Why the Smart Grid needs IPv6

Presented by Yurie Rich
Qinetiq, N.A.

May 27, 2010

Rocky Mountain IPv6 Task Force Conference

QinetiQ North America, Inc.
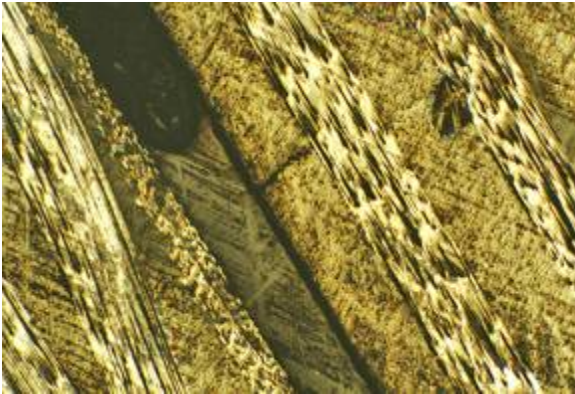
www.QinetiQ-NA.com

Agenda

- Introduce QNA

- The Utility Industry

- Smart Grid – What is it?

  - Today

  - Future

- Why the Smart Grid needs IPv6

  - Why IP?

  - IPv6

- Smart Grid IPv6 Case Studies

  - Silver Spring Networks

QinetiQ, NA - Technology Solutions Group

Technology Development

Systems Engineering

**Technical Services**

Production and Support


Product Development

Technology Development

Robotics / Unmanned Systems

Nanotechnology

Electronic Textiles

LCP Packaging

Coatings

Flexible Composites

Polymer MEMS

Space Structures

RF & Optical Communications

RF & Optical Sensor Systems

SONAR & Air Acoustics

Signal Processing

Space Qualified Processors

Advanced Engines & Fuels

Physiological Monitoring

Multi-Sensor Integration

Thermal Control Systems

Transportation Safety Systems

20 nm
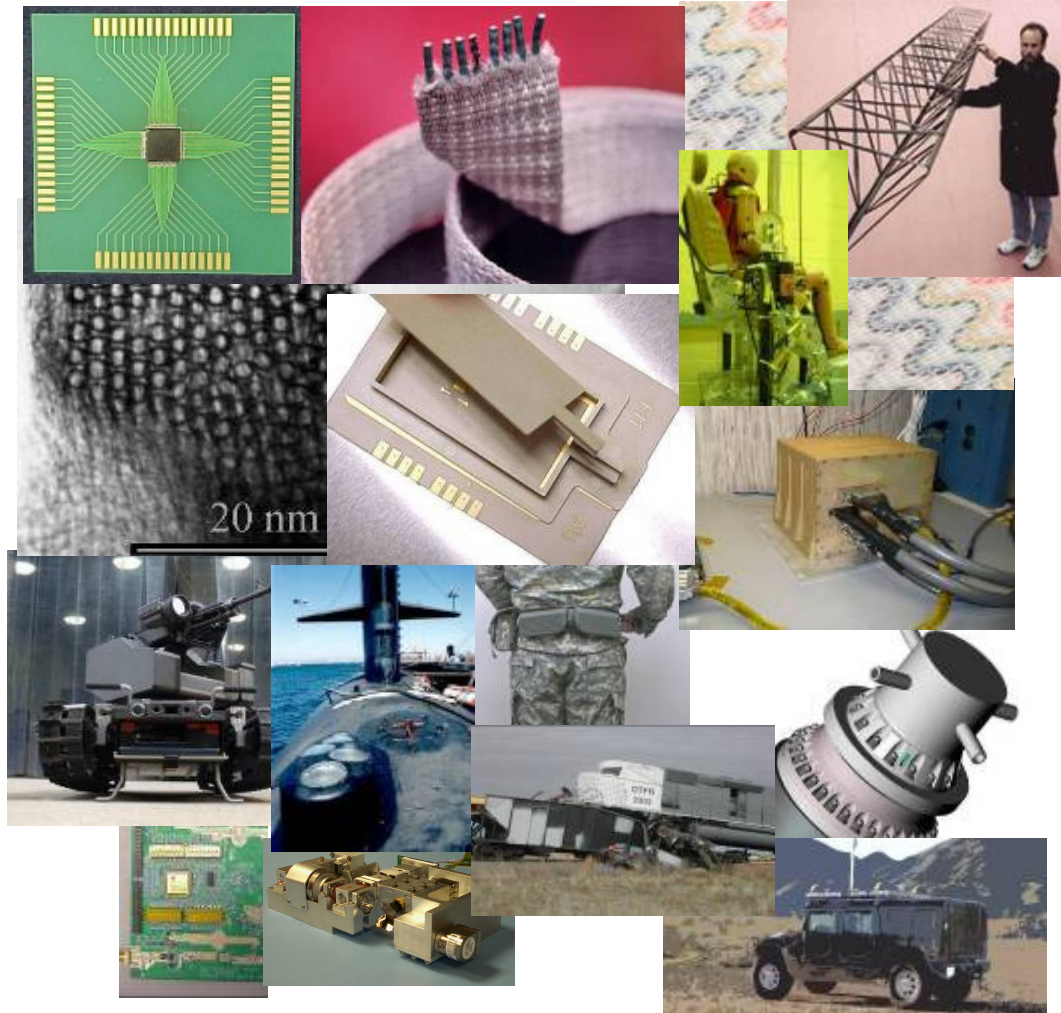
The Utility Industry
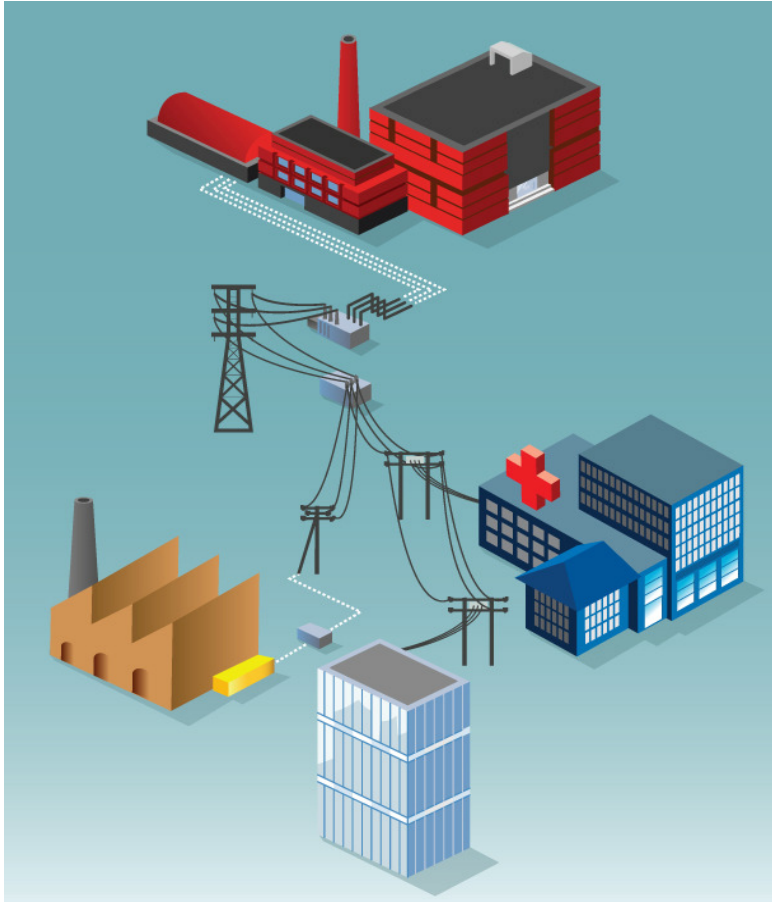
Generation – Coal, Nuclear, Natural Gas, Hydro, Wind, Solar, etc.

Transmission – Bulk transmission of power from generation to distribution networks

Distribution – Substations, Step-down transformers, intermediate volatage lines, and low voltage lines. Meters too…

The Smart Grid - Today

- Absolutely no consensus on a single definition of the "Smart Grid"

- But, there are common characteristics, including:
  – Integrating intelligence into the power infrastructure
  – Improving the degree of "control" over the power infrastructure
  – Improving the degree of interaction between the sellers and consumers of electricity

- US DOE says a "Smart Grid" must provide:
  – Self healing
  – Motivate consumers to participate in operation of grid (Demand Response)
  – Resist Attack
  – Accommodate all generation and storage options
  – Run more efficiently
  – More…

- Smart Grid Programs around the world
  – Mostly AMI (Advanced Metering Infrastructure) and pilots for HAN
  – Some DA & Distributed Generation

The Smart Grid – Tomorrow
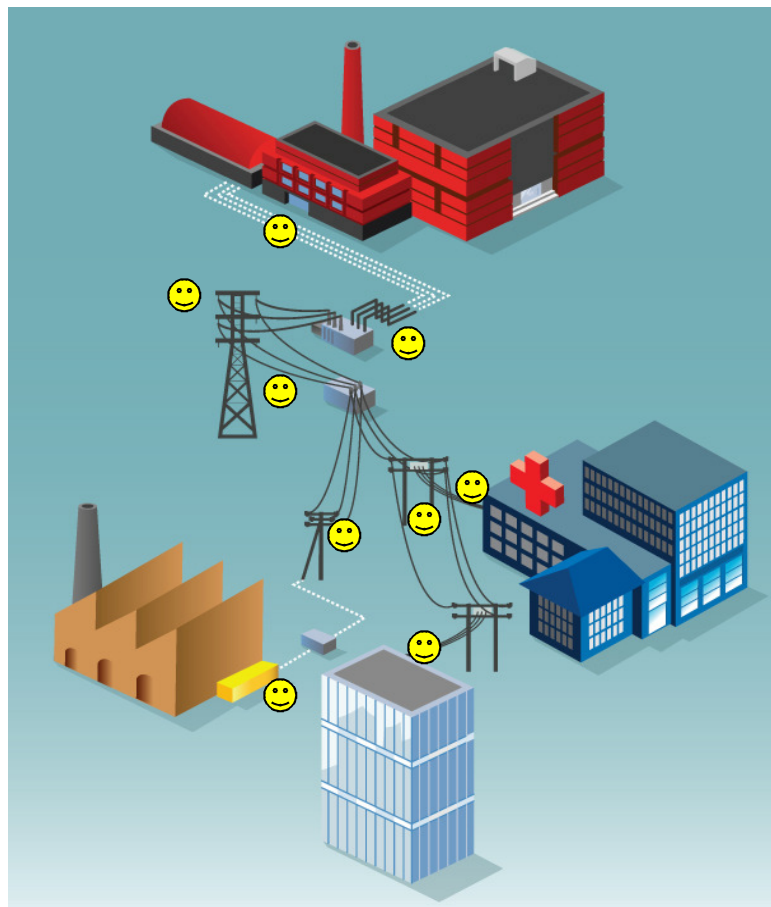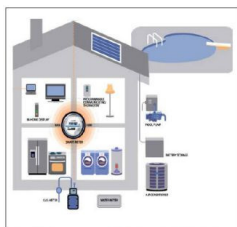
So why does the Smart Grid need IP (IPv6)

- 250+ protocols versus 1

  - Interoperability is the key to cost effective deployment, integration, and long-term support

  - Standards are available to all and developed by all

  - We know it, love/hate it, not perfect, but better than the alternatives

- Security

  - What communications protocol has been as heavily abused (and continues to be), from a security perspective, than IP?

  - The devil you know versus the devil you don't

  - We need standards – national vs. state level

- Why IPv6 specifically?

  - SCALABILITY ($$)

    - Tens of Thousands of devices on a single subnet
    - Hundreds of millions (or more) devices deployed

Strategery to Interoperabilitery

Standards Bodies

- National Institute of Standards and Technology

  - NIST Framework and Roadmap For Smart Grid Interoperability Standards v1.0

    - "**IP-based network by design is easily scalable**; any new Smart Grid devices, such as smart meters, smart home appliances, and data concentrators in neighborhoods, could be added to the network. "

    - "The fact that the available pool of IPv4 addresses will be exhausted soon should be considered carefully. Even though an alternative addressing scheme in conjunction with translation/mapping into IP addresses might work, **we encourage the use of IPv6 for new systems** to be developed and deployed "

- Smart Energy Profile, v1.0

  - "It is important to reuse and support existing utility investments in IT systems (e.g. back office, grid operations, billing, etc), therefore the technology; **Shall interoperate with utility commercial infrastructures; Shall provide directly addressable and routable native IP** support in devices; To the extent possible will enable IP based applications (e.g., SNMP)…)"

Case Study: Silver Spring Networks

- Caveat: Not an employee, don't own stock, not authorized to speak on their behalf, all requests for money denied, I didn't even get a t-shirt

- Silver Spring Networks provides Smart Grid infrastructure to support

  - Advanced Metering Infrastructure (AMI) (Smart Metering, Demand Response, HAN)

  - Distribution Automation

  - Distributed Generation

- Infrastructure solution is IPv6 from the Access Points down to the meters

- I'm guesstimating somewhere between 6 – 10 million devices deployed

  - Probably the largest IPv6 deployment on the planet….

- Customers

  - PG&E, Florid Power & Light, Duke Energy, American Electric Power, Pepco Holdings Inc.

Silver Springs Network

*Diagram property of SSN
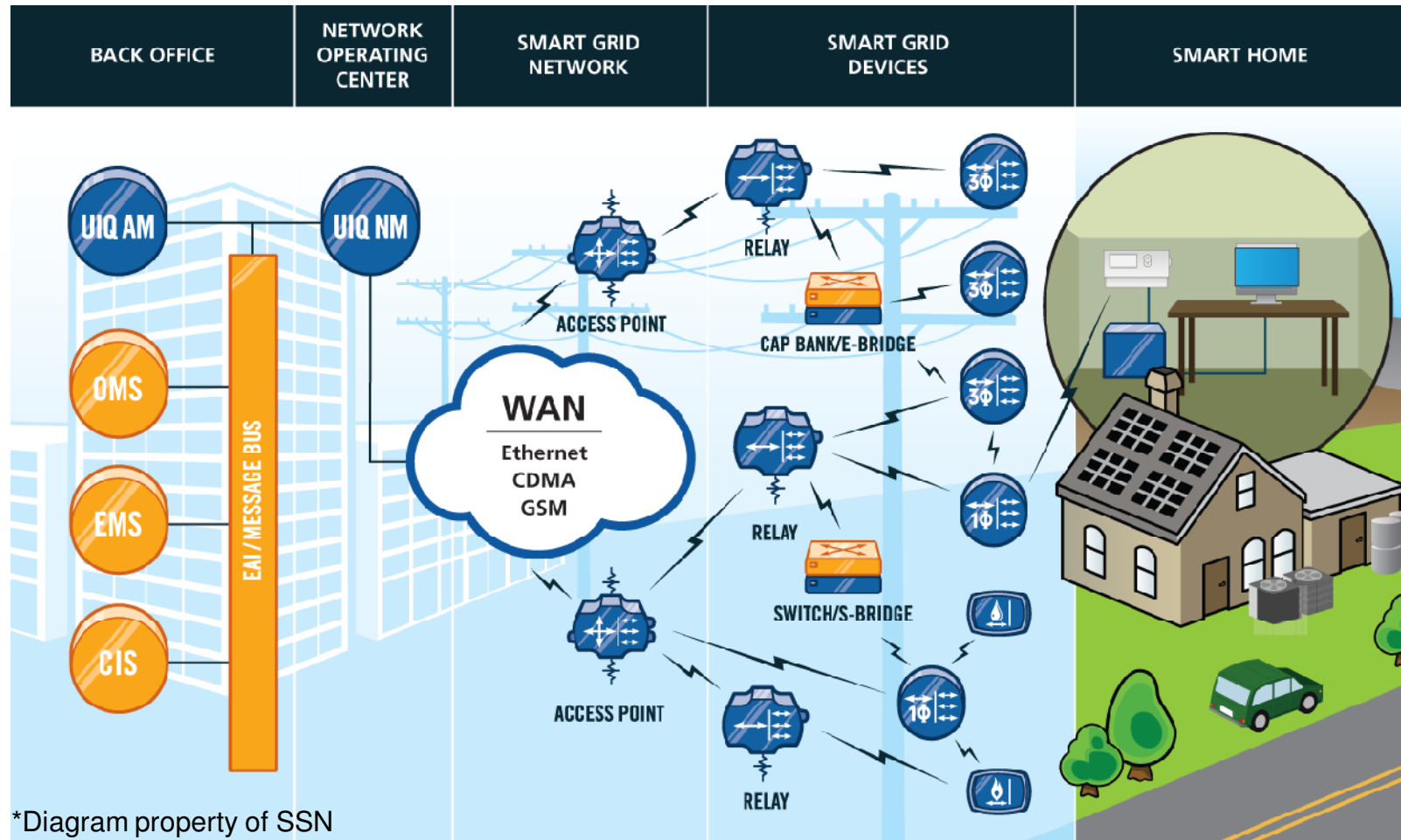
Thank you for your time!

yurie@qlabs.com
206.458.8082