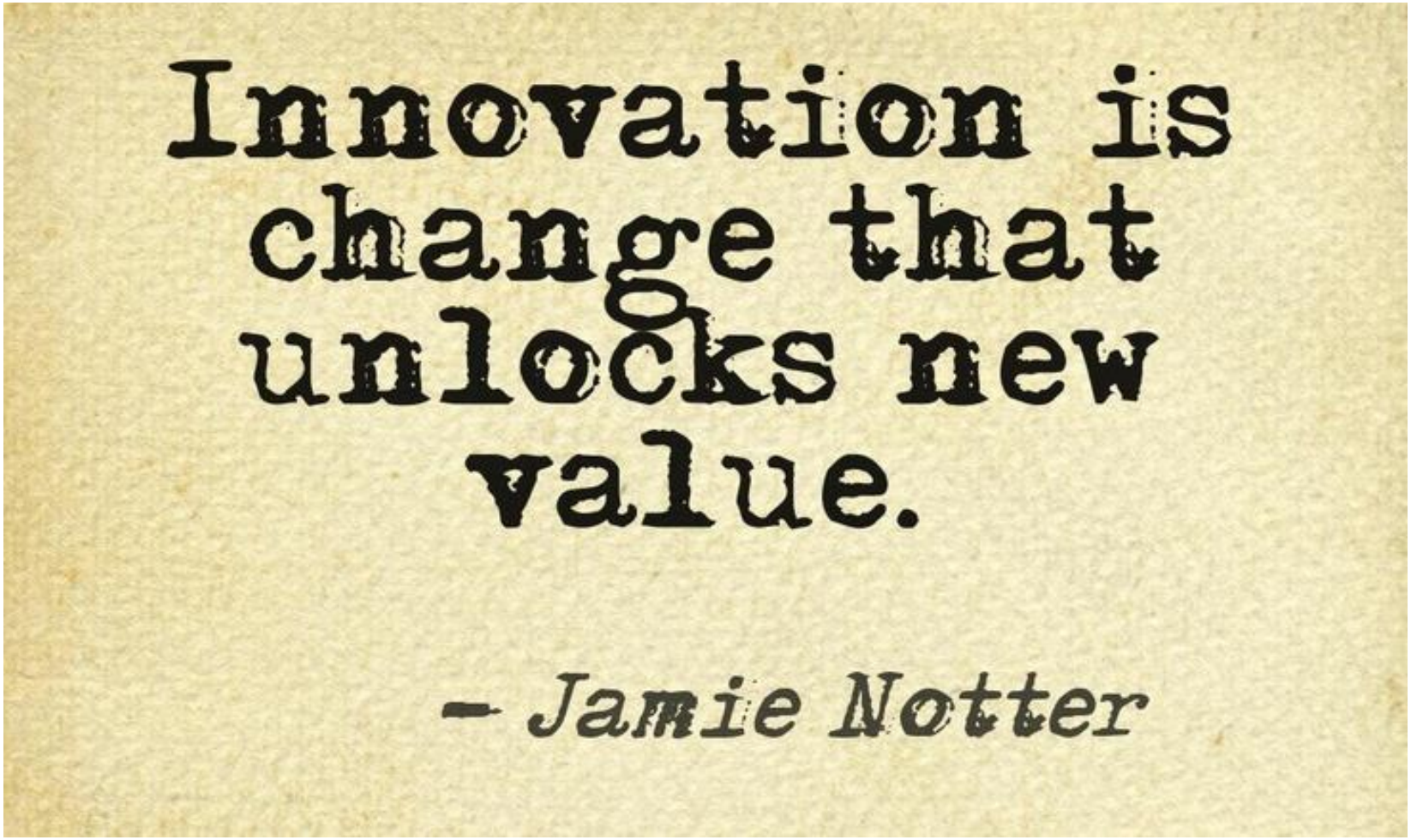
Smart Manufacturing Controls

Prepared for:

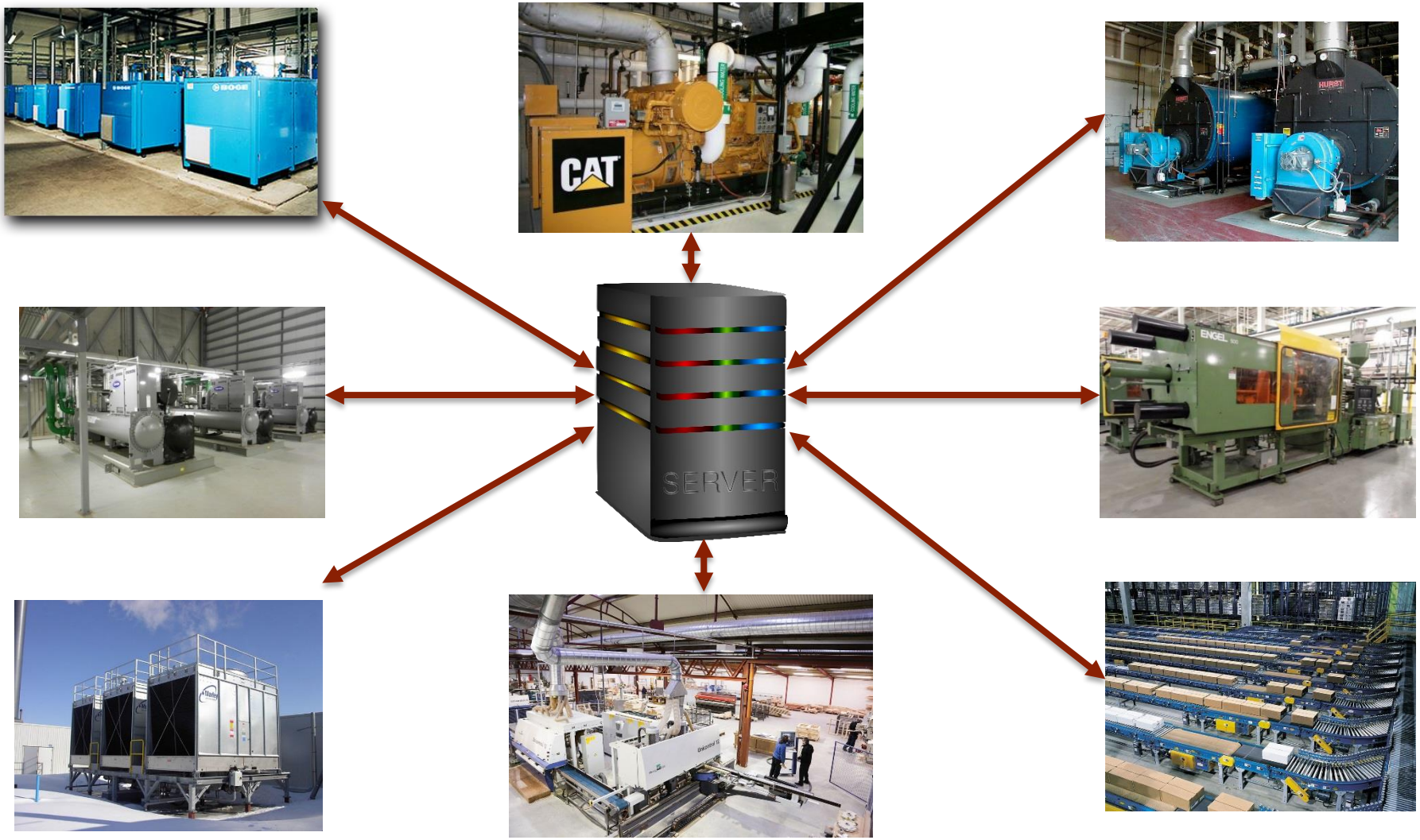
ACEEE Intelligent Efficiency

December 8, 2015

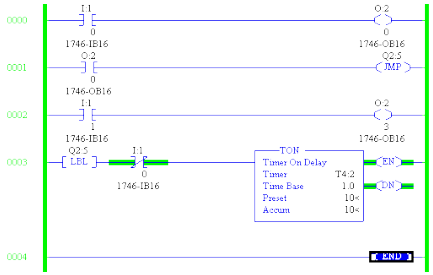

Innovation is change that unlocks new value.
- Jamie Notter

Commercial Building Systems

Manufacturing – Not typical or perfect…



Disparate Control Systems



Time to Integrate & Communicate

Innovation, Continuous Technology Improvement, Simplification

Transformational Technologies Driving Simpler Integration

- **Increase in open architecture platforms/systems - Translators**
  - CAN, Modbus TCP, Serial, HTTP protocol, LON, Industrial BacNet, etc.
  - Equipment shipping with hardware network ready
  - Simpler access to data from existing/new hardware – Network ready
- **Wireless sensors (inexpensive yet accurate)**
  - Temperature, power, vibration, occupancy, etc.
  - WiFi, Zigbee, Bluetooth, NFC, etc.
  - Simple setup via built in webserver with most self configuring
- **Web Enabled Equipment**
  - Most data can be “scraped” from devices allowing simple integration
  - Simple customer and installer interface for setup, daily operations, troubleshooting
- **Internet of Things**
  - The amount of devices is growing daily…..
  - Standardized communication protocols gaining traction
- **Cloud Based Storage**

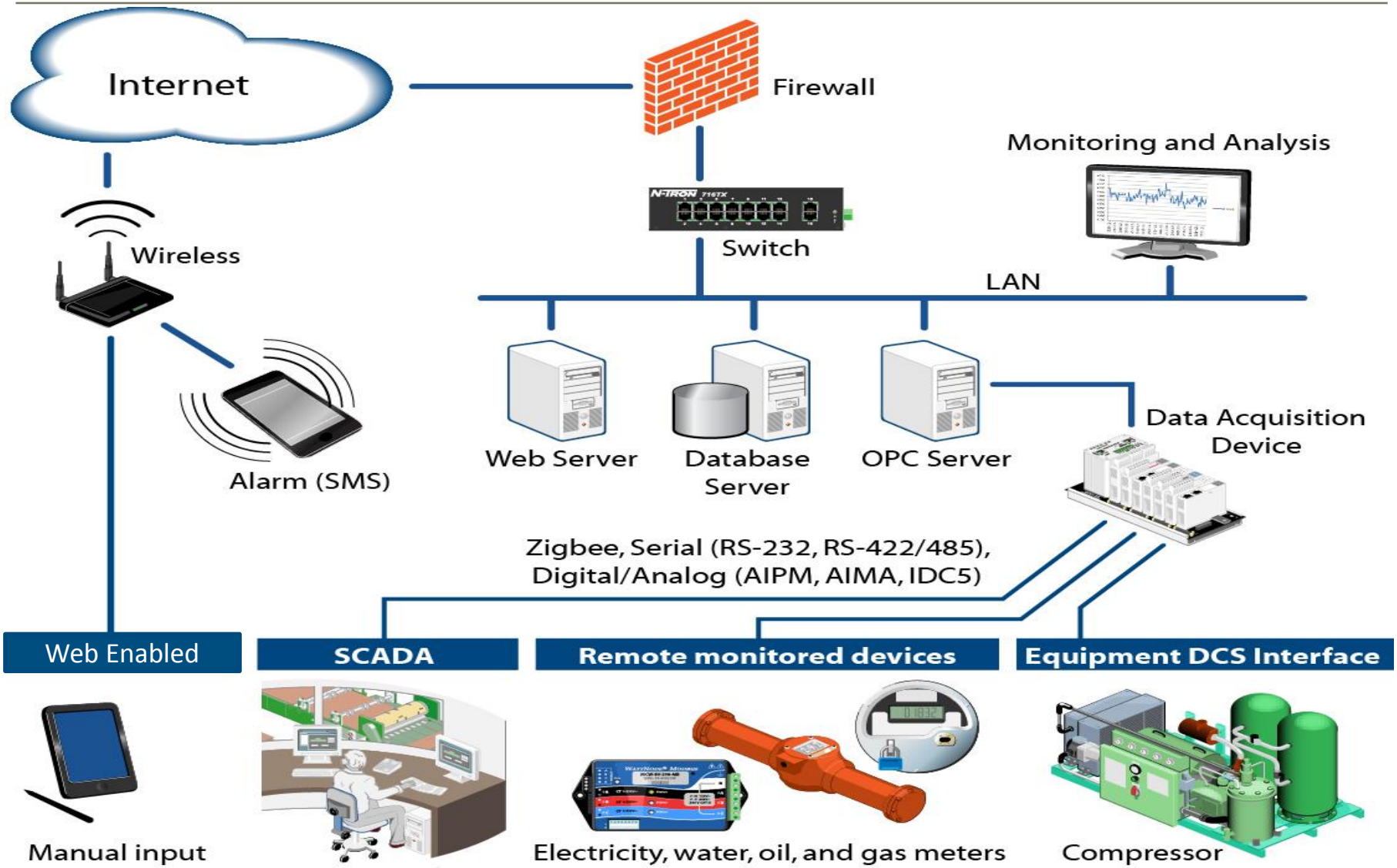
Path to Success

- **Vision and Game Plan**
  - Clearly defined holistic vision with a multi year timeline
  - Define systems to integrate – not everything is necessary
  - Multi phase integration plan – revise control specs to align
  - Clear scope of work – deliverables, time lines, implementation plan, data hierarchy
  - Start with data collection first – control second
- **Data Storage – Plan for a single data repository for all system data**
- **Integration Contractor**
  - Clear understanding of the objective – Good LEGO builder
  - Experienced in the integration of multiple systems w/ varying comm. protocols
  - Offers various integration solutions
- **Commissioning**
  - Point by point checks – Validate the data
  - Data is only as good as the points are commissioned correctly
- **Flexibility**
  - Be ready to adjust time lines as necessary.
  - Resolve issues as they arise so as not to create “wish list” after the install

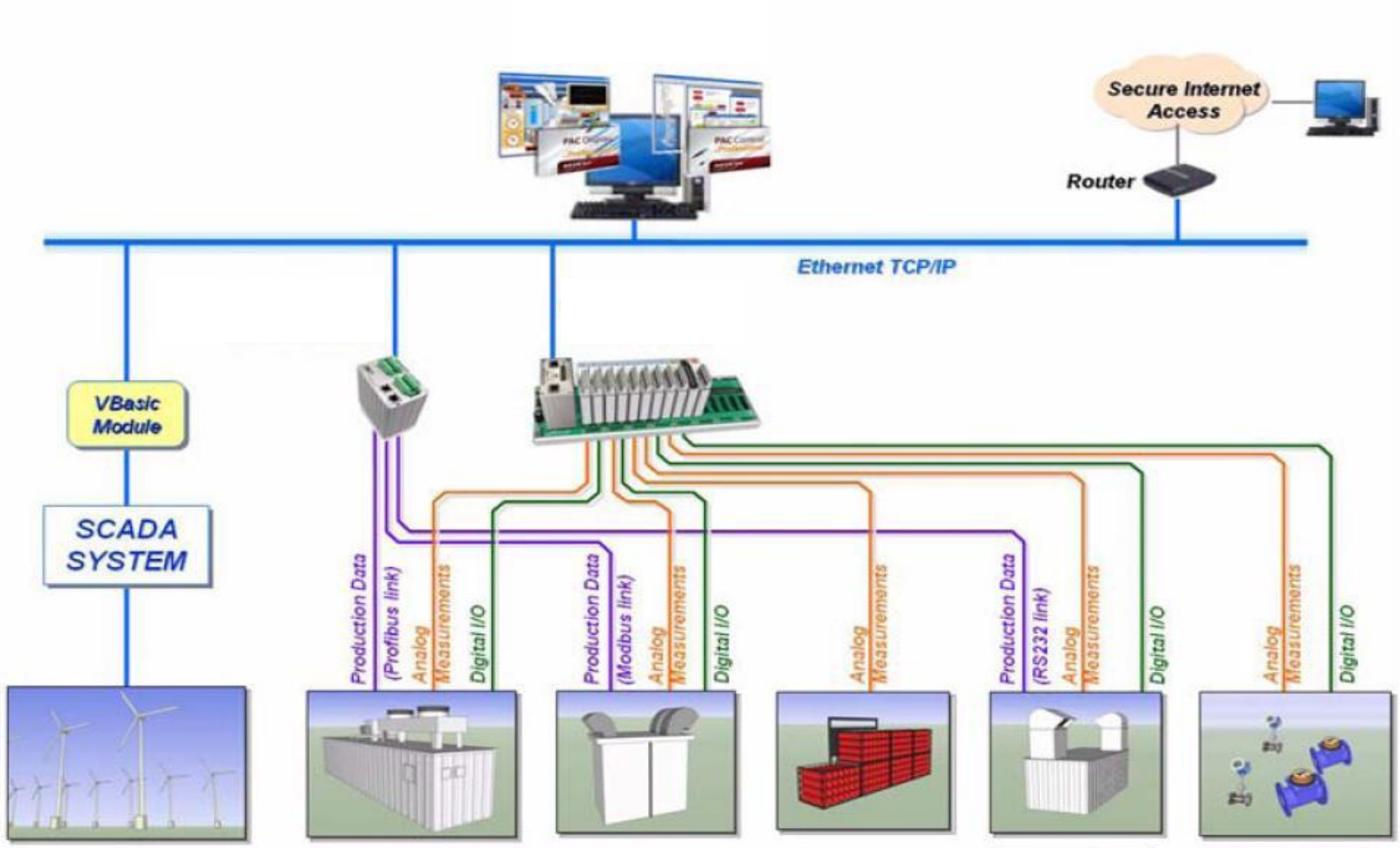
Systems to Address

- **Priority 1 - Utility Meter Data**
  - Electric
  - Gas
  - Water
- **Priority 2 – Primary support systems**
  - Compressed Air
  - Refrigeration
  - Chilled Water
  - Steam/Hot Water
  - Cogen
- **Priority 3 – General systems**
  - Lighting systems
    - Interior and Exterior
  - Building HVAC systems
  - Facility offices – tie into existing BMS if available – if not add points of control
  - Building access systems

High Level Architecture



System Integration Architecture



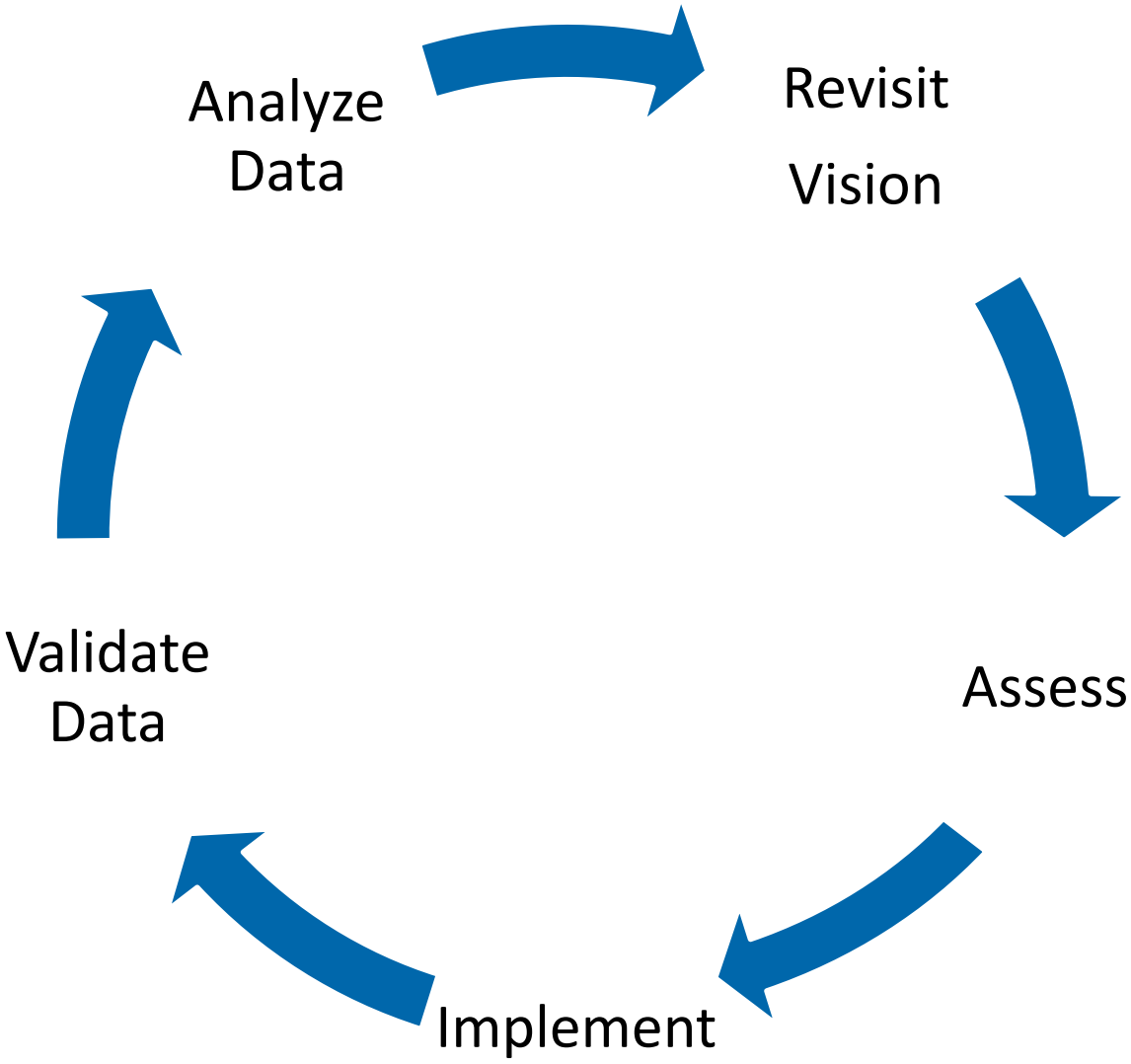
System Integration Benefits

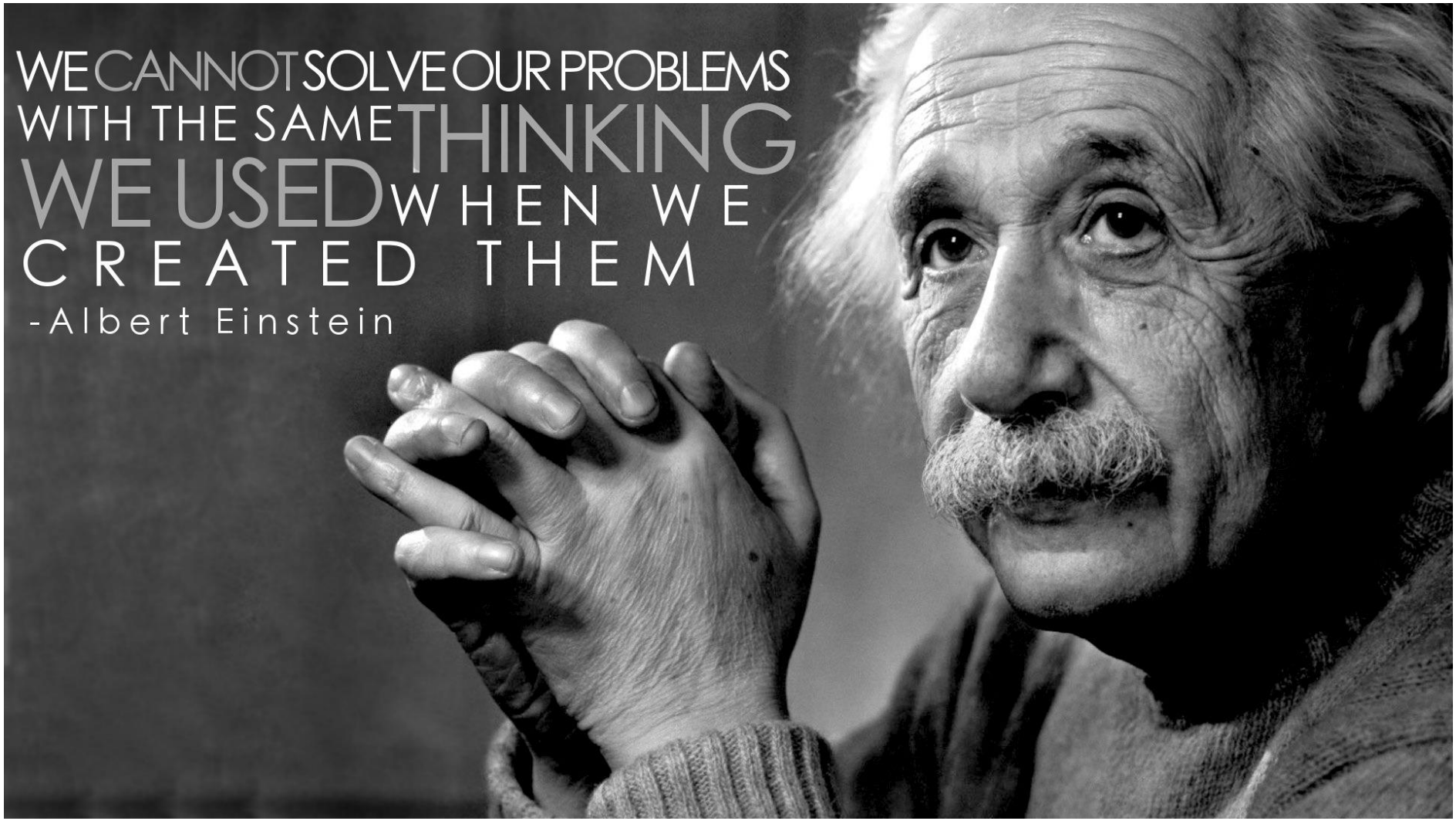
- Greater insight into energy consumption and load management
- Increased energy efficiency, open doors to new revenue streams
- New level of equipment interaction/control to drive greater efficiencies
- System/equipment optimization based directly on current plant demand
- Single dashboard provides a holistic view of operations facility wide
- Single command and control platform – stop accessing multiple interfaces
- Disparate systems are no longer out of sight, out of mind
- Facility maintenance personnel access to systems via remote devices for quicker troubleshooting reducing down time
- Single system for Alarms, alerts, etc. resulting in straightforward monitoring
- Fault Diagnostic Detection (FDD)
- Leverage remote IO - create a cost effective foundation for future control points

Data Warehouse Benefits

- **Real time performance monitoring – internally and externally**
- **Historical operational data in a common format, one home for all data – slice and dice**
- **Advanced dashboards provide holistic operational view**
- **Feed data into preventative maintenance programs allowing more precise scheduling of maintenance**
- **Advanced Analytics**
  - Benchmark facility against itself – year over year performance
  - Collection of data allows the use of tools to spot inefficiencies in operation and/or behavior
  - Supports the development of new energy efficiency retrofit projects
  - Calibrate program models based on monitored savings
- **M&V – Customer and Utilities**
  - Real time performance data to drive savings persistency
  - System performance is archived for future analysis – EM&V studies
  - Utilities can leverage system data for Pay for Performance program designs
- **Demand Response program lead in – automated DR**

Continuous Improvement




WE CANNOT SOLVE OUR PROBLEMS
WITH THE SAME THINKING
WE USED WHEN WE
CREATED THEM
-Albert Einstein

Other Benefits…….

This could be you!

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Questions