The Green Button Initiative

white house inspired.
industry led.

In response to the Obama Administration's call to action, 150+utilities and service providers commit to provide 60+ million homes and businesses with their own energy usage information in the consensus industry standard Green Button format

www.greenbuttondata.org

Photo credit: Silver Spring Networks CustomerIQ™ Energy Portal

John Teeter, Computer Scientist, NIST, john.teeter@nist.gov
Presidential Innovation Fellow Alumni

NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

engineering laboratory
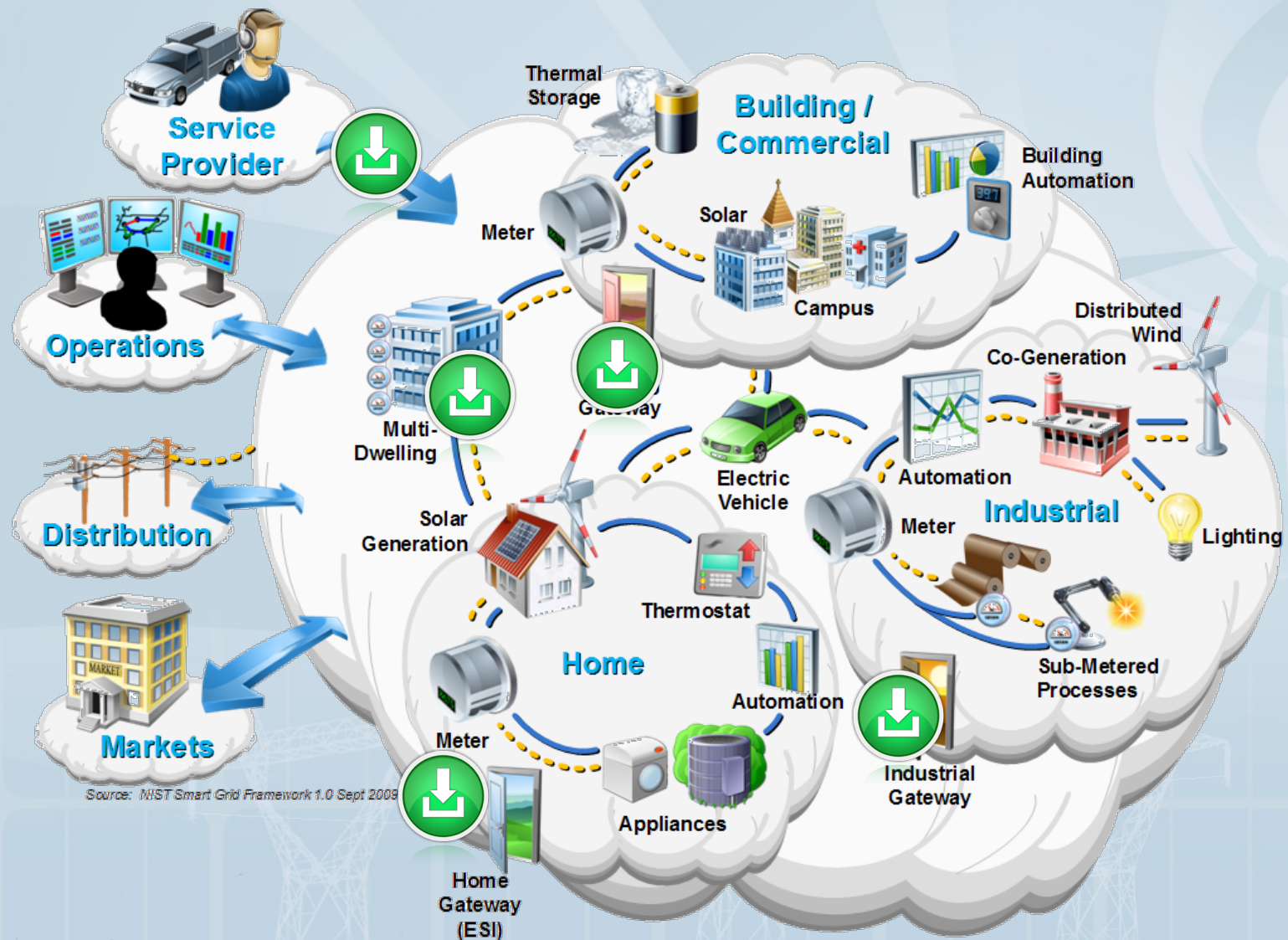
Green Button Technology

-- Consistency

– Interoperability

- Scaling to Market

Smart Grid Consumer Domain

Source: NIST Smart Grid Framework 1.0 Sept 2009

Green Button Privacy and Security

- Data Security.
  - Standard Certificate Based HTTPS and SFTP
  - Uses IETF OAuth2 authorization
  - Requires 128 bit (Third Party) and 256 bit (Data Custodian) Transport Layer Security
  - Aligned with NIST best practices

- Personal Identifiable Information (PII)
  - Certified Green Button Metered Data contains no PII
  - All Location information must be exchanged separately from Metered Data
  - Account and Portfolio information must be exchanged separately from Metered Data
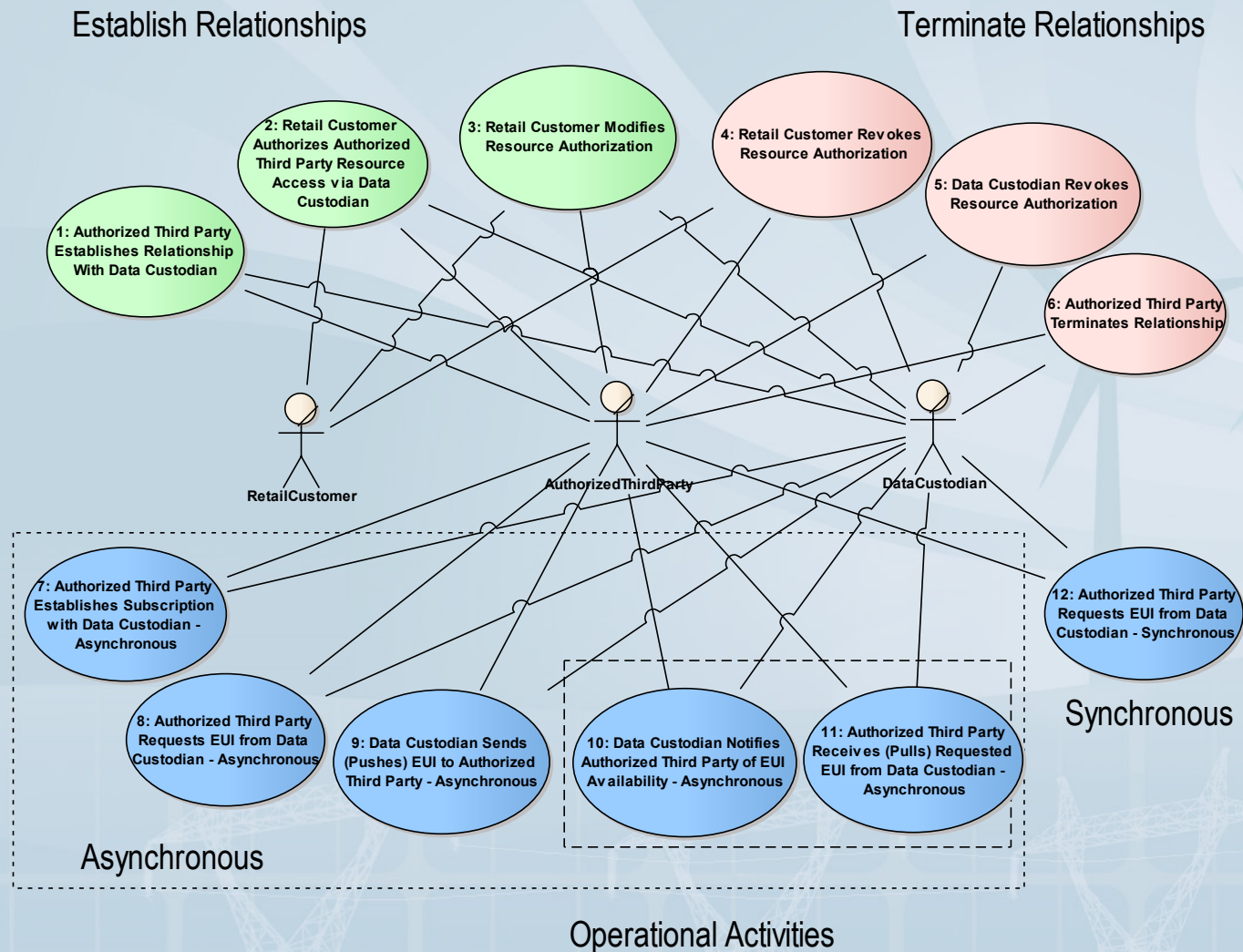
Both Utility and Facility Data

5

Utility Data

Facility Data
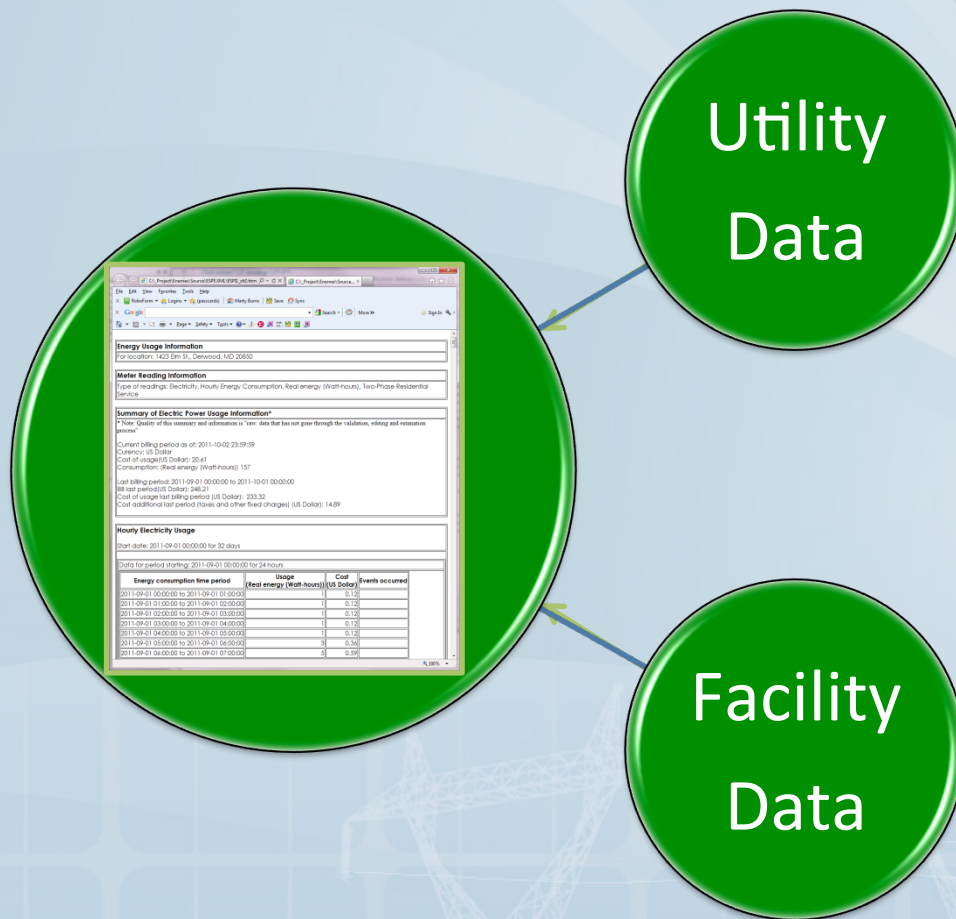
- Measurements of power, energy, gas, water, …
- Quality: Raw, validated, estimated, …
- Source: Meter near real-time, utility back end, third party
- Economics: Consumers need to know the cost of their consumed power (but we did not construct a pricing model)
- Identification: by customer, device, location
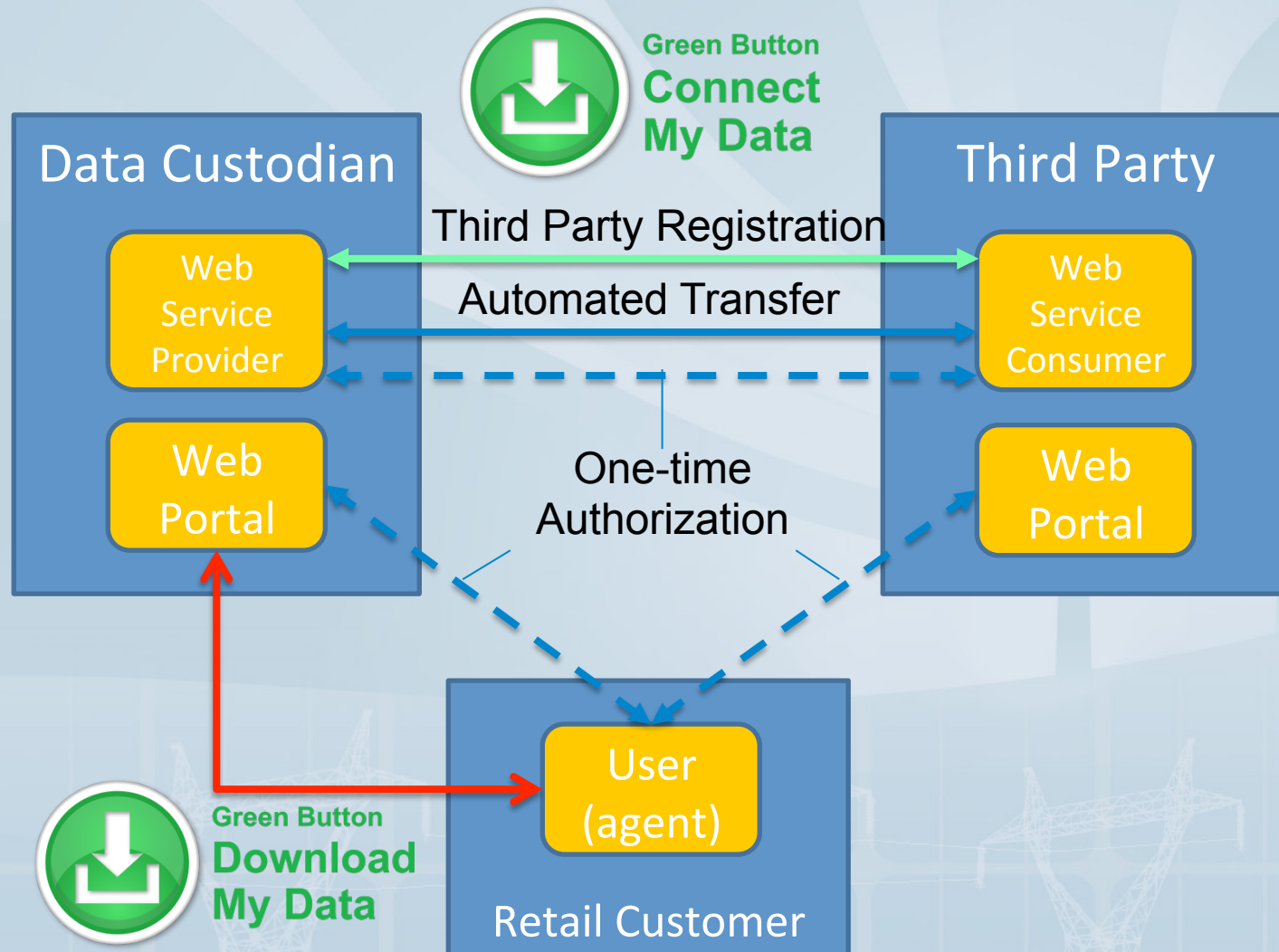- Interval data
- Summary Information
- Power Quality Metrics

NIST smart grid program   engineering laboratory
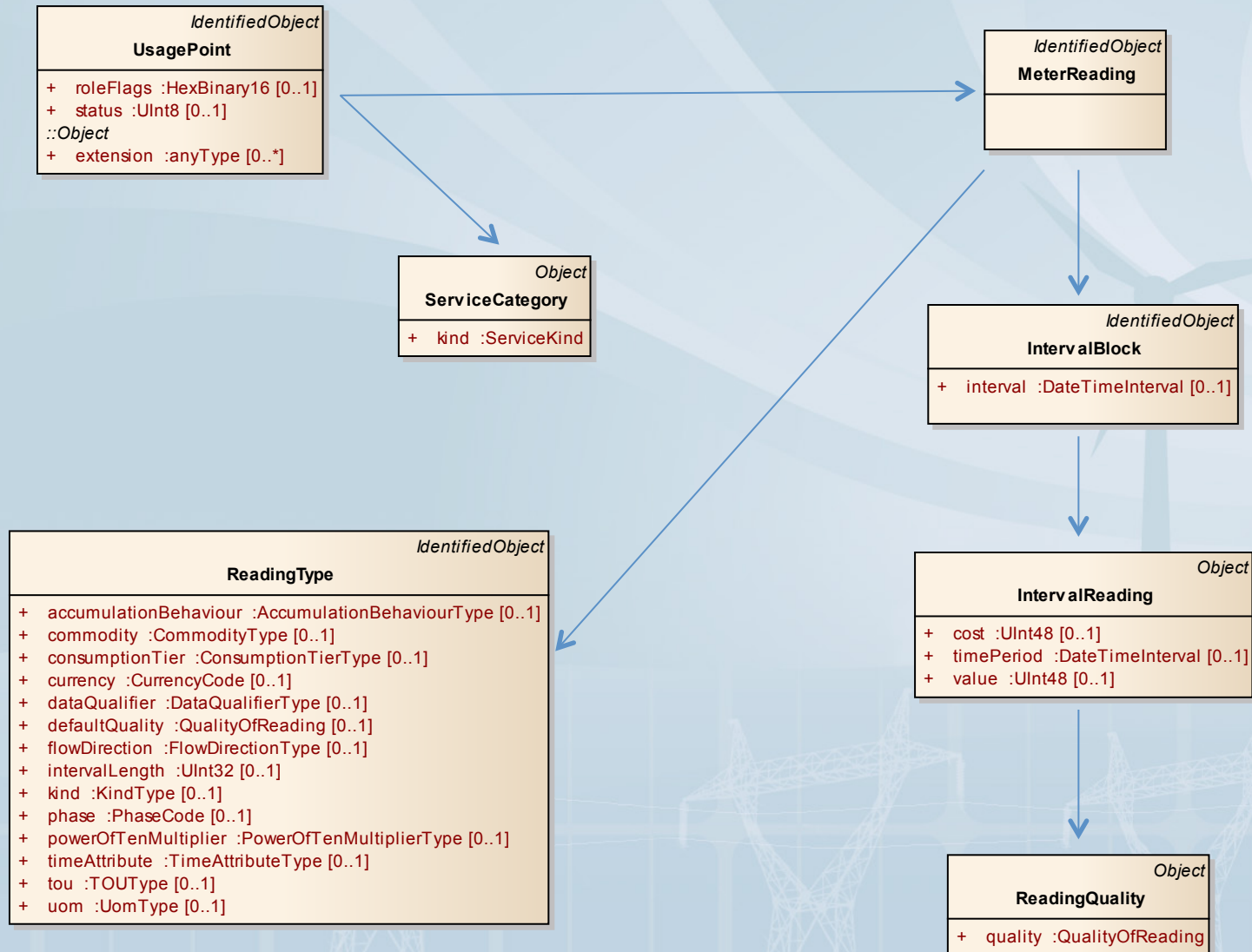
Green Button Connect My Data

Green Button Data Exchange

NAESB ESPI REQ.21 aka Green Button

UsagePoint
IdentifiedObject

+ roleFlags :HexBinary16 [0..1]
+ status :UInt8 [0..1]
::Object
+ extension :anyType [0..*]

ServiceCategory
Object

+ kind :ServiceKind

MeterReading
IdentifiedObject

IntervalBlock
IdentifiedObject

+ interval :DateTimeInterval [0..1]

ReadingType
IdentifiedObject

+ accumulationBehaviour :AccumulationBehaviourType [0..1]
+ commodity :CommodityType [0..1]
+ consumptionTier :ConsumptionTierType [0..1]
+ currency :CurrencyCode [0..1]
+ dataQualifier :DataQualifierType [0..1]
+ defaultQuality :QualityOfReading [0..1]
+ flowDirection :FlowDirectionType [0..1]
+ intervalLength :UInt32 [0..1]
+ kind :KindType [0..1]
+ phase :PhaseCode [0..1]
+ powerOfTenMultiplier :PowerOfTenMultiplierType [0..1]
+ timeAttribute :TimeAttributeType [0..1]
+ tou :TOUType [0..1]
+ uom :UomType [0..1]

IntervalReading
Object

+ cost :UInt48 [0..1]
+ timePeriod :DateTimeInterval [0..1]
+ value :UInt48 [0..1]

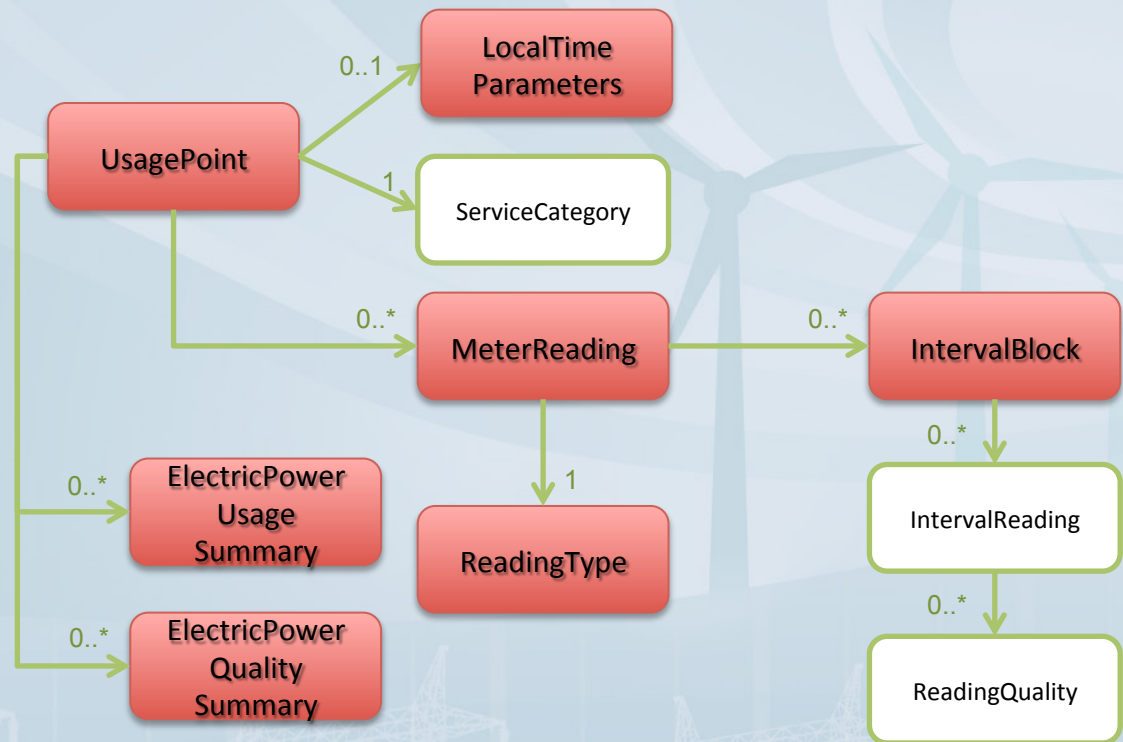**ReadingQuality**
Object

+ quality :QualityOfReading

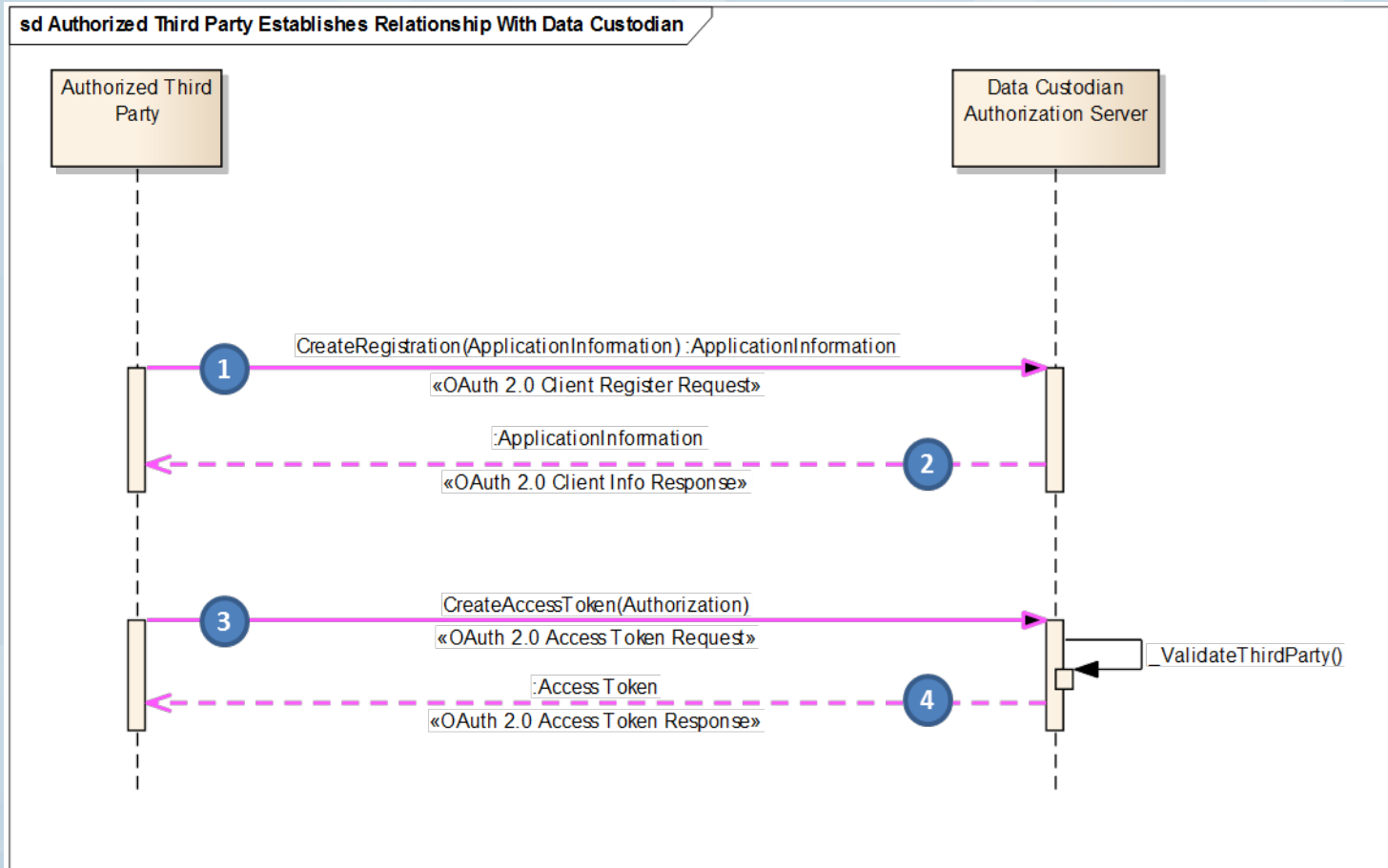# Composition and Atom Feed

Syntactic Model
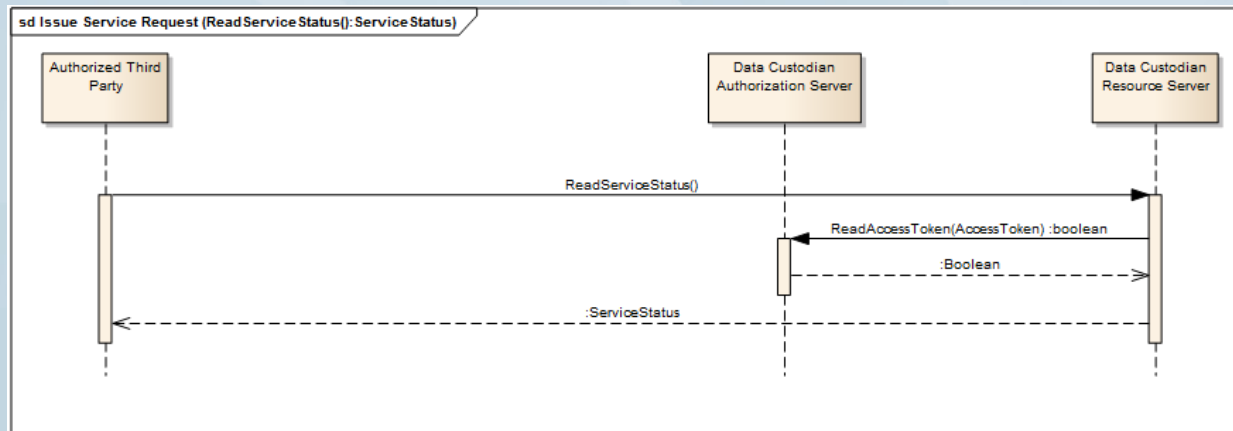Atom Feed View
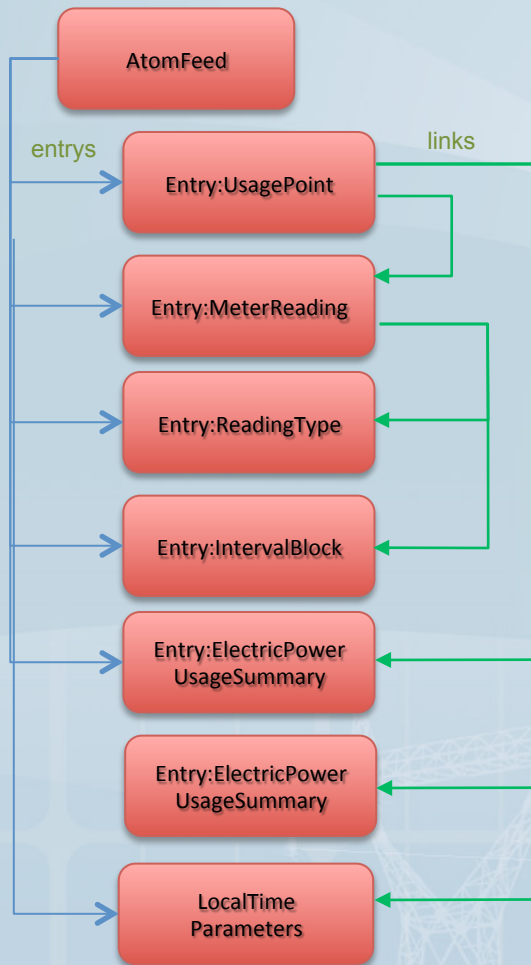
Information Model
Profile View

Note: This information is multidimensional. Many different reading types, summaries, and readings possible. i.e. not "flat"
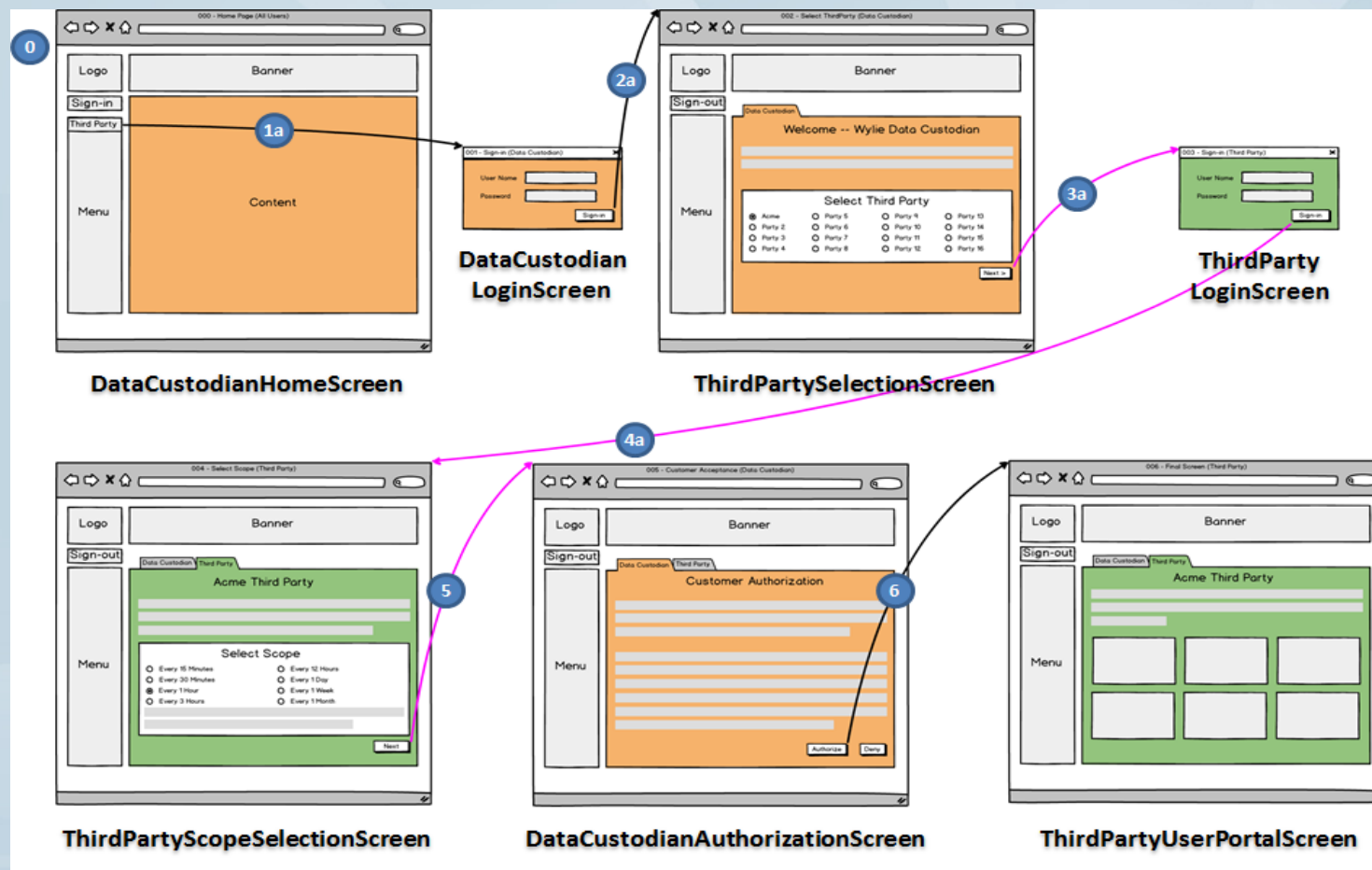
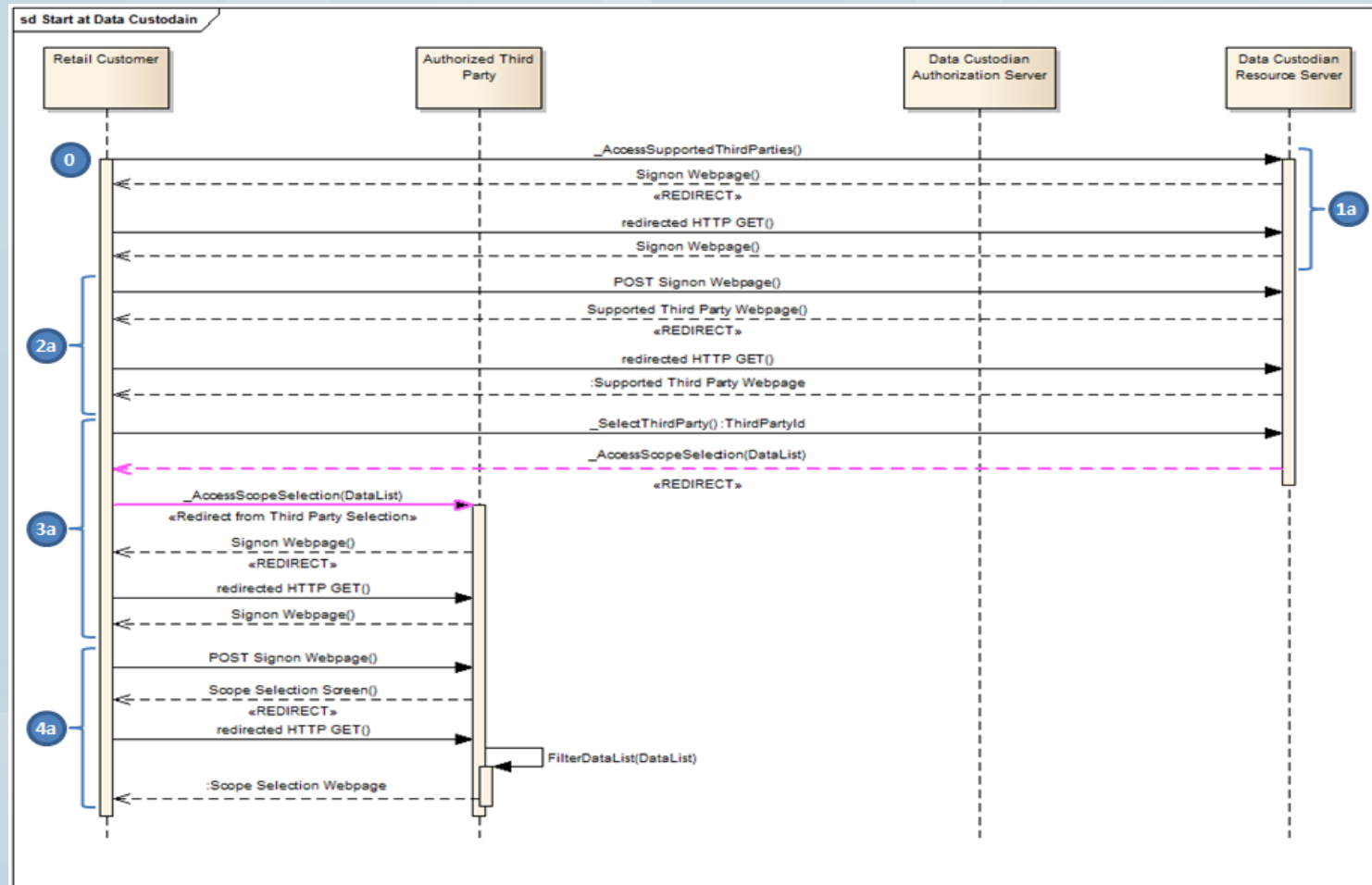# Green Button Connect My Data Registration

sd Authorized Third Party Establishes Relationship With Data Custodian

Authorized Third Party | Data Custodian Authorization Server

1 — CreateRegistration(ApplicationInformation) :ApplicationInformation
«OAuth 2.0 Client Register Request»

2 — :ApplicationInformation
«OAuth 2.0 Client Info Response»

3 — CreateAccessToken(Authorization)
«OAuth 2.0 Access Token Request»

_ValidateThirdParty()

4 — :AccessToken
«OAuth 2.0 Access Token Response»

Green Button Connect My Data Status and Notification

sd Issue Service Request (Read Service Status (): Service Status)

Authorized Third Party → Data Custodian Resource Server: ReadServiceStatus()
Data Custodian Resource Server → Data Custodian Authorization Server: ReadAccessToken(AccessToken) :boolean
Data Custodian Authorization Server → Data Custodian Resource Server: :Boolean
Data Custodian Resource Server → Authorized Third Party: :ServiceStatus

Green Button Connect My Data
User Experience Guidelines

DataCustodianHomeScreen

DataCustodian LoginScreen

ThirdPartySelectionScreen

ThirdParty LoginScreen

ThirdPartyScopeSelectionScreen

DataCustodianAuthorizationScreen

ThirdPartyUserPortalScreen

Green Button Connect My Data RetailCustomer Authorization

Green Button Connect My Data RetailCustomer Authorization
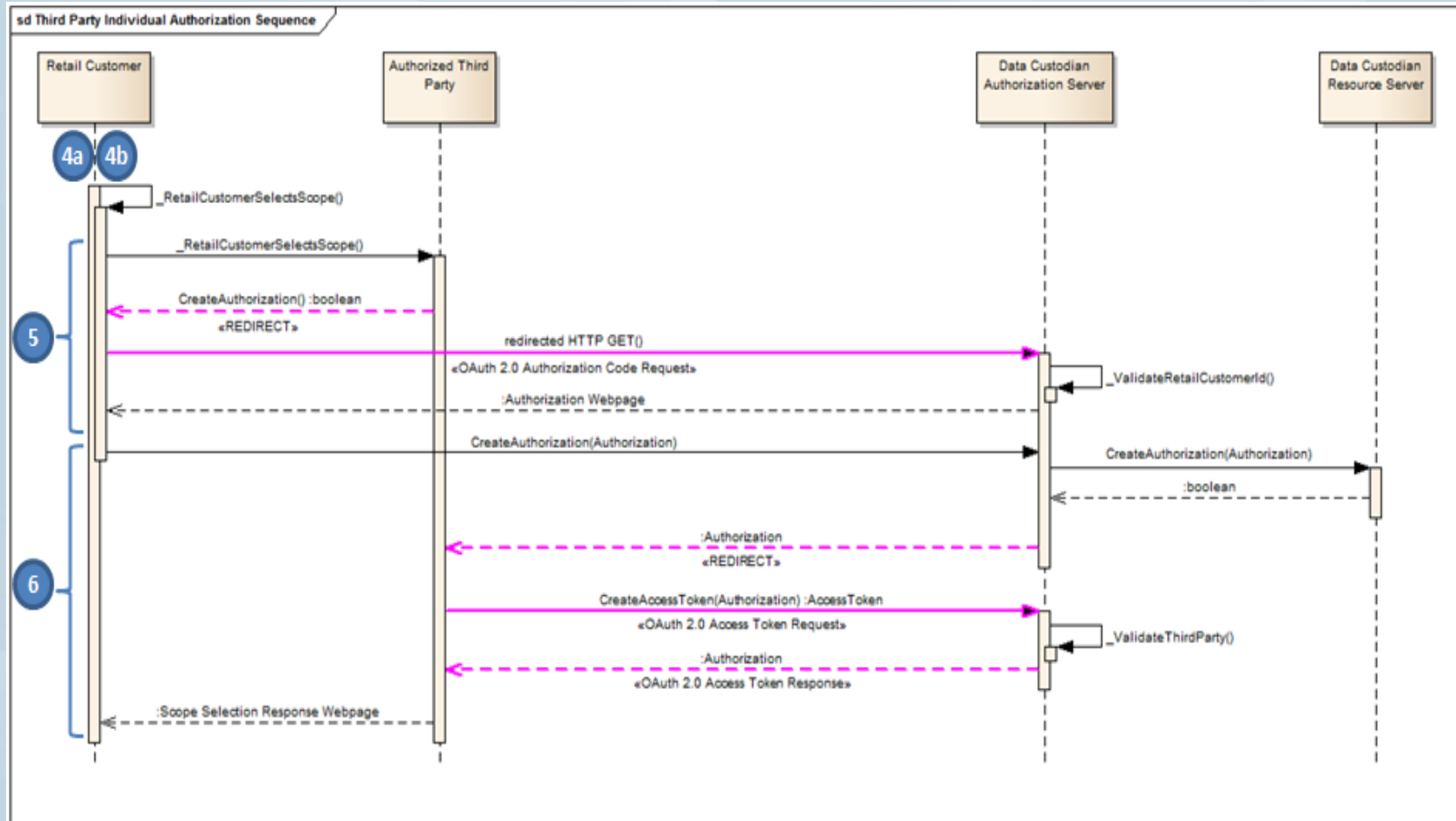
Green Button Connect My Data
Data Flows

sd 11: Authorized Third Party Receives (Pulls) Requested EUI from Data Custodian - Asynchronous

Authorized Third Party

Data Custodian Authorization Server

Data Custodian Resource Server

3 ReadData(DataResource) :Batch
«OAUTH 2.0 Information Request»

ReadAccessToken(AccessToken)

:boolean

4 :Batch
«OAUTH 2.0 Information Response»

Note: A valid Access Token is a precondition for all exchanges under the Authorization. The Third Party must be prepared to validate the Access Token prior to use or upon rejection by the Authorization Server. See the Third Party Validates Access Token sequence for details.

Open Source Green Button
https://github.com/energyos

Green Button Connect My Data Sandbox
http://services.greenbuttondata.org/

Green Button CMD Live API

Simple Agency Energy Manager
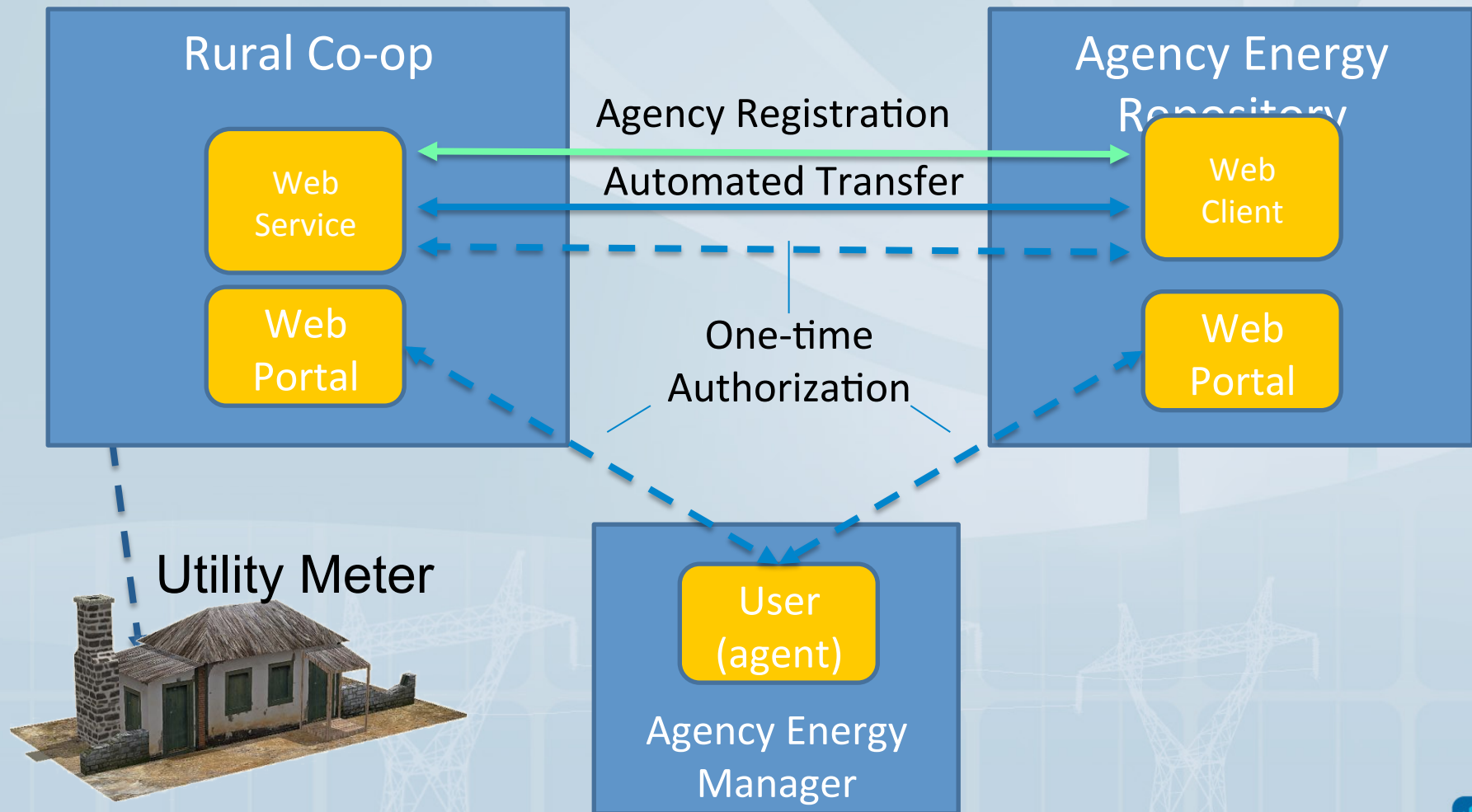
Where is More Technical Information

- Base Standard
    - http://www.naesb.org/ESPI_Standards.asp
- Developer Info
    - Content, Generation, and Samples (DMD)
        - https://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/GreenButtonSDK
    - Open Source (DMD/CMD)
        - http://energyos.github.io/OpenESPI-GreenButton-API-Documentation/API/
        - http://energyos.github.io/OpenESPI-GreenButton-API-Documentation/
        - https://github.com/energyos/OpenESPI-Common-java
        - https://github.com/energyos/OpenESPI-DataCustodian-java
        - https://github.com/energyos/OpenESPI-ThirdParty-java
    - SandBox (alpha)
        - https:/services.greenbuttondata.org/DataCustodian
        - https:/services.greenbuttondata.org/ThirdParty

- Testing and Certification
    - Download My Data Self-test tool
        - http://www.greenbuttondata.org/greentest.aspx
    - UCAIug OpenADE Task Force Testing Artifacts
        - OpenADE Test Plan Files

Information for YOU!

Thank You