ZigBee Smart Energy: The New Frontier for Energy Efficiency

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Chairman, ZigBee Alliance
www.zigbee.org
ZigBee Markets

BUILDING AUTOMATION
- Security
- HVAC
- AMR
- Lighting Control
- Access Control

ENERGY MGT. & EFFICIENCY
- Demand Response
- Net Metering
- AMI, SCADA

PERSONAL HEALTH CARE
- Patient monitoring
- Fitness monitoring

INDUSTRIAL CONTROL
- Asset Mgt
- Process Control
- Environmental
- Energy Mgt

TELECOM SERVICES
- M-commerce
- Info Services
- Object Interaction
- (Internet of Things)

CONSUMER ELECTRONICS
- TV
- VCR
- DVD/CD
- Universal Remotes

PC & PERIPHERALS
- Mouse
- Keyboard
- Joystick

HOME CONTROL
- Security
- HVAC
- Lighting Control
- Access Control
- Irrigation

TELECOM SERVICES
- M-commerce
- Info Services
- Object Interaction
- (Internet of Things)
ZigBee Alliance Overview

- Organized as an independent, neutral, nonprofit corporation in 2002

- Open and global
  - Anyone can join and participate
  - Membership is global [approx. 40% Americas, 30% EMEA, 30% Asia]

- Activities include:
  - Specification creation
  - Certification and compliance programs
  - Branding, market development and user education
ZigBee Alliance Promoters

...plus over 270 member companies from around the world
ZigBee Adoption ---

- Over 85K downloads of the ZigBee specification
- Growing acceptance and adoption across a range of markets and applications
  - Home Automation and Control
  - Building Automation
  - ZigBee Smart Energy
- Announced deployments around the world
  - California, Texas, Michigan, Virginia, Canada, Sweden, Australia
ZigBee Overview

- Open Standard
- Radio + Protocol
- Mesh Networking

- Up to 65,536 network nodes
- Full Mesh Networking Support
- Multiple channels in the global 2.4 GHz band and regional sub 1GHz bands
- 250Kbps data rate

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Network coordinator
ZigBee Router
ZigBee End Device
Communications flow
Virtual links
ZigBee Compliant Platform [ZCP]

- Platform certification - ensures all parts of the stack other than the application are compliant with the ZigBee Standard.
- Allows Network interoperability but does not imply interoperability at the application layer.
- There are multiple Compliant Platforms to choose from.
ZigBee Application Profiles

- Application profiles define what messages are sent over the air for a given application.
- Devices with the same application profiles interoperate end to end.
- ZigBee publishes a set of public profiles, but vendors may create manufacturer specific ones as well.

Clusters

0: off
1: on
2: scene 1
3: scene 2

Clusters

0: fan off
1: fan on
2: temp set
3: time set
ZigBee Public Profiles

- Commercial Building Automation (CBA)
- Home Automation (HA)
- Smart Energy (SE)
- Personal, Home and Hospital Care (PHHC)
- Telecom Applications (TA)

- Future profiles proposed by member companies…
ZigBee HA: Home Control

ZigBee Home Area Network (HAN)
Home Area Networks

Key to Advanced Energy Management

- Home Area Networks are key component to Smart Metering / AMI initiatives
  - Time-of-use pricing
  - Demand Response / Load Control
  - Customer choice

- ZigBee is the wireless HAN technology of choice
  - Mature, open standard
  - Proven, robust, secure
  - Selected by the leading AMI/HAN deployments
Features supported by ZSE profile include:

- Basic metering [measurements, historical information, etc.]
- Demand Response (DR) and Load Control
- Pricing [multiple units and currencies, price tiers, etc.]
- Text messages
- Device support for Programmable Communicating Tstats (PCTs), In Home Displays (IHDs), Load Control Devices, Energy Management Systems, etc.
- Security to allow consumer only, utility only or shared networks
With the Smart Energy Profile: ZigBee addresses green
“My biggest fear is that we are running out of generation.”
- Michael Morris. Chairman and CEO American Electric Power

“Demand Response programs are the most promising and cost effective options for reducing peak demand...”
- 2005 California Energy Commission
ZigBee Smart Energy
serves the energy industry by enabling

- load control
- demand response
- data presentation of grid status and real time energy cost
- customer communication
- energy management and metering services

with a worldwide open and interoperable standard
The AMI Revolution

- Support for Intelligent Grid
- Home Automation
- Demand Response
- RTP / CPP / Hourly Rates
- Remote Disconnect / Prepayment
- Smart Meter
- Mandatory Time Based Rates / Opt Out
- Voluntary Time Based Rates / Opt In
- Outage Reporting
- New Products & Services / Voluntary TOU
- Revenue Protection / Theft Detection
- Enterprise Meter Data Management
- Operational Improvements
- Revenue Cycle Improvements
- TOU / Demand / Net Metering
- Meter Reading Cost & Efficiency

AMI

AMR

Open Protocols

2-Way

FN-AMR

Drive-by

Walk-by

Wireless Control That Simply Works

ZigBee® Alliance

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Urgent demand for Smart Energy + compatibility with mainstream Home Automation systems enables customer choice.
Dimensions of Consumer Participation

- **Simple Awareness**
  - Direct Load Control
  - Price Response
  - DR + Conservation
  - Energy Management

- **New Regulation**
- **Enhanced Competition**
- **Mandatory Programs**
- **Voluntary Participation**
- **Demographics**
- **Economics**
- **Social Acceptance**
Event Day Scenario

1. Energy provider indicates opportunity to save money / reduce emissions

2. Homeowner’s systems alert them of the opportunity

3. Customer programs or manually takes actions

4. Metering records customers actions / available to system

5. Customer bills reflect credit results / cumulative benefits
ZigBee Enabled Thermostats
- Respond to Utility Price Signals

Rate, Bill & Usage Information

Information Screen

Rates

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<tbody>
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Residential Energy Services
ZSE Security and Authentication

Security is critical utility requirement
- Smart meter *must* have secure communications for safe smart grid
- HAN devices & meters *must* have strong authentication to assure authorized devices and use

Mature technology assures authentic, compliant & interoperable devices
- Provides implicit certificates used to authenticate each meter or HAN device
- Enable communication of unique keys per device for use with ZigBee AES encryption
ZigBee Smart Energy Products

- ZigBee Smart Energy products that meet all of the Alliance’s strict specifications and are certified to wear the ZigBee logo for easy identification.
  - Cellnet + Hunt - FOCUS AX - advanced metering product
  - Itron - OpenWay CENTRON - advanced electric meters
  - Itron - OpenWay Gas Module - natural gas meter module
  - Tendril - Outlet - load controller
  - Alektrona - Z-Aperture - broadband energy service portal
  - Computime Limited - CTW200 - smart thermostat
  - Computime Limited - CTW300 - in home energy display
  - Comverge - DCU - control unit for AC/pool pumps/etc.
  - Comverge - SuperStat - smart thermostat
  - Energate - Pioneer Z100 - smart thermostat
  - Greenbox Technology – Greenbox - web-based energy management platform
  - LS Industrial Systems - LK Series – advanced electric meters
  - PRI - Home Energy Controller - in home display
  - PRI - Single and Poly Phase Multi Rate Meters – advanced electric meters
  - National Technical Systems - Smart Energy Test Harness - speeds certification
  - Trilliant - SecureMesh Micro Access Portal – energy service portal
  - Wireless Glue Networks – GSF Smart Energy Device Simulator - speeds certification
“…a HAN communications system in support of demand response applications based on an open standard architecture that complies with **nationally recognized non-proprietary standards such as ZigBee**…”

- **Advanced Metering rules adopted May 2007**

www.puc.state.tx.us/rules/subrules/electric/25.130/25.130ei.cfm
“Southern California Edison will be relying on ZigBee Smart Energy products like these to connect homes to our industry leading Edison SmartConnect™ program,” said Paul De Martini, vice president at Southern California Edison. “ZigBee Smart Energy products will provide our customers with choice and promote long term sustainability.”
CenterPoint Energy Vision for Energy Management and Conservation

Water Heater

Smart Thermostat

ZigBee

Utility Price Signals

Pool Pump

Compressor

CenterPoint Energy

Wireless Control That Simply Works
ZigBee Alliance

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The ZigBee Smart Energy Advantage

■ Broad support within the Energy Supply Community, Regulators, and OEMs

■ Active Community Outside of Smart Energy
  ► Home Automation, Commercial Building Automation, Telecommunications, Personal Home and Hospital Care, Industrial Automation, to name a few!

■ Rock-Solid Network Stack
  ► ZigBee network stack vetted over many years
  ► Meshing, routing, security, and other details well defined, tested, and certified

■ IEEE 802.15.4 (Global 2.4 GHz Spectrum)
Energy Efficiency in Hotels

- Hotel energy management
  - Centralized HVAC control ensures empty rooms are not cooled or heated unnecessarily
  - Battery operated thermostats, occupancy detectors, humidistats can be placed for convenience
  - Multi-hop mesh network makes installation fast and easy
  - Realized 40% energy savings
  - Being deployed in--
The Home and Beyond from a Telecom perspective

Handset is the hub of the interaction between user and objects

**ZigBee Smart Home**
- Home Automation & Control
  - Lights, HVAC, Domestic appliances
  - Entertainment (e.g. DTT)
  - Healthcare, Tele-assistance
  - Monitoring & Security (e.g. temperature, gas)

**Digitally Smart City**
- Access Control
- Parking payment system
- Infomobility services (e.g. traffic control)
- Environmental Monitoring
- Localization

**M-Commerce Services**
- m-payments (bar, shops, supermarkets)
- m-ticketing (cinema, train, bus)

**Mobile Terminal**

**Source:** Mashnetworks
Future Enhancements

- ZigBee Smart Energy Working Group Will Continue to Push Forward
- Best Practices, FAQ, etc.
- Forward-Thinking Developments (PHEVs, V2G, etc.)

If your company is interested in helping to shape the future of Smart Energy technology, ----join the ZigBee Alliance!

For more information, please visit [http://www.zigbee.org](http://www.zigbee.org)
For More Information

CONFERENCE AND EXHIBITION

METERING
AUSTRALIA & NEW ZEALAND
2006

BILLING/CRM
AUSTRALIA & NEW ZEALAND
2006

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Melbourne,
Australia

ZigBee® Alliance

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