OM2M: Interoperable M2M service platform

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www.om2m.org

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- The current marketplace is extremely fragmented, which has increased the R&D cost in each specific domain.

- Current M2M silo model is not an efficient way to communicate, it is a barrier to further development.

- Many vertical M2M solutions have been designed independently and separately for different applications, which impedes large-scale M2M deployment.

Standards landscape for M2M

- 143 organizations around the world are involved in M2M standardization according to the Global Standards Collaboration M2MTask Force.

MS
T F M2M Standardization Task Force

Standards for M2M service capabilities

Standards for M2M Service capabilities:
Target: end-to end enablement across servers, gateways, devices with standardized service interfaces.
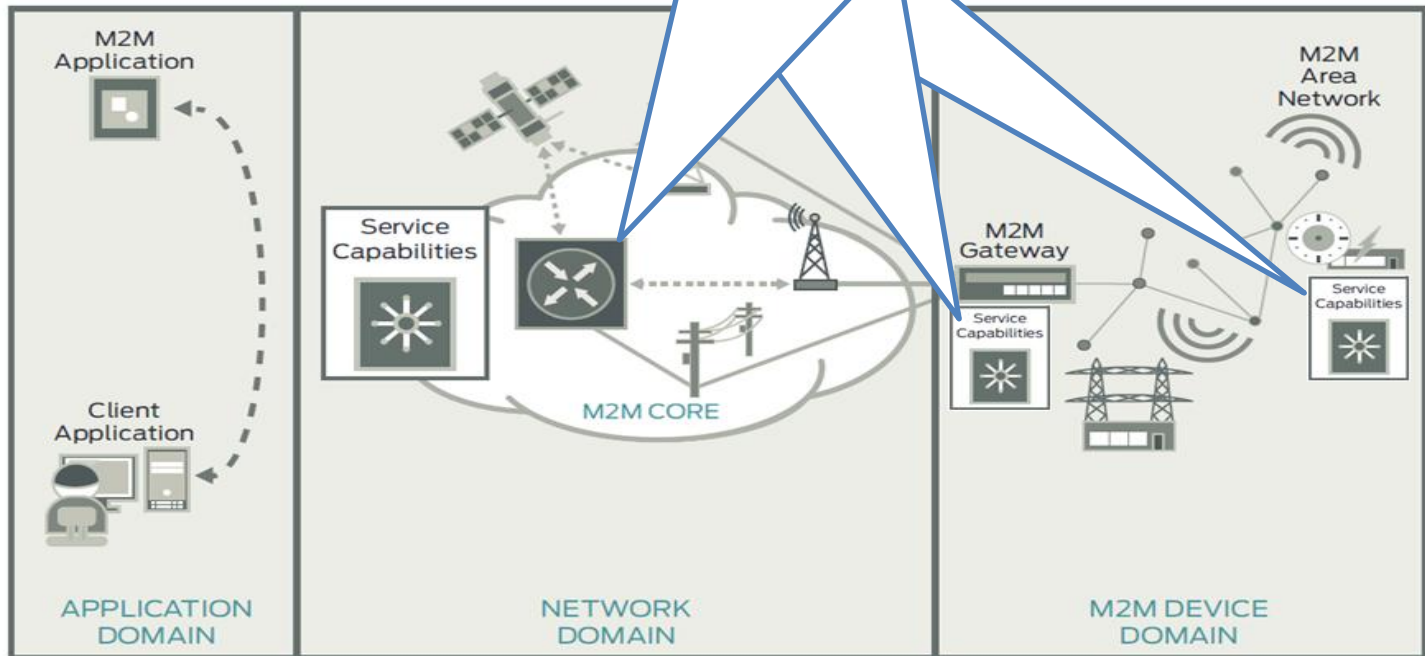

M2M network

Smart M2M standard (ETSI M2M)

- Provide a horizontal M2M service platform with a generic set of service capabilities to enable M2M interoperability in terms of communication and data.

- Define a Service Capability Layer (SCL) on top of connectivity layers:
  - SCL deployed in network server, gateways and devices.
  - SCL enables discovery, registration, authentication, data-transfer using containers, publish/subscribe, groups, access rights, security, etc.

- Interface with existing technologies:
  - Multiple communication protocol binding.
  - Re-use existing remote device management.
  - Interwork with vendor-specific and legacy devices.

- Facilitate innovation across industries by exposing data and providing services.
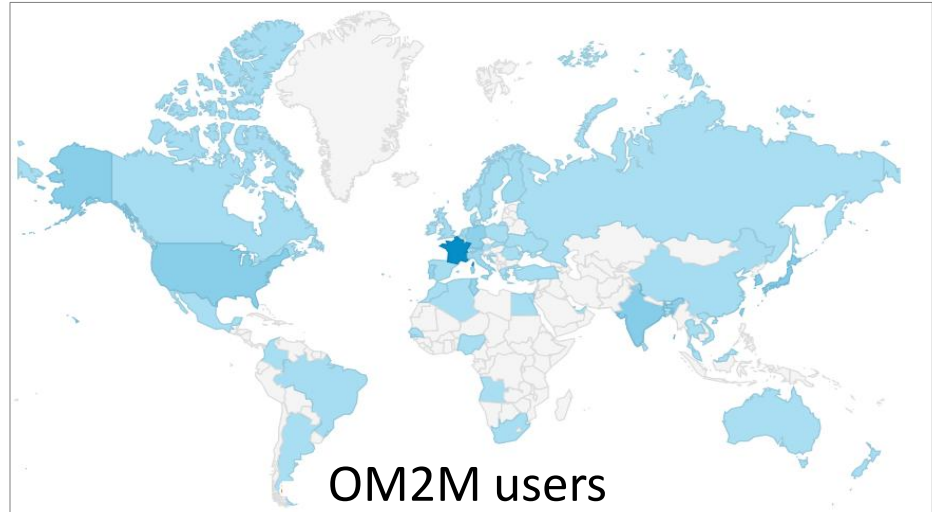

Source: ETSI M2M
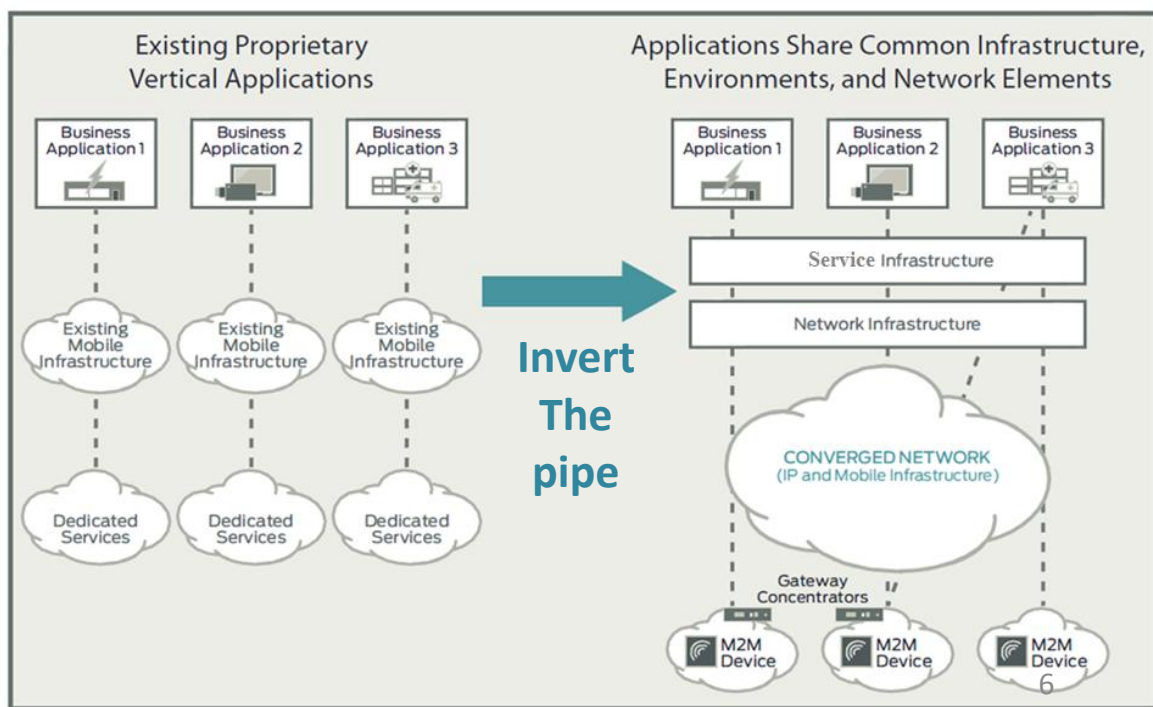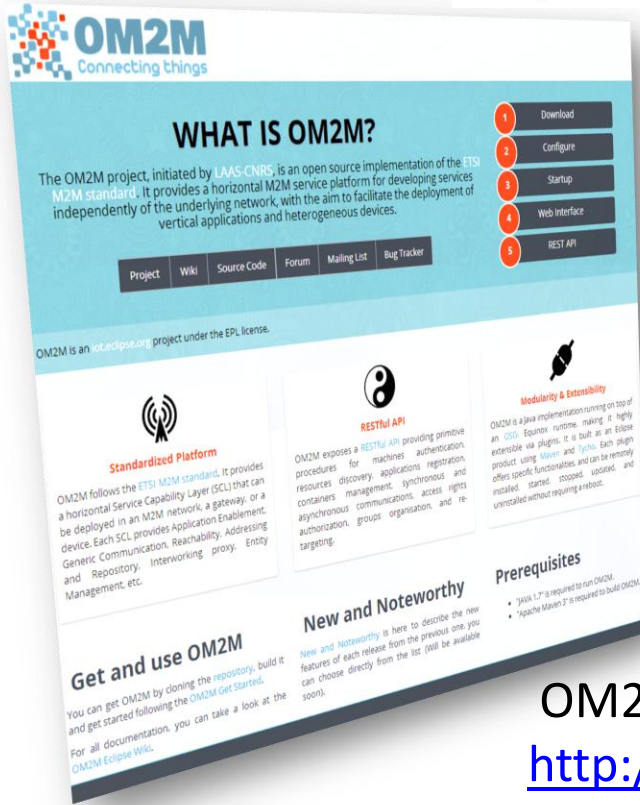
OM2M is an open source implementation of the Smart M2M standard, and is a member of Eclipse IoT Working Group.

OM2M Interested parties

OM2M web site
http://om2m.org

Eclipse IoT collaboration

OM2M users

OM2M architecture

End user devices

Data Analytic

SCADA Interface

M2M Server

HTTP/CoAP

HTTP/CoAP

M2M gateway

ZIGBEE

MQTT.ORG

phidgets

ZigBee

6LoWPAN

KNX

OM2M functional architecture

- OM2M provides a Service Capability Layer (SCL) including a set of common services for M2M interoperability.
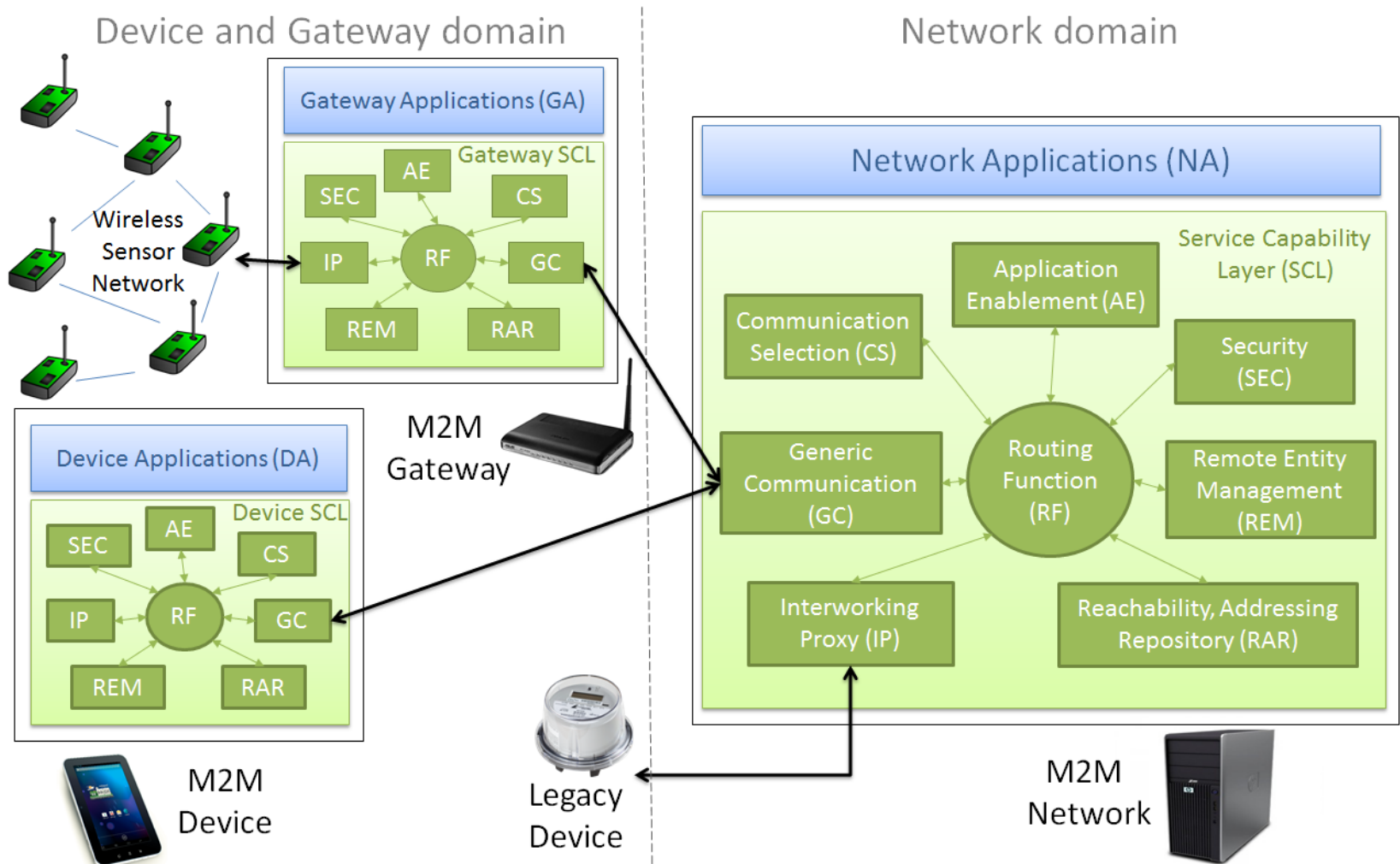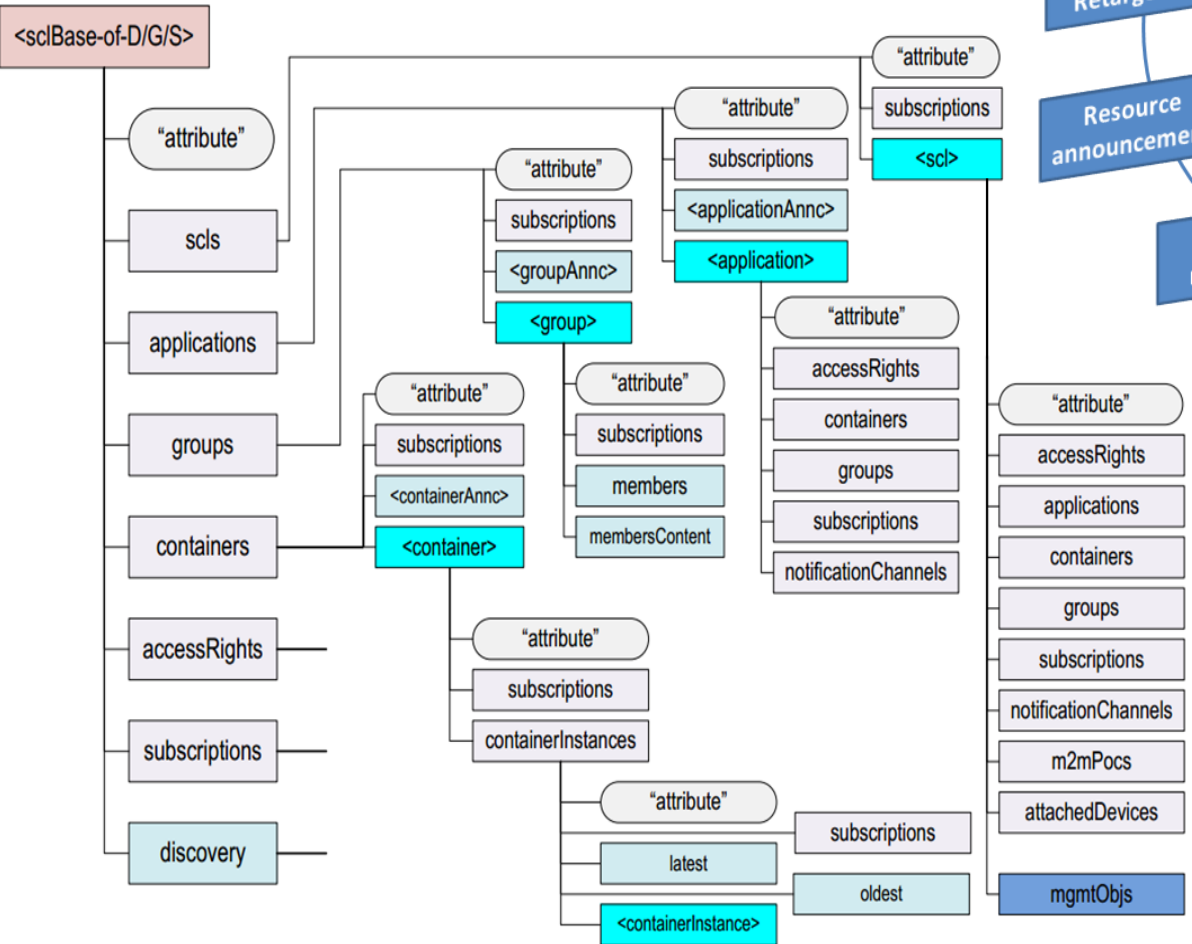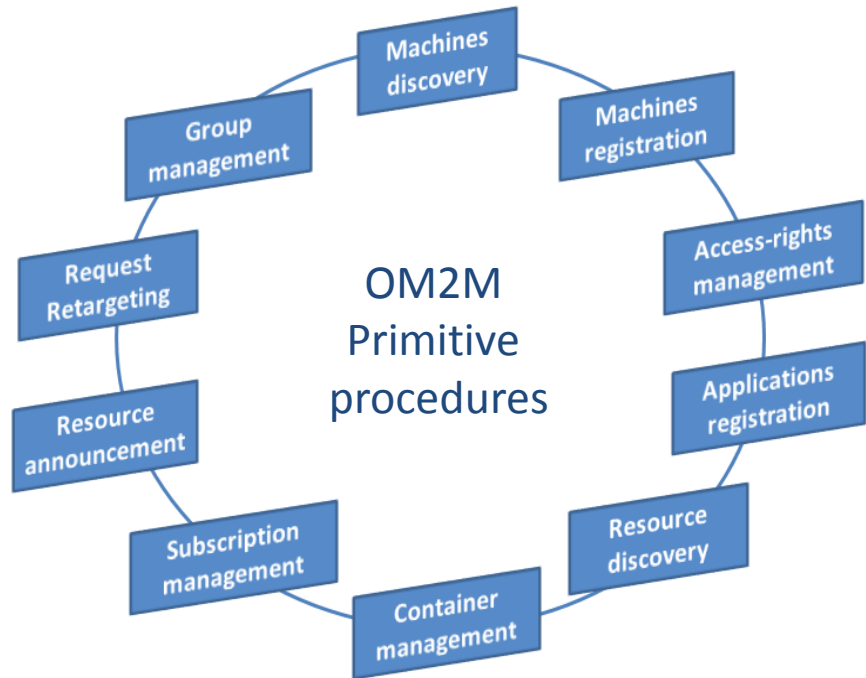- A SCL can be deployed on the Network domain, or on the Device and Gateway domain.

LAAS-CNRS
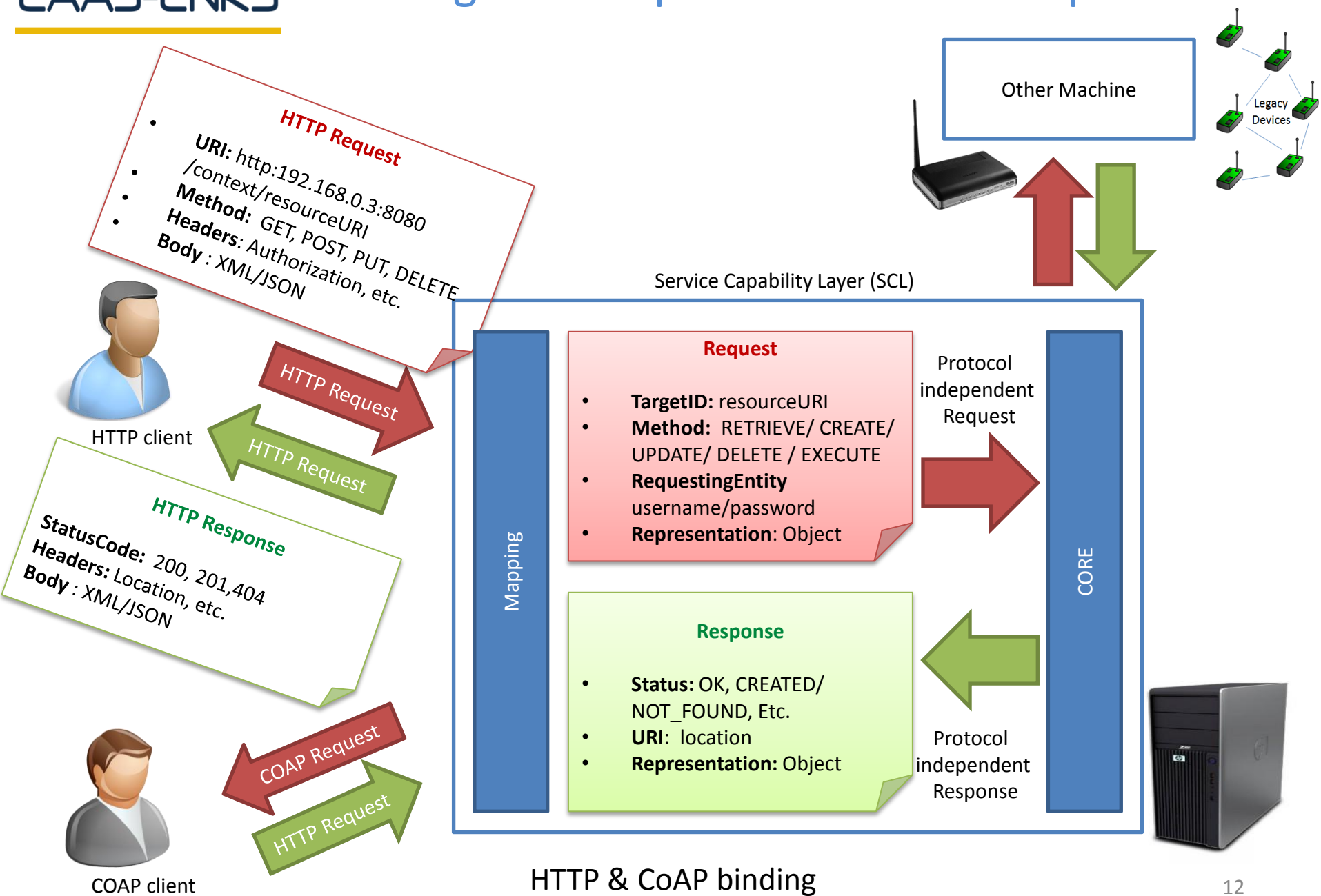
- OM2M implements a RESTful API.
- All M2M communications are performed based on simple primitive procedures.
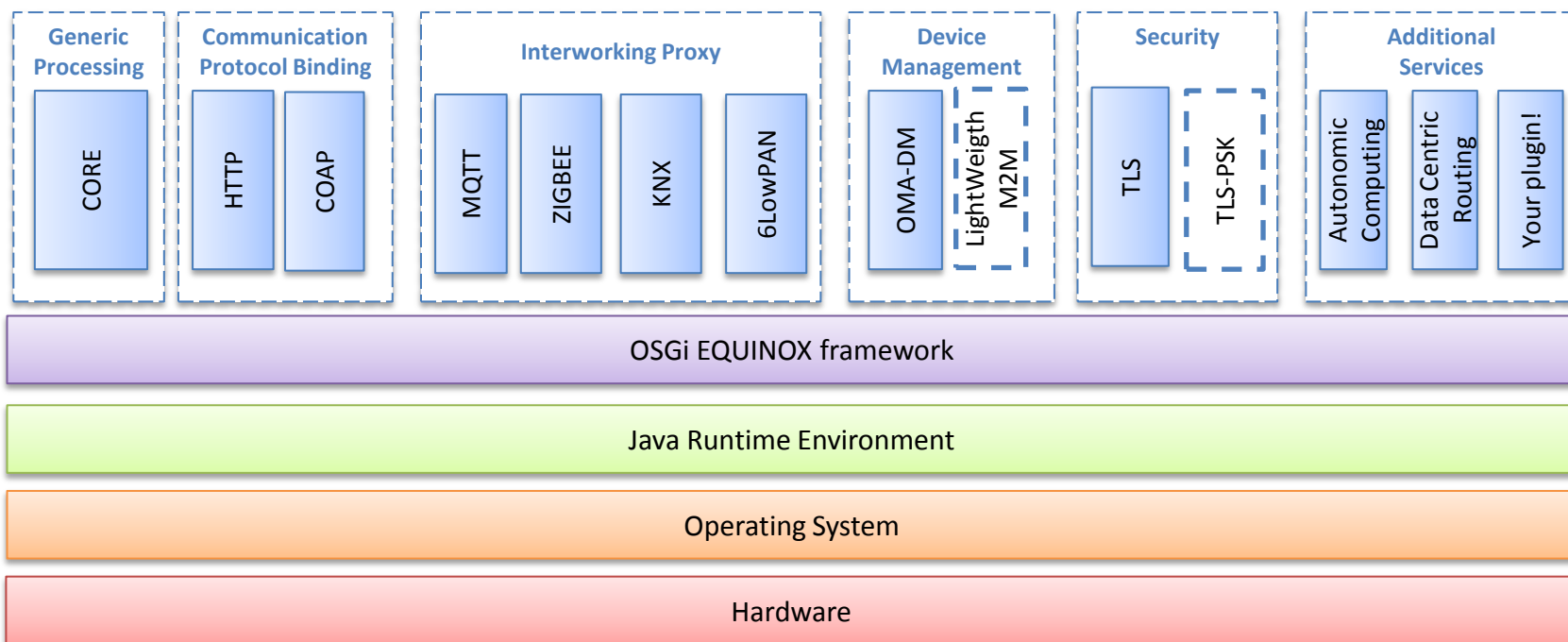

OM2M Primitive procedures

SCL resource tree structure

- Each SCL data model is structured using a standardized resource tree.
- The resources can be simply triggered using basic CRUD requests.

OM2M resource tree example

Binding to multiple communication protocols

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HTTP Request
- **URI:** http:192.168.0.3:8080 /context/resourceURI
- **Method:** GET, POST, PUT, DELETE
- **Headers**: Authorization, etc.
- **Body** : XML/JSON

HTTP client

HTTP Request

HTTP Request

HTTP Response
StatusCode: 200, 201,404
Headers: Location, etc.
Body : XML/JSON

COAP Request

HTTP Request

COAP client

Other Machine

Legacy Devices

Service Capability Layer (SCL)

Mapping

Request
- **TargetID:** resourceURI
- **Method:** RETRIEVE/ CREATE/ UPDATE/ DELETE / EXECUTE
- **RequestingEntity** username/password
- **Representation**: Object

Protocol independent Request

CORE

Response
- **Status:** OK, CREATED/ NOT_FOUND, Etc.
- **URI**: location
- **Representation:** Object

Protocol independent Response

HTTP & CoAP binding
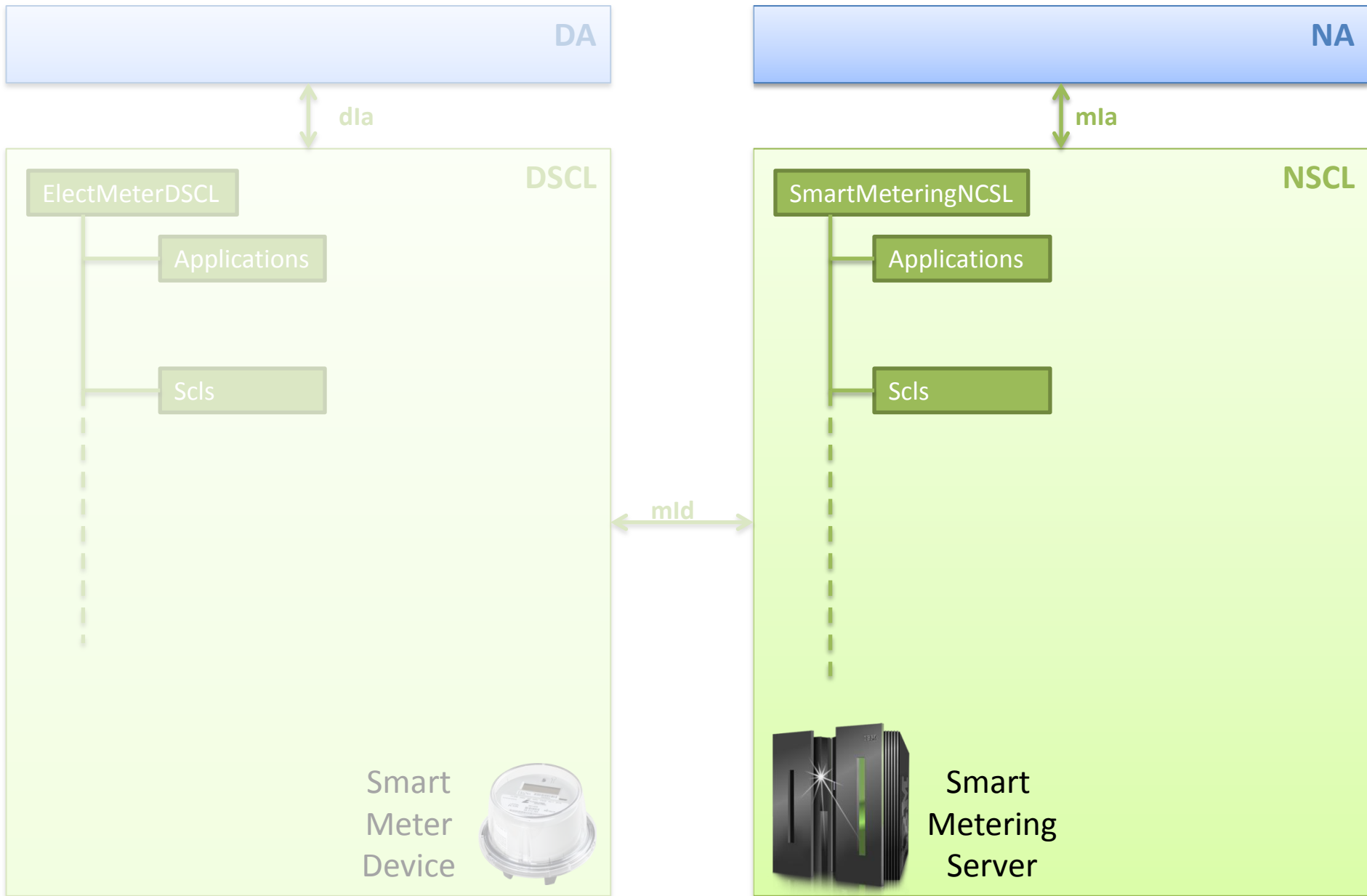
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OM2M building blocks

- OM2M is a java platform running on top of an OSGi Equinox runtime which make it highly extensible via plugins.

- Each SCL includes required plugins and is build as an Eclipse product using maven and Tycho.

Generic Processing	Communication Protocol Binding		Interworking Proxy				Device Management		Security		Additional Services		
CORE	HTTP	COAP	MQTT	ZIGBEE	KNX	6LowPAN	OMA-DM	LightWeigth M2M	TLS	TLS-PSK	Autonomic Computing	Data Centric Routing	Your plugin!

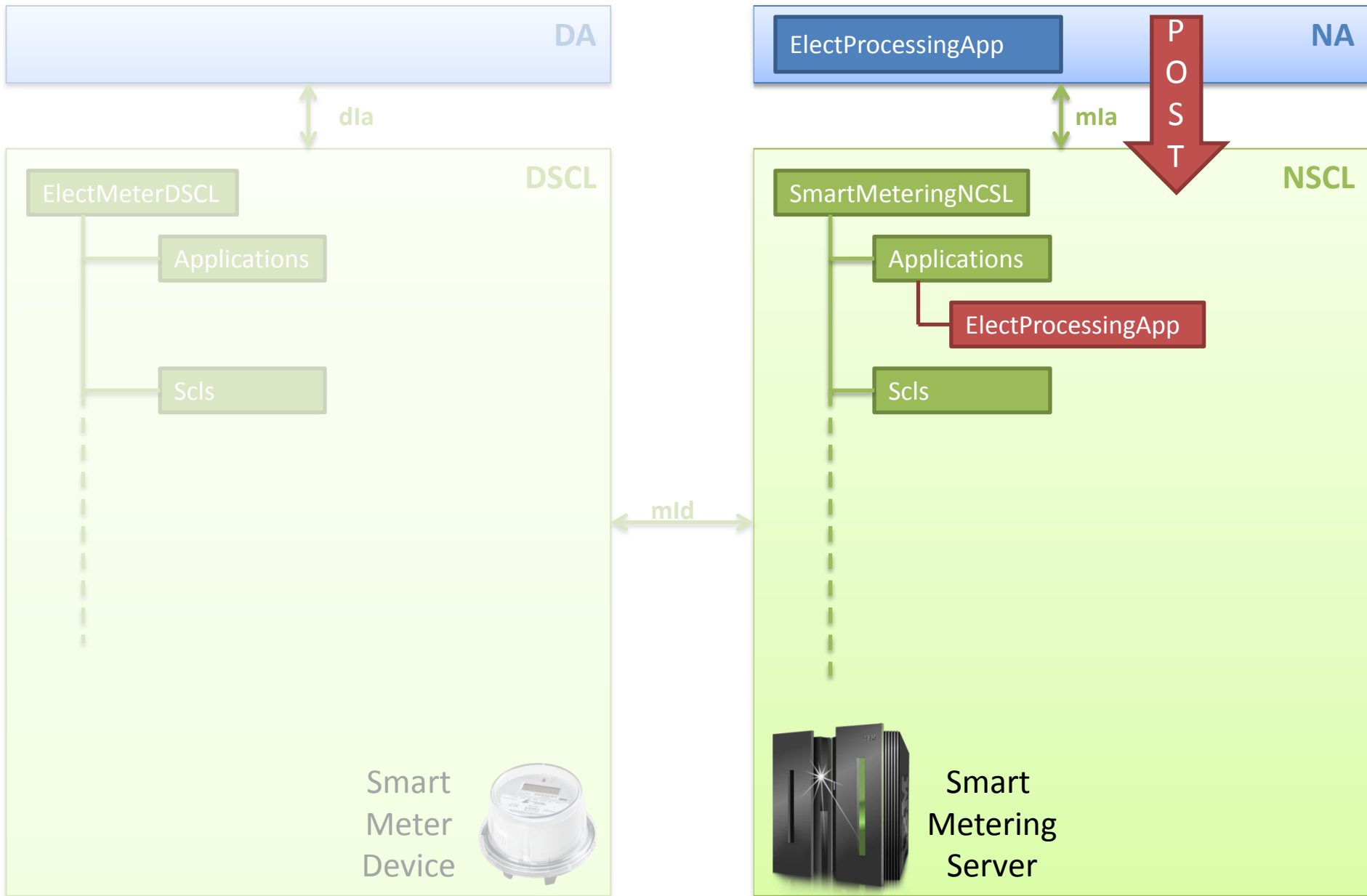| OSGi EQUINOX framework |
|---|
| Java Runtime Environment |
| Operating System |
| Hardware |

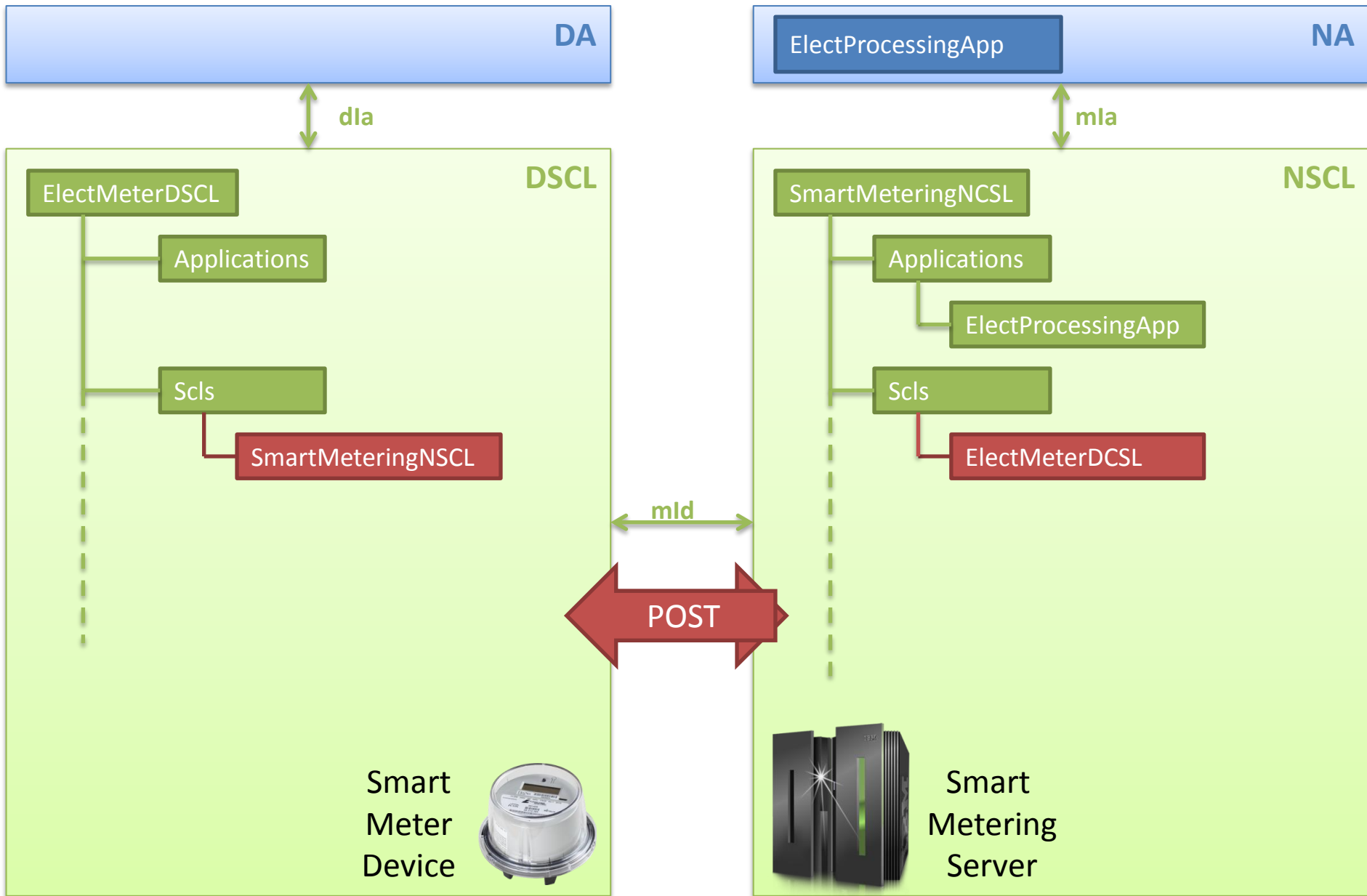**OM2M main building blocks**

M2M smart Metering Example 1

M2M smart Metering Example 1

A representation of the NSCL and DSCL along with their corresponding resource structure.
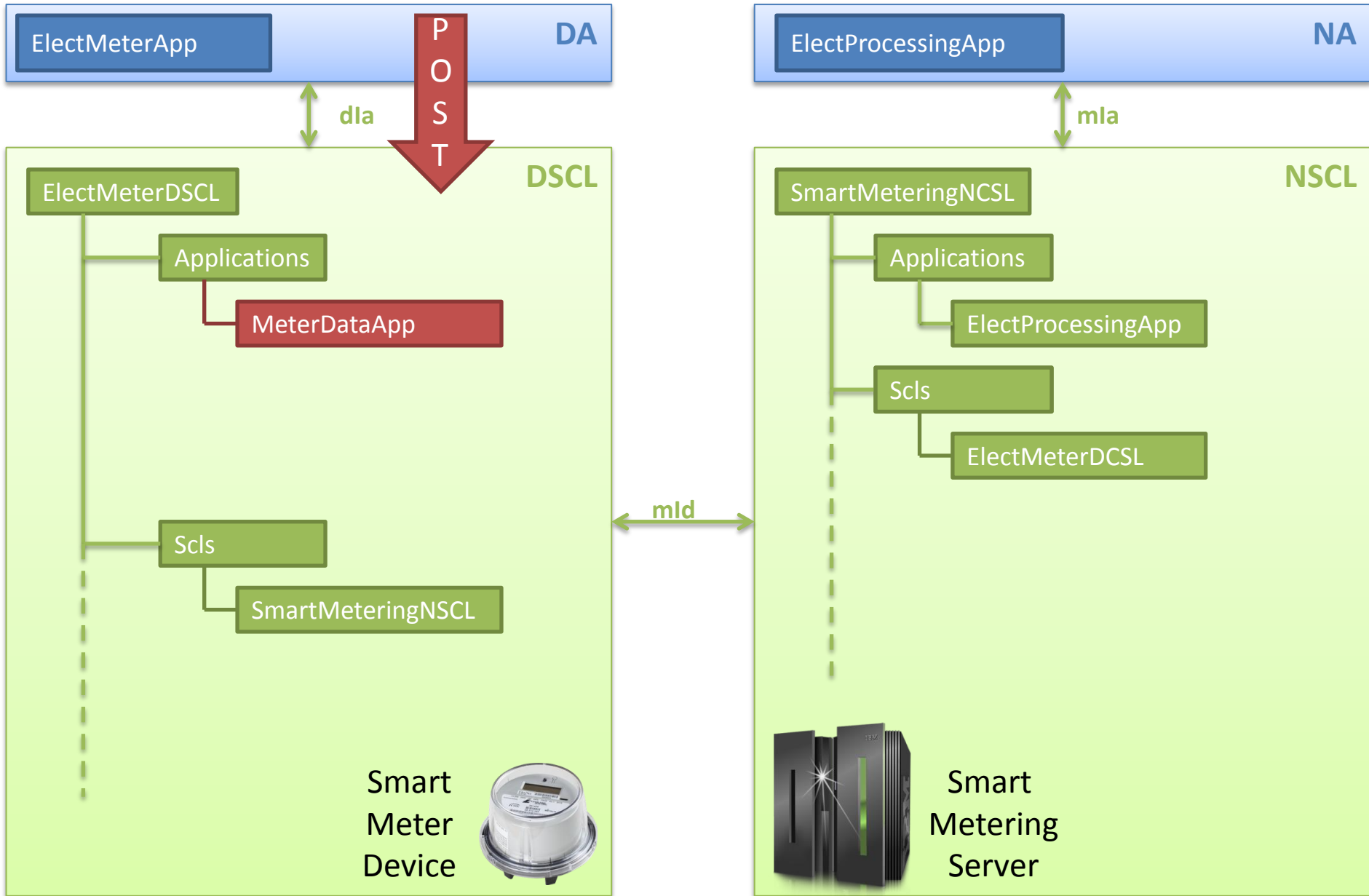
M2M smart Metering Example 1

DA

NA

ElectProcessingApp

P O S T

dIa

mIa

DSCL

NSCL

ElectMeterDSCL

SmartMeteringNCSL

Applications

Applications

ElectProcessingApp

Scls

Scls

mId

Smart Meter Device

Smart Metering Server

Step 1- Network Application Registers to the NSCL

M2M smart Metering Example 1

DA

NA

ElectProcessingApp

dIa

mIa

DSCL

NSCL

ElectMeterDSCL

SmartMeteringNCSL

Applications

Applications

ElectProcessingApp

Scls

Scls

SmartMeteringNSCL

ElectMeterDCSL

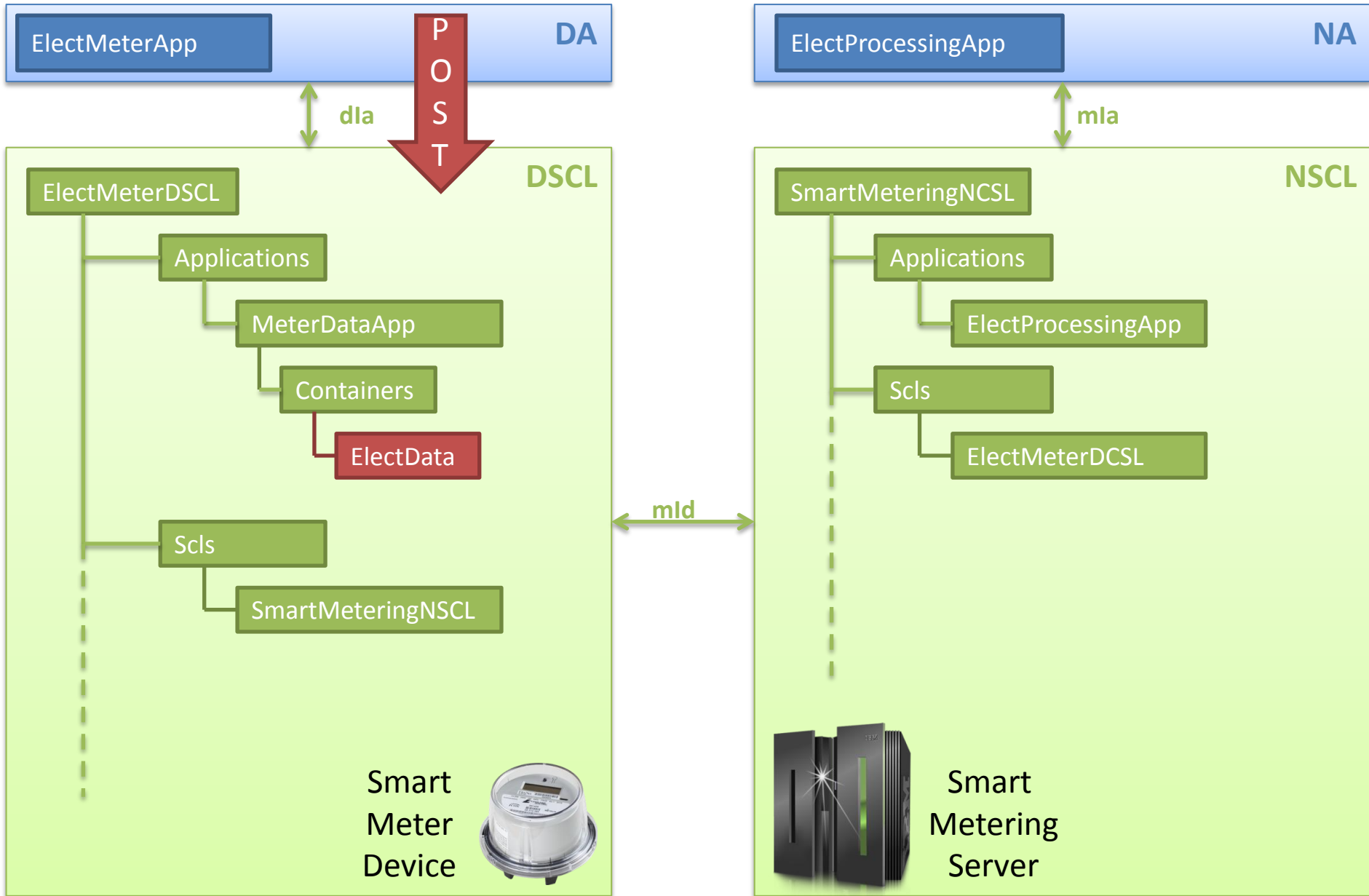mId

POST

Smart Meter Device

Smart Metering Server

Step 3- The Smart Meter Registers to the NSCL
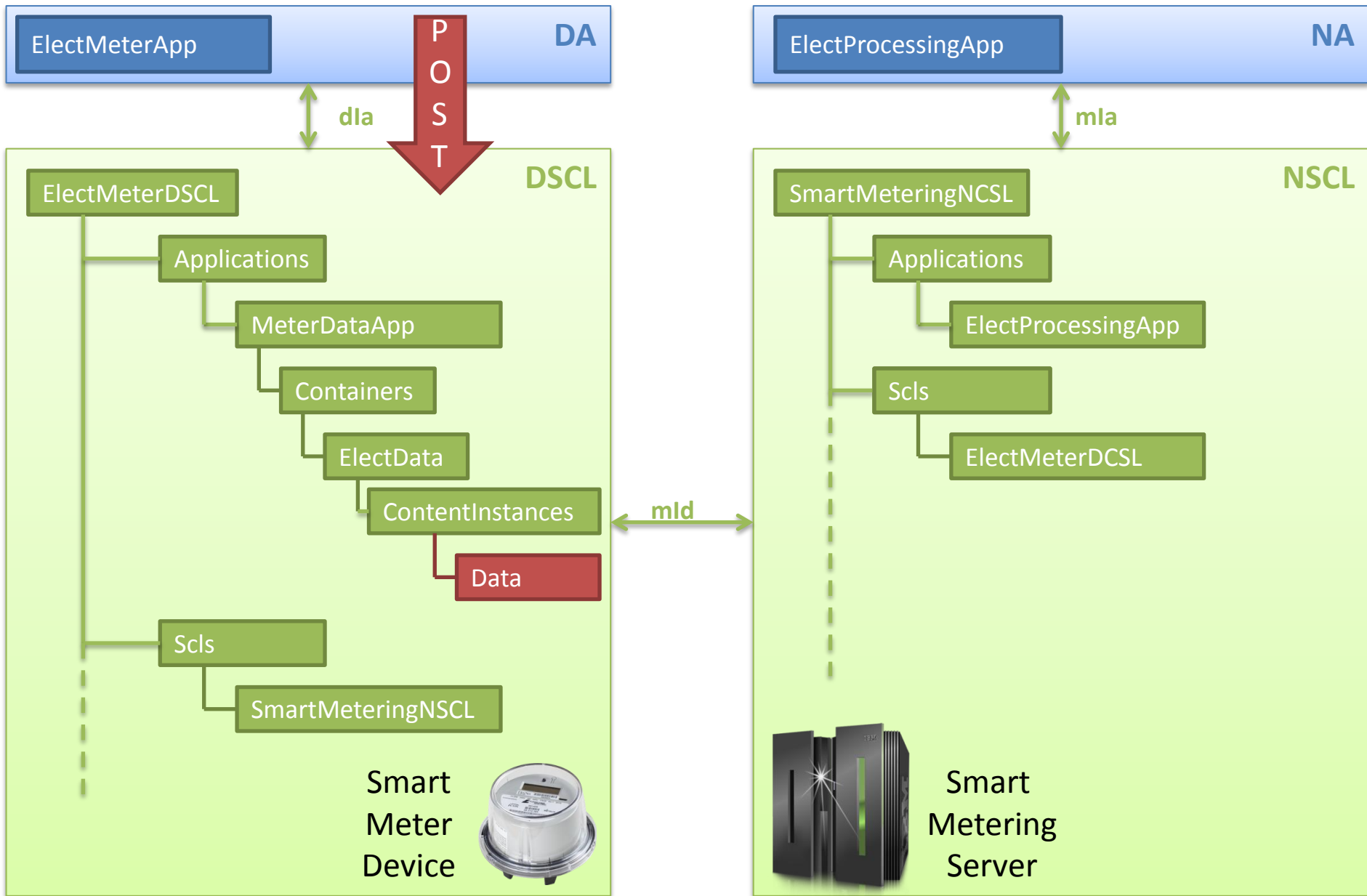
M2M smart Metering Example 1

Step 3- Device Application Registers to the DSCL
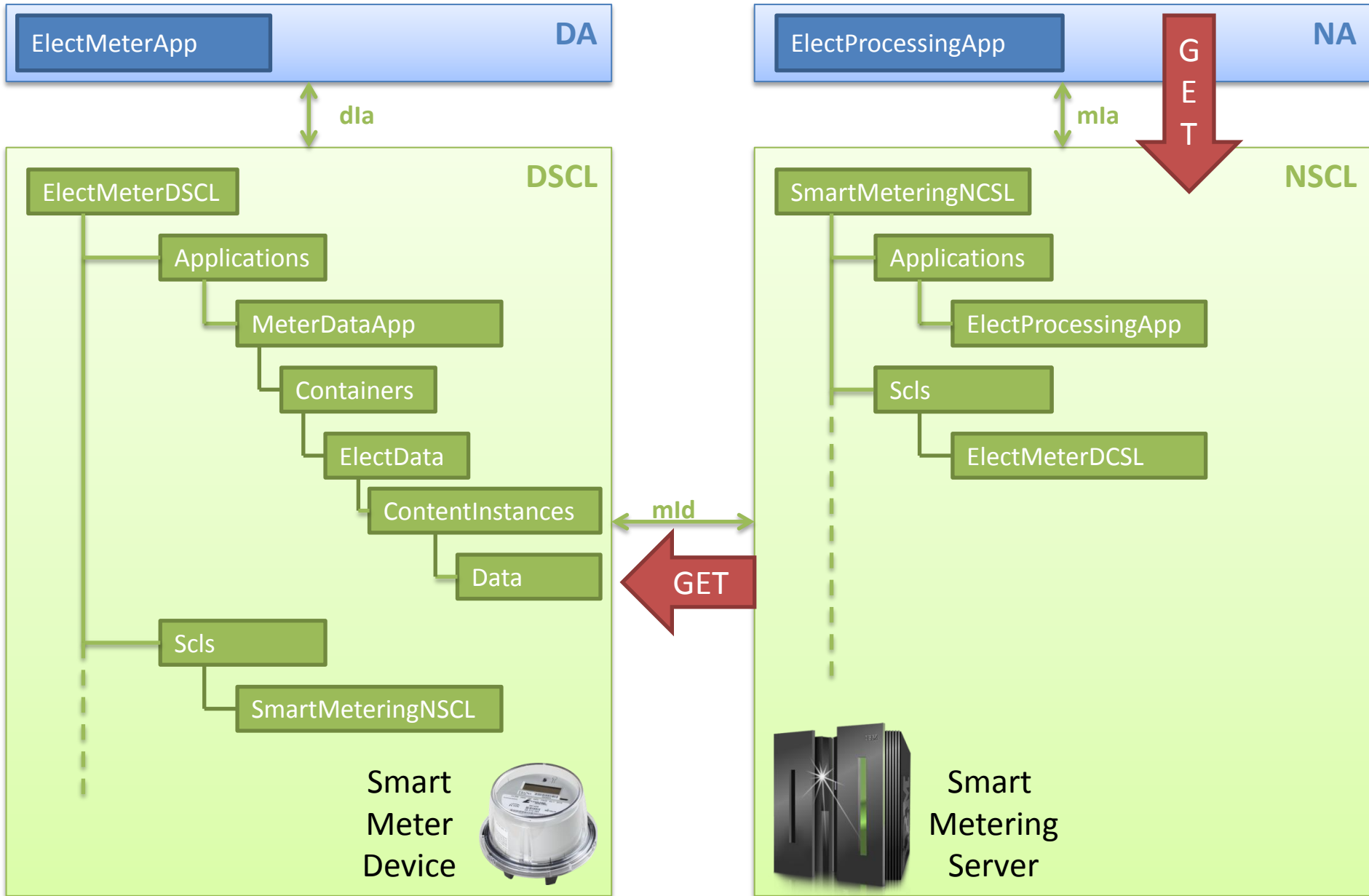
M2M smart Metering Example 1

Step 4- Device Application Creates An ElectData container
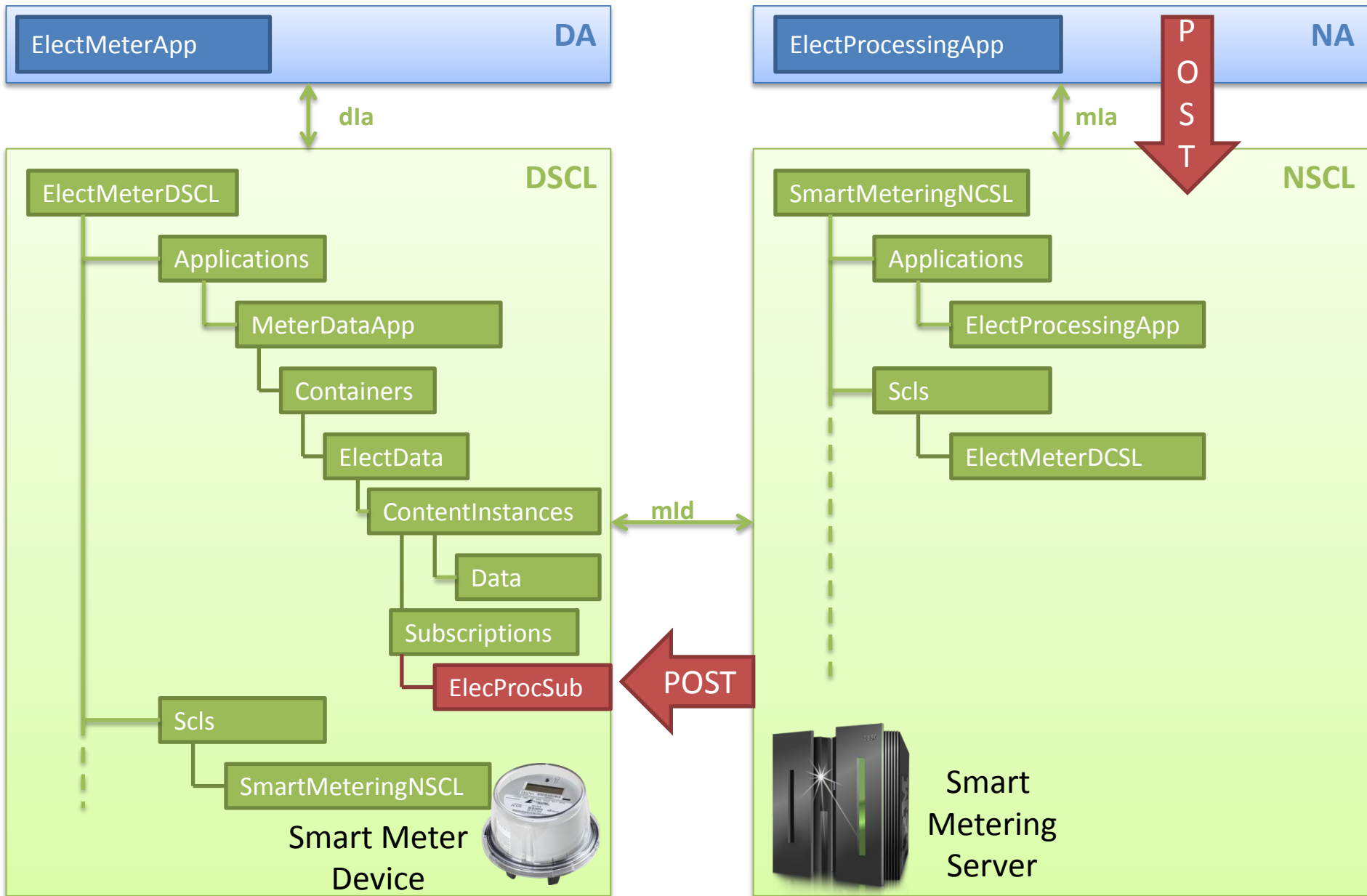
M2M smart Metering Example 1

Step 5- Device Application Creates a Data contentInstane
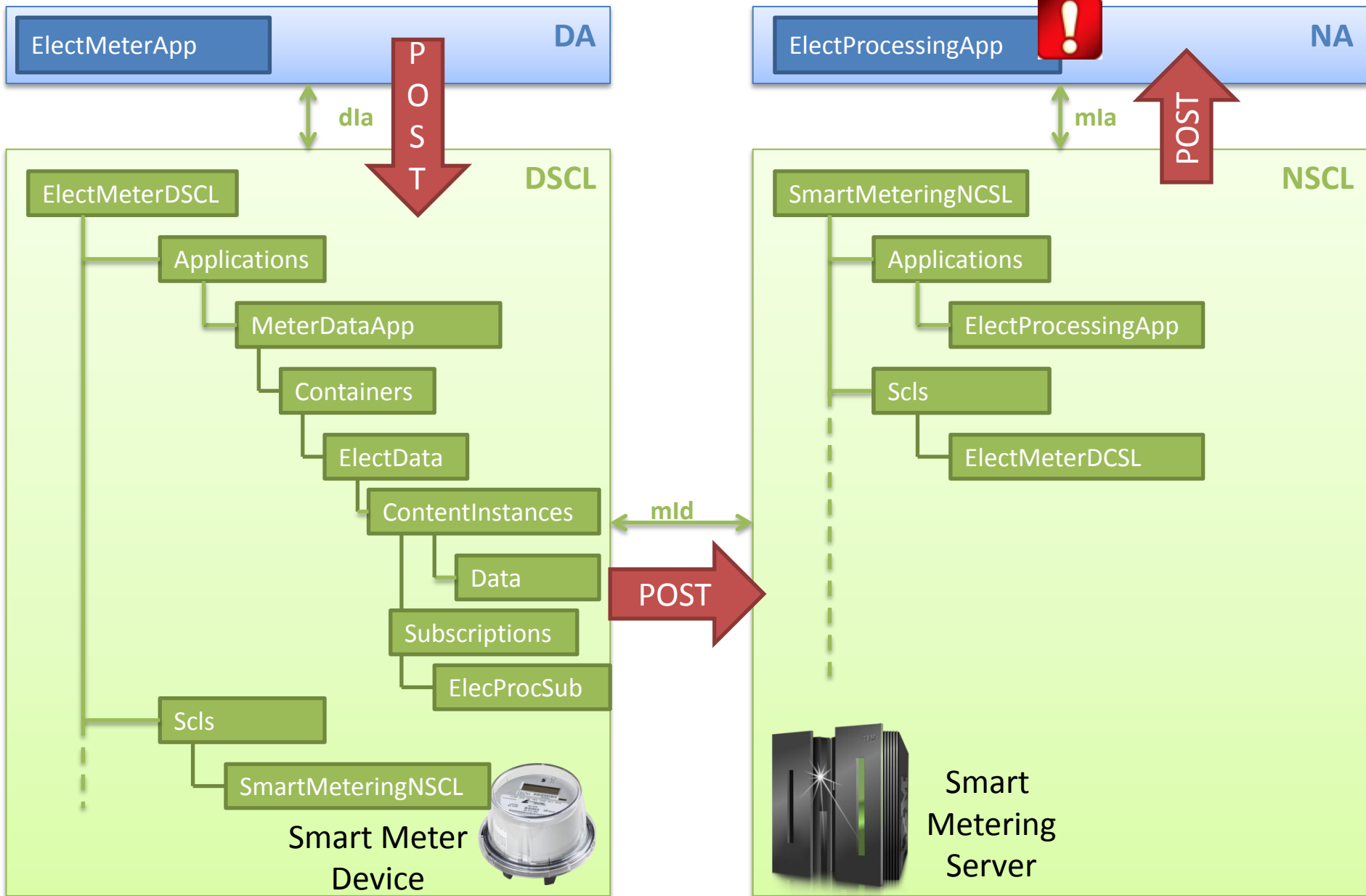
M2M smart Metering Example 1

Step 5- Network Application Read Data content Instance

M2M smart Metering Example 1

Step 5'- Network Application Create Subscription on ElectData contetnInstances
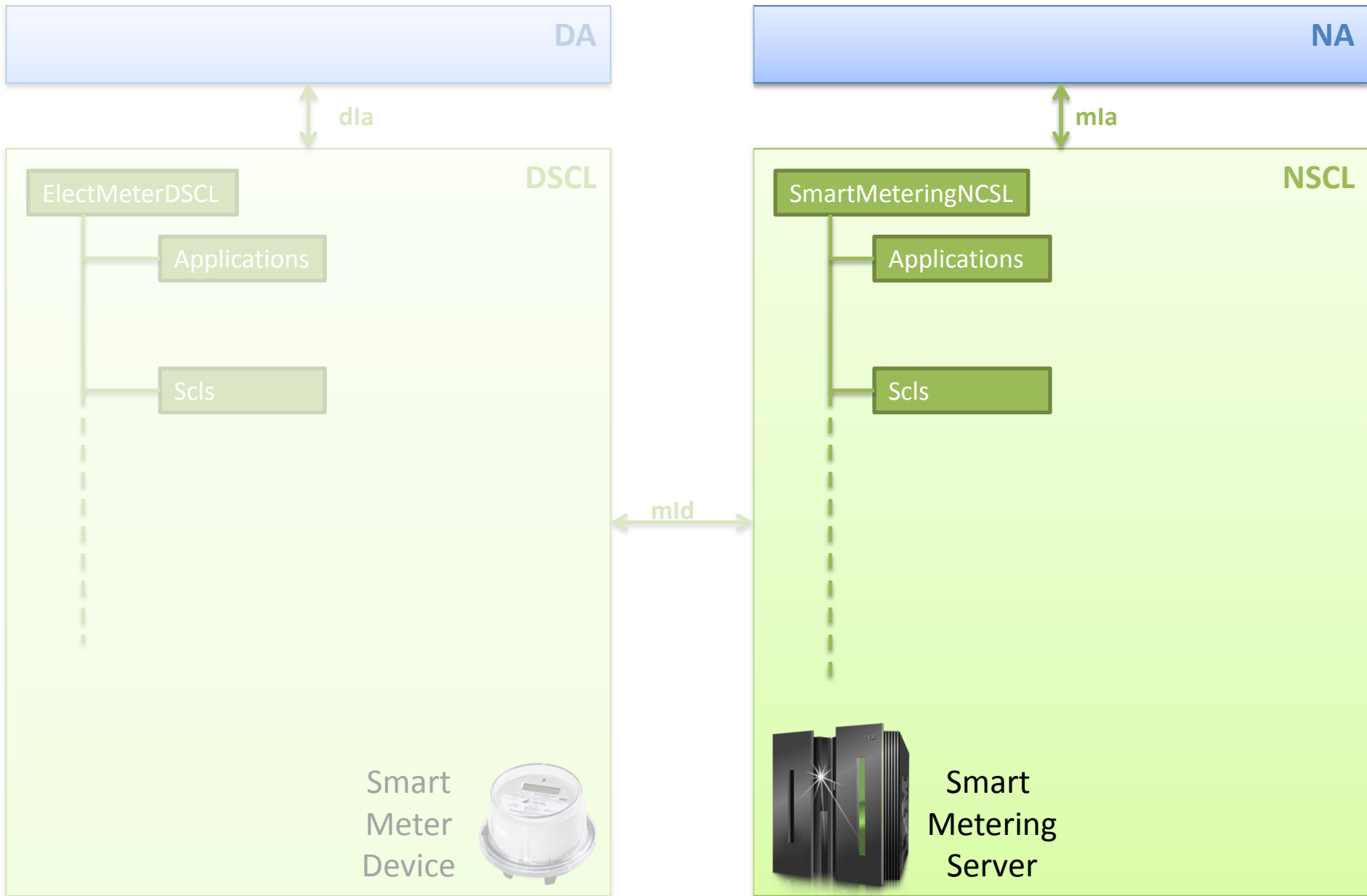
M2M smart Metering Example 1

Step 6'- Network Application receives notification

M2M smart Metering Example 2

M2M smart Metering Example 2

A representation of the NSCL and DSCL along with their corresponding resource structure.

M2M smart Metering Example 2

DA

dIa

DSCL

ElectMeterDSCL
- Applications
- Scls

Smart Meter Device

NA

ElectProcessingApp

post

mIa

NSCL

SmartMeteringNCSL
- Applications
  - ElectProcessingApp
- Scls

mId

Smart Metering Server
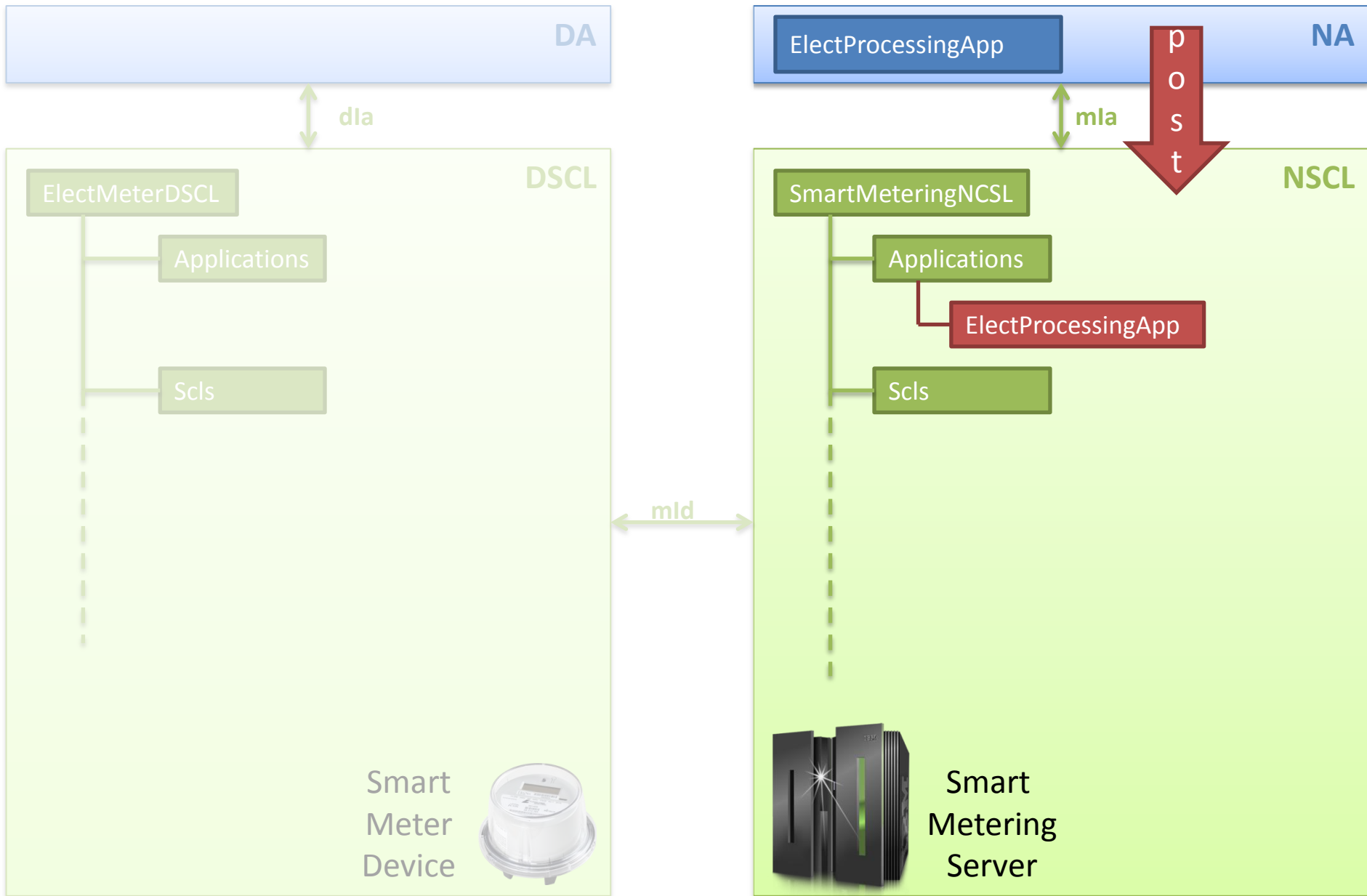
Step 1- Network Application Registration to the NSCL

M2M smart Metering Example 2
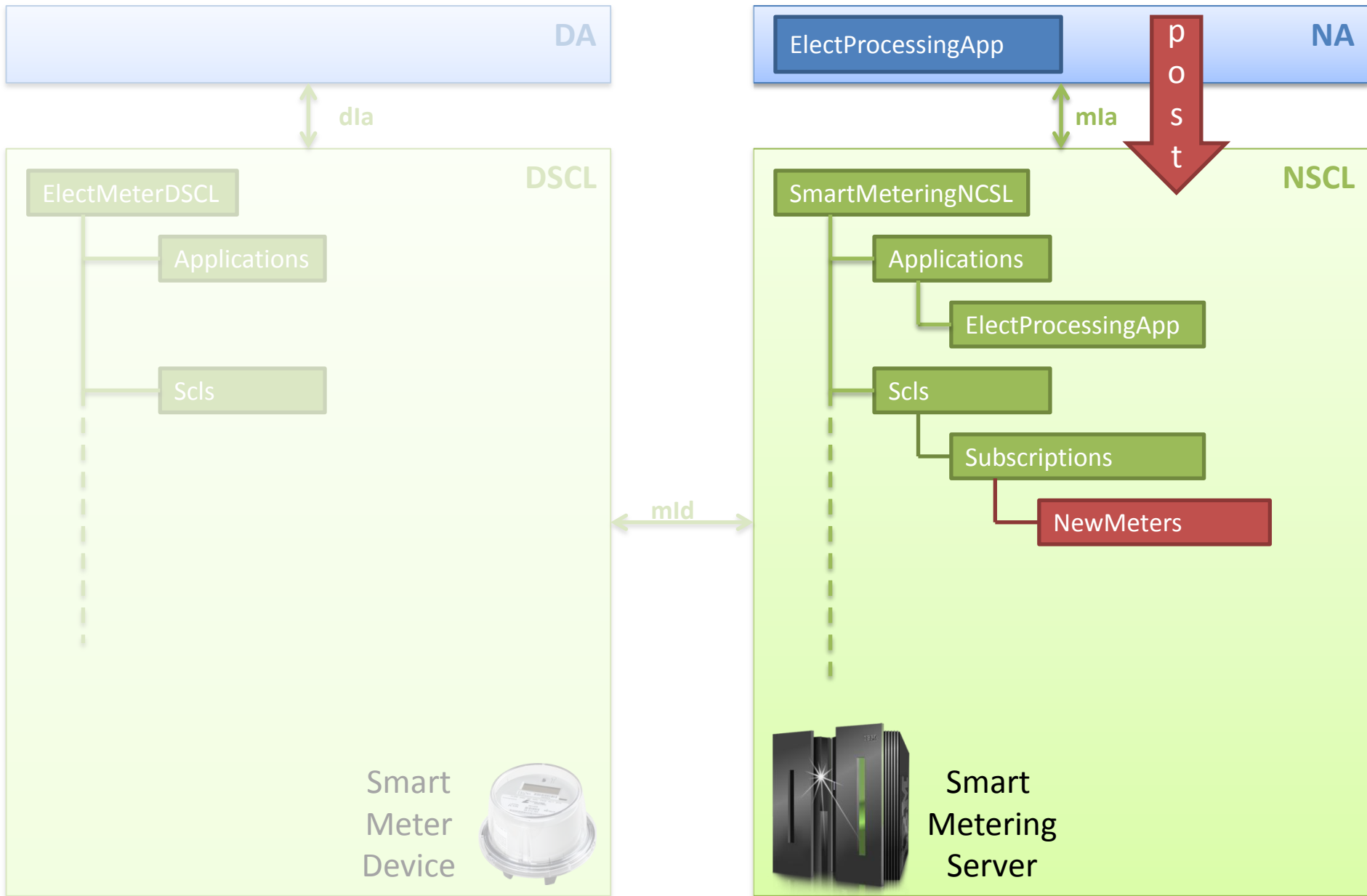
Step2- NA Subscribes for Registering Smart Meters

M2M smart Metering Example 2

Step 3- The Smart Meter Registers to the NSCL

M2M smart Metering Example 2
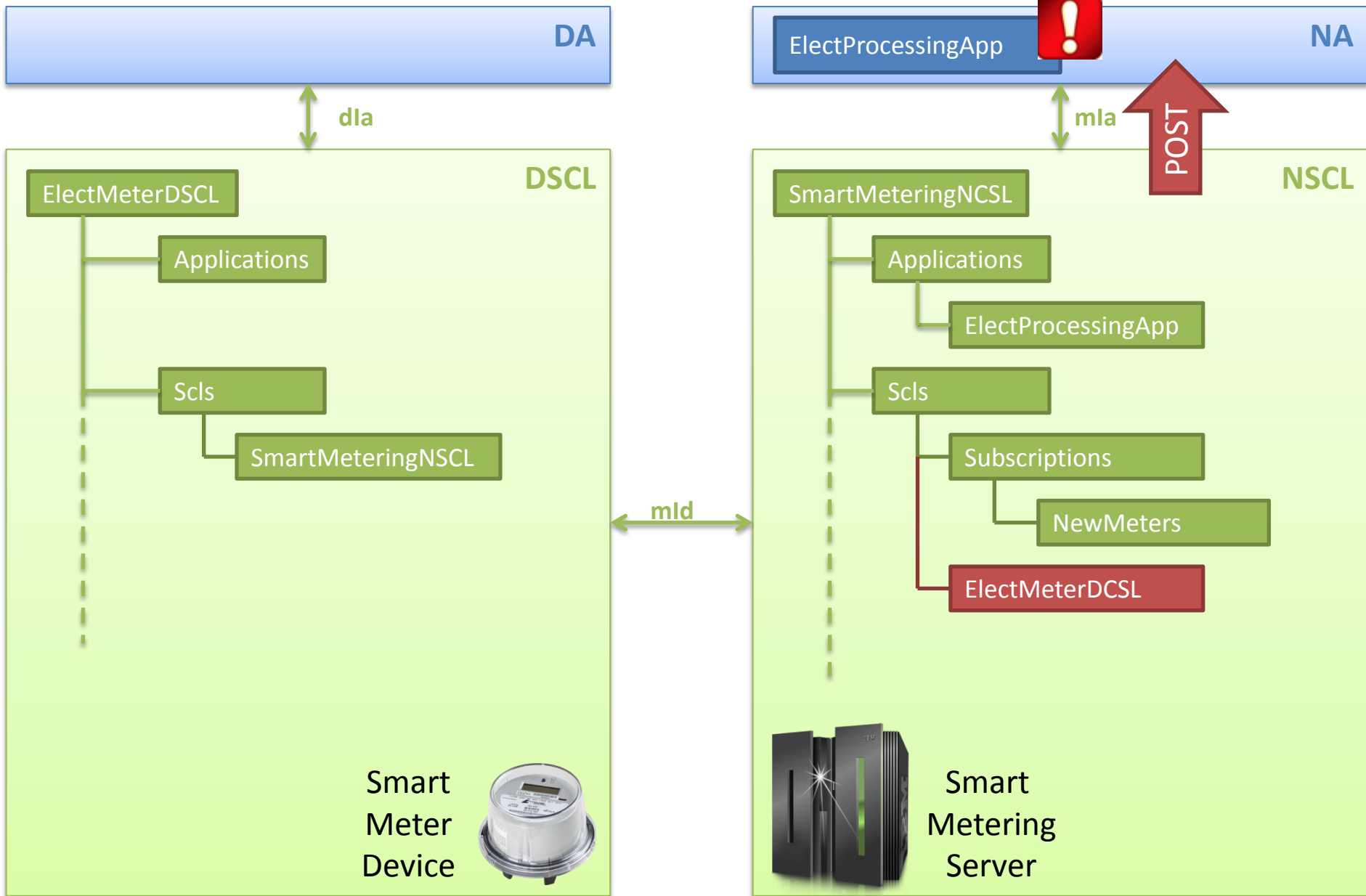
Step 4- Notifying the Network Application about a Registered Smart Meter
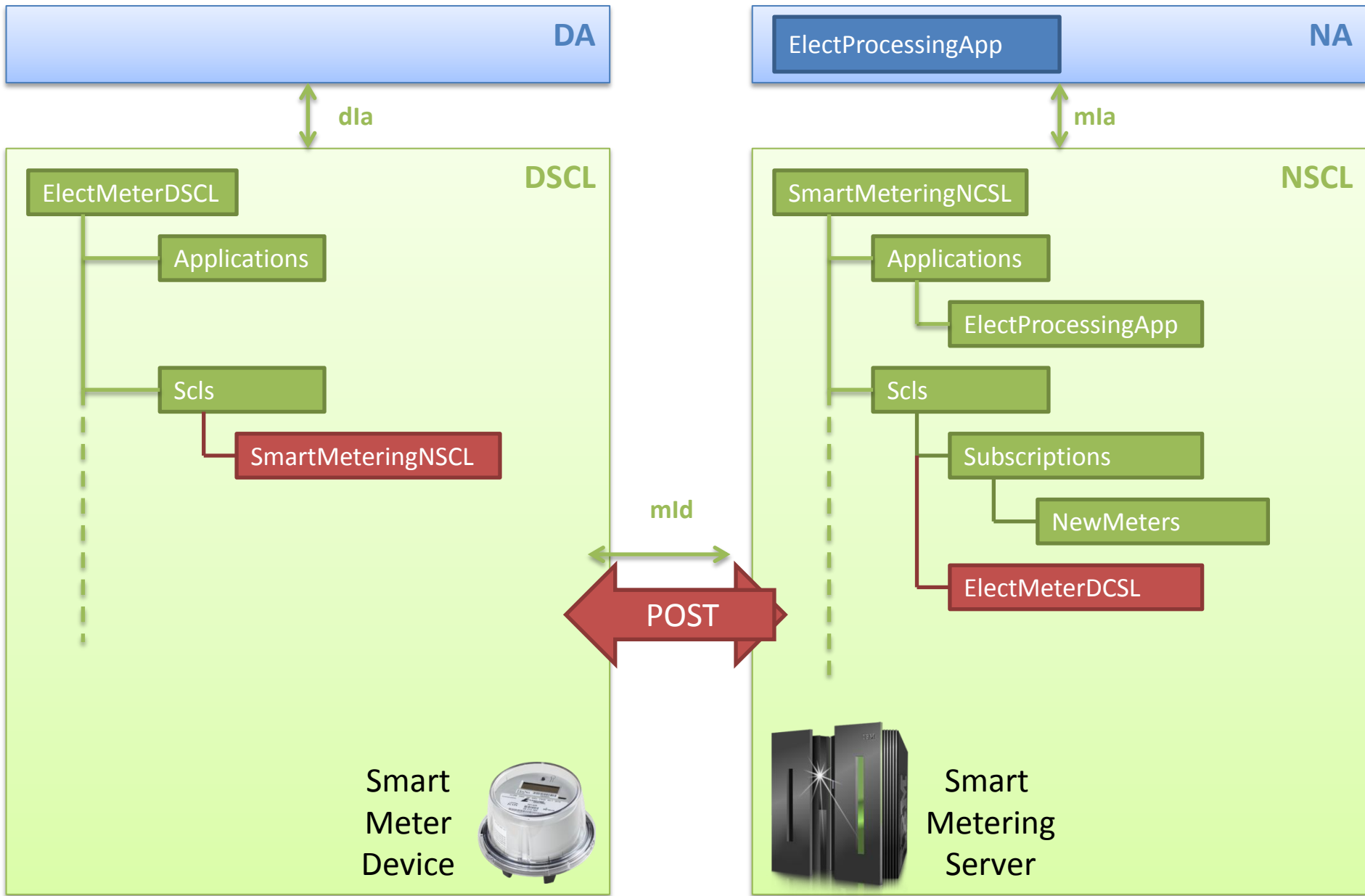
M2M smart Metering Example 2

DA

ElectMeterApp

P O S T

dIa

DSCL

ElectMeterDSCL
- Applications
  - MeterDataApp
- Scls
  - SmartMeteringNSCL

Smart Meter Device

mId

NA

ElectProcessingApp

mIa

NSCL

SmartMeteringNCSL
- Applications
  - ElectProcessingApp
- Scls
  - Subscriptions
    - NewMeters
  - ElectMeterDCSL

Smart Metering Server
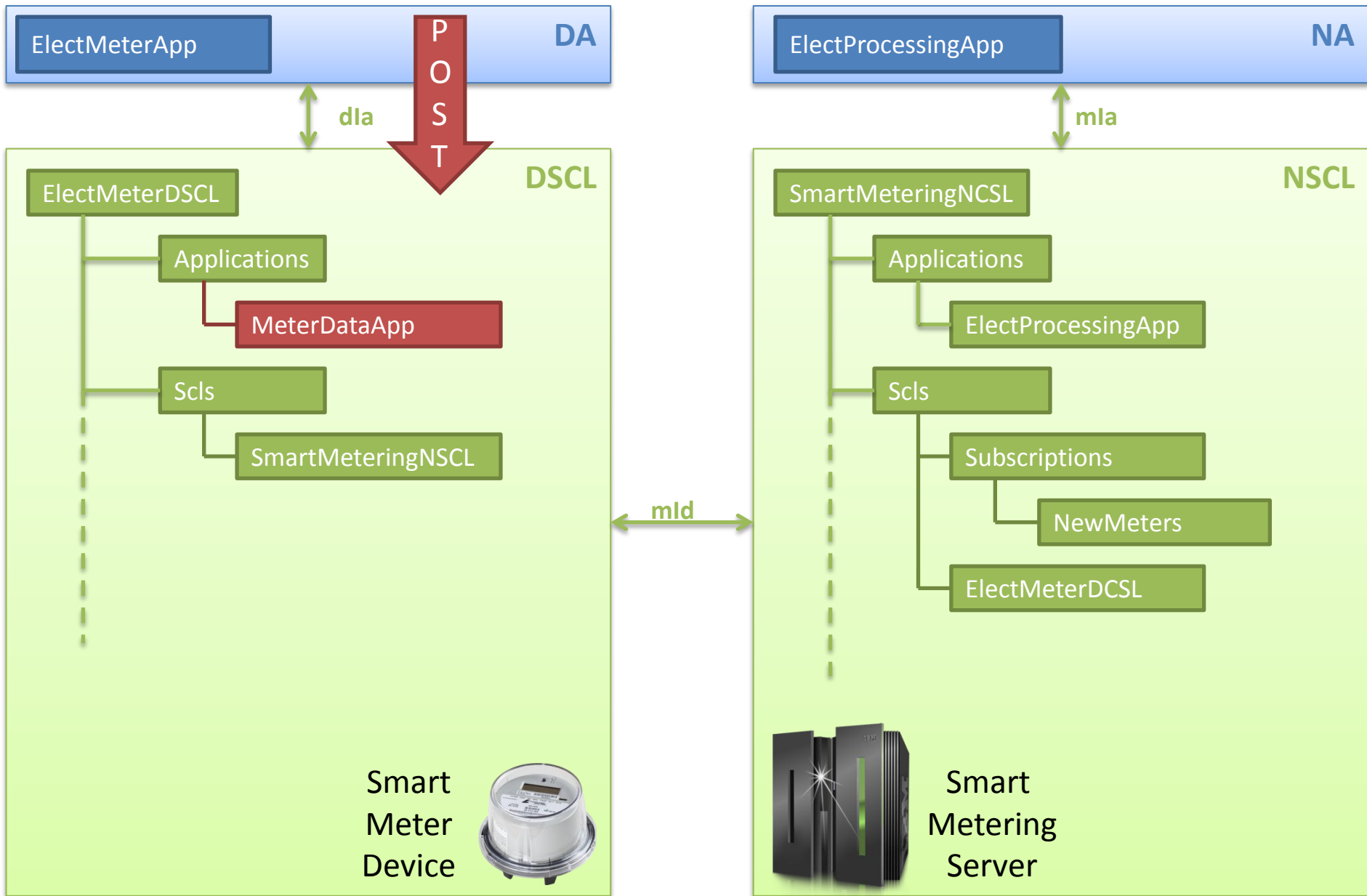
Step 5- Device Application Registration to the DSCL

M2M smart Metering Example 2

DA

ElectMeterApp

dIa

POST

DSCL

- ElectMeterDSCL
  - Applications
    - MeterDataApp
  - Scls
    - SmartMeteringNSCL

Elect Meter Device

mId

POST

NA

ElectProcessingApp

mIa

NSCL

- SmartMeteringNCSL
  - Applications
    - ElectProcessingApp
  - Scls
    - Subscriptions
      - NewMeters
    - ElectMeterDCSL
      - Applications
        - ElectMeterApp

Smart Metering Server
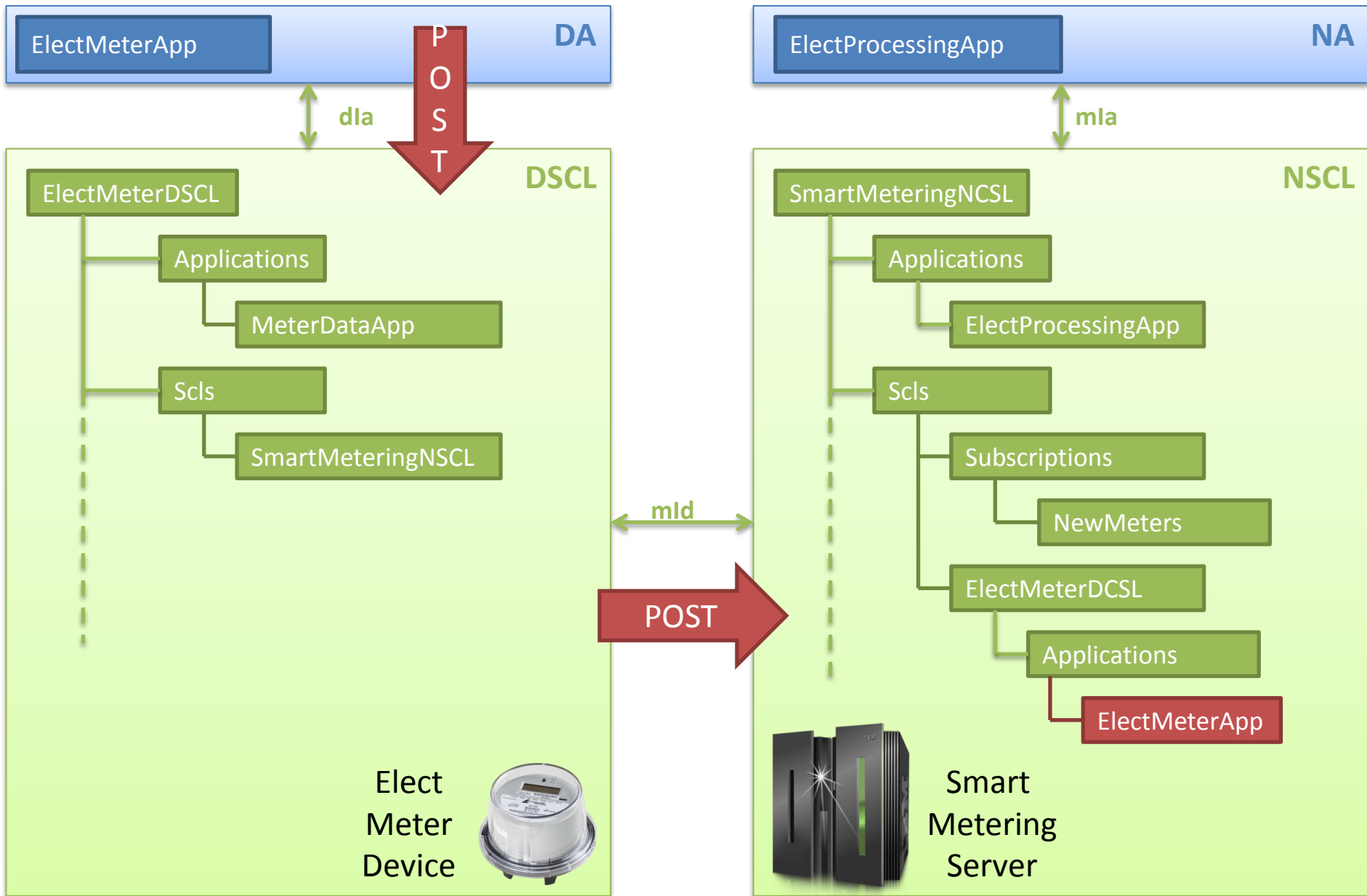
Step 6- Announcing a Registered DA to the NSCL

M2M smart Metering Example 2

DA

ElectMeterApp

dIa

POST

DSCL

ElectMeterDSCL
- Applications
  - MeterDataApp
- Scls
  - SmartMeteringNSCL

Smart Meter Device

NA

ElectProcessingApp

mIa

DSCL

SmartMeteringNCSL
- Applications
  - ElectProcessingApp
- Scls
  - Subscriptions
    - NewMeters
  - ElectMeterDCSL
    - Applications
      - ElectMeterApp
        - Containers
          - ElectData

mId

POST

Smart Metering Server
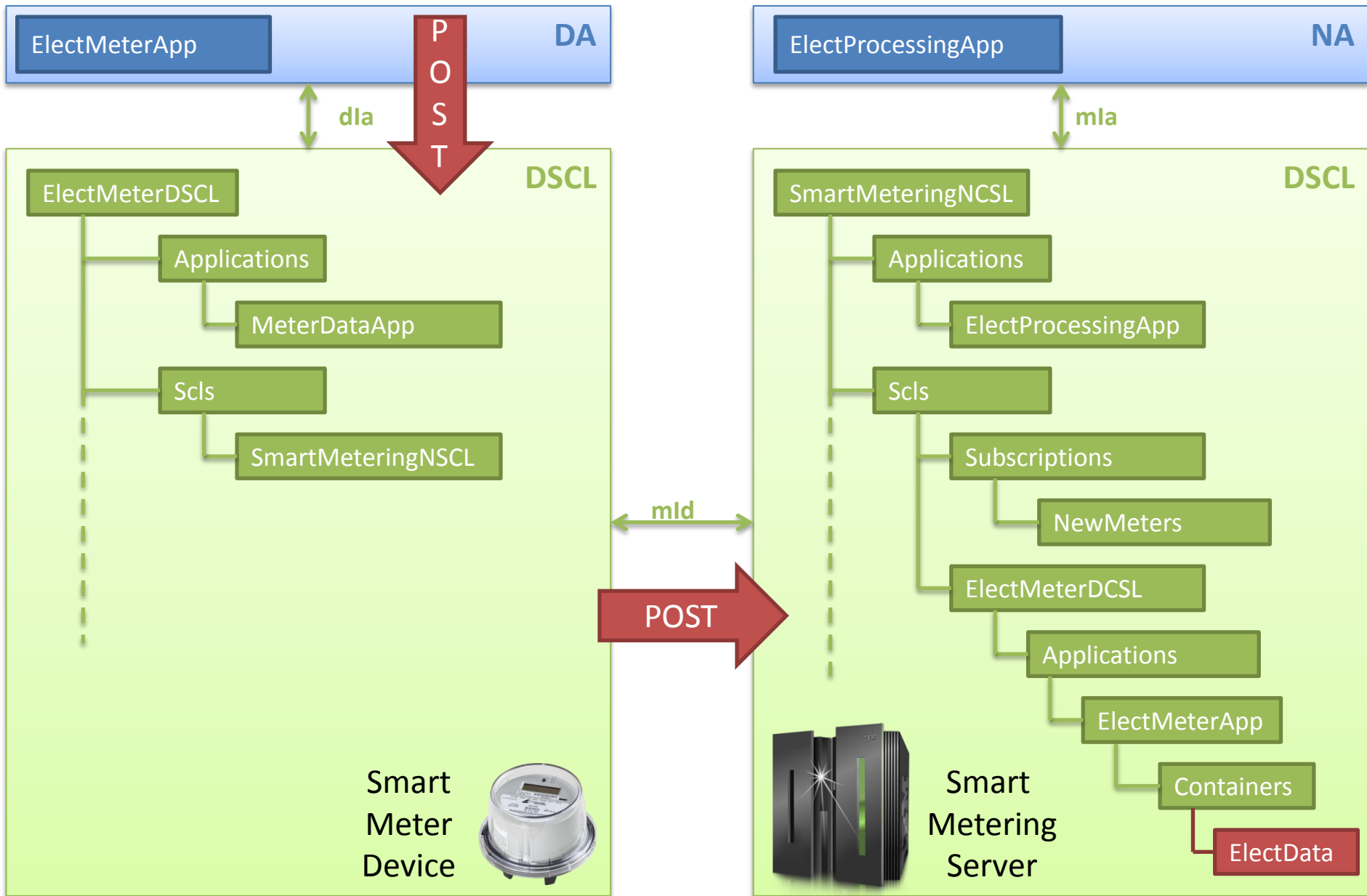
Step 7- Reporting Meter Data through the Use of Container Resource

Demonstration

Thank you for you attention