

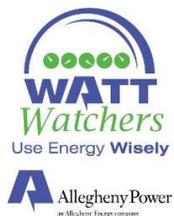


Advanced Utility Infrastructure

Allegheny Power's Smart Grid Vision

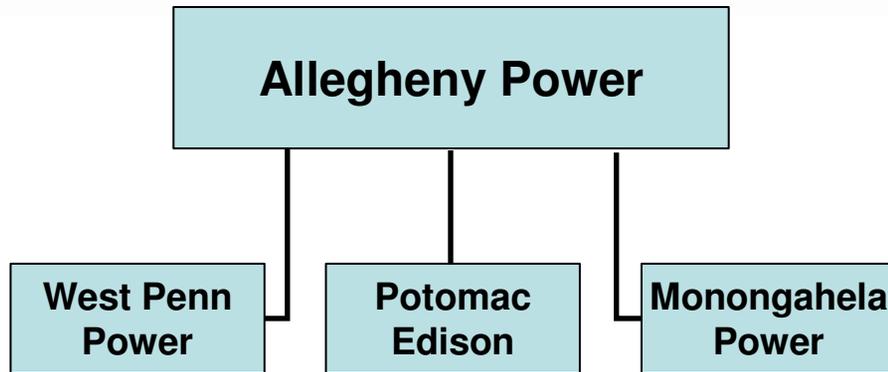
Fifth Annual Carnegie Mellon Conference on the Electric Industry

SMART GRIDS



John C. Ahr
March 10, 2009

Allegheny Power



Allegheny Power delivers low-cost, reliable electric service to approximately 1.6 million customers in Pennsylvania, West Virginia, Maryland, and Virginia.

Allegheny Power consistently wins high marks for customer satisfaction.

Ranked first in the Northeast Region in the 2008 TQS Research, Inc. Benchmark Survey of 60 large utilities on criteria of price, reliability, energy efficiency programs, power quality, account representative performance, handling inquiries, and image.



Challenges to the System

Delivery system requirements include:

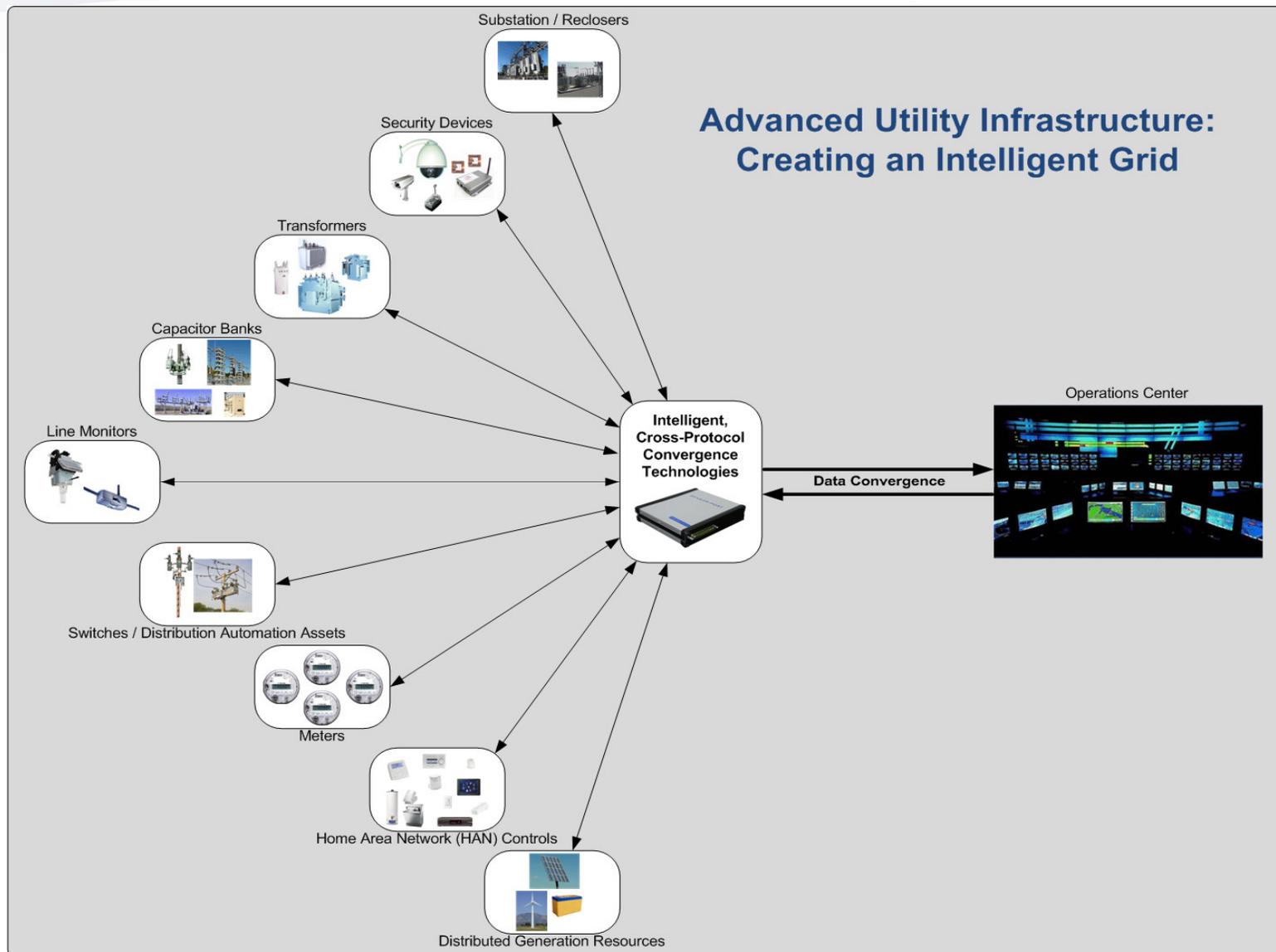
- Support AMI meters
- Assist energy efficiency and energy conservation objectives
- Furnish customer load / time-of-day usage data
- Integrate usage data into multiple data systems
- Provide demand response to alternative real time prices
- Monitor circuits to better achieve service restoration (self-healing)
- Achieve higher levels of system efficiency
- Improve electricity reliability for the customer
- Connect with end-use devices at the customer

These result in the need for a more intelligent grid.

Advanced Utility Infrastructure (AUI)

- Effective, real-time monitoring and control within the delivery system requires data from many other types of devices and equipment beyond meters.
- Real-time information from the delivery system requires sufficient bandwidth on an as-needed basis.
- It's more effective and efficient to deploy a comprehensive, interoperable, intelligent solution that incorporates a host of devices important to utility operations.
- Advanced Utility Infrastructure (AUI) is the solution to provide a unified network for the distributed integration, processing and communication of all types of data.

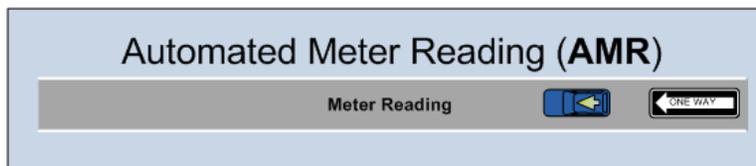
The AUI Concept



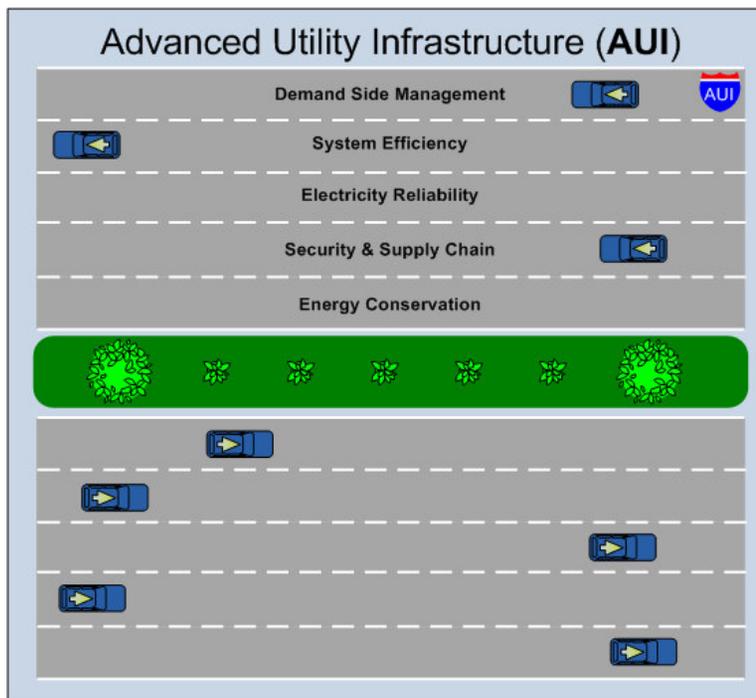
What's The Difference?

AMR, AMI, AUI

AMI is a two-lane road with data flowing in both directions



AMR is a one-way street with data flowing in one direction



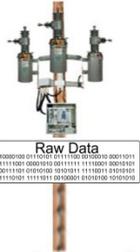
AUI is a multi-lane expressway, with different types of information flowing in both directions

AUI In Action

Operations Center Multiple Back-Office Systems -MDM, OMS, Billing, etc.



Distribution Automation Assets



Raw Data

```
00000000 01110000 01110000 00000000 00000000
11111001 00000000 00111111 11110000 00000001
00111101 01000000 00101011 11110011 00000000
11101001 11110011 00100001 00101000 01010010
```

Switches, Reclosers, Fault Detectors, DR Devices, etc.

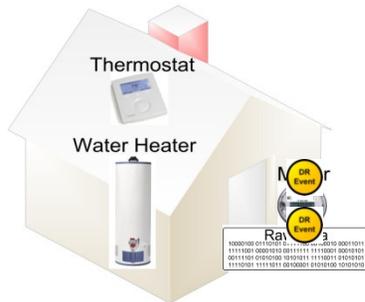
Site Security Devices



Raw Data

```
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11111001 00000000 00111111 11110000 00000001
00111101 01000000 00101011 11110011 00000000
11101001 11110011 00100001 00101000 01010010
```

Cameras, Sensors, RFID, etc.



Thermostat

Water Heater

Raw Data

```
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11111001 00000000 00111111 11110000 00000001
00111101 01000000 00101011 11110011 00000000
11101001 11110011 00100001 00101000 01010010
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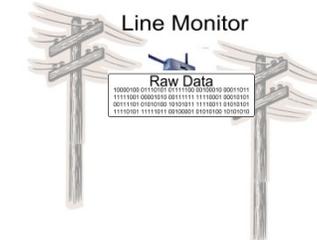
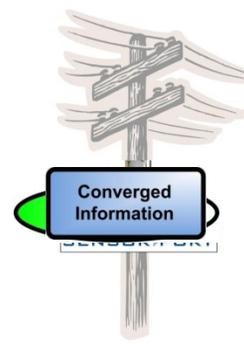
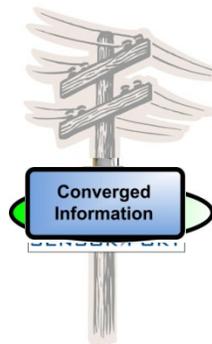
Substation Monitoring



Raw Data

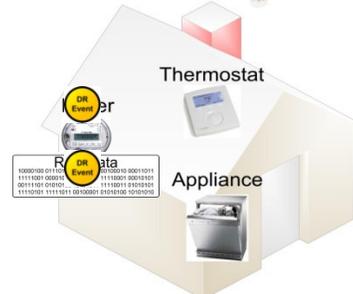
```
00000000 01110000 01110000 00000000 00000000
11111001 00000000 00111111 11110000 00000001
00111101 01000000 00101011 11110011 00000000
11101001 11110011 00100001 00101000 01010010
```

IEDs, SCADA Systems, Transformer Health Monitors, Sensors, etc.



Raw Data

```
00000000 01110000 01110000 00000000 00000000
11111001 00000000 00111111 11110000 00000001
00111101 01000000 00101011 11110011 00000000
11101001 11110011 00100001 00101000 01010010
```



Thermostat

Appliance

Raw Data

```
00000000 01110000 01110000 00000000 00000000
11111001 00000000 00111111 11110000 00000001
00111101 01000000 00101011 11110011 00000000
11101001 11110011 00100001 00101000 01010010
```

AUI Applications

Grid modernization projects in WV have enabled AUI technology testing...



AUI applications:

- Developmental Field Test
- Distributed System Integration Project
- Research Ridge Test Facility
- Substation Security

... demonstrating the use of a unified communications and computational network to power advanced capabilities.



What It Means To the Customer

- Manages load growth through demand reduction, loss reduction and usage reduction.
- Empowers customer with real-time information and control
- Provides utility with real-time information on system health.
- Meets stakeholder calls/requirements for increased reliability, enhanced efficiency, demand response and others.
- Is less costly and more effective than a piecemeal approach (such as separate metering & monitoring infrastructures).
- Provides a strategy for a successful, cost effective, reliable, efficient delivery system.

Thank You

Advanced Utility Infrastructure

Allegheny Power's Smart Grid Vision

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