Panel Session: Smart Metering & Smart Grid Solutions for the Modern World

April 18 – 20, 2011
Dallas, TX
Key Challenges to create a “Smart Grid”

- Connectivity
- Low Power
- Standards
- Cyber Security
- Cost
- Future-proof solutions
- Processor performance

Smart Grid will enable the power distribution network to support a bi-directional flow of power and communication capabilities from power distribution facilities to consumption locations.
Freescale Solutions Enable the Smart Grid

- #1 Appliances
- Home Automation

- Networking
- Communications

- #1 in Automotive

- Industrial Control
- Motor Drives

- Building Control
- Metering
- Lighting
Freescale in Smart Energy

**Broad-range Smart Energy Solutions Provider:**
- Metrology and home gateway solutions closer to home
- Data aggregators, grid routers, grid protection on grid end
- Secure, easy-to-use wireless networks
- Energy savings, Reduced costs
- Increasing security, reliability & transparency

**Data Concentrator (Aggregator):**
- GPRS
- LTE
- Ethernet
- ADLS
- 802.15.4g
- OFDM
- GPRS
- WiMax

**Metrology:**
- Zigbee
- Wifi
- M-Bus
- PLM
- <1GHz ISM

**HAN (Home Area Network):**
- GPRS
- LTE
- Ethernet
- ADLS
- Grid Power Protection, Relay/Switch Control and Monitoring
- Grid Power supervision, control and network protection system solutions; Protective Relays and Switches control for Power Grid

**Data Concentrator (Aggregator):** Sends data collected (or commands) to and from Neighbor Area Network (NAN) or Home Area Network (HAN) to utility

**Metrology:**
- Hardware that measures and controls flow of energy to/from building

**HAN (Home Area Network):**
- Gas/Water
- Hot Water Heater
- Electric Car
- Renewable Energy
- Thermostat
- Appliances

- m-Bus
- PLM
- <1GHz ISM
Introducing the Panelist Team

► **Mike Dow**: Smart Metering

► **Sujata Neidig**: Home Energy Gateway

► **Nick Sargologos**: Networked Smart Energy Gateway

► **Mike Dow**: Communication Technologies for HAN

► **Keith Tilley**: Communications Technologies for NAN
Mike Dow
Smart Energy
BizDev
Freescale
USA

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With an Unstable Standards and Regulatory Climate.... What Meter Architecture Works?

Unknowns:

• **Security Requirements** (FIPS, Key Storage, Tamper Detection)

• **HAN Standards** (SEP1.0/2.0, WiFi, ZigBee, HomePlug, G.hnem, M-bus, KNX)

• **Utility Legal Requirements**

• **NAN Standards** (RPL?, IPv6?, PLC vs RF)
Mitigate Risk with a Scalable MCU Architecture and Software

Scalable MCU Platform

- Cortex M4 Core w/ DSP and 16bit ADC
- Common Peripherals
- Scalable with Pin Compatibility
- 50-100MHz, 32K to 1M Flash
- 32 -256 Pin Packages
- Hardware Security – Tamper Detect, Secure Key Storage, Crypto Accelerators

+ Software Solutions

- Standards Based Software
- Smart Energy 2.0 stack
- Partnership with Mocana – a leader in embedded security
- Free – scalable MQX RTOS

+ Reference Platforms

- Metering System Expertise
- Pre-certification
- Multiple advanced metering algorithms (FFT, filter-based method)

Platform flexibility allows re-use of designs for Metrology, NAN, HAN

Consolidation of functionality possible w/ RTOS to manage multiple protocols on the same MCU

Metering Reference Platforms speed engineering reducing time to market
Sujata Neidig
Product Manager
Freescale
USA

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Home Area Networks – Managing Energy Usage

Smart Grid is entering the home
Growing energy cost mandates a change
Enabling control for consumers and utility companies – smart meters, appliances, thermostats, lighting
Technology enablers and standardization
Freescale’s Home Energy Gateway

► The Home Energy Gateway
  • Collects power consumption data
  • Controls activation/deactivation of HAN appliances
  • Generates dashboards for power usage feedback
  • Provides control menus to control appliances
  • Provides a ubiquitous link to the WAN for remote control/access
  • Acts as Gatekeeper between Smart Grid world and Consumer world

► Freescale Solutions
  • Multiple technologies to connect meters, appliances, thermostats, HVAC into a Home Area Network
  • Turnkey reference designs of systems to monitor and control these networks (Energy Gateway and In-Home Display concepts)
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“The average cost of saving a kilowatt-hour through efficiency is 1.7 cents per kilowatt-hour; the cost of generating any new kilowatt-hour of electricity today would be over 10 cents per kilowatt-hour – so the cost savings generated through efficiency are spectacular”
- John Bryson, chairman and CEO of Edison International, parent company of Southern California Edison
Networked Smart Energy Gateway (nSEG)

Enables Smart HH devices to remotely access & control:
- Smart Meters & Home Automation Devices
- Wireless-enabled safety devices
  - Lighting, Smoke alarms, Cameras
- “Anytime, Anywhere” access & control
Please note: Place your company logo here (i.e. replace the Spintelligent logo with your logo). Your company logo is only permitted on the first slide.
• Government mandates and stimulus funds are driving early adoption
  • 3.4 billion in stimulus funds awarded for the Smart Grid in the US
  • EU Plan 20% reduction of Energy consumption by 2020
  • China $9.7B investment to deploy AMR/AMI
• Industry Backing behind SE 2.0 for the HAN
  • NIST, AHAM, OpenSG
• Advanced Smart Meter Market is starting with large scale rollouts
  • Technology is available today, deployment are happening now
    • Over 10 million ZigBee enabled meters deployed through 2010
• Major companies launching products
  • GE, LG, Whirlpool and Indesit have announced/launched HAN enabled products
  • Cisco, Intel and Control4 have launched Home Energy Management systems
  • Google Power Meter & Microsoft Hohm
HAN Market Challenges

• Stimulus funds are driving rapid deployment in a traditionally conservative industry
  • Long development and product life cycles
• Introducing technology that changes rapidly
  • Meters can have a install life of 15 years or more, while new technologies for Smart Grid can change rapidly
• Changes in technology can present hurdles for both development and deployement
  • Require backwards compatibility or threatens to orphan installed devices
Freescale Approach

- Understand that one size does not fit all
  - Diverse product offering
    - Hardware and software
  - Partner for areas we don’t have product
    - Expands options for customers
- Design for flexibility and upgradability
  - Multiple technology choices provide flexibility to fit specific need
  - Upgradability helps ensure HAN devices are not orphaned
    - Upgrade path from SE 1.0 to SE 2.0
The NAN Dilemma

Different physical channels (Wireless/PLC)
Different frequency bands
Different communication protocols
New and evolving standards
No focused NAN communication solutions
Freescale’s Unique Solution

**MC13261**

<table>
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<th>MCU</th>
<th>Modem</th>
<th>RF/Analog</th>
<th>Software</th>
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<td>ARM926EJ-S™ Caches On-Chip Memory</td>
<td>Vector Signal Processor Software defined Extremely low power consumption</td>
<td>Integrated RF transceiver Integrated PLC Interface</td>
<td>Free RTOS Tools Stacks</td>
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**Comprehensive NAN Communications**

- Highest Integration
- Extremely flexible (software defined)
- Wireless and PLC support
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