2 - oneM2M Common Architecture for IoT

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M2M world of connected services

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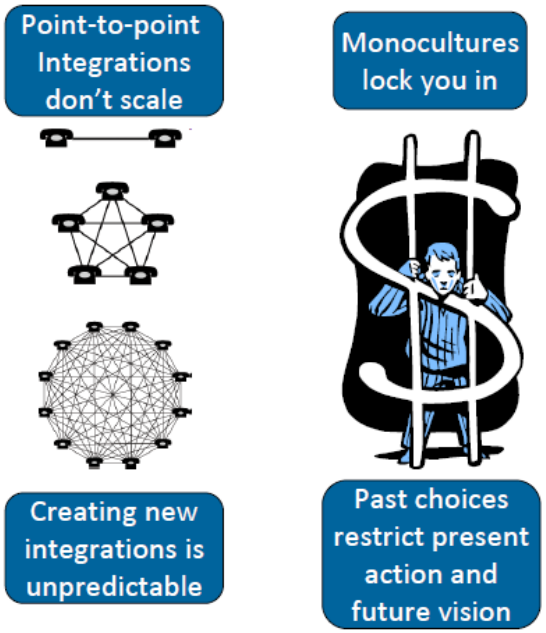
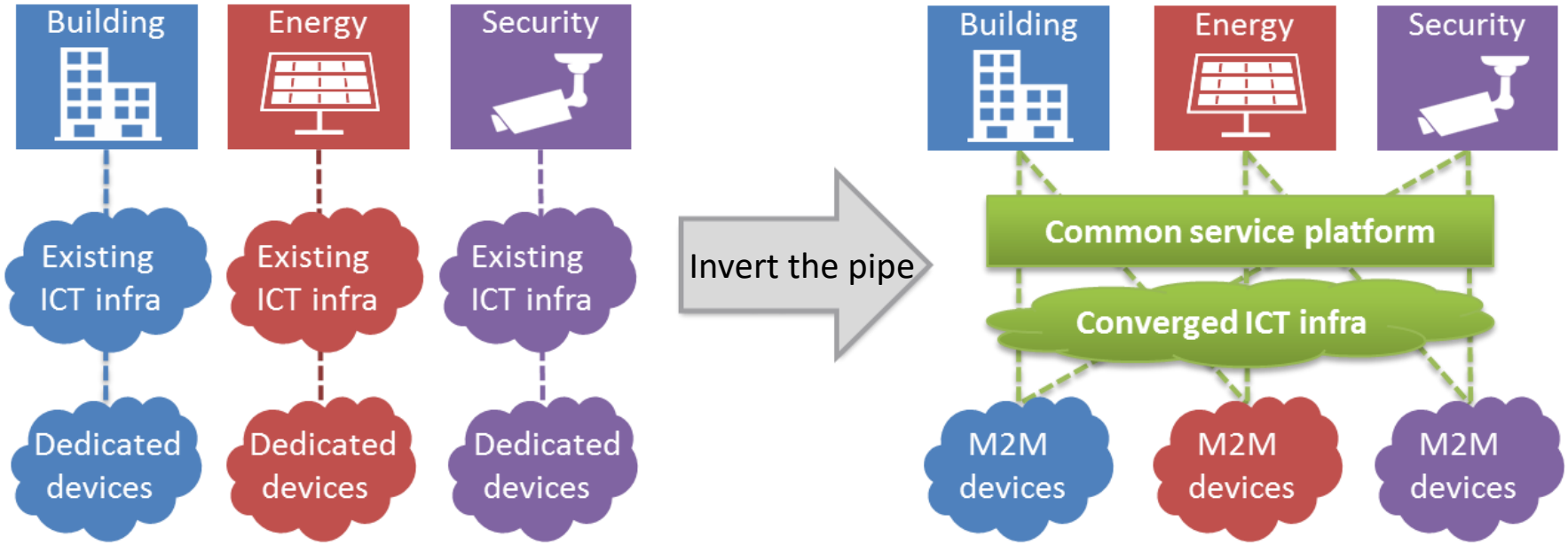
IoT market fragmentation



Source: CRYSTAL project/Philips

- The current marketplace is extremely fragmented, which has increased the R&D cost in each specific domain.
- Current IoT silo model is not an efficient way to communicate, it is a barrier to further development.
- Many vertical IoT solutions have been designed independently and separately for different applications, which impedes large-scale M2M deployment.

IoT cross-domain interoperability

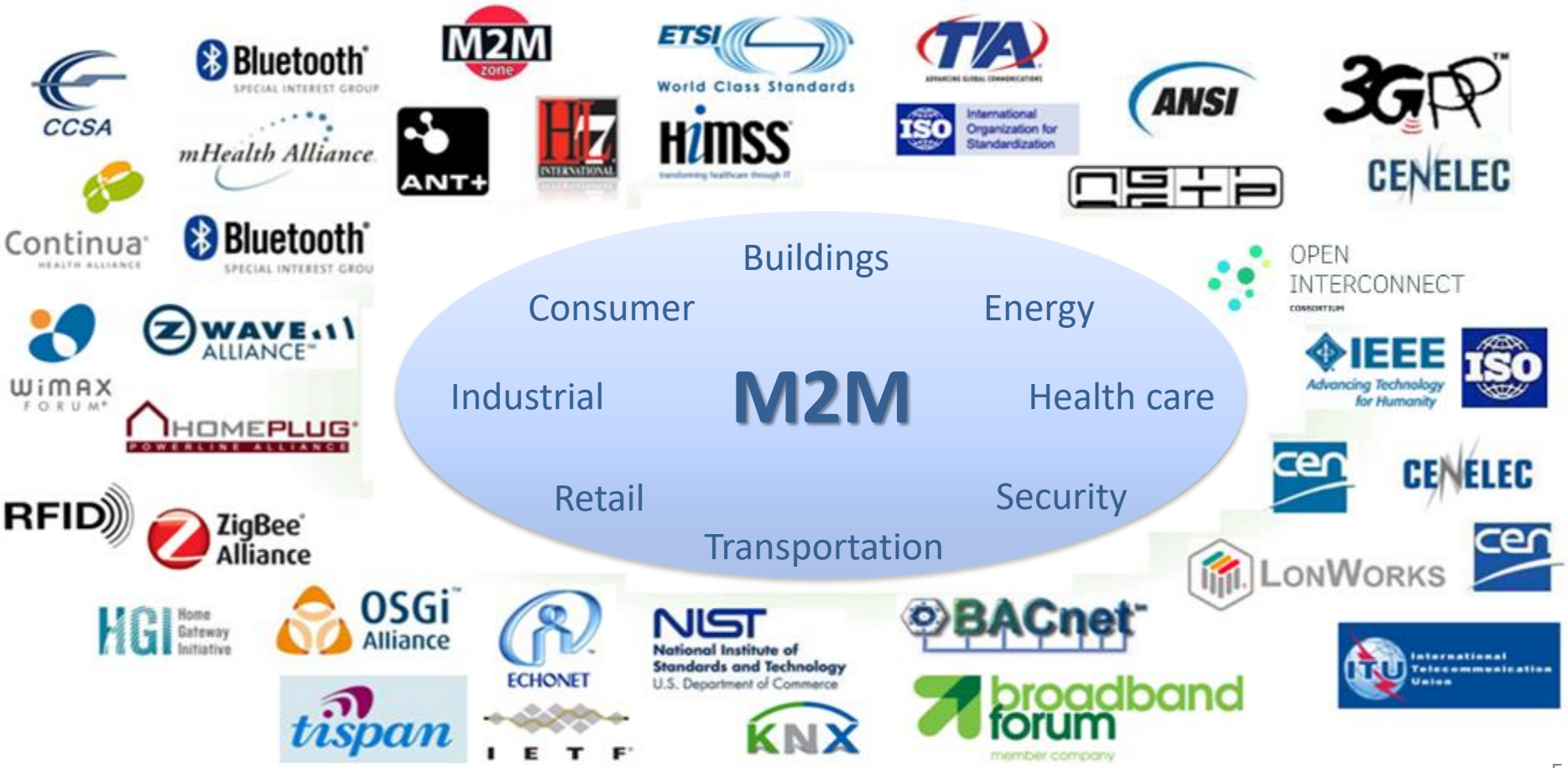


- Highly fragmented market with small vendor-specific applications.
- Reinventing the wheel: Same services developed again and again.
- Each silo contains its own technologies without interop.

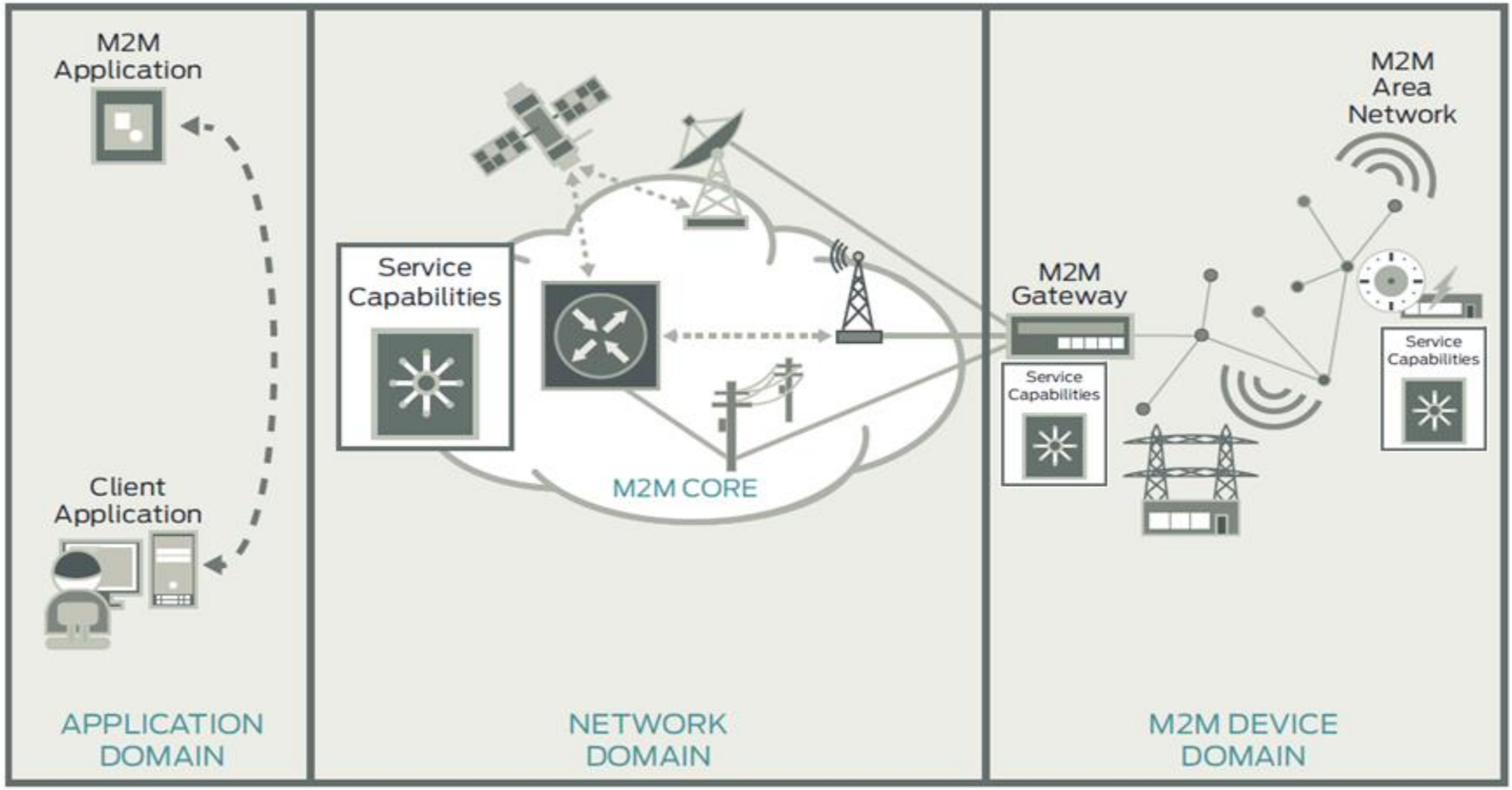
- End-to-end platform: common service capabilities layer.
- Interoperability at the level of communications and data.
- Seamless interaction between heterogeneous applications and devices.

Standards landscape for IoT

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



IoT high level architecture

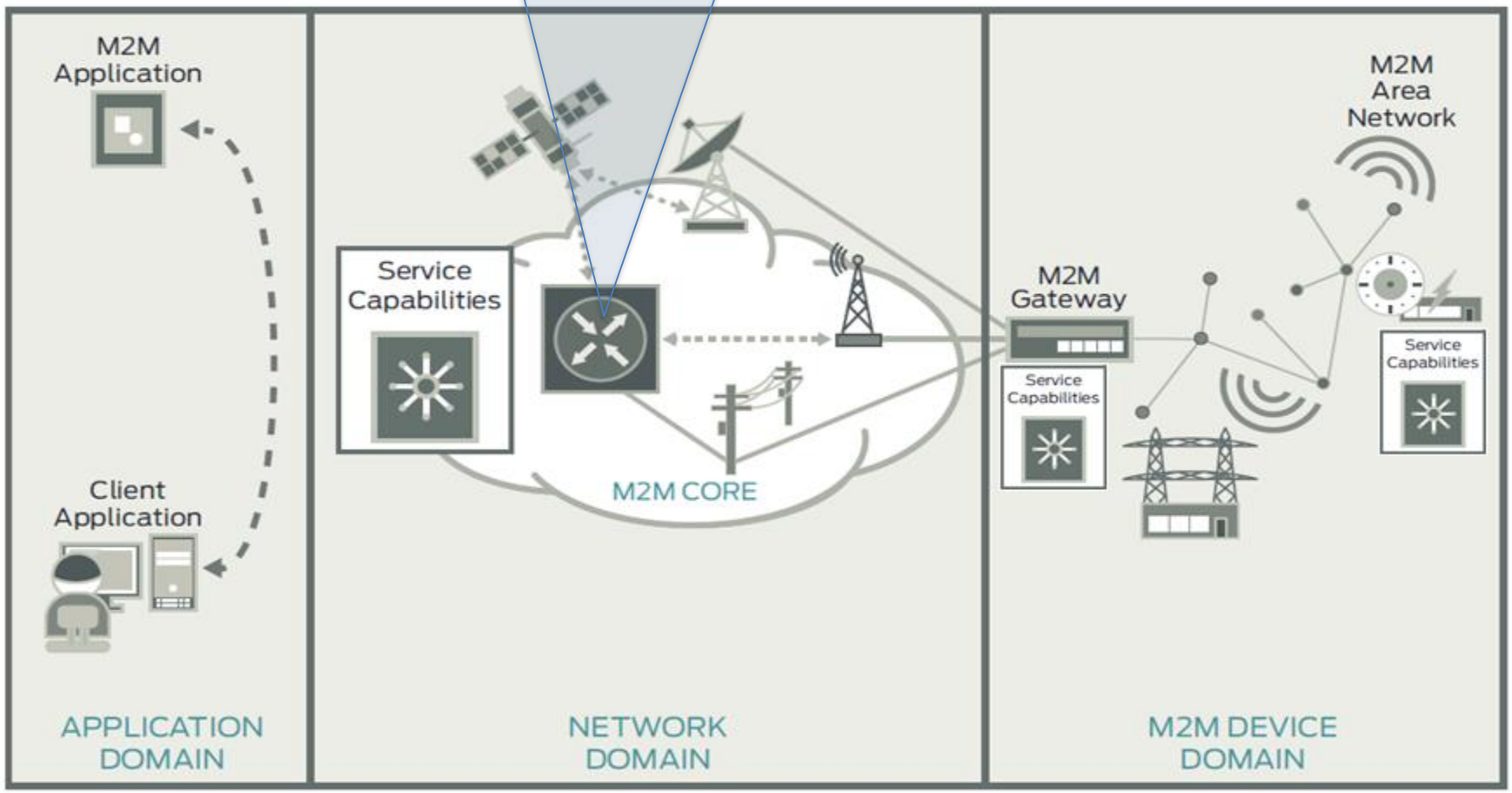


http://www.etsi.org/technologies-clusters/technologies/m2m

Standards for Wide Area Networks

Standards for Wide Area Networks (3GPP, fixed NW, WiMax…):

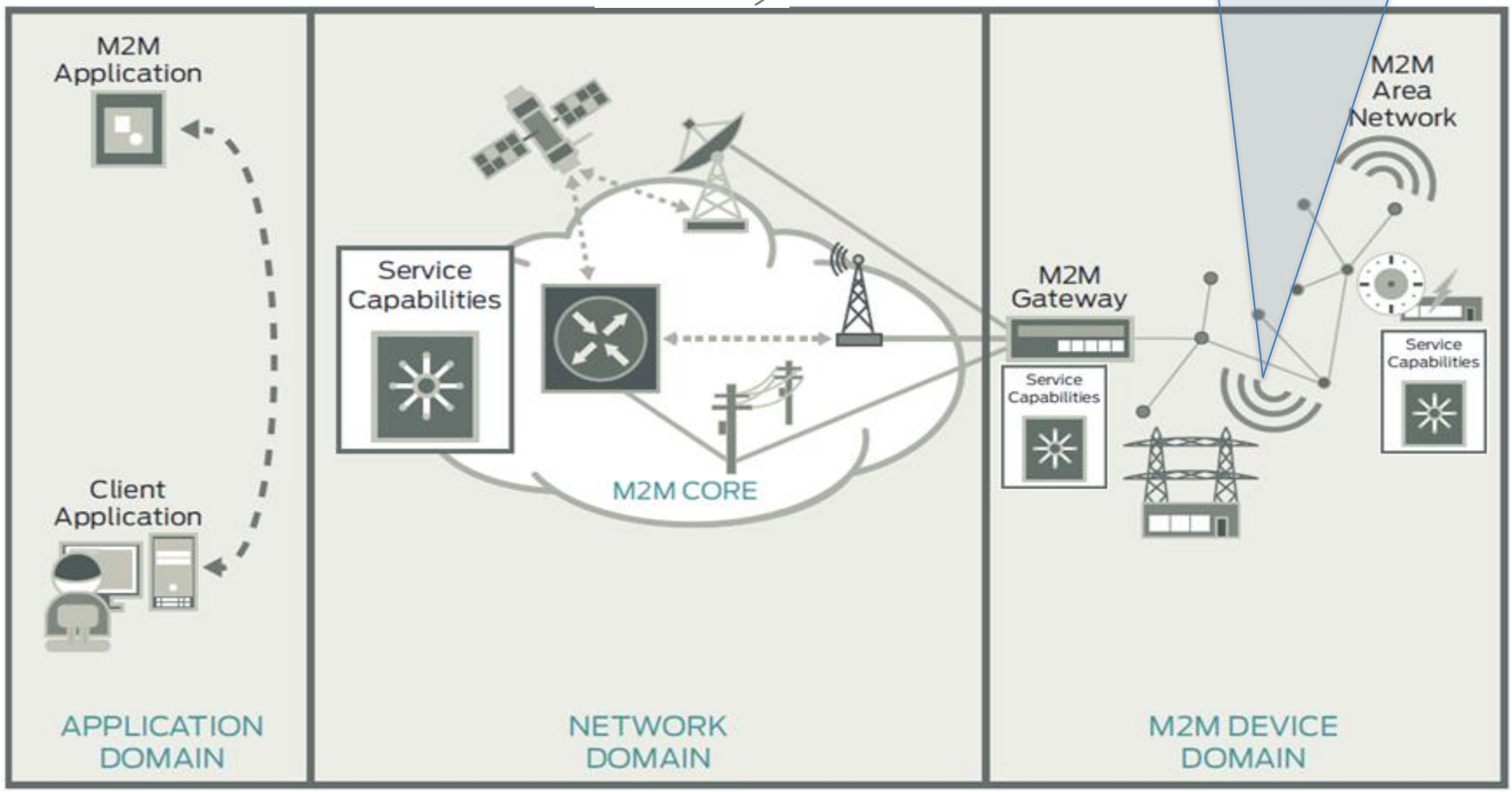
Target: protect networks against negative effects of M2M traffic (many devices, non-human traffic …)



http://www.etsi.org/technologies-clusters/technologies/m2m

Standards for M2M Area Networks

Standards for Local Area Networks (ZigBee, BLE, Enocean, PLC, etc.)
Target: foster use of LAN technology by supporting diverse ecosystem of service providers and device manufacturers.

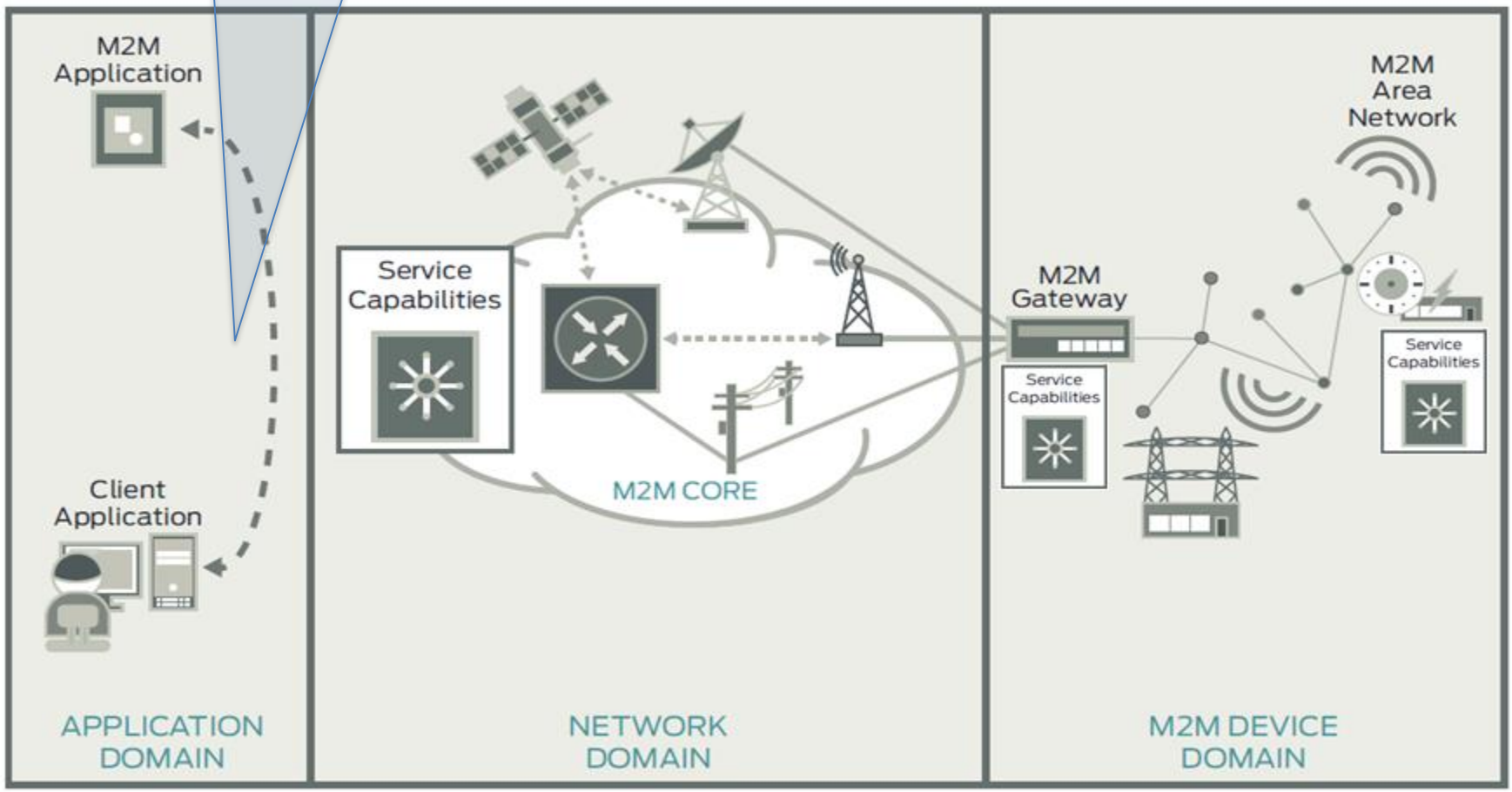


http://www.etsi.org/technologies-clusters/technologies/m2m

Standards for vertical industries

Standards for vertical Industries applications

Target: enable interoperable, cost-efficient Solutions.

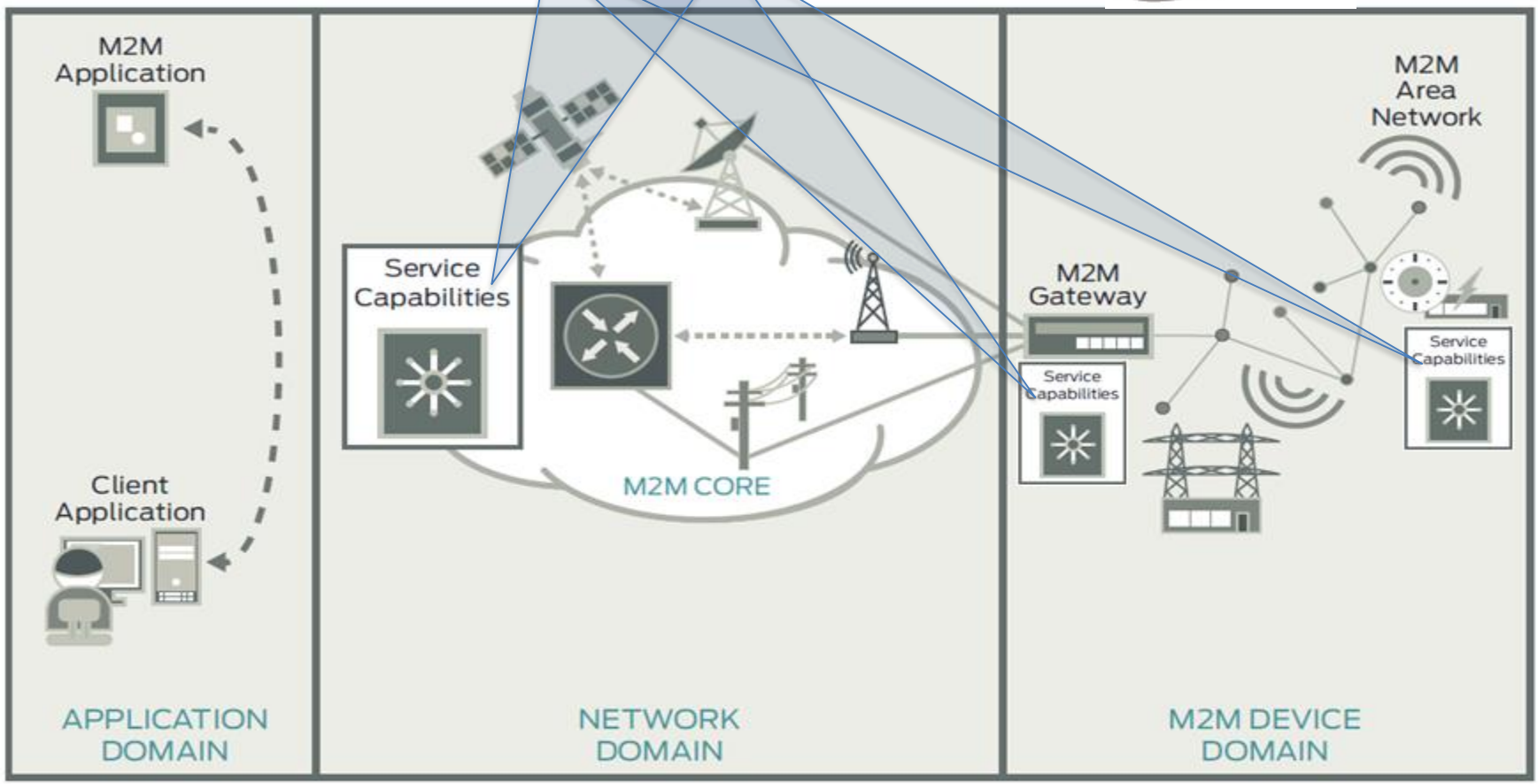


http://www.etsi.org/technologies-clusters/technologies/m2m

Standards for M2M service capabilities

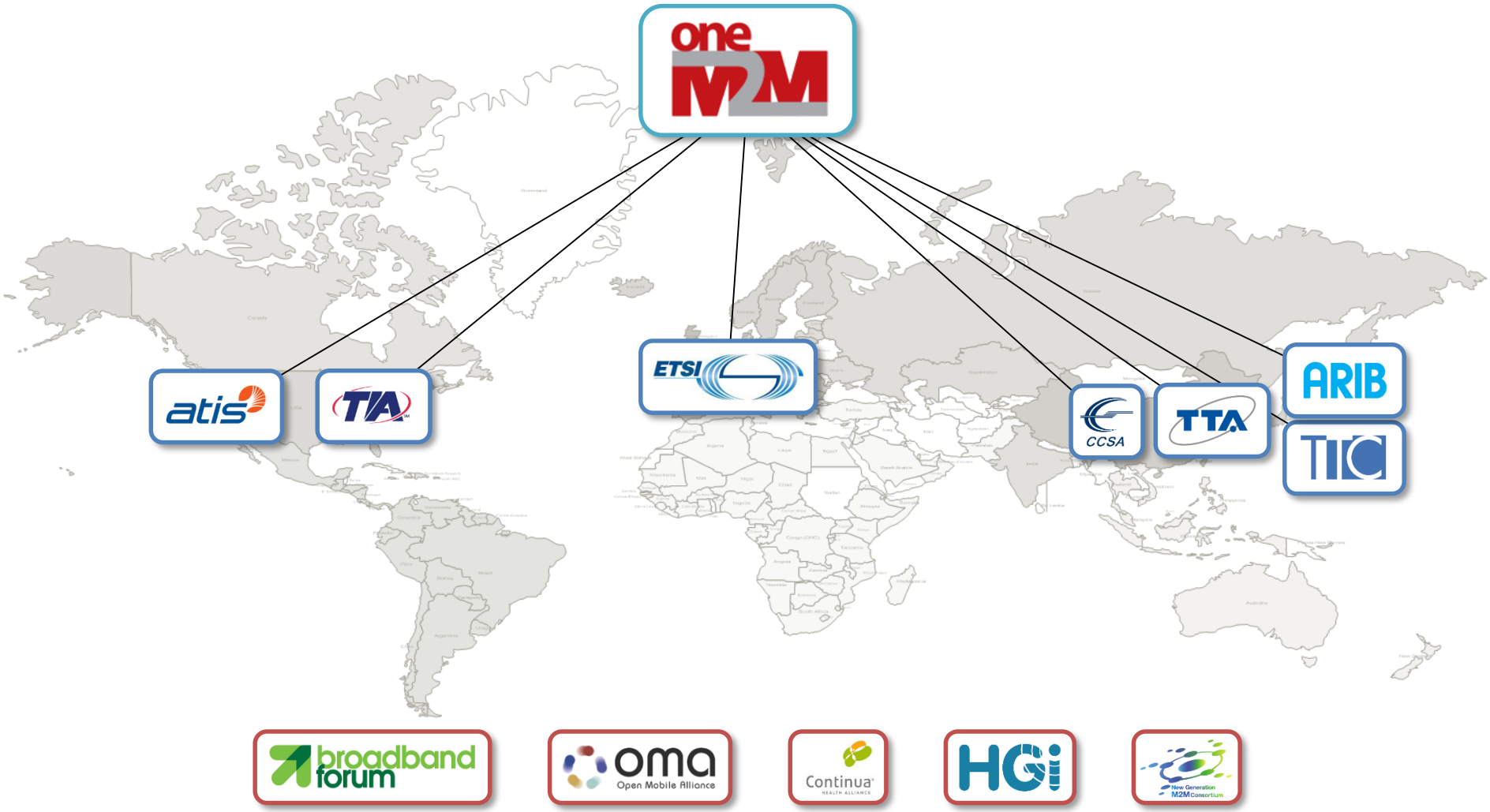
Standards for M2M Service capabilities:

Target: end-to end enablement across servers, gateways, and devices. Standardized service interfaces.



http://www.etsi.org/technologies-clusters/technologies/m2m

oneM2M: The Partnership Project



Over 200 member organizations in oneM2M

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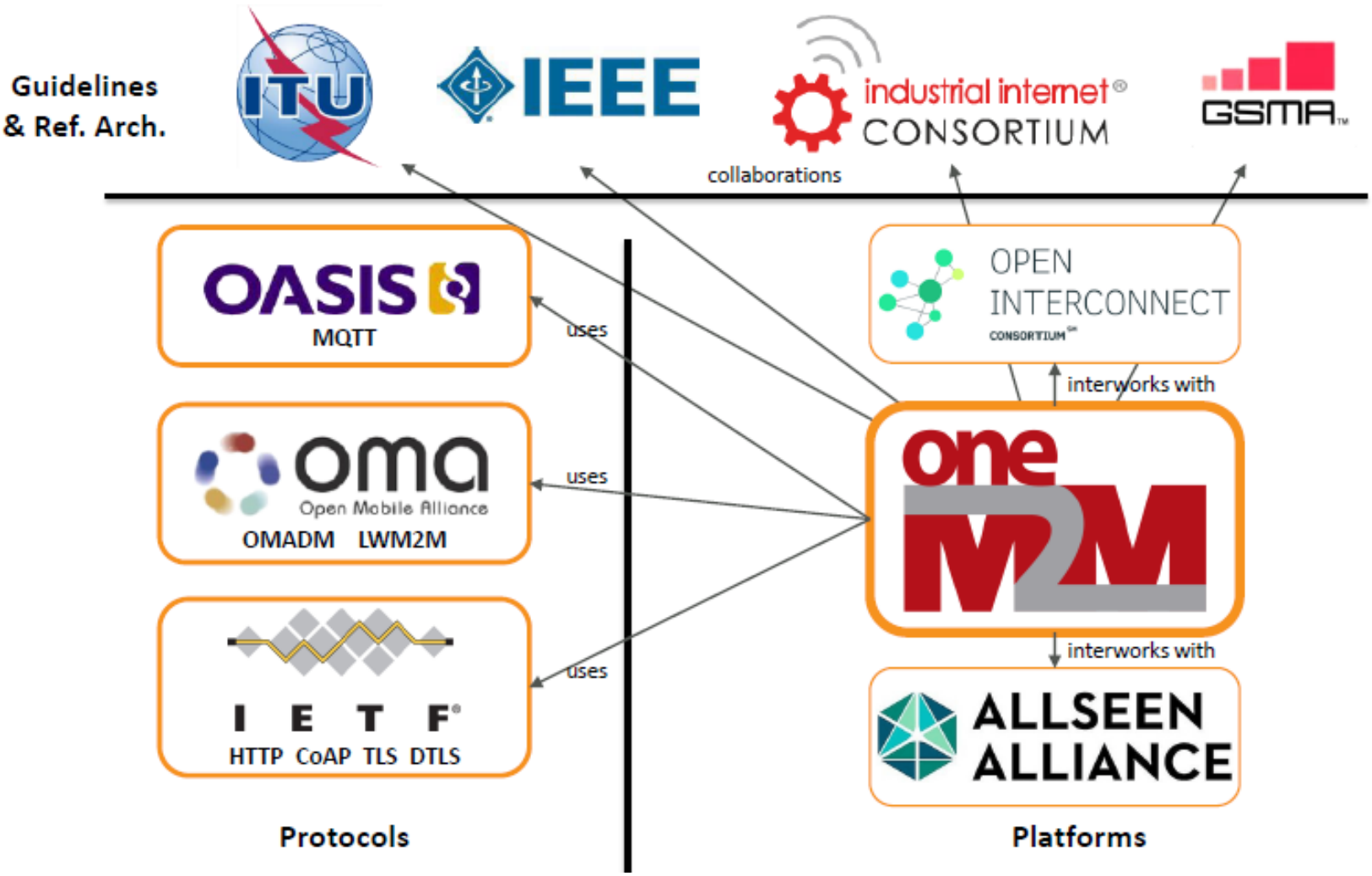
Jasper
T-Mobile
SIERRA WIRELESS
GEORGIA TECH
Sprint
LAAS-CNRS
Giesecke & Devrient
Itron
oberthur TECHNOLOGIES
EURECOM
orange
CISCO
IBM
SONY
QUALCOMM
Alcatel·Lucent
gemalto
vodafone
TELECOM ITALIA
ORACLE
ETRI 한국전자통신연구원
KDDI
Telefónica
sensinov Global IoT Platform
at&t
Haier
Fraunhofer FOKUS
Queen Mary University of London
BOSCH
FUJITSU
NIST National Institute of Standards and Technology U.S. Department of Commerce
LG
HUAWEI
inmarsat
ERICSSON
verizon
NTT docomo
intel
ZTE中兴
SUMITOMO ELECTRIC
NEC
InterDigital

oneM2M liaisons



Purpose, Work & Deliverables

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Purpose

To specify and promote an

M2M Common Service Layer

Work

Six physical 1-week meetings per year

About 5 conference calls per week between the meetings

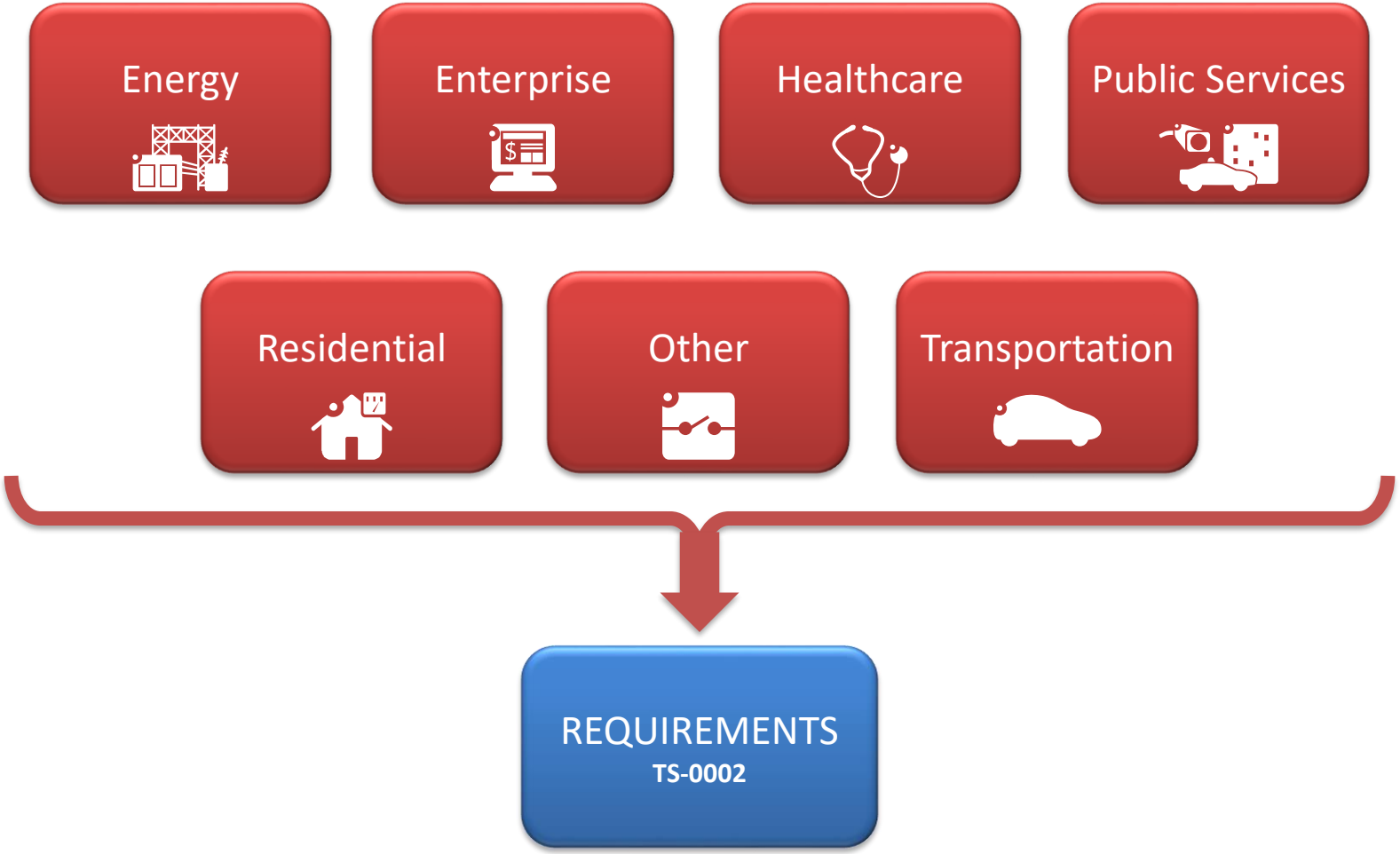
200+ documents produced and discussed at each meeting

3800 docs in 2013 4200 docs in 2014

Deliverables

Technical Reports and Technical Specifications

Use Cases & Requirements



Technical Specifications

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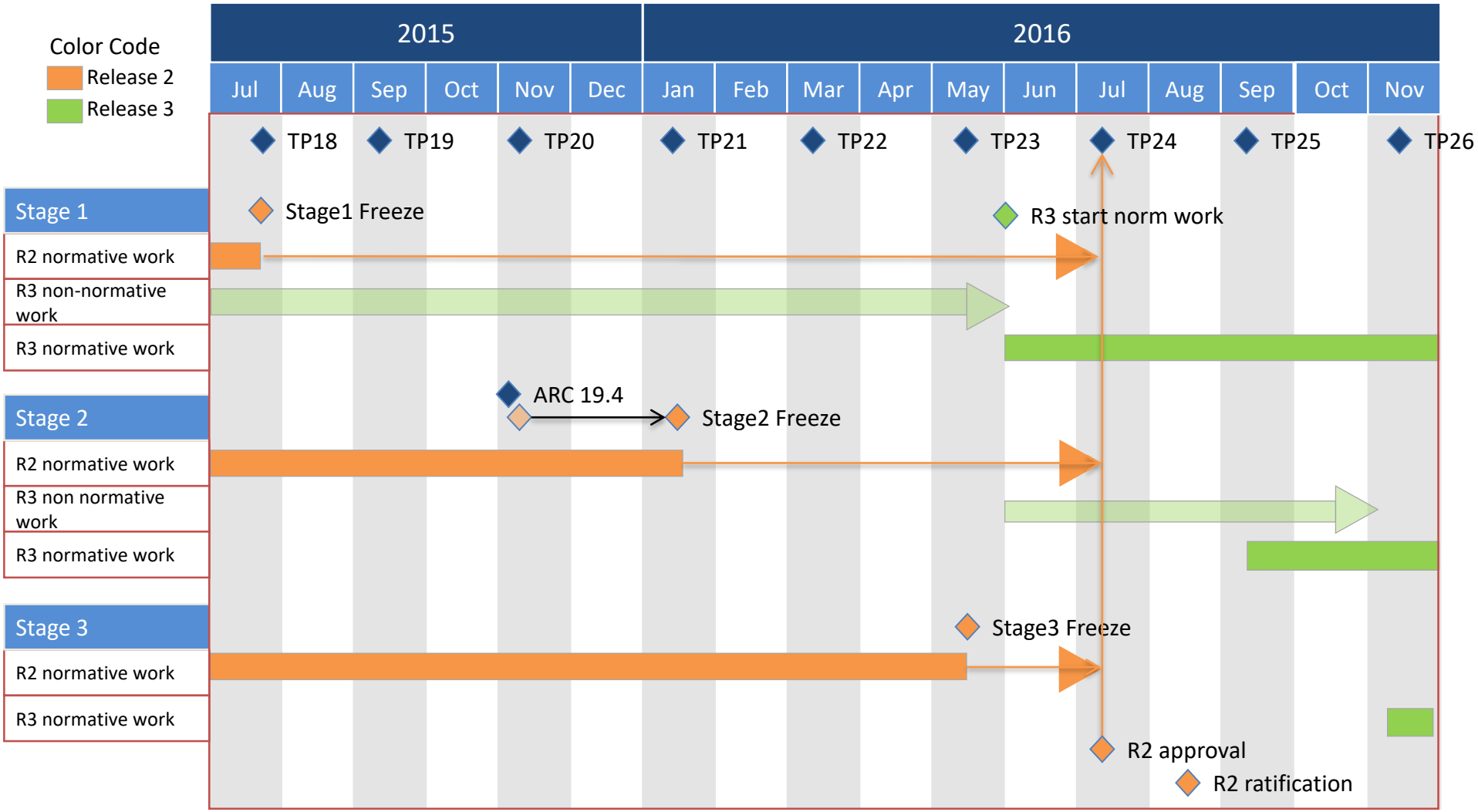
- Requirements **TS-0002**
- Functional Architecture **TS-0001**
- Security Solutions **TS-0003**
- Service Layer Core Protocols **TS-0004**
- HTTP Protocol Binding **TS-0009**
- CoAP Protocol Binding **TS-0008**
- Management Enabl^{nt} - OMA **TS-0005**
- Management Enabl^{nt} - BBF **TS-0006**
- MQTT Protocol Binding **TS-0010**
- Definitions & Acronyms **TS-0011**
- Service Components **TS-0007**
- …

Planning for Release 2 - Timeline



Planning for Release 2 – Planned Features

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oneM2M Application Identification Registry established

Advanced protocol binding

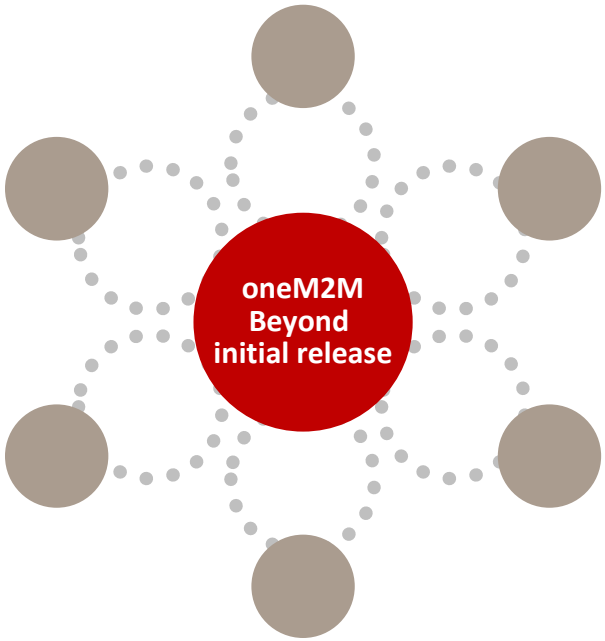
- WebSocket

Semantic interoperability

- base ontology
- semantic discovery
- semantic descriptions

Security

- Enhancement for authorization
- privacy support
- e2e security



Industrial domain enablement

- Time series, etc.
- In conjunction with the TR

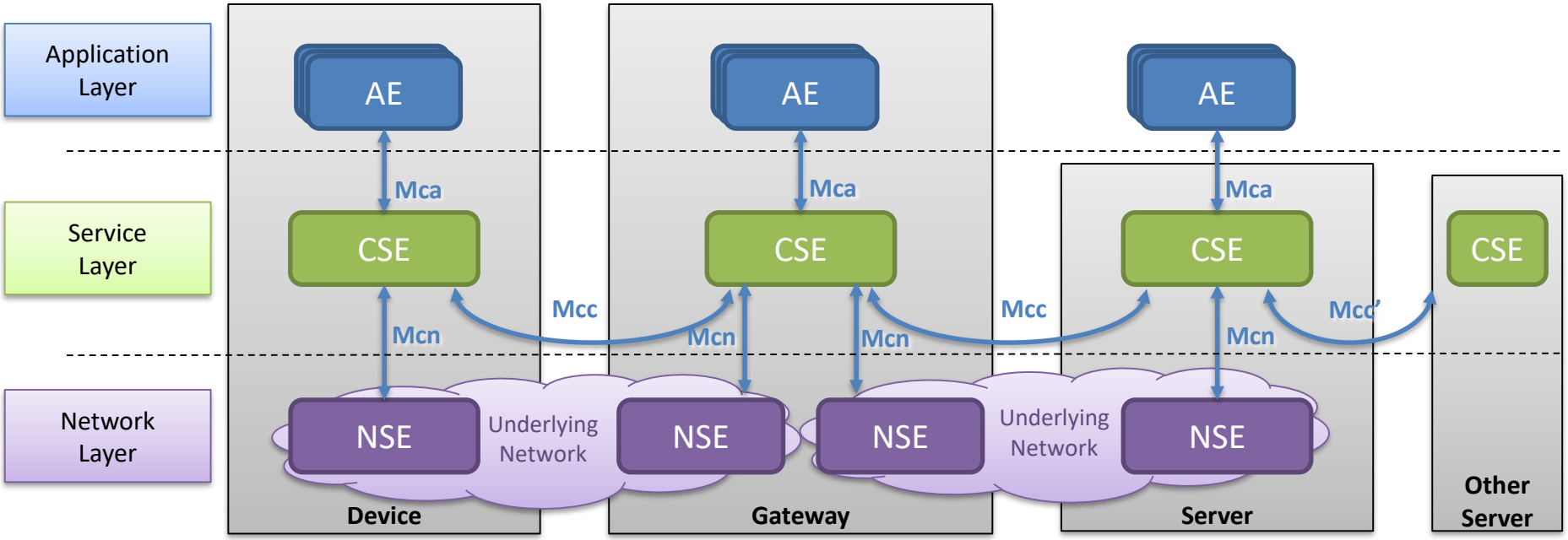
oneM2M interworking framework

- Generic interworking
- AllJoyn/AllSeen
- OIC
- OMA LightWeight M2M
- 3GPP Rel.13 interworking

Home domain enablement

- Home appliance information models

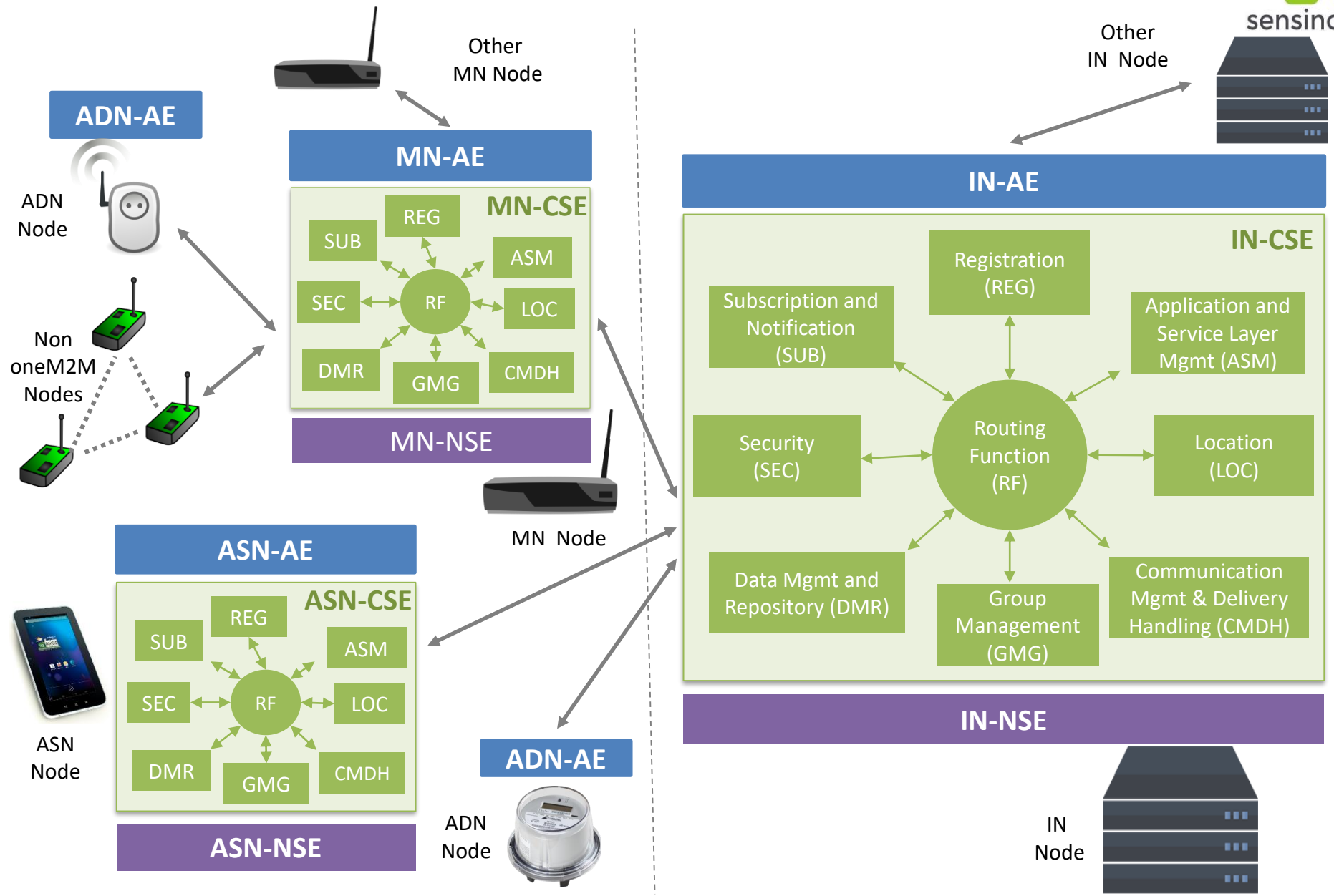
oneM2M high level architecture



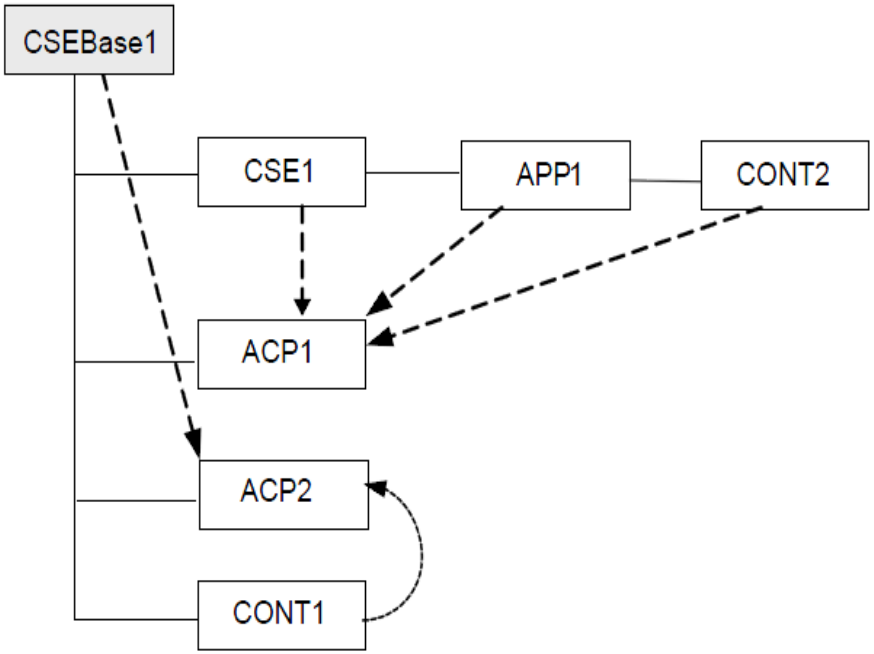
Entities: AE (Application Entity), CSE (Common Services Entity) and NSE (Network Services Entity)

Reference Point: One or more interfaces - Mca, Mcn, Mcc and Mcc'

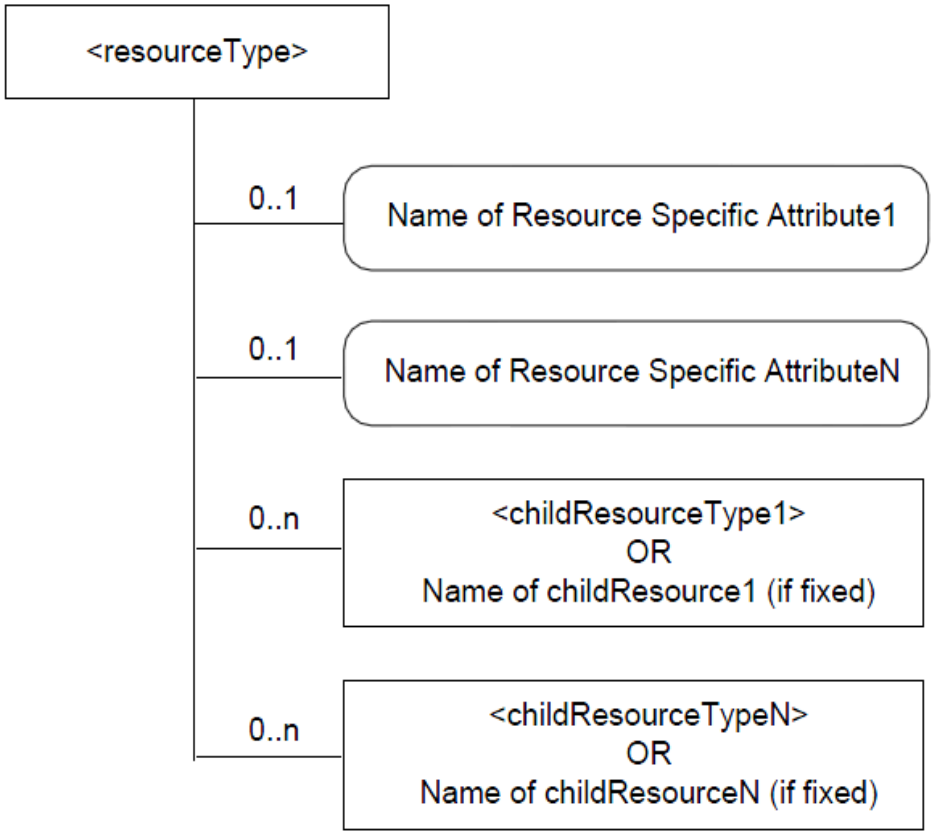
oneM2M functional architecture



OneM2M resource structure



OneM2M Resource structure



Resource type representation

oneM2M resource types

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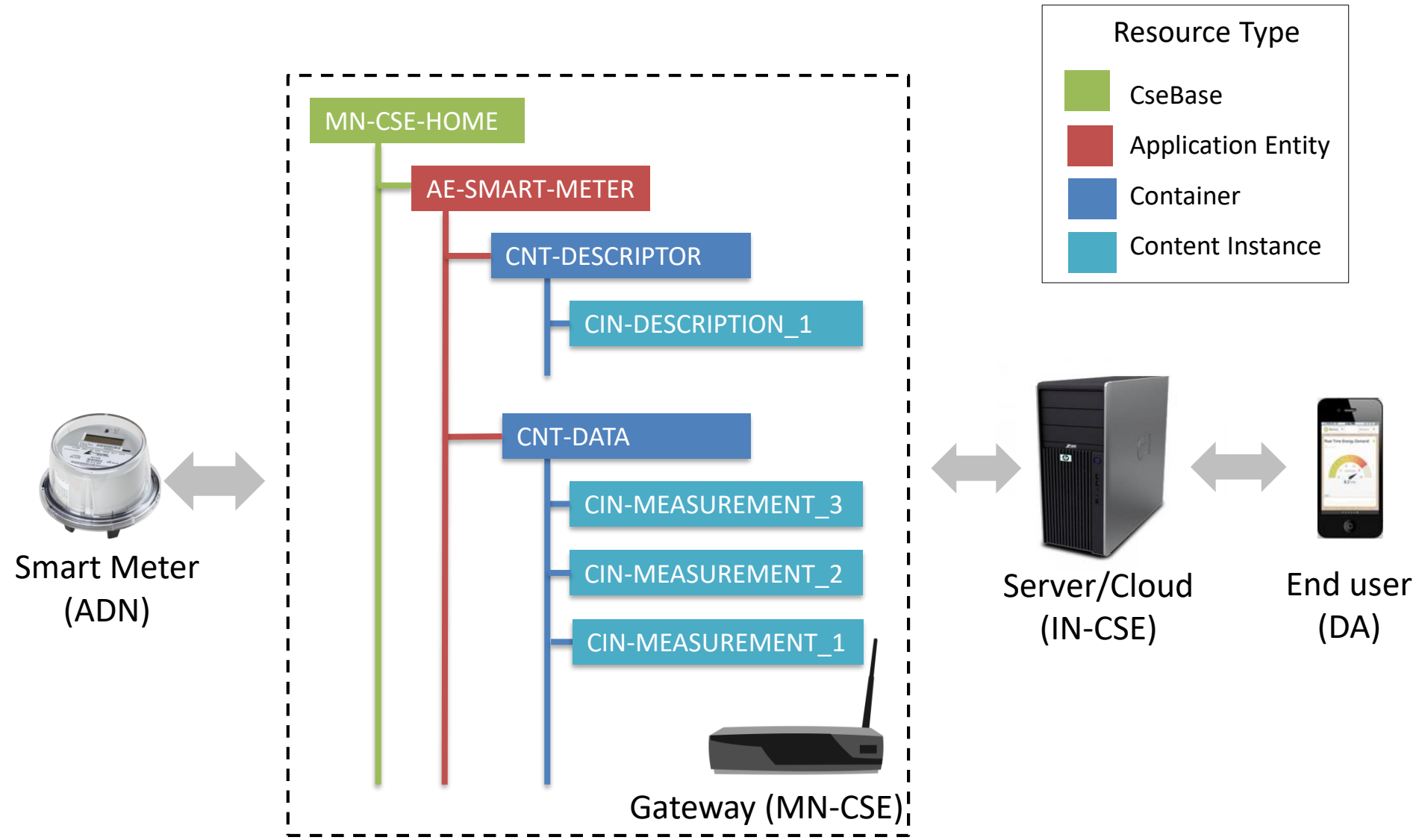
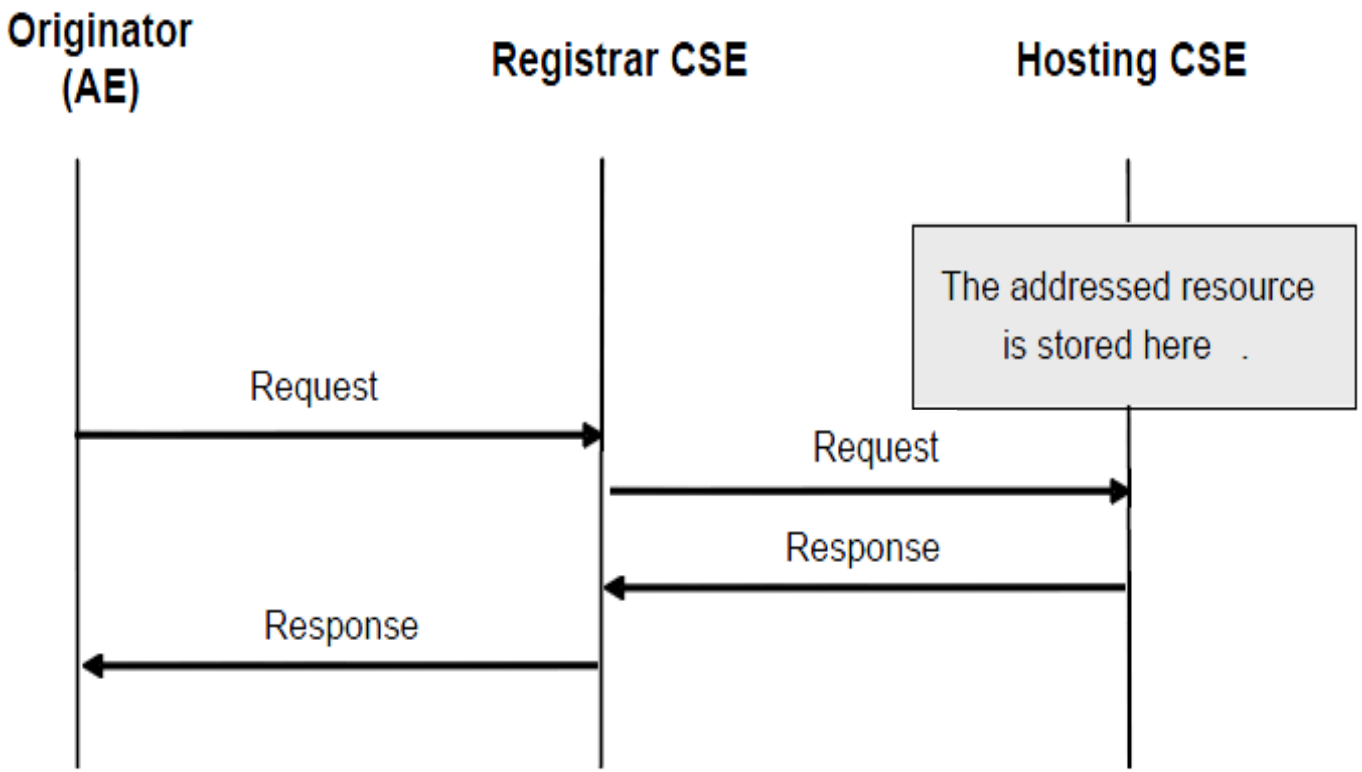
- Cse BASE
- Access Control Policy
- Remote CSE
- Application Entity
- Container
- Content Instance
- Group
- Subscription
- Polling Channel
- Node
- Mgmt Object
- …

oneM2M resource tree example

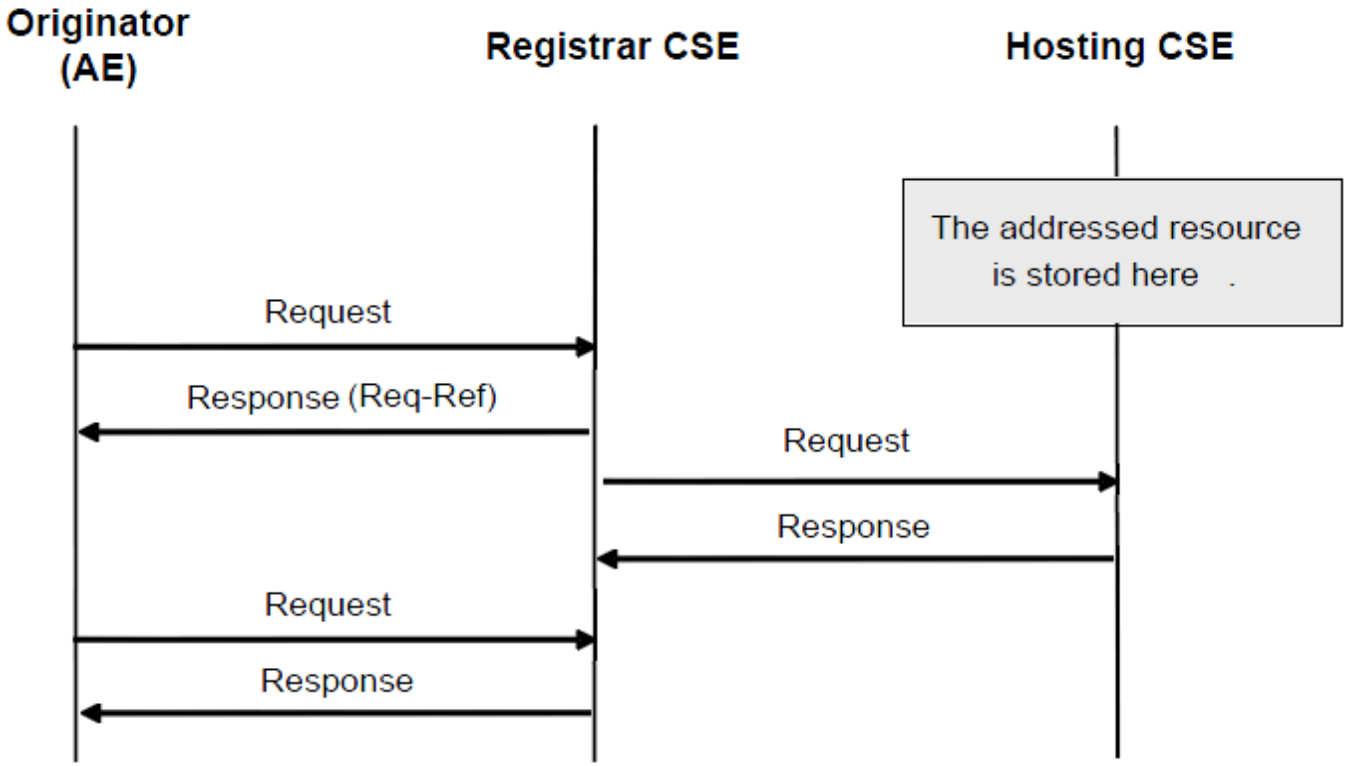


Accessing resources in oneM2M (Blocking)



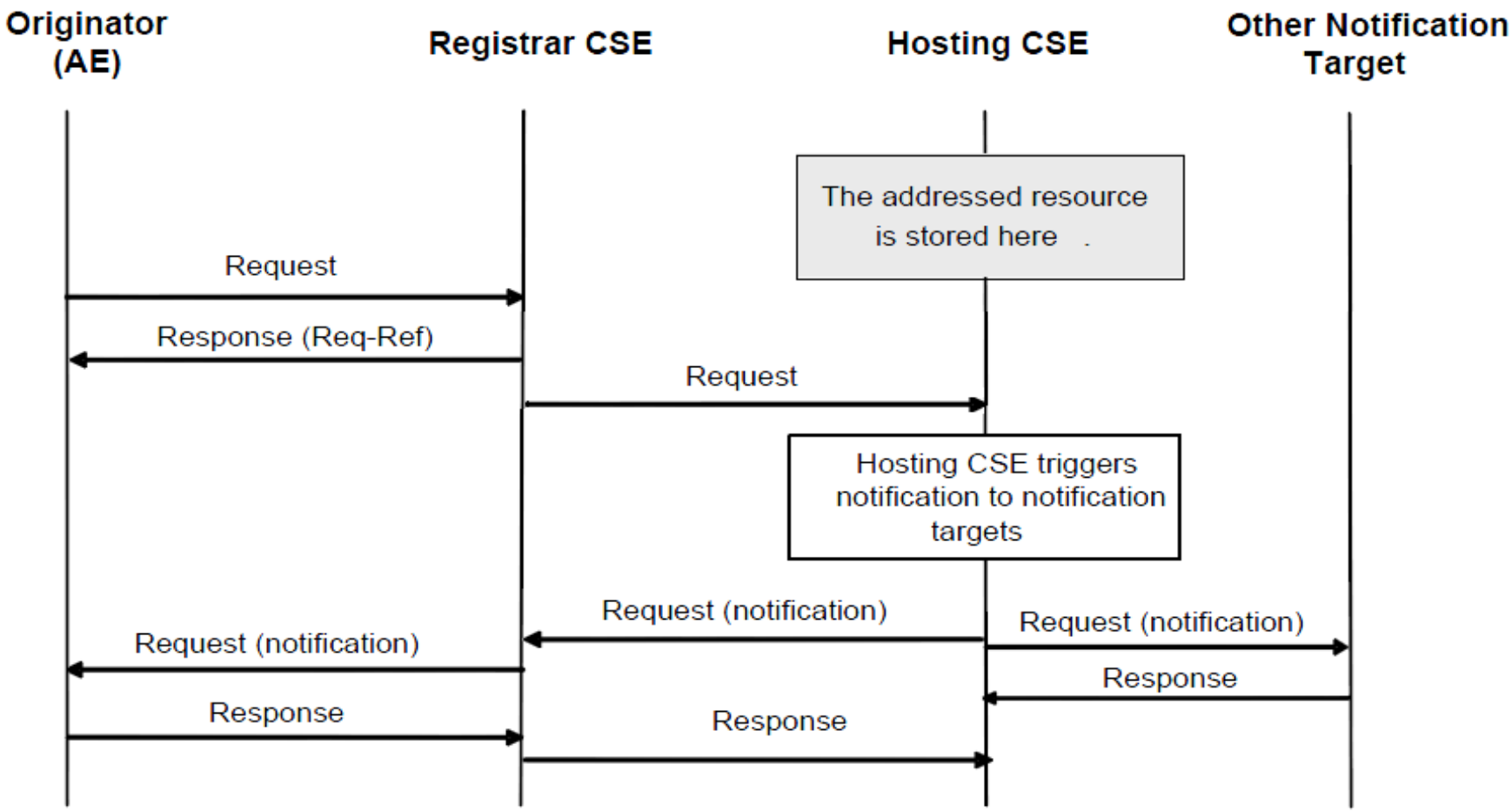
Blocking requests

Accessing resources in oneM2M (Non blocking Synchronous)



Non blocking synchronous requests

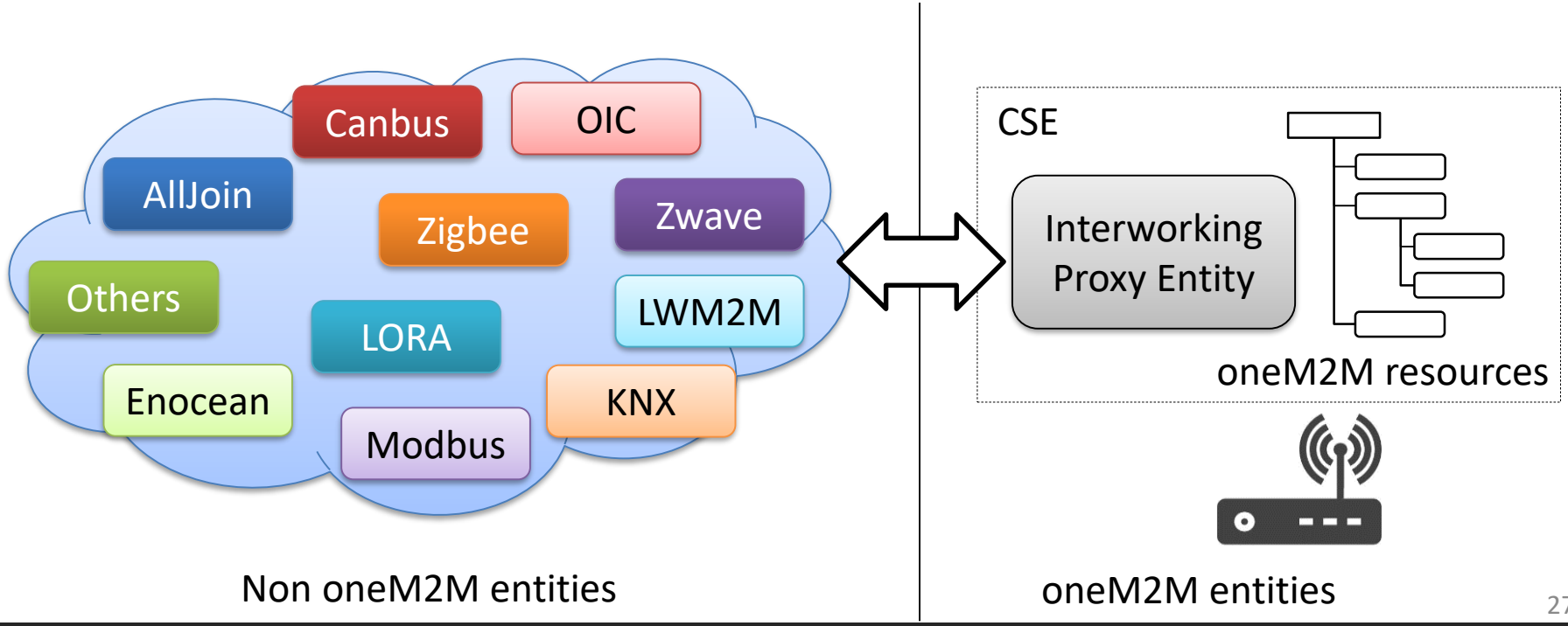
Accessing resources in oneM2M (Non blocking asynchronous)



Non blocking asynchronous requests

Interworking with non oneM2M devices

- The Interworking Proxy Entity (IPE) abstracts and maps the non-oneM2M data model to the oneM2M resources.
- Bidrectional communication between the oneM2M system and a specific technology (Monitor and Control).
- Seamless interaction between applications and devices using the oneM2M Restful API.



oneM2M implementations

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Open source

LAAS-CNRS

OM2M Connecting things

KETI

OCEAN

CISCO

OPEN DAYLIGHT

IotDM

Commercial & Demo

HUAWEI

LG

SIERRA WIRELESS

InterDigital

ils technology a Telit company

hp

Fraunhofer FOKUS

ERICSSON

QUALCOMM

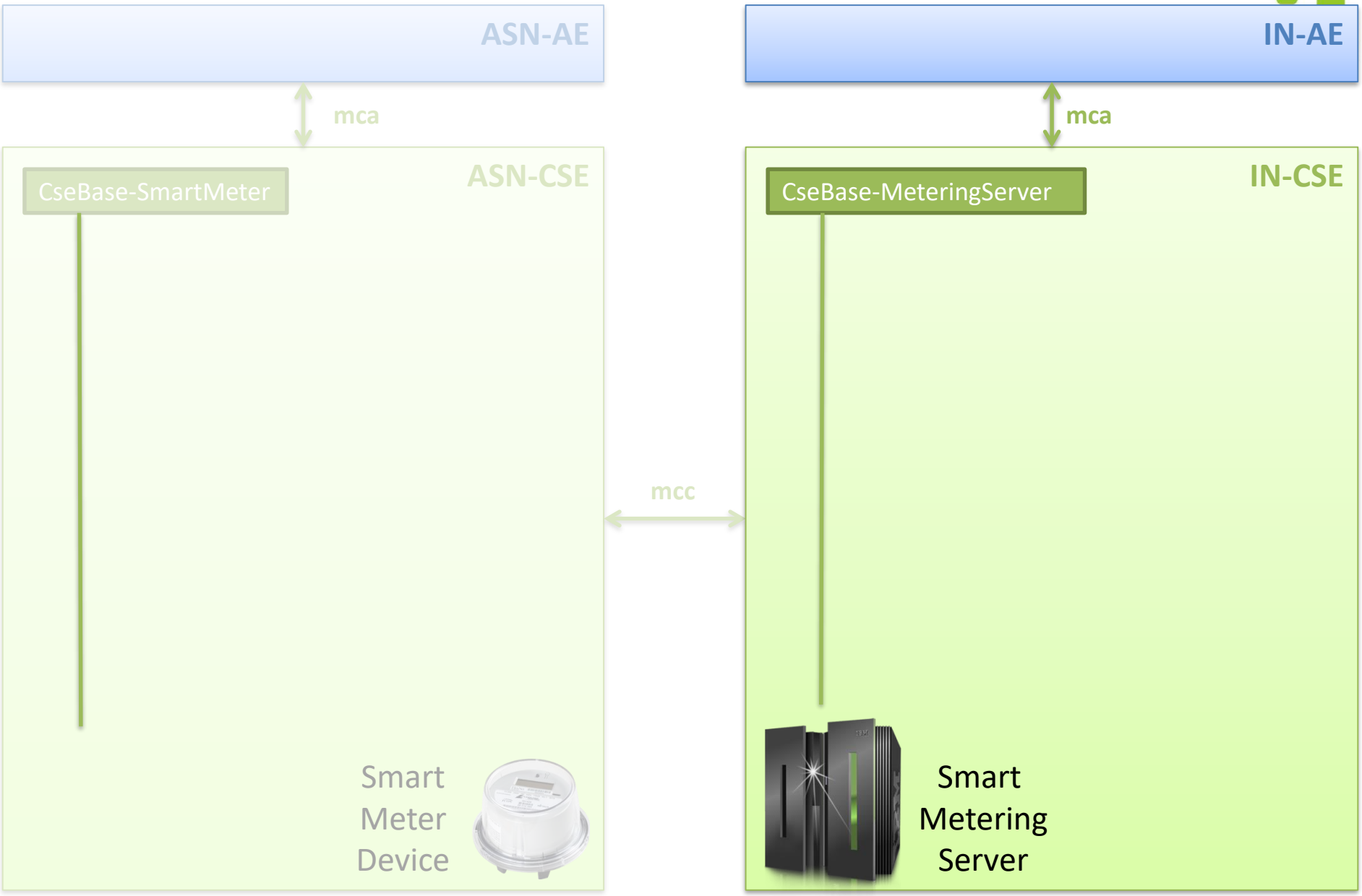
sensinov Global IoT Platform

oneM2M scenarios

- **Scenario 1 -** Nodes mutual authentication and applications registration
- **Scenario 2 -** Retrieve data from smart meter
- **Scenario 3 -** Get notified when new metering data is created
- **Scenario 4 -** Get notified when new smart a meter is registered
- **Scenario 5 -** Store smart meter data remotely using announcement

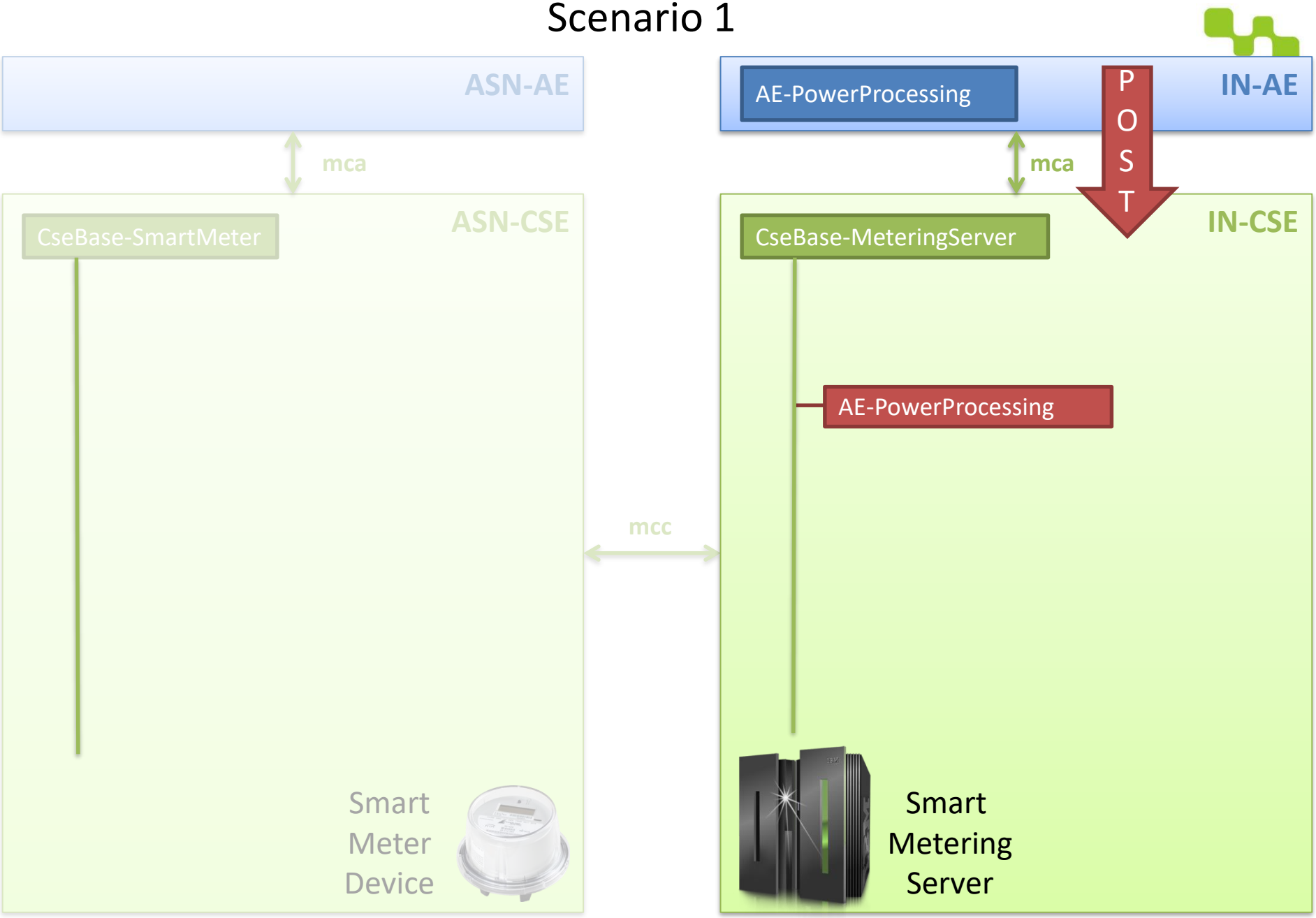
Scenario 1
Nodes mutual authentication and applications registration

Scenario 1



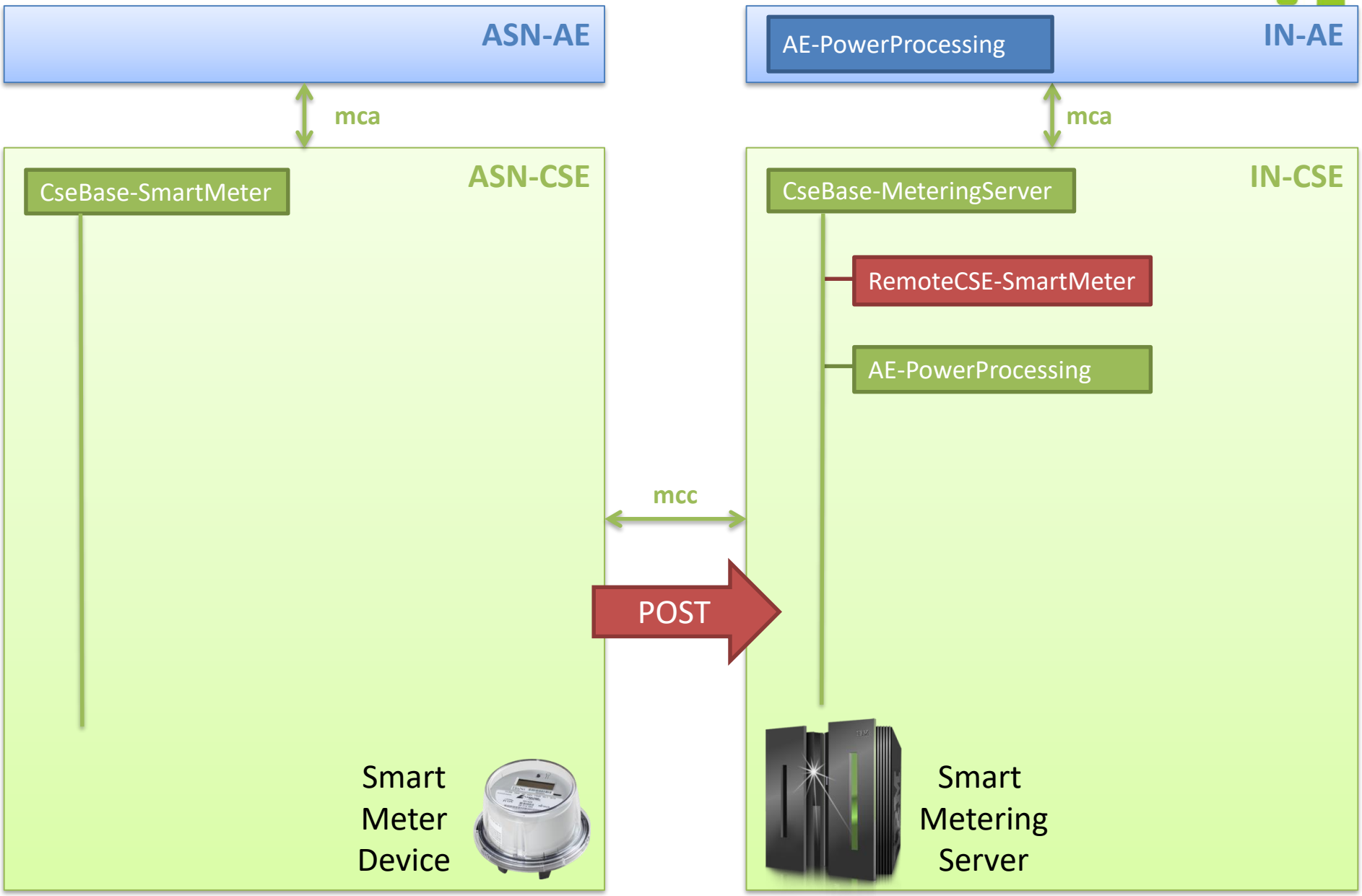
Initial state

Scenario 1



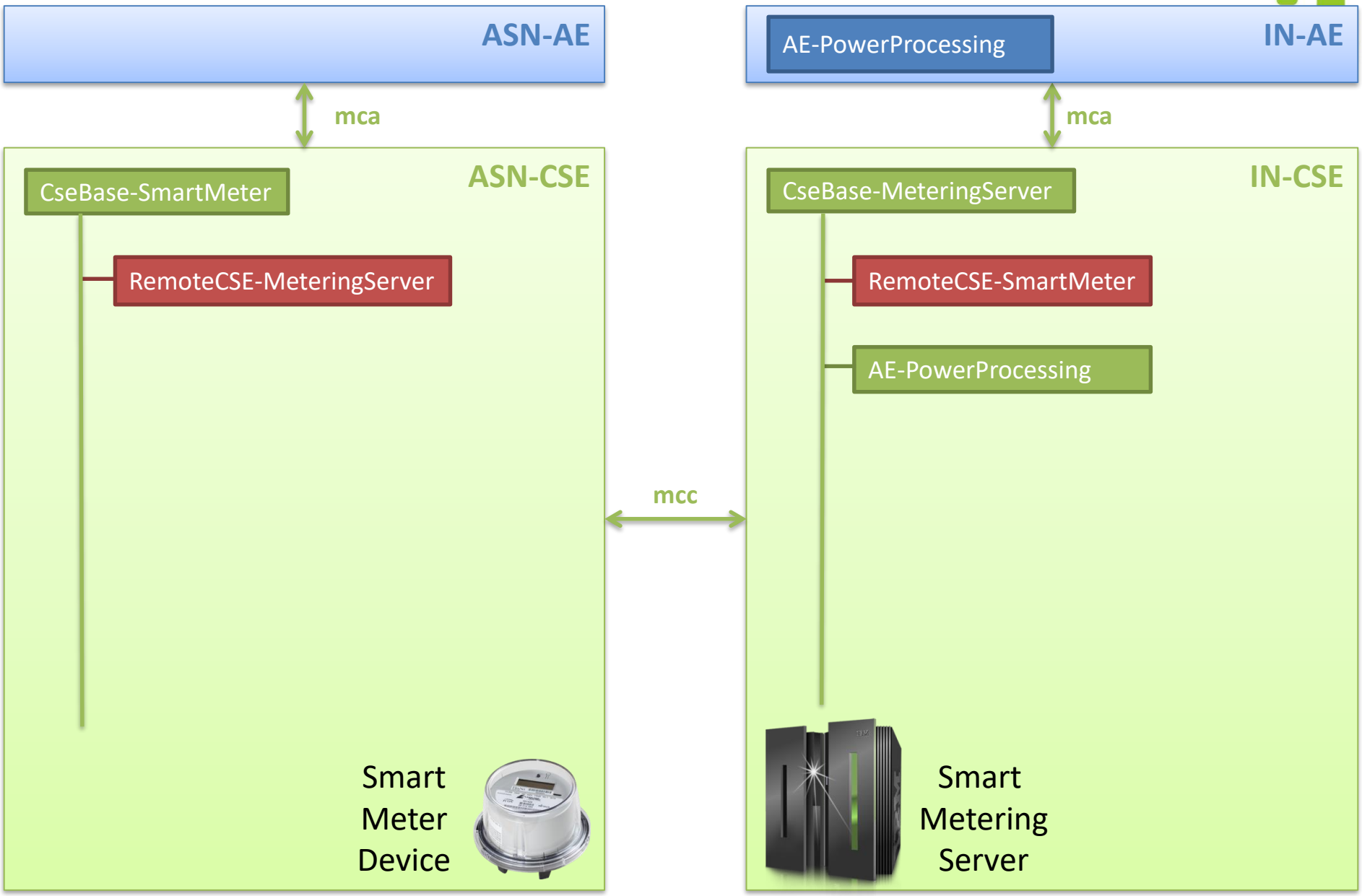
Step 1- AE-PowerProcessing Registers to the Metering Server IN-CSE

Scenario 1



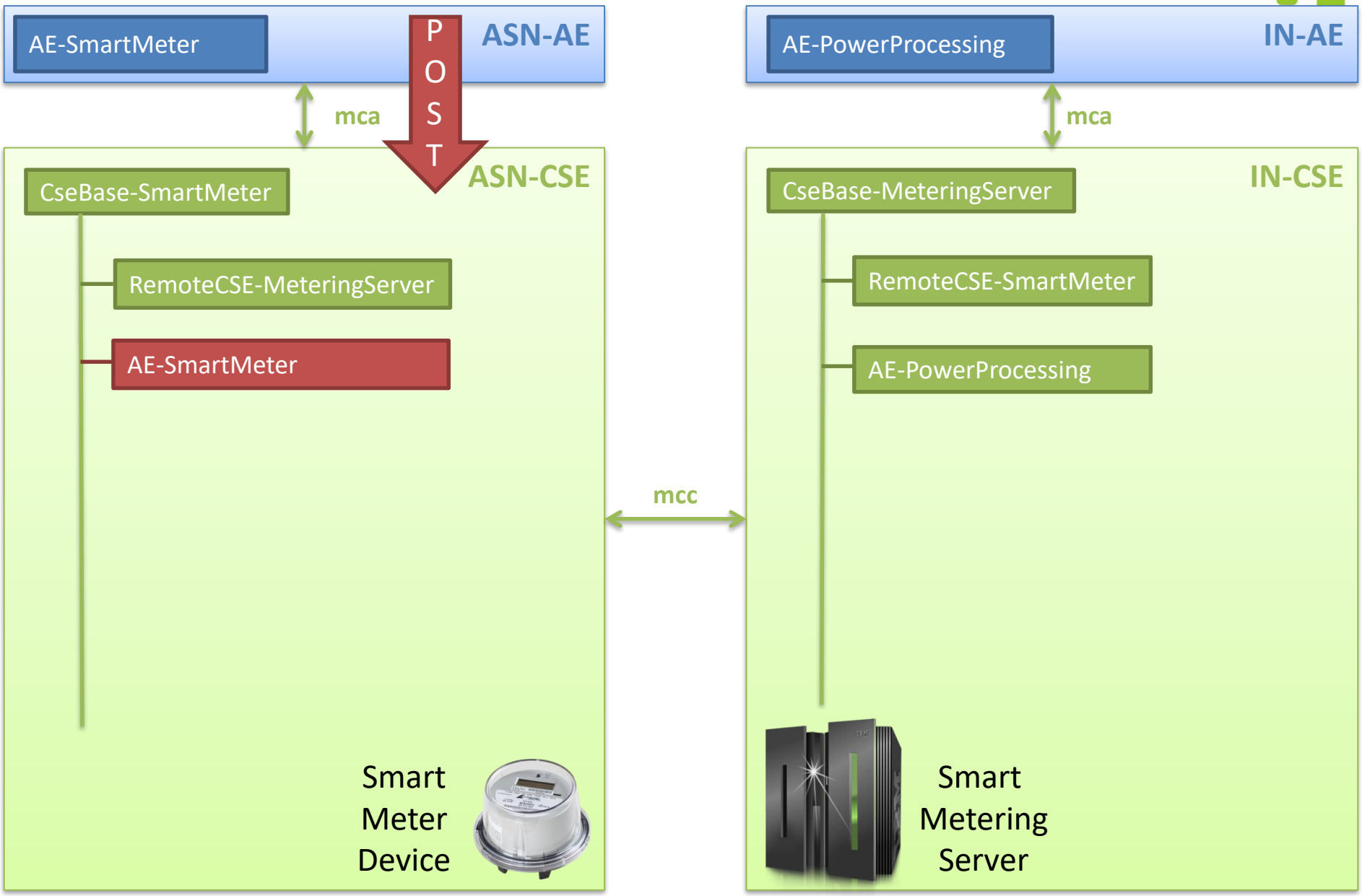
Step 2- The Smart Meter ASN-CSE registers to the Metering Server IN-CSE

Scenario 1



Step 3- The Smart Meter ASN-CSE Creates locally RemoteCSE-MeteringServer resource

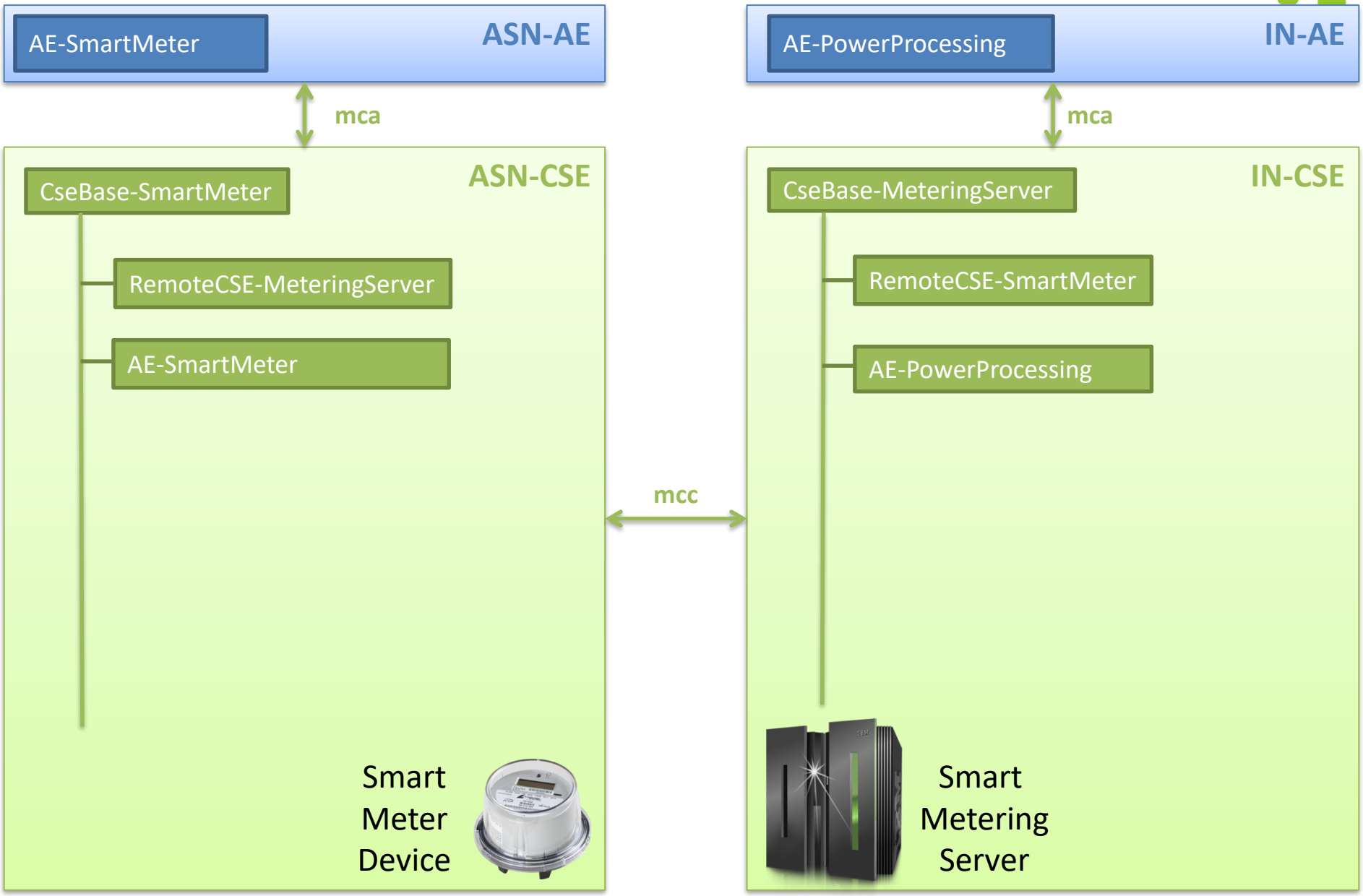
Scenario 1



Step 4- AE-SmartMeter registers to the Smart Meter ASN-CSE

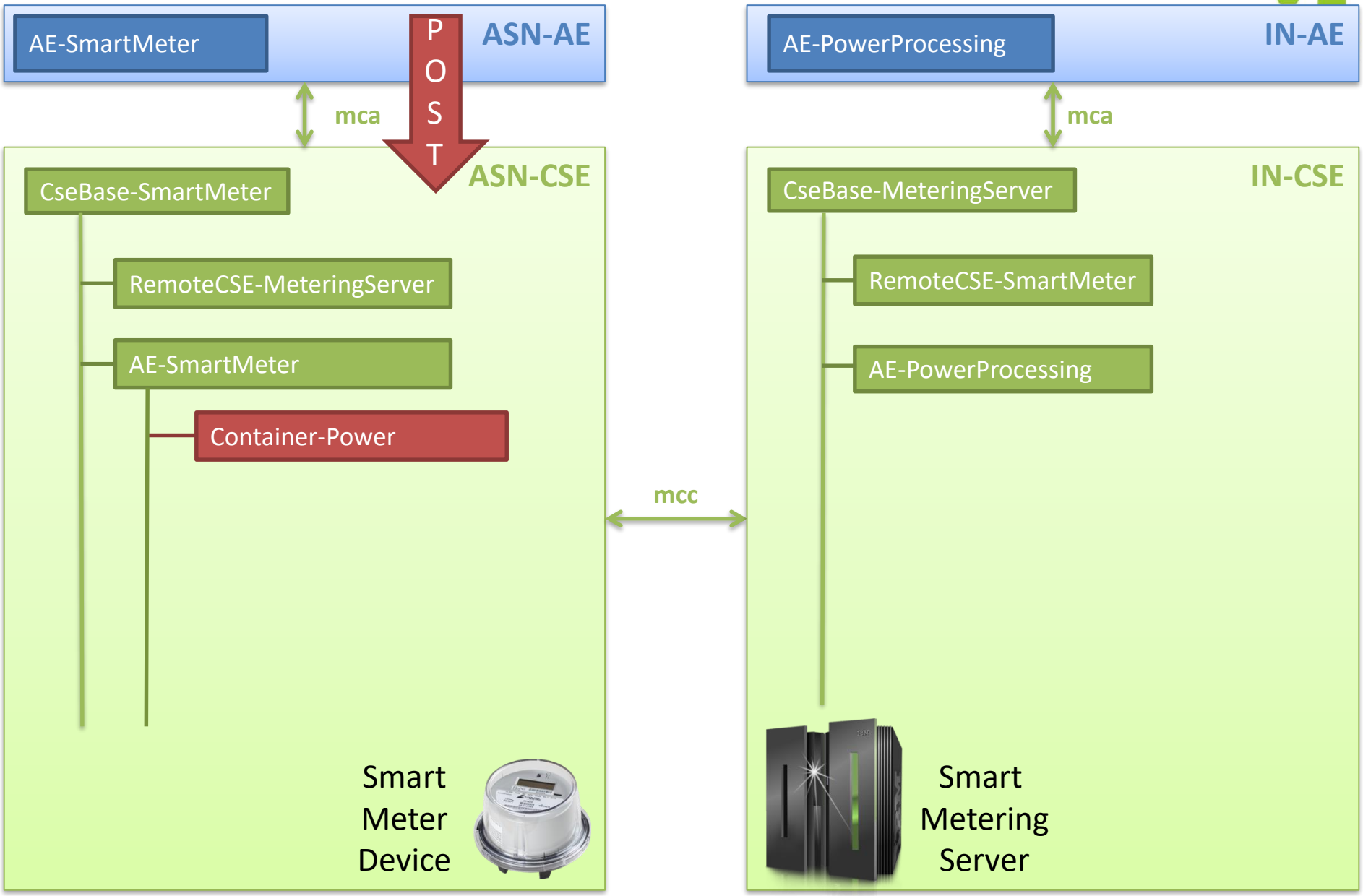
Scenario 2
Retrieve data from smart meter

Scenario 2



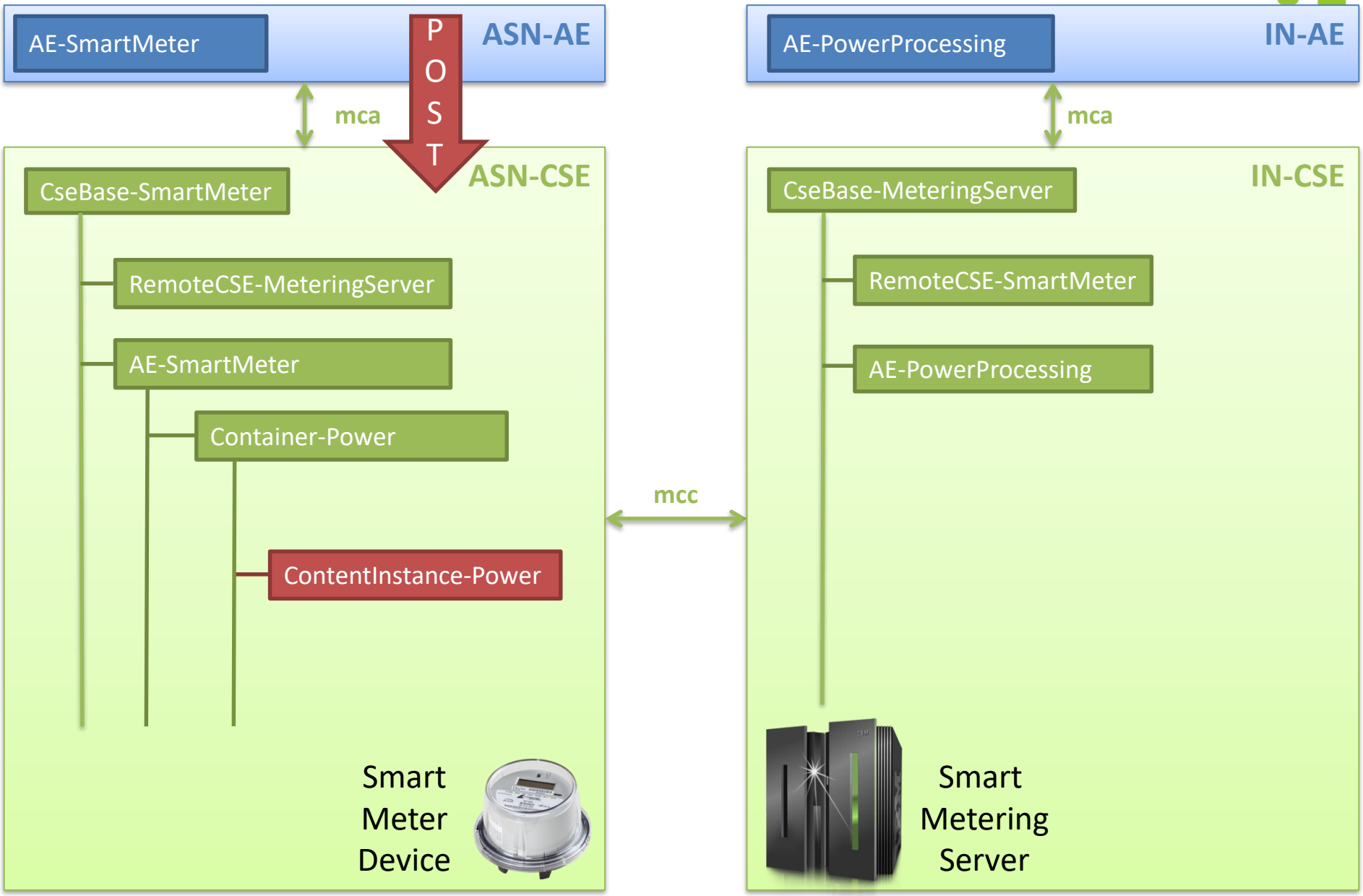
Initial state

Scenario 2



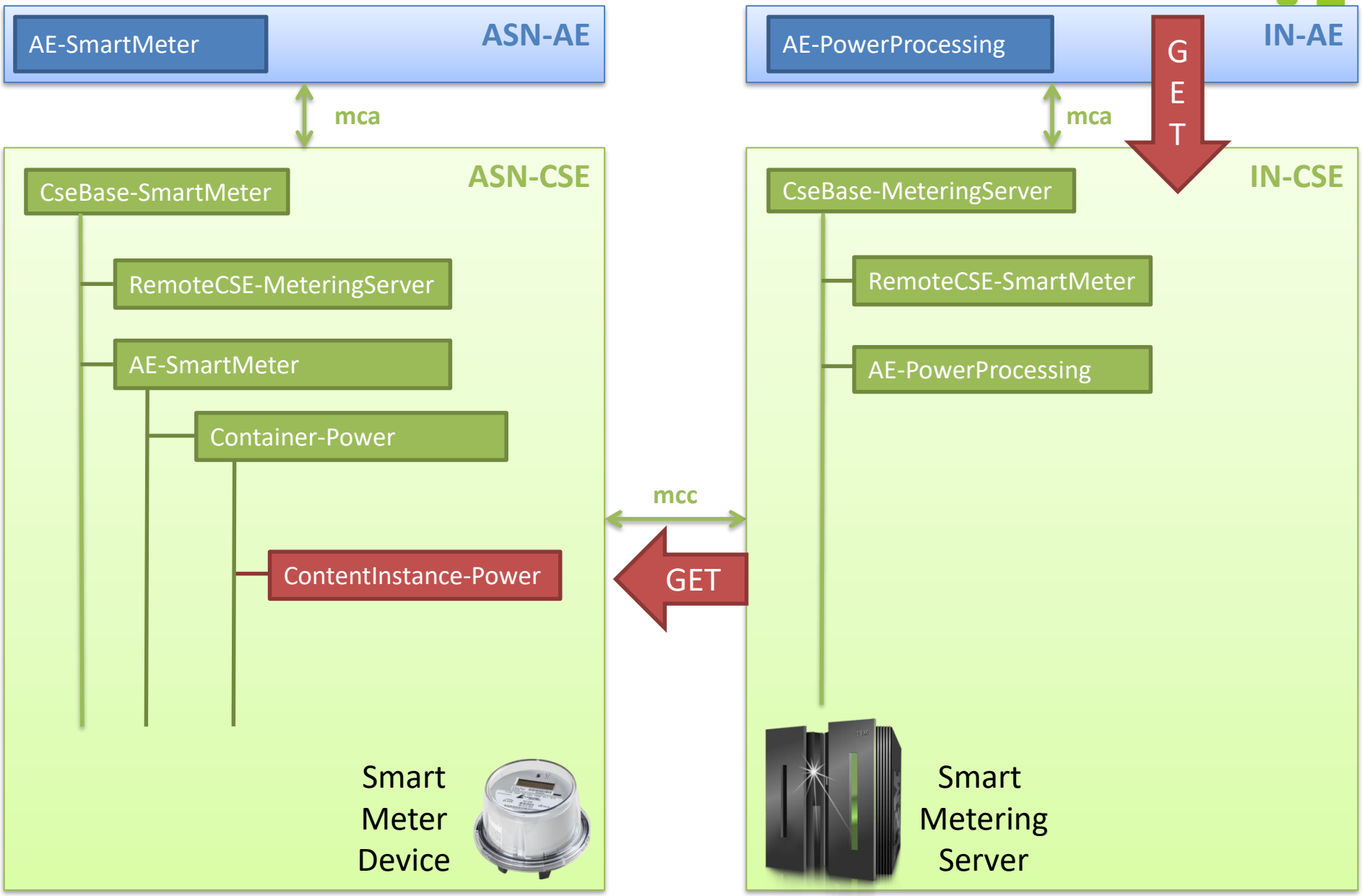
Step 1- AE-SmartMeter Creates Container-Power sub-resource

Scenario 2



Step 2- AE-SmartMeter creates ContentInstance-Power sub-resource

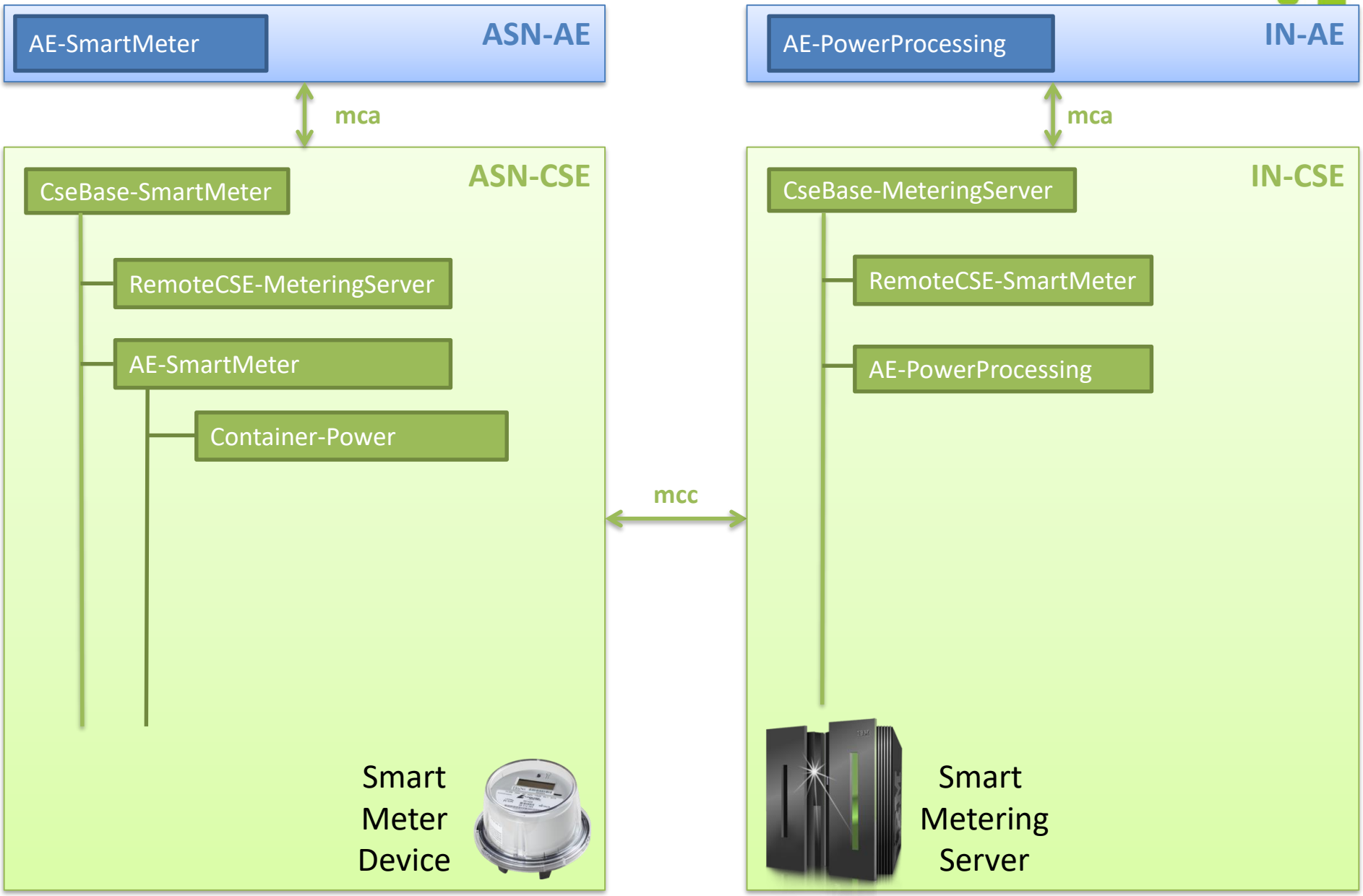
Scenario 2



Step 3- AE-PowerProcessing retrieves the ContentInstance-Power resource

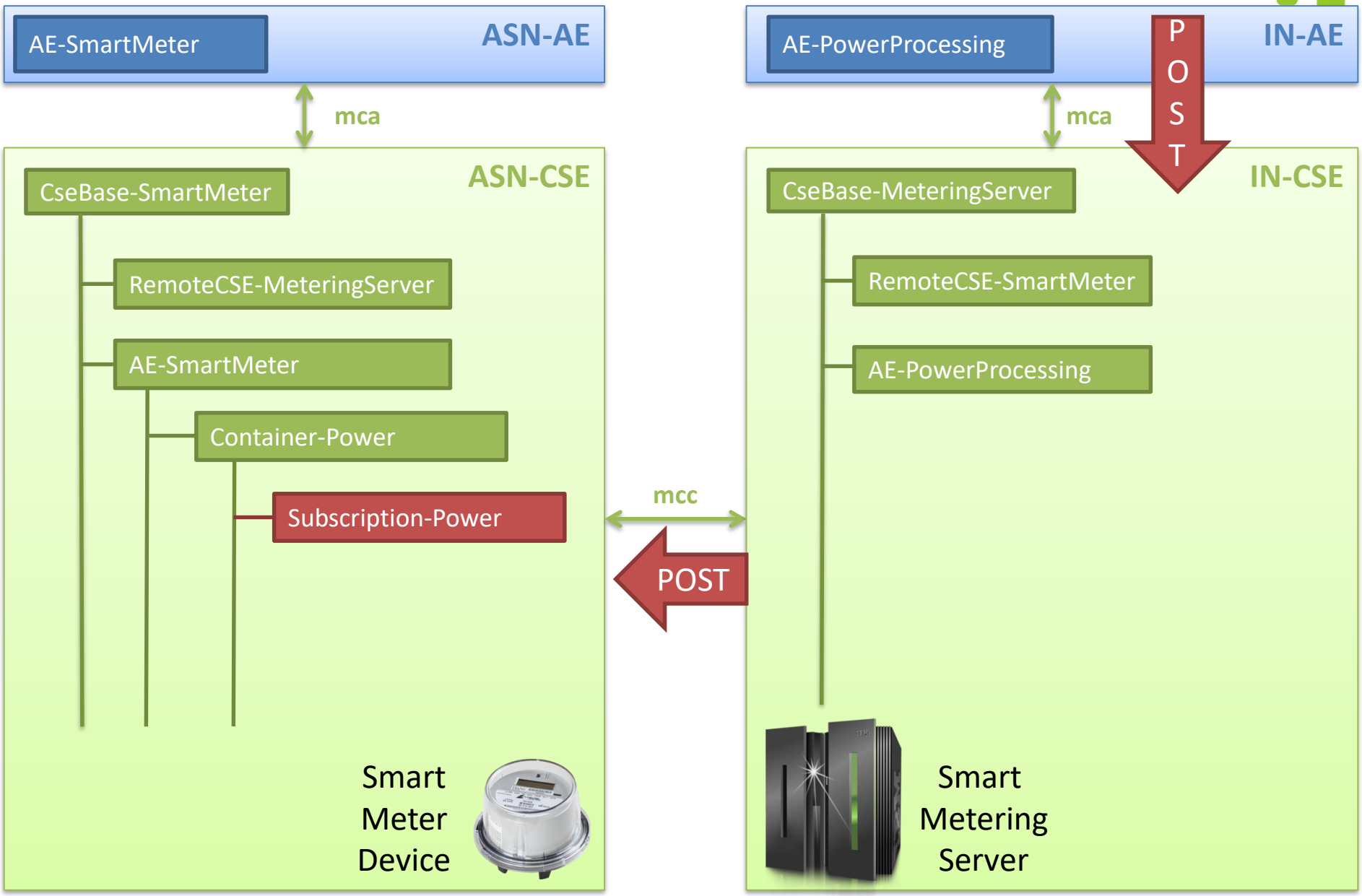
Scenario 3
Get notified when new metering data is created

Scenario 3



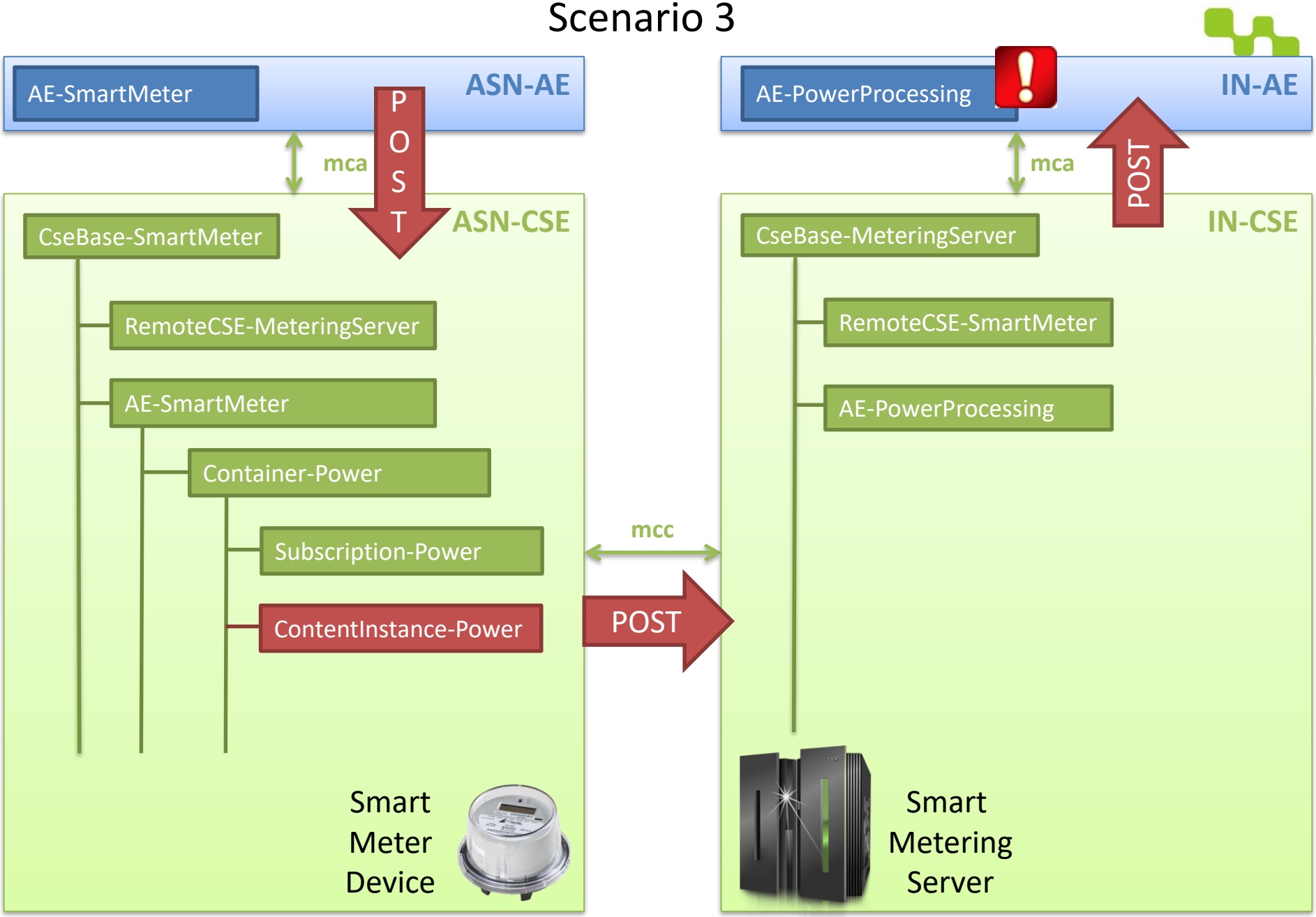
Initial state

Scenario 3



Step 1- AE-PowerProcessing subscribes to Container-Power of AE-SmartMeter

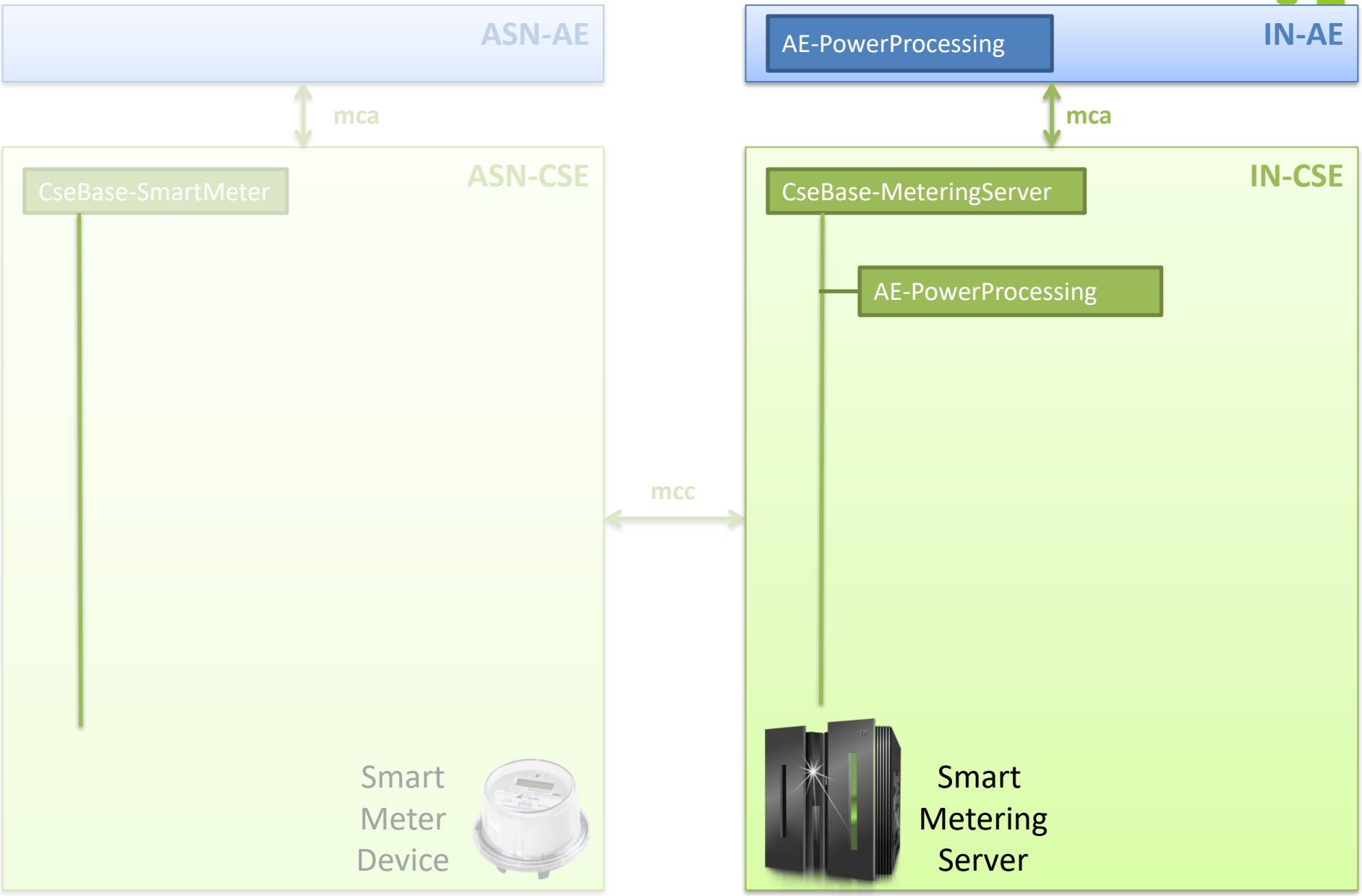
Scenario 3



Step 2- AE-SmartMeter creates ContentInstance-Power. AE-PowerProcessing is notified.

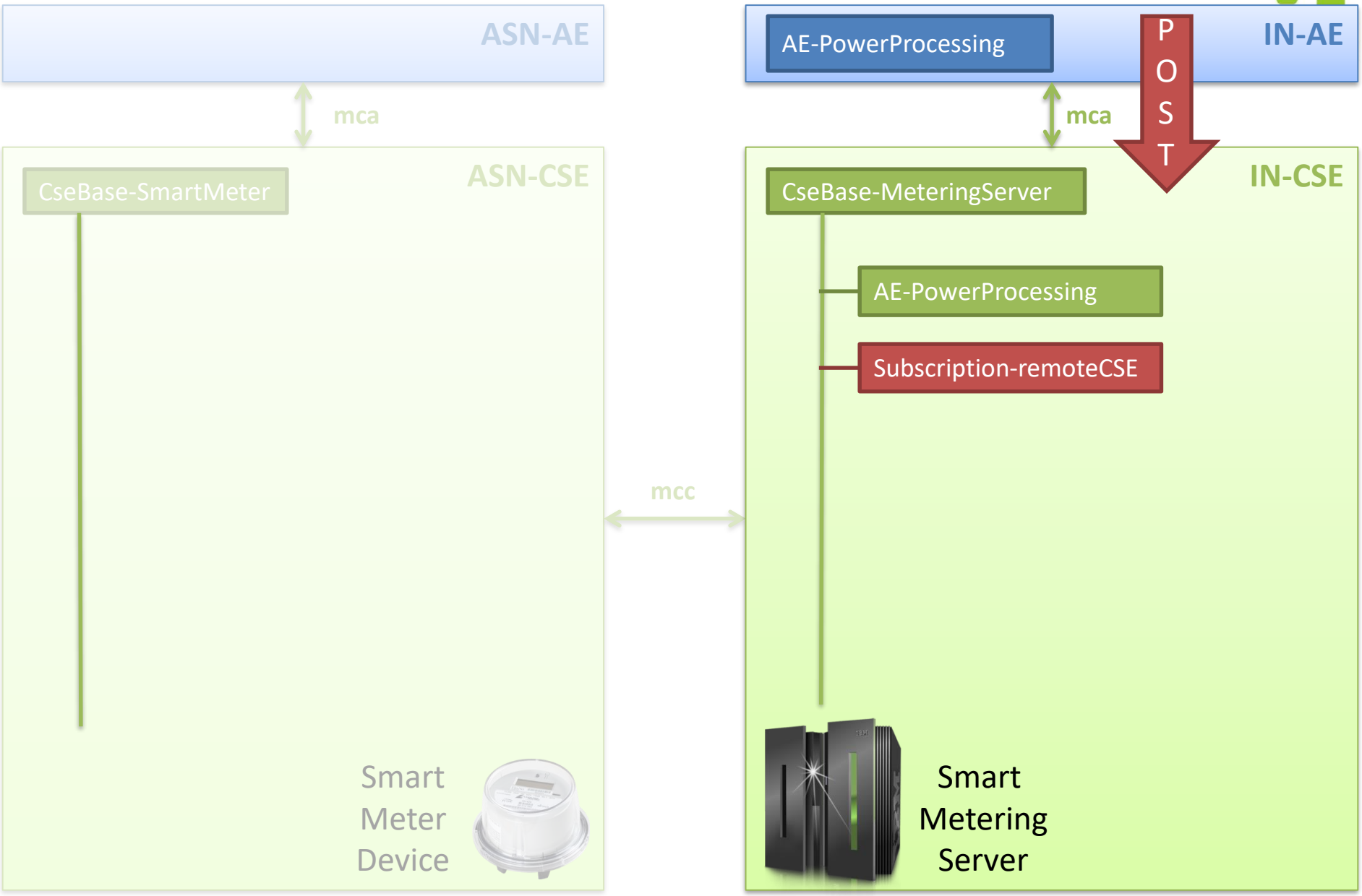
Scenario 4
Get notified when new smart a meter is registered

Scenario 4



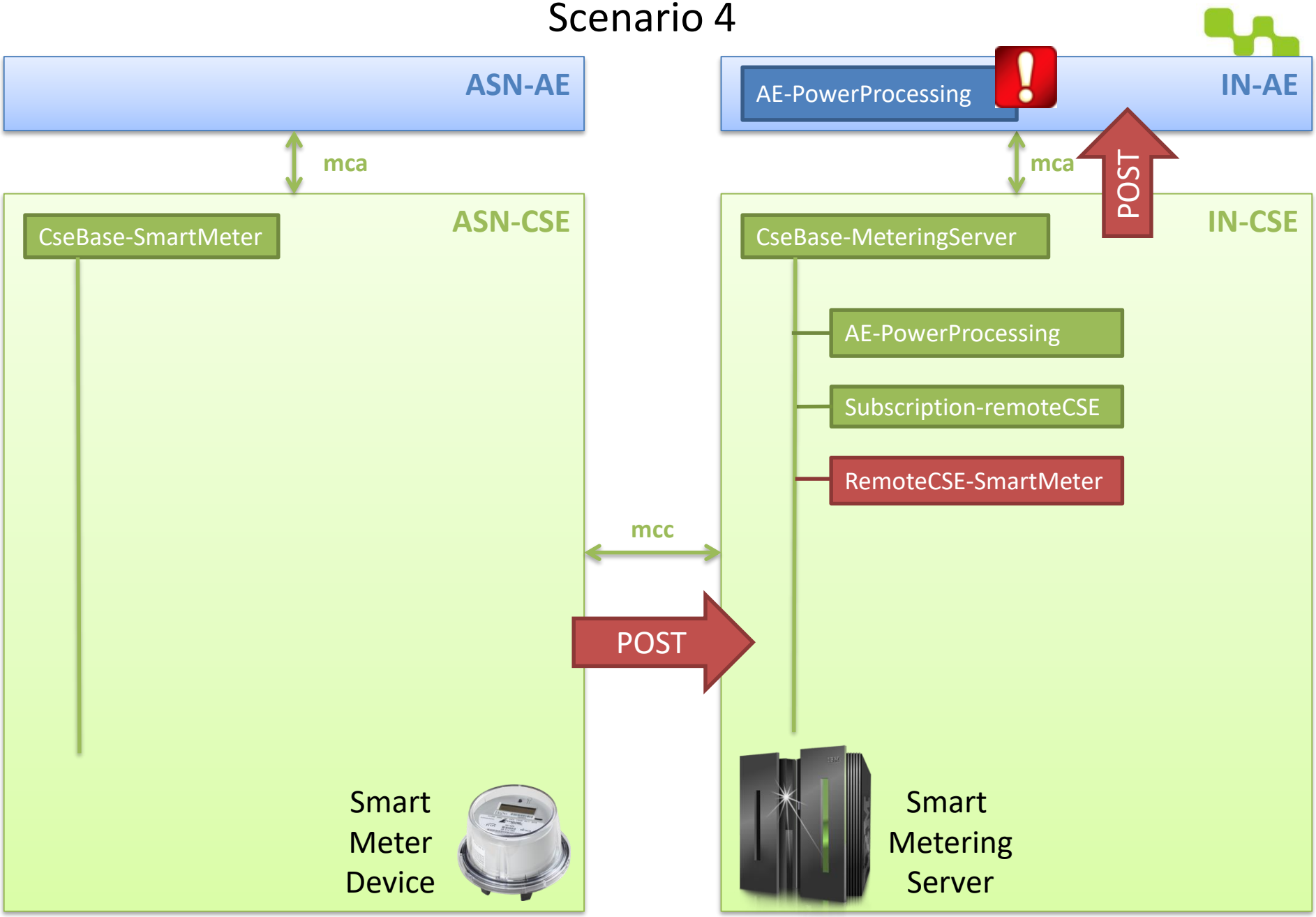
Initial state

Scenario 4



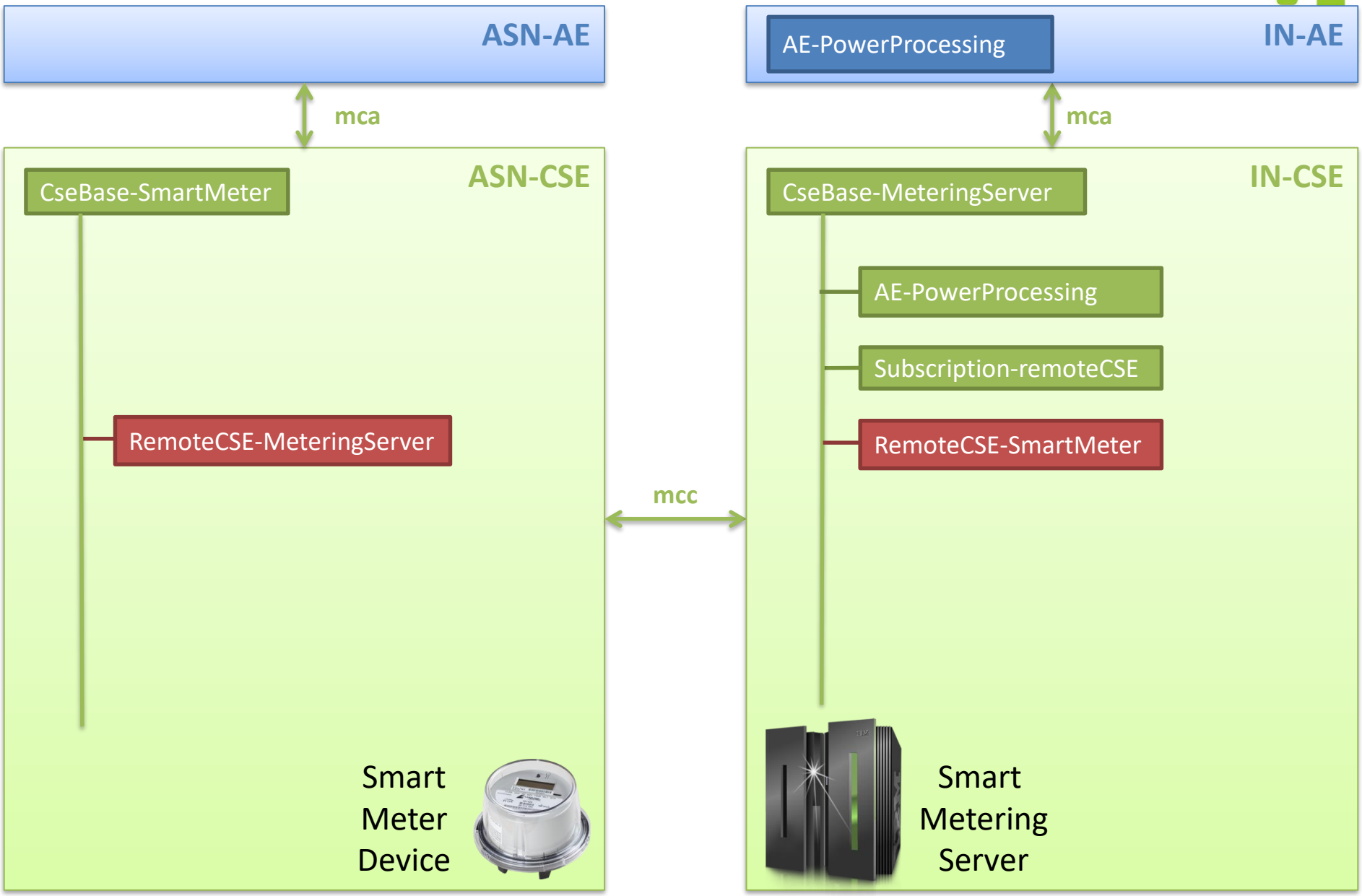
Step 1- AE-PowerProcessing creates Subscription-devices resource to get notified of new meters

Scenario 4



Step 2- The Smart Meter registers to the Metering Server. AE-PowerProcessing is notified

Scenario 4

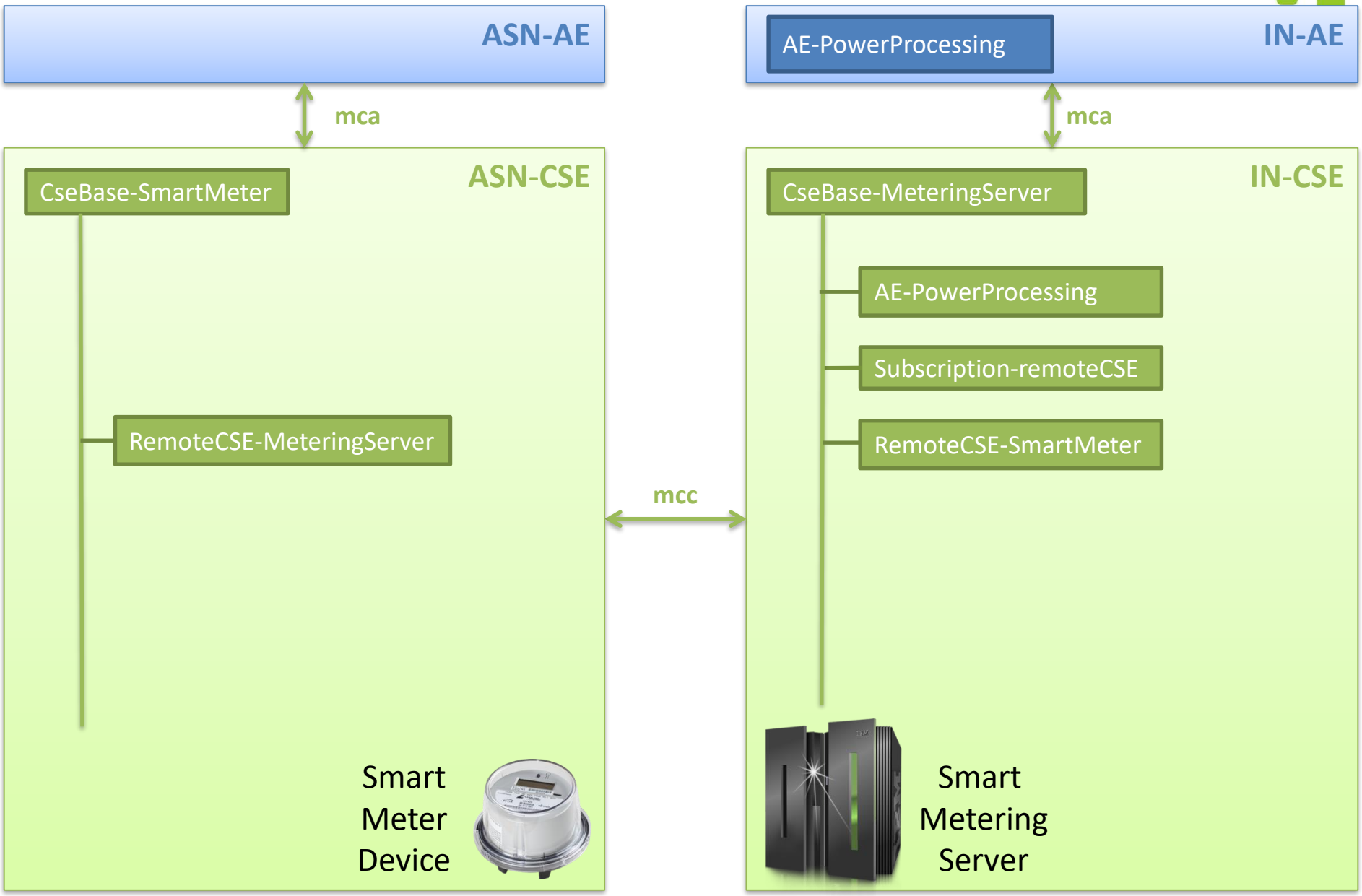


Step 3- The Smart Meter ASN-CSE Creates locally RemoteCSE-SmartMeter resource

Scenario 5

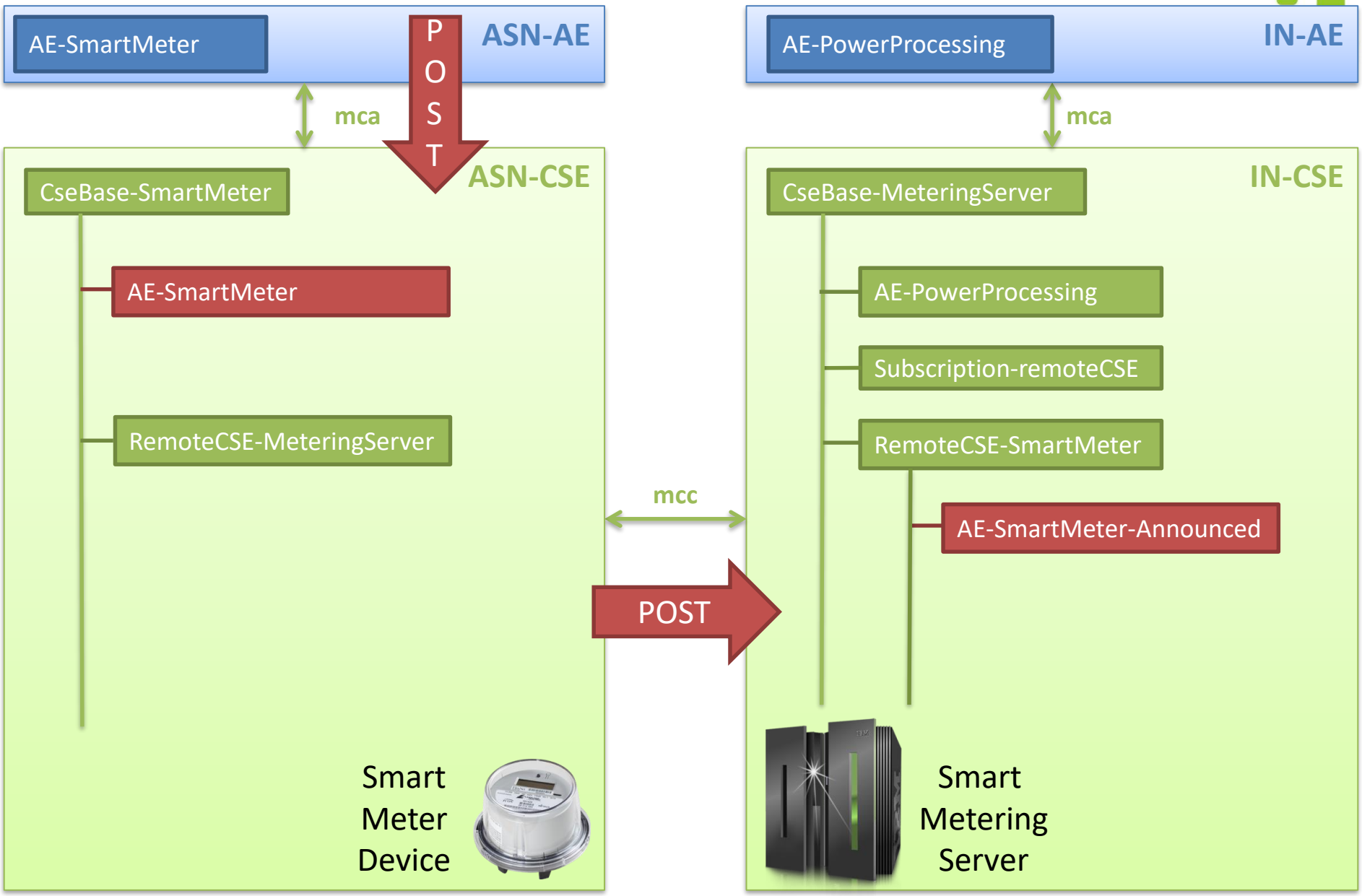
Store smart meter data remotely using announcement

Scenario 5



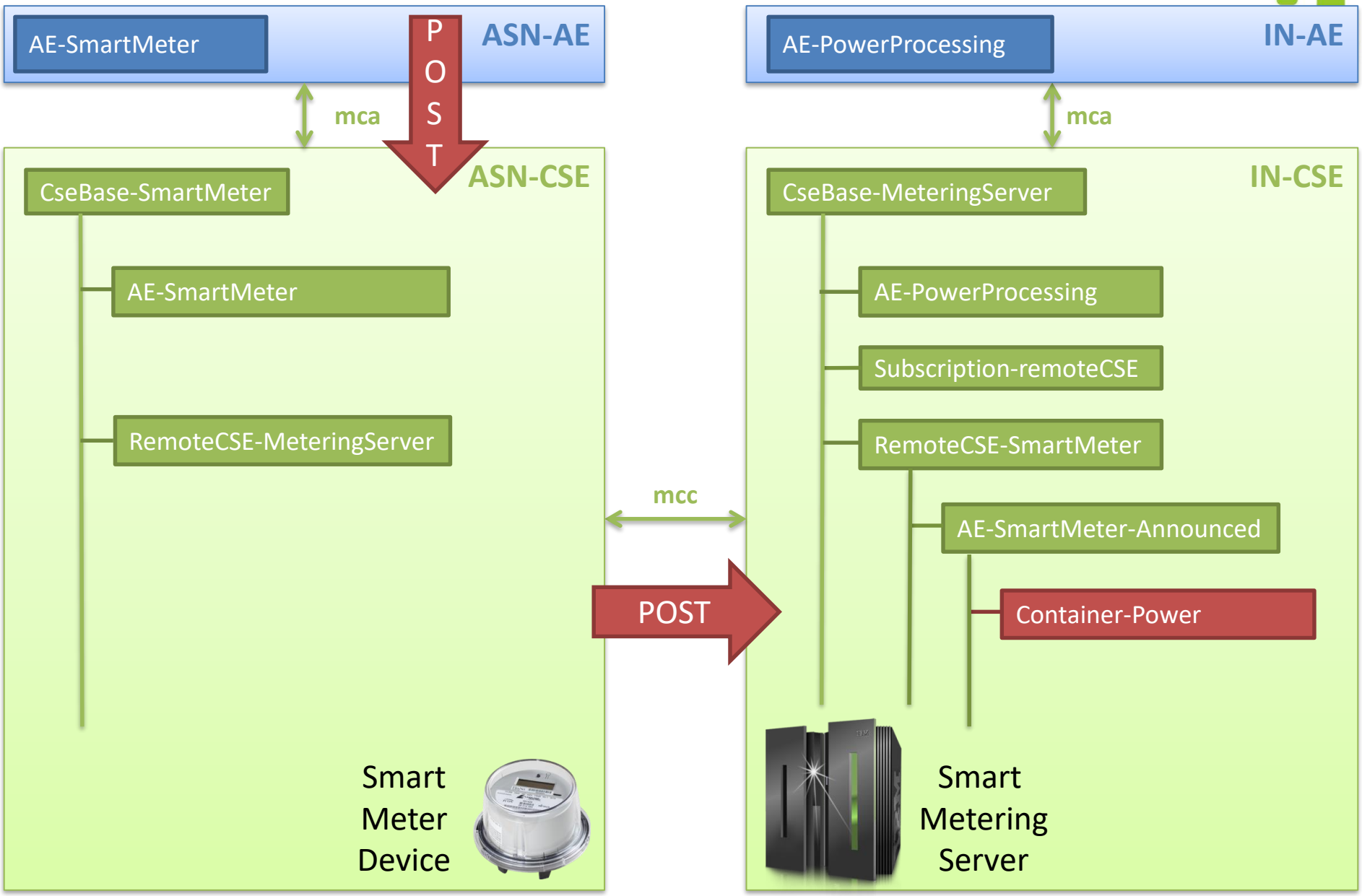
Initial state

Scenario 5



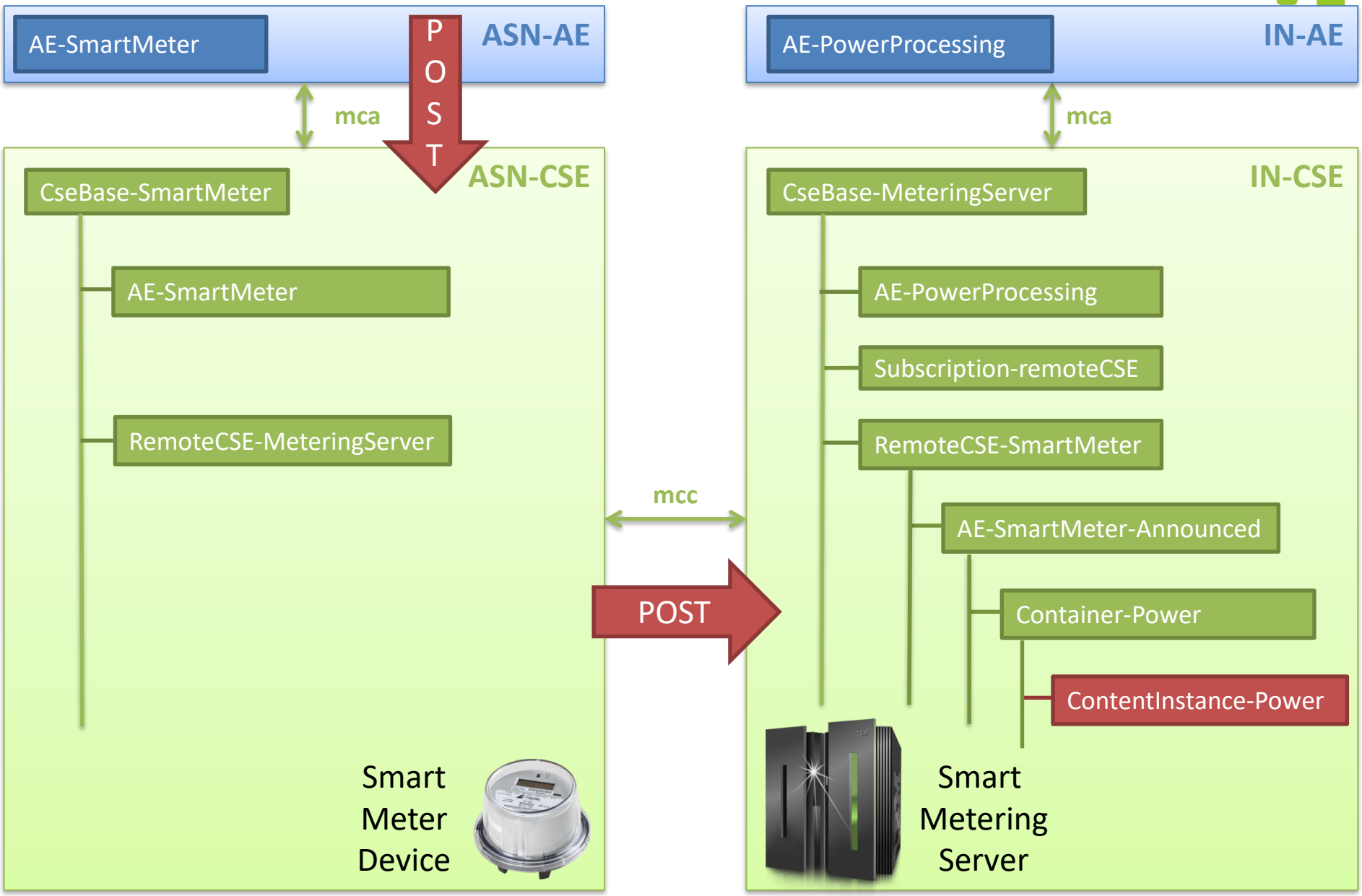
Step 1- AE-SmartMeter registers to the Smart Meter ASN-CSE with announcement.

Scenario 5



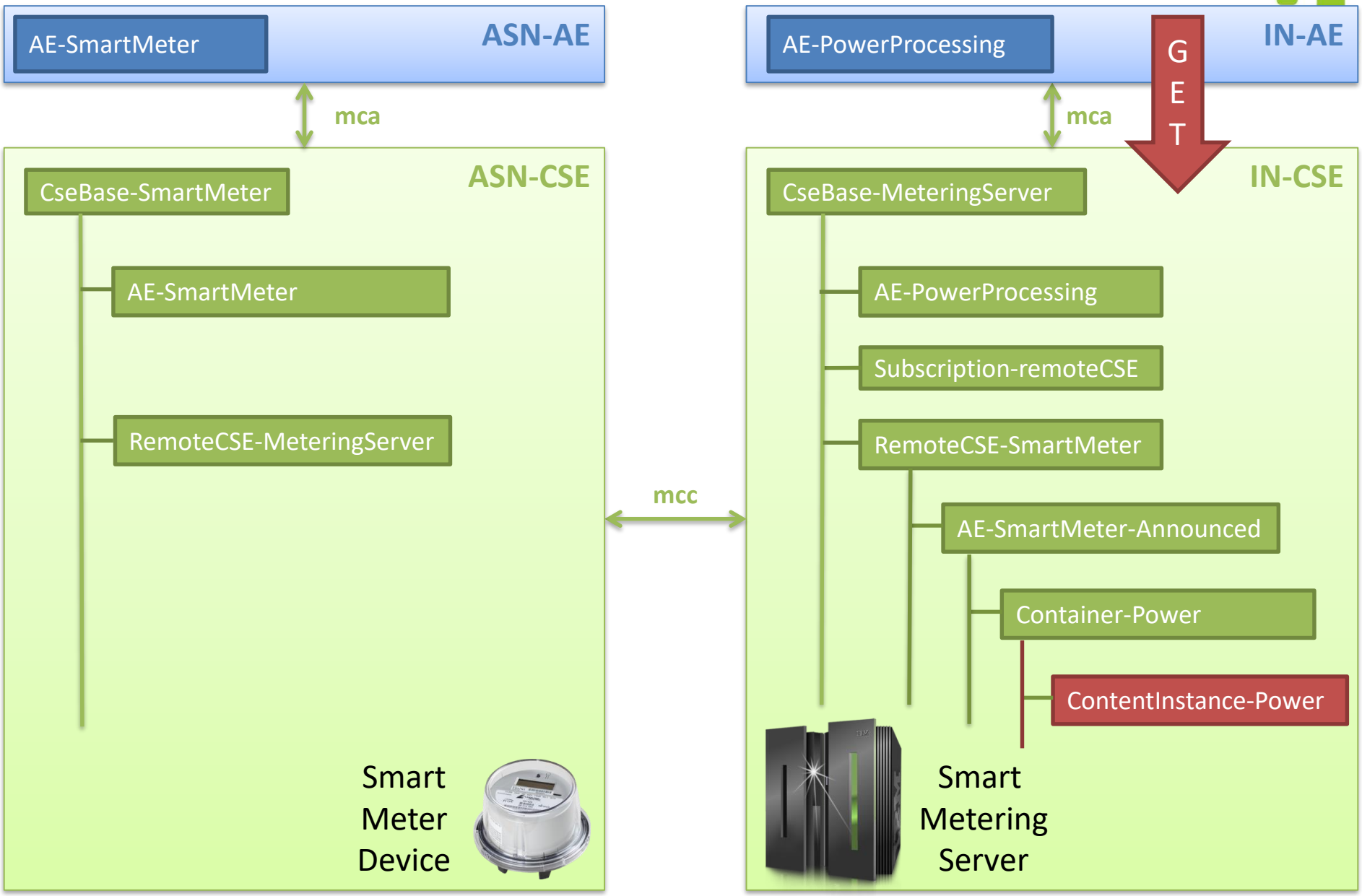
Step 2- AE-SmartMeter remotely creates Container-Power on AE-SmartMeter-Announced

Scenario 5



Step 3- AE-SmartMeter creates remotely ContentInstance-Power

Scenario 5



Step 4- AE-PowerProcessing retrieves the ContentInstance-Power resource direcly from IN-CSE

Thank you for your Attention

benalaya@sensinov.com
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