Integration of Metering Systems

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IEC 61968-9

- New international standard for the integration of metering systems being drafted by IEC TC57 WG14

- Extends the 61968 package of the IEC Common Information (CIM), where the core CIM is defined by IEC 61970-301

- Integration defined using XML messages as defined through XML Schema

- Messages have a header and a payload
  - Header identifies a noun and a verb
  - Payload uses CIM-derived type definitions

IEC 61968-9

- *Details of the meter and communication between meter and AMR system are outside the scope of the 61968-9*
- Meter modeled to identify general capabilities, as opposed to details of implementation (e.g. registers, protocols, …)
- AMR system can provide events for other systems
- AMR system collects meter readings
- Other systems may issue requests to AMR systems
- A variety of business processes may involve the meter, but may or may not involve the AMR system

Actors

- Customer
- Meter
- Meter Technician
- Energy Supplier
- AMR System
- Meter Reader

- Meter Data Manager
- Asset Managers
- Planner
- Forecaster
- System Operator
- Outage Management System
- Customer Billing System

Use Cases

- Meter Installation and Removal
- Meter Configuration
- Meter Reading
- Meter Read Request
- Outage Detection
- Power Quality Event Handling
- Meter Health and Tamper Detection
- Demand Response
- Load Control
- Real-Time Pricing
- Billing Inquiry
- Model Synchronization
- Get Historical Load Data
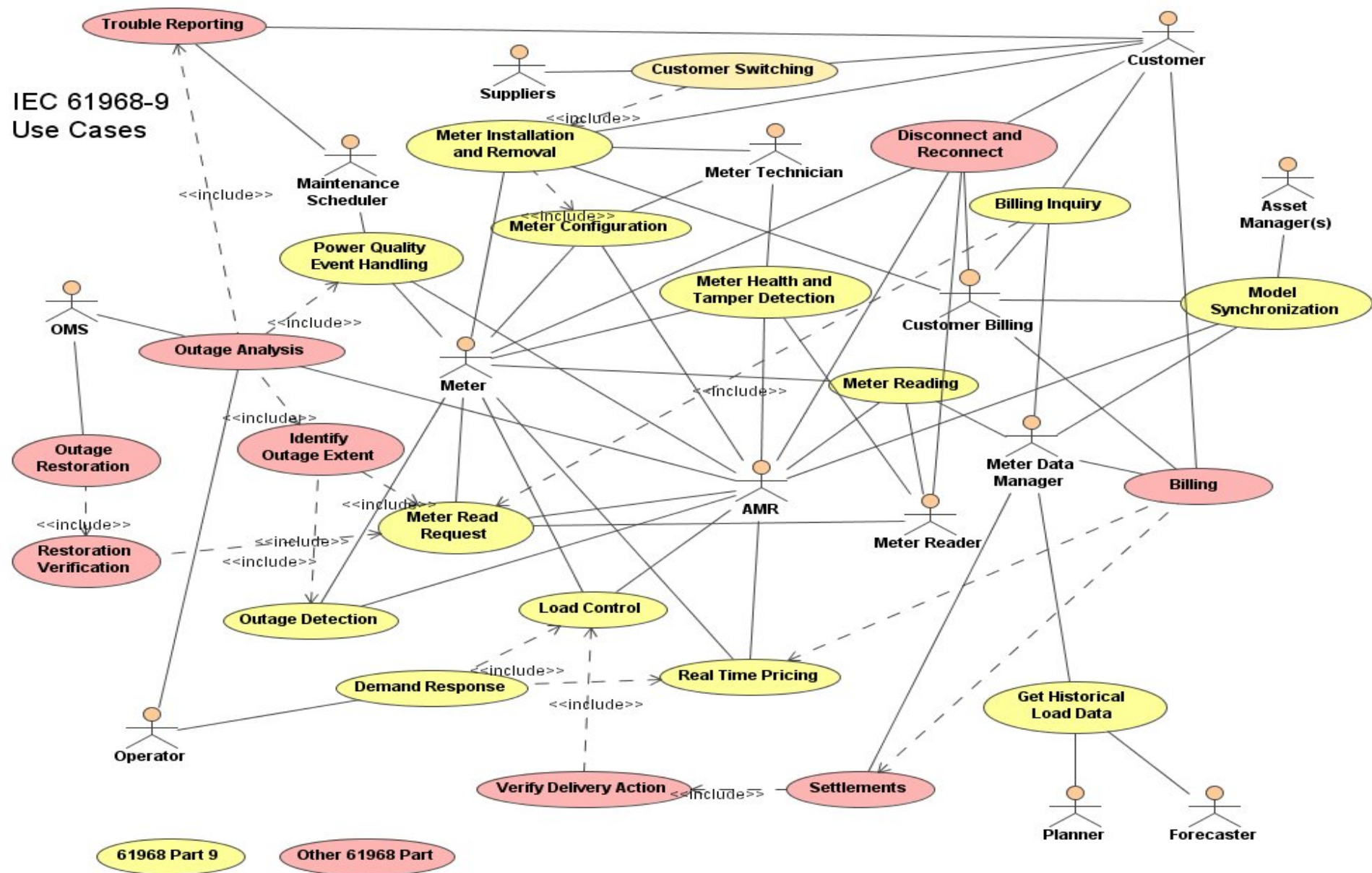- Customer Switching

Existing 61968 Use Cases:

- Outage Analysis
- Trouble Reporting
- Identify Outage Extent
- Outage Restoration
- Restoration Verification
- Meter Disconnect and Reconnect
- Billing
- Settlements
- Verify delivery Action

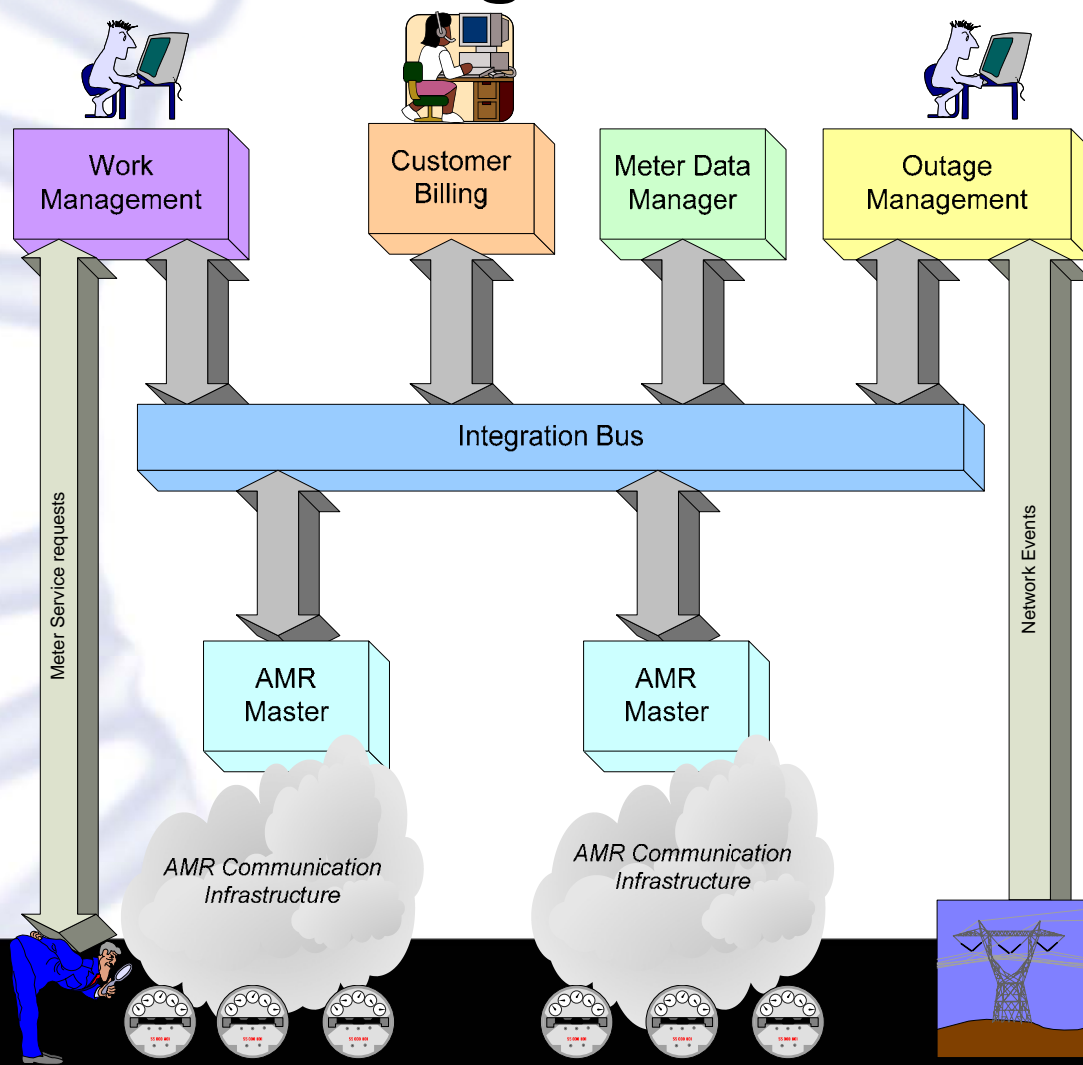Autovation 2005

IEC 61968-9 Use Cases

Issues Specific to AMR

- A wide variety of communication mechanisms are used between the meter and the AMR system
- In cases where information can be requested from a meter, the reply must be processed asynchronously due to the latencies involved
- Large volumes of data (e.g. $\sim 10^2$ meter reads per day from $\sim 10^6$ meters for a period of $\sim 10^3$ days results in typically more than 100 billion values)
- More than one AMR system and associated meter technology may be used by a utility
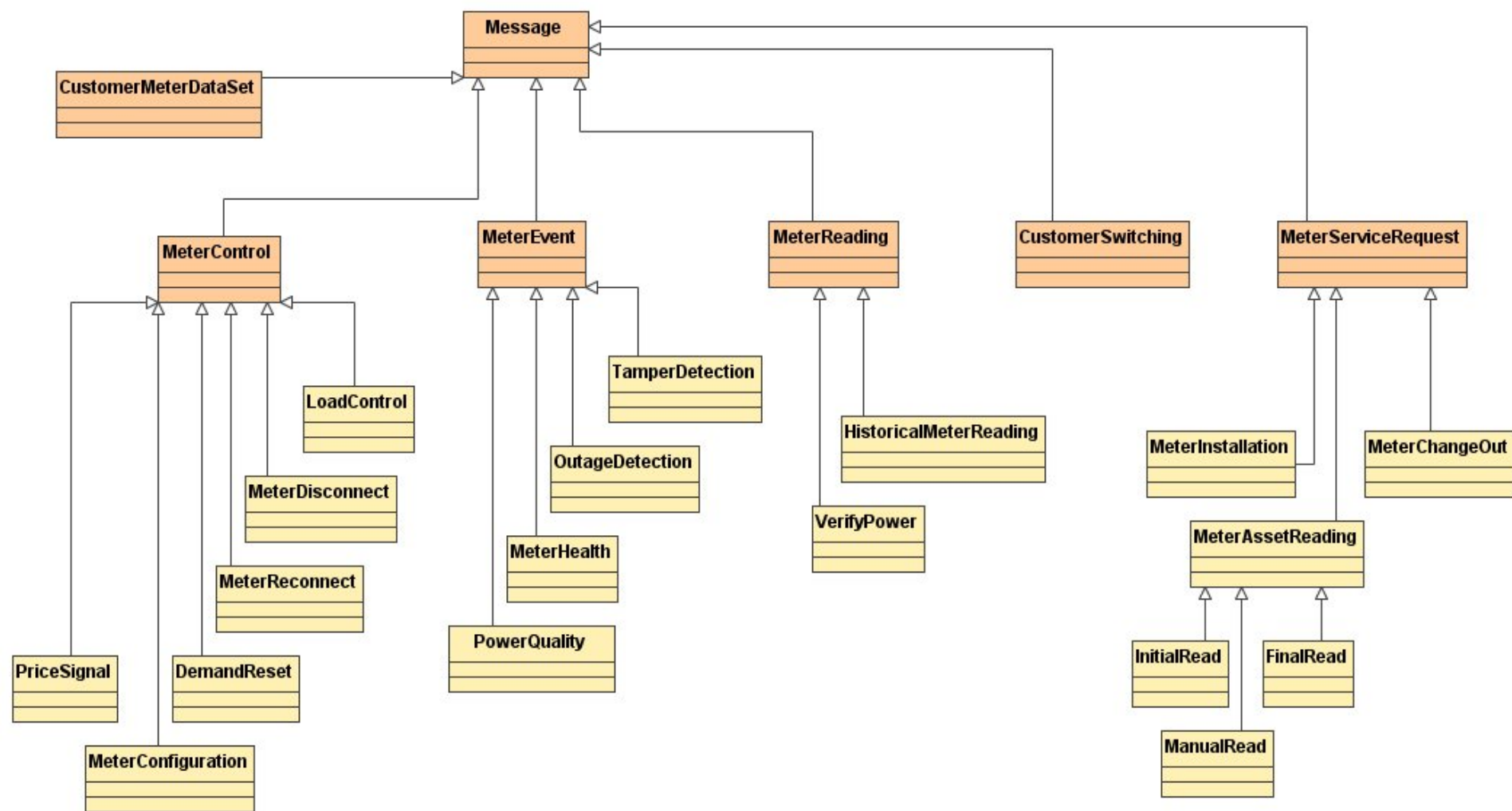- A variety of integration infrastructures and applications are used within utilities

Integration of AMR

Message Types

CIM AMR-Related Modeling

- CustomerMeter is a CIM PowerSystemResource
- CustomerMeter is located at a ServiceLocation
- A Customer may have one or more CustomerAccount
- CustomerAccount may have one or more CustomerMeters
- CustomerMeter may have associated ActivityRecords
- CustomerMeter is associated with a PowerTransformer
- CustomerMeter realized by a MeterAsset and optionally an AmrModule
- AmrModule has a set of capabilities related to collection of measurements, sending of measurements and controls
- AmrModule may belong to one or more MeterGroups
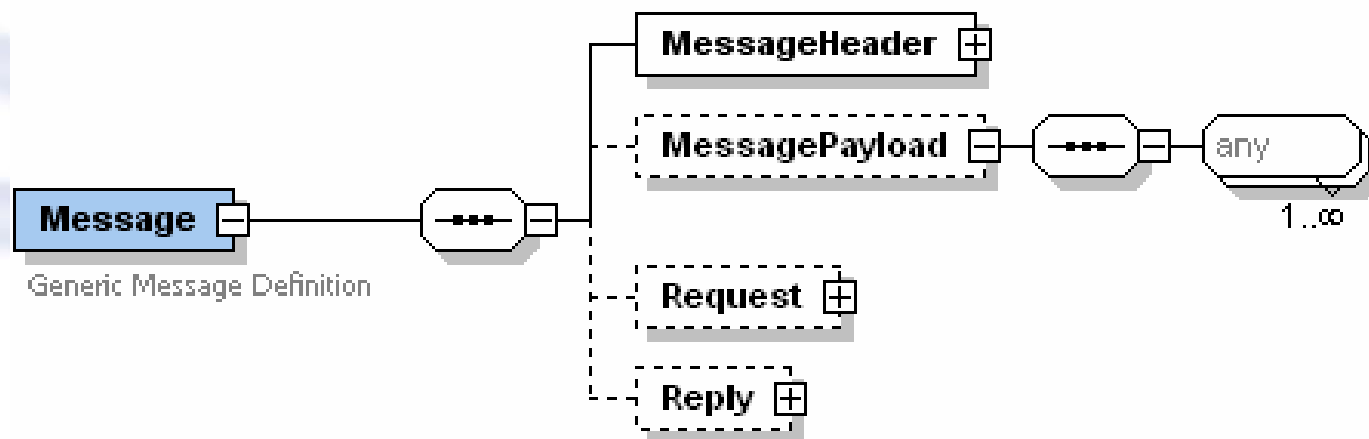- One or more Measurements are defined for each AmrModule

Meter Readings

- Meter readings are sets of CIM MeasurementValues
- There are a variety of quantities that can be captured, depending upon AMR technology and associated configuration
- The most commonly recorded data items include
  - kWh usage
  - kW peak demand
  - Event counts for momentary and/or sustained outages
- Additional data items that are sometimes recorded include
  - Real and/or reactive demand (i.e. kW, kVA or KVAR)
  - TOU tiers
  - Voltage
- There are also specific events that can be captured, including but not limited to:
  - Sustained outage reports
  - Tamper detection

IEC 61968 Messages

Generic Message Definition

- Message has header, with optional request, reply and payload sections
- Header includes information such as a verb, noun, timestamps, revision, source, replyAddress, …
- Supports request/reply, publish/subscribe and point-to-point messaging
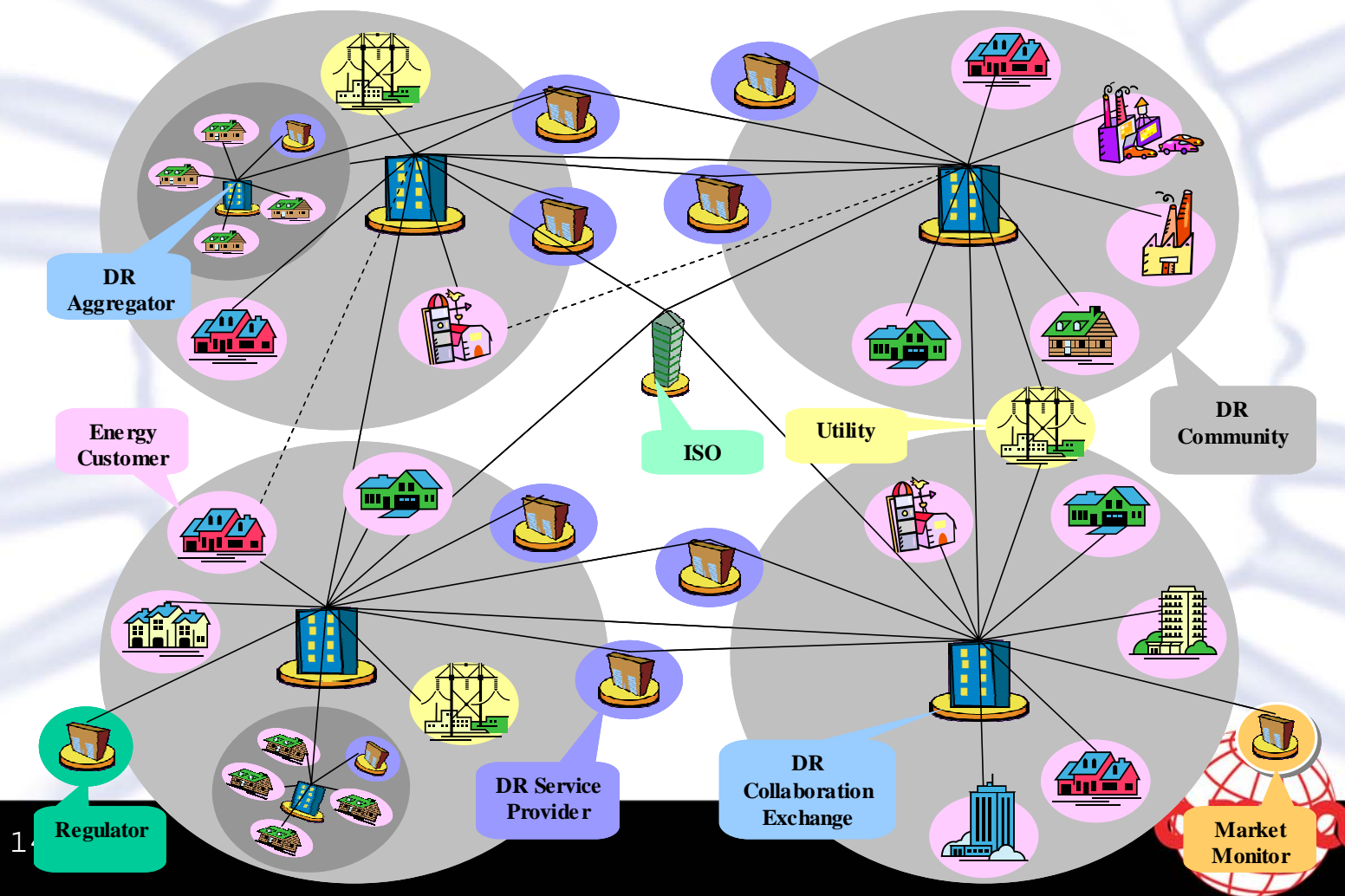
Message Payload Types (Nouns)

- CustomerMeterDataSet
- MeterReadings
- *MeterConfiguration*
- *MeterControl*
- *MeterEvent*
- *MeterVerification*

Demand Response: DRBizNet

References

- CIM User site: http://cimuser.org
- UISOL site: http://uisol.com