



# Advanced/Smart Metering and AMI Interfaces

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**Empowering Business in Real Time**  
**PI Infrastructure for the Enterprise**

# Traditional Meter Readings



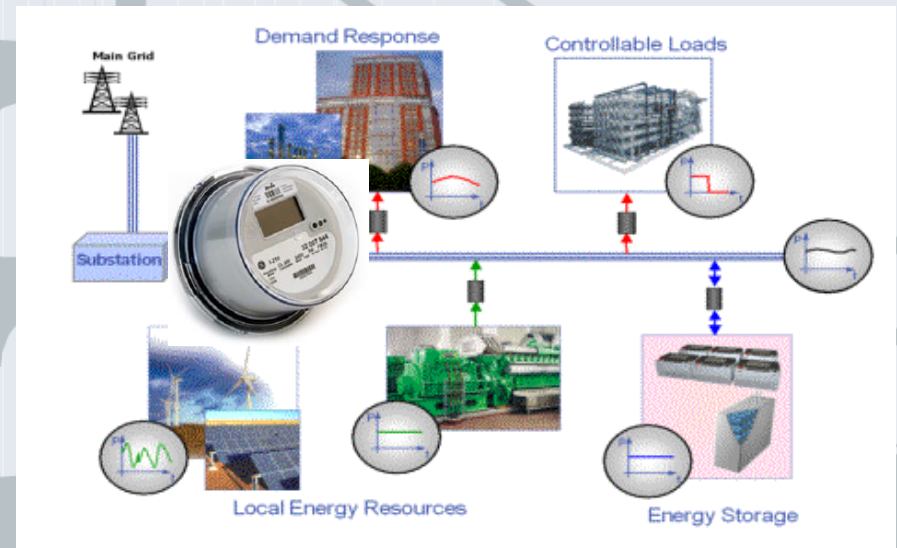
- Manual
  - Monthly
  - Billing
  - Some Planning
- Consumption Only

# Advanced / Smart Meter Infrastructure

- AMR (Automated Reading)
  - Daily
  - Billing
  - Planning
  - Outage Management
- AMI/SMI
  - Bi-Directional
  - Power Quality
  - Events closer to r/t
  - Premise Communication
    - ZigBee
    - Home Plug
    - ?

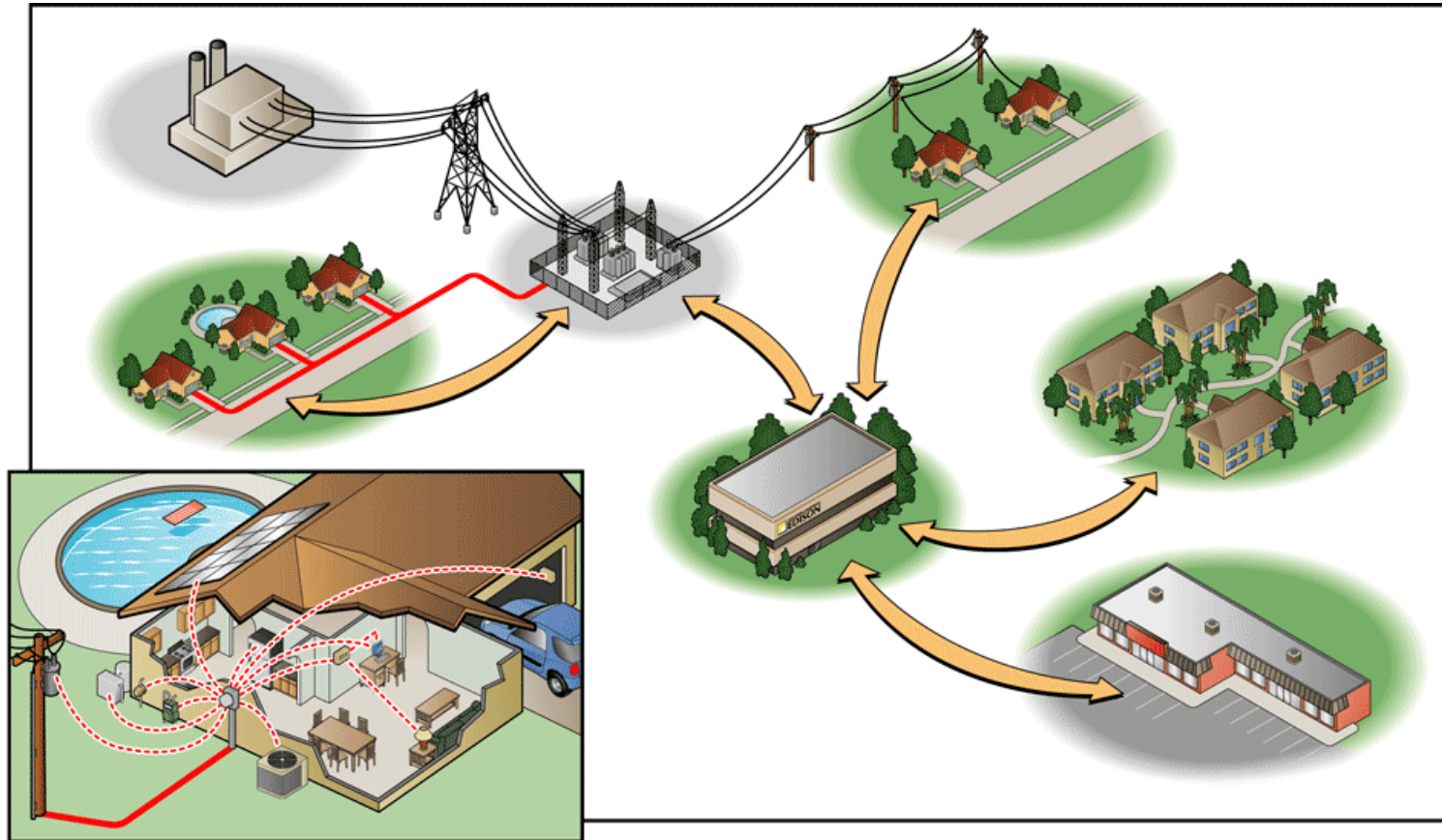


Communication Methods  
Broadband over power line (BPL)  
Power Line Carrier (PLC)  
RF Mesh  
WiMax

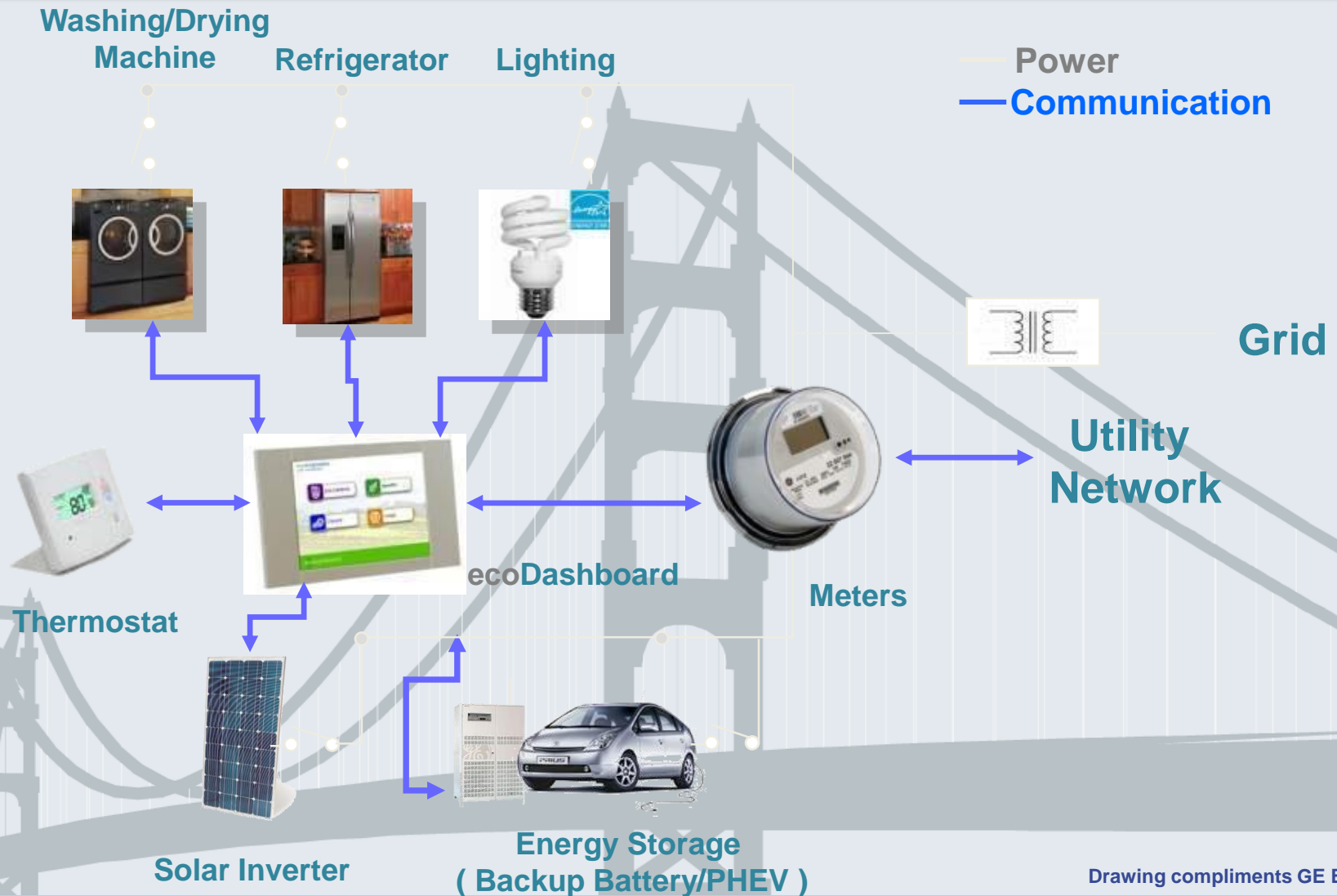


# The Smart Grid

The Smart Grid will link electricity producers, distributors and end-users with high-speed networks that provide **useful, actionable, real-time information** about system capacities, demand, prices, and status. The Smart Grid will be self-healing and hence more reliable. The Smart Grid will empower customers.

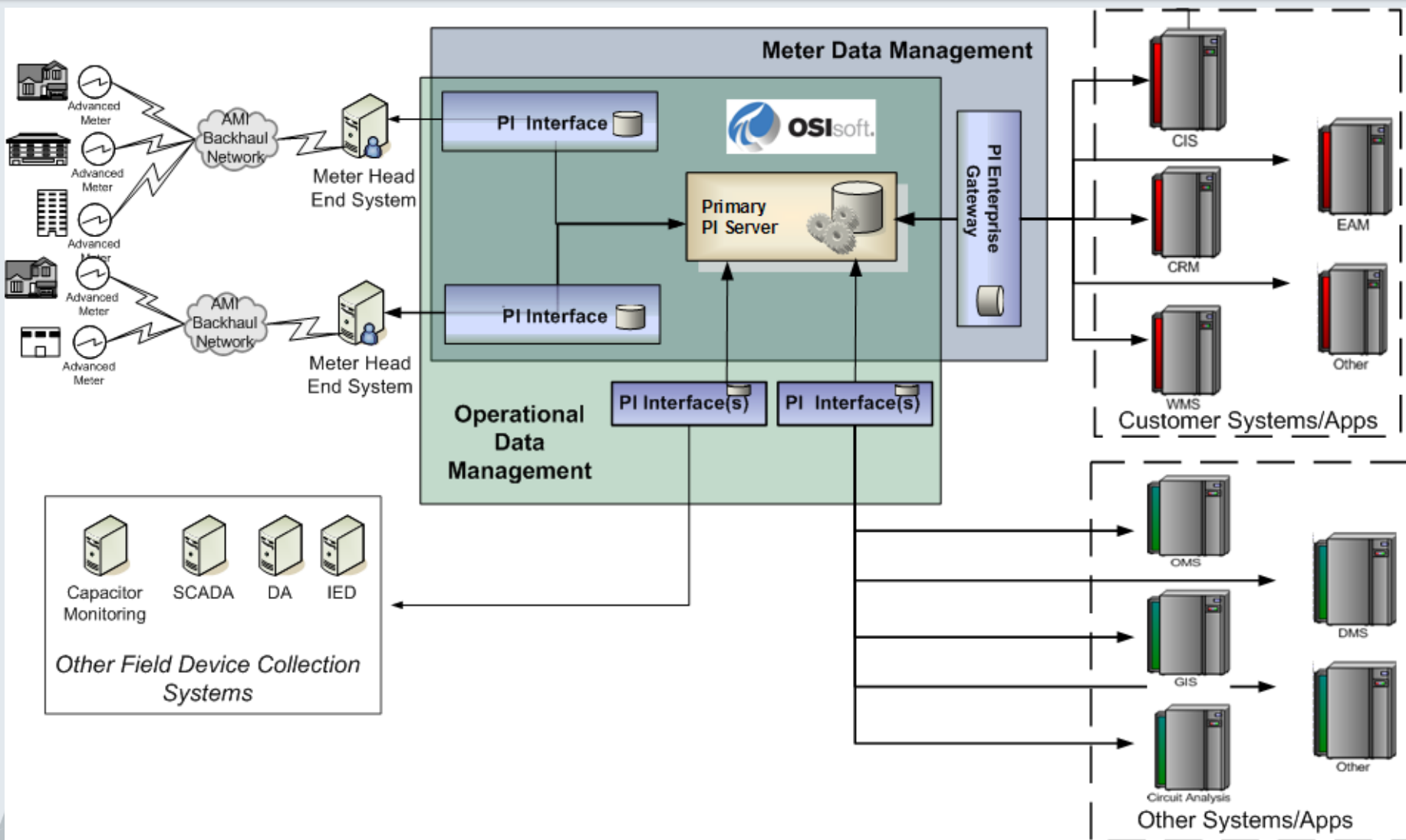


# Home System Architecture – with Future Additions



Drawing compliments GE Energy

# PI System: Foundation for the Smart Grid



# AMI Meter as an Asset

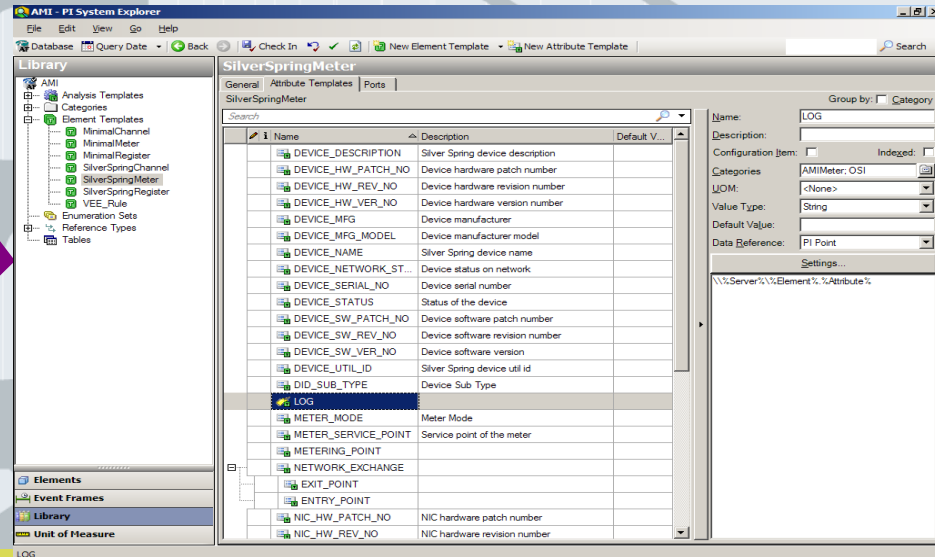
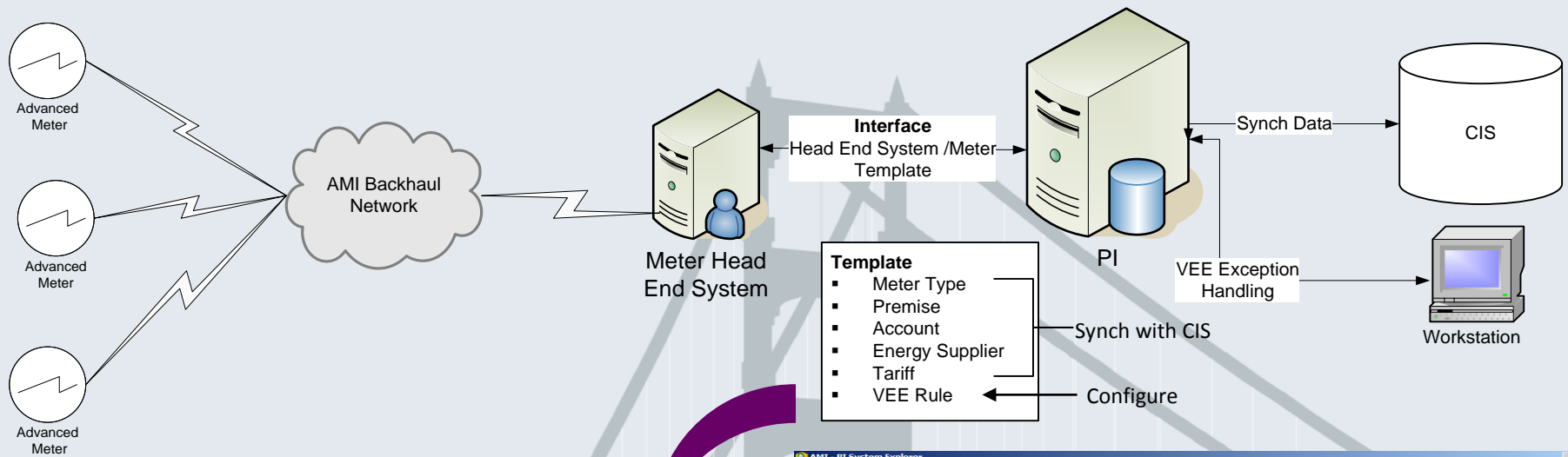
## Static Attributes

- Manufacturer Data
- Configuration (soft)
- POD
- Calculation Parameters

## Time Series Attributes

- Interval Readings
- Critical Events
- Read Events
- Command Status

# Meter AF Templates





# AF: What is it?

Asset

- Static Information
- Slow Changing
- Calculated Values
- Reference:
  - PI Data
  - Relational Data
  - Web Service Data

Relate

- Hierarchical
- Flow Network
- Complex Models
- Multiple Relationships

AF

- An infrastructure for future applications

# OSIsoft Interfaces (Next Generation)

They're like a

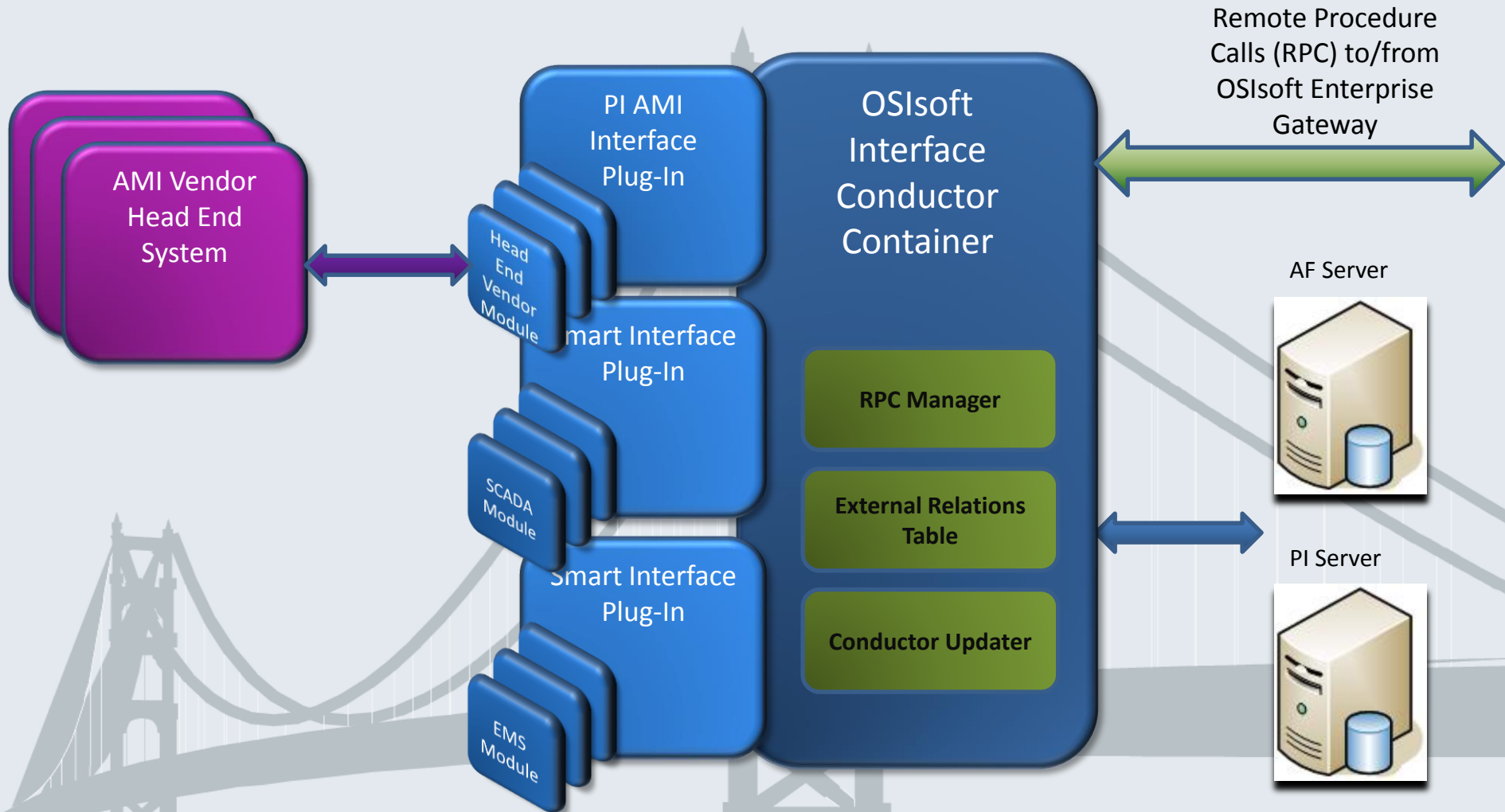


**MIND MELD**

DOESN'T ANYBODY JUST TALK ANYMORE?

[http://echosphere.net/star\\_trek\\_insp/star\\_trek\\_insp.html](http://echosphere.net/star_trek_insp/star_trek_insp.html)

# OSIsoft Interface (Next Generation)



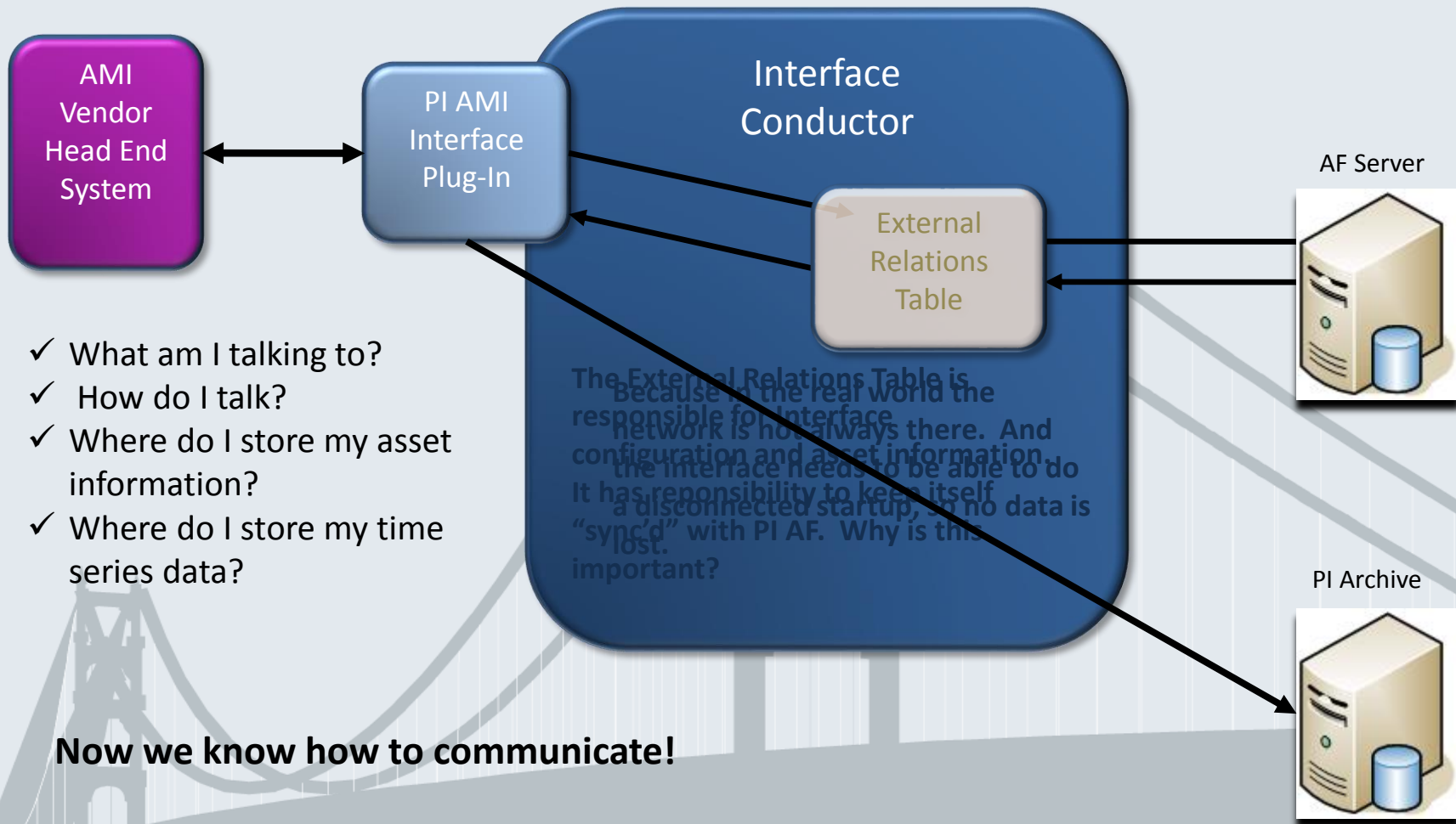
# PI AMI Interface Plug-In

- Bi-directional Communication (WSDL/SOAP)
  - Interval Meter Reading
  - On Demand Reads
  - Remote Connect/Disconnect
  - Demand Management / Load Limiting
  - Meter Events, Alarms and Reports
- Asset hierarchy
  - Meter
    - Channel1
    - Channel\_n
    - Register1
    - Register\_n

# Something New – Interface Conductor

- It's a PI Subsystem
- Responsibilities to Interface Plug-ins:
  - Manages
  - Configures
  - Provides infrastructure
- Facilitates Interface Connector:
  - Load and Unload
  - Initialize and Exit
  - Start and Stop

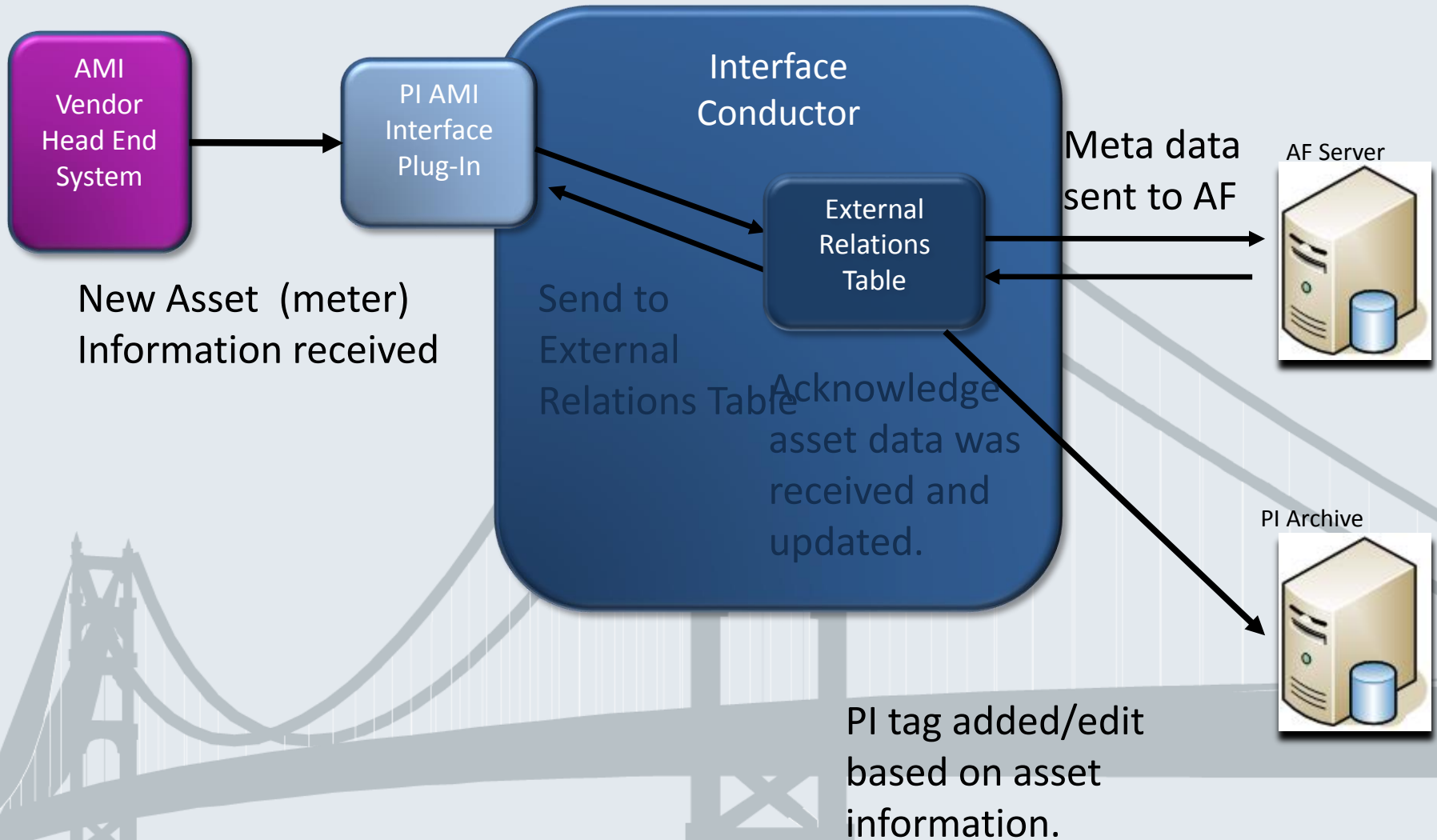
# How it works



- ✓ What am I talking to?
- ✓ How do I talk?
- ✓ Where do I store my asset information?
- ✓ Where do I store my time series data?

**Now we know how to communicate!**

# Asset Management



# AF Templates

The screenshot displays the 'SilverSpringMeter' configuration window within the 'AMI SSN - PI System Explorer' application. The interface is divided into several panes:

- Library (Left):** A tree view showing the project structure under 'AMI SSN', including 'Analysis Templates', 'Categories', 'Element Templates', and 'VendorXMeter'. The 'Measurement' element is selected.
- Measurement (Right):** A configuration table for the 'Measurement' template, with tabs for 'General', 'Attribute Templates', and 'Ports'. The 'General' tab is active, showing a list of attributes with their descriptions and default values.

Name	Description	Default Value
AccumulationBehavior	Attribute #3, CIM Accumulation behaviour	
CIMName	CIM ReadType.name	
DirectionOfFlow	Attribute #4, CIM Direction of flow	
InputReference	Reference to the Input Element Name	
IntervalLength	Interval Length in seconds	0
MeasurementCategory	Attribute #5, CIM Unit of Measure Category	
MeasurementCategoryModifier	Attribute #2, CIM Data Type	
MeterReference	Reference to the Meter Element	
Multiplier	Unit Multiplier	1
Phase	Attribute #7, CIM Phase	
RecordId	Unique record id if CIM is the same	0
TOURate	Attribute #6, CIM TOU Rate	
UOM	Attribute #8, CIM Displayable Unit of Mea...	
Value	Register Value	0



# AMI Meter Elements (inherited from templates)

The screenshot displays the AMI SSN - PI System Explorer interface. The left pane shows a tree view of elements, with SilverSpring\_CMS-2F11D selected. The right pane shows the details for this element, including a table of attributes and values.

**Elements**

- SilverSpring\_CMS-23415
- SilverSpring\_CMS-2F056
- SilverSpring\_CMS-2F0E4
- SilverSpring\_CMS-2F0E5
- SilverSpring\_CMS-2F0E6
- SilverSpring\_CMS-2F0E7
- SilverSpring\_CMS-2F11D
- Input001
  - Cumulative\_Forward\_Dema
  - Cumulative\_Total\_Demand
  - IntervalData\_Forward\_Ene
  - Max\_Indicating\_Demand\_
  - Max\_Indicating\_Demand\_
  - Totalizing\_Forward\_Energy
  - Totalizing\_Total\_Energy\_T
- SilverSpring\_CMS-2F11E
- SilverSpring\_CMS-2F192
- SilverSpring\_CMS-2F193
- SilverSpring\_CMS-2F194
- SilverSpring\_CMS-2F195
- SilverSpring\_CMS-2F1D3
- SilverSpring\_CMS-47E1D
- SilverSpring\_CMS-47E1E
- SilverSpring\_CON-1407-EO
- SilverSpring\_CON-1B5A-EO
- SilverSpring\_CON-2218-EO
- SilverSpring\_CON-226D-EO
- SilverSpring\_CON-2276-EO
- SilverSpring\_CON-2293-EO
- SilverSpring\_CON-22F9-EO
- SilverSpring\_CON-234C-EO
- SilverSpring\_CON-2494-EO
- SilverSpring\_CON-249F-EO
- SilverSpring\_CON-2858-EO
- SilverSpring\_CON-297F-EO
- SilverSpring\_CON-2895-EO

**SilverSpring\_CMS-2F11D**

General | Child Elements | Attributes | Ports | Version |

SilverSpring\_CMS-2F11D

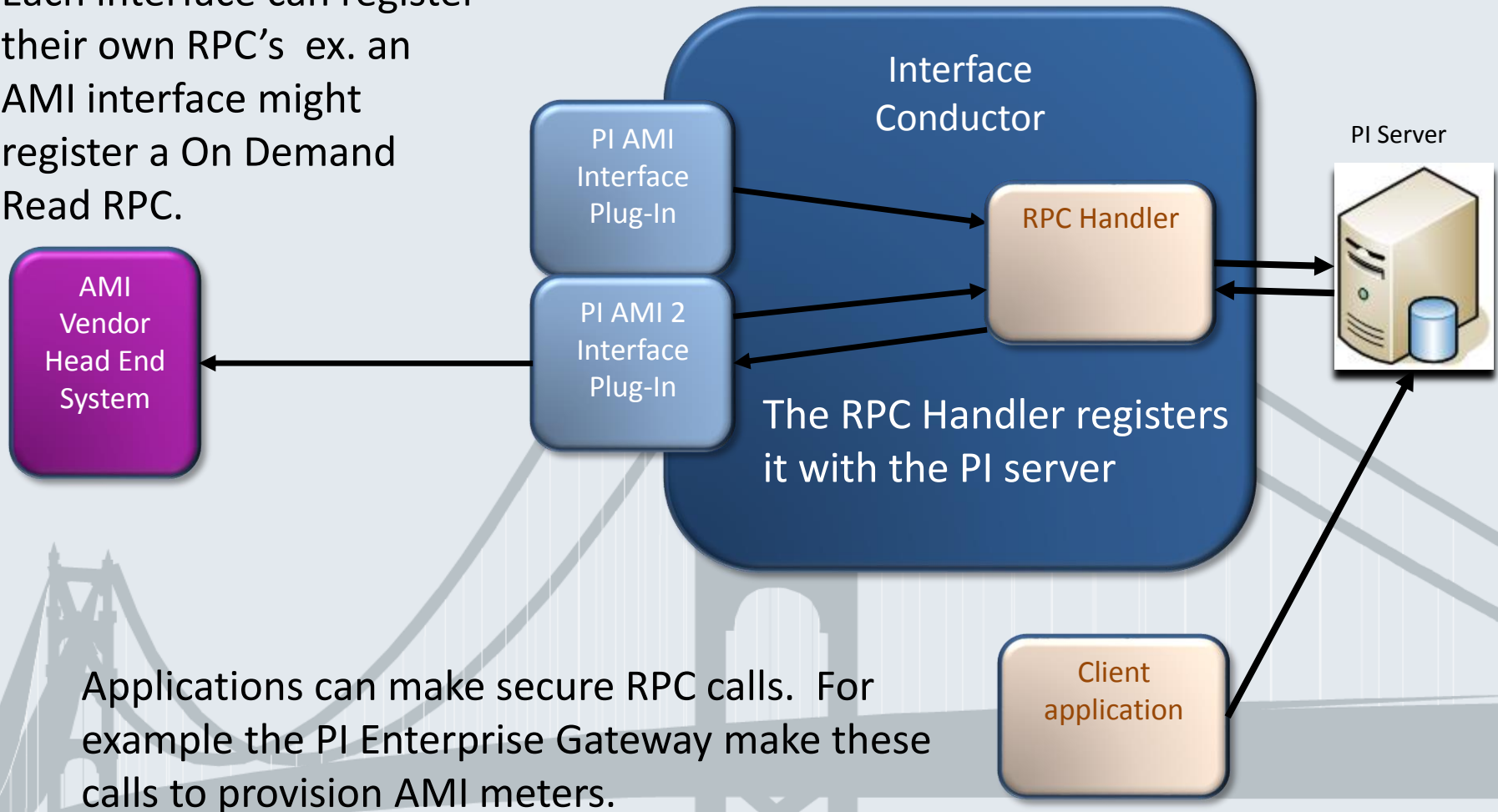
Group by:  Category

Search

Name	Value
DEVICE	
DEVICE_HW_REV_NO	
DEVICE_HW_VER_NO	
DEVICE_STATUS	
DEVICE_NETWORK_STATUS	
DEVICE_MFG_MODEL	
DEVICE_SW_REV_NO	
DEVICE_SW_PATCH_NO	
DEVICE_HW_PATCH_NO	
DEVICE_SW_VER_NO	
DEVICE_MFG	
DEVICE_UTIL_ID	
DeviceDescription	CMS-I210CRD-2F11D
DeviceName	CMS-2F11D
DeviceSerialNumber	38018014
Device Type	METER
DID_SUB_TYPE	I-210+C-RD
HeadEndID	SilverSpring
Log	RPC, DEMAND_READ, SUCCEEDED
METER_MODE	
NIC	
Ping	1104
PROGRAM_CONTROL_CODE	Res-64
PROGRAM_ID	1
State	Active
Status	C1219_READ_ACCESS
StatusCritical	NIC POWER RESTORE LOG ENTRY
UniqueID	CMS-2F11D

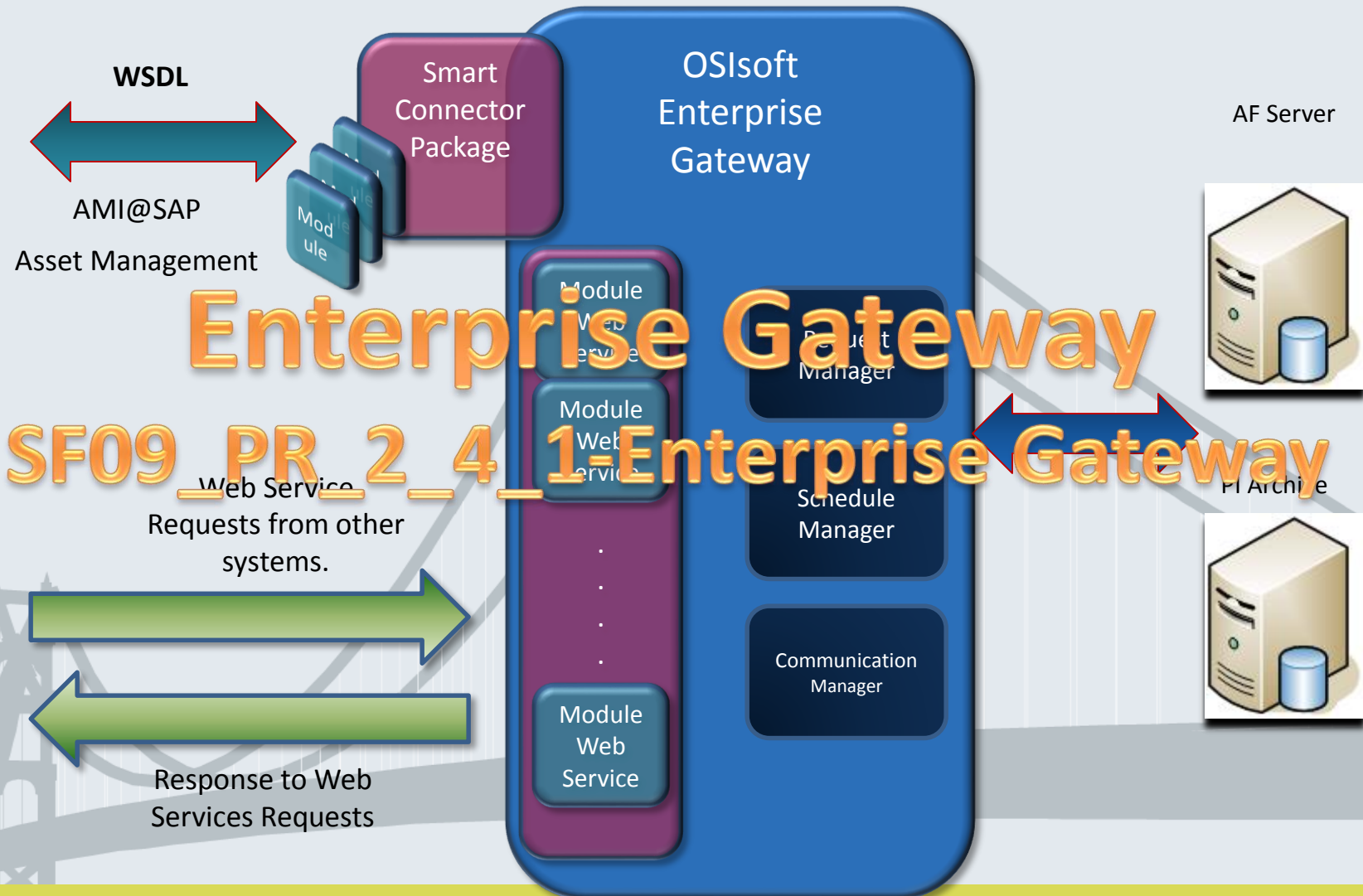
# Secure RPC Management

Each interface can register their own RPC's ex. an AMI interface might register a On Demand Read RPC.

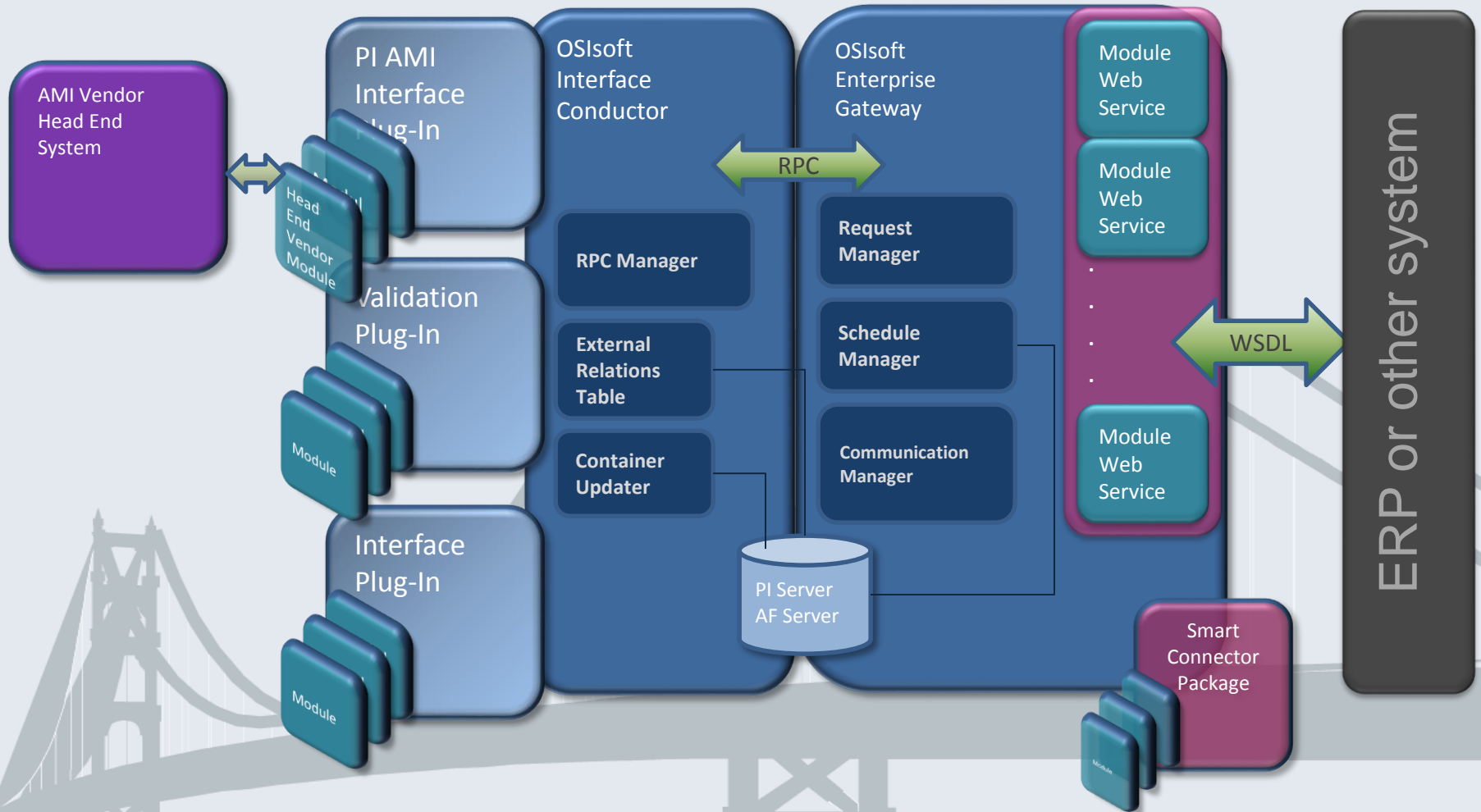


Applications can make secure RPC calls. For example the PI Enterprise Gateway make these calls to provision AMI meters.

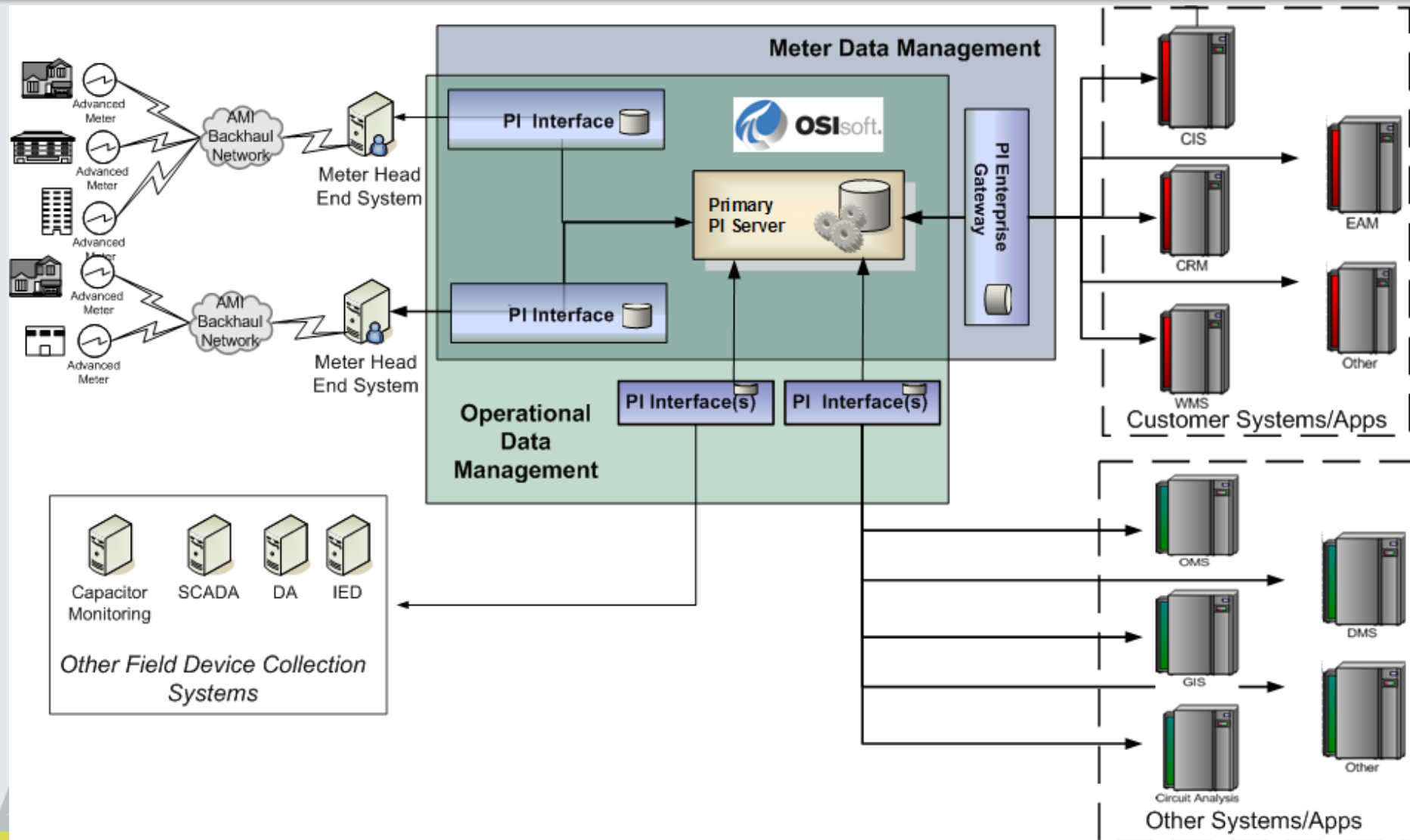
# Enterprise Gateway — Service Enabling PI



# Smart Connector Server



# Foundation for the Smart Grid



# What does it all mean

“Getting a handle on the smart grid is tricky. Grid intelligence (collecting and analyzing data about grid activities and behaviors) and the ability to act in real-time are the defining capabilities.”

*Source: Electric Perspectives October/September 2007 “Getting Smart”.  
Rob Robinson and Jim Henderson are vice presidents at Booz Allen Hamilton in Detroit, MI, and McLean, VA, respectively.*

# PI in Distribution: The Last Mile

**Generation**



**Business Applications**



**Distribution Automation**



**Marketing Operations**



**Commercial and Industrial**



**Grid Operations**



**Substation Automation**



**Residential**





# Our Original Abstract

A couple of OSIsoft rank amateurs babble on about interfaces, next generation and those glass covered spinning things on the side of your house