Role of Smart Energy Systems

Tobin Richardson
Director, Smart Energy
ZigBee Alliance

Grid-Interop 2012

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Becoming the Wireless Standard for Tomorrow's Smart Grid

- ZigBee Wireless Standards – Developing a Secure Utility-connected HAN
- Implementation & Texas Example
- Evolving Smart Energy Standards and Reach
- Supporting market innovation?
- What's next? What Challenges?

ZigBee Wireless Standards

- ZigBee Smart Energy
  - Developed in 2006, completed in 2008
  - Initially very similar to Home Automation functionality, adding high grade security and OpenHAN requirements
  - ZigBee approach was to use Cluster Libraries (effectively clusters of functionality)
  - IEEE-based, 802.15.4, with ECC security
- Development work included spectrum of equipment manufacturers, energy regulators, and utilities
- Initial products supported meters, load control devices (PCTs) and simple In-Home Displays
- Static for about a year, and then growth, followed by rapid growth – now at 315+ certified Smart Energy Products

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Four years of learning

- Multiple iterations of ‘bug fixes’, implementation lessons
- Adaptations to security and co-existence → ongoing security audits (CMU Audit, CSWG, PAP18, NESCOR…)
  - Example outcome: Increased key length, mitigation best practices
- Ongoing functional evolution
  - Example: BC Hydro Residential Inclining Block
- Overall - Flexible approach to support in depth backward compatibility while adding functionality and safeguarding reasonable forward compatibility
- All supported by active Working Group, and a CCB process (Change Control Board) for bug fixes, feature enhancements, and feature evolution

Implementation & Texas Experience

- A utility smart meter system is a system of systems
  - Data Repository
  - Meter Data Management System
  - Smart Meter Head End Application
  - Wide Area Communication Network
  - Field Area Communication Network
  - Meters
- Texas deregulated model adds additional layers of complexity
  - Smart Meter Texas Portal
  - REP Application Interfaces
  - Future 3rd party access
- All systems have to integrate and work flawlessly to enable full HAN functionality

TX HAN Smart Energy System

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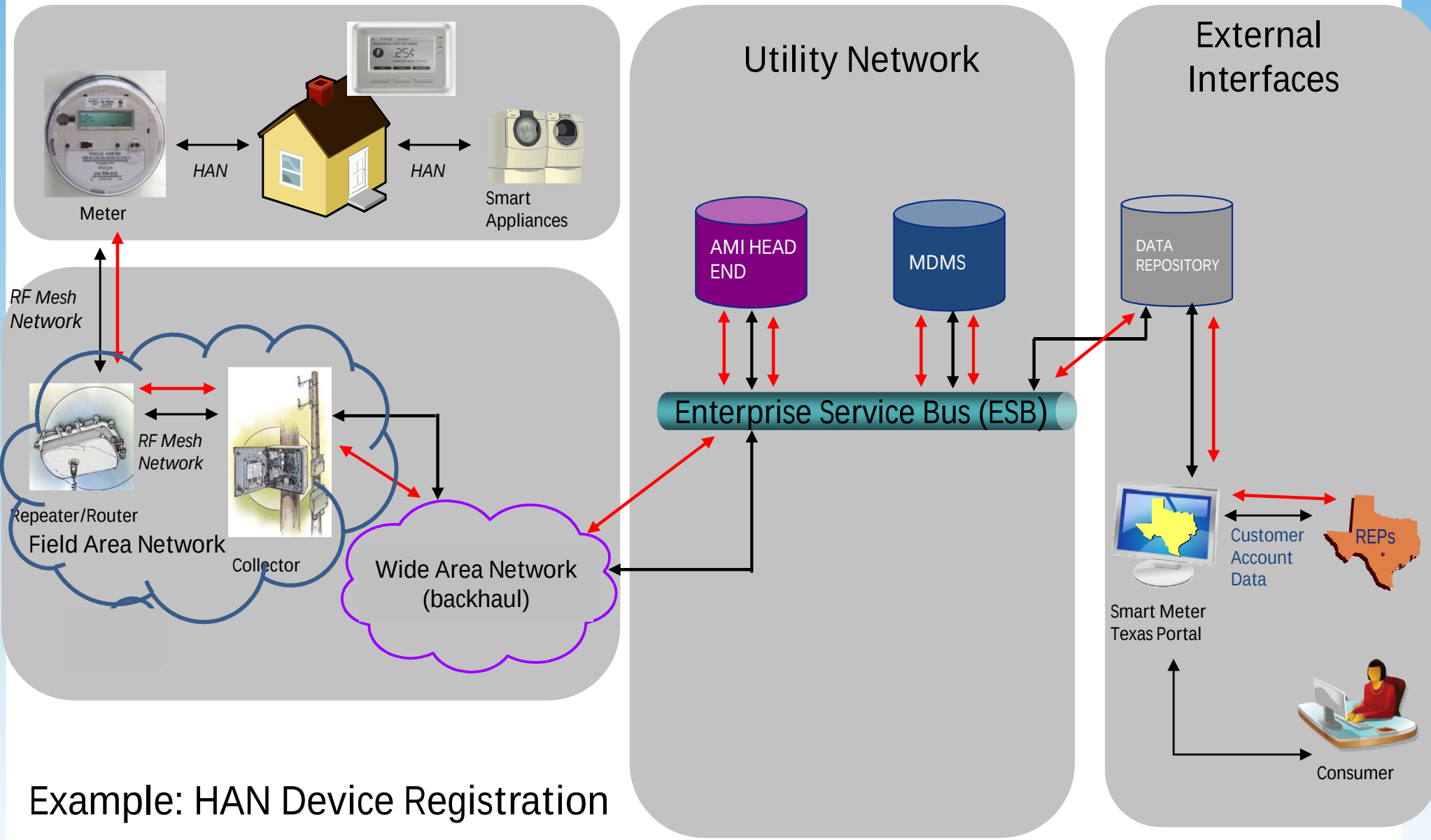

Example: HAN Device Registration

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Implementation Markers

- ZigFest TX
  - Interoperability in the ‘field’
  - Tied back to maintenance and evolution of standard
- Testing new regional requirements (e.g., Australia, BC Hydro RIB, etc.)
- California evolution
  - Likely repeat in-market support events (interoperability events)
  - Gain immediate value, experience and learning for utilities and consumers
  - Feed back in to both 1.x deployments, and future development and adoption of SEP 2.0

Adapting for broader value & system expansion

- Engaged with HomePlug in 2009
  - Utility driven requirements for multi-technology application
  - EISA-driven requirements around IP-based networks
  - NIST and SGIP preference for IP-based networks
- Encompass other wireless technologies
- Encompass other wired technologies
- Responding to Utility Drivers
  - IP networking at application layer
  - Easing gateways
  - PAP18/Integration of existing deployed ZSE 1.x systems
  - Flexibility to continue to evolve existing value
  - Continuing capability to evolve or continue to exact value on ZSE 1.x

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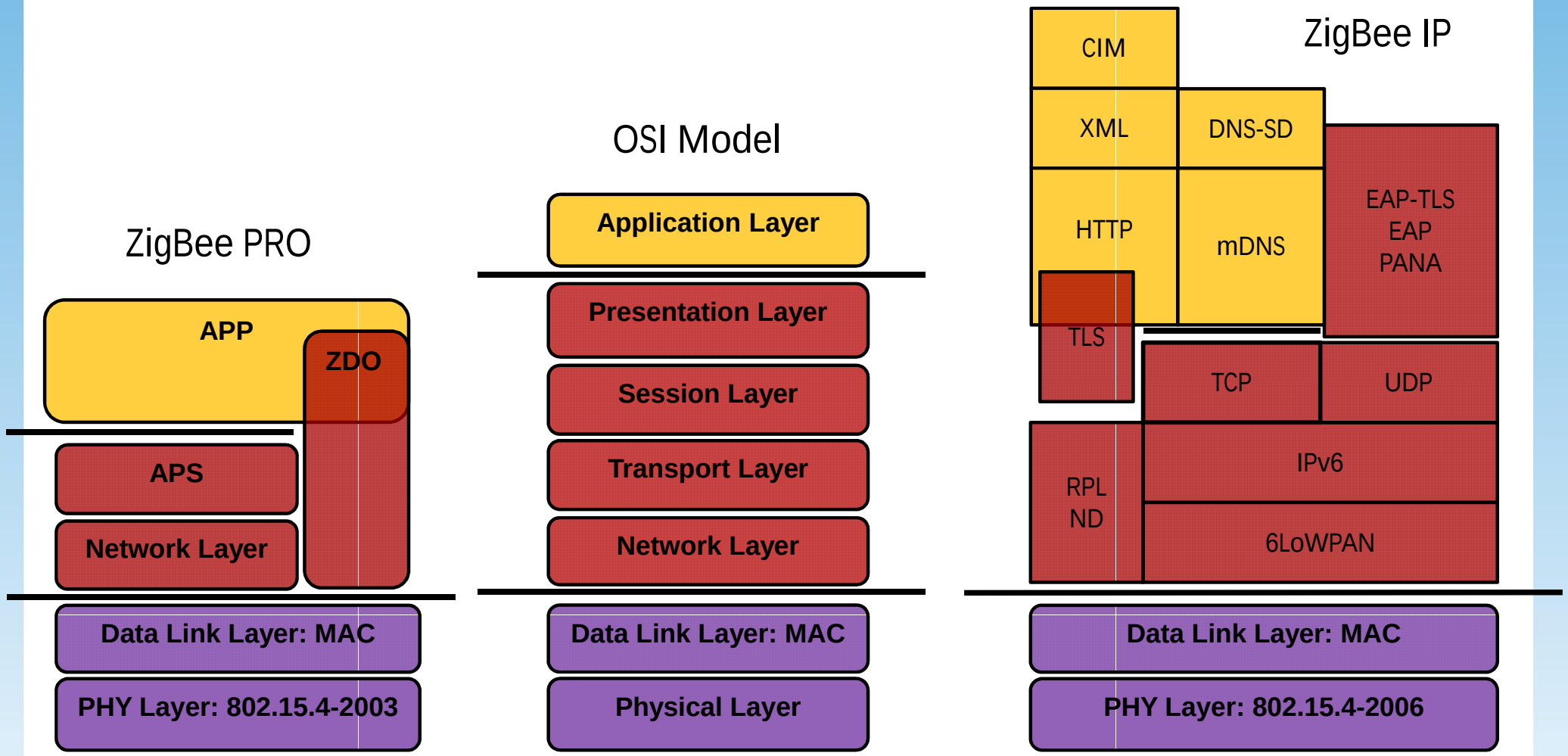
Stack Adaptation



Compliant Platform | Certified Product | MAC/PHY

Note: in the ZigBee IP TLS and EAP-TLS EAP PANA is part and is used in both the Core stack and the Application

Architecture to Support Innovation

- Flexible and IP-based architecture for 2.0
- Tunneling capabilities in ZSE 1.x; gateways/dual-mode development to support coexistence & migration capabilities
- Supported by active IETF development for HAN, mesh networking, low-power devices
- Enabling customer model
- *Many commercial applications being exploited, but takes time to bring to market*

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Continuing SEP 2.0 Innovation

- Capture best practices in implementation – in-field interoperability continues
- Ensure comprehensive testing capability across multiple wireless and wired platforms – created CSEP (Consortium for Smart Energy Profile Interoperability) – three technology alliances to start (ZigBee, HPLG, WFA)
- Align with multiple stakeholders for functionality (CIM-based, NAESB exchange, SunSpec, IEC, AHAM)
- Security – adopting best-in-breed, well-known and understood IETF (TLS), NIST CSWG Review

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What Next? Challenges?

- Utility trials and pilots continue apace
- Consumer demand still developing, consumer engagement still in nascent stages with utilities
- Flexible architecture, based on proven deployments is only way utilities will be comfortable with moving ahead
- Tying in SGIP, utility requirements, regulatory frameworks, and especially security are key to building the foundation
- Cooperation between multiple technologies, engaging with broad IETF approach and standards, and well-defined and tested cert/test programs
- New loads and applications – PEVs, Appliances at scale, integration of other systems (lighting, healthcare, HA, etc.) – ties in other backhauls but creates opportunity to share a different kind of load (data transfer)
- Security, security, security!

Questions???


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