Utility Standards Board (USB):

Utilities Develop Business Requirements for Interoperable Smart Grid Standards

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Abstract: The Utility Standards Board (USB), a group of six major utilities covering 20 US states and Canadian provinces, has funded a unique effort in which these large utilities are developing the Business Requirements which will drive the development of de facto Interoperable Standards for the interface between the Advanced Metering Infrastructure (AMI) systems and the many utility back office and operations systems which are interconnected to the AMI via a generic "Enterprise Bus (EB)". Although both the IEC TC57 WG14 and NRECA's MultiSpeak program have addressed this AMI/EB interface, they have not yet addressed all of the requirements, particularly for the larger utilities. Gap analysis and coordination with these efforts are major aspects of the USB Smart Grid process, which will ultimately lead to more complete interoperable standards across the AMI/EB Smart Grid interface.

1. Introduction to the Utility Standards Board (USB)

The Customer Care Research Consortium (CCRC), an executive forum of seventeen leading utilities for discussing strategy, co-funding research, and acting collectively on select issues, established the Utility Standards Board (USB) in late 2007. The USB, currently including six of the CCRC utilities[i], is charged with developing de facto standards for the interface between the Advanced Metering Infrastructure (AMI) and the Enterprise Bus (AMI/EB interface), based on utility Business Processes which exchange information across that interface. This effort is coordinated by Navigant Consulting, Inc. and DEFG, LLC. with technical support provided by Xanthus Consulting International.

1.1 Scope of USB Projects

The scope of AMI/EB interface is shown in Figure 1, namely the interface between the AMI systems which reach out to the meters and customer gateways, and the Enterprise Bus which connects to utility systems, including back office systems and certain distribution operations systems. Although implementation configurations of these systems can vary significantly, the basic architecture remains the same, with the Enterprise Bus acting as the conduit between the AMI systems and any other systems.

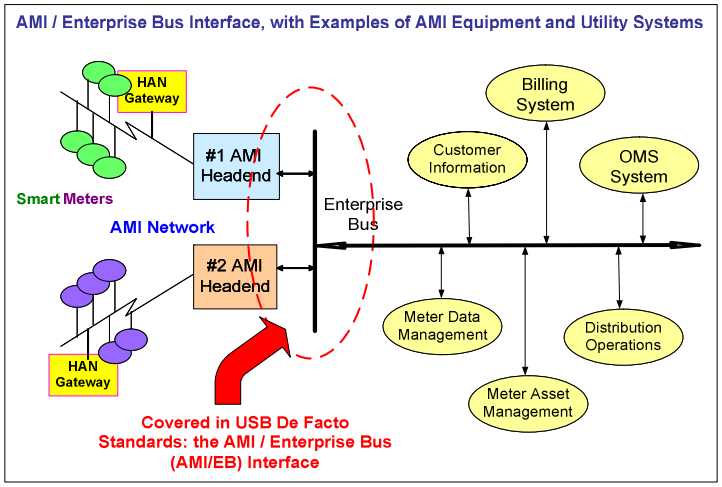

Figure 1: USB Scope: Interface between the AMI Systems and the Enterprise Bus

1.2 Breadth of USB Business Process Activities

The USB recognizes that there are a large number of business processes that will be utilizing the AMI/EB interface either directly or indirectly through using information that flows across the interface. The primary business processes are illustrated in Figure 2. The expectation is that the USB will focus on the business processes of the most interest to the utilities, taking them one at a time, rather than spreading their resources on attempting to undertake all of them at once.

1.3 USB Process

The USB fills a niche not served by the existing standards organizations by providing a focused methodology for utilities to develop their requirements.

The process used by the USB projects is:

- Develop extensive sets of Business Processes to act as sources of utility requirements
- Extract from these Business Processes the common information flows across the AMI/EB interface using Activity Diagrams
- After a gap analysis of the existing IEC 61968-9 draft standard and MultiSpeak documents, develop de facto standards to be specified and used by the USB utilities
- Provide input to the IEC TC57 WG14 for interface interactions not yet covered in the IEC 61968-9 draft standard. This process is shown diagrammatically in Figure 3.

Through dedicated work teams assigned to specific issues, the USB is dedicated to developing practical, de facto standards that utilities and technology vendors can embrace in the near-term and that the international standards bodies can incorporate into the global industry standards currently under development. The USB member utilities set the organization's research and development agenda working closely with the solution vendor community, other utilities, and other industry groups.

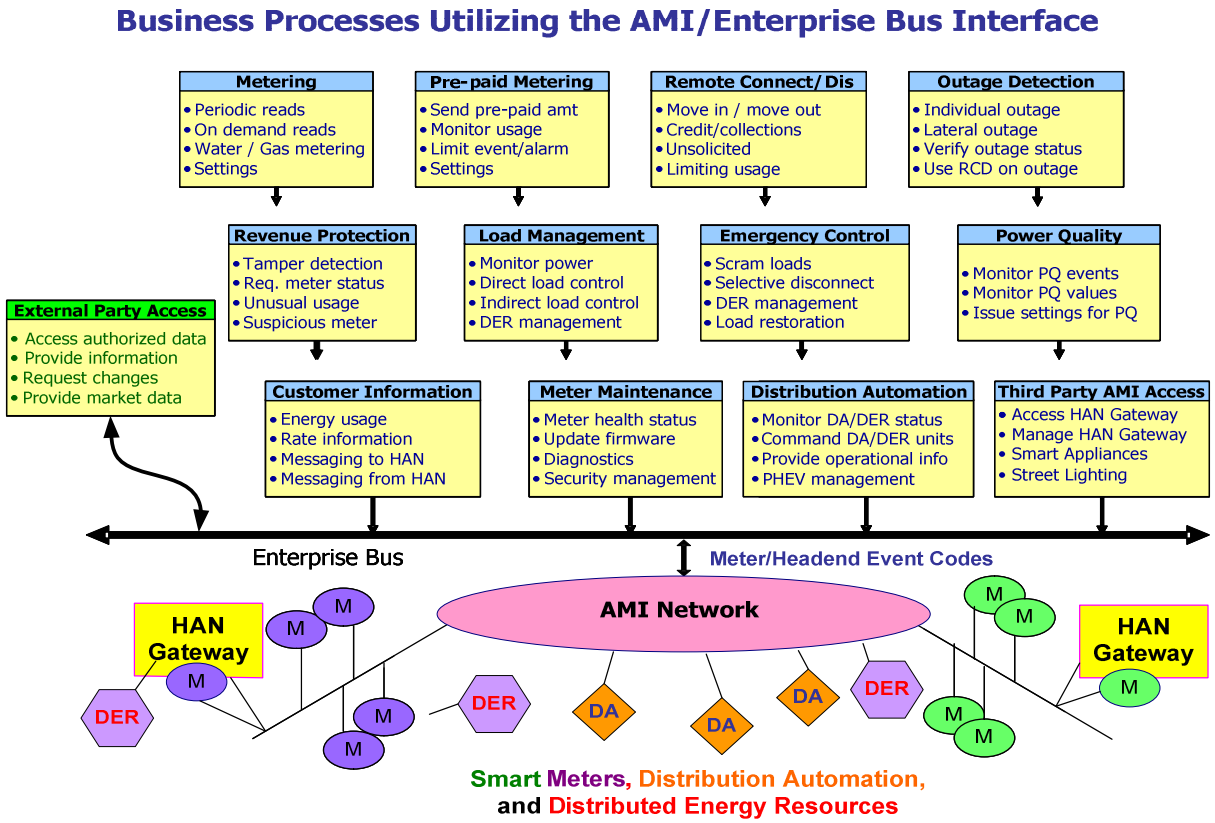

Figure 2: Primary Business Processes Utilizing the AMI/EB Interface

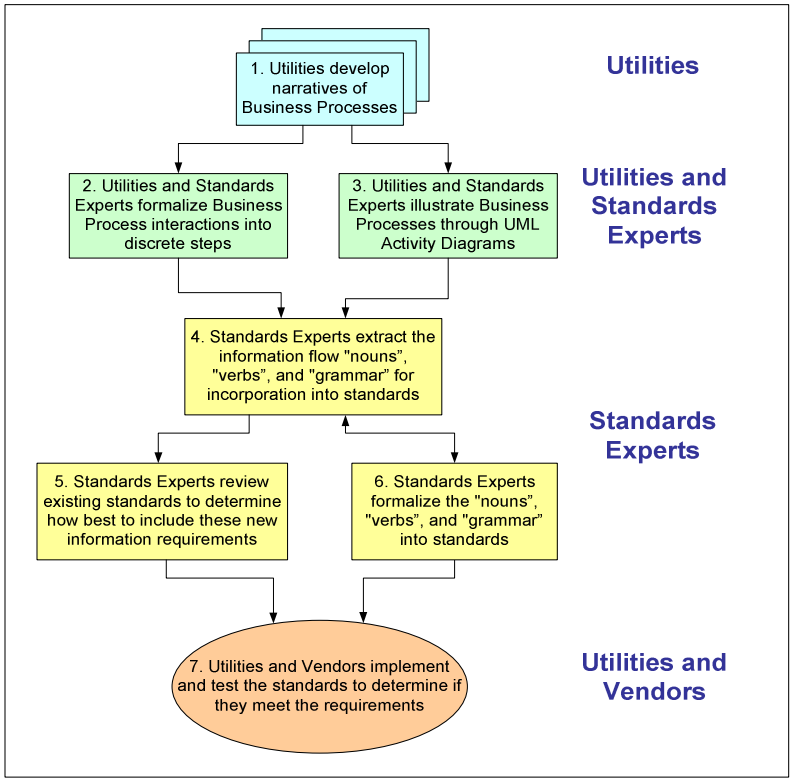

Figure 3: Procedure for Going from Business Processes to De Facto Standards

2. USB Project Teams

To date, the USB Leadership Team has approved and established the following three project teams:

- Meter/Headend Event Code (MHEC) project team
- Remote Connect/Disconnect (RCD) project team
- Outage Detection and Restoration (ODR) project team

As these complete their tasks, and as feedback is received from the teams, additional projects are expected to be authorized by the USB Leadership Team.

2.1 Meter/Headend Event Code (MHEC) Project Team

The MHEC project team is working to improve the organization, classification, and definitions for event codes that are received from the meters as well as those resulting from AMI issues. AMI and Meter Data Management (MDM) vendors were requested to provide a list of all event codes they either produce or encounter. Adding these to the existing ANSI C12.19 meter event codes and those developed by MultiSpeak, an exhaustive list of event codes was developed. These are being organized and combined into a draft set of event codes expressed in the XML Schema Definition (XSD) language. Preliminary de facto standards will be available for industry comment in Q4, 2008.

2.2 Remote Connect / Disconnect (RCD) Project Team

The RCD project team has developed business processes for remote connect, disconnect, and reconnect processes. These business processes include:

- Routine turn-on of service (move in)
- Routine shut-off of service (move out)
- Credit & Collections termination of service
- Credit & Collections reinstatement of service

- Local/on site shut-off of service
- Local/on site turn-on of service
- Credit & Collection Service Limiting
- Emergency Response / Load Shedding
- Unsolicited change of state of connect/disconnect switch including exceptions processing

The RCD project team has developed Activity Diagrams of RCD Basic Modules consisting of:

- Remote Connect Basic Module
- Remote Disconnect Basic Module
- Unsolicited RCD Switch Basic Module

An example of the Remote Connect Basic Module is shown in Figure 4.

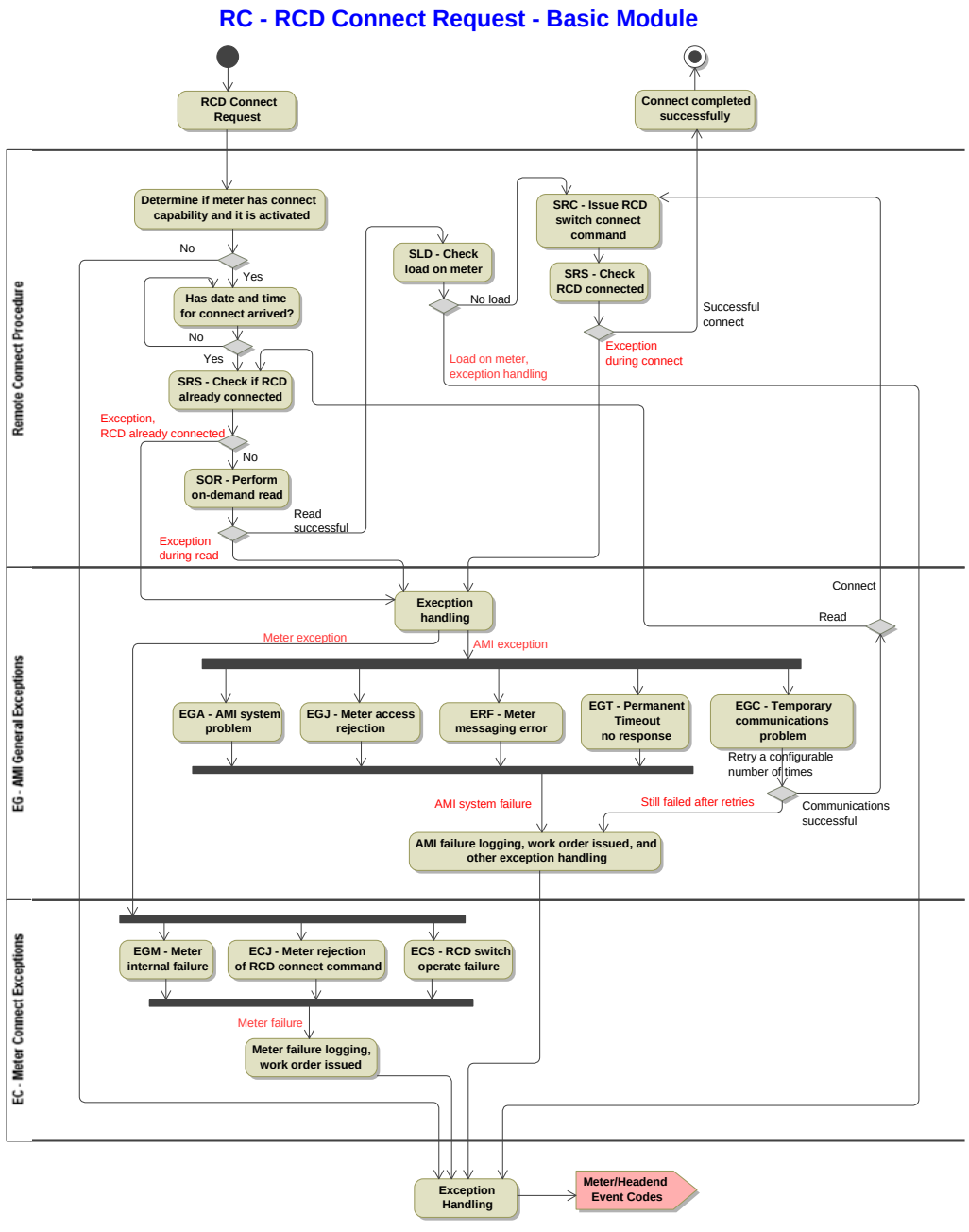

Figure 4: RC – Activity Diagram for RCD Switch Connect Request

These Basic Modules are comprised of Standard Modules which will become the de facto standards ultimately submitted to the IEC TC57 WG14. These Standard Modules include:

- **SRC**: Standard Remote Connect Command module
- **SRD**: Standard Remote Disconnect Command module
- **SLD**: Standard Check Load Value at Meter module
- **SUC**: Standard Unsolicited Connect Event module
- **SUD**: Standard Unsolicited Disconnect Event module
- **SCS**: Standard Check Status of RCD Switch module
- **SRE**: Standard for Determining Existence of RCD Switch module
- **SOR**: Standard On-Demand Meter Read module
- **Exx**: Many exception handling modules

The Standard Remote Connect Command module is shown in Figure 5.

From these Activity Diagrams, a set of RCD messages will be developed in XSD, similar to those in the IEC 61968 Part 9 and in MultiSpeak. Recommendations for additions and changes to the Common Information Model (CIM) RCD-related objects are being made.

These de facto standards will be made available for industry comment in Q1, 2009.

2.3 Outage Detection and Restoration (ODR) Project Team

The ODR project team, launched in September 2008, is starting the development of Business Processes related to outage detection and restoration services. The ODR process will be similar to the RCD process. The business processes will be completed in Q1, 2009, while the de facto standards development, if approved by the USB Leadership Team, will take place in early 2009.

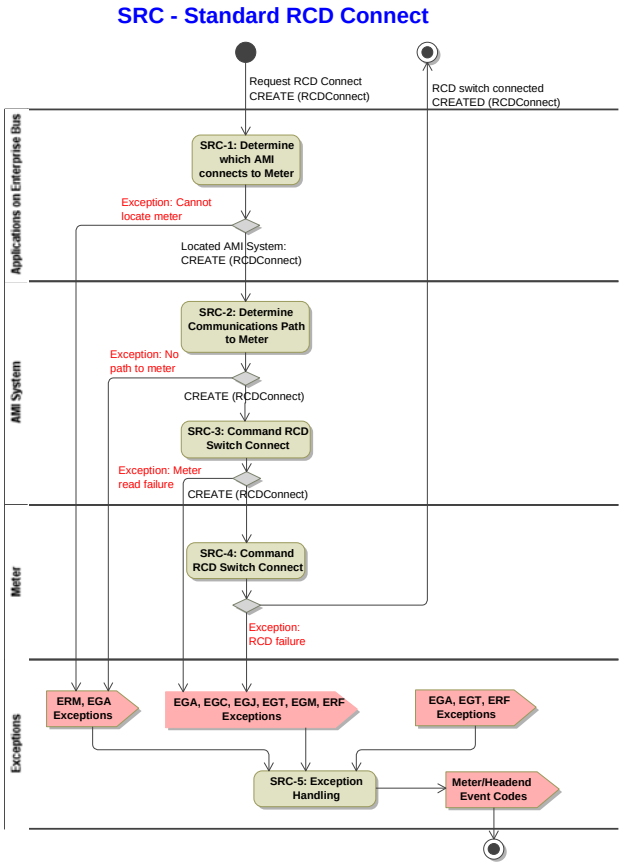

Figure 5: SRC –Standard Remote Connect Command Module

3. Conclusions

The USB is providing a fundamental, critical part of the Smart Grid concept, by establishing a concentrated, funded forum for utilities to discuss and develop the business processes which will lead ultimately to standards that truly meet the utility requirements, rather than just the vendor understandings of the utility requirements. All too often, utilities take a back seat in the standards development arena, relying on vendors and consultants to decide the sometimes very esoteric details in a standard. However, the USB determined that their interests were better served by becoming strongly involved both in developing their own requirements and promulgating the standards resulting from those requirements.

It is strongly urged that other utilities either join the USB or develop similar funded consortia to develop these business processes and the resulting standards that are required for true interoperability of the Smart Grid.

Biography

Frances Cleveland is President & Principal Consultant for Xanthus Consulting International, and has managed and consulted on Smart Grid information systems, interoperability, and security projects for electric power utilities for over 30 years, covering energy management systems, distribution automation, substation automation, distributed energy resources, advanced metering infrastructure, and energy market operations. She has participated in information standards development through the IEC and IEEE as convenor of IEC TC57 WG15 on security, member of IEC TC57 WG14 on distribution interface standards, and as chairperson of the IEEE PES Power Communications Committee. She is currently the Technical Advisor to the USB.

[i] AEP, Dominion, Duke, Exelon, Hydro One, and PHI