



Revenue Networks for Utilities

Silver Spring Networks
BWRC Presentation 6/3/03

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Agenda

- Opening Comments
- Typical Customer Presentation
- Design Considerations
 - “What makes this hard, expensive and complicated”
- Questions

Background on Silver Spring

- Based in Milwaukee
- Acquired assets of Innovatec Communications
- Deployments beginning in 1998
- Chosen as provider for SDG&E RTEM project
- Marketing-based product development
 - About 30 engineering employees

Me!

- Eric Dresselhuys
- EVP, Director of Sales and Marketing
- 6 years of working on metering/communications issues
- 10 years with Procter and Gamble
- Responsible for market-requirements development, regulatory activities, product partnerships

Form-Follows-Function

(or, requirements create products, right?)

- Metering is very much a market in transition
 - 100 years of odometer reads
 - Metering is a step in a broader business process, which is driven by even larger market dynamics
- Utilities have reacted to what is required of them
- So who is pushing the “Change Agenda”?
 - Market Influences (energy shortage, deregulation, etc.)
 - Regulators/Legislators
 - Market Participants (select customers, providers)
- Goal: More Efficient Markets

What is the “PULL”?

- Technology
 - Fact: Historic cost premium for advanced metering, demand response, RTP, etc. have been high
 - Commercial meter with real-time, two-way communications \$700-\$1000 + \$6-\$30/month in o/m
 - “Smart House” technologies at \$1,500+++ per premise
- Improving the Value Equation of Advanced Metering creates PULL, but isn’t the whole answer
- 9 million AMR devices sold in 2002, 65+% were for Mobile Technologies, less and 12% were two-way systems

The State of Customer/Meter Communications

- Information Requirements are Exploding
 - Interval data, TOU, Demand Management, Payment Options, more...
- Available Technologies have not kept Pace
 - Inflexible
 - High Cost for advanced functions
 - Poor Economies of Scale
- The result is an ineffective business case

What is a Revenue Network?

- More than meter reading
- Integrated system for pricing, measuring and controlling how customers use your product
 - Think: “Bar Code Scanners” for Utilities
- More cost effective, faster paybacks than traditional AMR



Enabling Technology for Changing Business Needs

- Everything you would expect from systems costing 5 to 10 times more
- More advanced data management than simple AMR
- Less than 1/10th the operating expenses of comparable systems



The AxisPath™ Network

Meeting the New Requirements

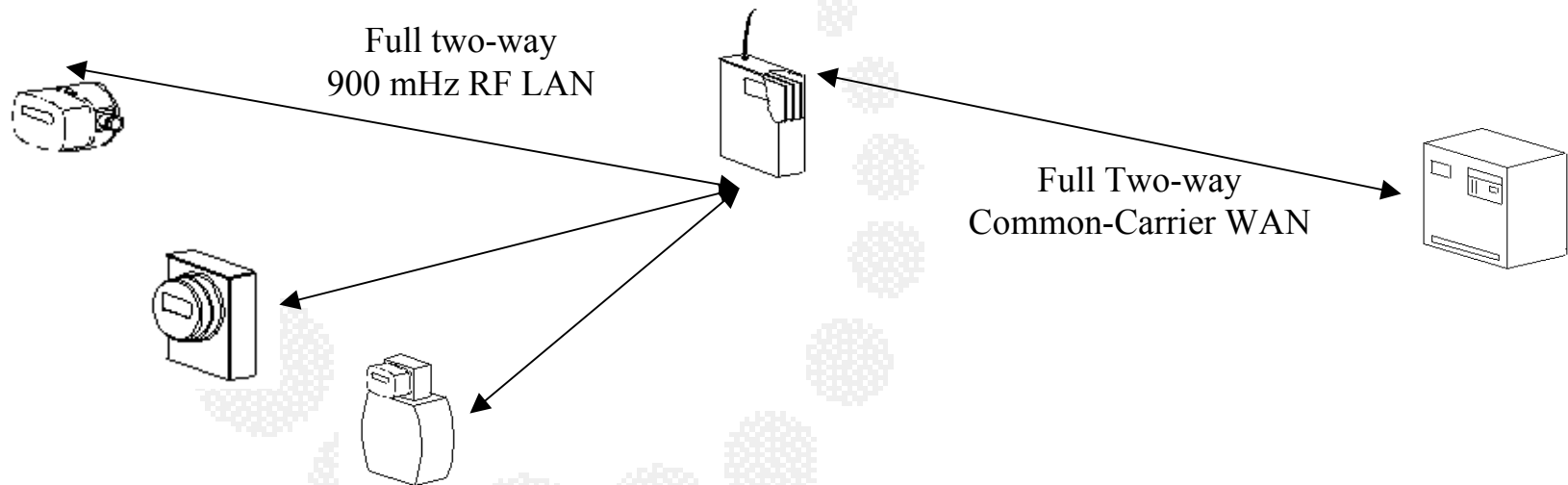
- Full two-way wireless communications between the Utility and the end-point
- Scalable to any size application
- Supports Electric, Gas and Water Metering, as well as a host of new value added services
- Host Configurable for a variety of information needs
- Flexible implementation options
- Beyond Meter Reading
 - Information Management and End-point Control

Functional Deliverables

- Consumption, Interval, TOU and PQ data
- Hourly, Daily, Day-of-Month and Route Scheduling, variable on the fly, from the host
- Real time alarms for outage, restoration, tamper, leak and virtual disconnect
- Service Disconnect
- Local meter intelligence for support of customer display
- Prepayment options
- On-line system monitoring for scheduling

How the System Works

- AxisPath creates a full two-way, Local Area Network (LAN) between endpoints and a Gateway Node
- A full two-way Wide Area Network (WAN) is used between the Host and the Gateway Node



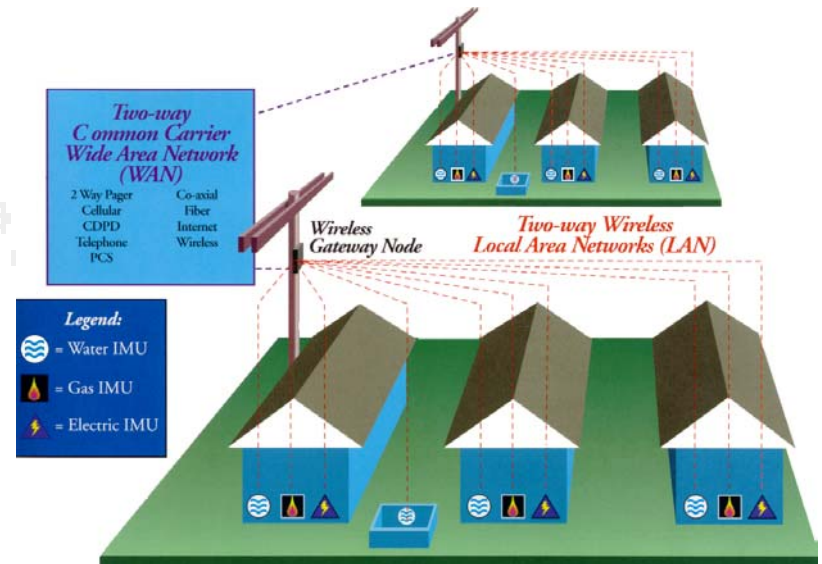
How It Works

Interval Data

- Schedules are deployed to the Gateway
 - Daily, Hourly, Day of Month, etc.
 - Interval Since-last-read, Specified time Period
 - Specific Meter or Group
- Gateway Initiates Communication
 - Direct or via relay(s)
- Comm Module reads Tables from Meter
- Responds to Gateway
 - Direct or via relay(s)
- Gateway Reads Next Meter(s)
- Gateway Calls Host over WAN
- Data Stored to AxisPortal Database
- Files Exported to MV-90, CIS or other location

Scaleable Advantage

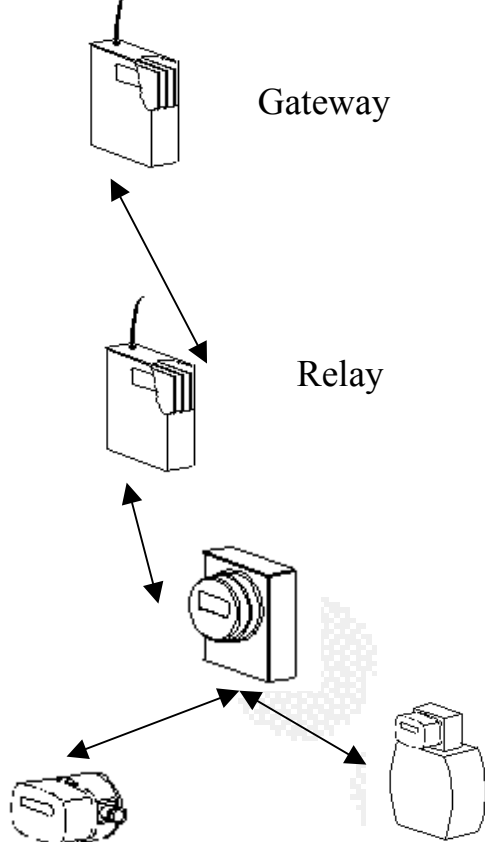
- Gateways support 100's-1,000's of meters
- Full two-way communications- near real time
- All endpoints are addressable
- Gateway concentrates volumes of data and communication links with meters, reducing operating costs and improving performance



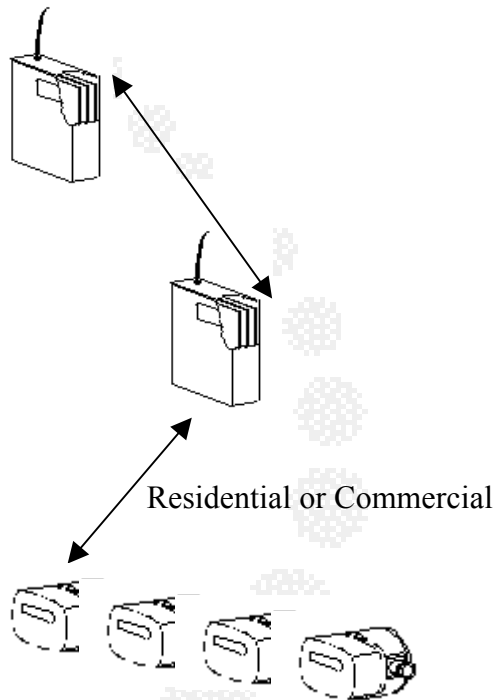
Flexible Configurations

Hardware and Software

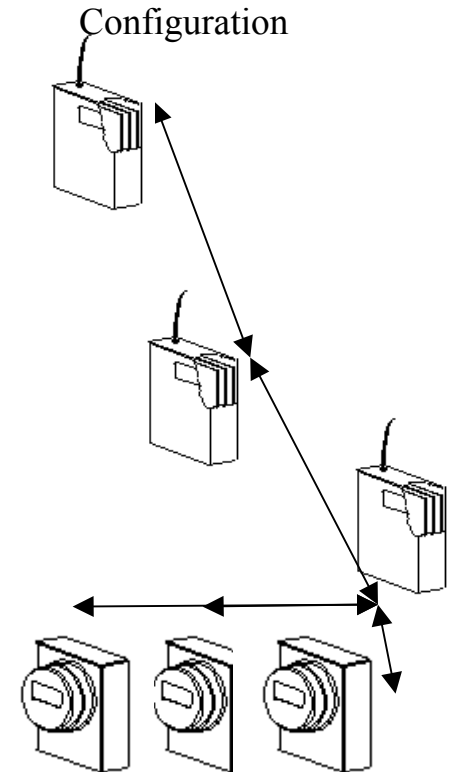
Monthly Reading of Electric Interval Data, supporting Gas/Water



Water or Gas-Only Applications



Mix of Daily and Monthly Interval Collection using Double-Hop Relay Configuration



Utility to Gateway Communications

- Common-Carrier Wide Area Networks
 - Telephone, CDMA Cellular, etc.
 - Significantly lower O/M than dedicated line
 - Built-in reliability and coverage
 - Lower Capital than proprietary WAN
- Private WANs
 - Option of using utility-owned infrastructure
 - Wireless (DataTac, UtiliNet, etc.) or Wireline (Fiber, etc.)

The PowerPoint™ Electronic Electric Meter Interface

- Interface Module for Electronic, Solid State Electric Meters
- Meter Data stored at the Meter, not created by the network
- Landis/Gyr S4, Focus, GE KV7, others
- EXAMPLE:
 - 35+ days of Interval data (1-6 channels) stored at the meter
 - Network Configured for reading schedule (every night after midnight, data since last read, etc.)
 - Network acts as data transport, handshake confirmation and network monitoring
- For C/I- many advanced measure functions (Power Quality, etc.) also available
- Full One-watt Radio
- Serves as a signal relay for other network devices (gas/water IMUs and other)
- OPTIONAL FUNCTIONS
 - Physical Disconnect

The Water Interface Management Unit™

- Register Head and Communications Device in One unit
- Retrofits most major Water meters of all sizes
 - Badger, ABB, Neptune, Invensys, Hersey
 - Any size/model with removable register
- Displays reading and flow-indication
- Monitors tamper, leaks, low battery, run-away and virtual shutoff
- Two actuators on board for control of shutoff valve
- Submersible for pit applications
- Remote antennas for basements and pits



The Gas Interface Management Unit™

- Register Head and Communications Device in One unit
- Retrofits most major Water and Gas meters of all sizes
 - American, Invensys/Rockwell, Sprague
 - Any size/model with removable register
- Displays reading and flow-indication
- Monitors tamper, low battery, run-away and virtual shutoff
- Two actuators on board for control of shutoff valve



Why Two Way?

- Function
 - Remote disconnect/connect of service
 - Interval data collection
 - Advanced alarming and information collection capabilities
- Reliability
 - Hand-shake communications
 - Automatic Retries
 - Real-time communications
- Ease of Use
 - Smart Meters/Distributed computing model
 - Information, not Data, management

Host Software

- Network Operating Software
 - Manages schedules, network configuration, network performance, data format and outputs
- Does Not:
 - Replace CIS, MV90, Outage Presentation System, etc.
- Does:
 - Scale from small to large applications, give total network control from the host, allow scheduling and information management criteria on the fly

Software features

- IBM Websphere based application server
- Browser-based User Interface
- Standard, defined interface between host and gateway
- APIs for common interface applications
- Robust logging and reporting
- Database independence
- OS neutral
 - AS400, Windows, Linux, Solaris, etc.
- Client/Server or Mainframe

User Interface

AxisPortal 3.0

Advanced Schedule Add

Enter information to create a new Schedule.

Time Zone Options: <input checked="" type="radio"/> Use Server Time Zone <input type="radio"/> Use Gateway Time Zone(s)	Callback Options: Override Gateway callback rules: <input type="checkbox"/>	Priority Level: Priority: <input type="text" value="High"/>
Electric End Point Options: Re-Queue Period: Days Hours Minutes <input type="text" value="000"/> <input type="text" value="00"/> <input type="text" value="05"/> Maximum Re-Queues: <input type="text" value="15"/>	Battery End Point Options: Re-Queue Period: Days Hours Minutes <input type="text" value="000"/> <input type="text" value="00"/> <input type="text" value="20"/> Maximum Re-Queues: <input type="text" value="4"/>	

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AxisPortal 3.0

AxisPortal Home

<Errors - none>

Quick System Status

WAN Communication	# Queues in retry state	1
	# Queues in error/retry states	2
	# Gateway queues with outgoing messages	5
	# Failed deployments (meters, schedules, activities)	0
Scheduled Activities	# Requeued activities	1
	# Undeployed on-demand activities for user Admin	0
	# Failed activities within the last 24 hours	0
Schedule Summary	# Expired schedules	5
	# Active schedules	27
	# Inactive schedules	3
Miscellaneous	# Devices with time change errors	2
	# Timestamp of last host link file activity	3/25/03 12:30 PM
Alarms	A tamper alarm was received from meter 4584875435 at 3/23/03 03:34 PM An AC power restored alarm was received from meter 4582275435 at 3/23/03 05:34 PM A tamper alarm was received from meter 1111875435 at 3/23/03 03:34 PM	

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How is this Different?

- From Mass-Deployment Alternatives
 - Better data integrity
 - Full two-way communications
 - Common-carrier backhaul
 - Higher Function, more flexible
- From Targeted C/I Alternatives
 - Significantly lower capital and operating costs
 - Efficiently scales to larger deployments
 - Effective in support of gas and water
 - Greater meter interoperability

Summary of Benefits

- Full Two-way
 - Better Data Integrity
 - Useable value-added information
- Built for High-Throughput Applications
 - Interval data for large numbers of meters
- Lower Capital and O/M Expense than alternatives

Next Steps

- Review requirements of your application:
 - Estimated read volumes, frequency, etc.
 - How important are alarms?
 - On-demand reads?, Disconnect?, Prepay?
- Conduct Free Assessment
 - Map(s) of service territory
- Deploy Pilot Site/Trial

Design Considerations

- Environment
 - Temperature, humidity, UV, etc. all add costs
- Durability
 - 15-20 year system life required without regular service to most/all field components
- Scalability
 - Think 4 Million+ Devices “on line”
 - 2% failure = 80,000 manual interventions

Design Considerations

Application

- How do you cover all of the meters?
 - Meters are where they are and they are not moving for you
 - Support of Gas/Water hold additional challenges
- Manage the data
 - +/- 5 terabytes of data per month for every million meters
- 90% of the application is easy, 5% is somewhat hard, 5% is really hard
 - Most cost, work in the last 5%

Design Considerations Convention

- “Open Standard” vs. Proprietary
 - Open has lots of cost, nobody will buy proprietary
 - Support for a variety of meter brands, models (the installed base)
- Why have a display?
- How integrated can the meter and the communications be?
- Why are water meters in pits at the curb?
- Etc.....