AEP CIM Experience

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Introduction

- **AEP Stats and Enterprise Overview**
- **AEP Project Description and Goals**
- **CIM Adoption**
- **CIM Implementation Tasks**
- **Project & Architecture Diagrams**
- **Messages Used**
- **Summary**

AEP Statistics

- AEP comprises three main energy areas; Generation, Distribution, and Transmission

- AEP owns nearly 38,000 megawatts of generation capacity in the United States.

- AEP also has the largest electricity transmission system with an approximately 39,000-mile network.

- AEP distribution units operate in 11 state, including Ohio, Michigan, Texas, Virginia, West Virginia, Tennessee, Indiana, Kentucky, Oklahoma, Arkansas, and Louisiana.

Enterprise Overview
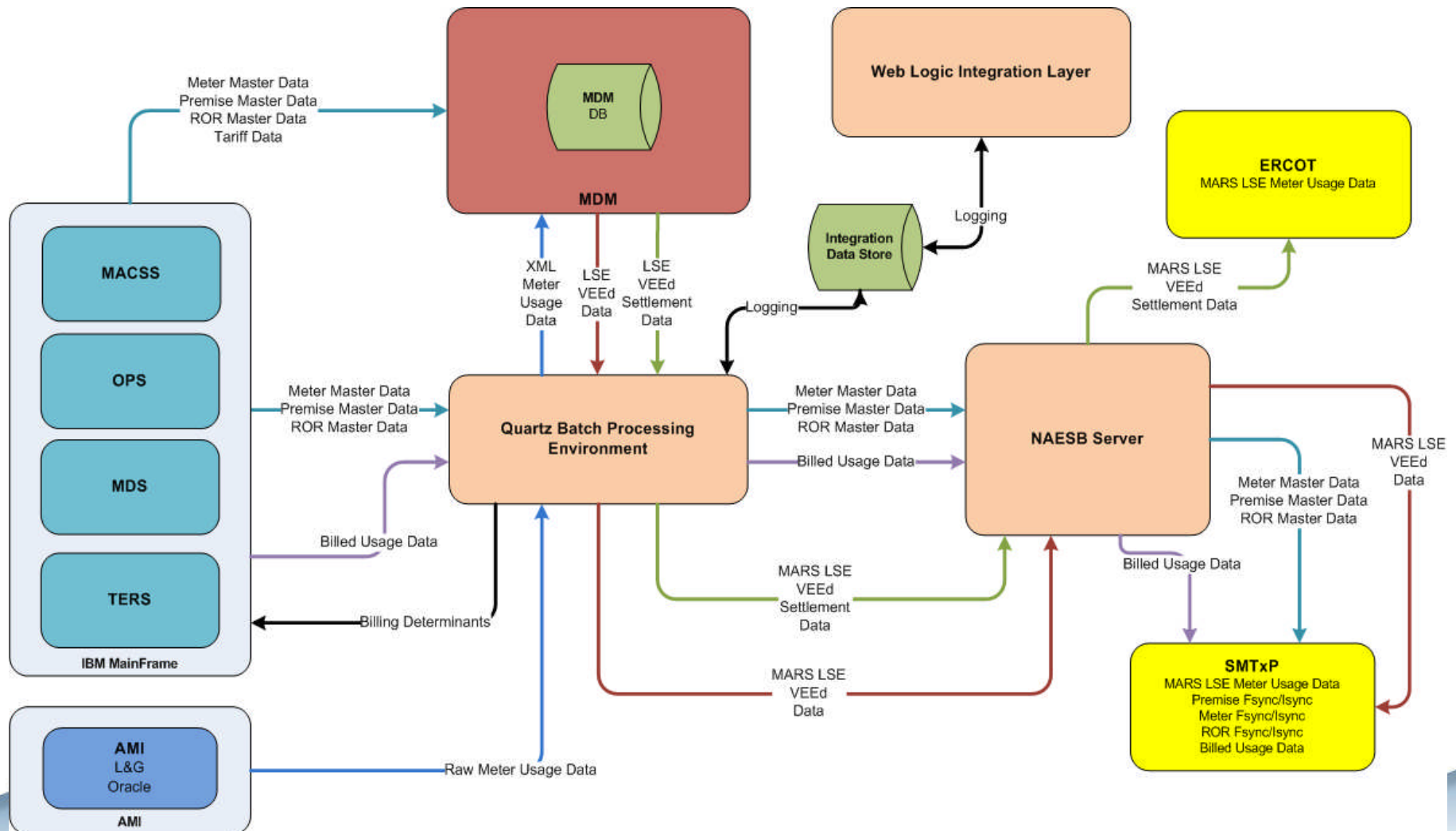
AEP Project Description and Goals

- AEP's *gridSMART* initiative is a comprehensive approach to improving system efficiency and lowering operating costs, providing new services to customers, and allowing consumers to better control energy usage and costs.

- After completion of a pilot program involving 10,000 customers to test gridSMART technology in South Bend, Indiana, several new projects are underway:

  – Plans to install one million smart meters in Texas over the next several years.

  – The DOE has awarded $75 million to AEP to demonstrate smart grid technologies within a 110,000 meter deployment in central Ohio

  – Plans are being finalized to deploy 15,000 meters in Oklahoma to demonstrate conservation effects of in-home displays and other smart grid technologies

CIM Adoption

- AEP made a strategic decision to adopt the CIM standards for the integration of the AMS systems.

- They worked with consultants from companies serving on the CIM standard committees and participated in the CIM standard refinement activities.

- Plan was to build a foundation to adopt IEC 61968 and IEC 61970.

- Began a pilot project to initiate the adoption of the IEC CIM Standard.

- Each AMS business functions used in the pilot had multiple service consumers to interface to multiple service providers.

CIM Adoption - Continued

- To minimize the complexity of the pilot, AEP made the decision to use a Canonical Data Format where participating applications would only have to translate their internal proprietary data format to and from a single Canonical Data Model, in XML format, before sending out their messages.

- AEP created a CIM Based Canonical Data Model for each AEP business function in the pilot, including Meter onDemand Reading, Meter Control (Meter Connect/Disconnect & onDemand Peak Reset), Meter Status, Meter Data Synchronization, Premise Data Synchronization.

CIM Adoption - Continued

- The Canonical Data Models used attributes from the classes in Part 9 of the IEC 61968 standard with a few attributes from the IEC 61970 standard.

CIM is a major commitment and highly complex undertaking without clear planning and adoption strategy

Establishing CIM Adoption Strategy → CIM Adoption Roadmap → CIM based Modeling and Development

- Understand Why CIM?
- Utility's Vision for CIM
- Identify CIM Tooling
- Criteria for CIM based integration
- Understanding of current state
- Knowledge and Training Needs

- CIM Training & Workshops
- Well defined System Integration Requirements
- Alignment with Enterprise Architecture
- Review business processes and implementation strategy
- Understand use cases

- Define CIM based Messages
- Modeling and Profiling
- Define CIM Extensions
- Develop CIM based service design (XSD, WSDLs)
- Repeatable processes and Templates

CIM users group

CIM Implementation Tasks

- The architect team started by creating a superset of the data attributes of all participating applications of a particular business function.

- A business data glossary where a catalog of business data attributes, their names, structure, and usage was defined.

- Then we mapped each data attribute to the corresponding CIM Data Objects.

- When possible the existing IEC Part 9 Profile message definitions were used or extended to create AEP's CIM Based Canonical Message Format.

CIM Implementation Tasks - Continued

- Used the profiles to create the XSD for each message payload.

- Identified and defined a few CIM extensions, which are currently being reviewed by the CIM Standard Committee for inclusion in the CIM Data Objects.

- A header was added to the payload, the WSDLs were created, and the developers started building the code to translate the internal application data format into the CIM Based Canonical message format.

Inputs

Consolidated Interface Catalog

Integration Architecture Blueprint

Services Framework and Architecture

Integration Patterns

Activities

Review interface catalog and determine prioritization using CIM Adoption Decision Matrix

For each integration scenario to be CIM-enabled, perform the following set of activities:

Collect requisite API and data structure definition documents for all end-point systems including respective meta-definitions

Develop canonical model consisting of common fields and unique fields for all end-point systems involved

Map canonical model to CIM UML Model, identifying required CIM extensions

Define Utility's AMS Implementation Profile

Create XML Message Definitions (XSDs)

CIM Adoption

Utility's CIM Model

- Utility's AMS Implementation Profile
- Utility's-specific CIM Model

CIM-Based Message Model

- Message Types (XSDs)
- Service Definitions (WSDLs)

Recommendations to IEC

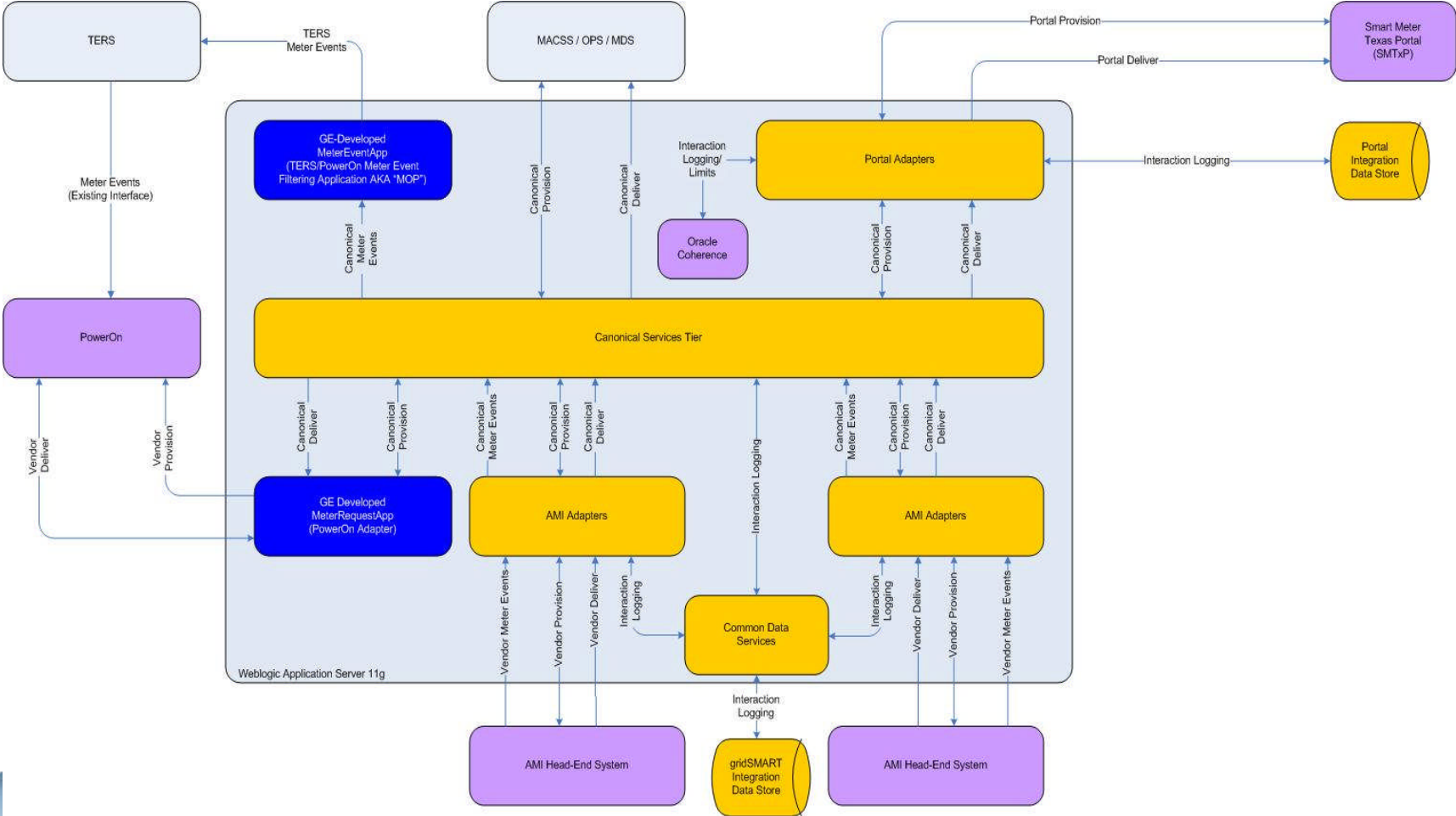- Submission of CIM Extensions
- Submission of new Message Types

Project Pre-requisites and Accelerators

IEC CIM Model 61968 and 61970 and its Message Model
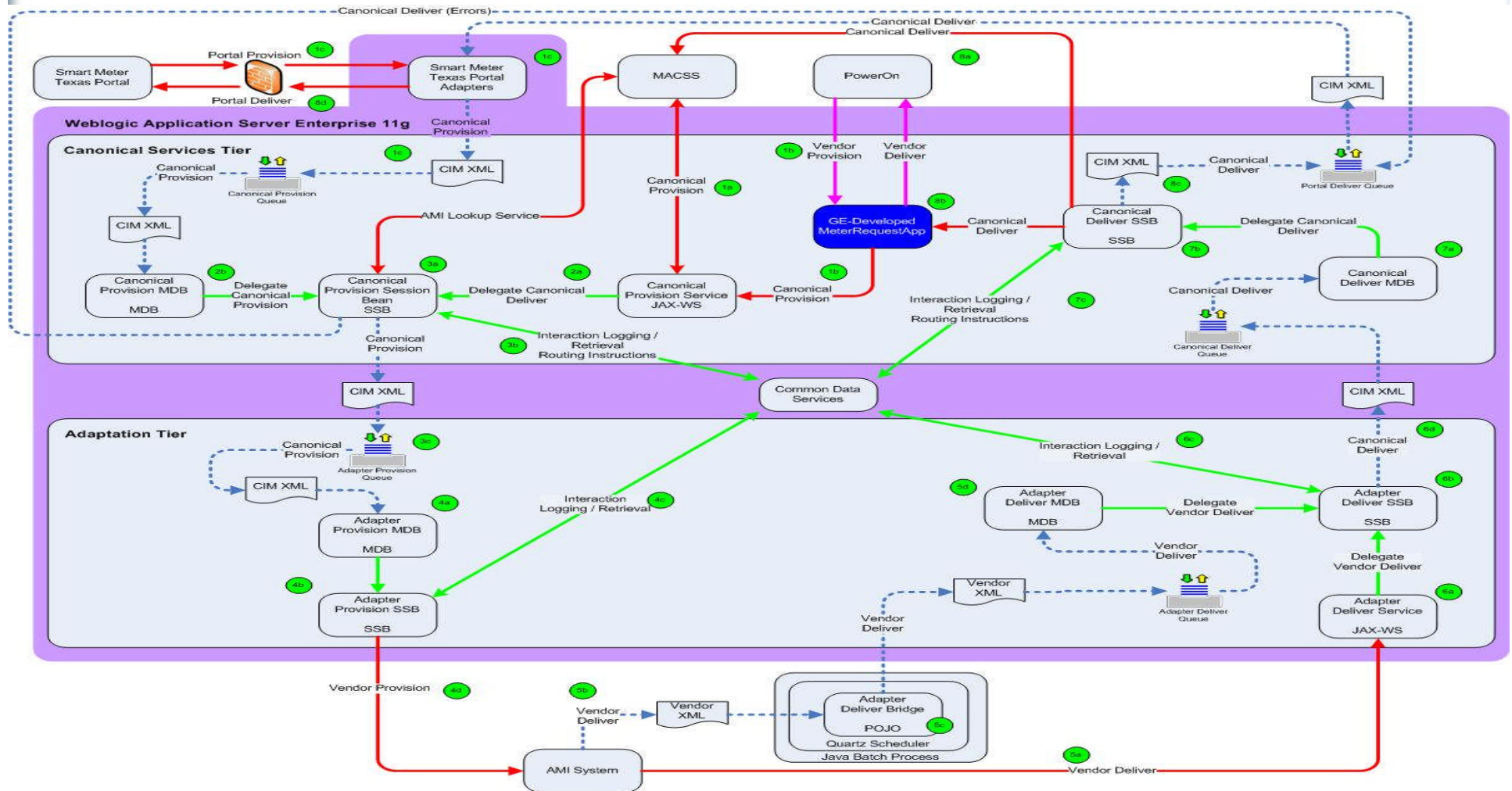Software Modeling Tool with CIM plug-ins

CIM users group

Pilot System Context Diagram
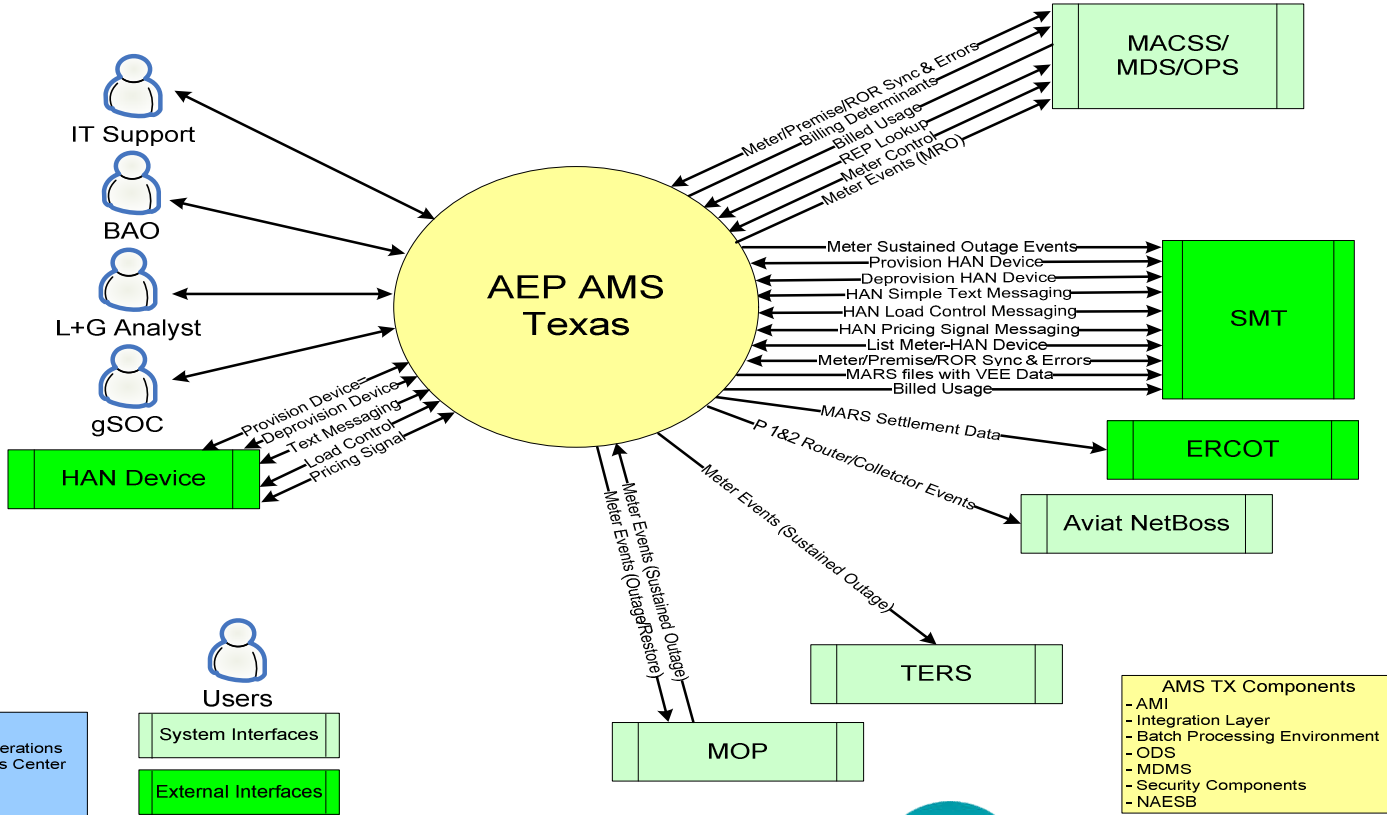
Architecture Overview

Integration Architecture Overview

CIM Usage Architecture Overview

Messages Used

- CustomerMeterDataSet (use to Sync with Common Texas Portal, AMI, MDM, etc)
- EndDeviceAsset
- EndDeviceControl (for Meter Control Operations: Disconnect/Reconnect, Peak Demand Reset, etc.)
- EndDeviceResponses
- GetDeviceStatus (New and not accepted by IEC)
- GetMeterReadings
- MeterReadings
- HAN/PAN Messages
- RTP Messages

Summary – Critical Tasks for Success

- Review, Analyze and Validate integration approach
- Complete Training and Workshops for CIM
- Capture the requirements for use of CIM
- Map Legacy Message Data to CIM
- Define a Utility specific message model based on CIM
- Generate XSD Messages using CIM model
- Develop a CIM-based Service Design

Project Summary and Results

- AEP is committed to participate in the IEC CIM Interoperability tests to ensure their compliance with the CIM standards.

- AEP's adoption of the CIM Data Models has simplified the interoperability between applications and will benefit future use of business rules, security, and overall service governance.