Wireless Mesh for Advanced Metering

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Introduction to Trilliant
What is AMI?
Why are Utilities interested in AMI?
Wireless Mesh Technologies for AMI
What is AMI?

- Communications network owned by the utility
- Real-time, two-way communication between Utility Enterprise Systems and...
  - Meters
  - Customer premise equipment
  - Grid equipment
  - Distributed generation & storage

AMI Network Architecture
Utility Service Point Area Network (Meters)

- A Comprehensive Last-mile Network
  - Pervasive mesh network (e.g. meter-to-meter)
  - Highly extensible LAN (5-30 km)
    - Up to 10 hops to access point
    - ½ to 3km per hop

- Functions
  - Advanced Metering
    - Anytime interval data from all meters
    - TOU readings for billing
    - Real-time outage notification
  - Service Provisioning
    - Logical service turn on/off
    - Point of service quality monitoring

Grid Area
- Mesh Connected IED’s
- WAN Connected IED’s
- Substation Meters
- Substation Monitoring Devices
- Mesh Meters (Reliability Sensors)
- Workforce

2006 Connexus Load Profile
**Time-of-Use (TOU) Pricing:**
These daily energy or energy and demand rates are differentiated by peak and off-peak (and possibly shoulder) periods.

**Critical Peak Pricing (CPP):**
CPP is an overlay on either TOU or flat pricing. CPP uses real-time prices at times of extreme system peak. CPP is restricted to a small number of hours per year, is much higher than a normal peak price, and its timing is unknown ahead of being called.

**Real-Time Pricing:**
RTP links hourly prices to hourly changes in the day-of (cool-t ime) or day-ahead cost of power. One option is 'one-part' pricing, in which all usage is priced at the hourly, or spot price. A second approach is 'two-part' pricing.

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**Connexus 2006 Load Duration Curve**

80 hours or 0.9% of year = 16% of peak load

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Uses of AMI Systems

- Outage management
- Pre-pay metering
- Remotely changing metering parameters
- Remote service provisioning
- Load forecasting
- Non technical line losses
- Price responsive demand response
- Enhanced customer service
- Asset management, including transformer sizing
- Premise device / load control interface or capability
- Pricing event notification capability
- Power quality monitoring
- Tamper detection
AMI Technology Trends

Wireless Architecture

- Reliability
  - Highly Redundant
  - Auto Re-routing
  - Auto Re-association
  - Multiple Retry

- Performance
  - Sub-second Messages
  - Sub-minute On-demand
  - Sub-hour Interval Read
  - Cycle

- Low Cost
  - Smart Affordable Radios
  - Low cost concentrators
  - Aggregated communications
The MESH system is composed of a WAN (Wide Area Network) based on TCP-IP and LAN (Local Area Network) based on IEEE 802.15.4.
Advanced Metering

U.S. Penetration of Advanced Metering

Penetration of Advanced Metering by Customer Class

Smart Grid Solution

Devices
- "Meters"

Connectivity
- "Carriers/Networks"

Solutions
- "Network Apps"

Service Reliability
- "LiveGrid"

Service QA/QC
- "Home Line"

Demand Response
- "DR"

Advanced Metering
- "AMI"

Asset Mgt

Network Mgt
- "LiveNet"

Home Comfort
- "Home"

Consumer Messaging

Source: ERCOT Survey

Source: ERCOT Survey
Questions?