

# oneM2M TS 0001



oneM2M IoT 플랫폼 기술

## Published Specifications

As we publish new specifications, they will appear here or on release-specific pages.

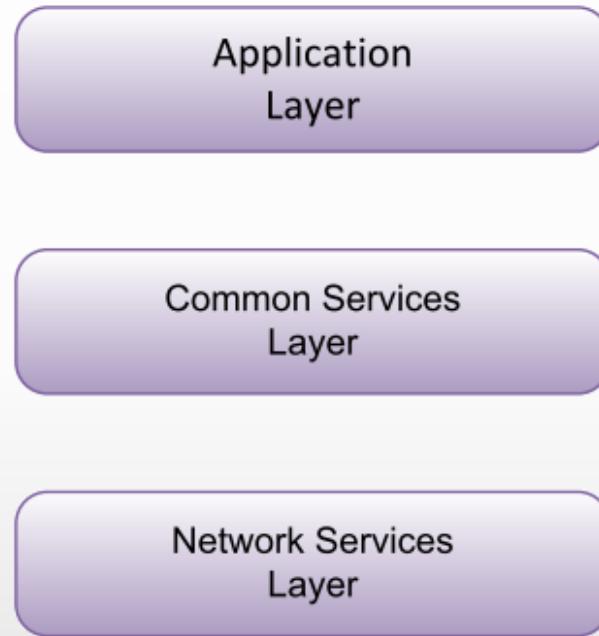


### oneM2M Release 1 specifications

Latest	Reference	Version	Title	Date	ARIB	ATIS	CCSA	ETSI	TIA	TTA	JTC
	TS 0001	1.6.1	Functional Architecture	01/2015		ATIS.oneM2M.TS0001V161-2015		TS 118 101 V1.0.0	TIA-5022.001	TTAT.MM-TS.0001	TS-M2M-0001v1.6.1
★	TS 0001	1.13.1	Functional Architecture	03/2016			TS 118 101 V1.1.0				TS-M2M-0001v1.13.1
★	TS 0002	1.0.1	Requirements	01/2015		ATIS.oneM2M.TS0002V101-2015	TS 118 102 V1.0.0	TIA-5022.002	TTAT.MM-TS.0002		TS-M2M-0002v1.0.1
	TS 0003	1.0.1	Security Solutions	01/2015		ATIS.oneM2M.TS0003V101-2015	TS 118 103 V1.0.0	TIA-5022.003	TTAT.MM-TS.0003		TS-M2M-0003v1.0.1
★	TS 0003	1.4.2	Security Solutions	03/2016			TS 118 103 V1.1.0				TS-M2M-0003v1.4.2
	TS 0004	1.0.1	Service Layer Core Protocol Specification	01/2015		ATIS.oneM2M.TS0004V101-2015	TS 118 104 V1.0.0	TIA-5022.004	TTAT.MM-TS.0004		TS-M2M-0004v1.0.1
★	TS 0004	1.6.0	Service Layer Core Protocol Specification	03/2016			TS 118 104 V1.6.0				TS-M2M-0004v1.6.0
	TS 0005	1.0.1	Management Enablement (OMA)	01/2015		ATIS.oneM2M.TS0005V101-2015	TS 118 105 V1.0.0	TIA-5022.005	TTAT.MM-TS.0005		TS-M2M-0005v1.0.1
★	TS 0005	1.4.1	Management Enablement (OMA)	03/2016			TS 118 105 V1.1.0				TS-M2M-0005v1.4.1
	TS 0006	1.0.1	Management Enablement (BBF)	01/2015		ATIS.oneM2M.TS0006V101-2015	TS 118 106 V1.0.0	TIA-5022.006	TTAT.MM-TS.0006		TS-M2M-0006v1.0.1

# In this presentation,

- Functional Architecture
- Common Services Entity
- Resources
- Communication Flow



**Figure 5.1-1: oneM2M Layered Model**

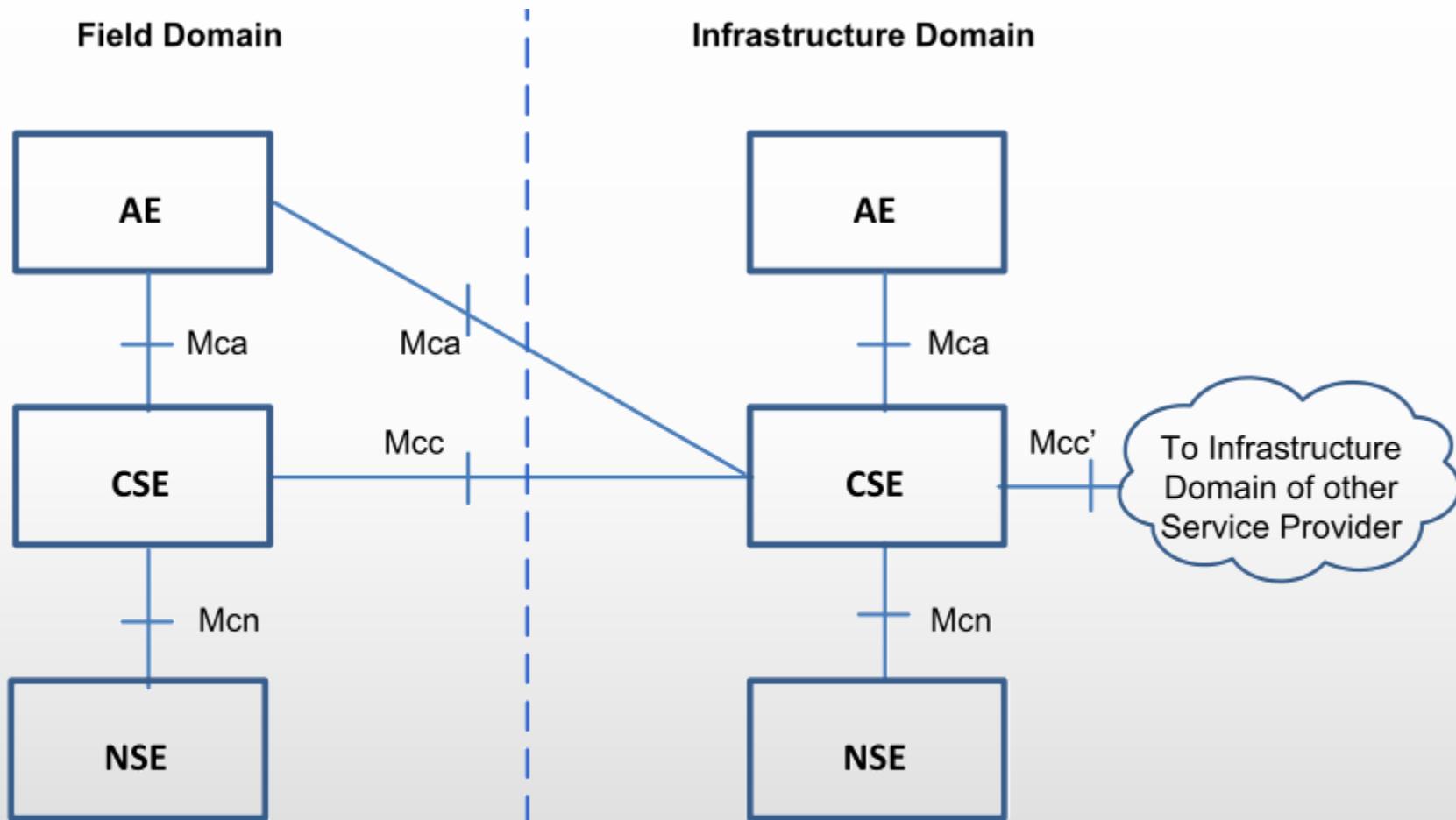


Figure 5.2.1-1: oneM2M Functional Architecture

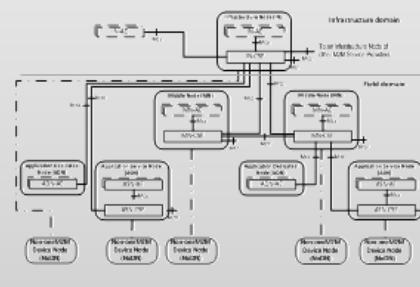
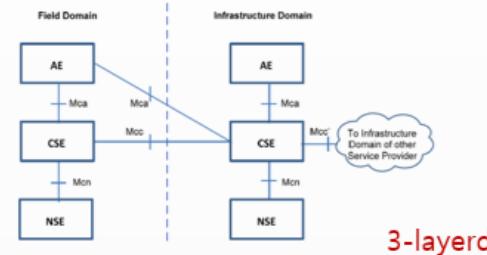
- background
    - oneM2M 타깃 서비스 분야 : target domain
    - '응용 서비스 요구사항' 도출 : requirement
    - '응용 서비스 기능' 도출 : CSF → CSE

- Architecture model

- General concepts (5.1 절)
  - Functional architecture (5.2 절)
    - AE : Application Entity
    - CSE : Common Service Entity
    - NSE : Network Service Entity
  - Reference points (5.2 절)
    - Mca : M2M communication with A
    - Mcc : M2M communication with C
    - Mcc' : M2M communication with C'
    - Mcn : M2M communication with N
    - and others

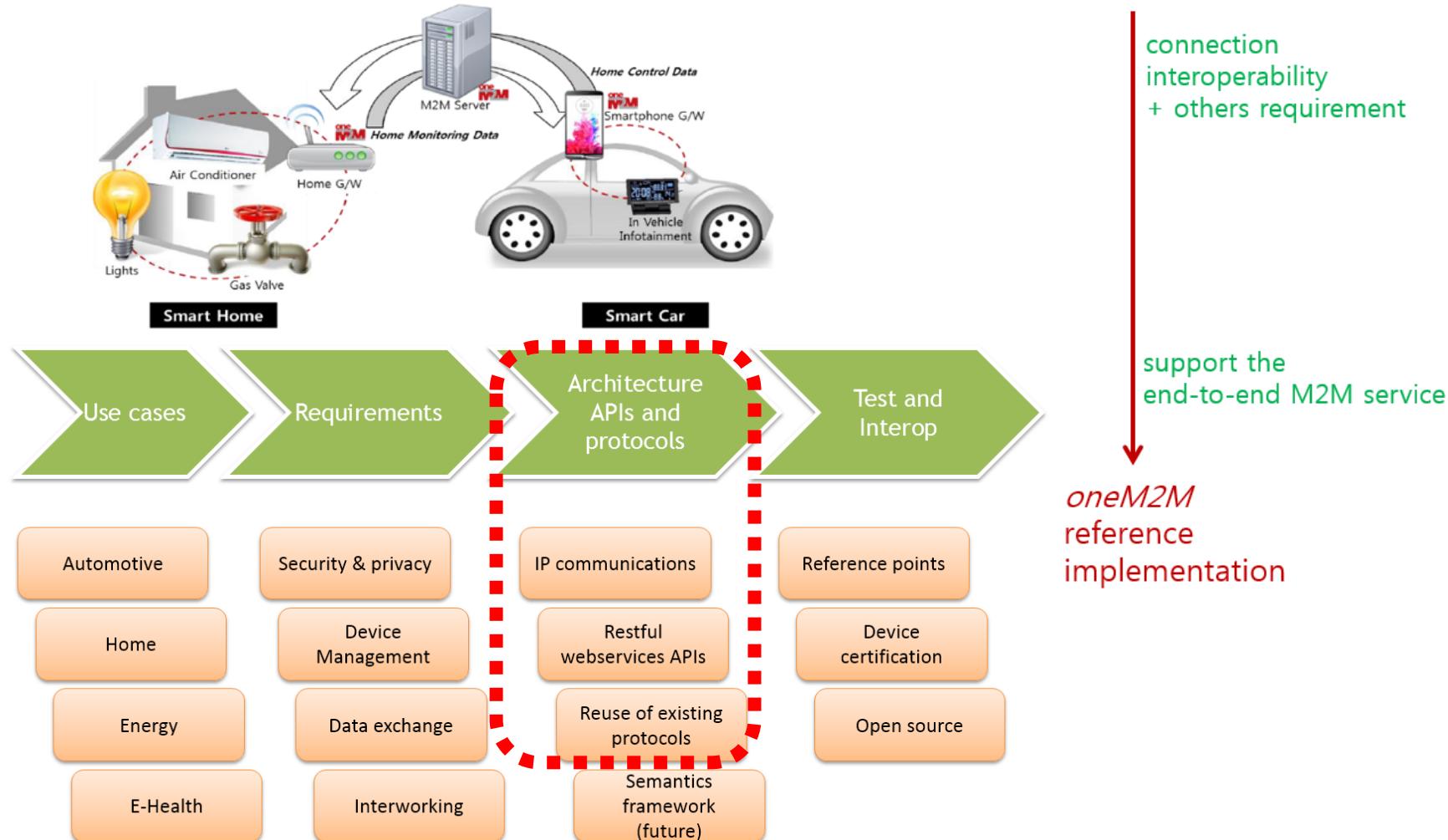
- Architecture Aspects

- Configuration supported by oneM2M Architecture (6.1 절)
    - Infrastructure domain, Field domain
    - IN : Infrastructure Node
    - MN : Middle Node
    - ASN : Application Service Node
    - ADN : Application Dedicated Node



- 주요 타겟 서비스 분야 : domain
  - 스마트 홈, 스마트 카, 에너지, 헬스케어 등

Domain *constraint* !



# oneM2M Architecture Model

- ‘공통 서비스 요구사항’ 도출

Application		Use Cases			
Smart Home	HEMS <sup>1)</sup>	Electrical Charging Vehicles at Home	Semantic Home Control	Semantic Device Plug and Play	Event Triggered Task
Smart Car	Vehicle Diagnostic & Maintenance Report	Remote Maintenance services	V2V <sup>2)</sup>	Fleet mgmt	
Energy	Wide Area Energy Control	Analytics for oneM2M	Smart Meter Reading	Energy Monitoring using Satellite	Oil/Gas Pipeline GW
Healthcare	Health care GW	Wellness services	Remote patient care		
Enterprise	Smart building				
Public Services	Street Light Automation	Car/Bicycle Sharing Services	Smart Parking	Public Safety	
Other	M2M Access Network using satellite	3GPP Interworking	Sleepy Device Control		

↓  
+ requirement

## □ 일반 요구사항

- 성능, 네트워크 연결 지원에 따른 다양한 IoT 장치 지원
- QoS<sup>3)</sup> 기반 메시지 전달
- 3GPP Interworking
- Group 제어, 멤버 제어
- 장치의 위치 관리
- 과금 관리

## □ 장치 관리 요구사항

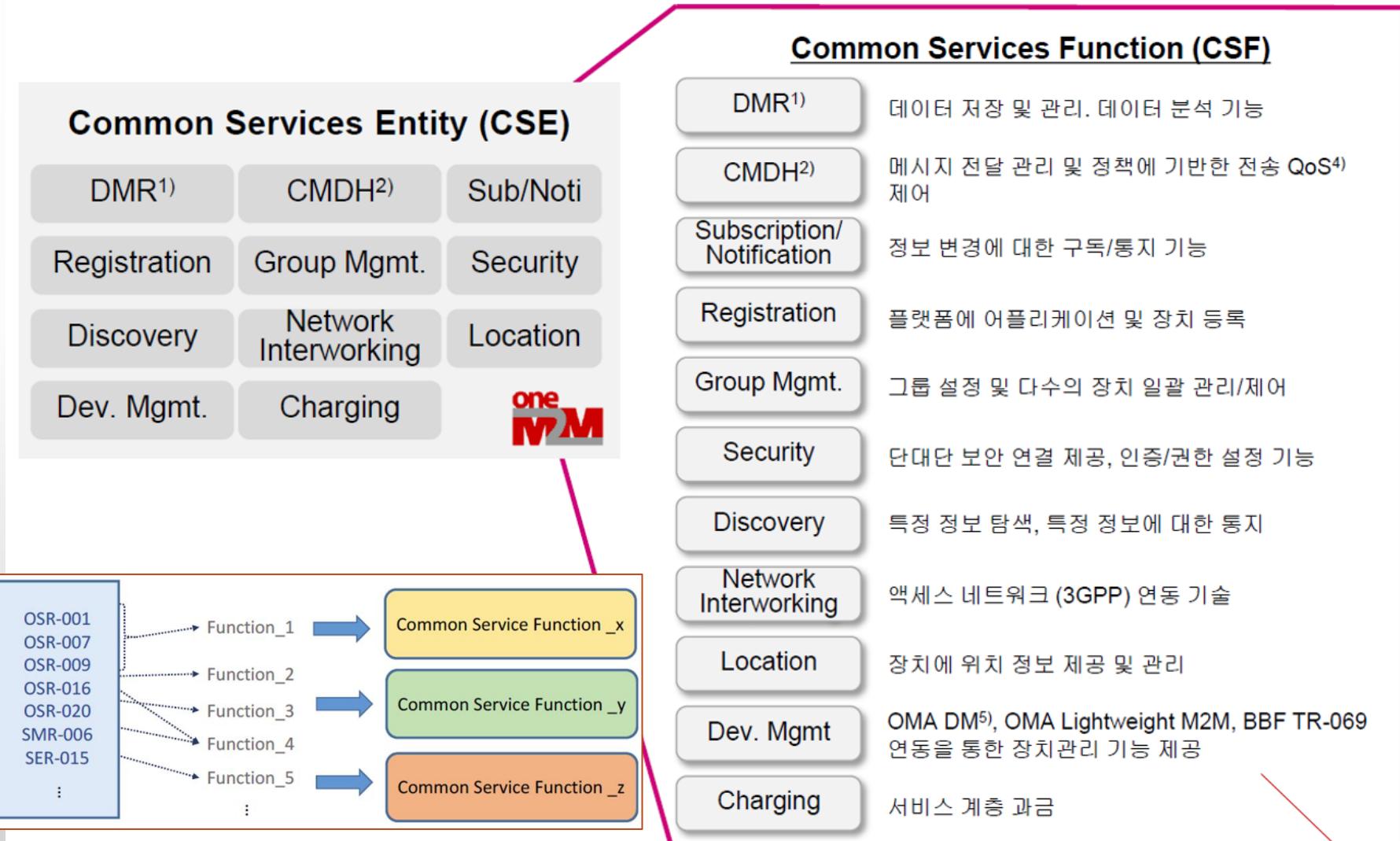
- OMA DM/BBF TR-069 표준 지원
- 펌웨어, 소프트웨어 제어
- 장치 분실, 고장 제어

## □ 보안 요구사항

- 요청자에 대한 인증/권한 부여
- 기반 네트워크 보안 기능 활용

# oneM2M Architecture Model

- ‘공통 서비스 기능(CSF)’ 도출 → 그 구현 : CSE

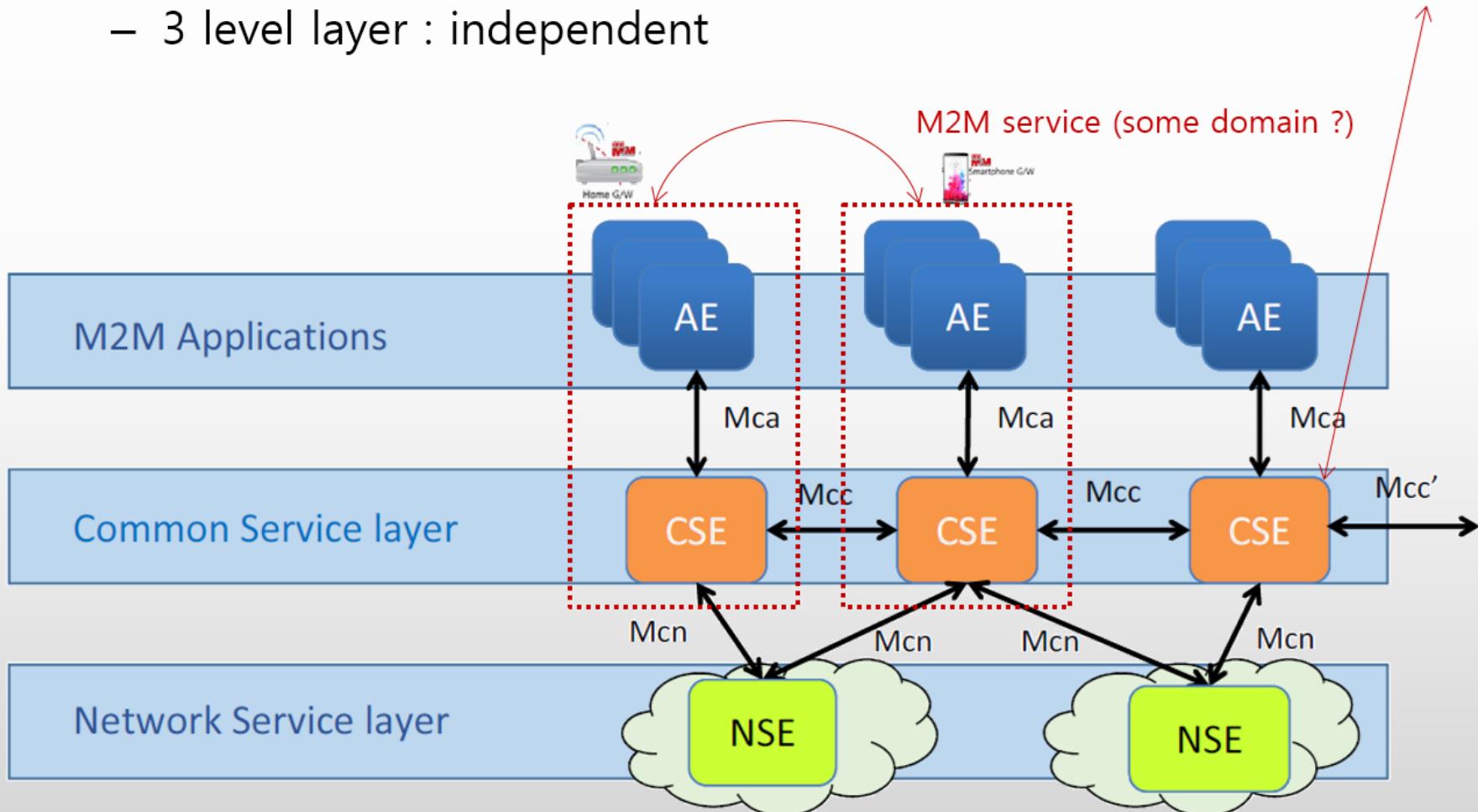


# oneM2M Architecture Model

- General concepts

- M2M service 간의 end-to-end 연계 지원
- 3 level layer : independent

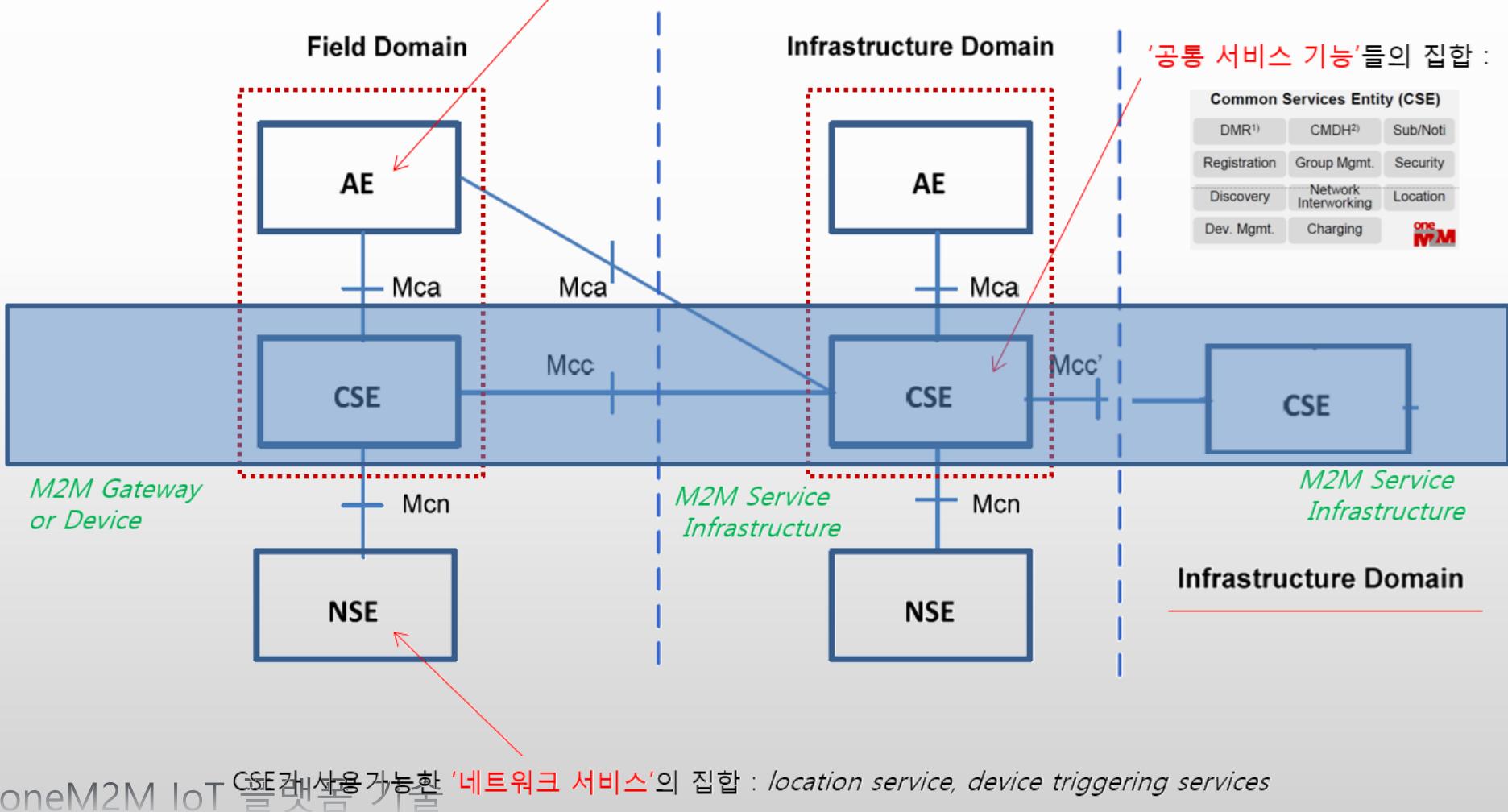
Common Services Entity (CSE)		
DMR <sup>1)</sup>	CMDH <sup>2)</sup>	Sub/Noti
Registration	Group Mgmt.	Security
Discovery	Network Interworking	Location
Dev. Mgmt.	Charging	oneM2M



# oneM2M Architecture Model

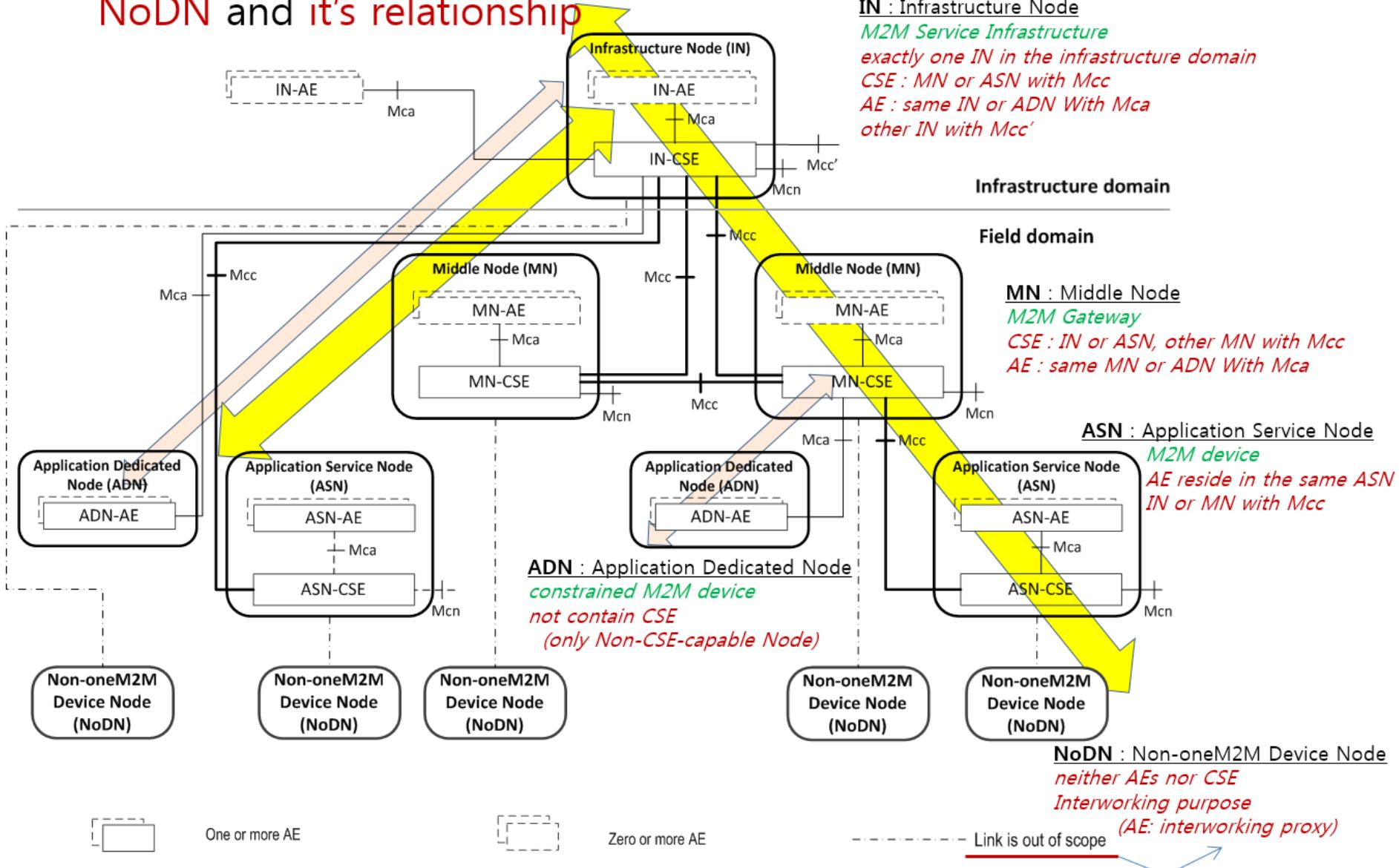
- Functional Entity : AE, CSE, NSE

문제 해결을 위한 M2M solution의 세부 application logic의 구현 :  
*power metering, tracking application*

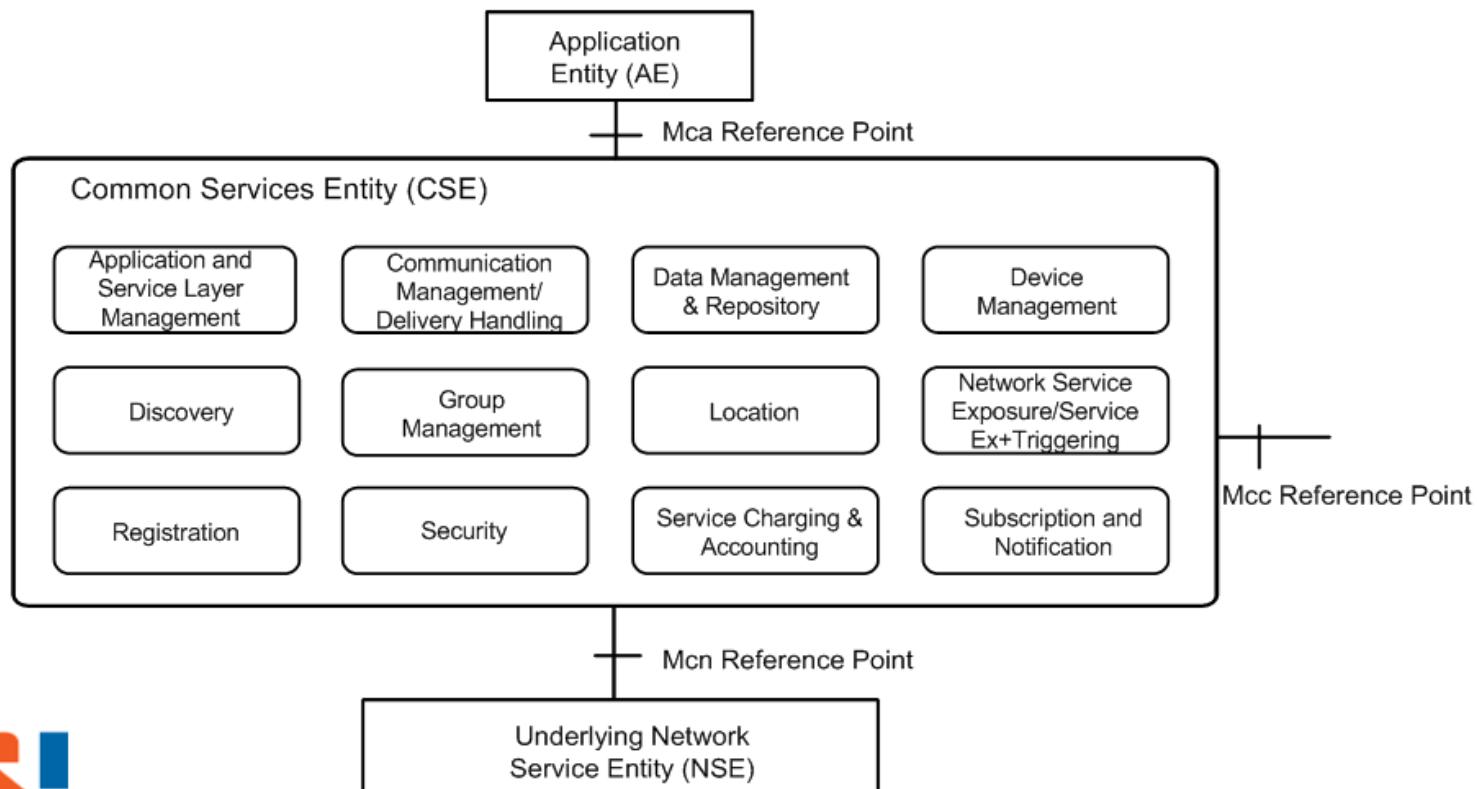


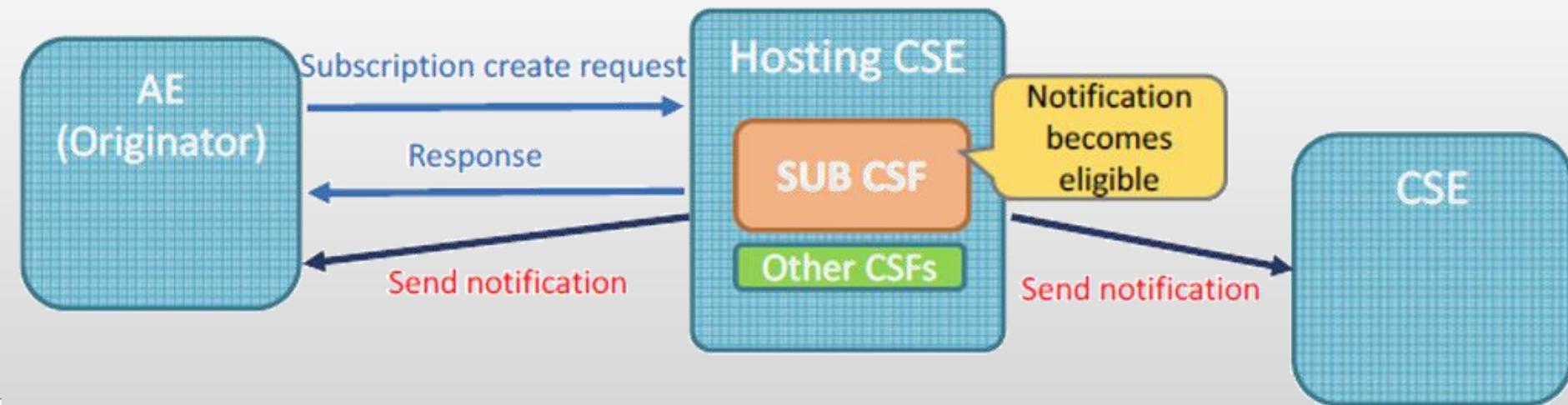
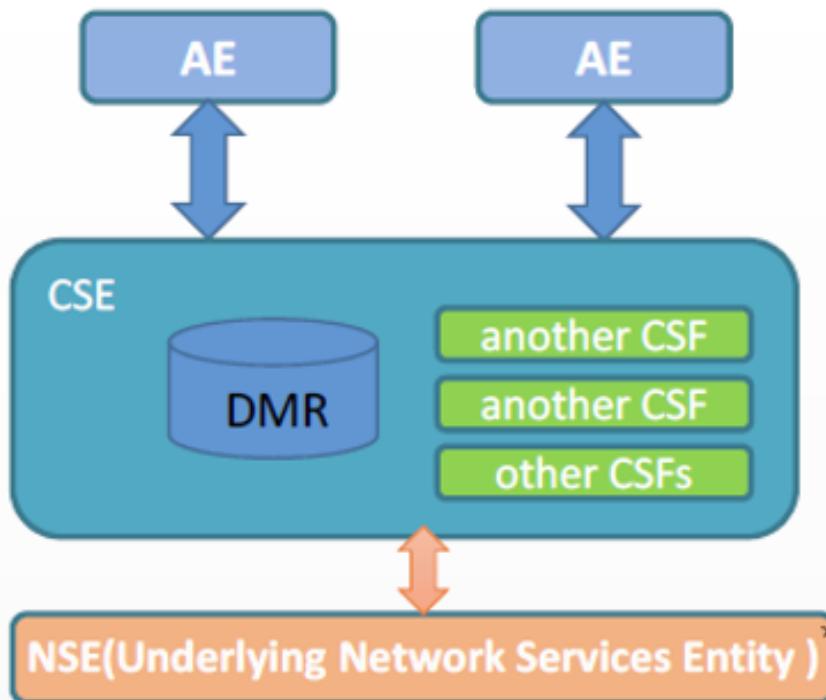
# oneM2M Architecture Model

- oneM2M architecture 기본 Configuration : IN, MN, ASN, ADN, NoDN and its relationship

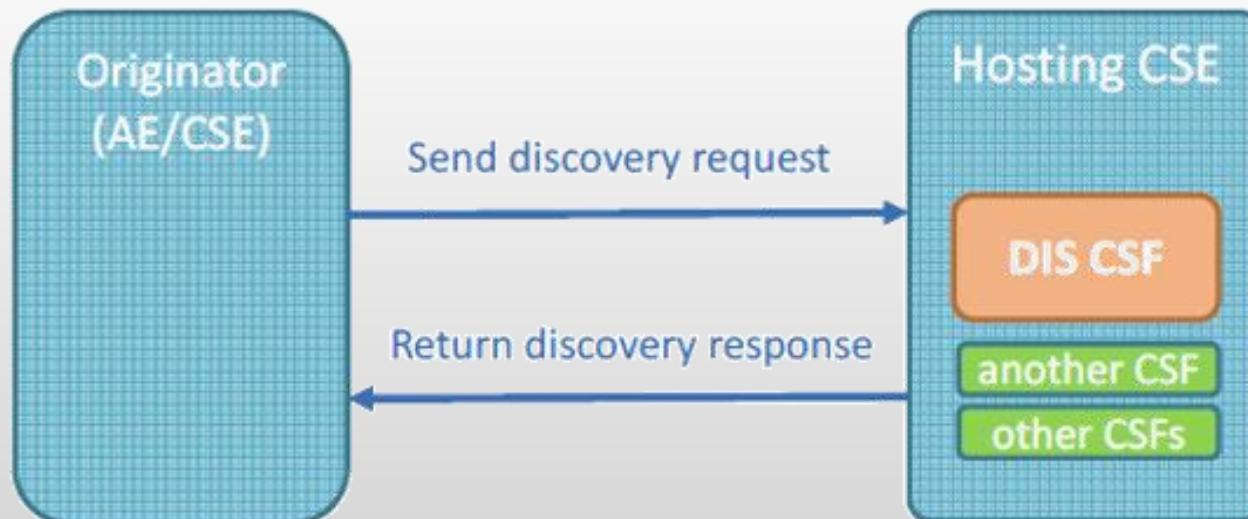
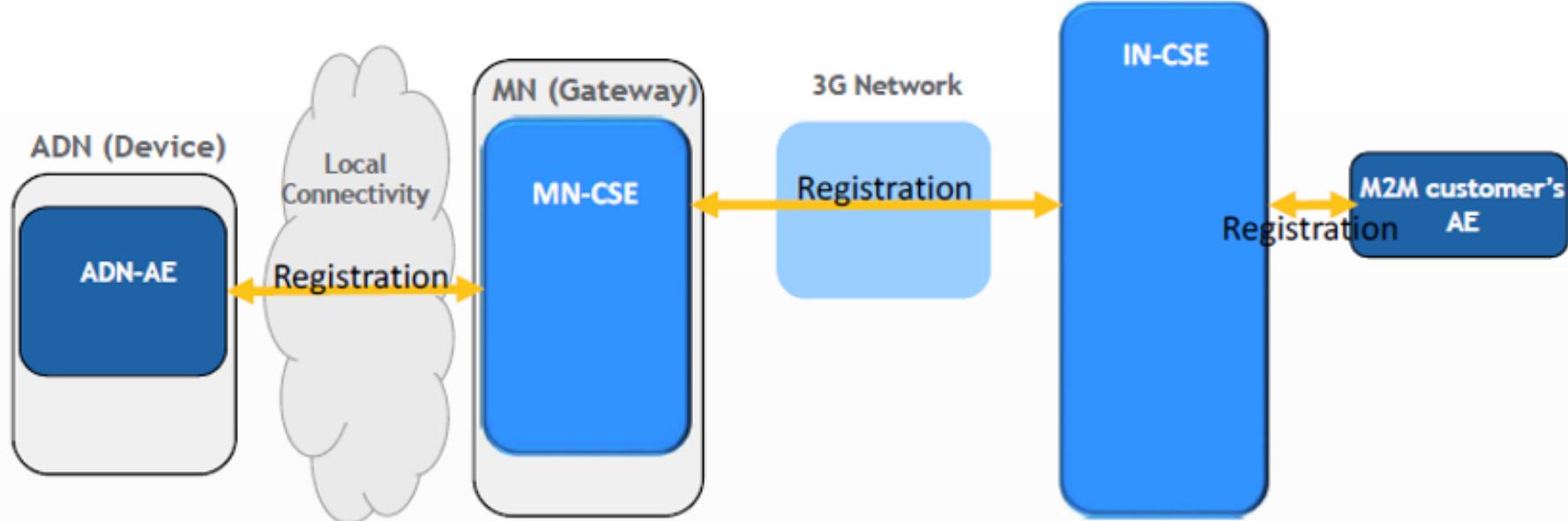


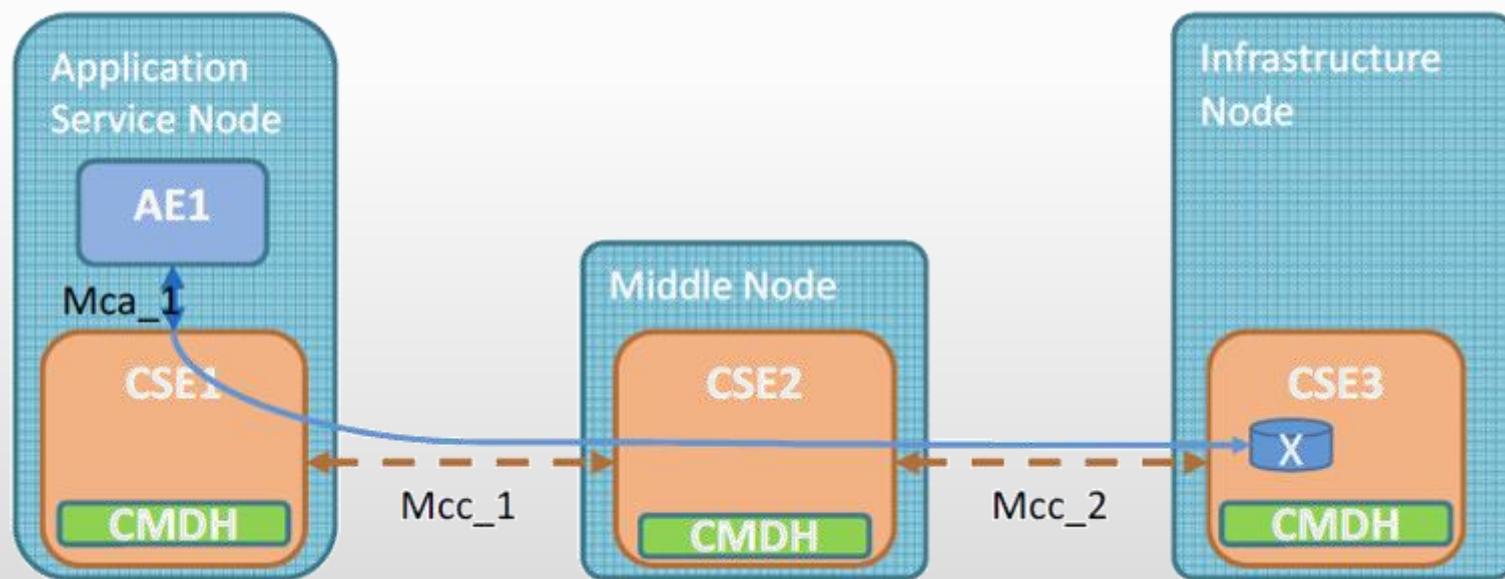
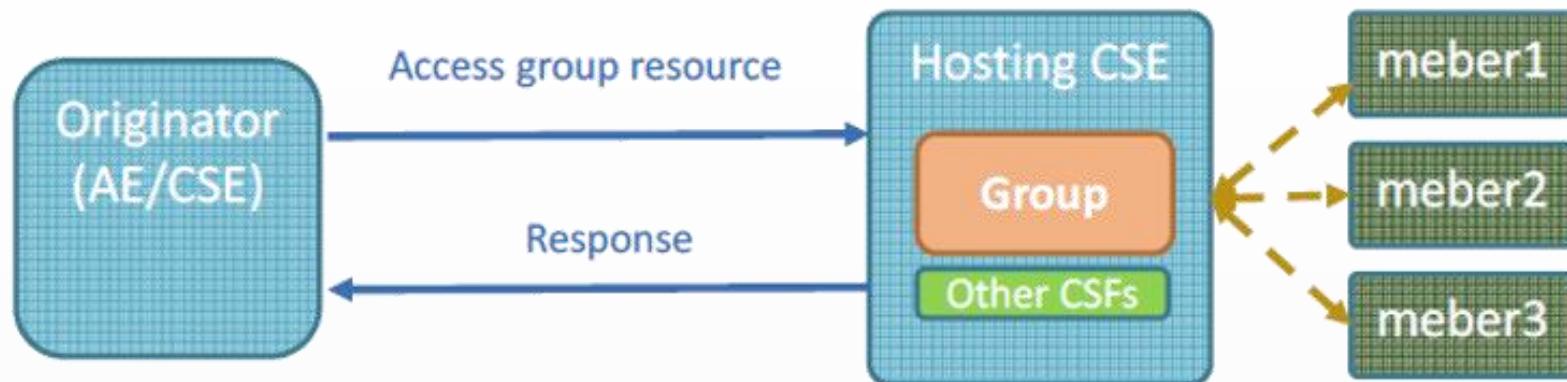
- What is common services functions
  - The services provided by the Common Services Layer
  - Reside within in a Common Services Entity
  - Provide services to the AEs via Mca and the other CSEs via Mcc
  - Interact with the NSE via the Mcn





IN (Infrastructure)

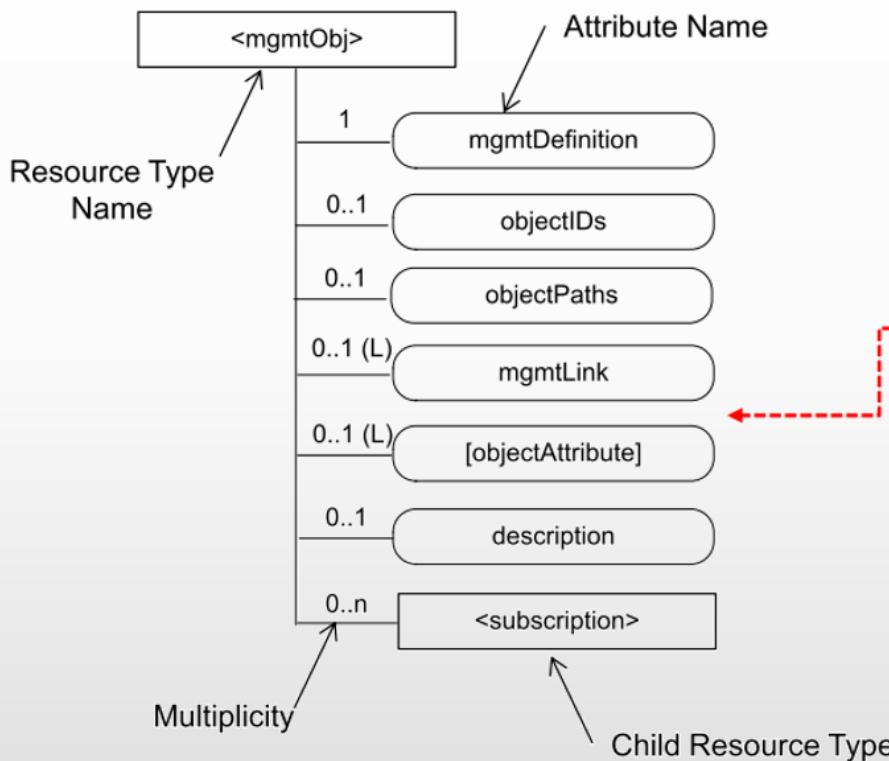




- CSF(Common Service Function)s와 Resource Types간의 관계

CSFs (Informative)	Resource Types (Normative)
Data Management & Repository (DMR)	<container>, <contentInstance>
Subscription/Notification (SUB)	<subscription>, <pollingChannel>, <pollingChannelURI>
Communication Management and Delivery Handling (CMDH)	<delivery>, <request>, <cmdhPolicy>, <cmdhDefaults>, <cmdhLimits>, <cmdhNetworkAccessRules>, <cmdhBuffer>
Device Management (DMG)	<mgmtObj>, <mgmtCmd>, <execInstances>, <execInstance>, <parameters>, <node>
Location (LOC)	<locationPolicy>
Registration (REG)	<CSEBase>, <remoteCSE>, <AE>
Group Management (GMG)	<group>, <fanOutPoint>
Security (SEC)	<accessControlPolicy>
Discovery (DIS)	<**Ann>
Service Charging and Accounting (SCA)	<statsConfig>, <eventConfig>, <statsCollect> <schedule> <m2mServiceSubscriptionProfile>, <serviceSubscribedNode>

## Resource Figure



## Conventions

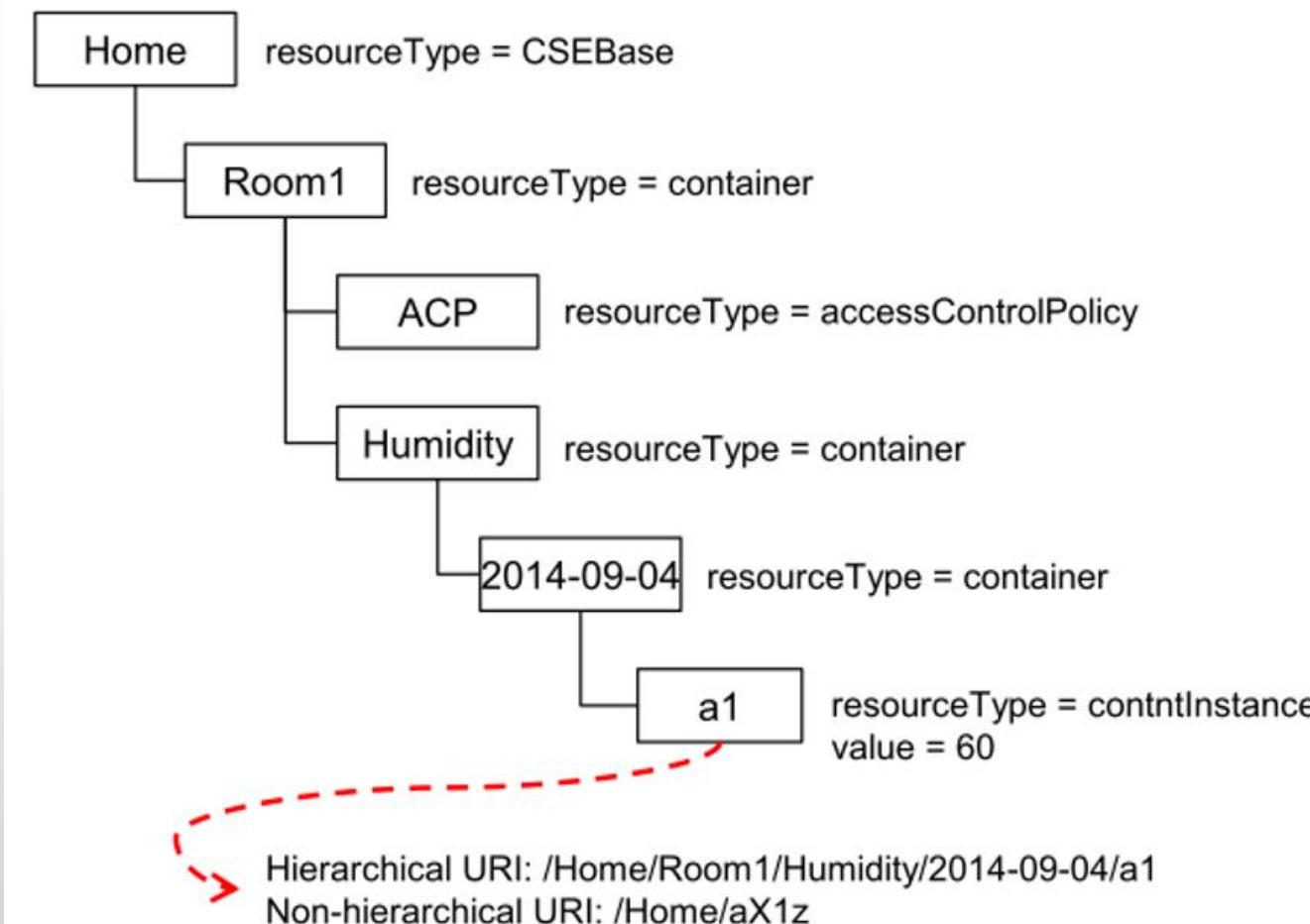
- Resource Type Specification을 시각적으로 표현
  - ✓ Resource는 Child Resource와 Attribute으로 구성
  - ✓ Common Attribute은 표현하지 않음
  - ✓ Resource Specific Attribute만 표현
  - ✓ Child Resource / Attribute의 Multiplicity 정보 표현
- Naming Conventions
  - ✓ <aaa>: “aaa” Resource Type을 나타냄.
  - ✓ [bbb]: “bbb” Resource Instance 또는 Attribute를 나타냄. 실제 이름은 해당 Resource Instance 생성 시 결정.

Table 9.6.3-1: Child resources of <CSEBase> resource

Child Resources of <CSEBase>	Child Resource Type	Multiplicity	Description
[variable]	<remoteCSE>	0..n	See clause 9.6.4

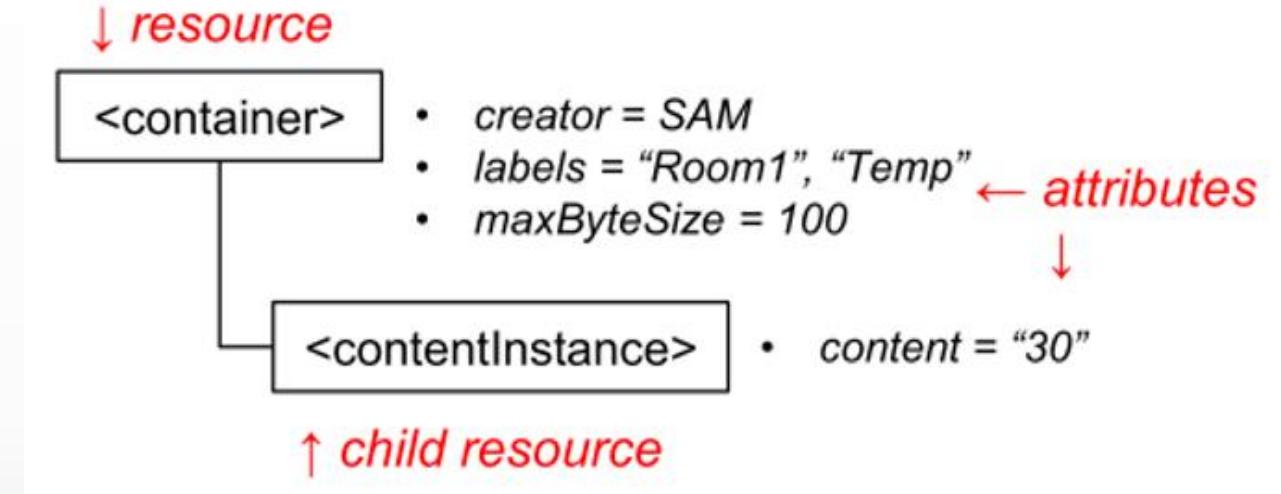
# Resource Structure

- The "type" of each resource shall be specified
- The root of the resource structure in a CSE shall be assigned an absolute address
- Both hierarchical and non-hierarchical URIs shall be supported by all CSEs

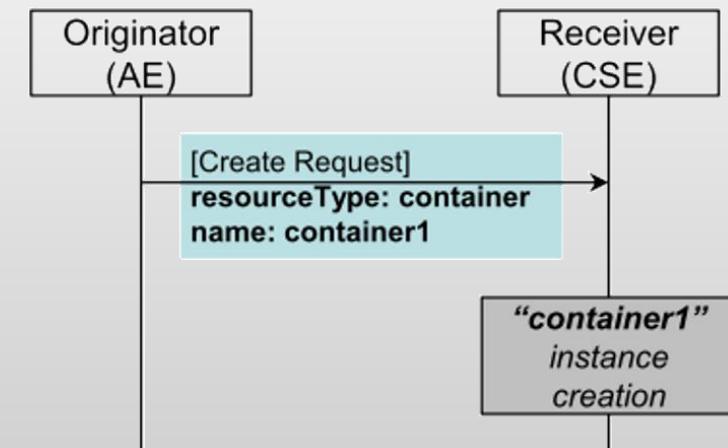


# Resource Structure

- The attributes for all resource type shall be specified
- All resources and associated attributes shall be addressable



- Each resource type may be instantiated as multiple resources via Create procedure



- Relationships between Resources

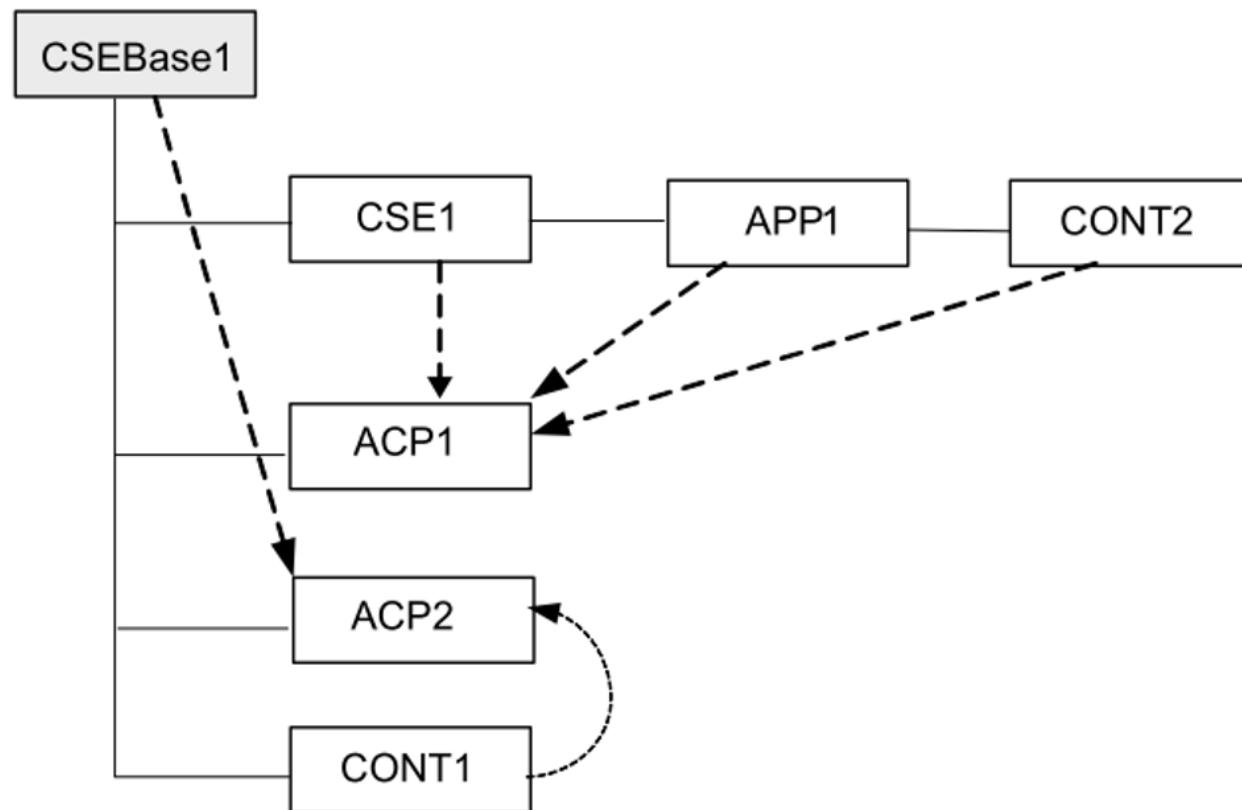
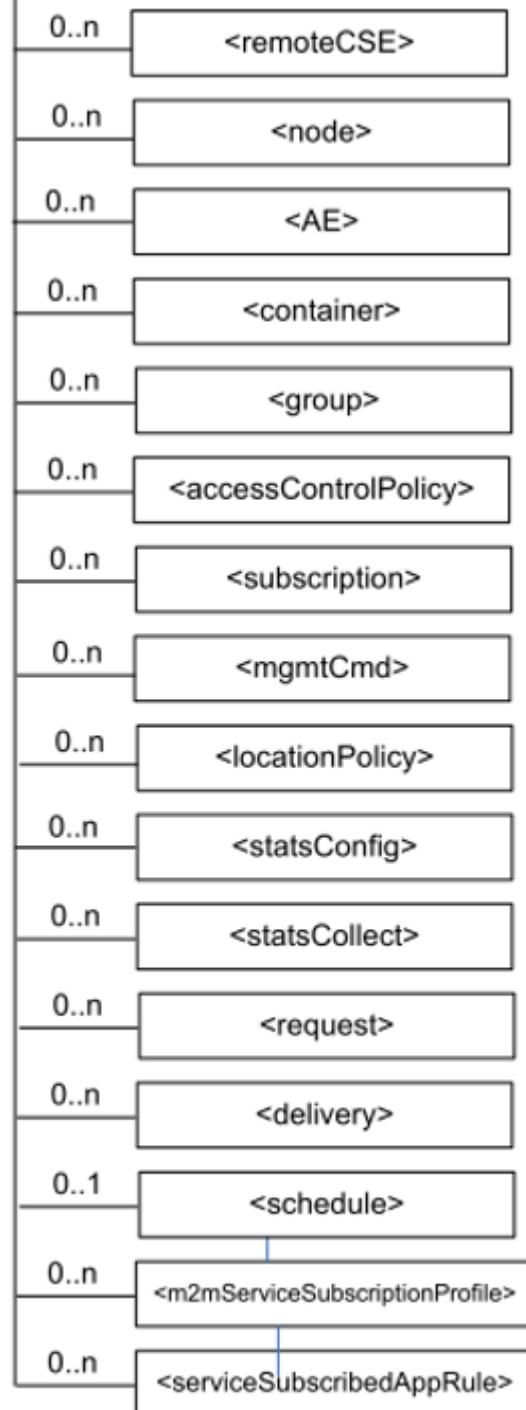
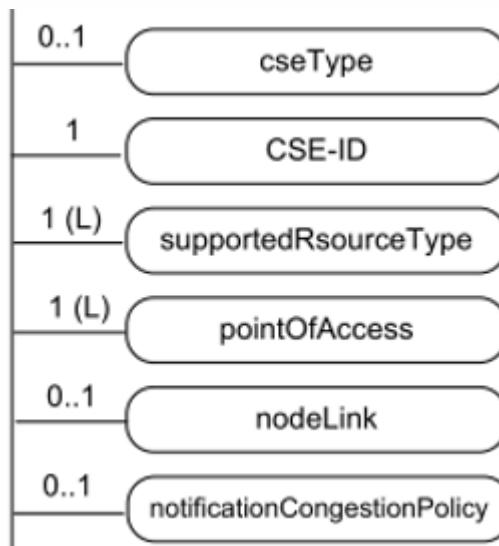
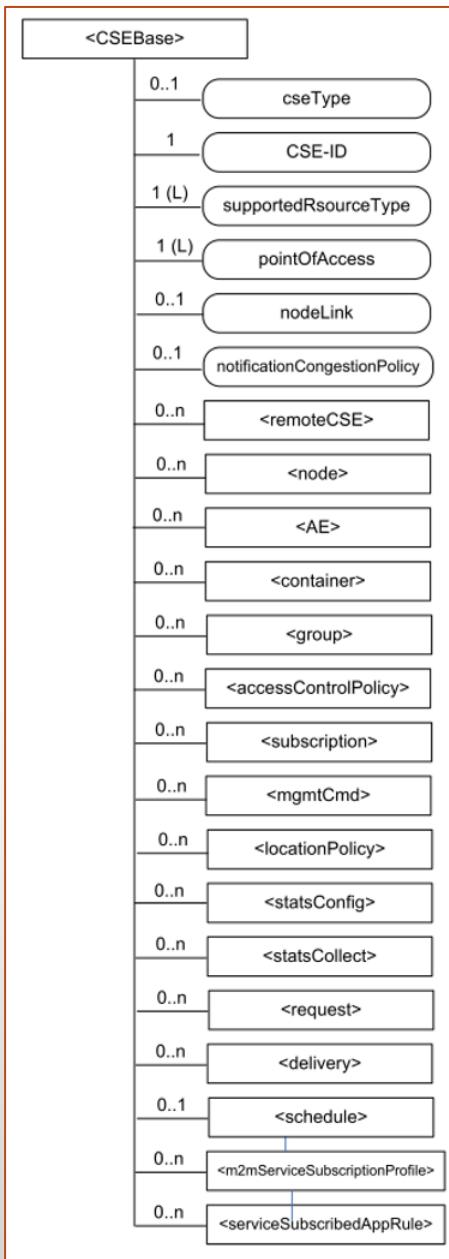


Figure 9.4.1-1: Resource Relationships Example in a CSE

# <CSEBase>



# Resource Structure

- 3 categories of resources

Category	Description	Resources
<b>Normal Resource</b>	<ul style="list-style-type: none"> <li>Child Resource / Attribute 등을 포함</li> <li>서비스/기능이 Child Resource / Attribute를 통해 Expose됨</li> </ul>	Clause 9.6의 Virtual Resource 제외한 모든 Resource Type
<b>Virtual Resource</b>	<ul style="list-style-type: none"> <li>Child Resource / Attribute 없음</li> <li>별도의 Operation 정의</li> </ul>	<fanOutPoint>, <pollingChannelURI>
<b>Announced Resource</b>	<ul style="list-style-type: none"> <li>특정 CSE에 Resource 생성 후 이 자원을 다른 CSE에 Announce 자원으로 생성</li> <li>원본 Normal Resource의 사본 (일종의 바로가기)</li> </ul>	<accessControlPolicyAnn>, <remoteCSEAnn>, <AEAnn>, <containerAnn>, <contentInstanceAnn>, <scheduleAnn>, <locationPolicyAnn>, <groupAnn>

# Resource Structure

- Universal attributes

Attribute Name	Description
resourceType	Resource Type Write Once (resource가 create될 때, 할당되어 변경 불가)
resourceID	resource의 identifier non-hierarchical addressing 방식으로 할당됨 Hosting CSE가 resource를 create할 때 할당함 Hosting CSE 내에서 unique함
resourceName	resource의 이름 hierarchical addressing method 방식으로 할당됨 예를 들어, /CSEBase/ae1/container1
parentID	parent resource의 resourceID
creationTime	resource가 create된 일시
lastModifiedTime	resource가 update된 일시
labels	resource discovery(검색)에서 사용될 수 있는 token, tag 정보

- Notification Re-targeting

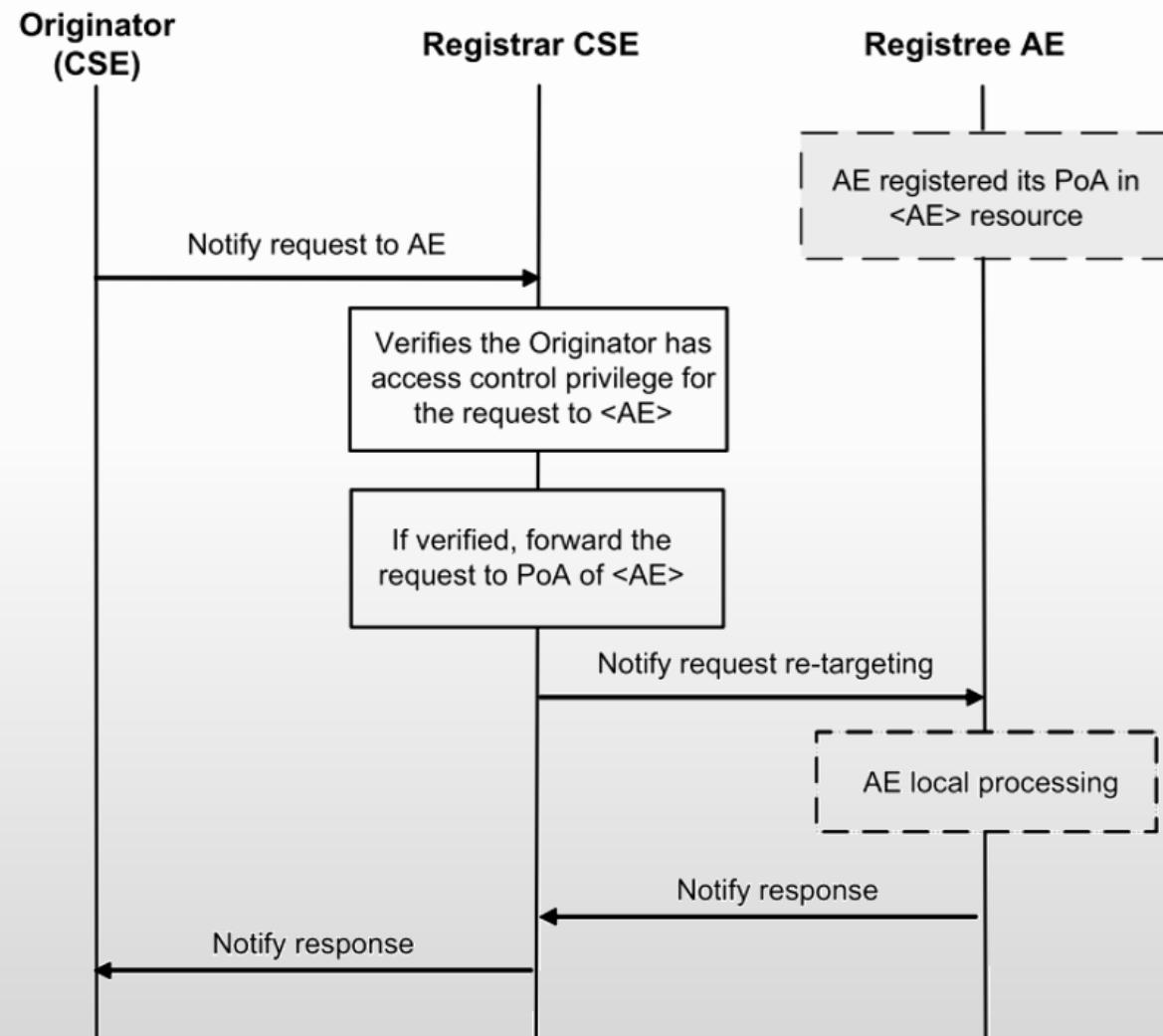
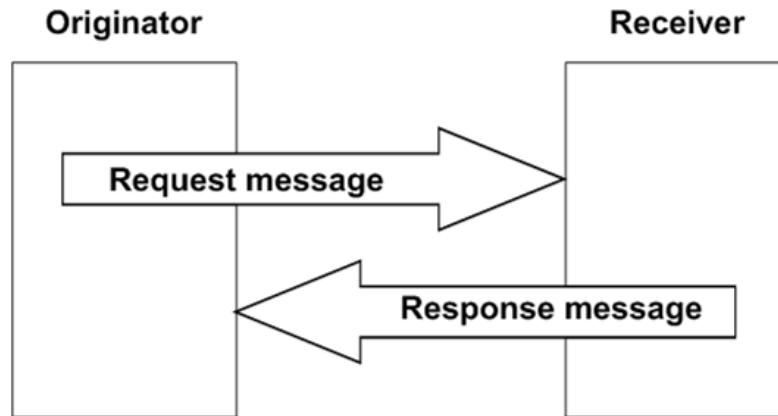


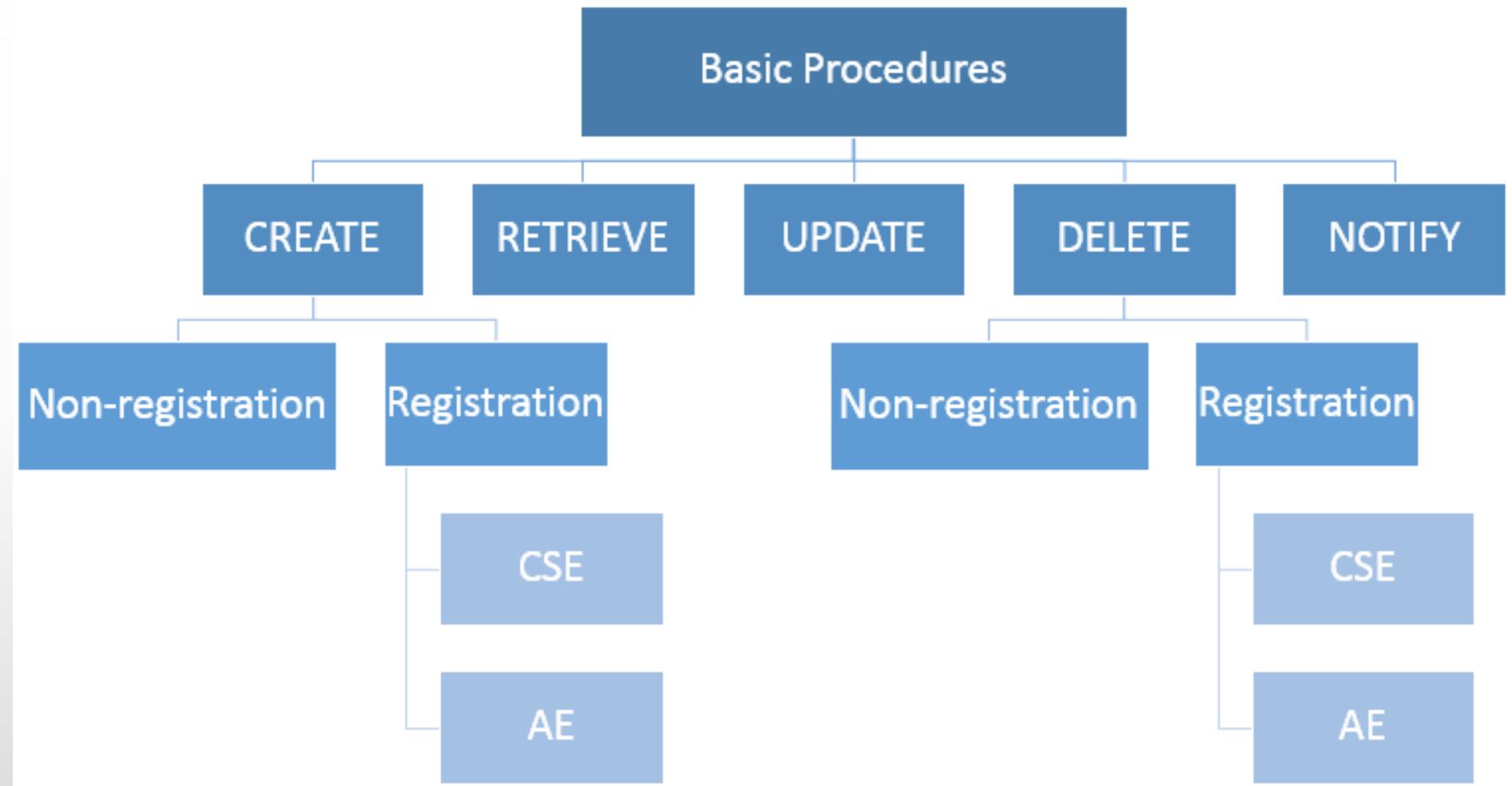
Figure 9.3.2.3-1: Re-targeting a notification request to an AE

## General Communication Flow Scheme on Mca and Mcc Reference Points

- based on the use of Request and Response messages
- between an AE and a CSE (Mca reference point)
- among CSEs (Mcc reference point)

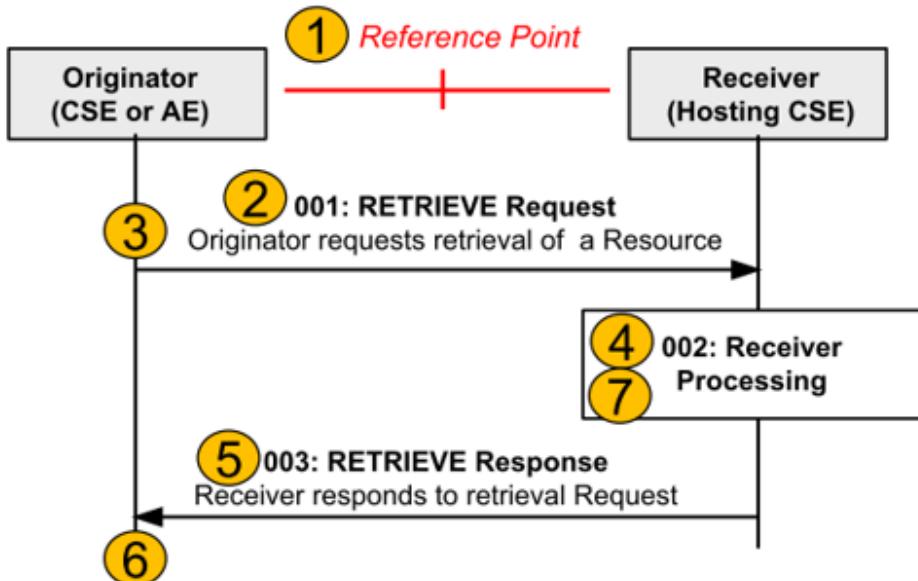


# Communication Flow



## CRUDN Basic Procedures (Clause 10.1)

- Resource Manipulation에 공통적으로 사용되는 Create/Retrieve/Update/Delete/Notify 프로시저 정의
- Basic Procedures는 3 Step으로 구성
  - ✓ 001: Request Message (from Originator)
  - ✓ 002: Resource Manipulation (Receiver Processing)
  - ✓ 003: Response Message (from Receiver)



## Resource Type Specific Procedure (Clause 10.2)

<remoteCSE> RETRIEVE	
1	Associated Reference Point Mca, Mcc, Mcc'
2	Information in Request message All parameters defined in table 8.1.2.1-1 apply with the specific details for: <i>cn</i> : void
3	Processing at Originator before sending Request According to clause 10.1.2
4	Processing at Receiver According to clause 10.1.2
5	Information in Response message All parameters defined in table 8.1.2.1-1 apply with the specific details for: <i>cn</i> : attributes of the <remoteCSE> resource as defined in clause 9.6.4
6	Processing at Originator after receiving Response According to clause 10.1.2.
7	Exceptions According to clause 10.1.2

# Request

- from an Originator to a Receiver, shall contain mandatory and may contain optional parameters

Primitive Parameter	CREATE	RETRIEVE	UPDATE	DELETE	NOTIFY
Operation	M	M	M	M	M
To	M	M	M	M	M
From	M	M	M	M	M
Request Identifier	M	M	M	M	M
Resource Type	M	NP	NP	NP	NP
Name	O	NP	NP	NP	NP
Content	M	O	M	NP	M
Originating Timestamp	O	O	O	O	O
Request Expiration Timestamp	O	O	O	O	O
Result Expiration Time	Blocking, non-blocking		O	O	O
Operation Execution Time	O	O	O	O	O
Response Type	Attribute, URI, partial...		O	O	O
Result Persistence	O	O	O	O	NP
Result Content	Immediate, latest, BestEffort..		O	O	NP
Event Category	O	O	O	O	O
Delivery Aggregation	O	O	O	O	O
Group Request Identifier	O	O	O	O	O
Filter Criteria	NP	O	O	O	NP
Discovery Result Type	NP	O	NP	NP	NP

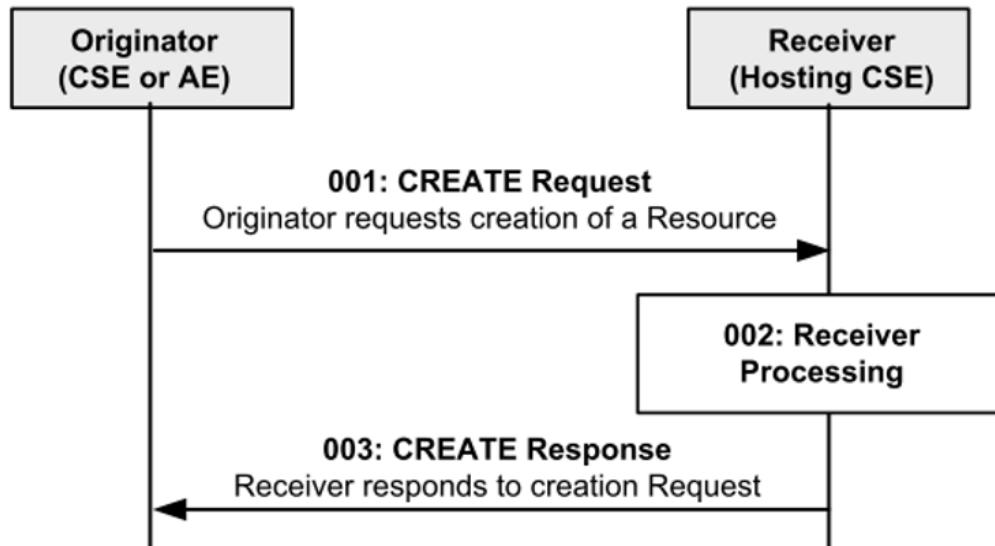
**001**

Figure 10.1.1.1-1: Procedure for CREATEing a Resource

**Operation:** C (Create);

**To:** Address of the target resource where the new resource should be created (identifies the parent resource);

**From:** ID of the Originator (either the AE-ID or CSE-ID);

**Resource Type:** Type of resource to be created;

**Request Identifier:** Identifier provided by the Originator. Needed for correlation of responses regarding this Request.

**Name:** optional name of the resource to be provided by the Originator.

**Content:** attributes of the resource to be provided by the Originator.

# Communication Flow

002

- 1) 요청자의 권한 확인
- 2) Name 파라메터 확인
- 3) Resource ID 할당
- 4) 필수 RO 속성 할당
- 5) 주요 속성 할당

- parentID,
- 생성시간,
- 만료시간,
- 최근변경시간,
- 기타 RO 속성

6) Create 요청이 유효하다고 판단될 경우, 해당 자원 생성

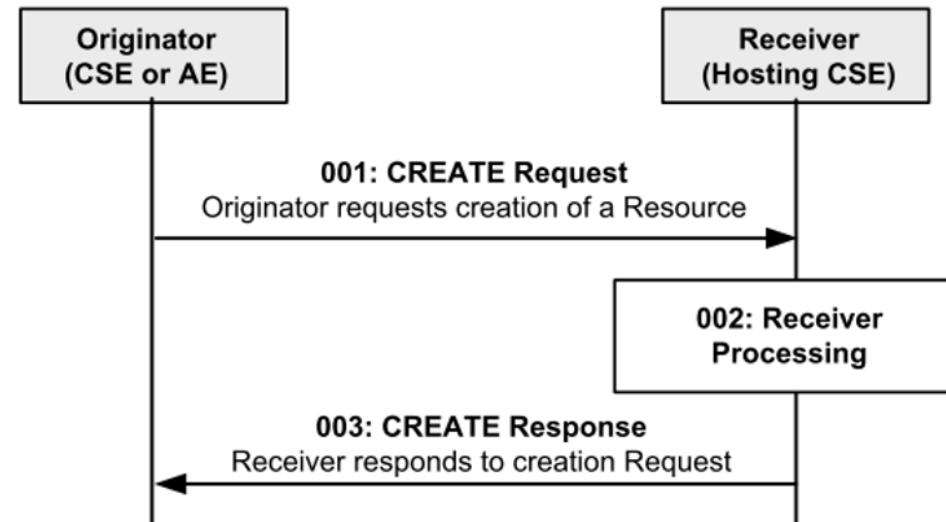


Figure 10.1.1.1-1: Procedure for CREATEing a Resource

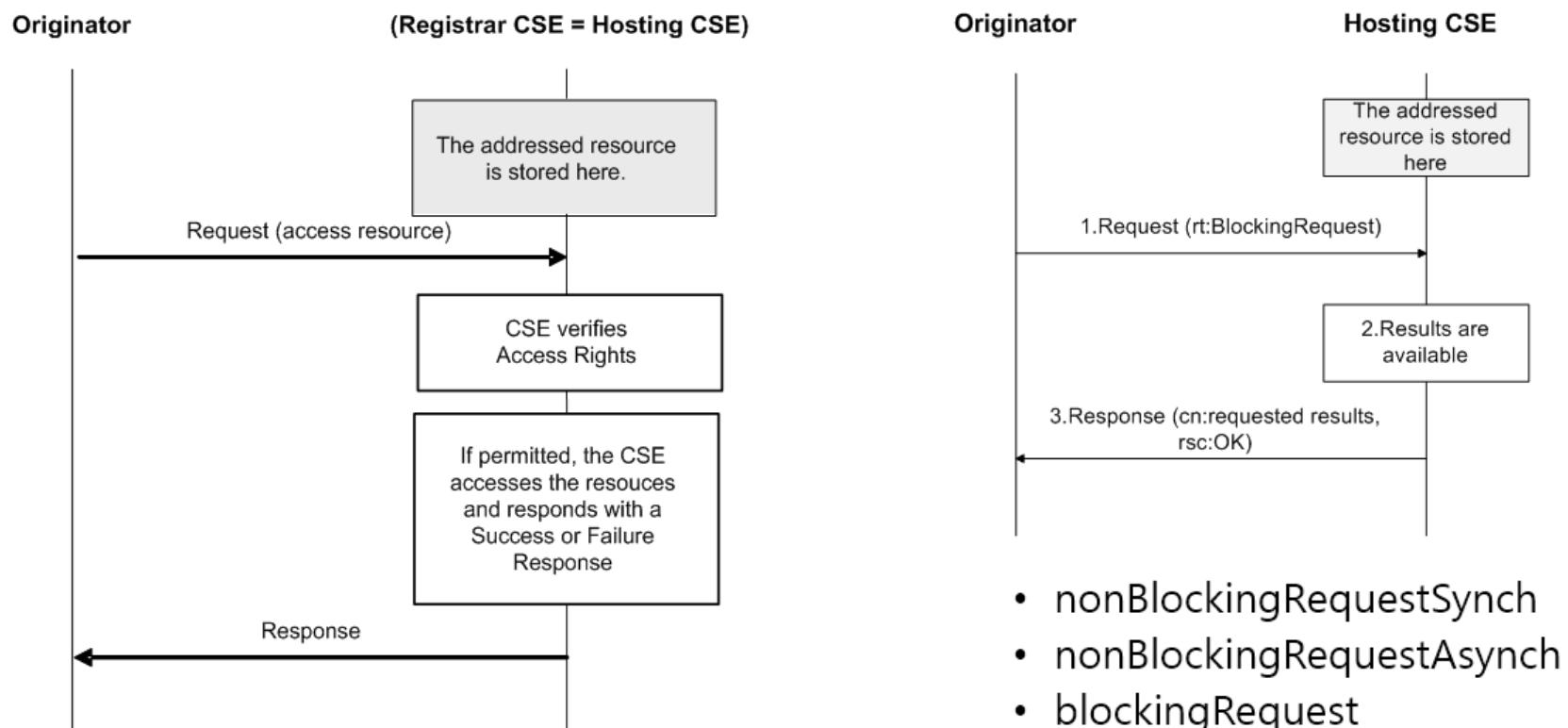
003

exceptions

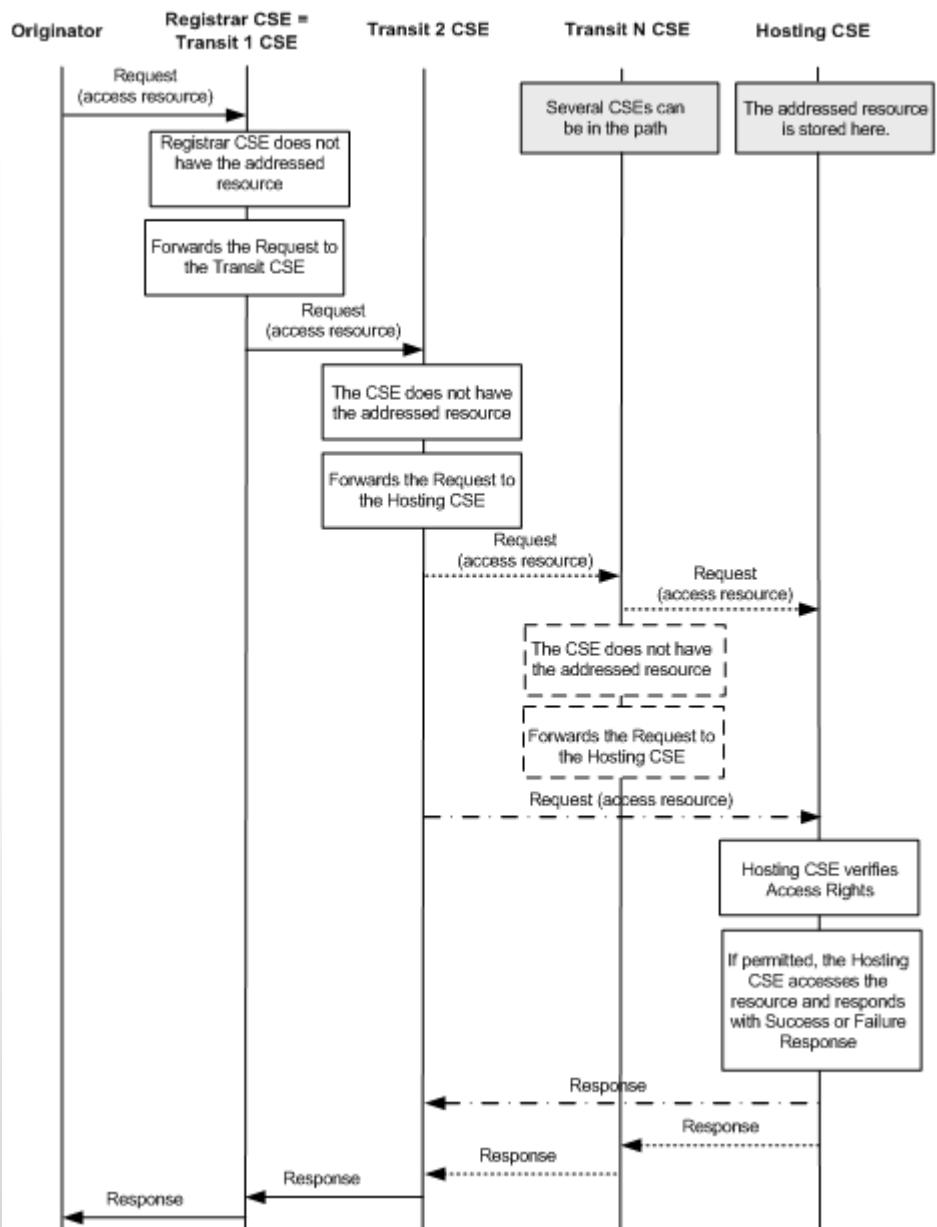
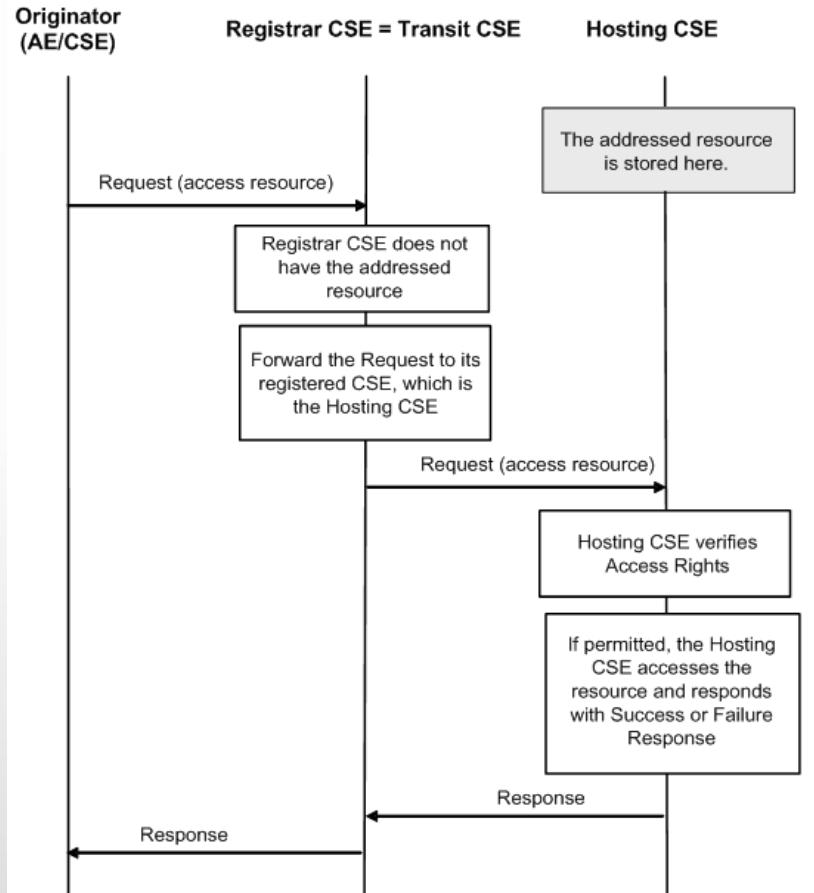
To,  
From,  
**Request Identifier**,  
Name,  
Content

- 1) 요청자가 권한 없을 때
- 2) Resource Name 충돌
- 3) Content 파라메터 미비

# Originator accesses a resource on the Registrar CSE (No Hops)

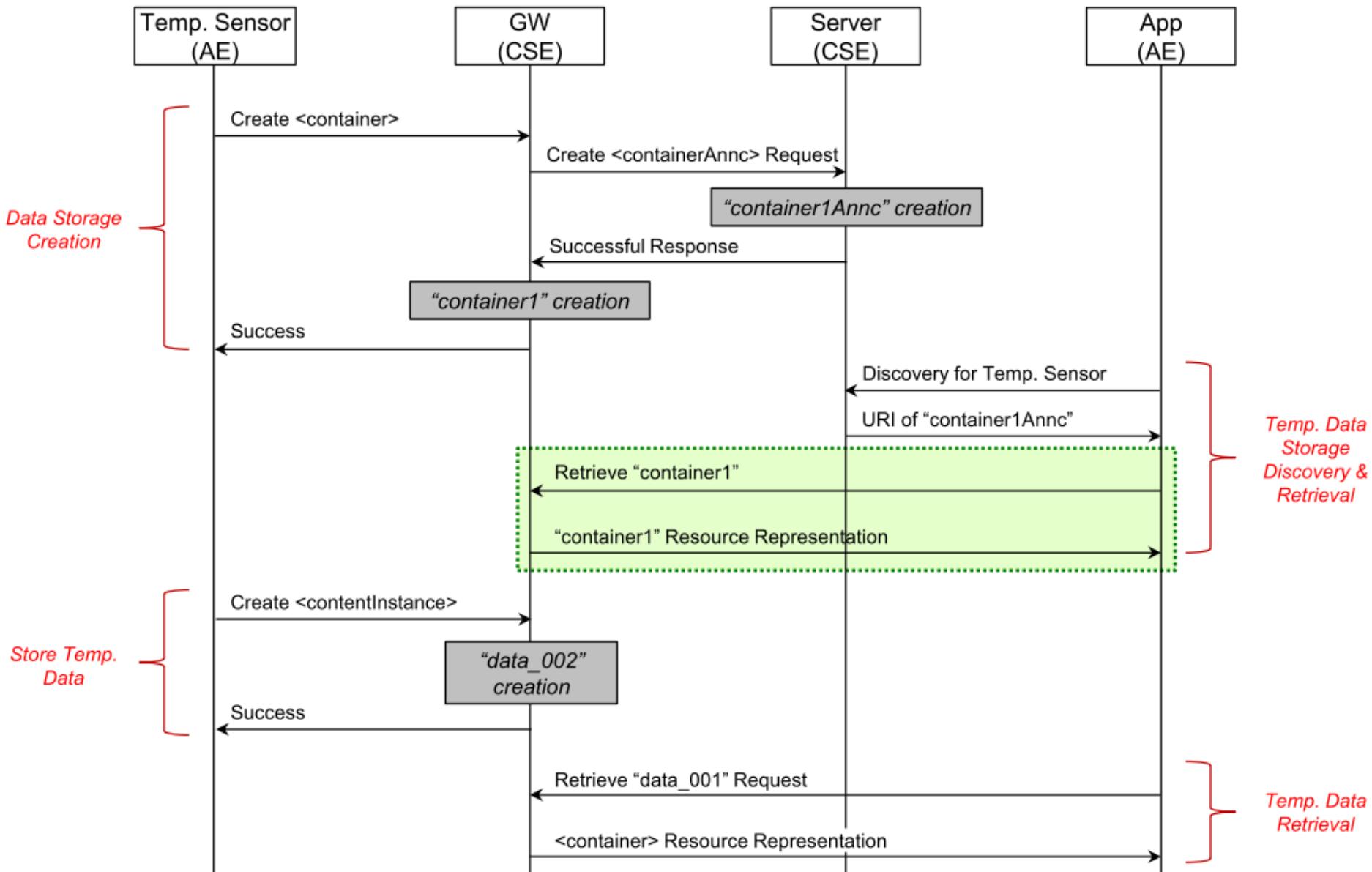


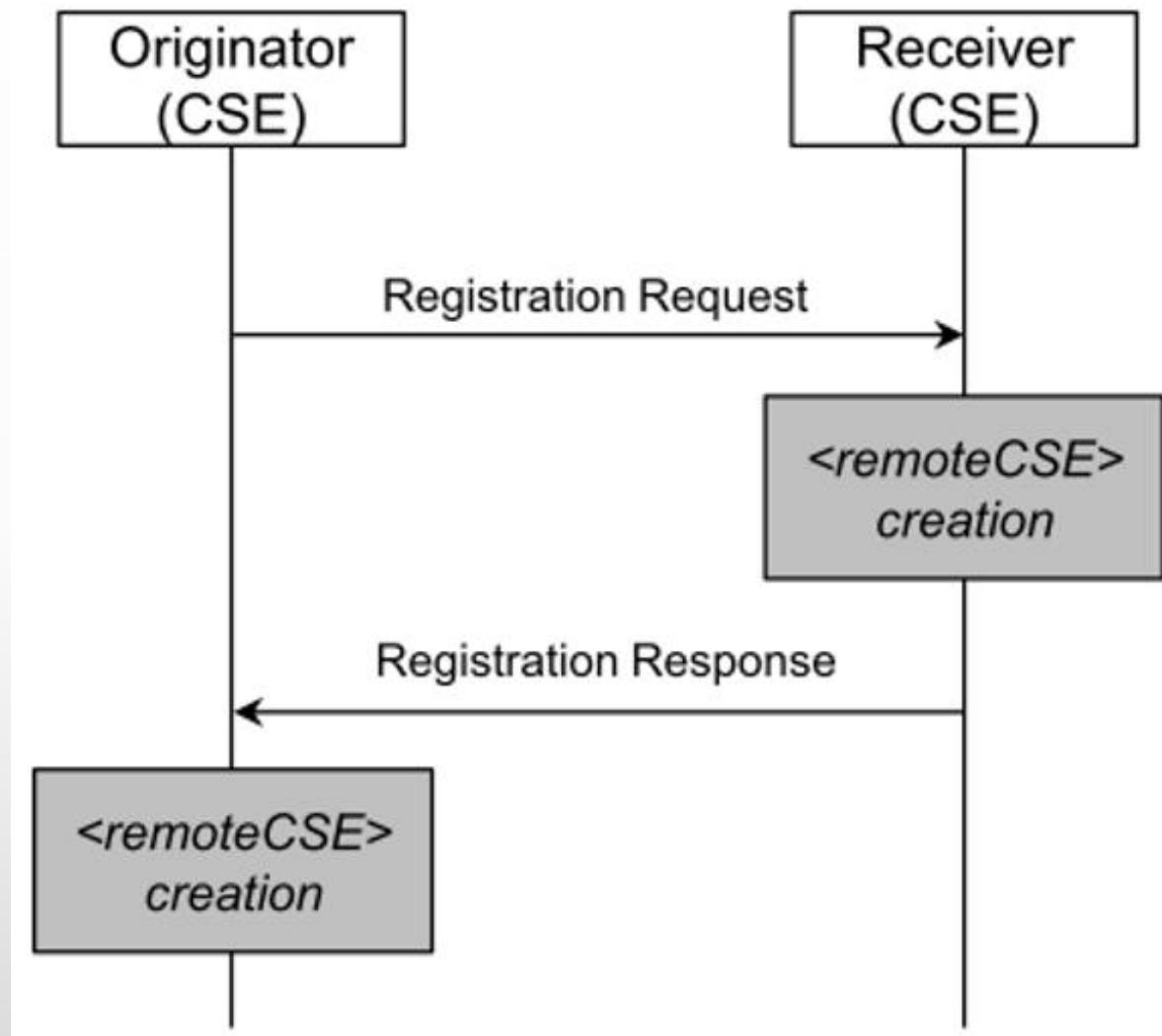
# Communication Flow

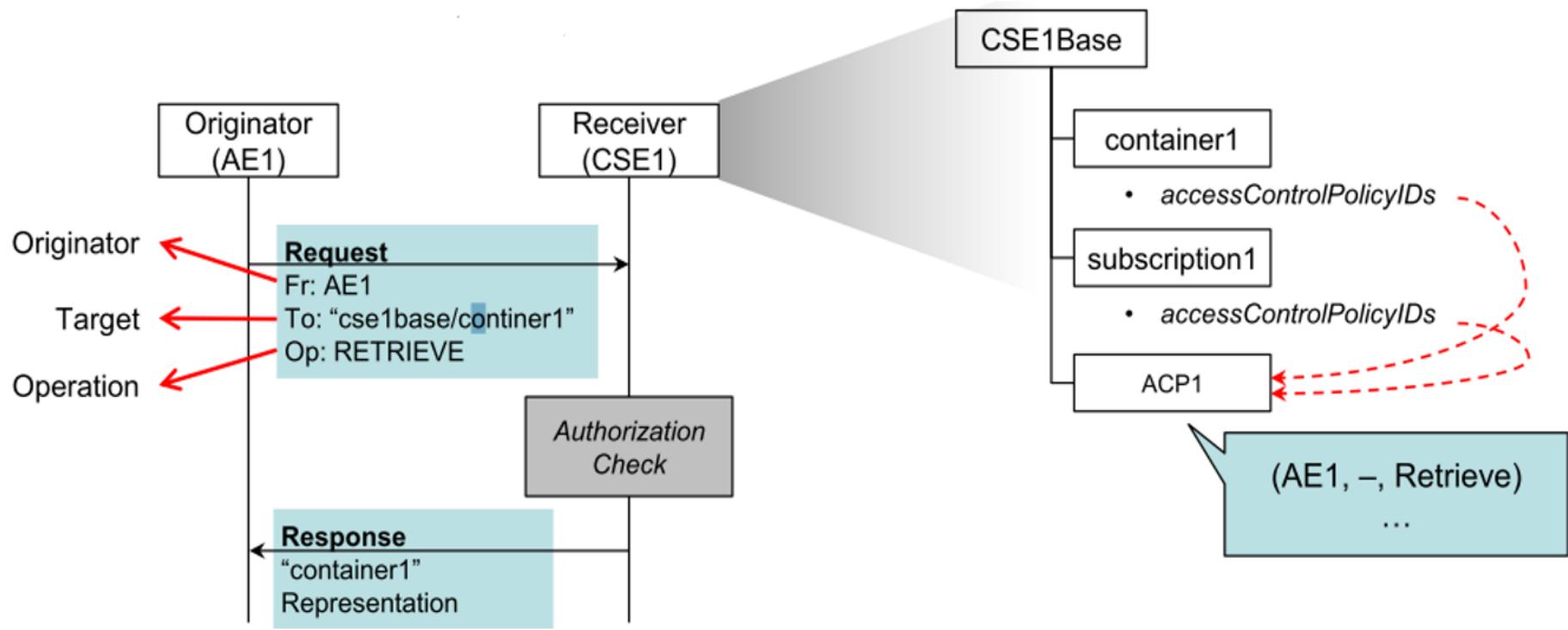


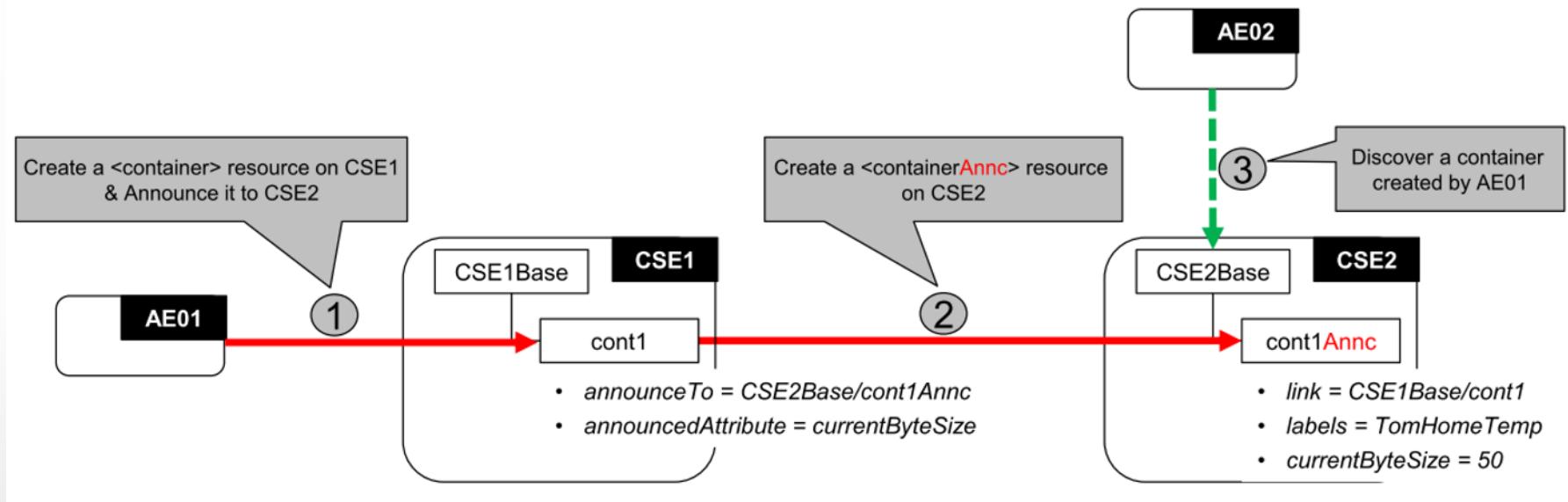
# Specifics

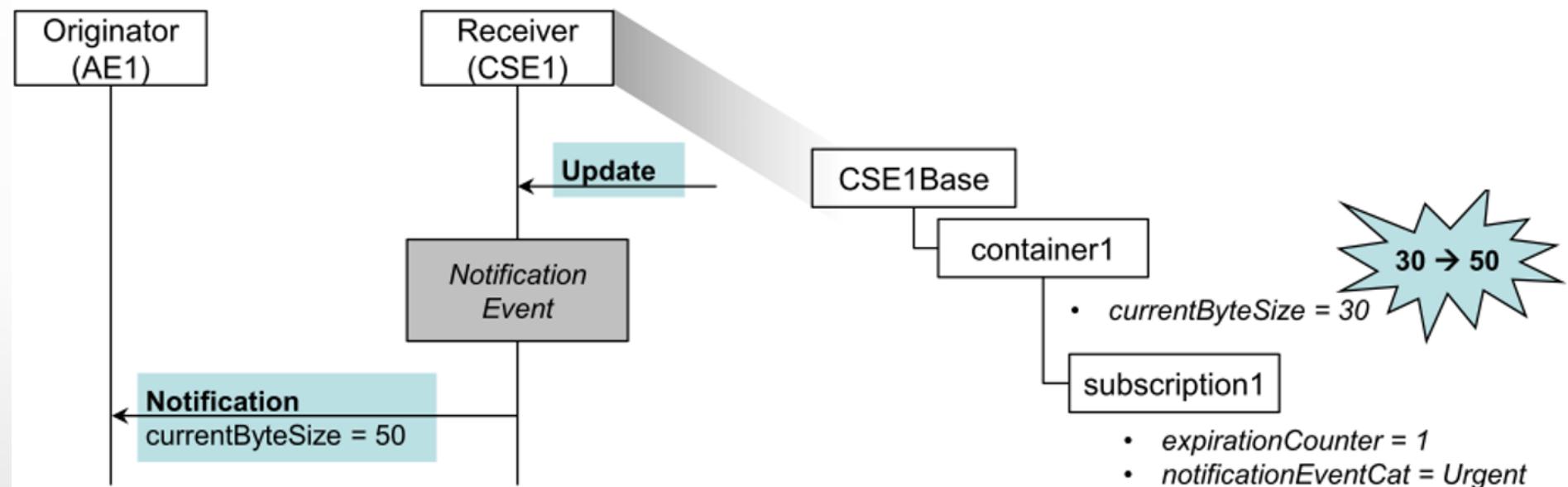
## Different Applications Share Data using Container and Discovery Features

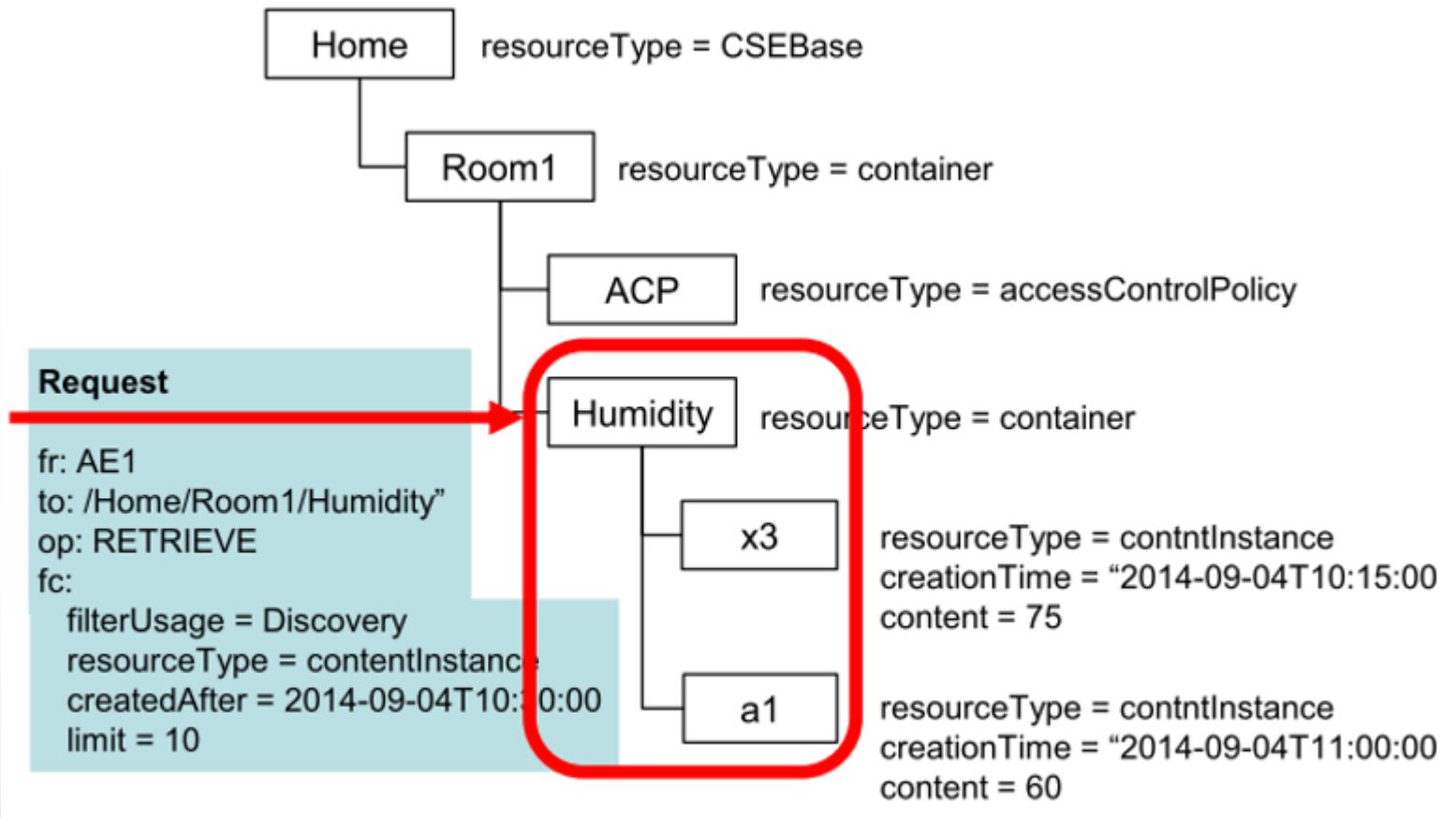












- Discovery를 위한 별도의 Resource Type 없음
  - 특정 Resource를 Target 자원으로 설정
  - 해당 자원 및 하위 모든 자원이 검색 대상으로 설정
- Filter Criteria를 사용하여 검색 조건 부여
  - Size, Time, Resource Type, 특정 Attribute 값 사용 가능
- Filter Criteria를 만족하는 자원의 URI 반환
  - 검색 결과 개수 제한 가능

## Binding to HTTP 1.1 (RFC2616)

### HTTP Request and Request Primitive

	HTTP Message Parameter	oneM2M Primitive Parameter
Request-Line	Method	Operation
	Request URI	filterCriteria name resource type
	HTTP Version	"HTTP 1.1"
Header Fields	Host	from
	Accept	"application/vnd.onem2m-resource-data+xml"
	Content-Type	"application/vnd.onem2m-resource-data+xml"
	Etag	-
	From	from
	X-M2M-RI	requestID
Message Body	Message Body	<i>other parameters</i>

### HTTP Response and Response Primitive

	HTTP Message Parameter	oneM2M Primitive Parameter
Status-Line	HTTP Version	"HTTP 1.1"
	Status Code	responseStatusCode
	Reason Phrase	responseStatusCode
Header Fields	Content-Type	"application/vnd.onem2m-resource-data+xml"
	From	from
	Location	-
	X-M2M-RI	requestID
	Message Body	<i>other parameters</i>

oneM2M Operation	HTTP Method
CREATE	POST
RETRIEVE	GET
UPDATE	PUT
DELETE	DELETE
NOTIFY	POST

**Extensibility, Scalability, Fault tolerance and robustness, Efficiency, Inter-operability, Self-operation and self-management, ...**

