor Manufacturing
  - European Electrical Equipment for Intel
  - IEC 61000-4-11

- **Computer Equipment**
  - Samsung
  - Outage
  - Ride-Through

- **Digital Equipment for Samsung**
  - European Electrical Equipment <15 Amps
  - IEC 61000-4-11
SEMI F-47 impact

- The societal benefit of SEMI F47 is now being realized in lower production and downtime costs of 300mm equipment.
- Most semiconductor fabs still utilize a mixed strategy of tool level, control level, and panel level power conditioning solutions.
- Utilities that feed semiconductor plants are hearing fewer complaints as a result of SEMI F47.
- SEMI F47 has “opened the door” for equipment purchasers to expect better power quality performance from the systems they procure.
- 200mm equipment will need to be dealt with by the fabs in embedded solution retrofits or panel level solutions. Most tool suppliers are not focused on fixing 200mm issues.
- 450mm is on horizon which requires new advanced manufacturing…. 
Team work: Utility/Auto Industry Collaboration

- EPRI engaged in standards definition, technology and supplier evaluation through implementation

- EPRI Infrastructure Working Council central to setting technical direction

- SAE participation from Utility, automotive and electrical equipment manufacturing industries
And you think you are done? Test and Certification Process

- **Static Conformance Review of vendor attested PICS per application profile**
  - Verification of the vendor declared feature set by qualified and sufficiently independent personnel.

- **Y/N**

- **Test Plan Generation**
  - Fulfills mandatory & optional feature set per application profile?
  - Generation of a plan of work that catalogs the applicable test cases out of appropriate test suites from the test specification. Valid test cases are cross referenced to the current test case reference list.

- **Testing**
  - Testing using a validated test harness, configured for a test profile that corresponds to the application profile that the vendor product operates.

- **Y/N**

- **Test completion**
  - Pass or Fail the certification test?
Test and Certification Process (cont.)

- Test completion
  - Test service provider generates a test report, detailing the results of the certification testing, and where appropriate and necessary, state the clear Pass/Fail results

- Y/N
  - Forward to qualified personnel to independently verify the test results?

- Y/N
  - Technical qualifier, independent from the vendor and the test process, reviews the results, and organizes the product compliance folder

- Y/N
  - Recommend for certification?

- Y/N
  - Certification body that administers the program reviews the total work, and makes decision on listing the product as “certified”

- Certification Complete

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SUMMARY: Remember Barriers

- **Organizational**
  - Corporate culture
  - Existing policies
  - Departmental “Silos”
  - Lack of human resources

- **Knowledge**
  - Missing applications
  - Missing algorithms
  - Lack of training

- **Systems**
  - Lack of standards
  - Too many “standards” to choose from
  - Missing products and services
  - Not applying formal methodology

- **Business**
  - Lack of policy to use standards
  - Not writing it into RFP’s
DANGER: Advanced Mfr Integration without Standards or Architecture?

• It is not sufficient just to integrate systems haphazardly
• There must be an overarching plan, or blueprint
• Otherwise, vital systems integration may be prevented because of:
  – High costs
  – Missing technology
Conclusion

• Many of the standards we need are already there
• There are different needs in different environments
  – Define new applications and procedures
  – Agree on common information models
  – Adopt, evolve existing technologies and protocols
  – Develop new technologies and protocols
  – Apply systems engineering discipline
• Each of these tasks comes with a cost
• Standards provide the most benefit when implemented frequently and pervasively
• Pay attention to the business case
• Specify the use of standards in RFP’s
What are we saying: Don’t reinvent the wheel

• There are organizations generating application scenarios, functional requirements, best practices, standards, and the methodology for doing all of the above – all in the public domain
  – EPRI IntelliGrid – Requirements development methodology and systems driven approach to system architecture development
  – UtilityAMI – minimum AMI requirements
  – OpenHAN – HAN device minimum requirements
  – UtiliSec / AMI-SEC – smart grid security and privacy requirements
  – AMI-Enterprise – Utility enterprise integration requirements
• Participate, exchange lessons learned, re-use, contribute
Together…Shaping the Future of Electricity