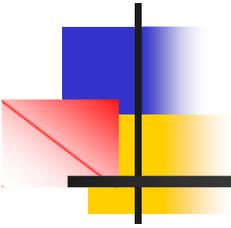


Effective Wireless Data Communications Solutions for Air Monitoring Systems

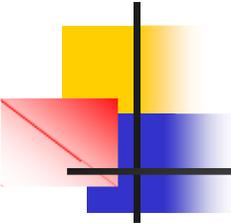


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2006 National Air Monitoring Conference
Las Vegas, NV

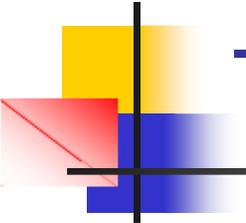
November 8, 2006



Revised Ambient Air Monitoring Regulations

September 2006, EPA revised Ambient Air Monitoring Regulations

- EPA, S/L/T improve public health protection and better inform the public about AQ in their communities
- AQ regulators to take advantage of improvements in monitoring technologies
- Add more real-time AQ measurements for particle pollution and ground-level ozone



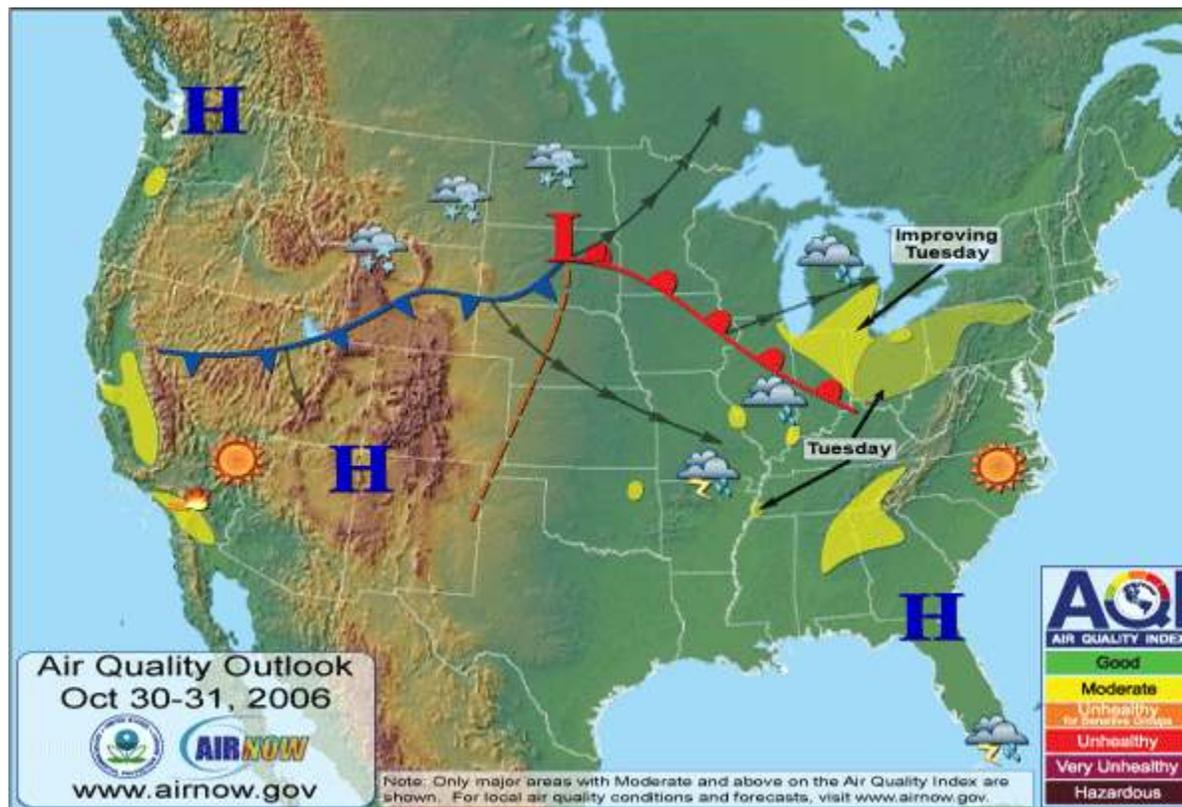
Wireless Data Communications As A Tool to Assist S/L/T Agencies

- Important to establish a team to achieve an end-to-end solution.
- Many technological alternatives are available.
Which alternative is best?
- Remote wireless communications are successfully deployed and proven cost-effective.

Mobile Monitor With Wireless Modem



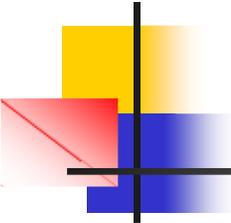
AQI Map



Adopters Will Always Encounter Hurdles

- Remote hardware
- Networking technology
- Back-end application
- Integration
- Data storage
- Security
- Monthly recurring charges
- Select a team with experience



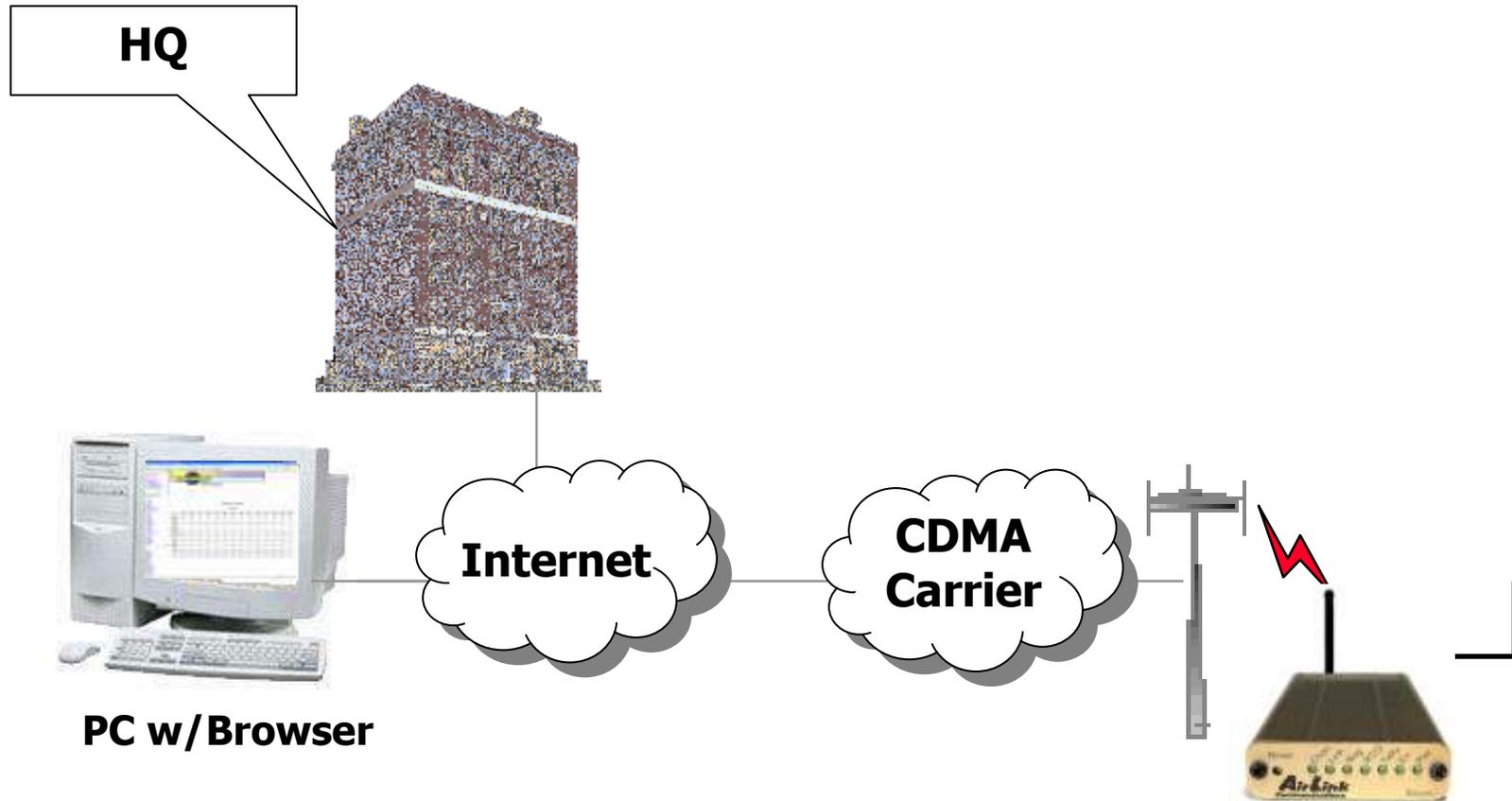


Available Technological Alternatives

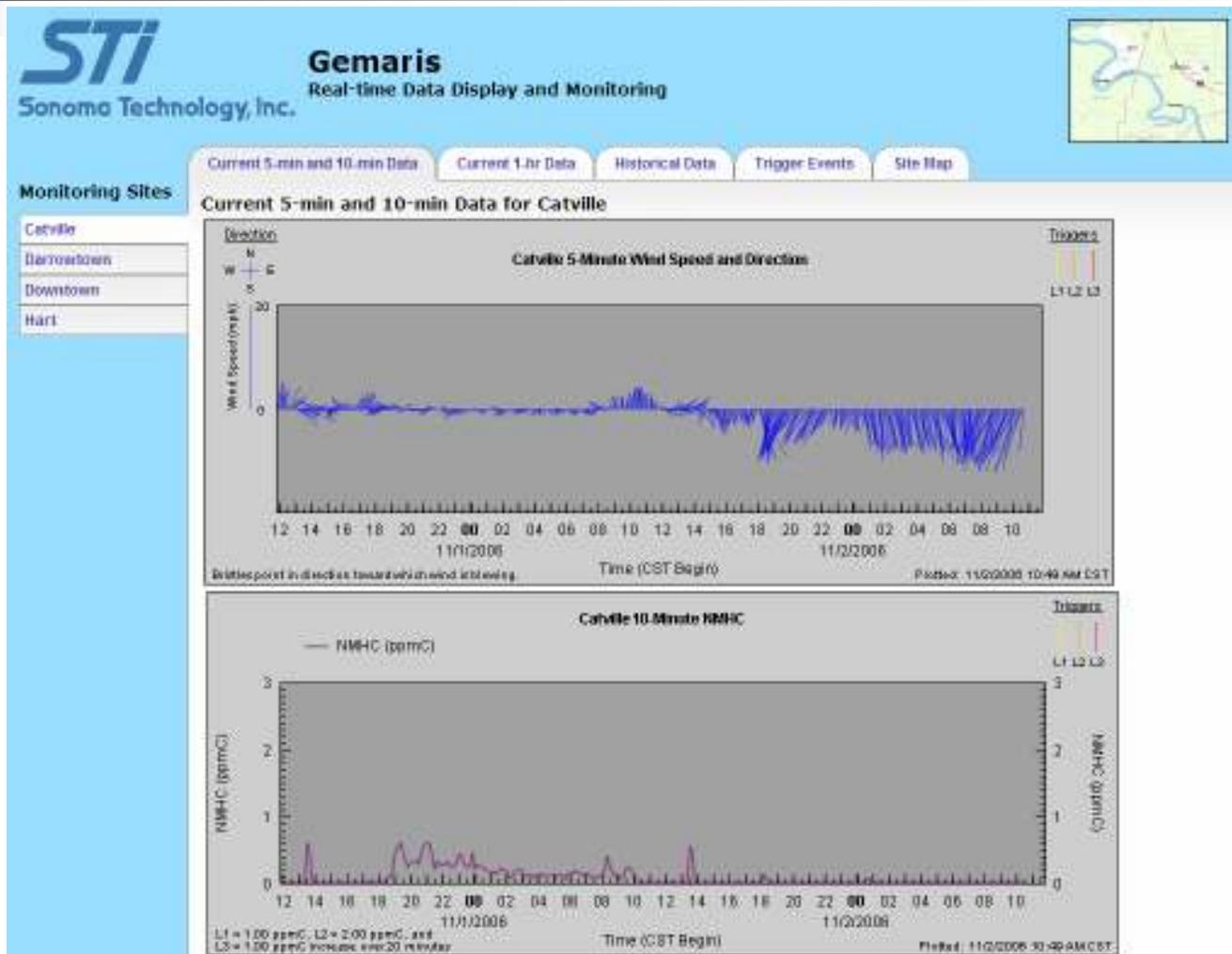
2006 Continuous AQ Monitoring Sites

- AQ monitors with serial interface – directly addressable
- Digital data – wireless or wire line connectivity
 - Wireless
 - CDMA 1xRTT vs GSM EDGE (2.5 generation)
 - CDMA EVDO vs GSM UMTS (3 generation)
 - CDMA EVDO (real-world rate 300–700 kbit/s)
 - GSM HSDPA = Enhanced Data Rates for GSM Evolution (384 kbit/s)
 - Wire Line
 - POTS
 - DSL
- DAS – push or pull data to central PC
- Result: real-time access via Internet

What A System Can Look Like...



Example: Real-time Data Updated Every 10 Minutes



Example Wireless Modem: AirLink Raven



Telemetry Features

- Always-On Connection
- Integrated TCP/IP Stack
- Class 1 Div 2 certified
- Domain name addressable
- Low power consumption
- Stateful Inspection Firewall

High-Speed Data Connections

- Rugged device for mobile data 1X data connections
- High-speed connectivity for any PC, router, or remote device
- Backup network connectivity for routers and servers

Popular Applications

- Seismographic Vibration Monitoring
- Natural Gas Wellhead Monitoring
- Transmission Line Flow Meters
- Energy Management Systems
- Air Quality/Meteorological Monitoring
- Water Level Monitoring

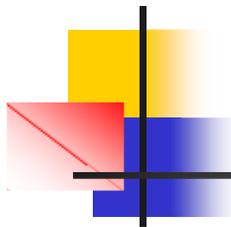
CDMA

1XRTT

GPRS

EDGE

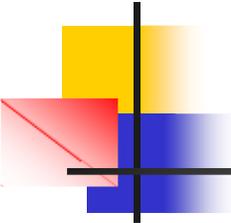
iDEN



Security

Security and Encryption = COMPLEX ISSUES!

- IT = Business Prevention Group
- Critical Infrastructure Protection (CIP) – ME provides CIP for Homeland Security
- Security and Encryption are handled by various means
 - Carrier – how they provide IP's and service on their networks
 - Static IP's can be restricted or unrestricted (Internet accessible or not)
 - Firewall with specific ports open
 - Closed networks with host connectivity to the carrier through dedicated lines
- Hardware and software solutions



A Team Solution

- Provides products that simplify the capture and integration of machine-to-machine (M2M) data
- Offers unique solutions designed for wireless networks
- Enables customers and solution providers to quickly and cost-effectively deploy M2M solutions in ways never before possible

Many Combinations for System Solutions

Remote Machines

- Machines
- Controllers
- RTUs / PLCs
- Meters / Loggers
- Transducers
- Switches/ Sensors
- Motes
- Appliances



Network Adapters

- Dialup Modems
- Ethernet Adapters
- Device Servers
- Terminal Servers
- Wireless Adapters
- Wireless Modems



Networks / Carriers

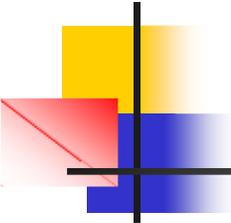
- Dialup ISPs
- Cable/DSL
- Dedicated Internet
- Frame Relay
- Circuit-Switched
- Wireless Carriers
- SMS
- Private Radio



Service / Application

- ASP Services
- Data Centers
- Hosting Company
- Telematics Providers
- AVL Providers
- HMI / MMI Servers
- Private Applications
- End User PC/Handheld



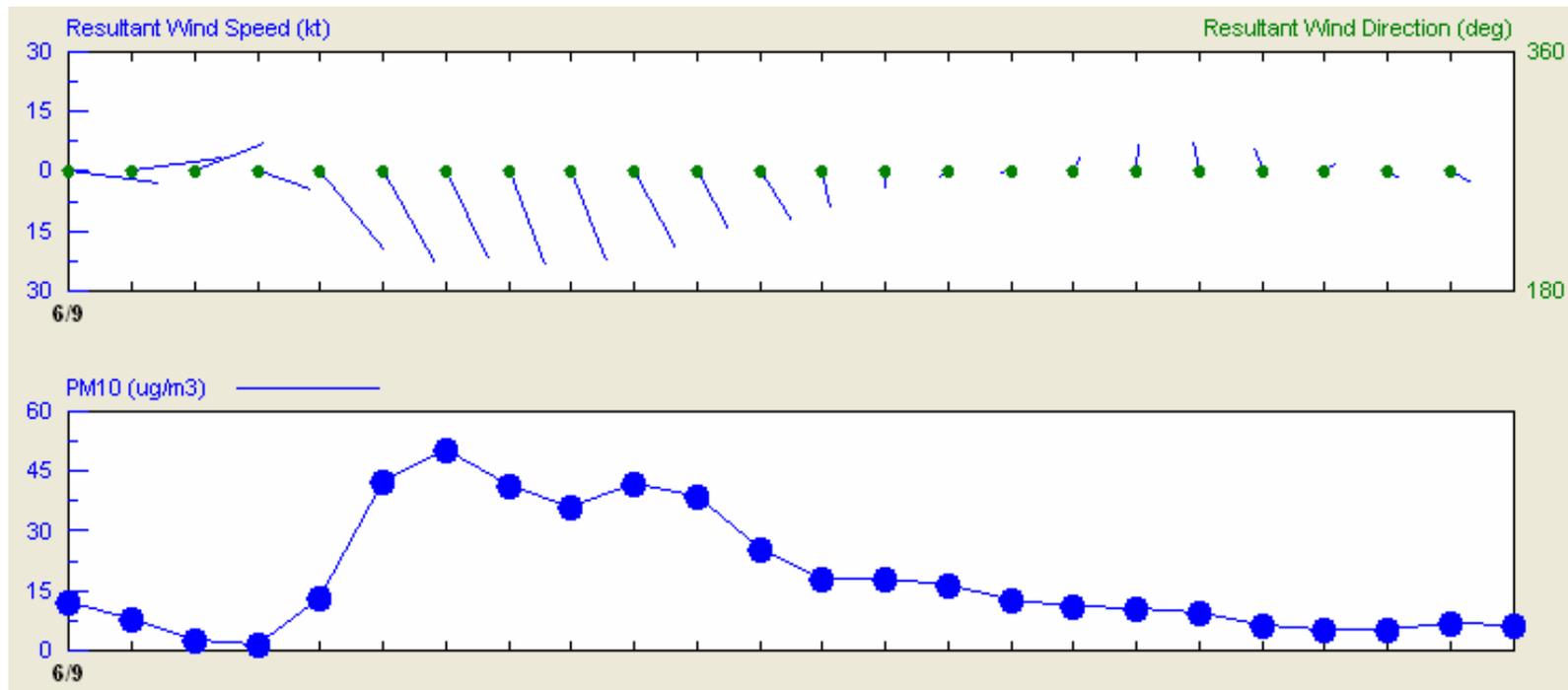


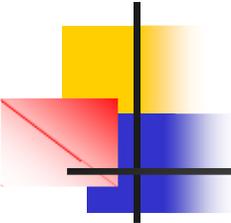
Possible Characteristics of User System (1 of 2)

- A wireless network interface of continuous AQ monitors and DAS using AirLink modems.
- Public and private web sites – offers options to solve difficult internal IT security demands & improve productivity.
- Methods to distribute information via the Internet using real-time relational databases to distribute AQ data for scientific and general public use.
- Software to view, validate, and analyze air quality data (example on next page).

Possible Characteristics of User System (2 of 2)

Point-and-click software to view, validate, and analyze
air quality data:





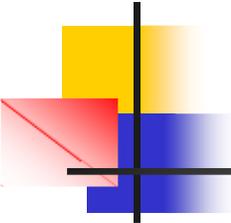
Wireless Advantages

Manual vs. Remote Data Retrieval

- Manual – labor-intensive, not real-time data access
- Remote – POTS vs. Wireless
 - POTS – Plain old telephone services
 - Worked fine for daily polling 1-hour data
 - Hourly calls costly (for real-time web & AIRNow posting)
 - Labor intensive for polling 1-minute data on weekly basis
 - Modems are becoming difficult to maintain – hard to find and costly
 - Wireless – M2M
 - Greater bandwidth at lower recurring costs
 - Supply real-time digital information improving operations
 - Enhanced trouble shooting and maintenance capabilities via direct addressable monitors
 - Multiple user access via Internet, increasing productivity
 - Increased mobility

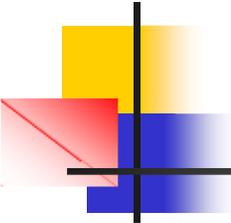
Example: Return on Investment – 28 Site Network

Yearly Expenditure	POTS	Wireless
Useage Fee	\$22,176	\$500 1-time
Modem	\$6,600	\$23,100
Hourly + 1-minute polling	\$3,838	\$6,720
Total	\$32,614	\$30,320
		11 month ROI



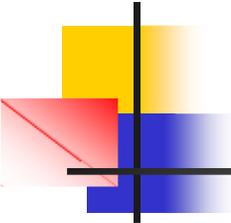
Team Success: STI Field Demonstration

- Client to provide Ethernet connection, but...
- 5 working days before demonstration: client informs STI no telemetry connection available
- STI contacts ME
 - Verizon contract executed
 - Raven E modem purchased, programmed, delivered
 - Day 3 modem installed on-site, but . . . IP address error needs to be de-bugged with ME help
 - Day 5 demonstration proceeds as scheduled
- STI repeats the demonstration a few months later 2,000 miles away (with the same equipment)



Wireless Figures Prominently in AQ Monitoring Today

- Ambient air monitors with serial interface an IP enabled, wireless IP networks and Internet distribution and dissemination of digital data
- The constraints of communication cables are eliminated
- The costs to implement and operate wireless digital telemetry are affordable



What Is Next?

- Evaluate your AQ monitoring network
 - Does it comply with revised monitoring regulations to inform the public and take advantage of real-time monitoring advances?
 - Where are improvements warranted?

For suggestions, contact

- STI (707.665.9900)
- Mobile Electron (813.649.8221)

