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Empowering Business in **Real Time.**

PI Infrastructure for the Enterprise.

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Advanced/Smart Metering and AMI Interfaces (Next Generation)

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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
    - ?

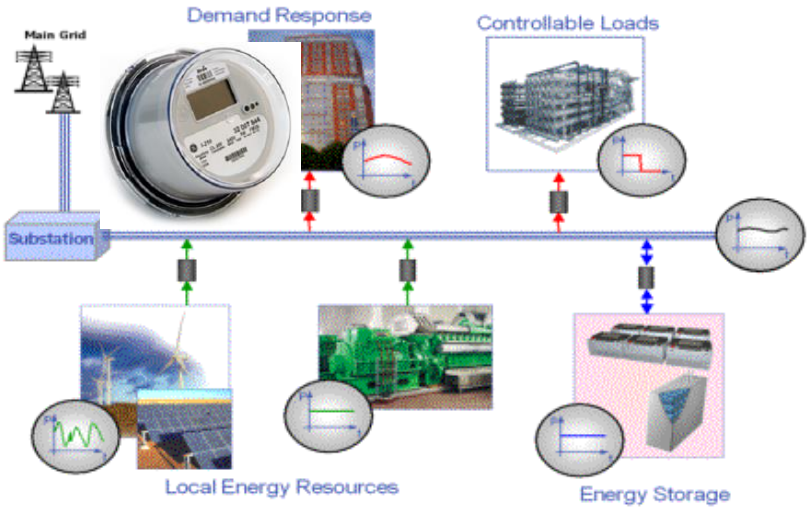
Communication Methods

Broadband over power line (BPL)

Power Line Carrier (PLC)

RF Mesh

WiMax



AMI Use Cases developed by SCE

Use Cases

Billing & Customer Service	Customer Interface	Delivery	Energy Procurement	Field Services & System Recovery	Installation & Maintenance
B1 Multiple clients read demand and energy data	C			S1 AMI system recovers after power outage, communications or equipment failure	I1 Utility installs, provisions and configures AMI system
B2 Utility remotely limits or connects / disconnects customer	C				I2 Utility manages end-to-end life-cycle of the meter system
B3 Utility detects tampering or theft at customer site	C				I3 Utility upgrades AMI system to address future requirements
B4 Contract meter reading for other utilities	C4 External clients use the AMI system to interact with customer devices	D4 Distribution operator locates outage using AMI data and restores service			

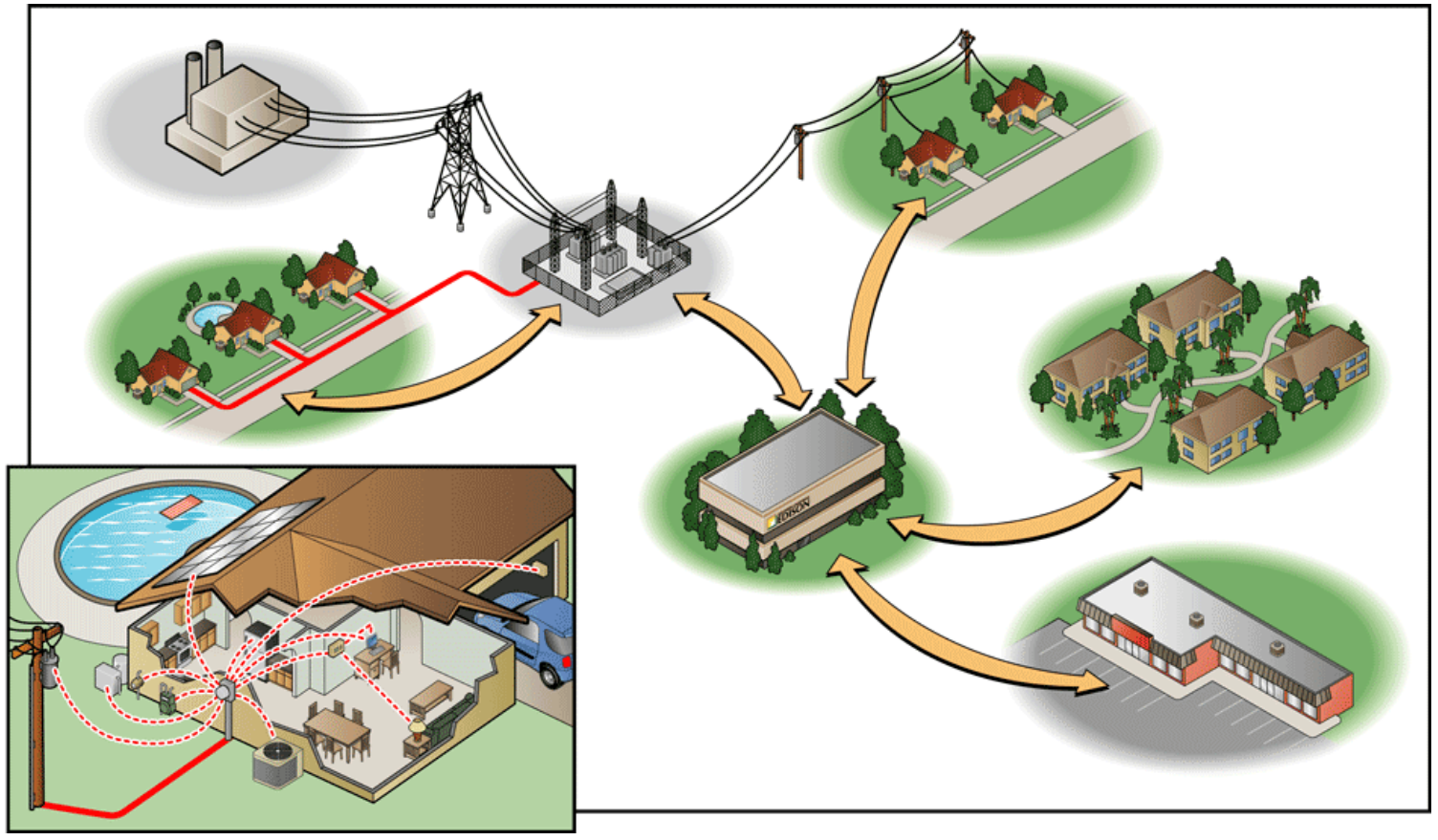
D2
Distribution operators optimize network based on data collected by the AMI system

By Southern California Edison

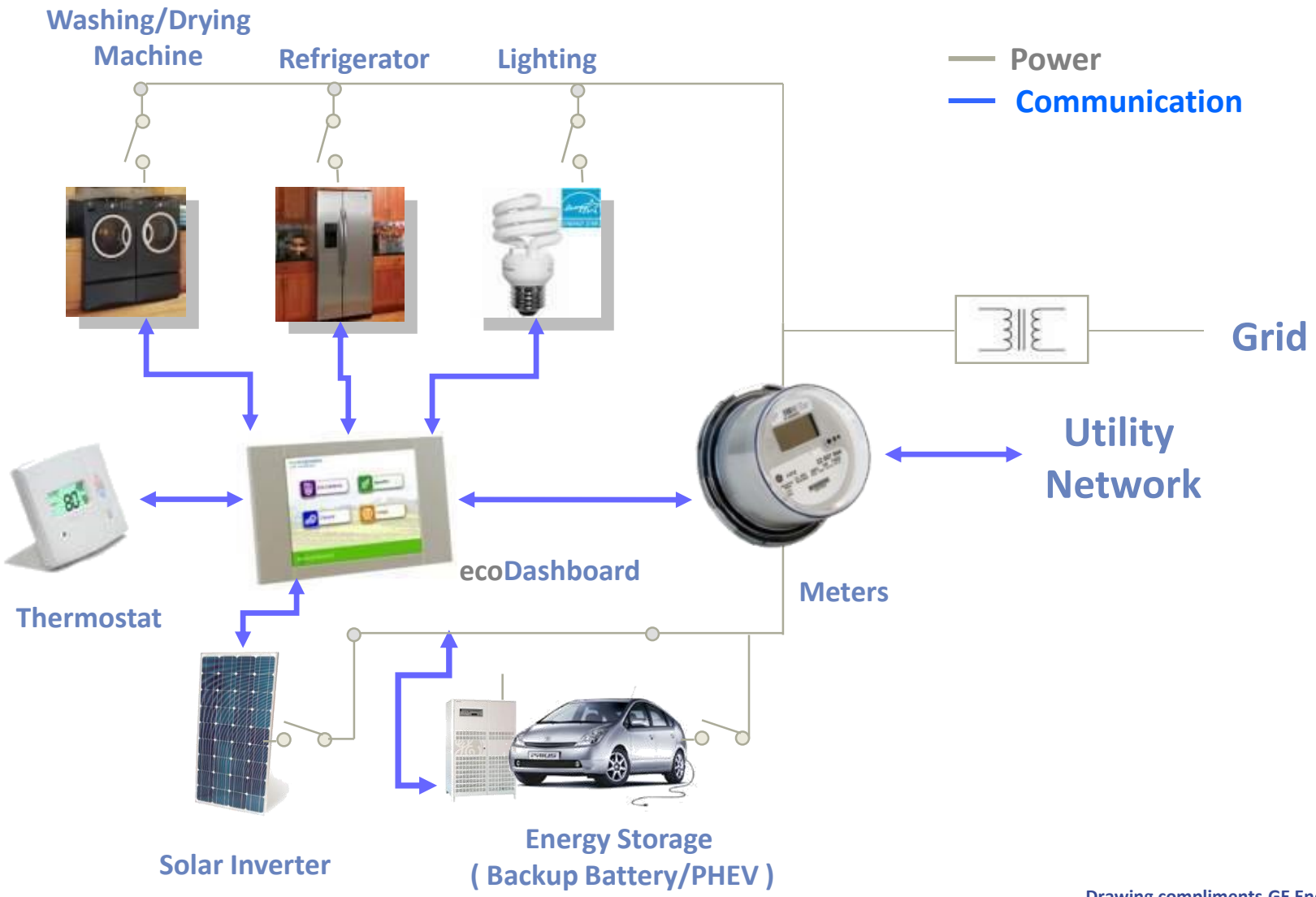
The Smart Grid

SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL Company

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.

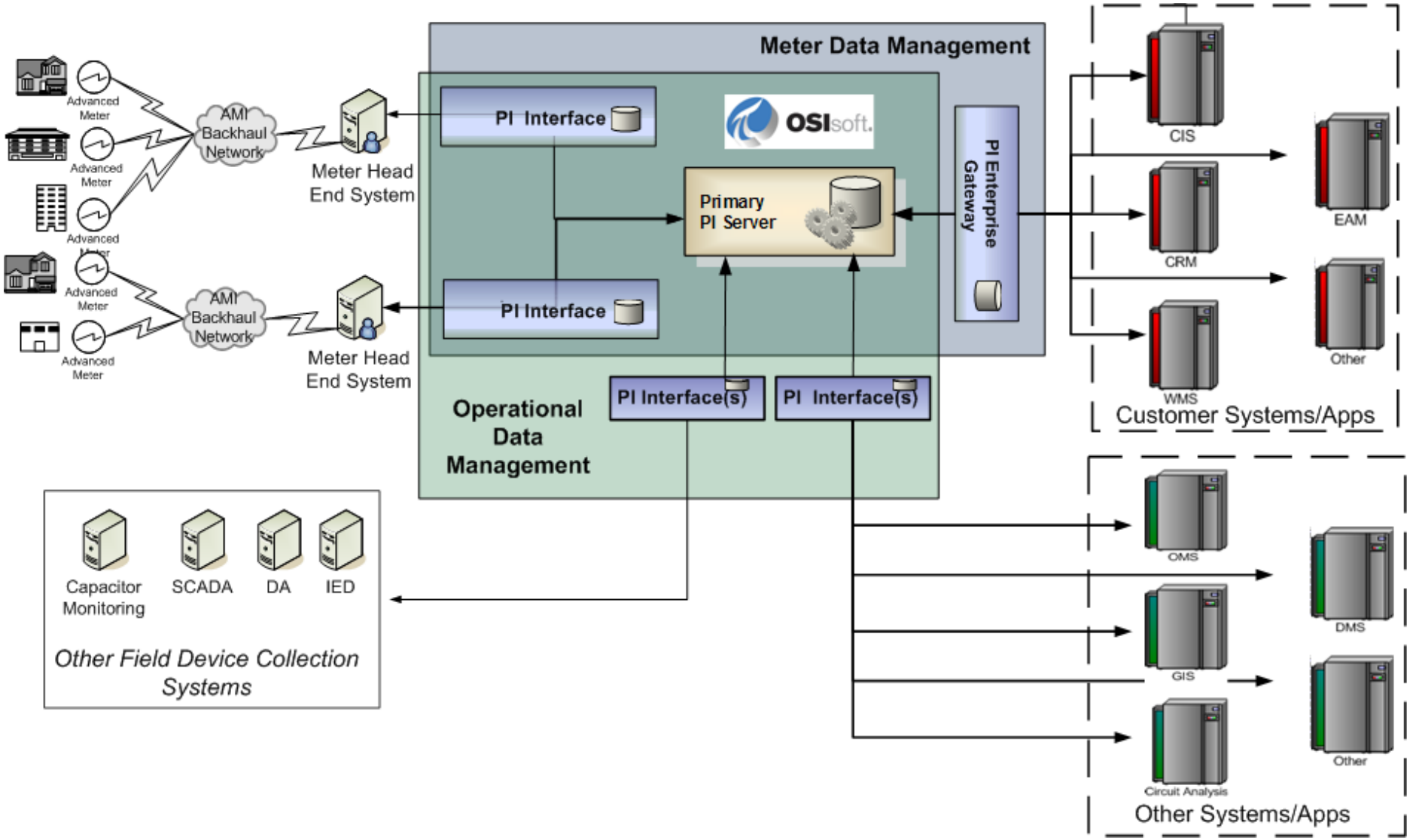


Home System Architecture – with Future Additions



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

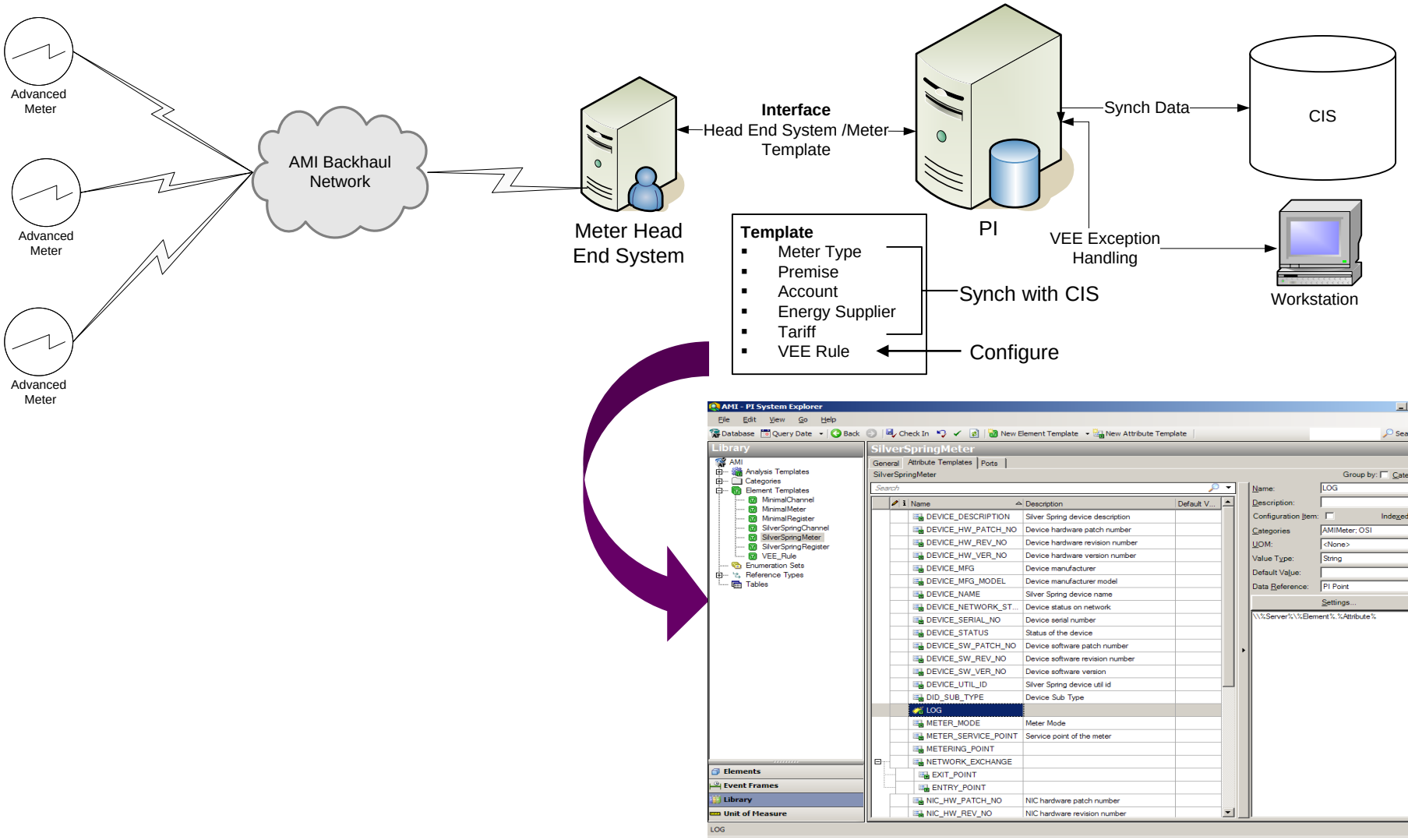
AF: What is it?

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

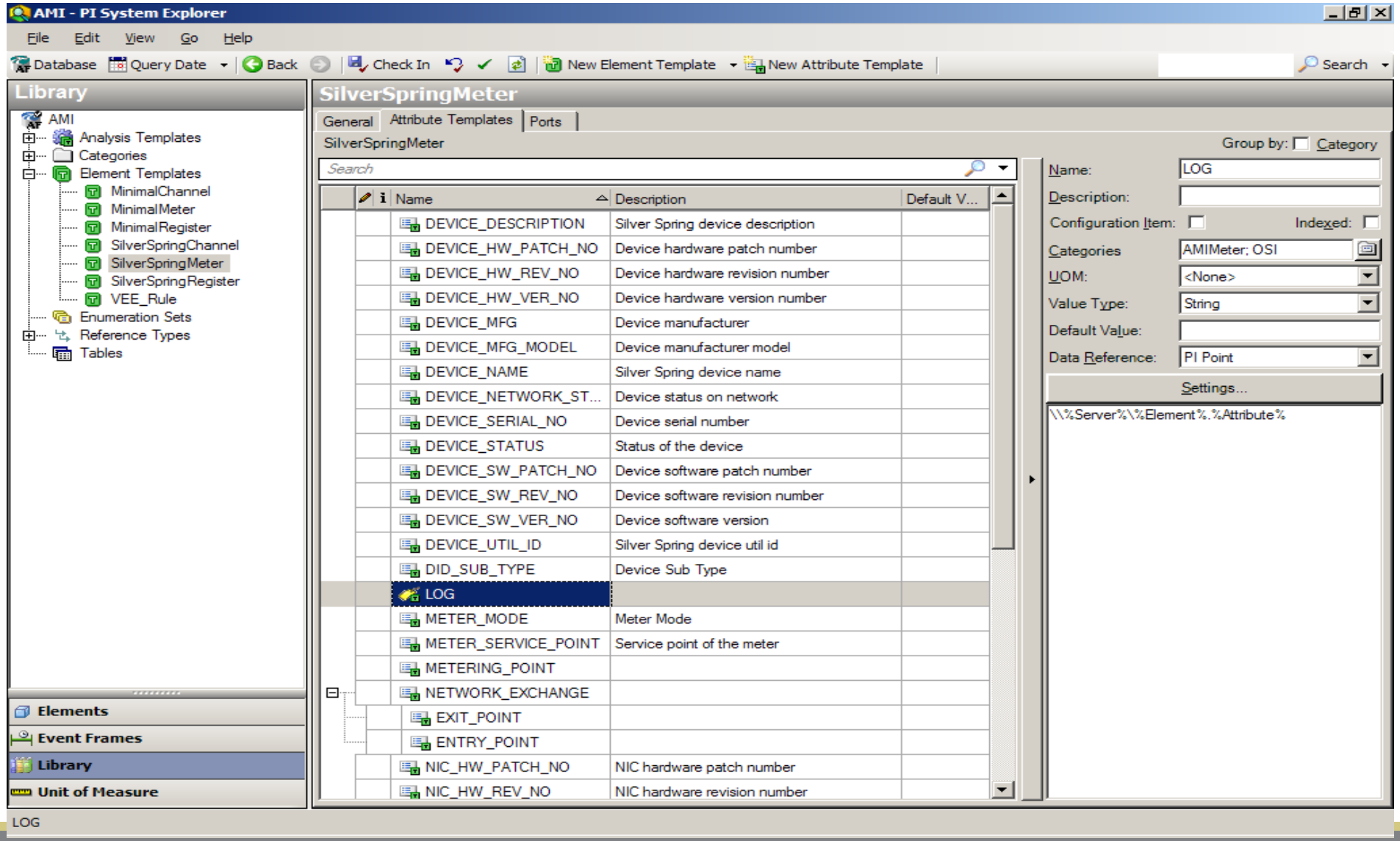
- Hierarchical
- Flow Network
- Complex Models
- Multiple Relationships

- An infrastructure for future applications

Meter AF Templates

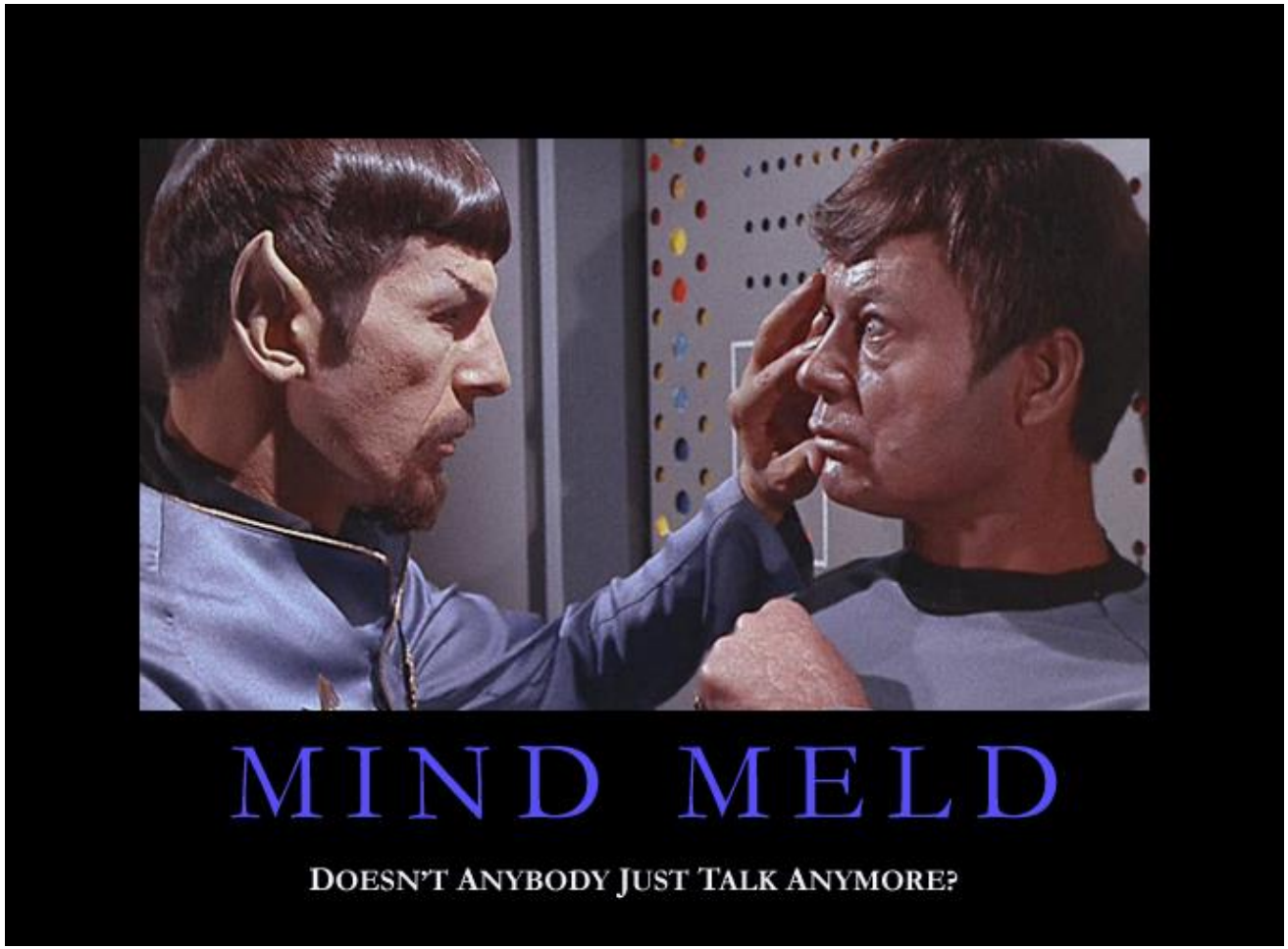


Eye chart magnified



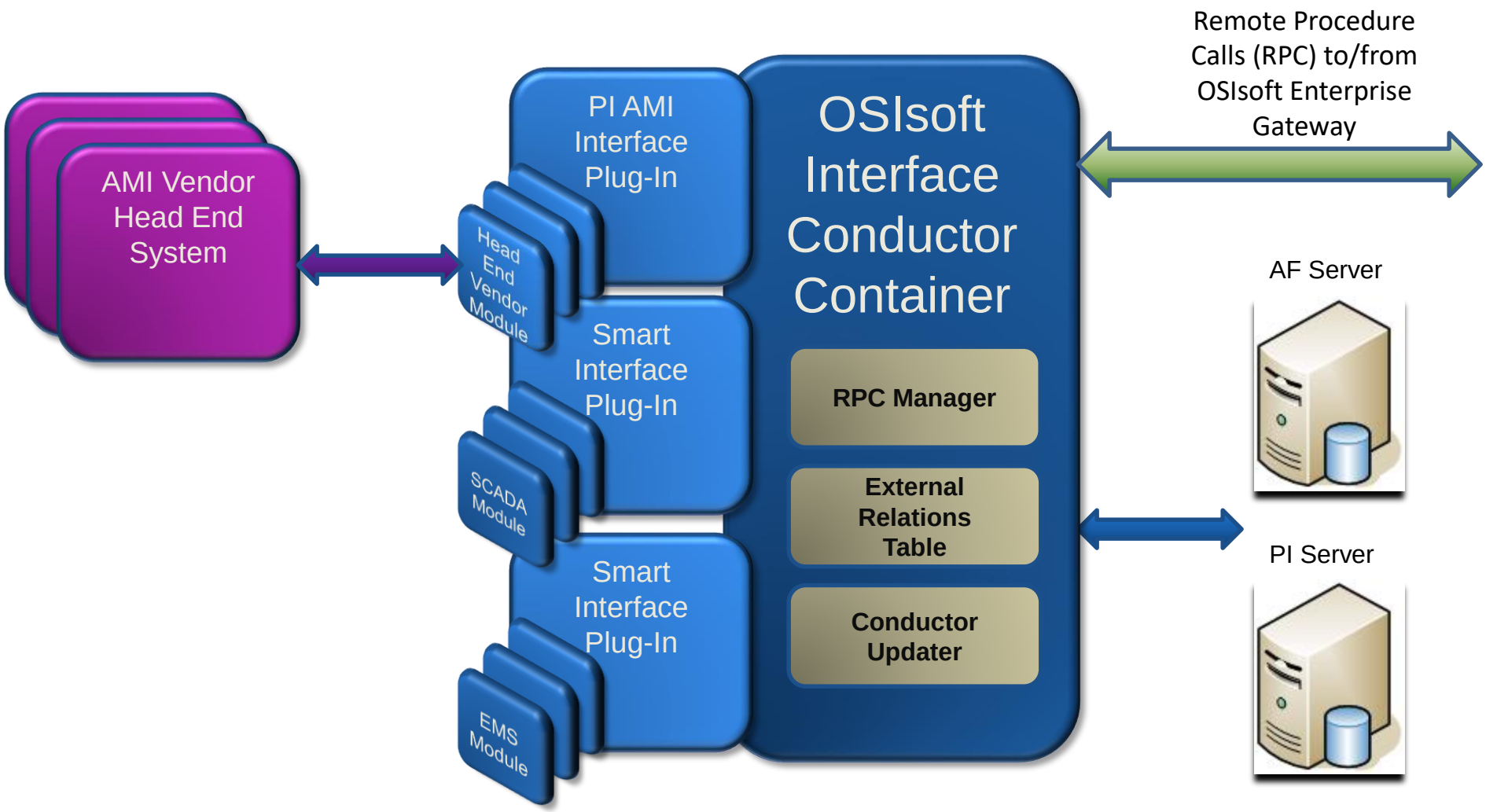
OSIsoft Interfaces (Next Generation)

They’re like a



http://echosphere.net/star_trek_insp/star_trek_insp.html

OSIsoft Interface (Next Generation)



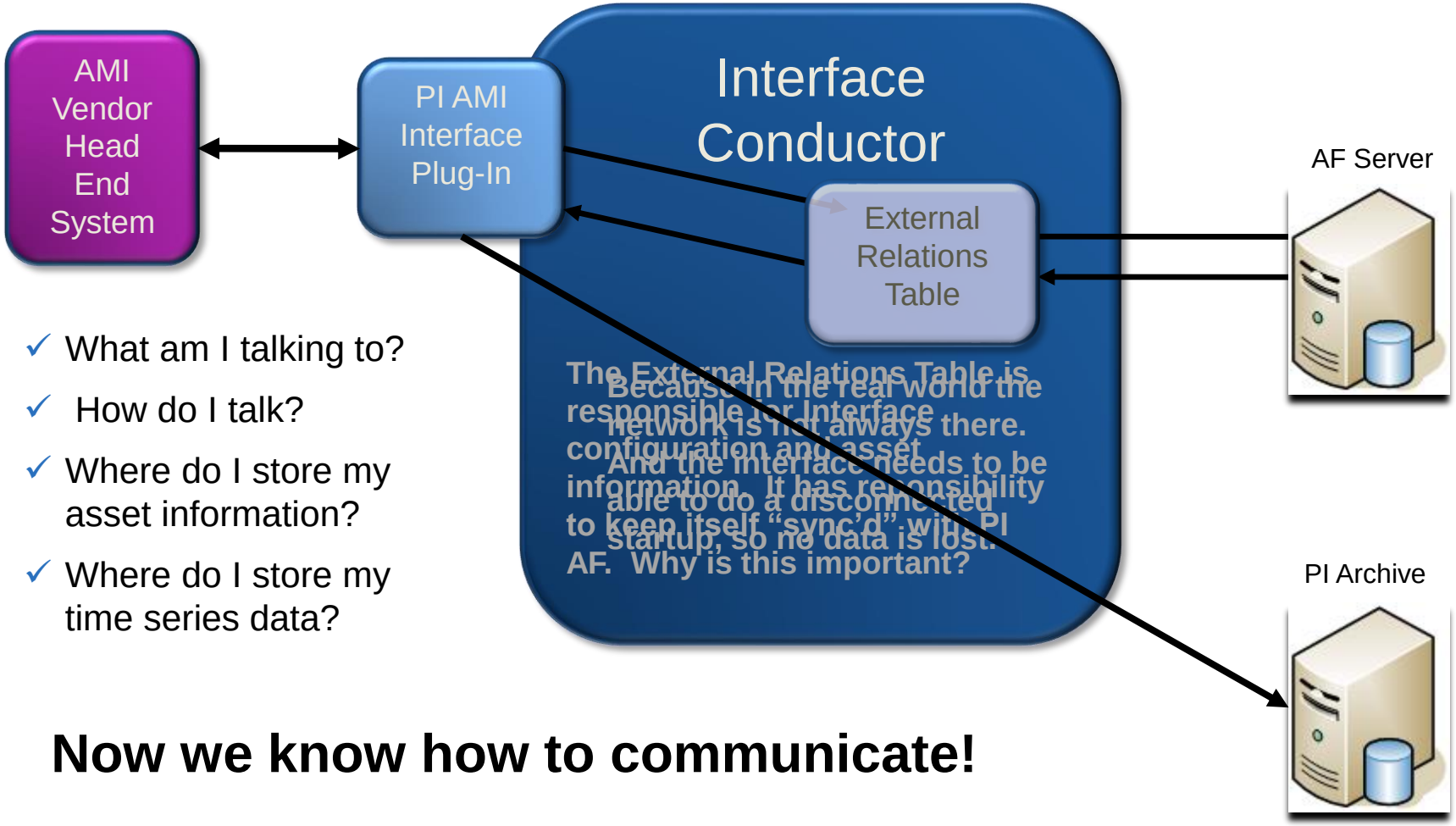
PI AMI Interface Plug-In

- 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
  - Supports
- Facilitates Interface Connector:
  - Load and Unload
  - Initialize and Exit
  - Start and Stop

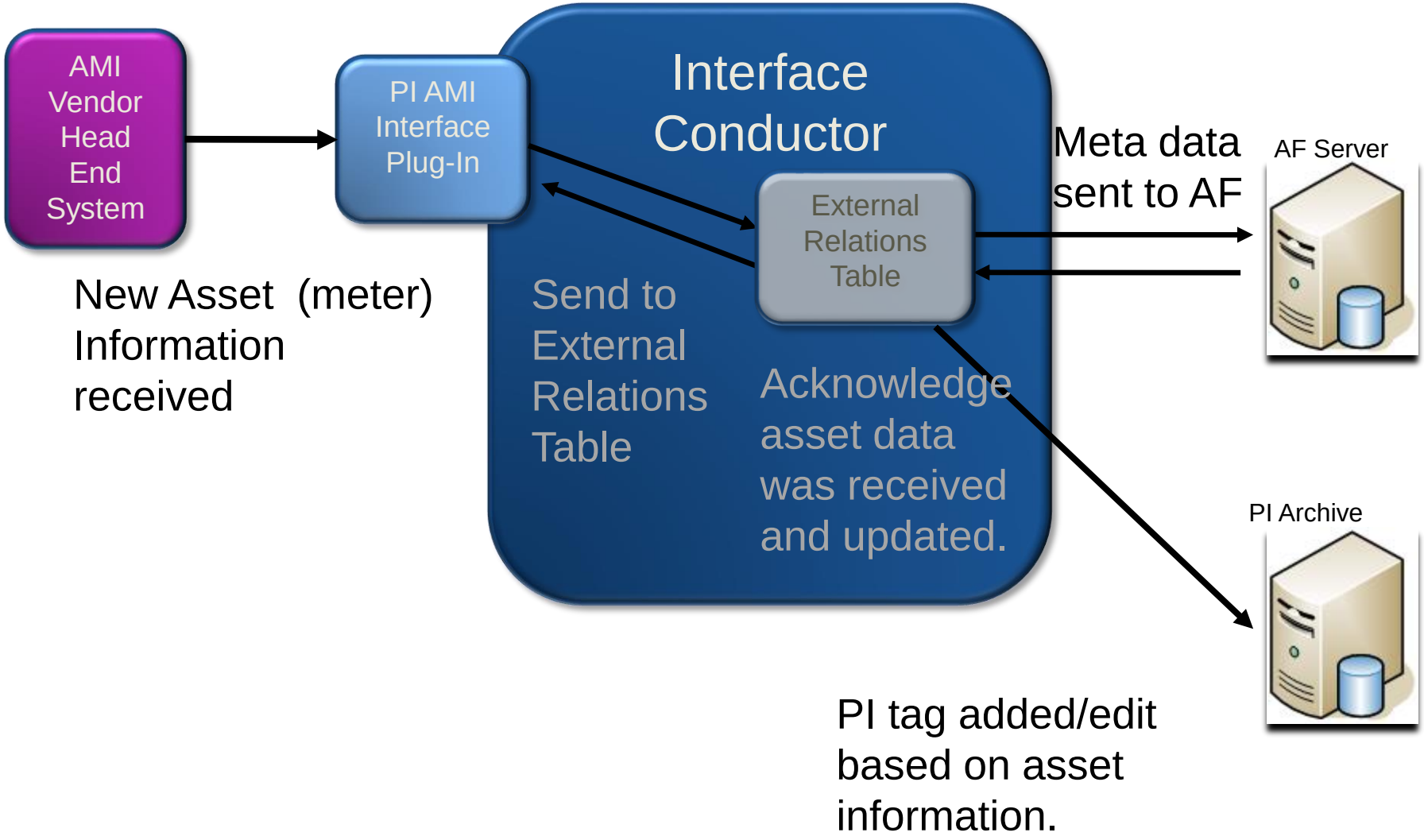
How it works



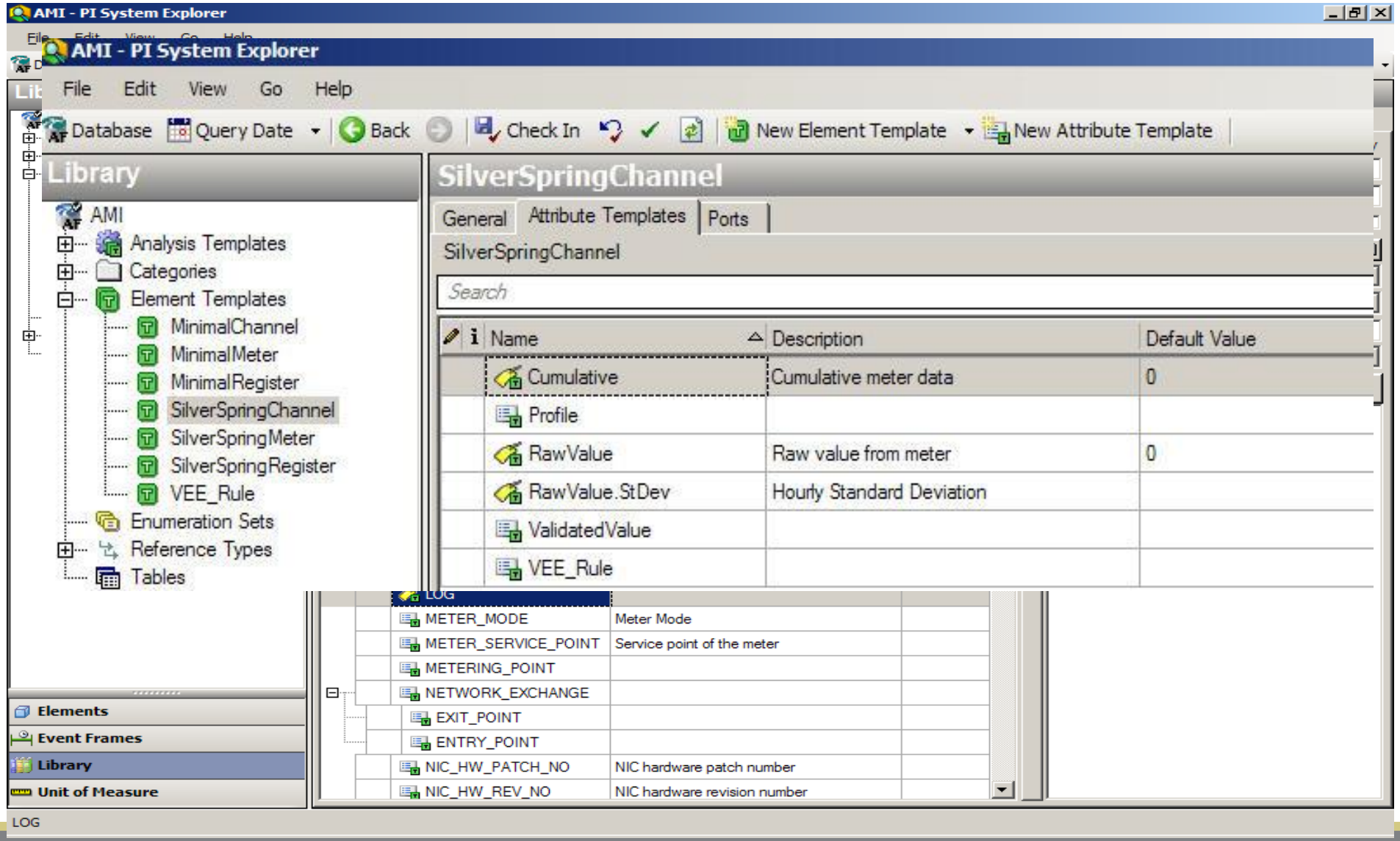
- ✓ What am I talking to?
- ✓ How do I talk?
- ✓ Where do I store my asset information?
- ✓ Where do I store my time series data?

Now we know how to communicate!

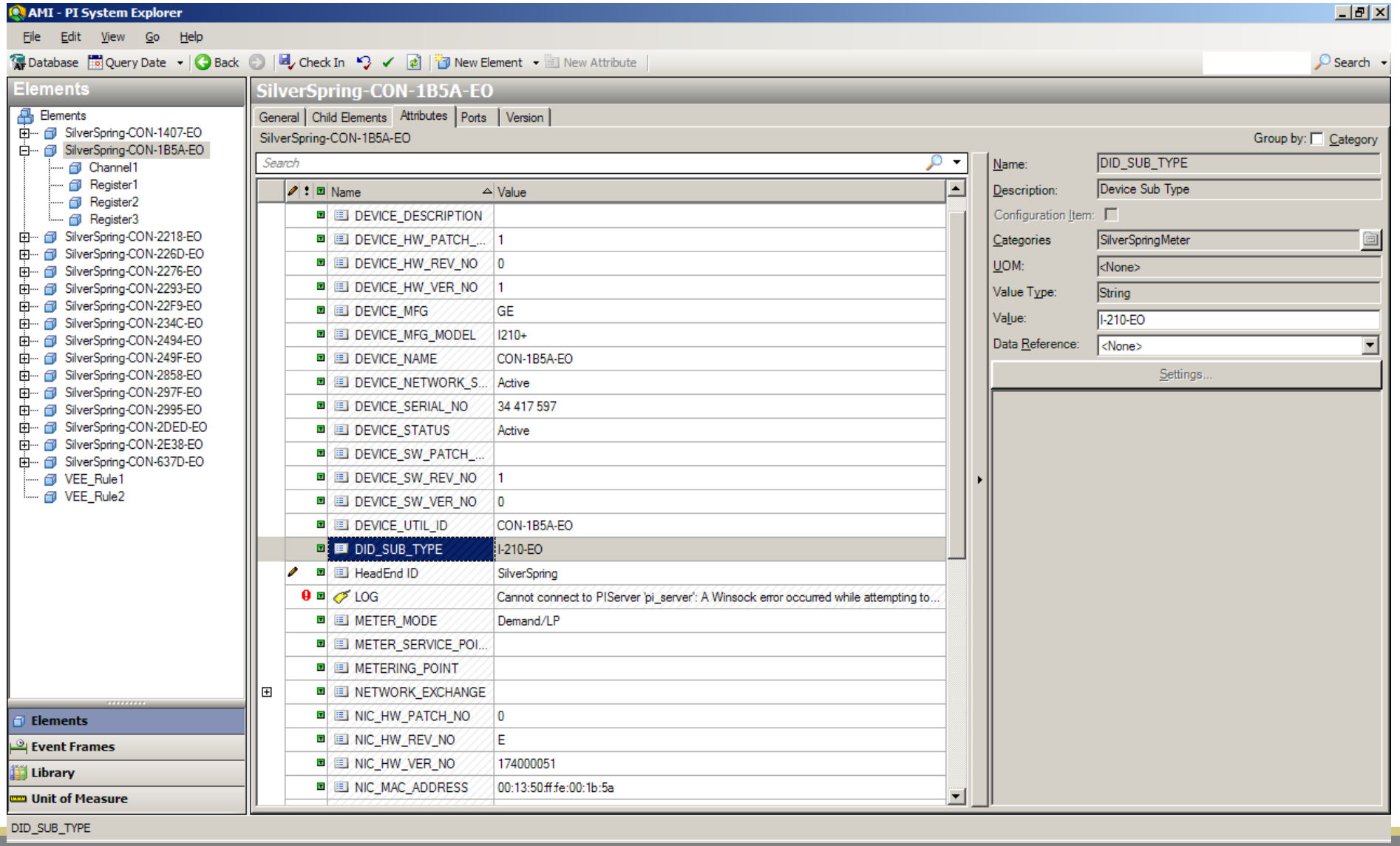
Asset Management



AF Templates

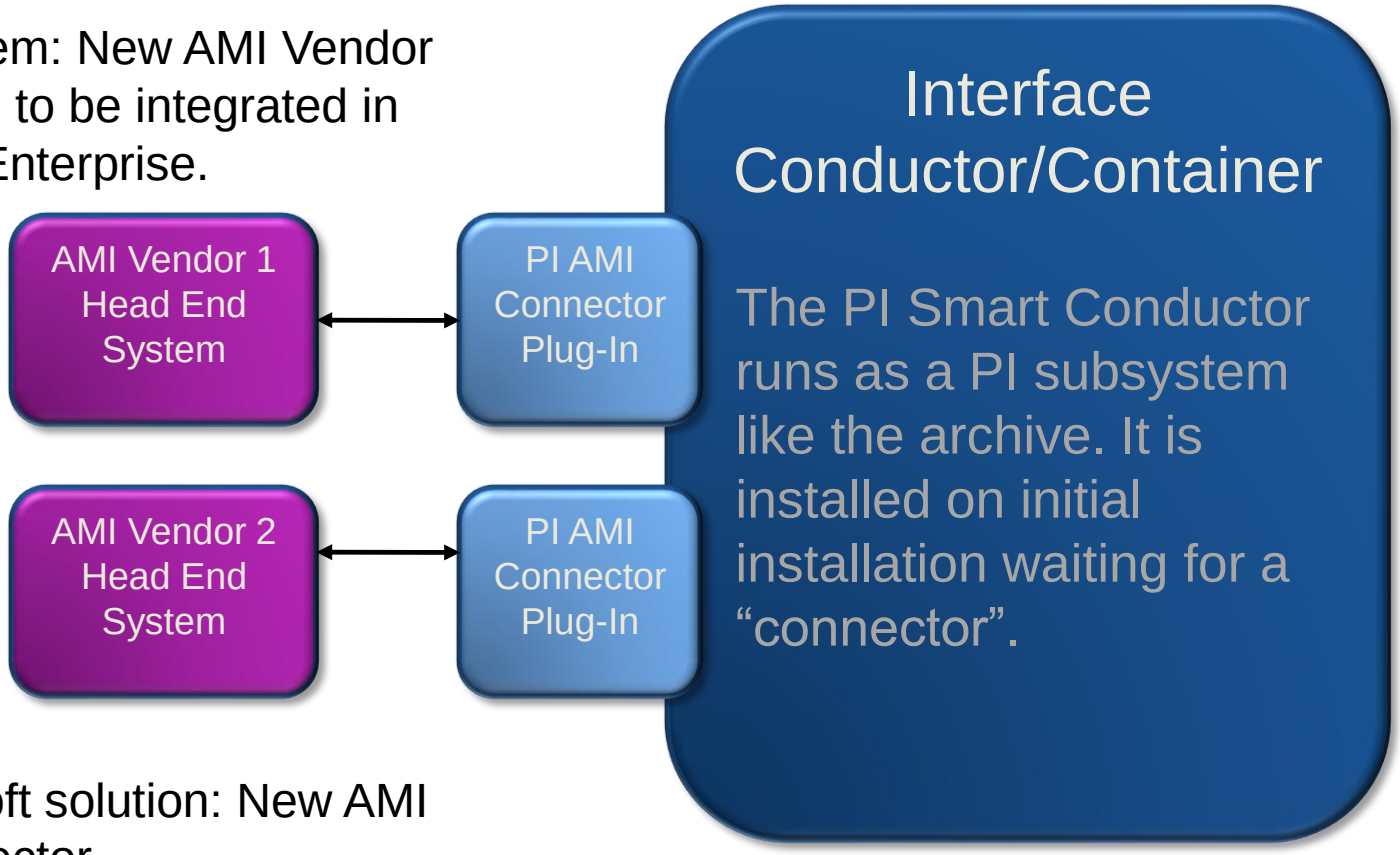


AMI Meter Elements (inherited from templates)



Single Conductor supports Multiple Interface Plug-Ins

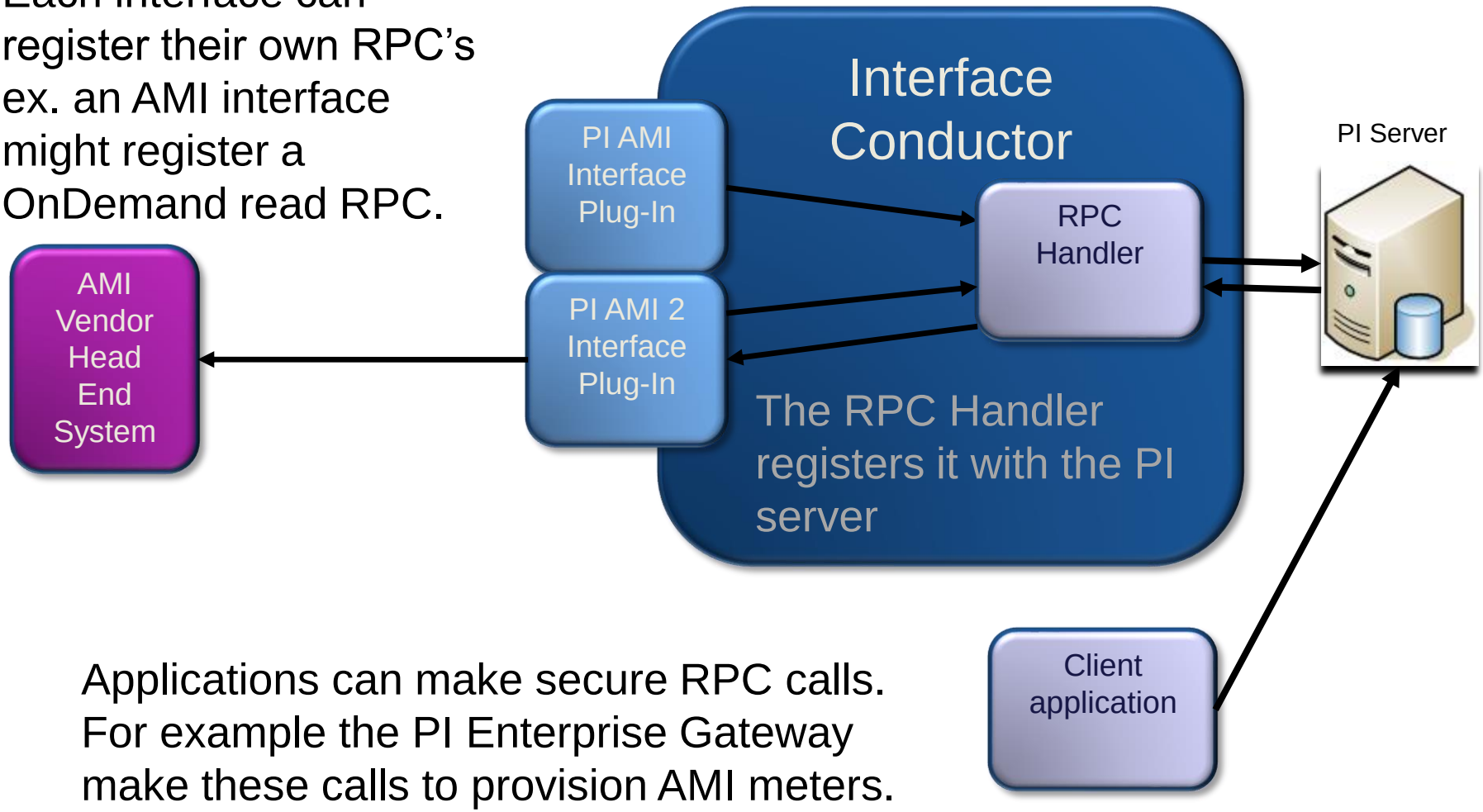
Problem: New AMI Vendor needs to be integrated in your Enterprise.



OSIsoft solution: New AMI Connector

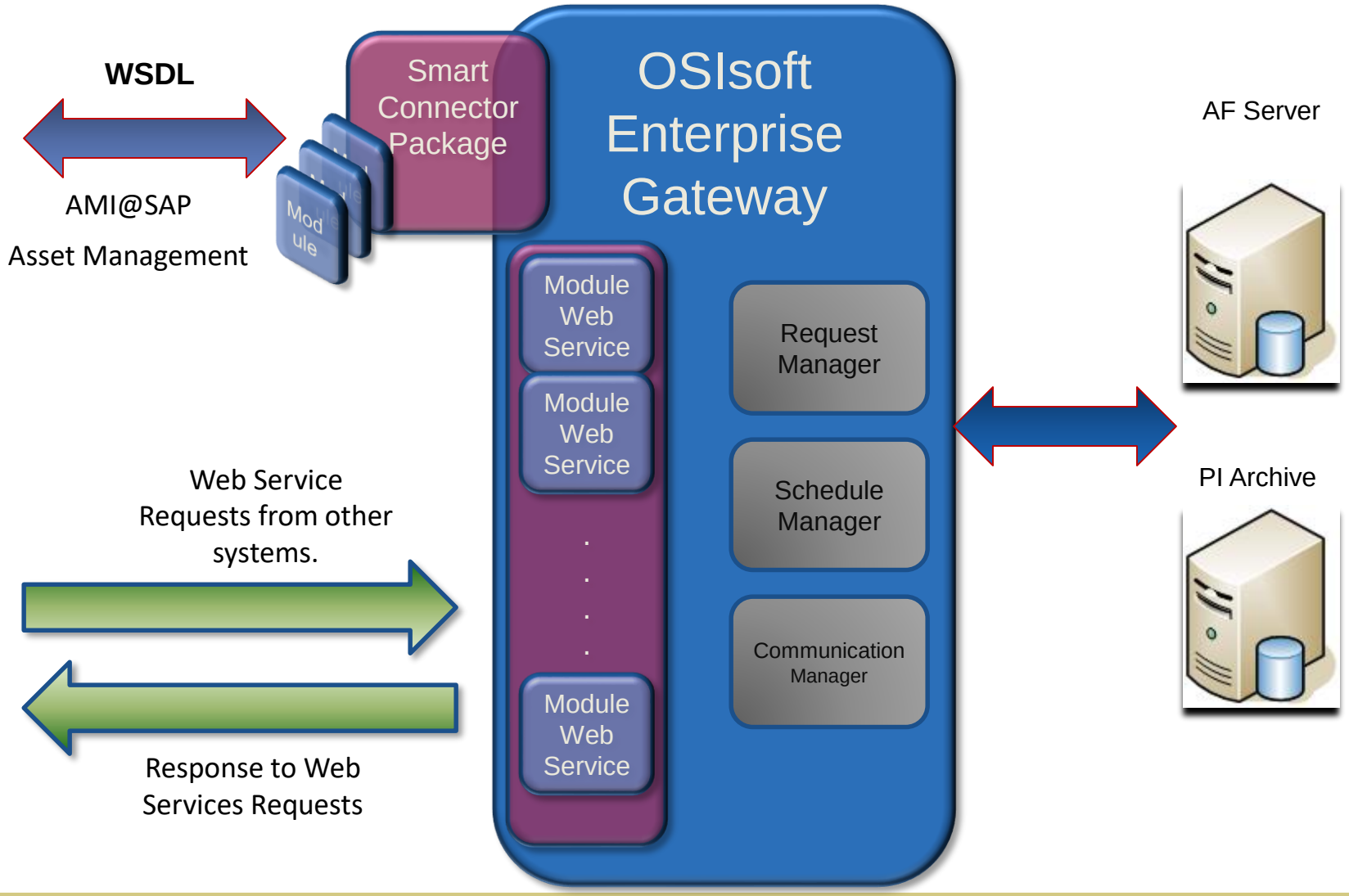
Secure RPC Management

Each interface can register their own RPC's ex. an AMI interface might register a OnDemand 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



Web Services

- Clearly defined with a singularity of purpose
- Modular for mixing and matching with other components
- Distributable across systems or networks
- Swappable so they can be easily replaced with like components
- Easily shareable or reusable

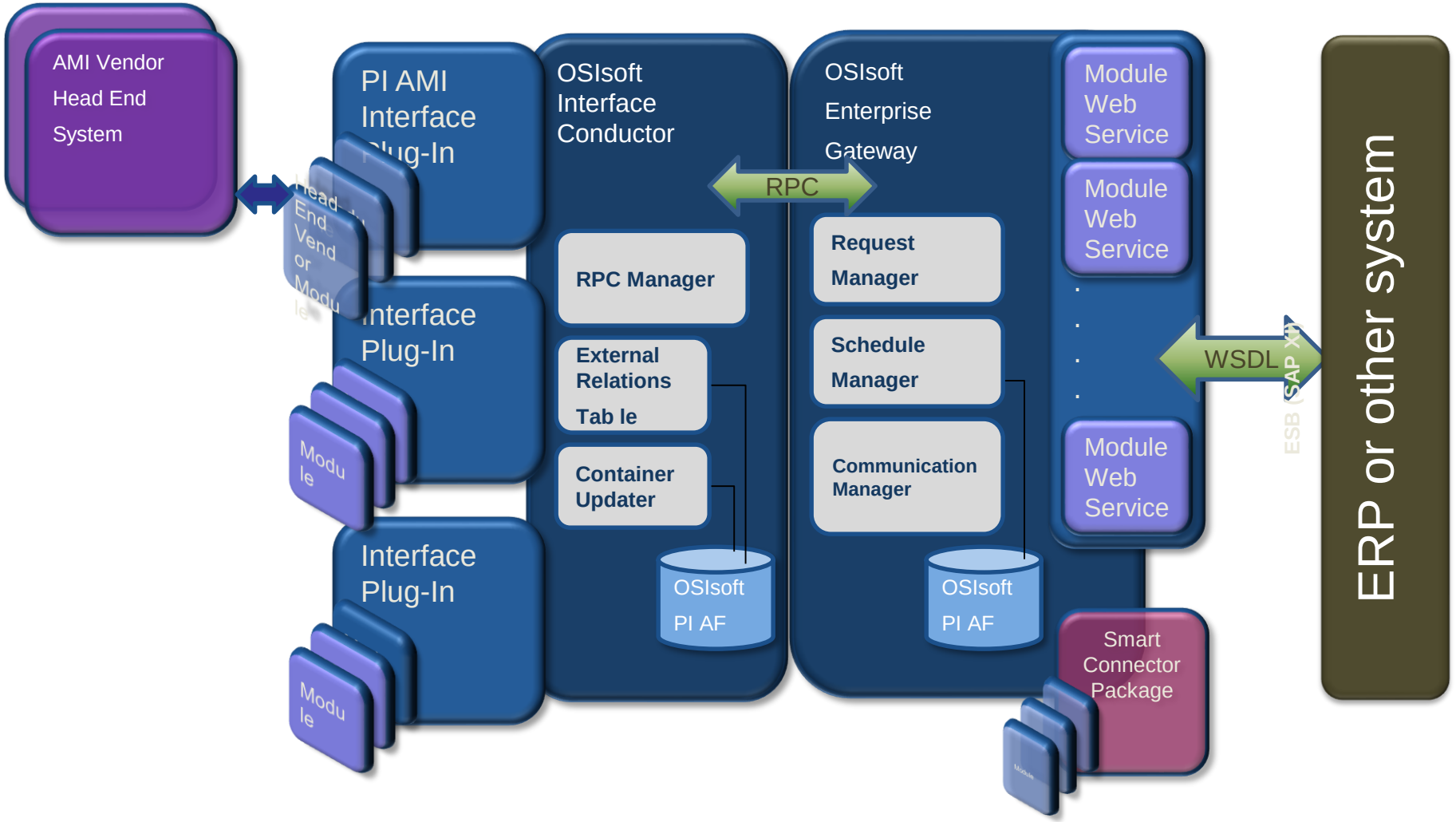
Smart Connector Server

- Web Service Front End
- Service Request Tracking
  - Identity
  - Source
  - Time Stamp
- Service Scheduling
- Distributed Architecture Possible
- Scalable Both Vertically and Horizontally
- PI System RtBaseline Services
  - Service based data access layer
  - Disparate data sources

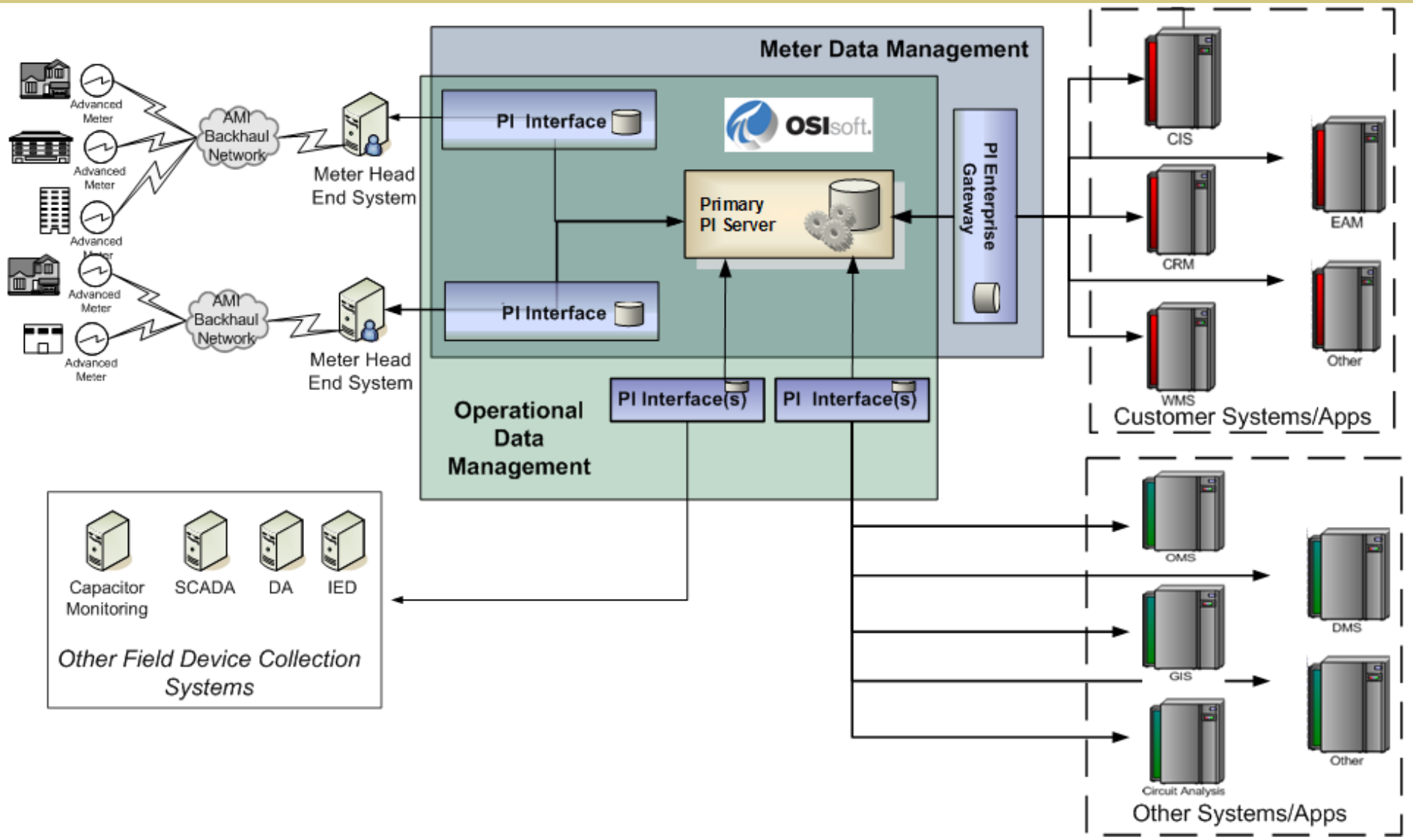
Enterprise Service Interaction Possibilities

- Initiated by Business System with confirmation
- Task Scheduled At Some Frequency
- Bundled request multiple transactions of the same type in single request with single reply of individual replies
- Multiple Transactions of different types to complete business logic no confirmation
- Scheduled Request with confirmation. Results for request are sent and confirmation returned

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

Residential

Substation Automation

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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

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THANK YOU