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oneM2M Rel-1 프로토콜 표준규격
(Core PRO TS, CoAP/HTTP Binding TS)

1. Introduction
2. Primitive and Data Types
3. Analysis of Data Sharing Example based on Core PRO TS
4. Binding with oneM2M and CoAP/HTTP

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LG 전자 / 최 희 동
(heedong.choi@lge.com)

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Introduction

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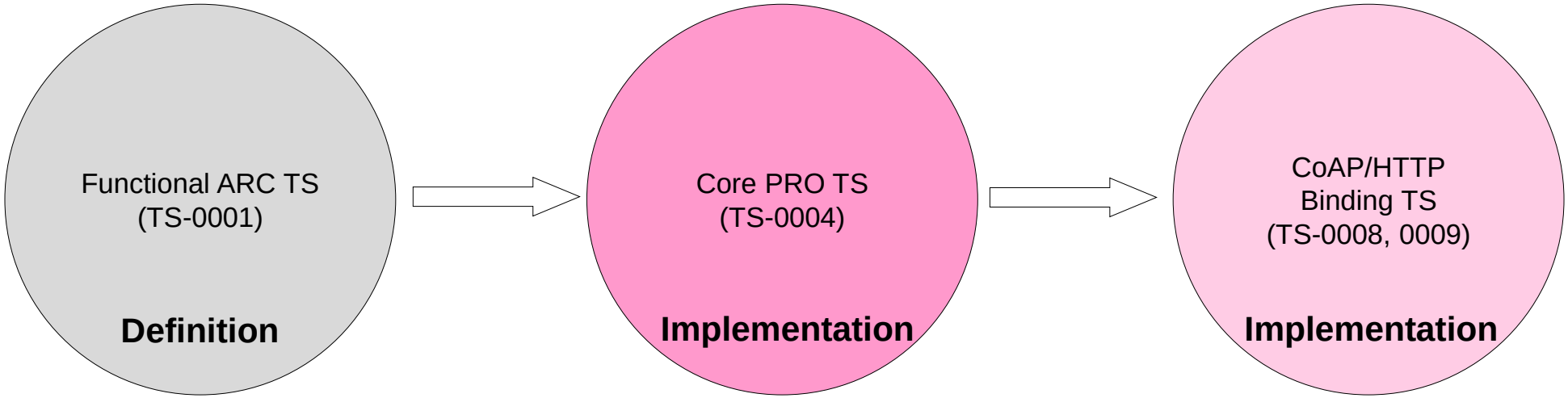
- What is “Core PRO TS(TS-0004)”?
  - ✓ **<u>Implementation of functional architecture TS</u>**(TS-0001)
  - ✓ *The present document specifies the communication protocol(s) for oneM2M compliant systems, M2M applications, and/or other M2M systems. The present document also specifies the common data formats, interfaces and message sequences to support reference points(s) defined by oneM2M*

- What is “CoAP/HTTP Binding TS(TS-0008, TS-0009)”?
  - ✓ **<u>Mapping to oneM2M primitive with transport layer protocol</u>** such as CoAP and HTTP
  - ✓ *The specification will cover the protocol specific part of communication protocol used by oneM2M compliant systems as ‘RESTful CoAP/HTTP binding’*



Overview of oneM2M Core PRO TS

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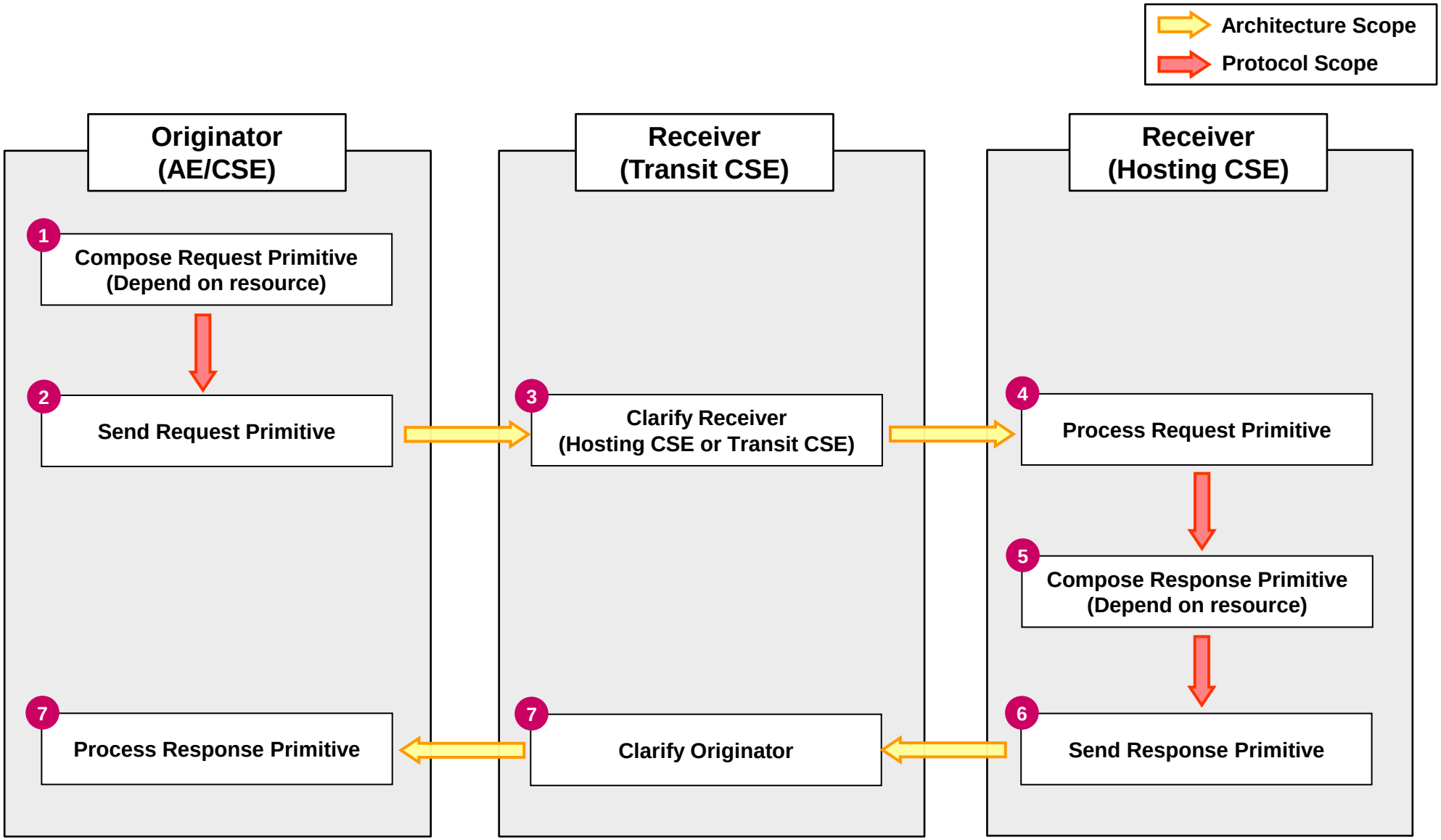

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- Primitive: Application/service layer messages transmitted over the Mca and Mcc reference points
  - ✓ Operation(CRUD and N) is mapped to one or more primitives
  - ✓ The primitive is then further mapped to transport layer protocols such as HTTP, CoAP and MQTT for the transmission

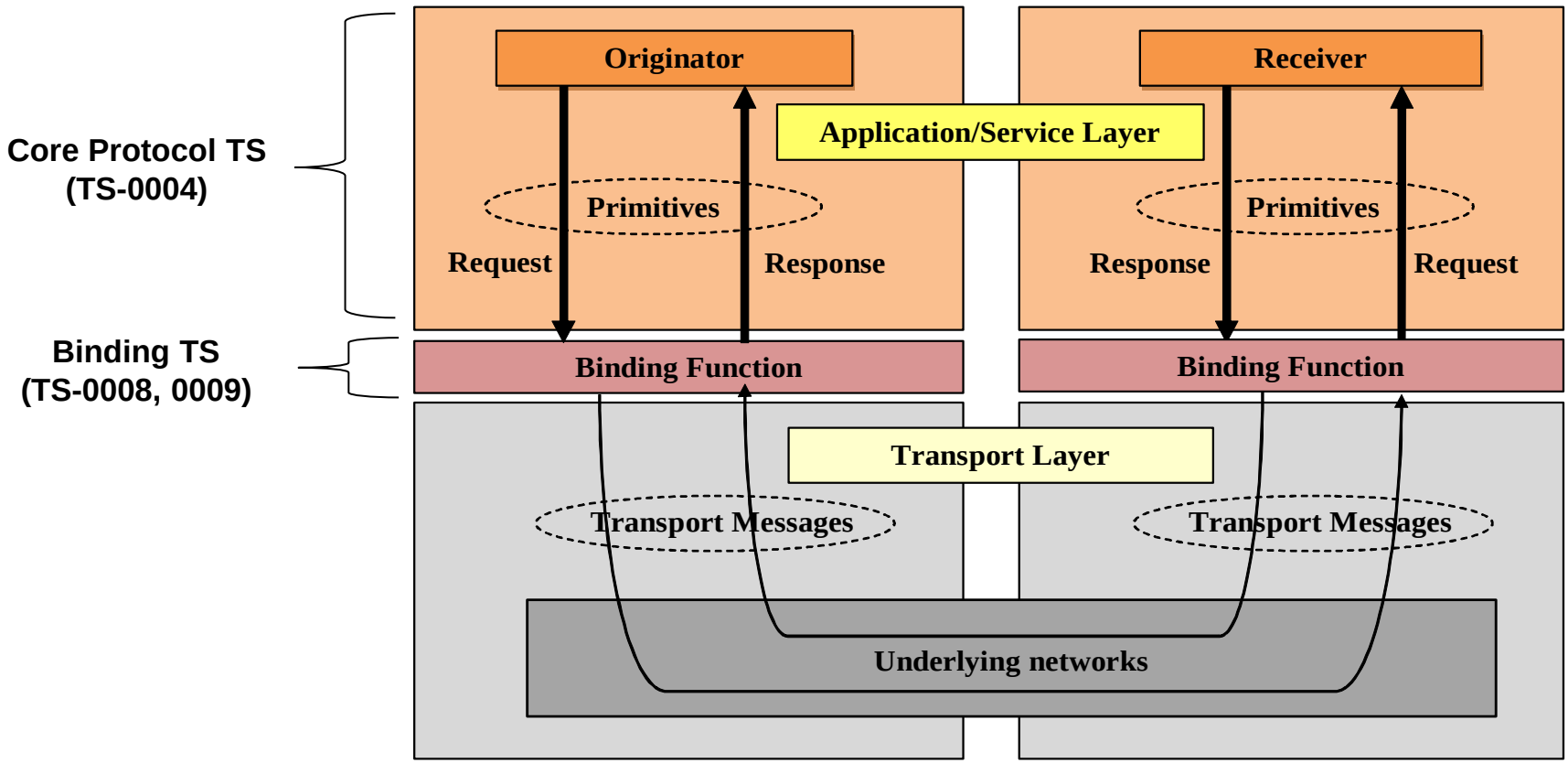
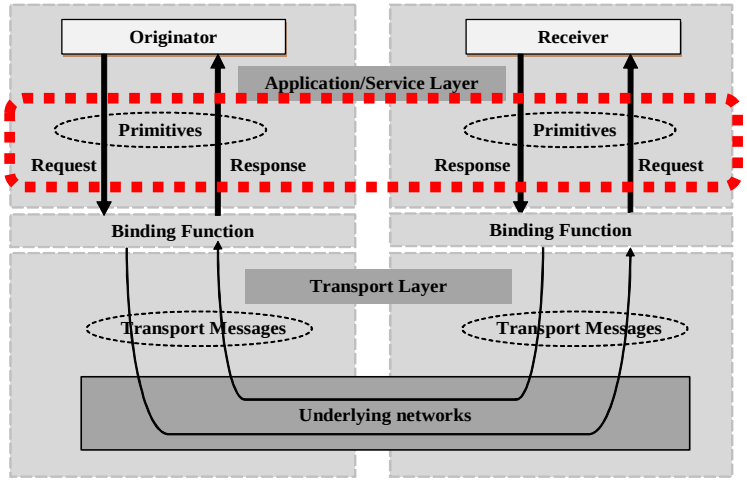


Figure 5.3.1-1: Primitive overview

- Data type is a classification identifying one of various types of data
  - ✓ such as real, integer or Boolean, that determines the possible values for that type;
  - ✓ the operations that can be done on values of that type;
  - ✓ the meaning of the data; and the way values of that type can be stored

- Each resource operation comprises a pair of primitives:
  - ✓ Request and Response



Request parameters
Content
Filter Criteria
From

Response parameters
Content
From
Originating Timestamp

Architecture Scope

Mapping

Data Type
m2m:content
m2m:filterCriteria
xs:anyURI

Data Type
m2m:content
m2m:id
m2m:timestamp

Protocol Scope

- Common data types
  - ✓ Simple data types: which are incorporated from XML schema (e.g., xs:string, xs:boolean, xs:decimal, xs:float,…)

Data Type	Description (See Table 6.3.2.1-1)
xs:string	The string datatype represents character strings in XML

  - ✓ Additional data types: which are defined by oneM2M for use in the oneM2M
    - Simple data types (e.g., m2m:id, m2m:acpType, m2m:listOfEventCat, m2m:listOfMinMax,…)

XSD type name	Type Name	Description (See Table 6.3.2.1-1)
m2m:id	Generic ID	Used to represent generic IDs generated and used within oneM2M

    - Enumerated data types (e.g., m2m:resourceType, m2m:locationSource, m2m:operation, m2m:responseType,…)

XSD type name	Type Name	Description (See Table 6.3.2.2.2.7-1)
m2m:response Type	Response Type	Used for rt parameter in request and operation attribute in <request> resource. Available values are as follows: 1 – nonBlockingRequestSynch 2 – nonBlockingRequestAsynch 3 - blockingRequest

    - Complex data types

XSD type name	Element	Element Data Type	Description (See Table 6.3.2.3-1)
m2m:eventCat	eventCatType	m2m:eventCatType	Used for ec parameter in request and eventCat attribute of <delivery> resource.
	eventCatNo	xs:nonNegativeInteger	

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- Message parameter data types
  - ✓ Request message parameter data types

Request message Parameters	Data Type
Content	m2m:content
Delivery Aggregation	xs:boolean
Event Category	m2m:eventCatType
Filter Criteria	m2m:filterCriteria
From	xs:anyURI
Group Request Identifier	xs:string
Name	xs:string
Operation	m2m:char
Operational Execution Timestamp	m2m:timestamp
Originating Timestamp	m2m:timestamp
Request Expiration Timestamp	m2m:timestamp
Request Identifier	xs:string
Resource Type	m2m:resourceType
Response Type	m2m:responseType
Result Content	m2m:resultContent
Result Expiration Timestamp	m2m:timestamp
To	xs:anyURI

  - ✓ Response message parameter data types

Response message Parameters	Data Type
Content	m2m:content
From	m2m:id
Originating Timestamp	m2m:timestamp
Request Identifier	xs:string
Result Expiration Timestamp	m2m:timestamp
To	xs:anyURI

How to Read/Understand the Core PRO TS (1/4)

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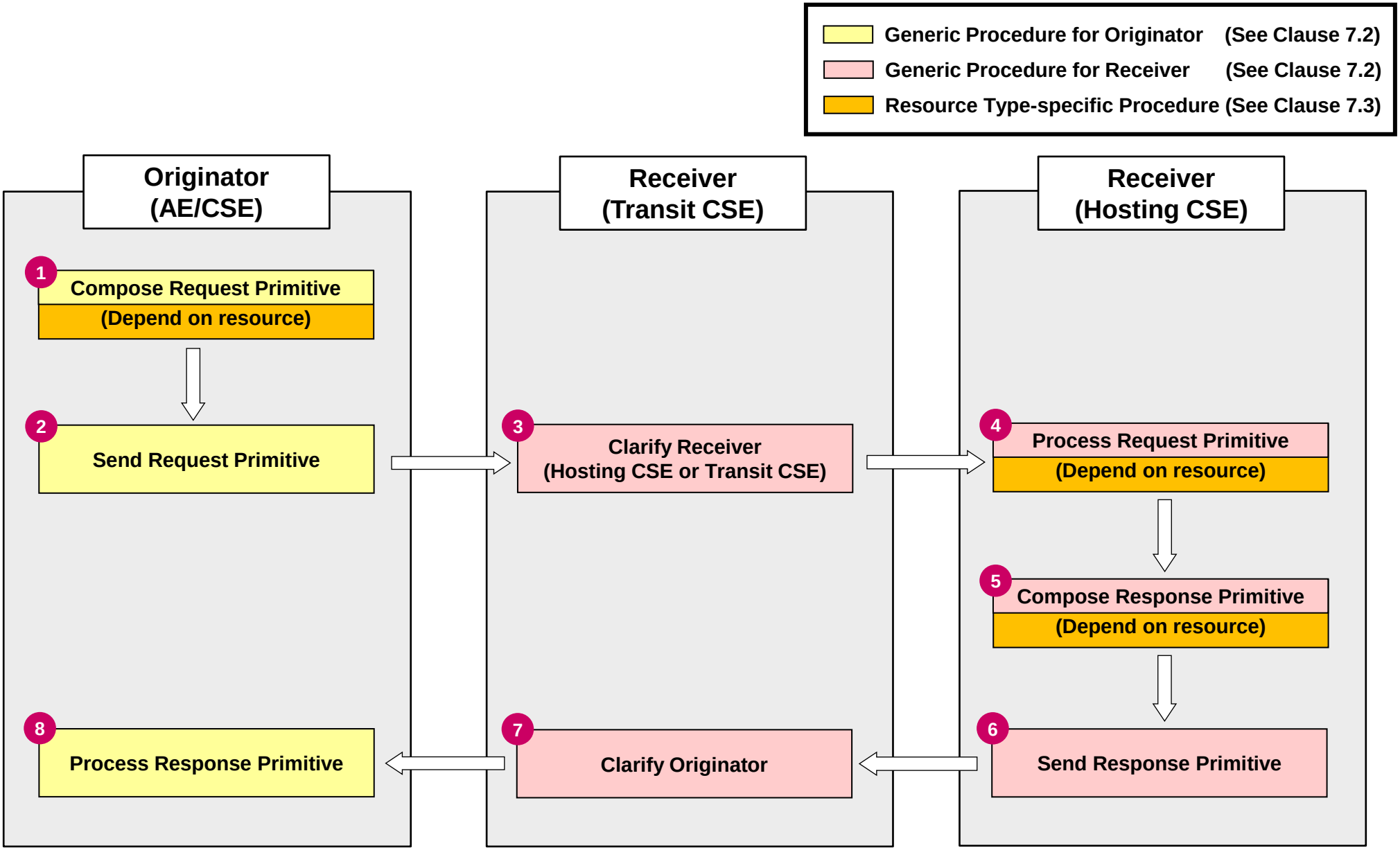
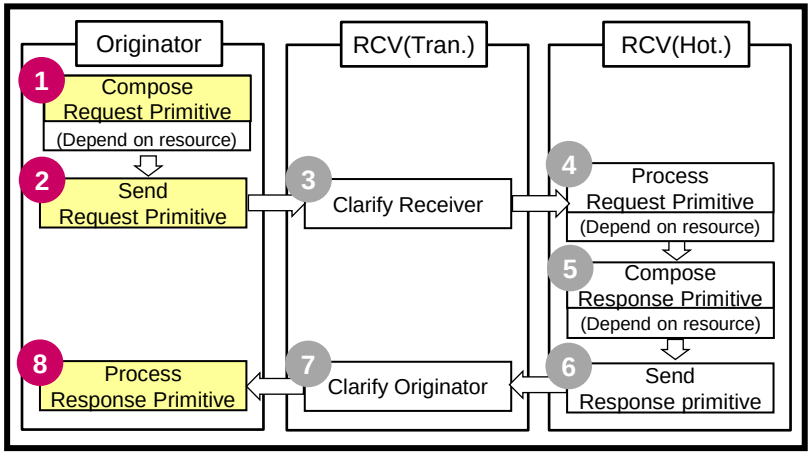


For Internal Use Only



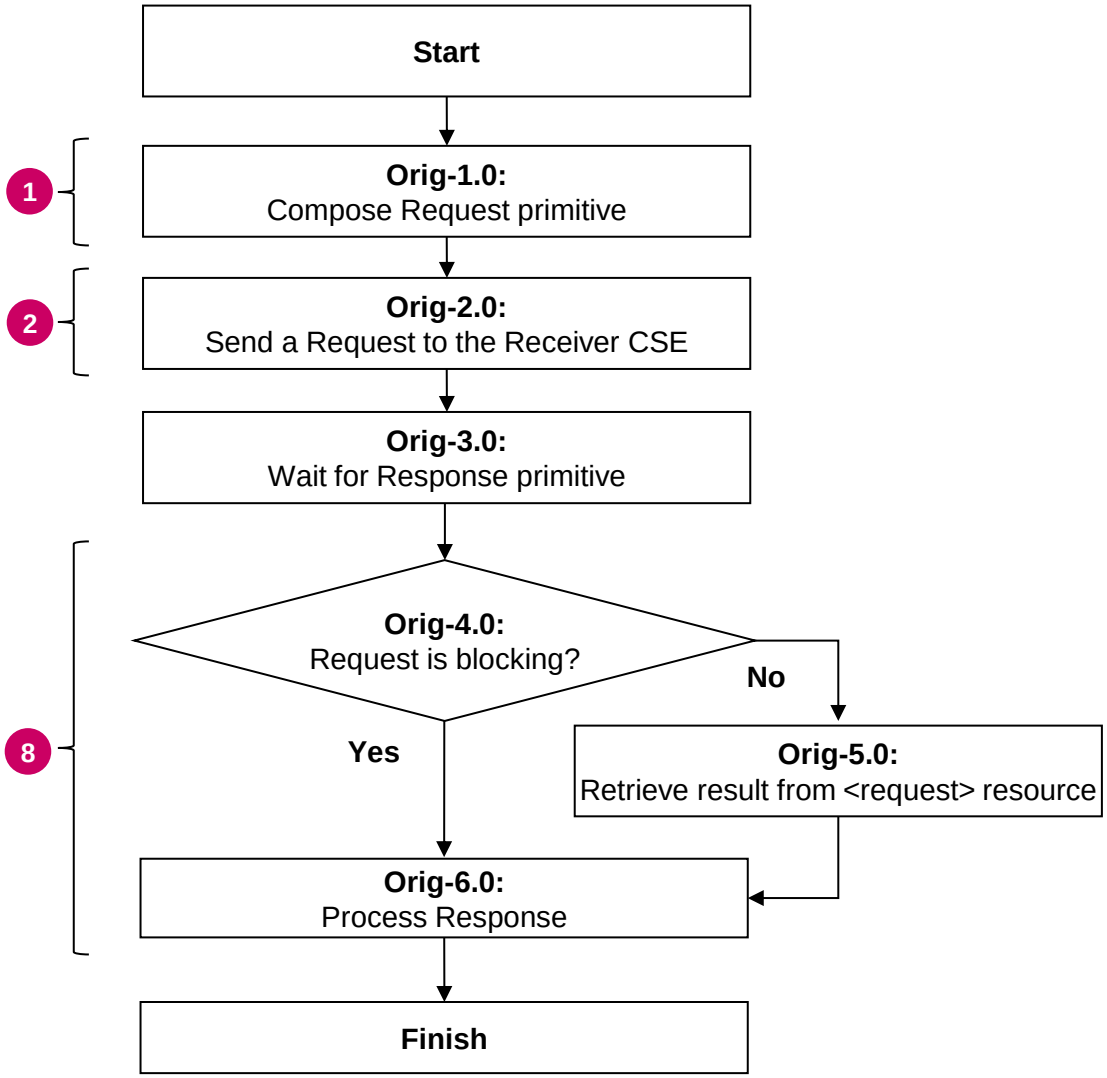


Figure 7.2.1.2.1-1: Generic procedure of Originator

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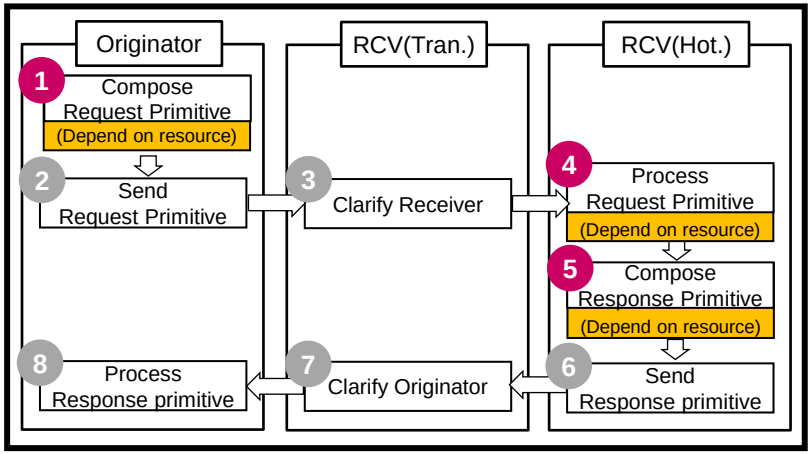


i Resource Type

- Clause 7.3.x

ii Operation

- Create/Retrieve/Update/Delete

iii Behavior

- No change from the generic procedures
- Specific description for each resource type

i 7.3.7. Resource Type subscription

…

7.3.7.2. Resource Specific Procedure on CRUD Operations

This sub-clause describes <subscription> resource specific behaviour for CRUD operations.

ii 7.3.2.1. Create

Originator:

No change from the generic procedures in clause 7.2.1.2.1.

Receiver:

The followings are additional Hosting CSE procedures to the generic resource handling procedures (figure 7.2.1.2.2-2 in clause 7.2.1.2.2). The additional procedures shall be inserted from Recv-6.2 to Recv-6.8 as below.

iii The resource handling procedure for the Hosting CSE which receives <subscription> Create request shall perform the following procedures in order:

1. Recv-6.2
2. Recv-6.3
3. Check if the subscribed-to resource, addressed in *to* parameter in the Request, is subscribable. Subscribable resource types are defined in [6], they have <subscription> resource types as their child resources.

…

7.3.2.4. Delete

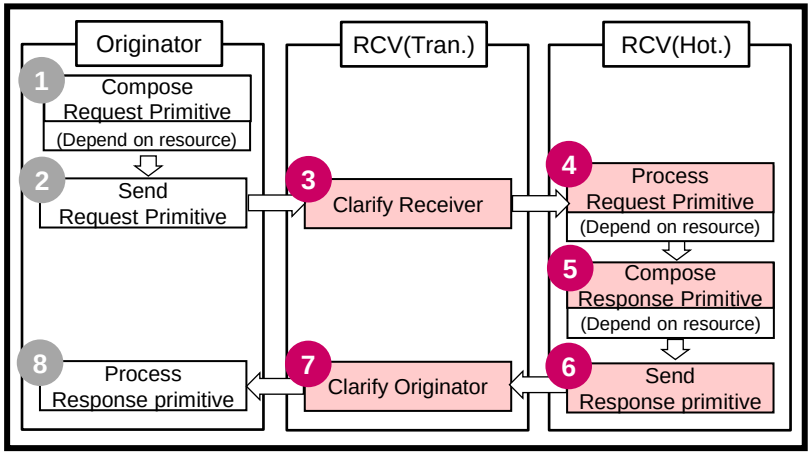
Originator:

No change from the generic procedures in clause 7.2.1.2.1.

Receiver:

No change from the generic procedures in clause 7.2.1.2.2.

For Internal Use Only



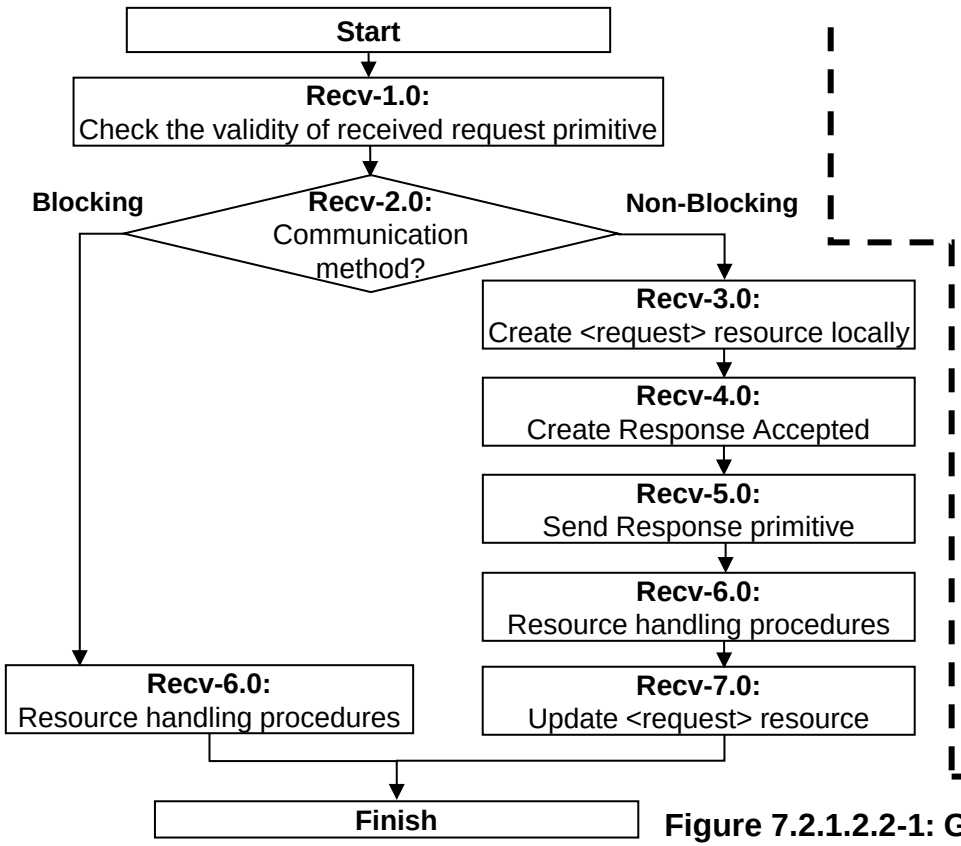


Figure 7.2.1.2.2-1: Generic procedure of Receiver

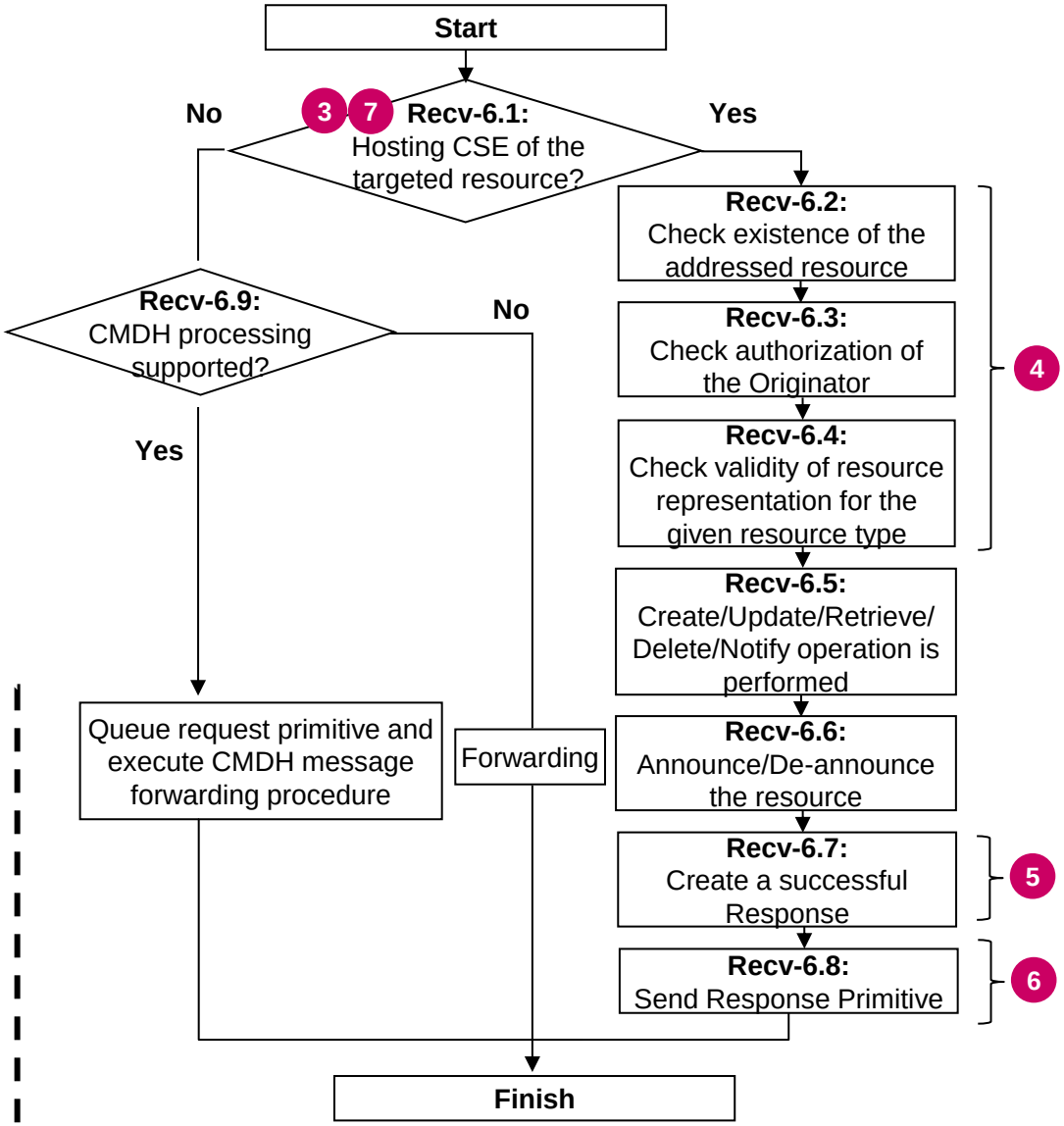
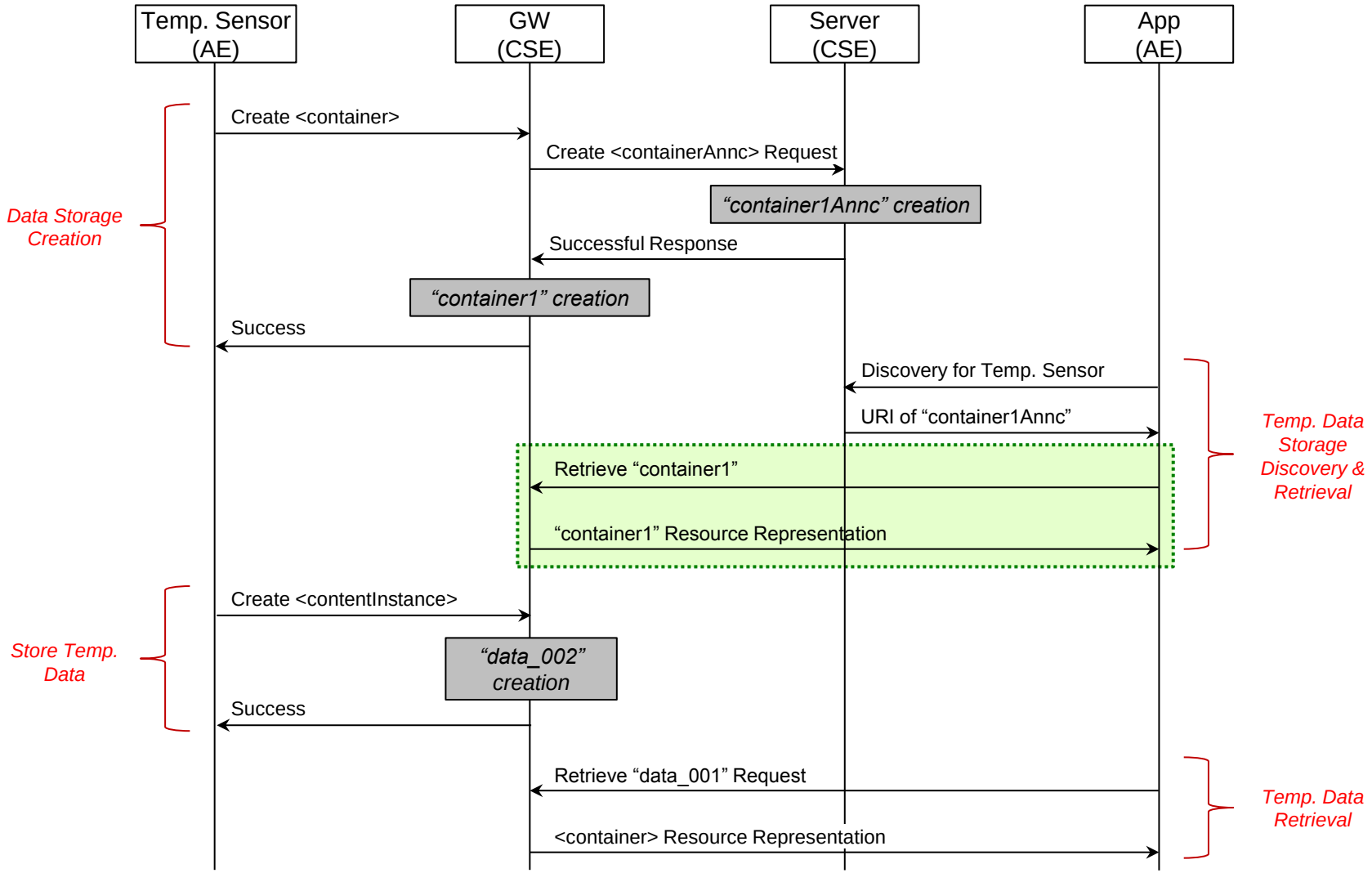


Figure 7.2.1.2.2-2: Resource handling procedure

Different Applications Share Data using Container and Discovery Features



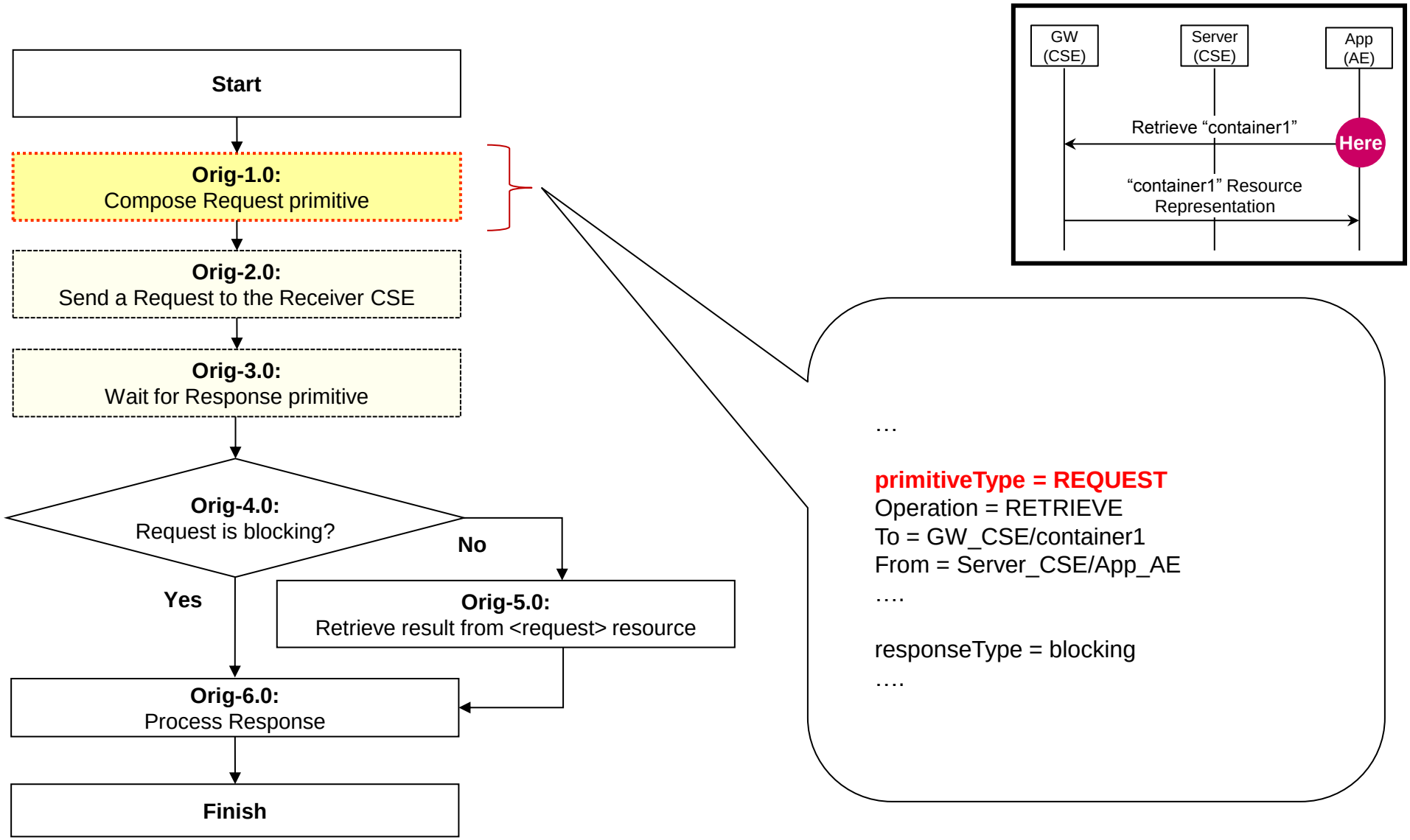


Figure 7.2.1.2.1-1: Generic procedure of Originator

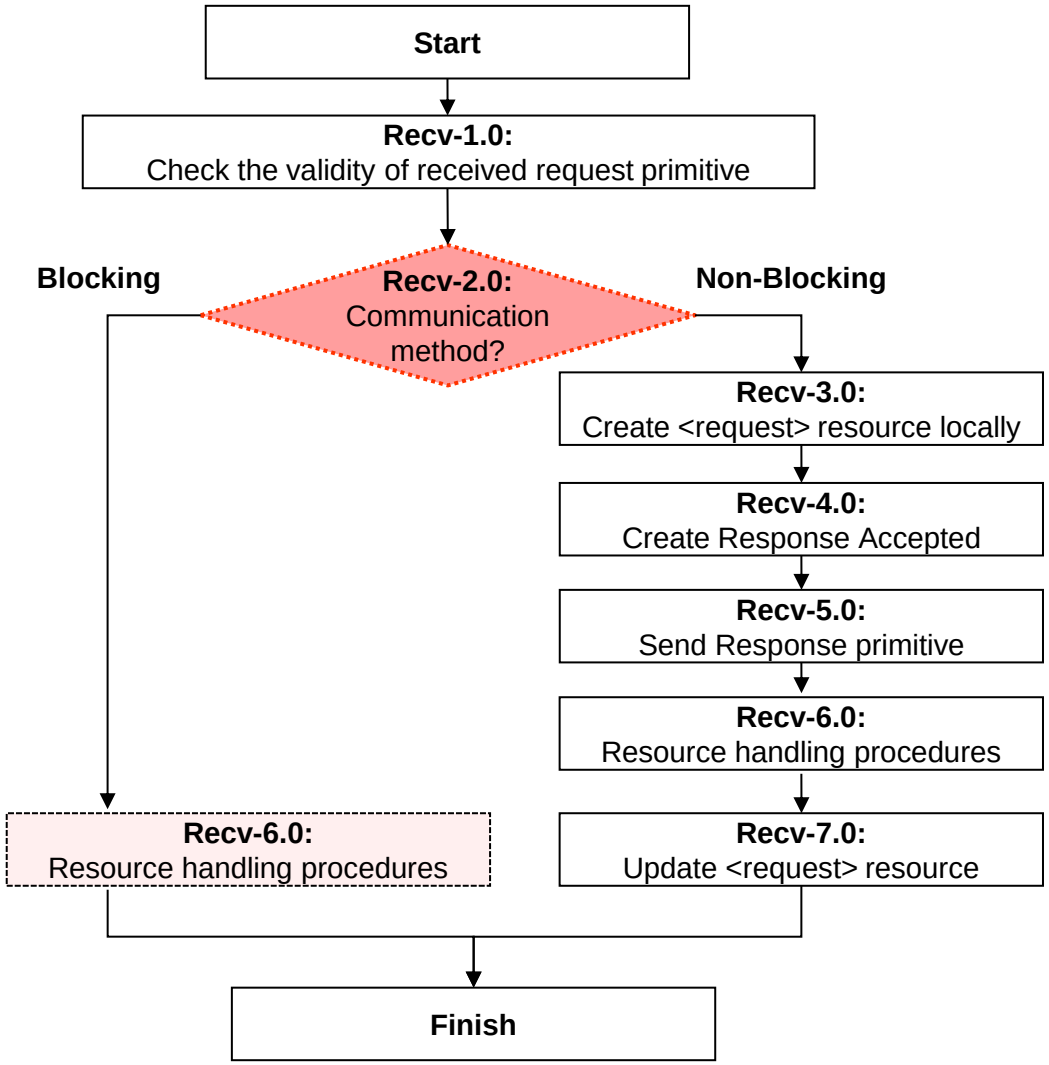
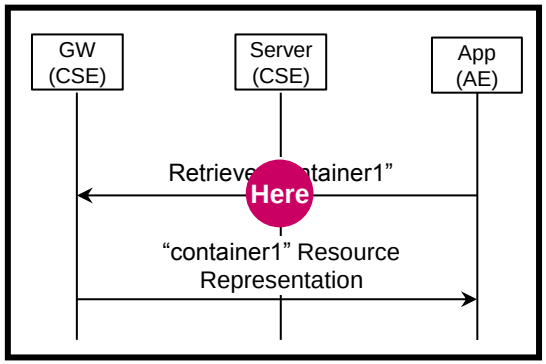


Figure 7.2.1.2.2-1: Generic procedure of Receiver



…

primitiveType = REQUEST
Operation = RETRIEVE
To = GW_CSE/container1
From = Server_CSE/App_AE
….

responseType = blocking
….

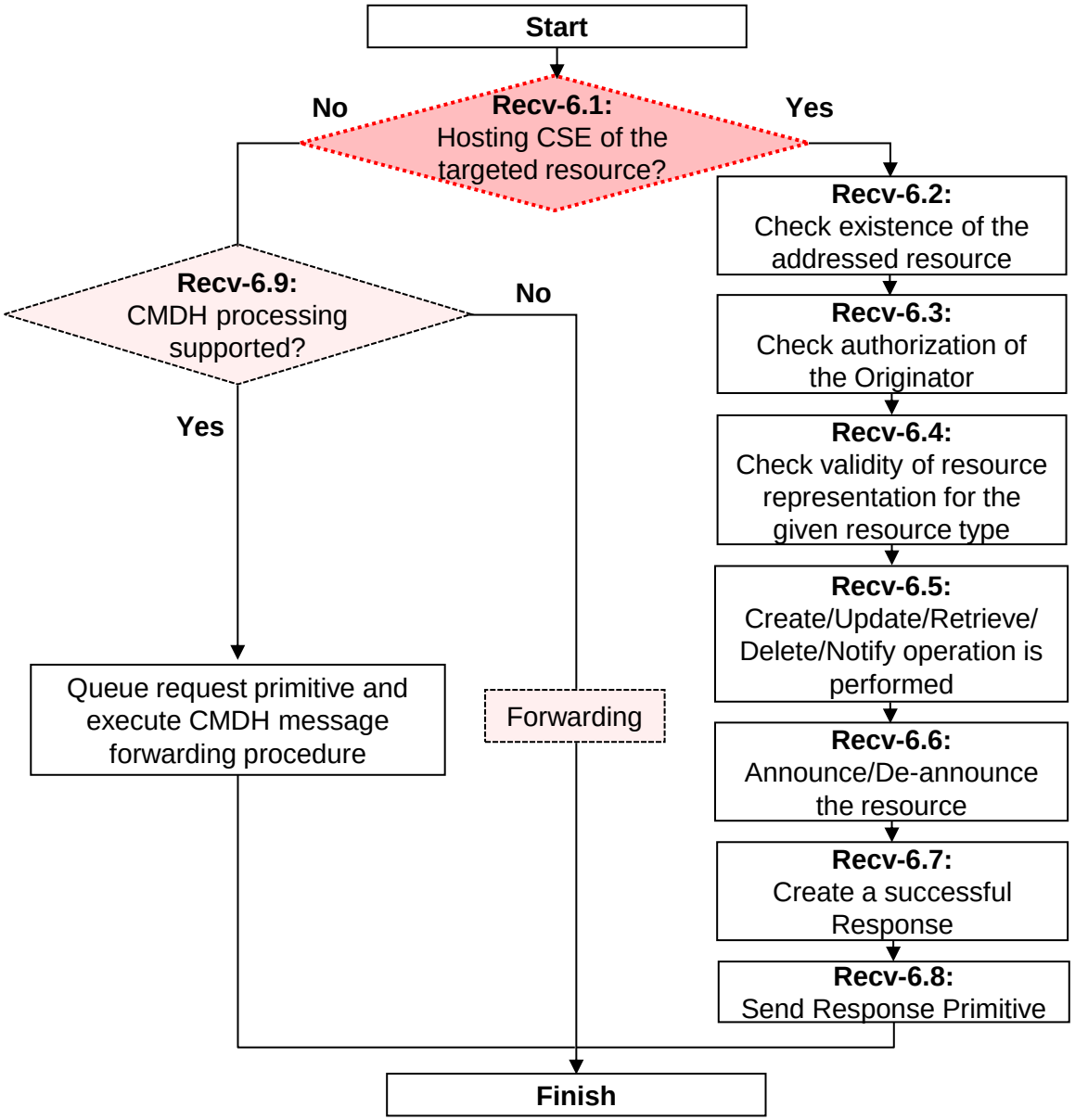
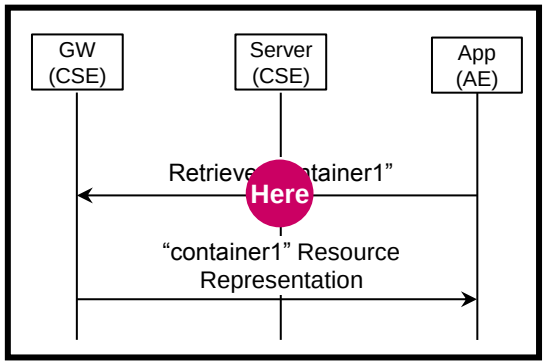


Figure 7.2.1.2.2-2: Resource handling procedure



…

primitiveType = REQUEST
Operation = RETRIEVE
To = GW_CSE/container1
From = Server_CSE/App_AE
….

responseType = blocking
….

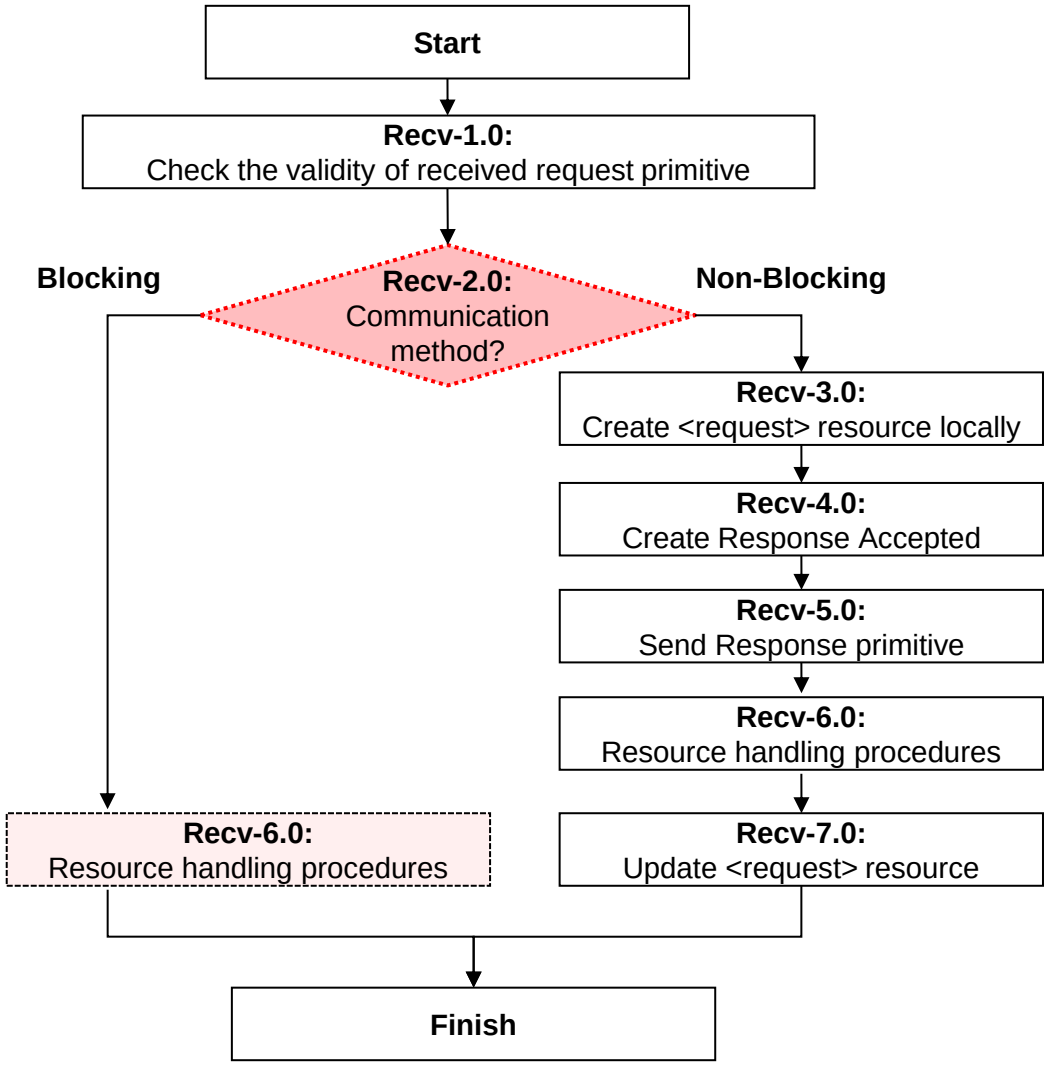
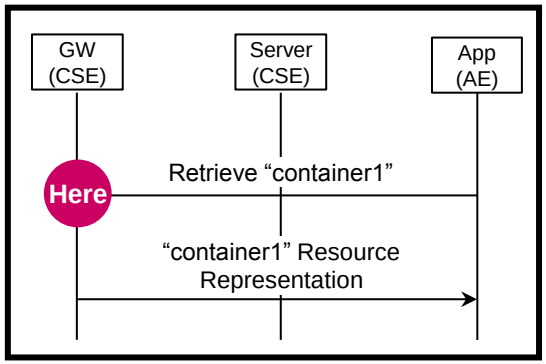


Figure 7.2.1.2.2-1: Generic procedure of Receiver



…

primitiveType = REQUEST
Operation = RETRIEVE
To = GW_CSE/container1
From = Server_CSE/App_AE
….

responseType = blocking
….

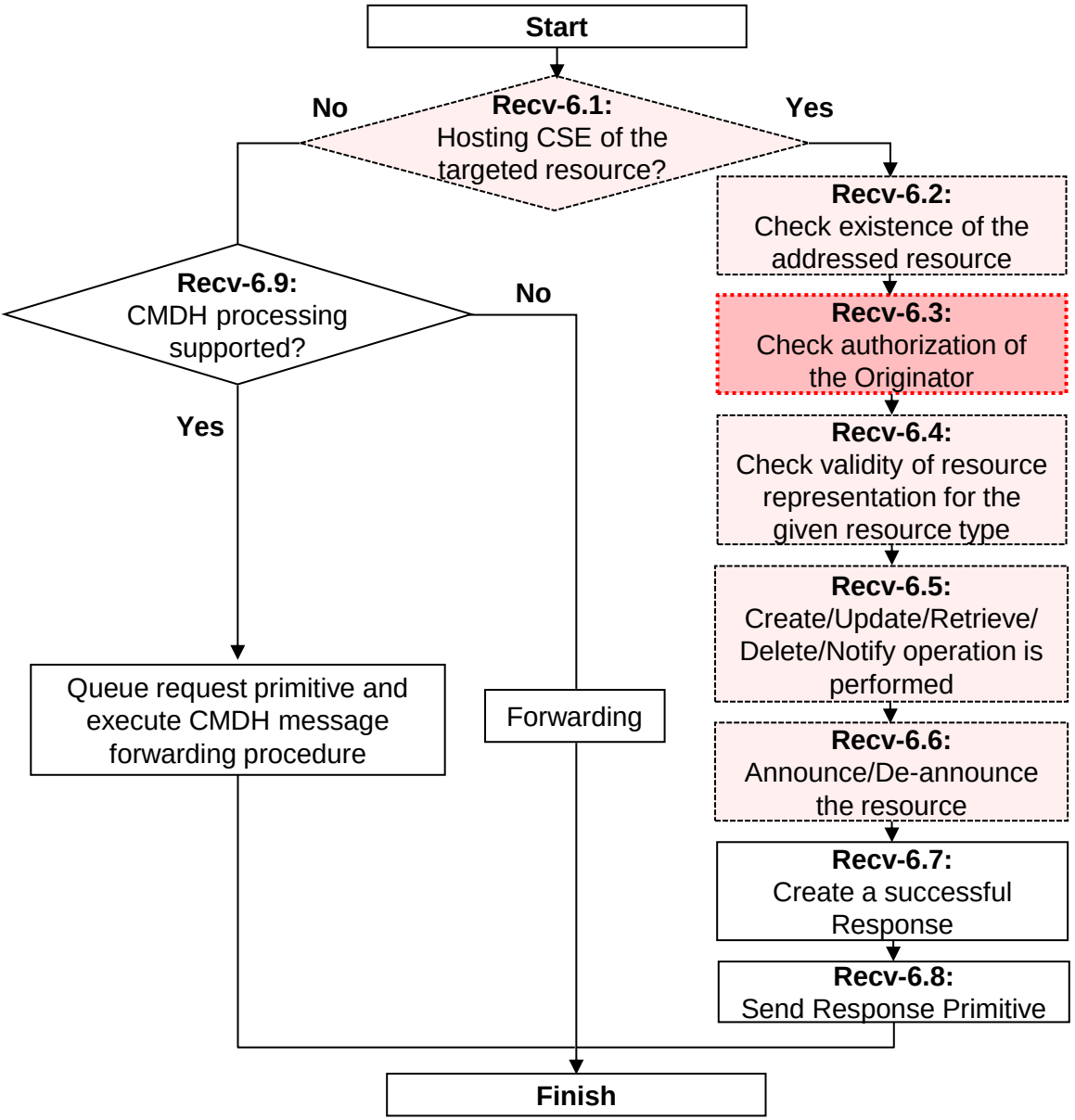
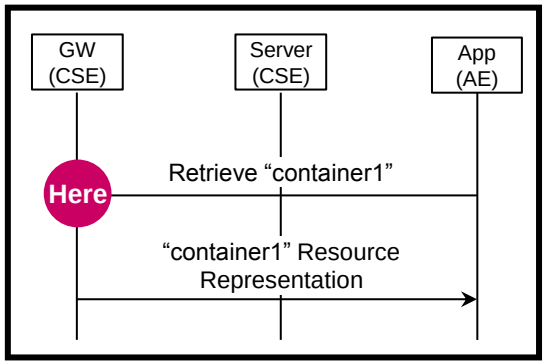
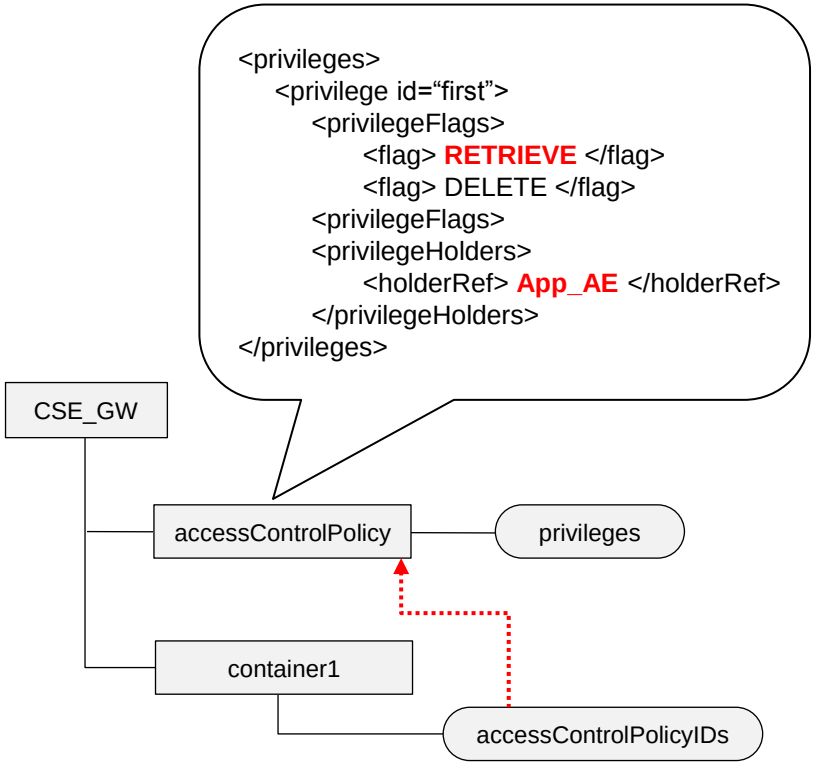
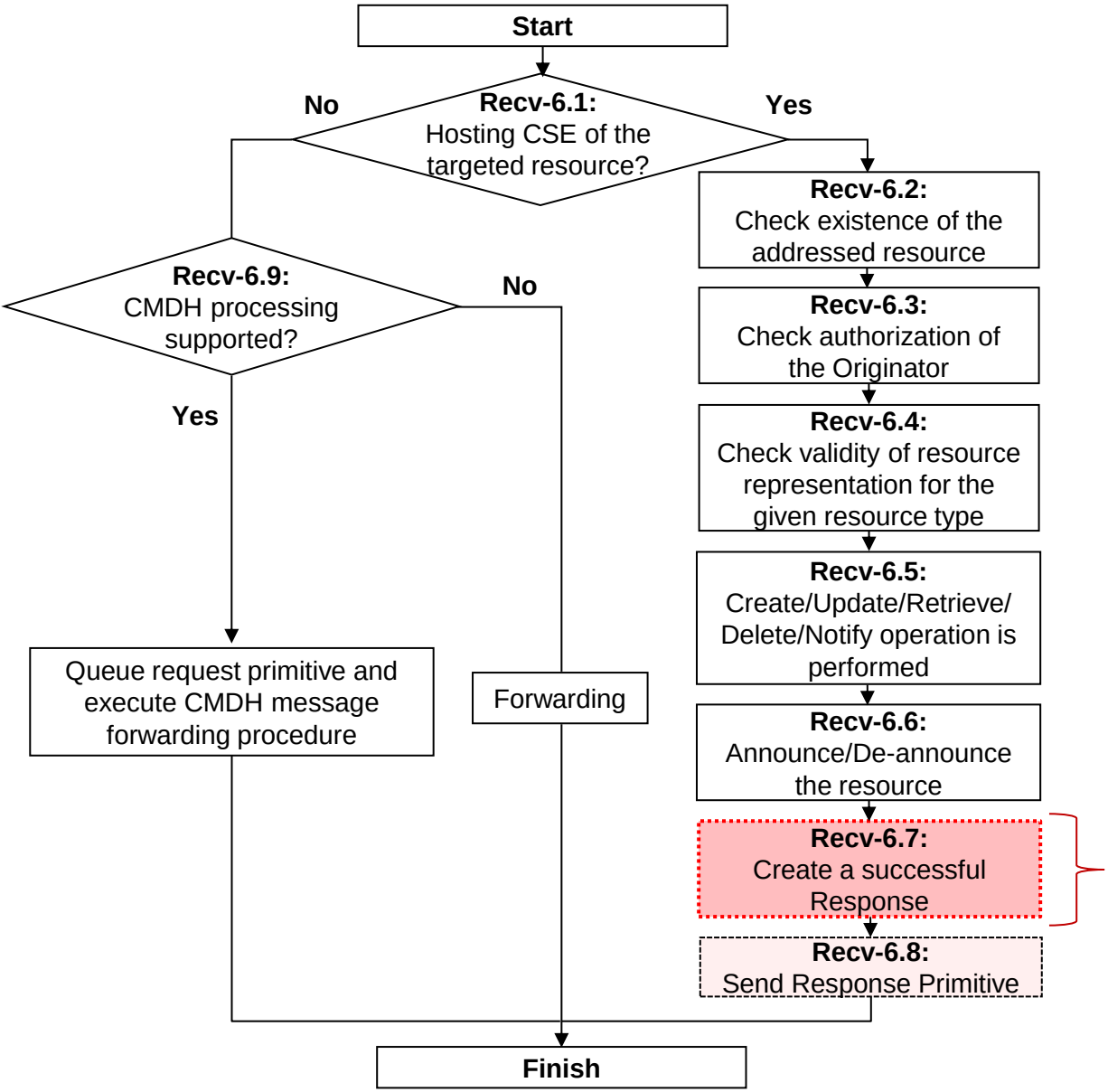
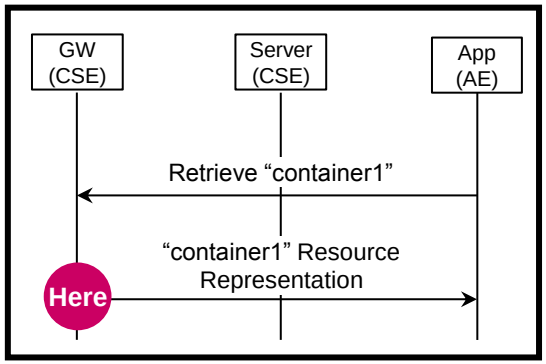


Figure 7.2.1.2.2 2: Resource handling procedure









…

primitiveType = RESPONSE
ResponseCode = Successful
….

currentNrOfInstances = 2
currentByteSize = 95
latest = CSE1/container1/a1bx3
….

To = Server_CSE/App_AE
From = GW_CSE/container1
….

Figure 7.2.1.2.2 2: Resource handling procedure

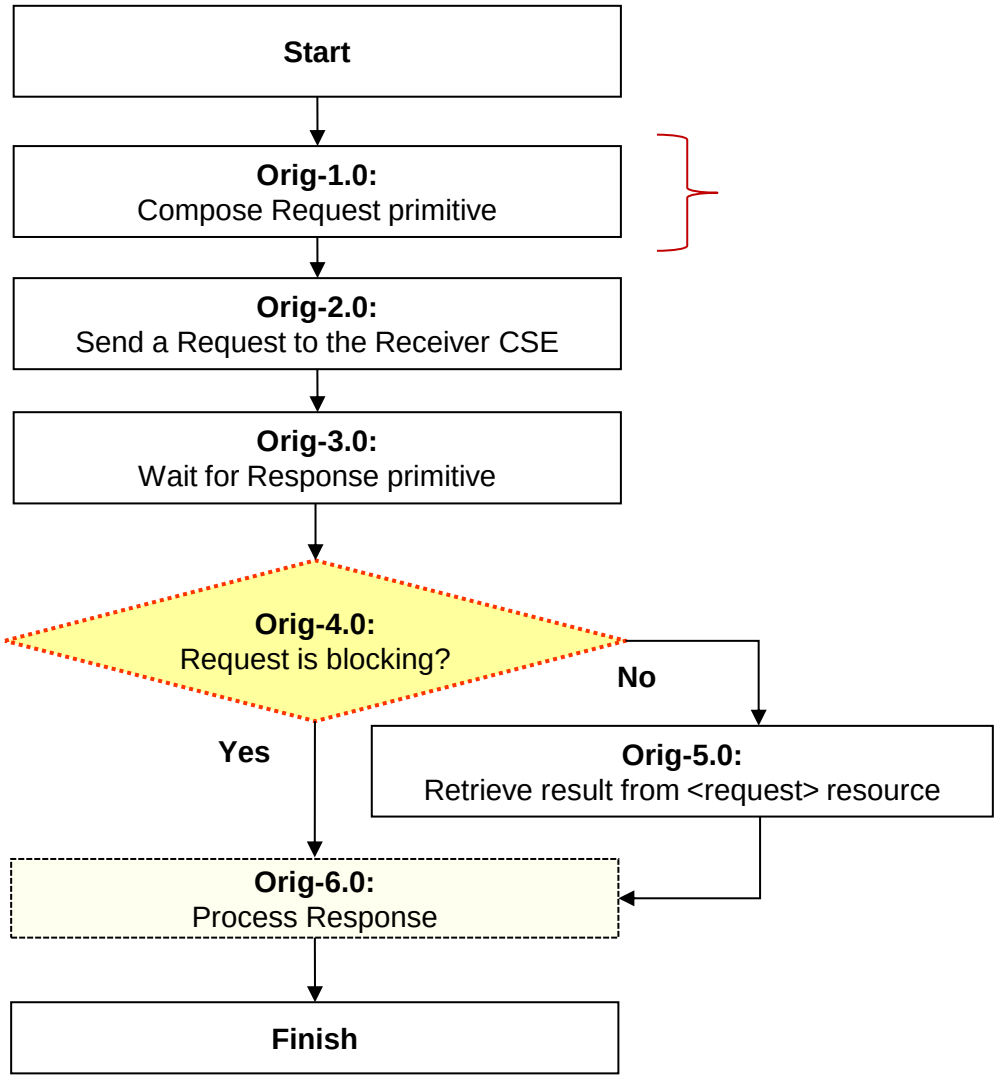
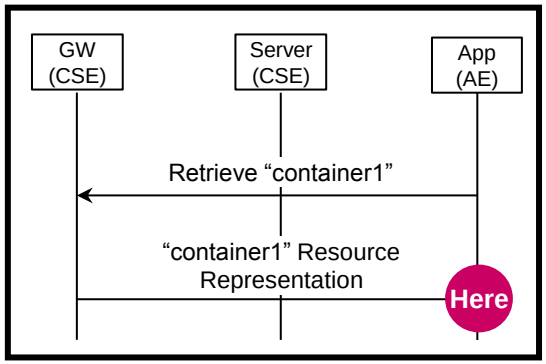


Figure 7.2.1.2.1-1: Generic procedure of Originator



…

primitiveType = RESPONSE
ResponseCode = Successful
….

currentNrOfInstances = 2
currentByteSize = 95
latest = CSE1/container1/a1bx3
….

To = Server_CSE/App_AE
From = GW_CSE/container1
….

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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	*other parameters*

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	Message Body	*other parameters*

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

Binding oneM2M Primitives to HTTP Messages

Learning Purpose Only

GW
(CSE)

Request Primitive

From: Server_CSE/App_AE
To: GW_CSE/container1
Operation: RETRIEVE
RequestID: 001

Content:
currentNrOfInstances,
currentByteSize,
latest

HTTP Request

```
GET /GW_CSE/container1 HTTP/1.1
Host: http://m2m.sp1.com
From: Server_CSE/App_AE
X-M2M-RI: 001
Accept: application/vnd.onem2m-resource-data+xml
Content-Length: 115

<xml>
  <content>
    <attributeName>currentNrOfInstances</attributeName>
    <attributeName>currentByteSize</attributeName>
    <attributeName>latest</attributeName>
  </content>
</xml>
```

App
(AE)

Request Primitive

From: Server_CSE/App_AE
To: GW_CSE/container1
Operation: RETRIEVE
RequestID: 001

Content:
currentNrOfInstances,
currentByteSize,
latest

Retrieve “container1” Request

Response Primitive

responseCode = Success
RequestID: 001

currentNrOfInstances = 2
currentByteSize = 95
latest = CSE1/container1/a1bx3

“container1” Resource Response

HTTP Response

```
200 OK
X-M2M-RI: 001
Content-Type: application/vnd.onem2m-resource-data+xml
Content-Length: 115

<xml>
  <container>
    <currentNrOfInstances>2</currentNrOfInstances>
    <currentByteSize>95</currentByteSize>
    <latest>CSE1/container1/a1bx3</latest>
  </container>
</xml>
```

Response Primitive

responseCode = Success
RequestID: 001

currentNrOfInstances = 2
currentByteSize = 95
latest = CSE1/container1/a1bx3

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Binding to CoAP (RFC7252)

CoAP Request and Request Primitive

CoAP Option	oneM2M Primitive Parameter
Method	Operation
Uri-Host, Uri-Port, Uri-Path, and Uri-Query	to, filterCriteria, resource type, name, originating timestamp, request expiration timestamp, result expiration timestamp, response type, result content, response persistence, operation execution time, event category, delivery aggregation, group request id, discovery result type, *from*
Version	1
Accept	“application/vnd.onem2m-resource-data+xml”
Content-Type	“application/vnd.onem2m-resource-data+xml”
Message Body	*cn*

CoAP Response and Response Primitive

CoAP Option	oneM2M Primitive Parameter
Version	1
Code	responseStatusCode
Content-Type	“application/vnd.onem2m-resource-data+xml”
Message Body	*responseStatusCode, cn*

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

Binding oneM2M Primitives to CoAP Messages

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GW
(CSE)

Request Primitive

From: Server_CSE/App_AE
To: GW_CSE/container1
Operation: RETRIEVE
RequestID: 001

Content:
currentNrOfInstances,
currentByteSize,
latest

CoAP Request

Type: Confirmable
Code: 0.01(GET)
Message ID: coap123
Token: m2m123
URI-Host: coap://m2m.sp1.com
URI-Path:/CSE1Base/container1
URI-Query: ?fr=CSE2/AE21&ri=001
Accept: application/vnd.onem2m-resource-data+xml
Content-Type: application/vnd.onem2m-resource-data+xml

```
<xml>
  <content>
    <attributeName>currentNrOfInstances</attributeName>
    <attributeName>currentByteSize</attributeName>
    <attributeName>latest</attributeName>
  </content>
</xml>
```

App
(AE)

Request Primitive

From: Server_CSE/App_AE
To: GW_CSE/container1
Operation: RETRIEVE
RequestID: 001

Content:
currentNrOfInstances,
currentByteSize,
latest

Retrieve “container1” Request

Response Primitive

responseCode = Success
RequestID: 001

currentNrOfInstances = 2
currentByteSize = 95
latest = CSE1/container1/a1bx3

“container1” Resource Response

CoAP Response

Type: Ack
Code: 2.05(Content)
Message ID: coap123
Token: m2m123
Content-Type: application/vnd.onem2m-resource-data+xml

```
<xml>
  <container>
    <currentNrOfInstances>2</currentNrOfInstances>
    <currentByteSize>95</currentByteSize>
    <latest>CSE1/container1/a1bx3</latest>
  </container>
</xml>
```

Response Primitive

responseCode = Success
RequestID: 001

currentNrOfInstances = 2
currentByteSize = 95
latest = CSE1/container1/a1bx3

감사합니다!