Measurement Communication Advancements

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Topics for Discussion

- Evolution of Communication Technologies for Gas Measurement Business
- Current communication technologies/strategies for accessing data from remote assets
- Discussion on the economics of deploying various communication & SCADA strategies.
- New advancements in local communications on a wellpad or other remote location.
  - Advancements in wireless technology creates opportunities for cost savings.

Early methods for Data Collection

- Circular chart recorders with charts collected and integrated typically monthly.
- EFM units connected to a dP transmitter requiring manual downloads or readings on the display.
- Workers on scheduled “routes” to collect data and/or address issues identified at the site.

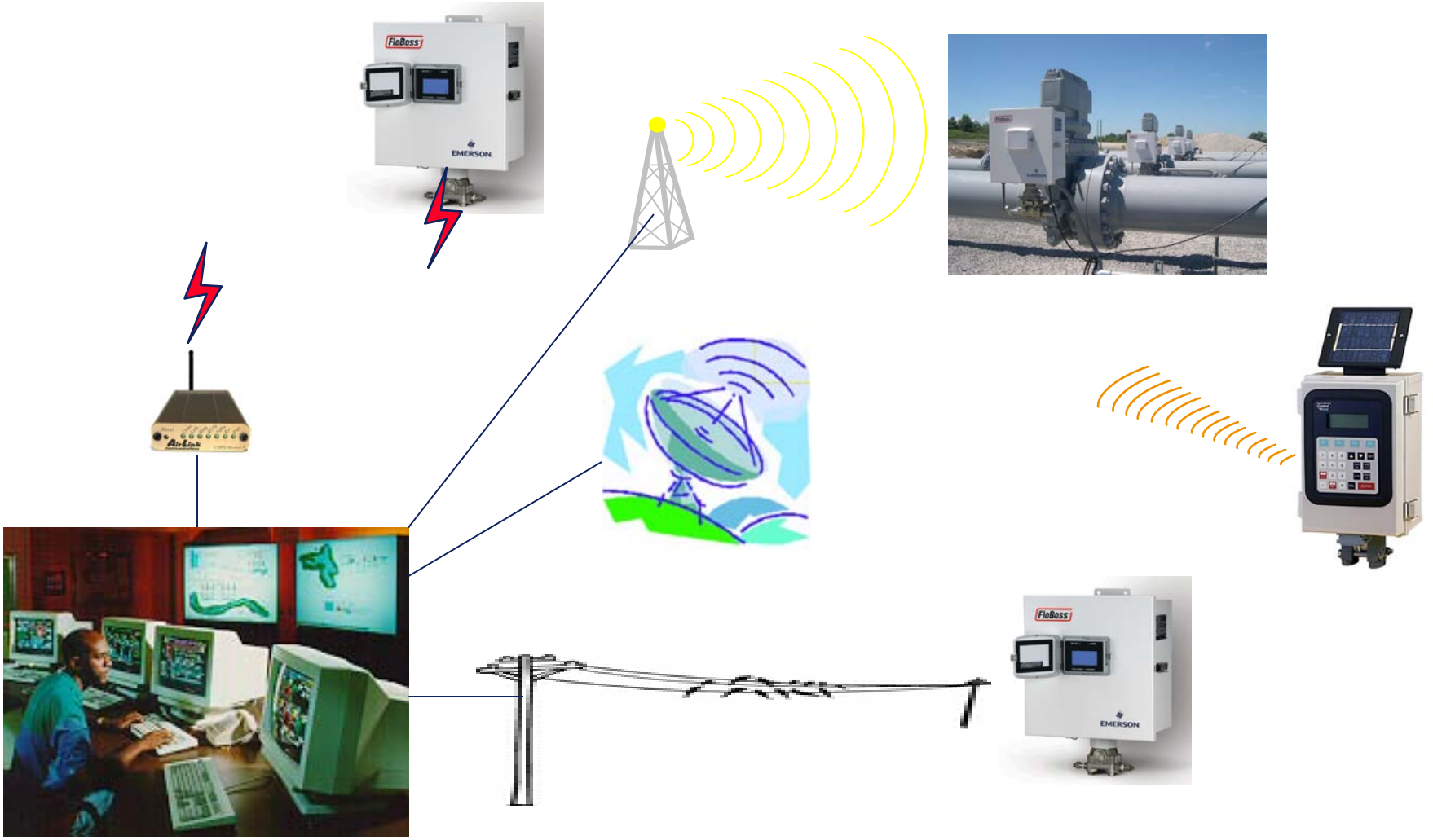
Today's Data Collection Methods

- Automated Software packages with user-friendly graphical interfaces and vendor proprietary protocols collecting, validating and serving real-time data to measurement, operations, billing, and other business divisions.
- Hybrid Communications Infrastructure
  - Solutions tailored to the application based on factors such as geography, required interval for receiving data, economics, volume of data required, etc.
- Additional data now readily available such as casing and tubing pressures, plunger arrivals, tank levels, liquids production, valve position etc.

So what does it mean?

- It means more accurate real-time access to data translating to quantifiable improvements in abilities to manage business.
- It means better operational efficiency
- It means maintenance based on real-time knowledge of where the issues are rather then “ghost chasing” or “route based” maintenance.
- It means a work force geared towards solving business problems rather then finding them.

Today's options are many



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Communications Options

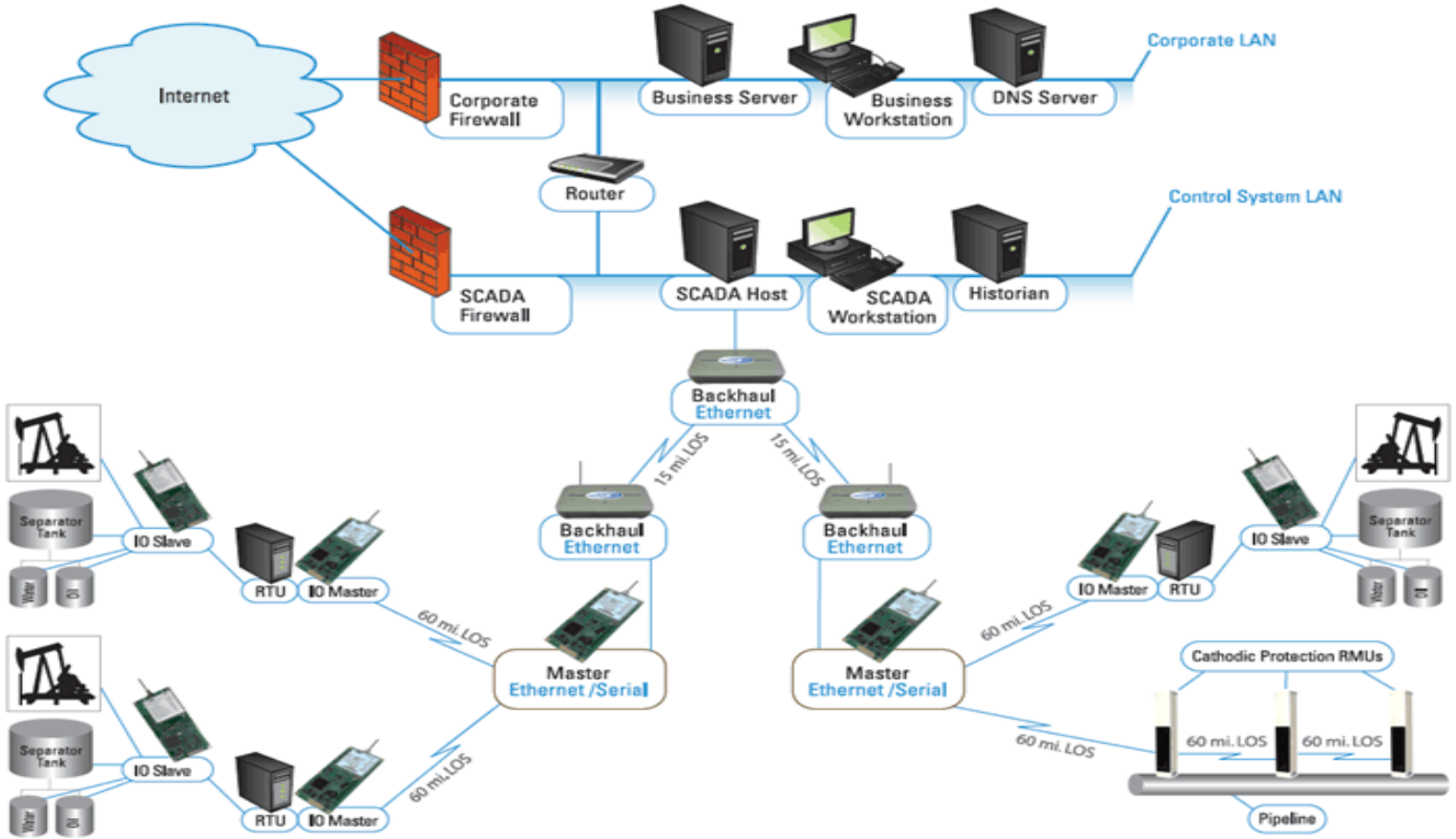
- Telephone Line/Leased Line
  - Advantages
    - Flat cost regardless of data volume and polling frequency
    - Reliability
  - Disadvantages
    - Initial cost to install can be high.
    - Monthly cost could be more then other options
    - Dependant on Phone Company for initial setup and maintenance
    - Susceptible to lightning/storm damage
    - Dedicated phone lines required on both “end points”

Communication Options

- Spread Spectrum Radio

  - Advantages
    - No recurring cost to access data.
    - Low Power consumption
    - Multiple communication modes and polling strategies.
    - Integrate into local wireless strategies for device data.
  - Disadvantages
    - Infrastructure such as towers can be required.
    - Incremental cost to bring in additional devices can be high dependant on proximity to network availability.
    - Network maintenance required.

Diagram of Radio Network



Credit : Freewave Technology

Radio Communication

- Optimal areas for radio network.
  - Fields with high density of well locations and relatively good line of sight.
  - Areas where existing Right of Ways and infrastructure allow for easy and cost effective deployment.
- Cost Considerations
  - $500-$800 per site for serial radio and accessories
  - Additional cost for infrastructure largely determined on case by case basis.
    - Proper due diligence up front can help plan for this.

Radio Communication

- Power Considerations
  - Today's Spread Spectrum radios offer many power saving features such as "sleep" or "low power" mode.
  - Generally, incremental power required for radio depends on polling frequency but generally compares well with other communication options.
- General Considerations
  - Proper FEED (Front End Engineering and Design) study will provide much greater likelihood of an on-time and on budget radio network deployment.

Radio Communication

- General Considerations
  - Depending on distance from the host system infrastructure to the first radio or repeater, it may make sense to use any of a number of communication options to make the first link.
  - Field training for support and field personnel should be budgeted and implemented. This will pay significant dividends relative to ongoing system maintenance and growth.

Communication Options

- Cellular TCP/IP Modems

  - Advantages
    - Cost Effective Hardware
    - Low Power
    - Available wherever Cellular Data Service is available
    - Reliability largely equal to the provider's signal reliability
  - Disadvantages
    - Cellular service not available everywhere
    - Potential security concerns could lead to requirement of a VPN connection with multiple cellular providers.

Cellular Communications

Host

Internet

Frame Relay
or
VPN

Network

Wireless
Carrier
Network

Cellular Communications

- Optimal areas for cellular communications
  - When time is of the essence. No significant path studies required or infrastructure needed.
  - Anywhere robust cellular coverage exists.
  - As a “back haul” device for a radio network.
  - Where actual internet service is desired for rigs or other operational requirements during or after drilling. Ethernet cellular modems combined with a wireless router can create a “hot spot” at your well site.

Cellular Communications

- Cost Considerations
  - Hardware cost is competitive ($400-$700)
  - Monthly subscription cost between $10-$60/month
    - Dependant on quantity of units, volume of data to be moved, polling frequency, cellular provider, etc.
  - If you require a VPN, initial cost as high as 30K.
- Power Considerations
  - Depending on the frequency of polling and assuming 3-4 polls per day, power requirements are minimal and many time served by existing solar power or slightly upgraded solar panel size.

Cellular Communications

- General Considerations
  - The physical modem hardware varies from carrier to carrier (ie. A modem in your inventory for the Verizon network will NOT work on the AT&T network).
    - If it's possible to minimize carriers and standardize, this makes sense for a number of reasons.
  - IT issues – For static IP modems over the internet (as opposed to VPN), many IT departments will want involvement in allowing communication to these devices while protecting the integrity of the company network.

Cellular Communications

- General Considerations
  - Cellular data modems present a nice opportunity as a “back-haul” device enabling you to reach out to a field service by a radio network that is hundreds of miles away.
    - Think of the option to bring back information from 100 devices on one $30/month data plan as opposed to 100 separate $20/month data plans. This scenario could save $20K+/year in communication costs.
    - Investment in a sound and solid FEED (Front End Engineering and Design) Study can assist greatly in determining the most robust, cost effective solution. As illustrated above, the payback on a good FEED study can be nearly immediate.

Communication Options

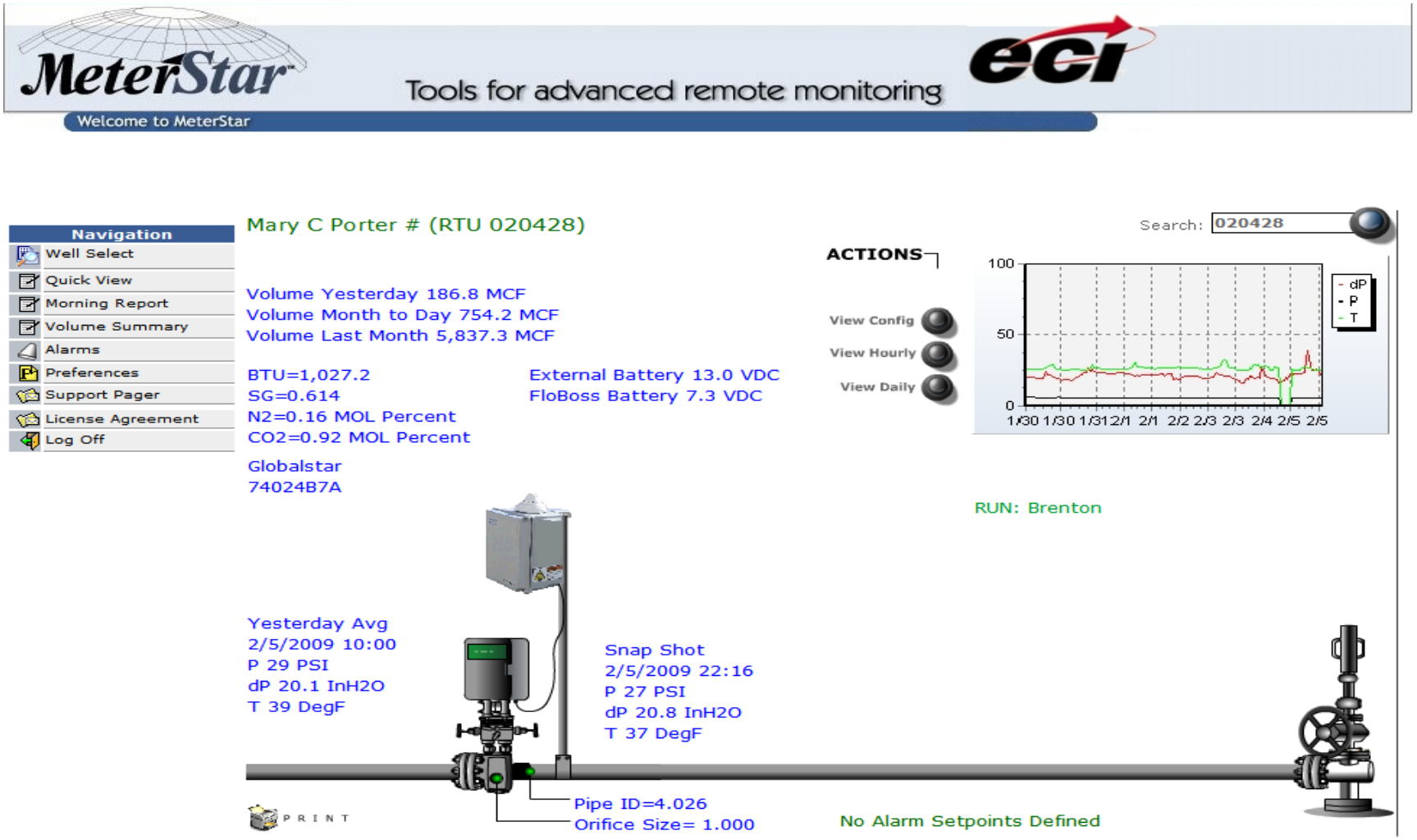
- Satellite Communications – LEO

  - Advantages
    - Communication in places otherwise not accessible.
    - Cost Effective access to otherwise inaccessible data
    - Multiple solutions available based on application.
  - Disadvantages
    - Can be power hungry.
    - Latency of minutes to hours based on satellite constellation.

Communication Options

- Optimal area for satellite communication
  - Geographic regions where not other comm is available.
  - Areas where site surveys for radio or cellular is not an option or time is a constraint.
  - Where there is no desire to add internal and external infrastructure.
  - You do not have a traditional polling SCADA system
    - Satellite solutions can PUSH the data from the device back to an email address, webpage, FTP server and other

Another option for Sat Data



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Communication Options

- Cost Considerations
  - Wide variance in hardware costs ($600-$2000)
  - Monthly Costs of $15-$150/Month per site
  - Web-hosting charges vary by provider
  - All monthly packages are not created equal.
    - Some provide only “snapshot” operational data such as yesterday’s total flow, average dP and average P.
    - Others provide full API 21.1 compliant custody transfer quality data including alarms, events, hourly & daily logs.
  - Proper evaluation must be done on capital cost versus monthly data costs.

Communication Options

- Power Considerations
  - Generally, the power requirements are slightly greater when doing satellite communications but still manageable by solar power packages
  - Programming fixed intervals for “store and forward” type communication can be helpful in managing power requirements.
- General Considerations
  - Satellite communications provides a nice “tool in the toolbox” when developing a comm strategy. Sometimes it fits everywhere and other times as a piece of the puzzle but not the puzzle itself.

Communication Options

- Satellite Communications – VSAT
  - Advantages
    - Real-time access with ~100% availability
    - Polling frequency measured in minutes rather then hours or days.
    - Reliability
  - Disadvantages
    - Cost
    - Power Consumption

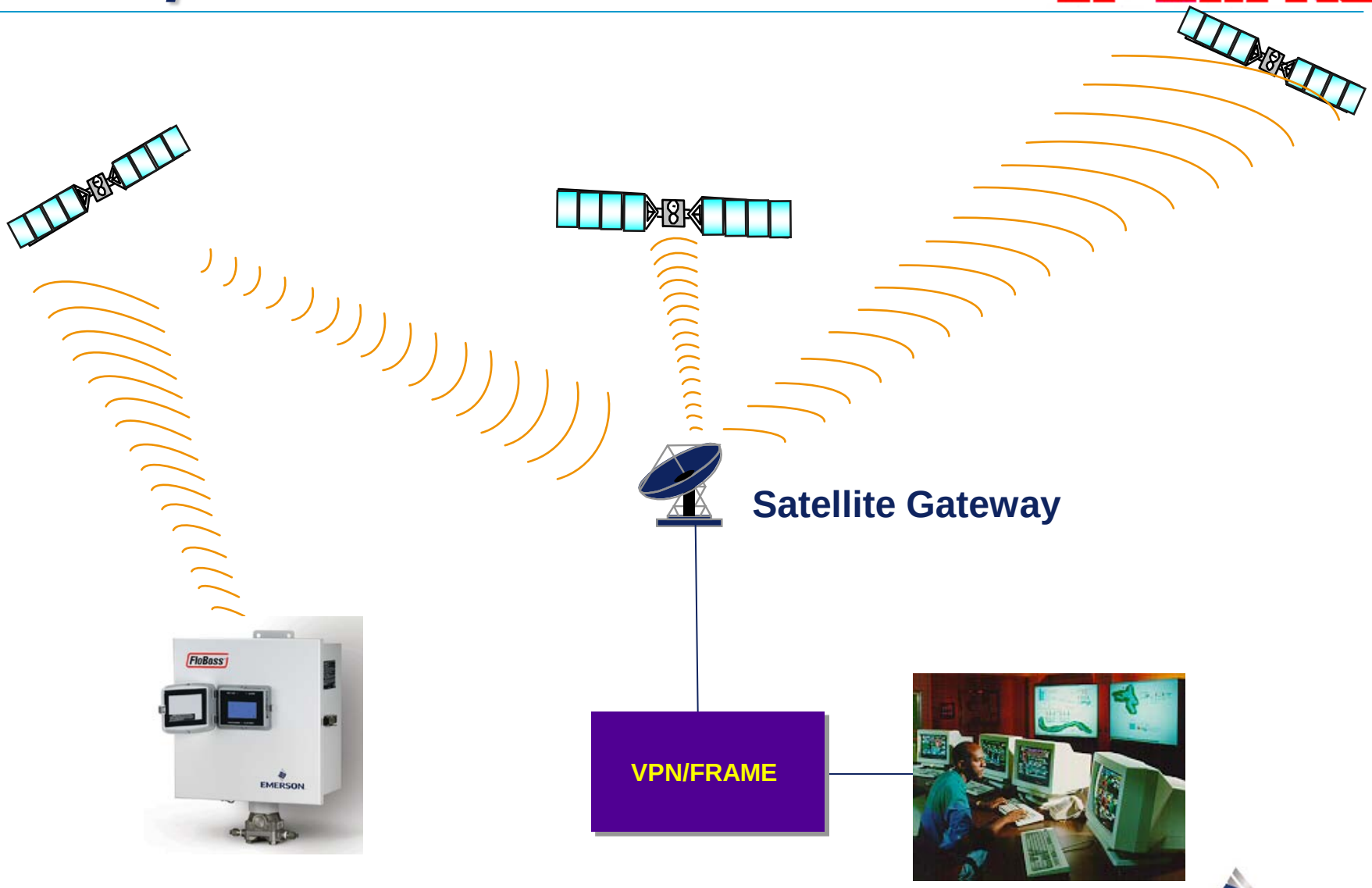
Communication Options

- Optimal Areas for VSAT communication
  - Where real-time data is needed all the time.
    - VSAT can serve as a constant connection to the process.
  - Where it isnt cost effective or practical to bring your network to the field.
- Cost Considerations
  - Initial cost can be in the thousands or tens of thousands depending on application.
  - Monthly costs are much higher then LEO (typically hundreds of dollars) but also offer much higher reliability.
  - Power requirements can also add cost as power draw is high.

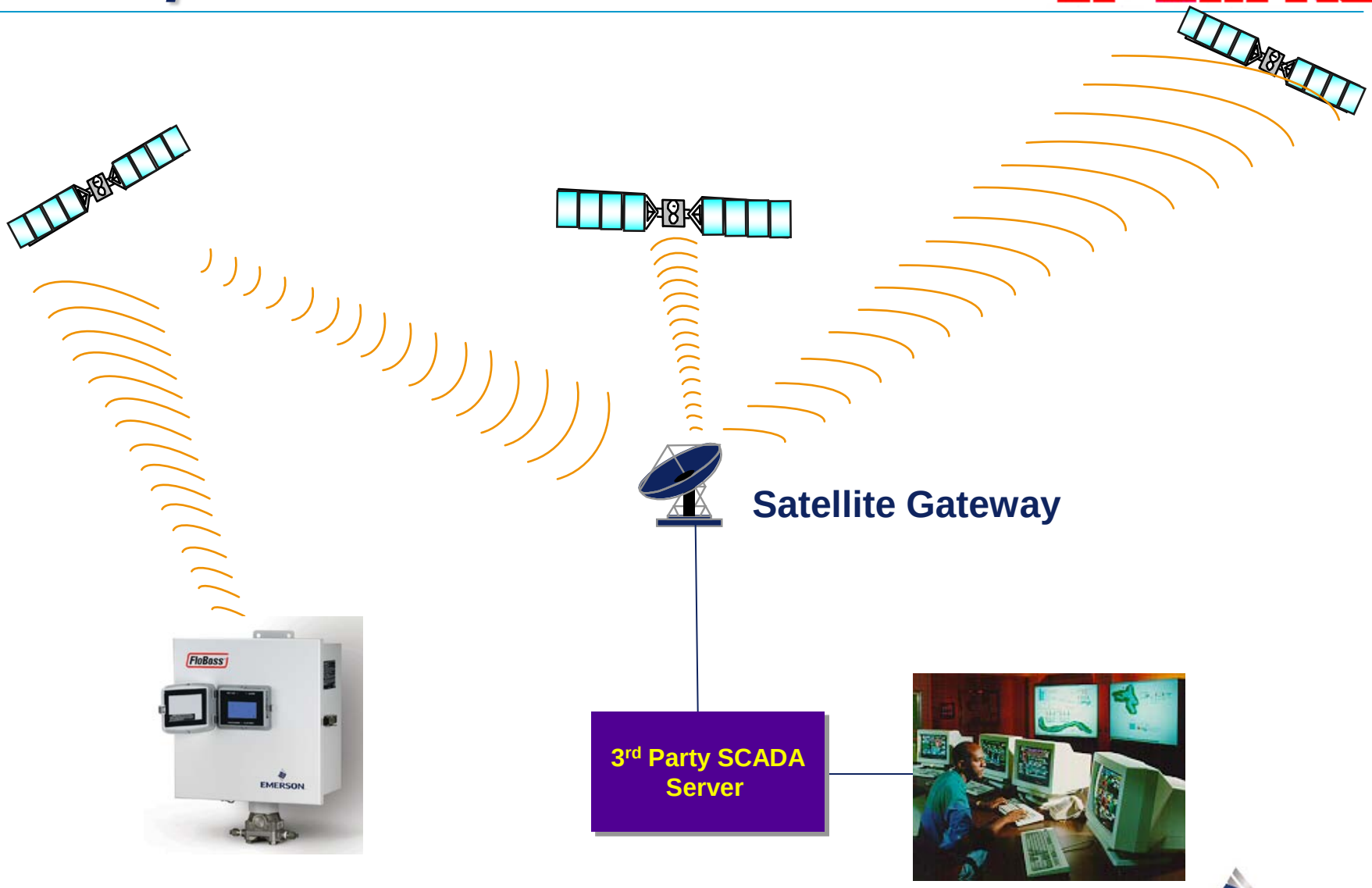
Communication Options

- Power Considerations
  - VSAT solutions typically consume far more power then most communication options and thus must be planned for. Fixed power or Large Solar packages are both viable options.
- General Considerations
  - VSAT is an excellent tool to provide a way to access critical data a processes that would otherwise not be reliably reachable. While more costly then other solutions, it provides a whole lot more value as well and is worthy of consideration based on the application.

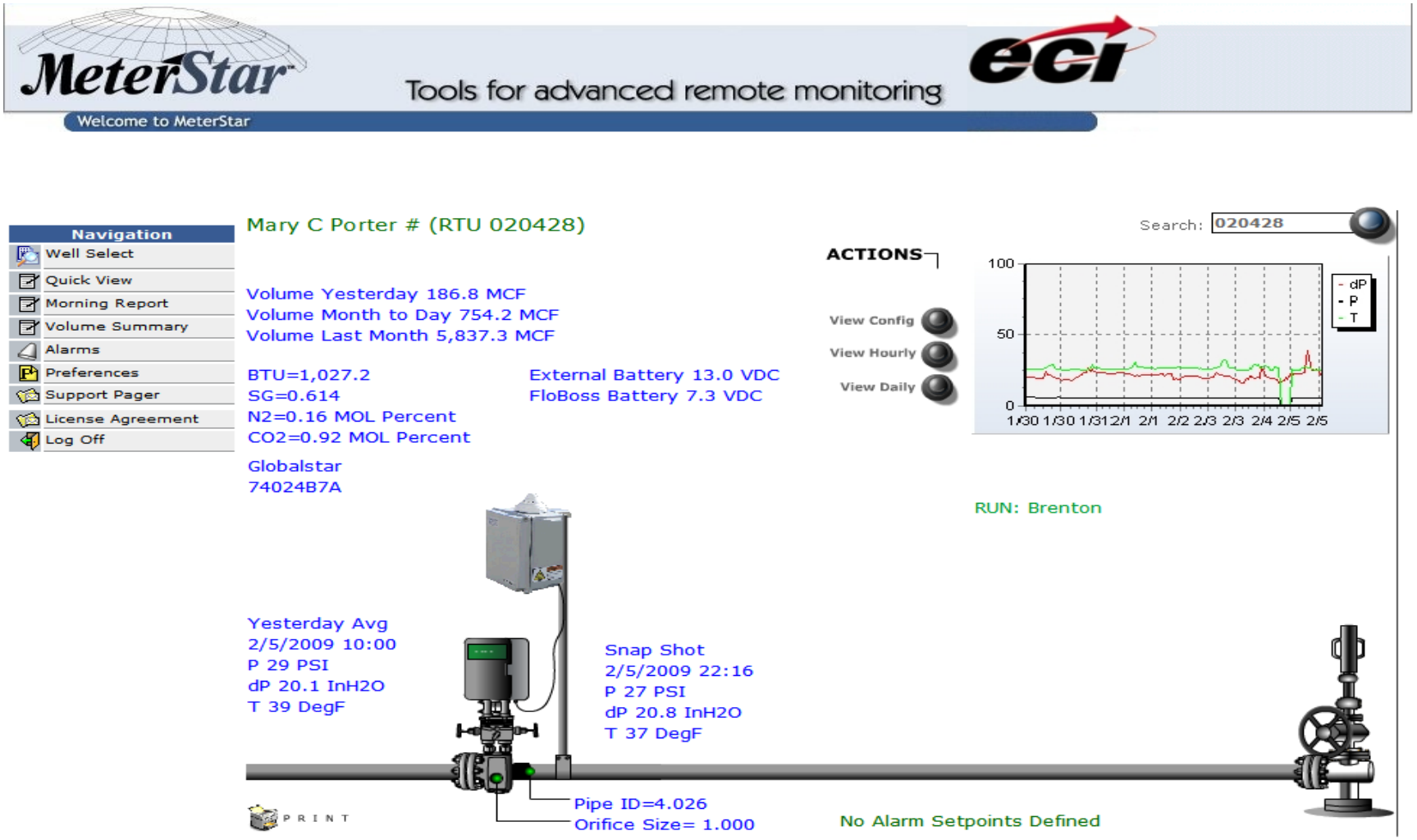
Example of Satellite Comm.



Example of Satellite Comm.



Another option for Sat Data



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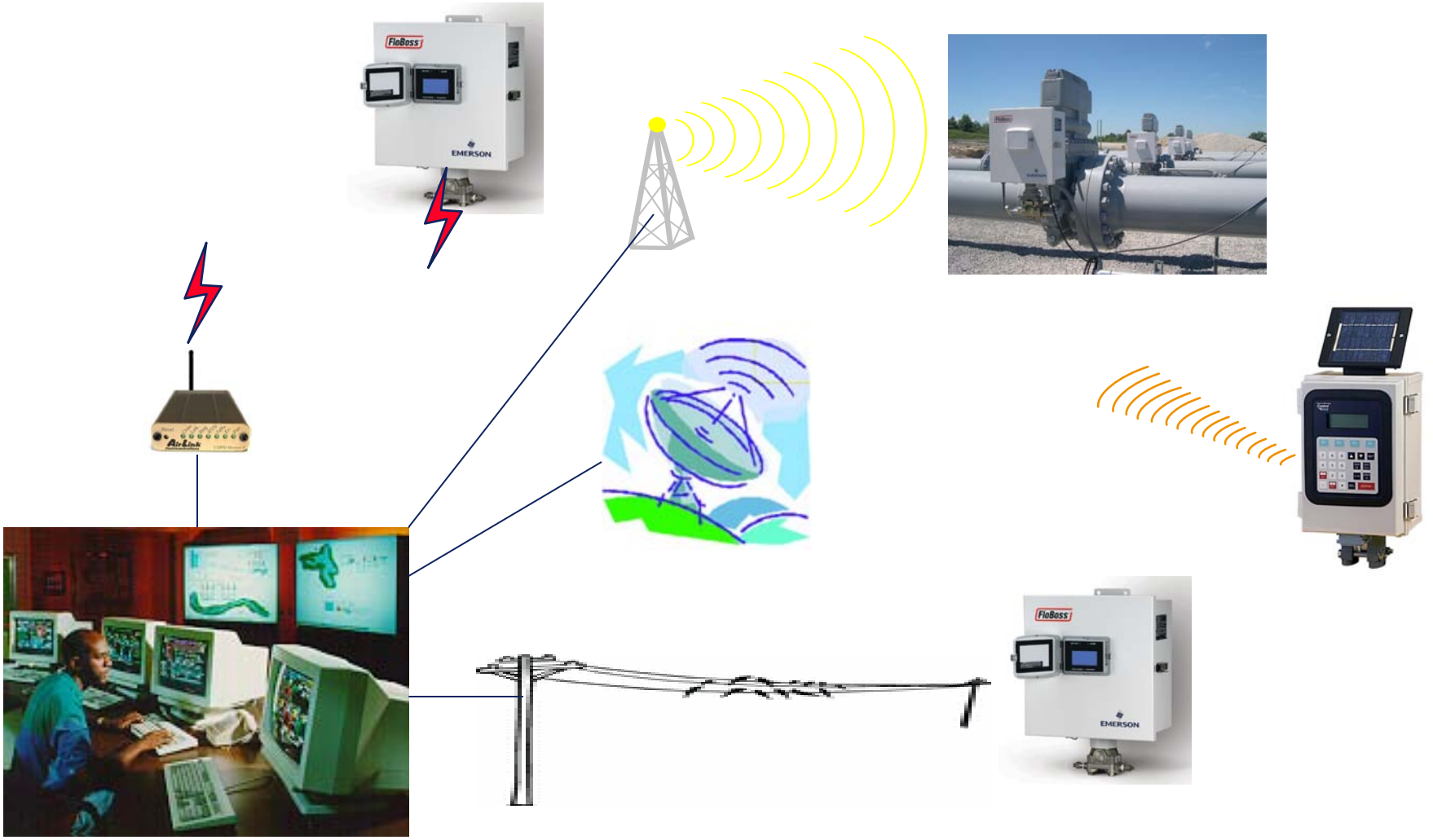
Hybrid Solutions for Data Retrieval

- Optimal areas for Hybrid Solution
  - Everywhere!
  - In order to put together a rock-solid and cost effective communication infrastructure, careful consideration should be given to:
    - Your project goals
      - How often you need data updated?
      - Who needs access and at what level?
      - What interface works best for you (SCADA, Web, Email, etc)?
      - Do you want to integrate with other software systems?
    - Different factors impacting different fields and how best to create a solution that is both cost effective and reliable.

Today's options are many



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Hybrid Solutions for Data Retrieval

Host

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Remote
Gas Field

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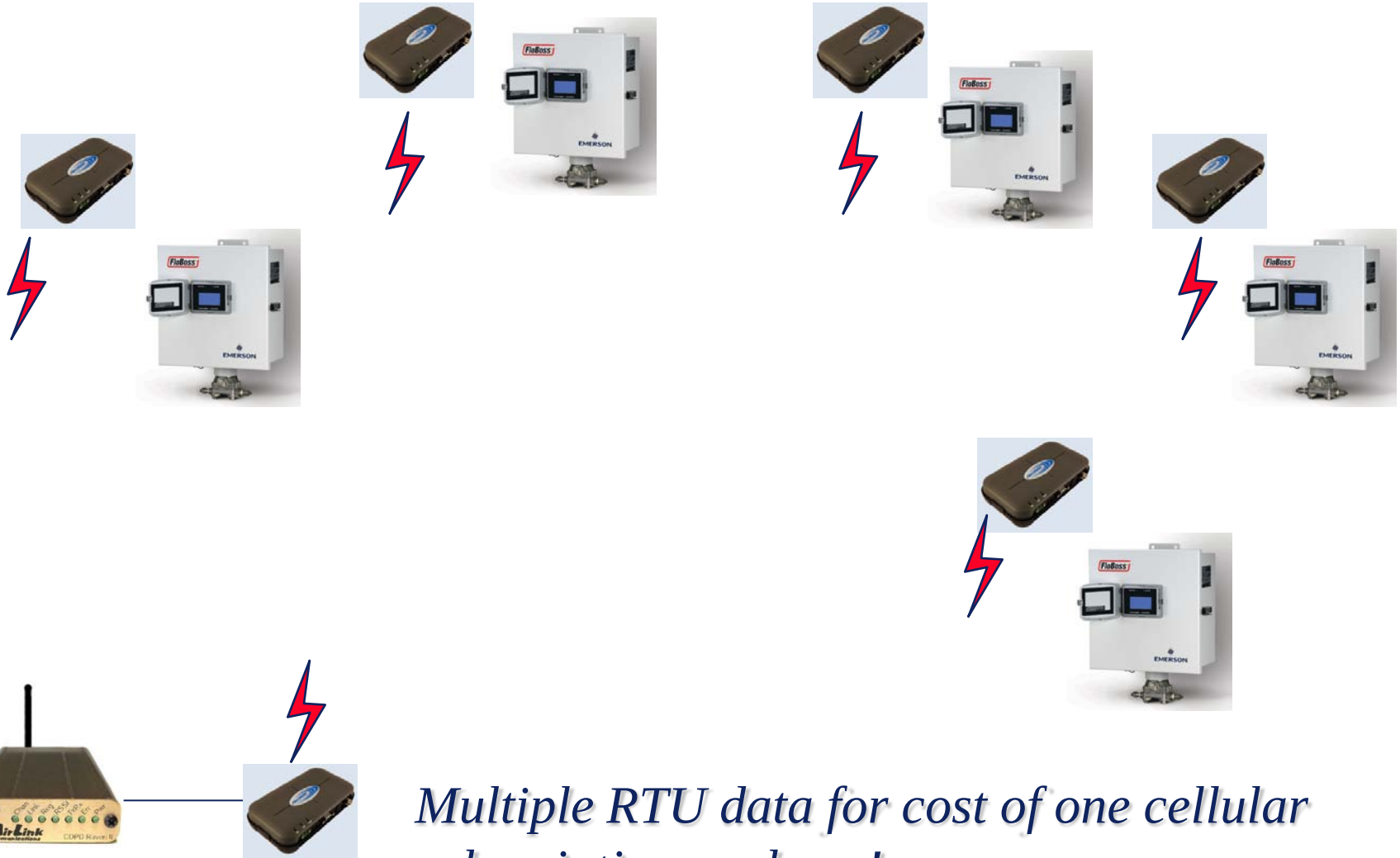
Remote Gas Field Data Retrieval



Multiple RTU data for cost of one cellular subscription package!

- Now lets drill down into an individual site

Local Area Network Communication

- Improvements in communication protocols have made instrument communication onsite much easier to implement and more cost effective.
- Multi-Drop technologies such as RS485/Hart allow for multiple devices to report back to an RTU on a single pair of wires.
- Wireless technologies are now available allowing data such as casing & tubing pressures, plunger arrival, tank levels, etc to be brought into the RTU and, ultimately, the SCADA system without the need for wires.

Traditional Wellhead with Wires

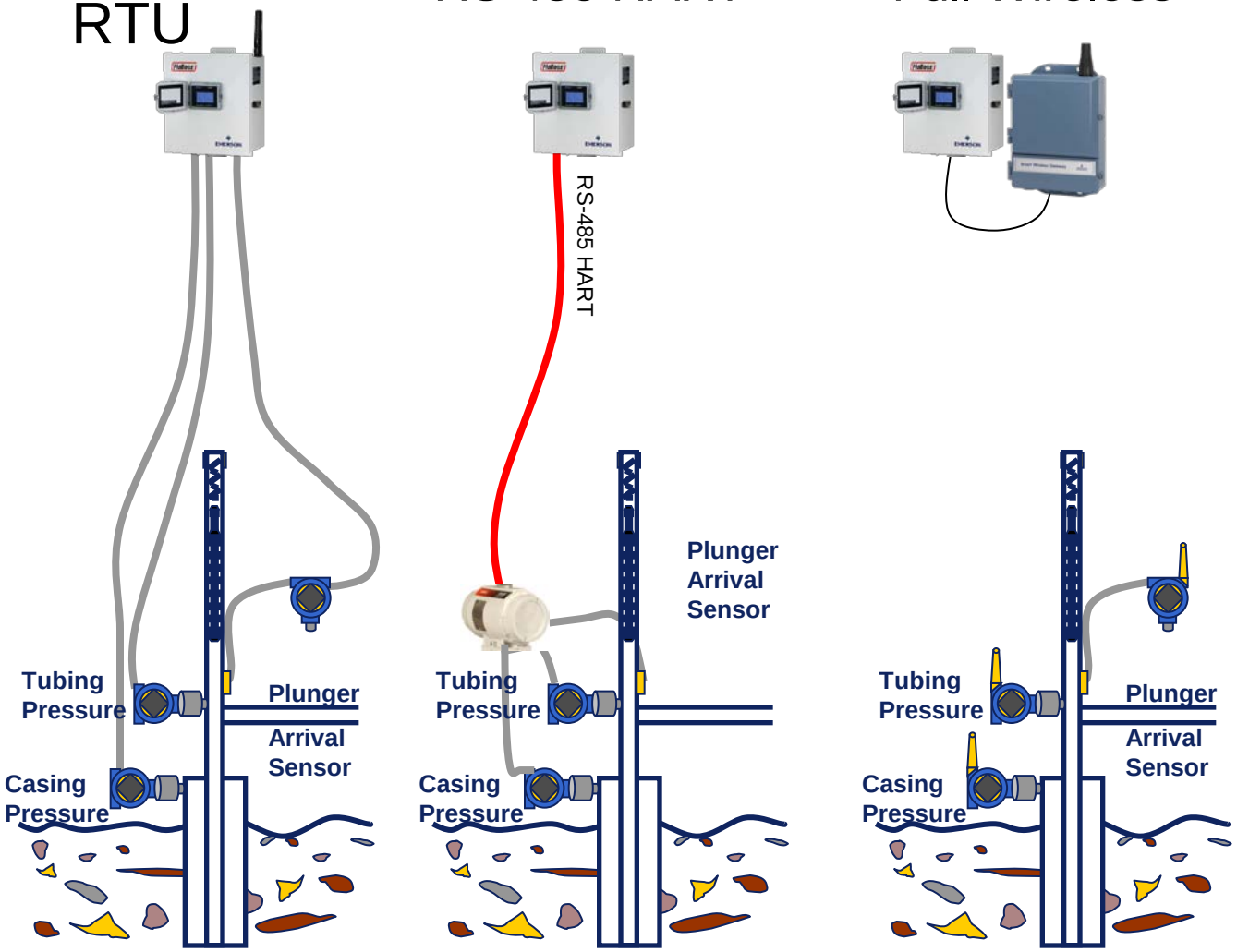
- Conduit
- Wire
- Electricians
- Wiring Checkout
- Time Requirements
- Trenching

Wellhead Infrastructure

Traditional RTU

RS 485 HART

Full Wireless



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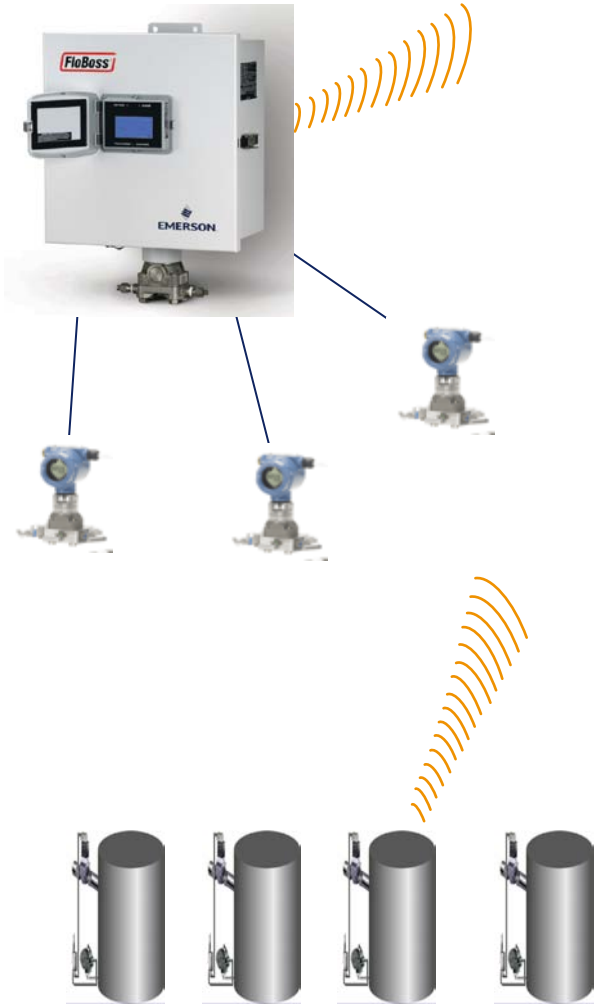
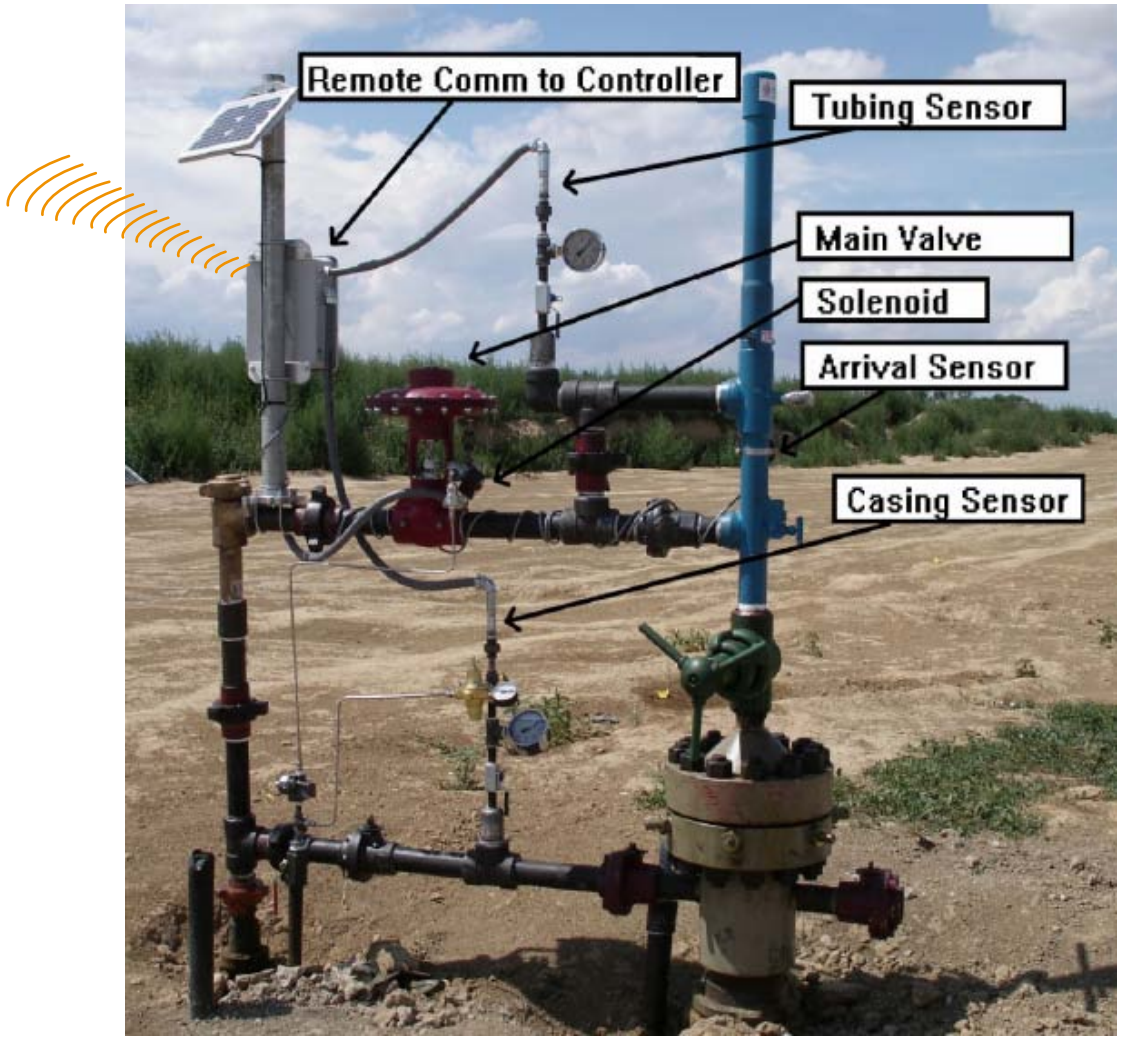
Sample Wireless Installation





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Benefits of Wireless at Wellhead

- Potential for significant cost savings in wire, conduit, trenching, panel size, etc.
- Much quicker installation allowing for well to come online in a timely fashion with all data available in real-time.
- 10-15% reduction in total installed cost.
- Simplified installation at the site.

Potential Pitfalls

- With wireless transmitters, battery maintenance is required as batteries will require replacement.
- While wireless signal integrity is getting more and more robust, new buildings, tanks or other infrastructure can cause potential interference or signal blockage at a site.
- As with any other solution, proper planning including sizing of power systems, signal paths/reliability, etc should be done to assure a proper installation.

Summary

- Communication options abound in today's measurement world.
- Careful consideration to all aspects of a system on the front end affords much better opportunity for successful implementation.
- Help is available to assist in assessing the proper way to go relative to communication strategy.
- Wireless solutions both locally and on a wide area basis are becoming more and more viable.

Questions??

- For more information or to set up a meeting for follow-up discussion, please feel free to contact us as we would be happy to visit with you.

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