



Advanced Metering Solutions for Federal Agencies - A Systems Integrator's Approach to Metering -

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Design Criteria

- Open
- Multi-vendor
- Extensible
- Future proof
- Security
- Reliable data and high system up-time
- Make good use of existing infrastructure
- Access to database by external third-party vendors

System Integrator's Toolkit

Technique: functional layer building block approach

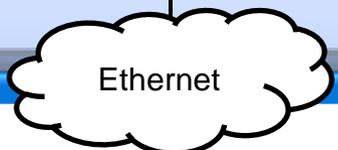
- Utility meters
- Data collectors (and gateways)
- Communications (multiple protocols)
- Database/historian
- Servers and application software
- User HMI/visualization (Web)
- Web-based software tools
- Integration with other systems

HMI = human-machine interface

Visualization



Access applications over HTTP (Internet or intranet)

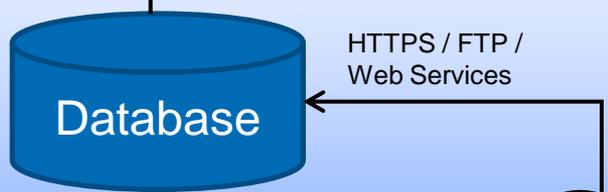


Enterprise



Trends, reports, analytics, data export

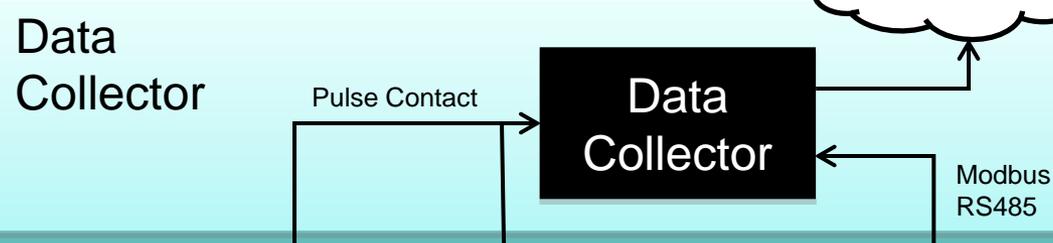
Historical Data Storage



Data accessible to applications using open standard interfaces (third party single-point access)



Facility



Acquisuite[®], JACE[®], others provide data store and forward capability

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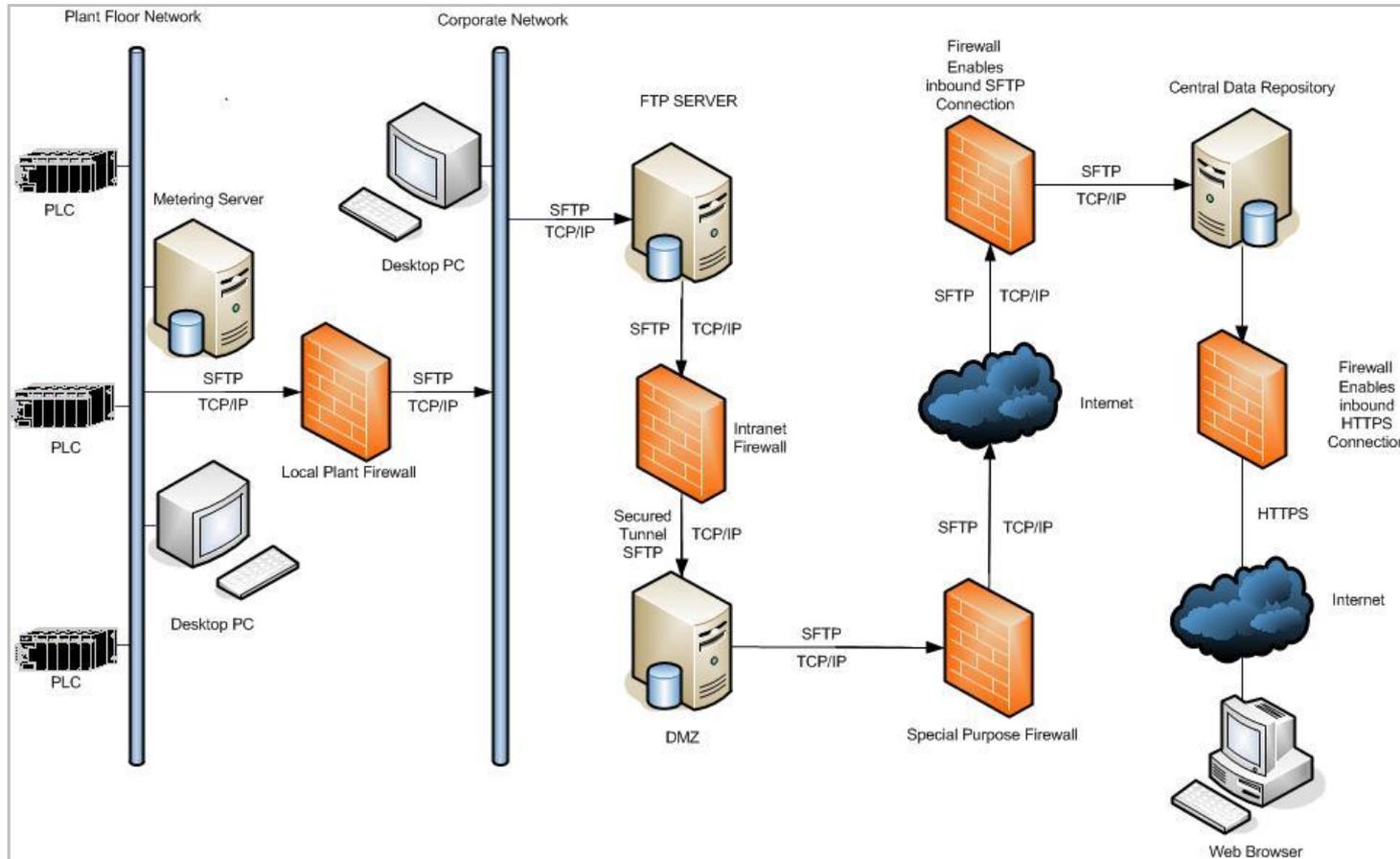
Modbus[®], BACnet[®], others

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Communication Architecture Diagram

Outbound Data Only (Push) to Third-party Supplier

Security requirements from IT department (nine-month effort)

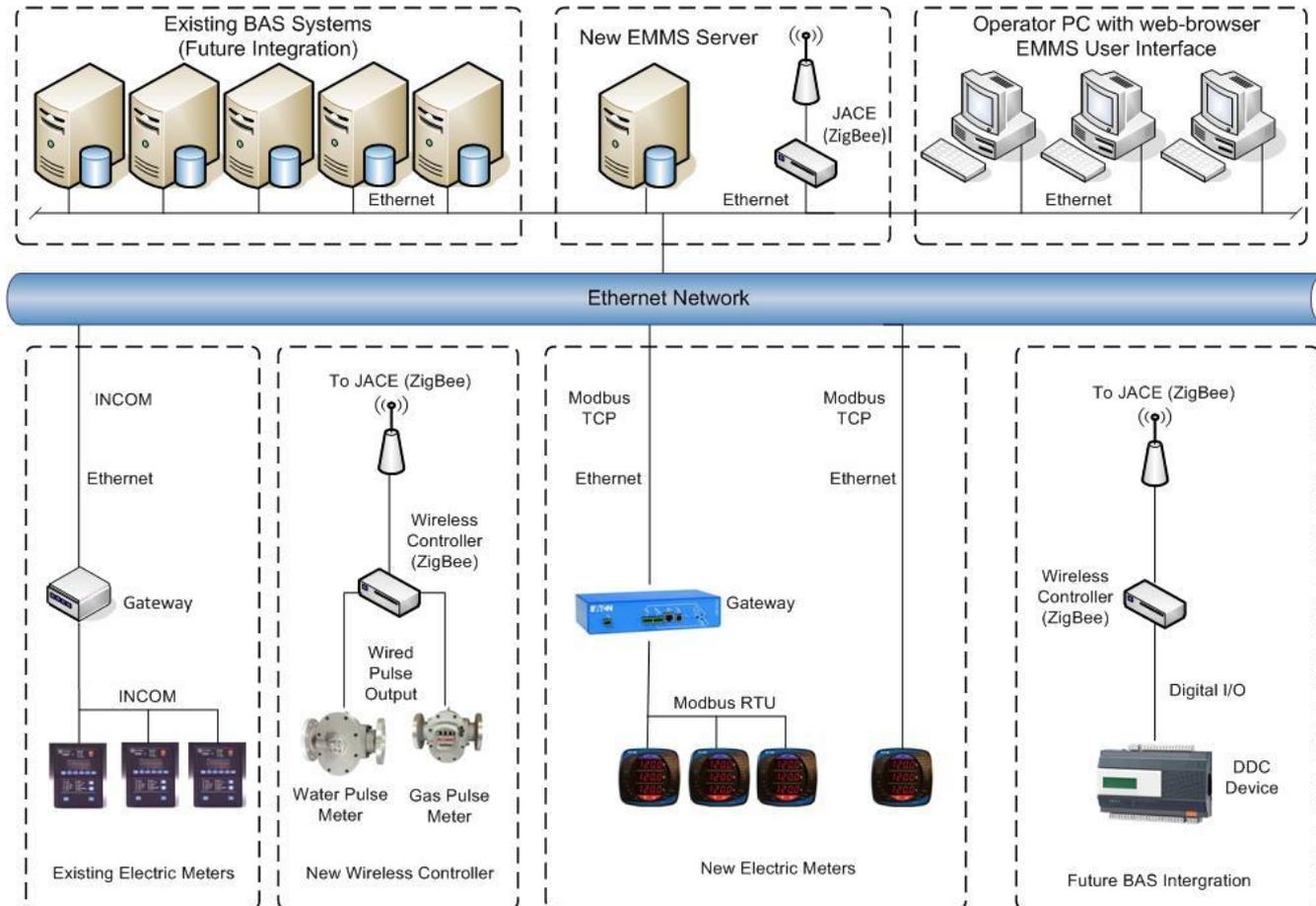


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SAIC
From Science to Solutions

Federal Lab Metering Architecture



BAS = Building Automation System EMMS = Energy Metering and Management System

I/O = Input/Output RTU = Roof Top Unit TCP = Transmission Control Protocol DDC= Direct Digital Control

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Modbus - Wikipedia

- **Modbus[®]** is a serial communications protocol published by Modicon in 1979 for use with its programmable logic controllers (PLCs). **It has become a *de facto* standard communications protocol in industry and is now the most commonly available means of connecting industrial electronic devices.**
- The main reasons for the extensive use of Modbus over other communications protocols are
 - It is openly published and royalty-free
 - Relatively easy industrial network to deploy
 - It moves raw bits or words without placing many restrictions on vendors
- Modbus allows for communication between many devices connected to the same network.
- Modbus is now administered by modbus.org

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Raw Data Collected

- Energy consumption (kilowatt hours, pounds steam, therm, gallon, scf, BTUs, etc.)
- Demand/load (electric)
- Power factor (PF)
- Data collection rates
 - Consumption; 15-minute intervals
 - Load (profile); 1-minute intervals
 - Demand; maximum demand per 15-minute window
 - PF; same as demand interval

scf = standard cubic foot BTUs = British Thermal Units

Accuracy and Data Reliability Issues

- Standards/accuracy ANSI C12.20 (0.5 percent)
- Current transformers (CTs)
- Meters (electric, gas, steam, water, etc.)
- Installation details (up/down stream runs)
- System reliability (meter, data collector, communications, servers) – minimize potential for data “gaps”
- Guideline – avoid using EMCS for metering and/or data collection (due to gaps)

ANSI = American National Standards Institute EMCS = Energy Monitoring and Control System

Use True Server Class Computers

PC under desk is
NOT a server



Proper server
installation



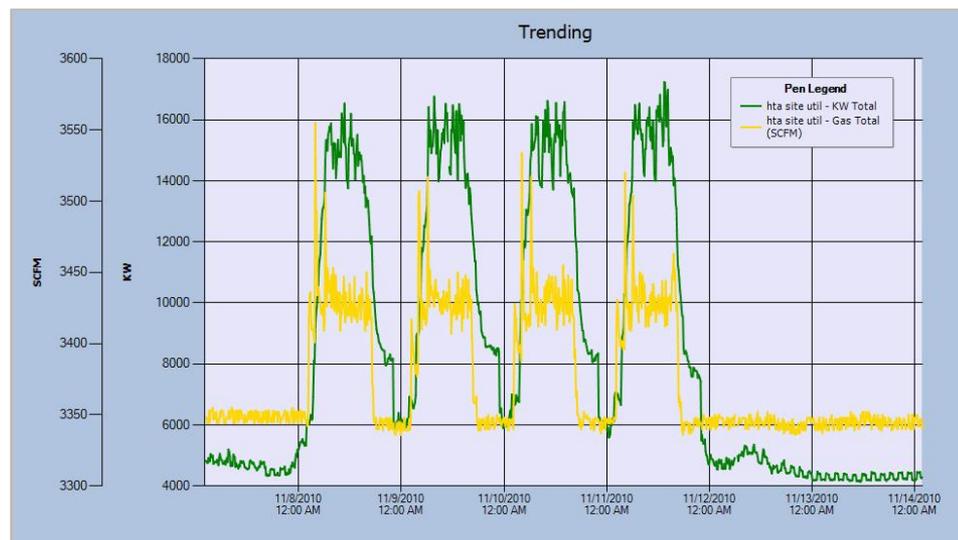
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Getting Value Out of the Data

Web-based Tools – Trend (Profile) Features

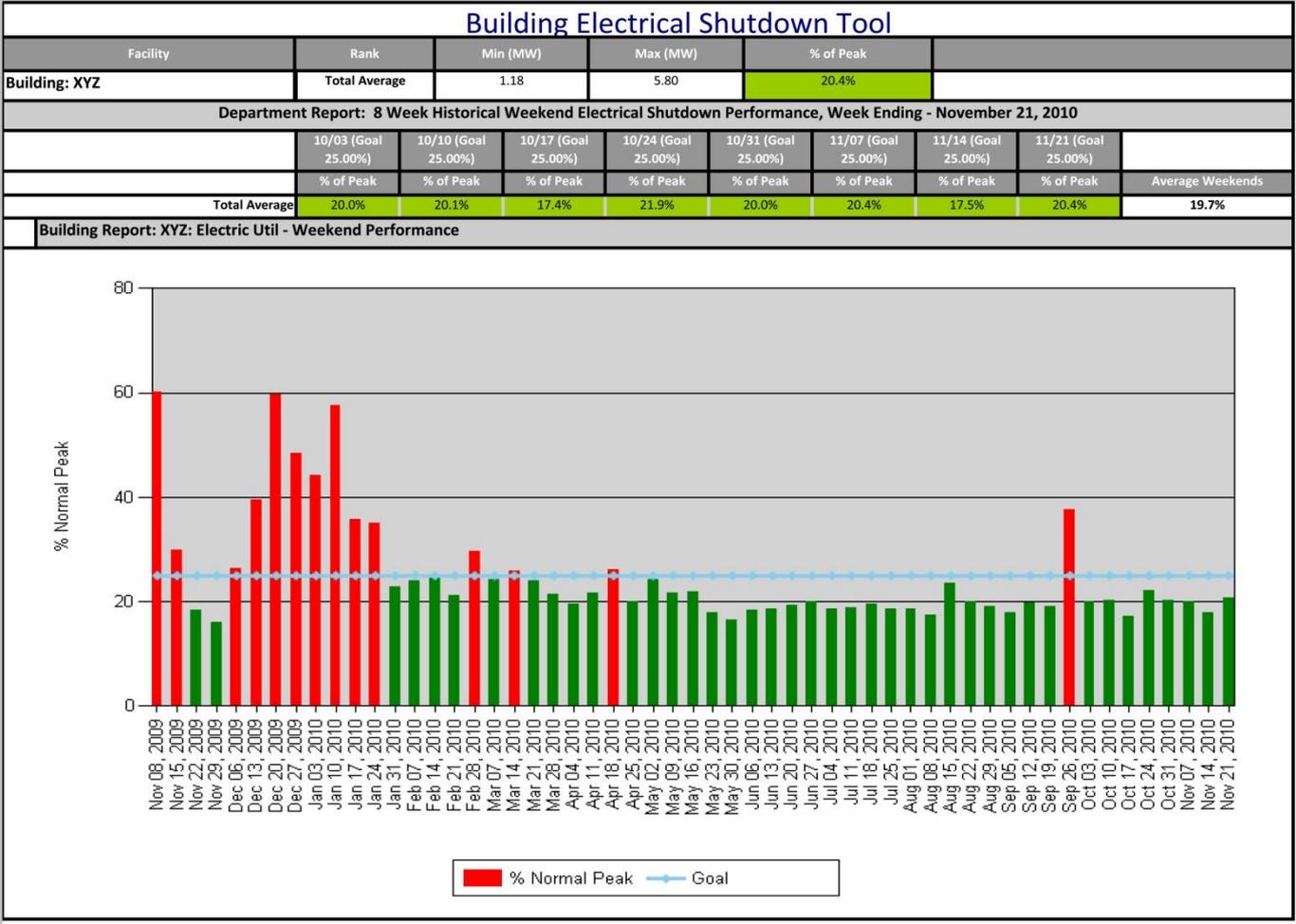
- Uniquely configure each trend chart
- Save trend chart configurations
- Easily add points and change devices
- Overlay different trend charts
- Selectable zoom area
- Capture point-in-time data values
- Quickly remove unwanted points
- Export data to Excel®



timestamp	hta site util - KW Total	hta site util - Gas Total (SCFM)
11/7/2010 5:00	4810	3344
11/7/2010 5:10	4681	3347
11/7/2010 5:20	4920	3345
11/7/2010 5:30	5061	3352
11/7/2010 5:40	4915	3348
11/7/2010 5:50	4851	3353
11/7/2010 6:00	4848	3353
11/7/2010 6:10	4737	3353
11/7/2010 6:20	4735	3350
11/7/2010 6:30	4736	3344
11/7/2010 6:40	4822	3345
11/7/2010 6:50	4701	3344
11/7/2010 7:00	4850	3348
11/7/2010 7:10	4923	3347
11/7/2010 7:20	4778	3348
11/7/2010 7:30	5204	3350
11/7/2010 7:40	5131	3353
11/7/2010 7:50	4994	3347

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Shutdown Tool Graph



Getting Value Out of the Data It's All About the Database/Historian



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When It Comes to Budget, Do Not Confuse “Wants” With “Needs”

- Determine accuracy requirements per meter type
- Do not over-specify meter requirements
- You do not need to burden meters with data collection or input/output requirements (keep-it-simple)
- Use existing infrastructure (IT, meters, current transformers, pulse contact output on utility company meter, etc.)
- Involve IT early (they are a stakeholder)
- Output - many reporting features are never used