GridWise™ Interoperability Framework Extensions of Concepts

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Overview

The framework provides a good outline of many of the key issues but a few of the larger ones are missing. Of course details in each of those presented are excellent subjects to flesh out as well as the general taxonomy of the systems that need to be present for a robust future. The organization and elements presented in the framework are a good start. DOE GridWise™ has done well to provide this taxonomy of key elements and thoughtful discussion. This paper is intended to augment these efforts. The following are presented in the spirit of the framework to likewise stimulate further discussion on the topics. Following the two major concepts presented here are some additional depth and discussion on topics introduced in the framework document. This whitepaper is presented in three sections, two of which introduce some missing or lightly addressed topics in the framework that should be considered fundamental elements necessary to take the industry forward on several levels.

I. Road Map to an Industry-Level (Global) Architecture

While the framework has done a good initial job of framing key topics the one that is missing and perhaps the most challenging is the concept of a roadmap and vision for how the elements need to come together into an overall architecture. While this may sound grandiose it is necessary to develop a roadmap for how the pieces could plausibly be brought together as a strategic whole. In addition this vision must be held up as a vision and work toward its manifestation must take place. Lack of this vision will sentence the industry to more of what it has been doing over the last four decades: struggling with a variety of technologies that must be patched together through translators, gateways and a variety of proprietary designs that integrate at a lowest common denominator. Unfortunately the free market does not do infrastructure, or when it does it tends to be the minimum to be able to sell something. The Internet of today, held up as the set of interoperable technologies of the modern age was "invented" about 40 years ago in the late nineteen sixties under a Government initiative. Many of the applications for home energy services and home automation and now praised as absolutely necessary to get California out of a new pending crisis were largely understood by the team of dedicated individuals working on critical interoperability standards when the Consumer Electronics Bus was initiated in 1984. We are no closer to a fully integrated automated home today than when this work was started under the EIA. Today, we are coming close to drowning in technology. Residential systems are more chaotic today than they were 23 years ago. The need for large scale architecture development concepts need to be applied. The two large elements that need to be present include the perspective of an overall industry level and International level architecture. This really should be a vision of a Global Architecture since the major companies that will be supplying both products for end users as well as those supporting the infrastructure are International in scope.

Think Globally, Act Locally

It is still ok to start with designs and implementations that are locally developed and applied, however they must have an underlying strategic vision as the driver. The roadmap will be developed though doing a good job on future requirements and a full set of systems management requirements. These requirements will need to be developed in a structured way through the disciplines described in the next section It should be remembered that the systems developed will use the requirements as the key drivers for the technologies. In other words the technologies, standards and ultimately deployed devices and systems are subordinate to the requirements for a diverse group of end users. The future end users will also include several people in distinct roles within the operation, management as well as use of the system.

Ok to Start Small

It is ok to work on small elements of the overall picture but at some point the need to integrate on higher levels needs to be kept in perspective. The need to scale up to massive numbers of equipment and networks of networks is a necessary element to design into development work from the start. Many pilots and programs fail to adequately consider the systems and network management required on large scales.

II. Systems and Complex Systems Engineering

The framework focused mainly on the "content" topics that need to be developed however the path to get to the vision needs improved methods, tools and disciplines than what have been used over the past four decades. 1968 was the year that the term Software Engineering was coined and brought to the forefront of key industry leaders that could see the issues looming on the horizon. Software Engineering is a subset of the complex set of disciplines that are necessary to bring the vision to real systems. The need for improvements in the disciplines surrounding key elements of engineering complex massively scaled networks and distributed computing systems are also critical to any of the "content" becoming real and robust for the future. The disciplines of requirements engineering, system modeling and formal methods need to be developed and put to use in the development of future systems. The methods and disciplines necessary to document, specify and design future highly integrated systems are not yet fully developed. The development of future systems engineering should be considered in parallel with the development of the "content" required for interoperability.

III. Elements of the Roadmap

The future is not all daunting challenges. There are key topics introduced in the framework paper that contain elements of strategies that will be key components of the roadmap that can lead us out of the morass of diverse systems we face today. Two are selected here as examples of expansions: Common Application Level Semantics and Systems Management.

Common Application Level Semantics

Common Application Level Semantics is one way out of the morass of communications and networking technologies that create a tower of Babel today. As brought out in the framework the need for a common set of semantics or an application level common language is a key strategy that can be robust to underlying physical media and networking technologies. This is key area that continues to limit interoperability on all levels extending from ISO/RTO operations down to in home equipment integration. Some elements of this work have been started within the standards mentioned in the framework and it is critical to develop semantics that can be used on industry level scales.

Security Policy Implementation and Enforcement

Security policy implementation and enforcement are key emerging areas. NERC, DHS and other entities have been working on recommended practices, guidelines and other policy oriented concepts that must be taken into account when systems are developed. It is critically important for systems built upon open standards to have a robust set of security infrastructure functions ready so that emerging and future security and management policies can be implemented.