

CCNx Extension for NRS

ICNRG Interim meeting in Singapore

Jungha Hong

ETRI

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Problem statement 1 : Routing Scalability

- Regardless of name scheme, if non-aggregated name prefixes are injected to the Default Route Free Zone (DFZ) of ICN, then they would be driving the growth of the DFZ routing table size
- This is the same as the scalability issue of IP routing
- Thus a solution to keep the routing table size under control is needed
 - It can be done by defining indirection layer
 - NRS can be utilized to lookup the indirection

Problem statement 2 : Replica Service

- Similarly with CDN approach, multiple media servers containing popular contents can be deployed in different areas
- But all of media data in replica servers must have equivalent name to keep data integrity as one publisher's authority
- In order to take an advantage from the replica servers, NRS can be utilized to lookup the physical locations of the replica servers
 - So, request for media data can be forwarded to the nearest replica server
 - The nearest replica server can be chosen from the information resolved by NRS

Problem statement 3 : Producer Mobility

- Producer mobility in ICN is not trivial
- NRS can be utilized to lookup the physical location of the moving producer instead of updating the routing system according to the producer's movements

Design consideration 1 as a Service

- Resolution entity
 - Host based resolution : DNS-like, always lookup
 - Network based resolution : network node such as content router
 - When does the resolution take place?

Design consideration 2 as a Service

- Protocol and semantics for NRS
 - Design new protocol and semantics
 - Utilize the current protocol and semantics
 - Communication channel (link) : legacy data plane vs. new control channel

Design consideration as a System

- Deployment scale
 - Local vs. Global
- Mapping base
 - Centralized vs. Distributed

Our design choice as a Service

- Resolution entity
 - Host based resolution
 - **Network based resolution**
 - When does the resolution take place?
- Protocol and semantics for NRS
 - Design new protocol and semantics
 - **Utilize the current protocol and semantics**
 - Communication channel (link) : legacy data plane vs. **new control channel**

Our design choice as a System

- Deployment scale
 - Local vs. Global
- Mapping base
 - Centralized vs. Distributed

Our design choice description as a Service

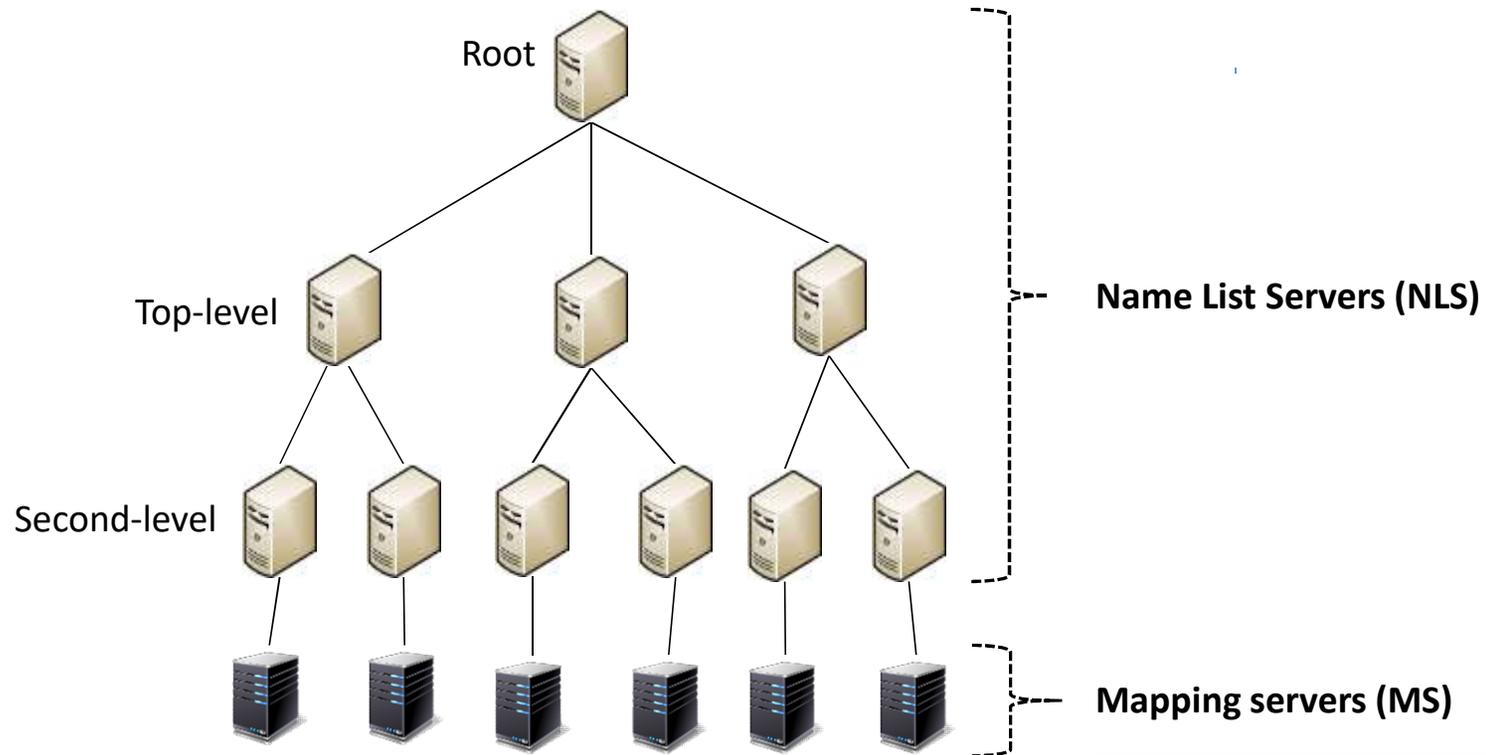
- Resolution entity
 - Host based resolution
 - Network based resolution → Content Router (CR) in CCN
 - When does the resolution take place? → If no information in FIB, then send the request for NRS
- Protocol and semantics for NRS
 - Design new protocol and semantics
 - Utilize the current protocol and semantics → Use CCNx semantics
 - Communication channel (link) : legacy data plane vs. new control channel → TCP one hop link

Our design choice description as a System

- Deployment scale
 - Local vs. Global
- Mapping base
 - Centralized vs. Distributed

→ Utilize the DNS-like tree structure

Mapping system for NRS in CCN



Mapping Table	
com/ccnx/presentation/slide10	com/ccnx/server1 com/ccnx/server2
⋮	⋮

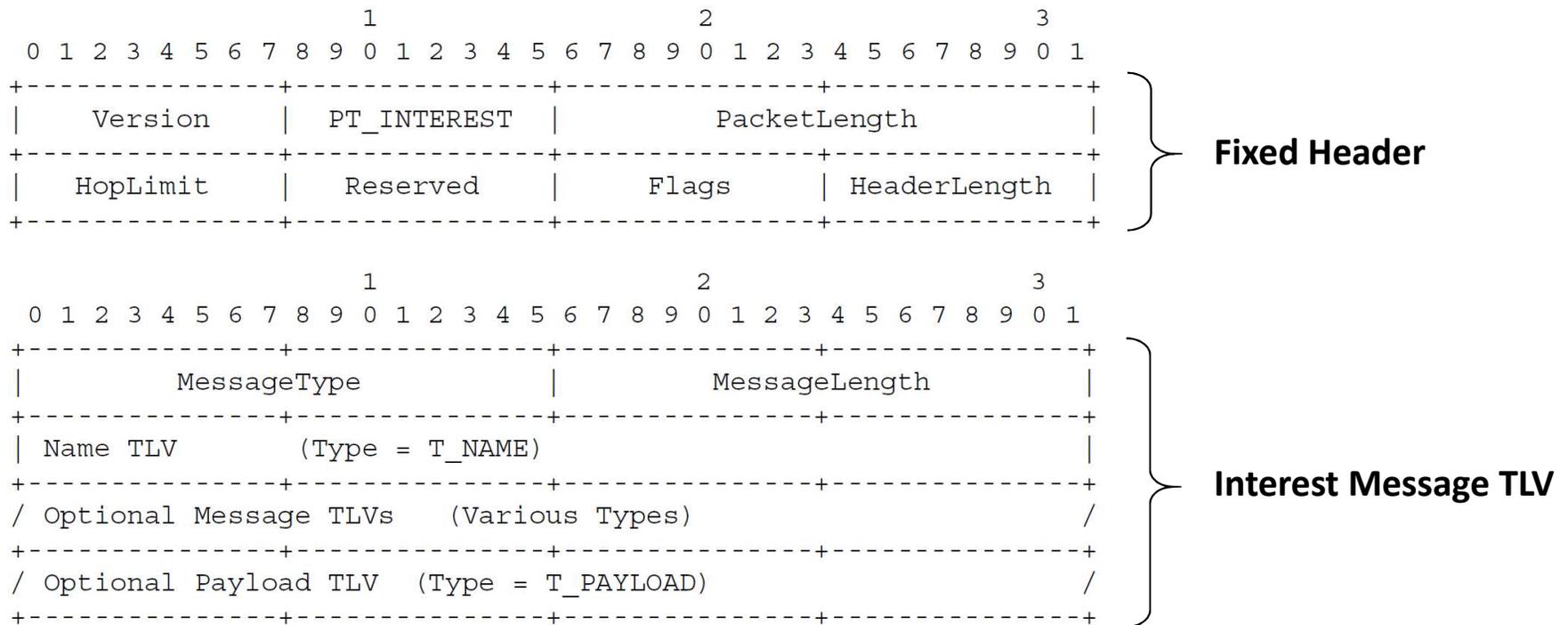
New network entity : Mapping server (MS)

- Stores and maintains the mapping table which keeps the bindings of name to some information that is used for forwarding Interest
- All NRS messages are processed through the MS
 - CR sends an Interest (I) to MS for name resolution request
 - MS responds to CR by Content Object (CO)
- Assumes that each CR knows its default MS
- MS can be deployed by single network provider
- Moreover, we assume that an ICN edge domain is required to have at least one MS

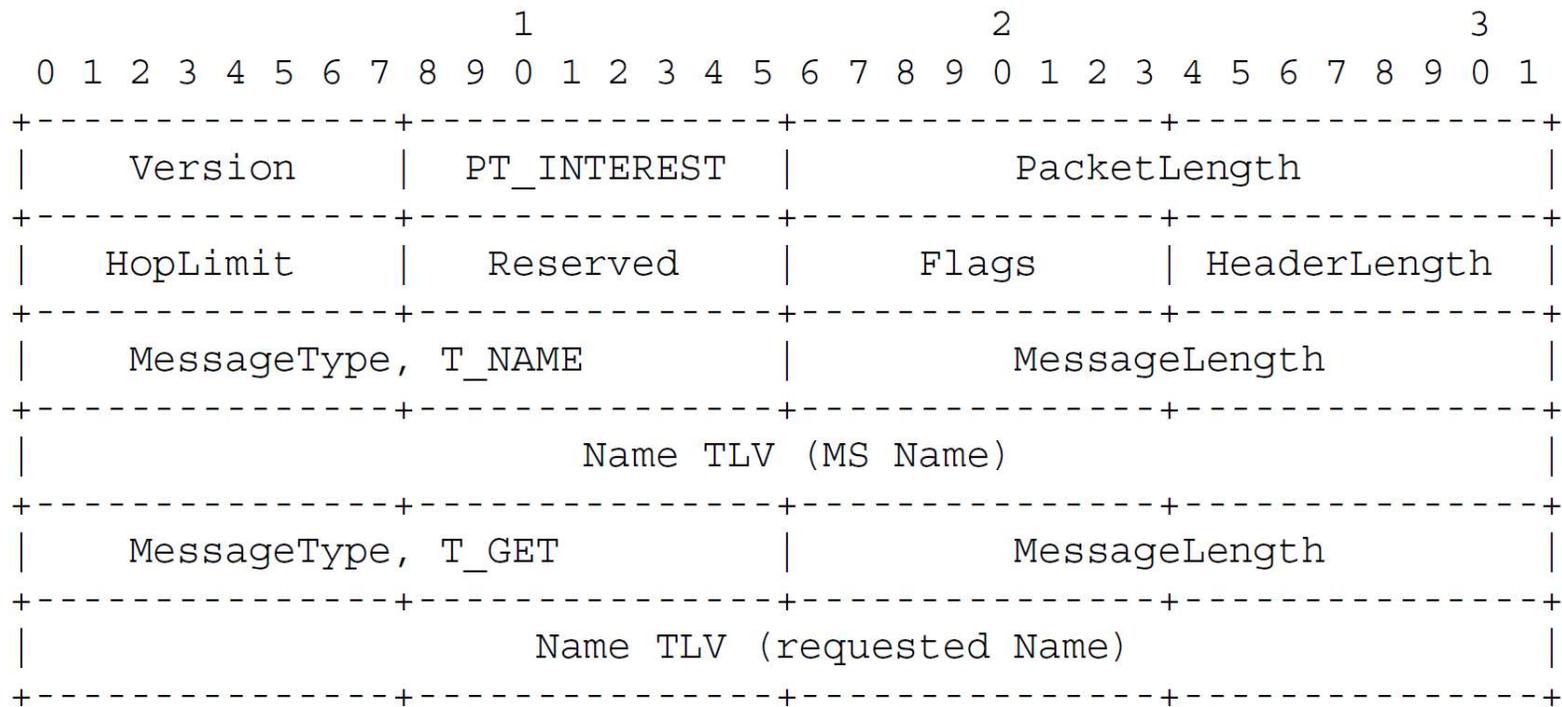
New network entity : Name list server (NLS)

- Constructed by the DNS-like tree according to the name hierarchy in CCN
- Only used to find the corresponding MS which stores the binding information of the requested name
 - since CR sends the NRS lookup request to its default MS whether it has the binding information of the requested name or not
- IP communication is used between MSs and NLSs

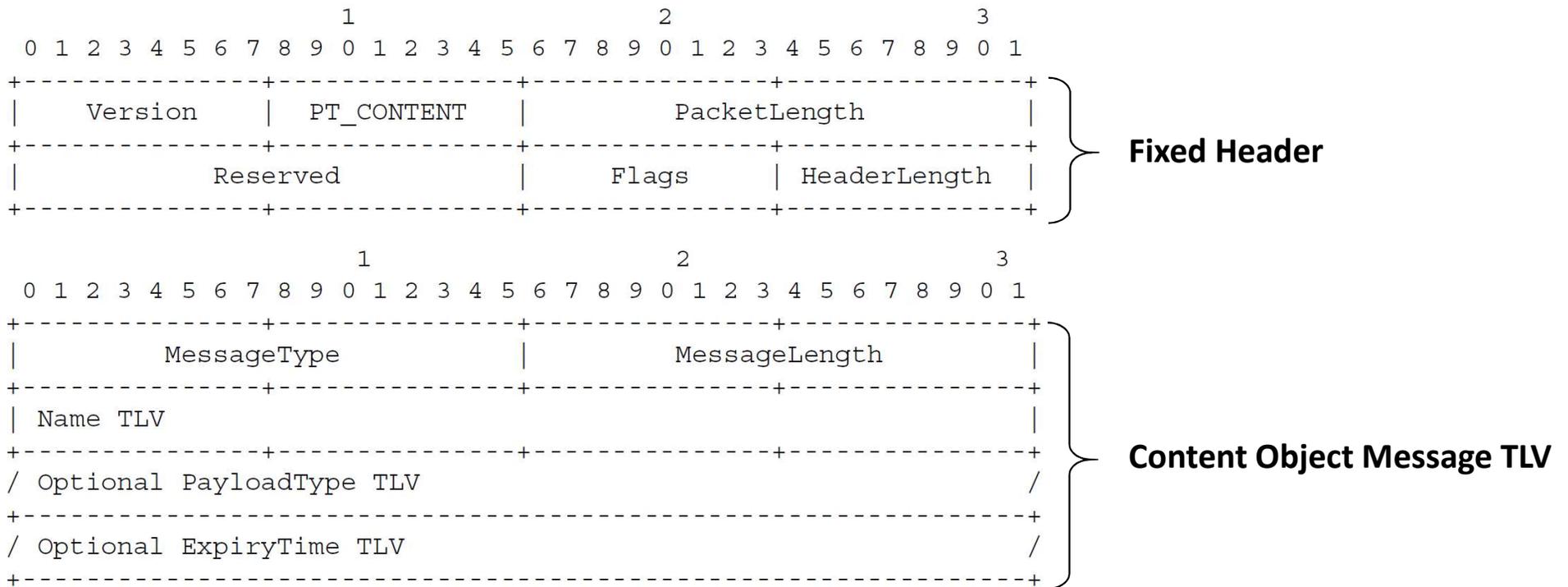
CCNx Interest format



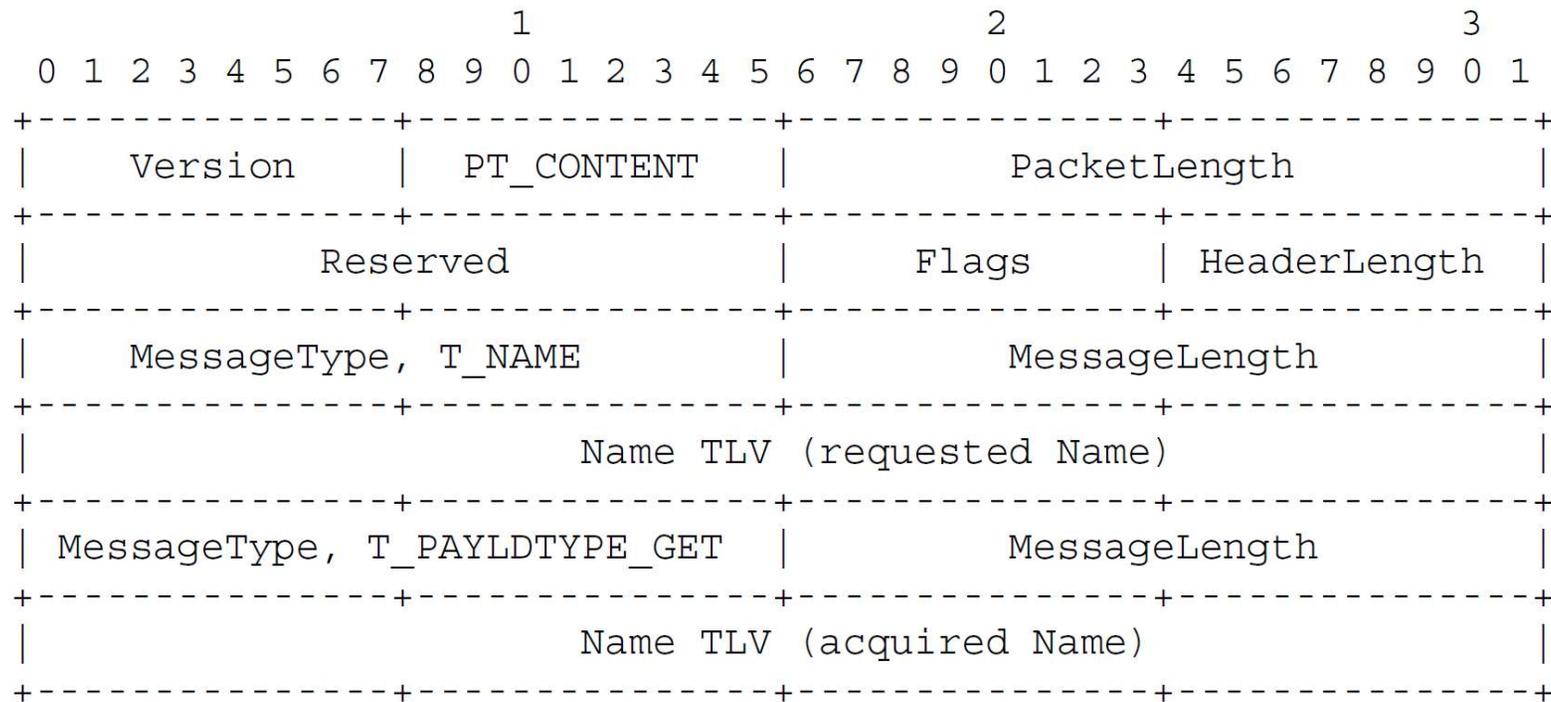
Interest format for name resolution request



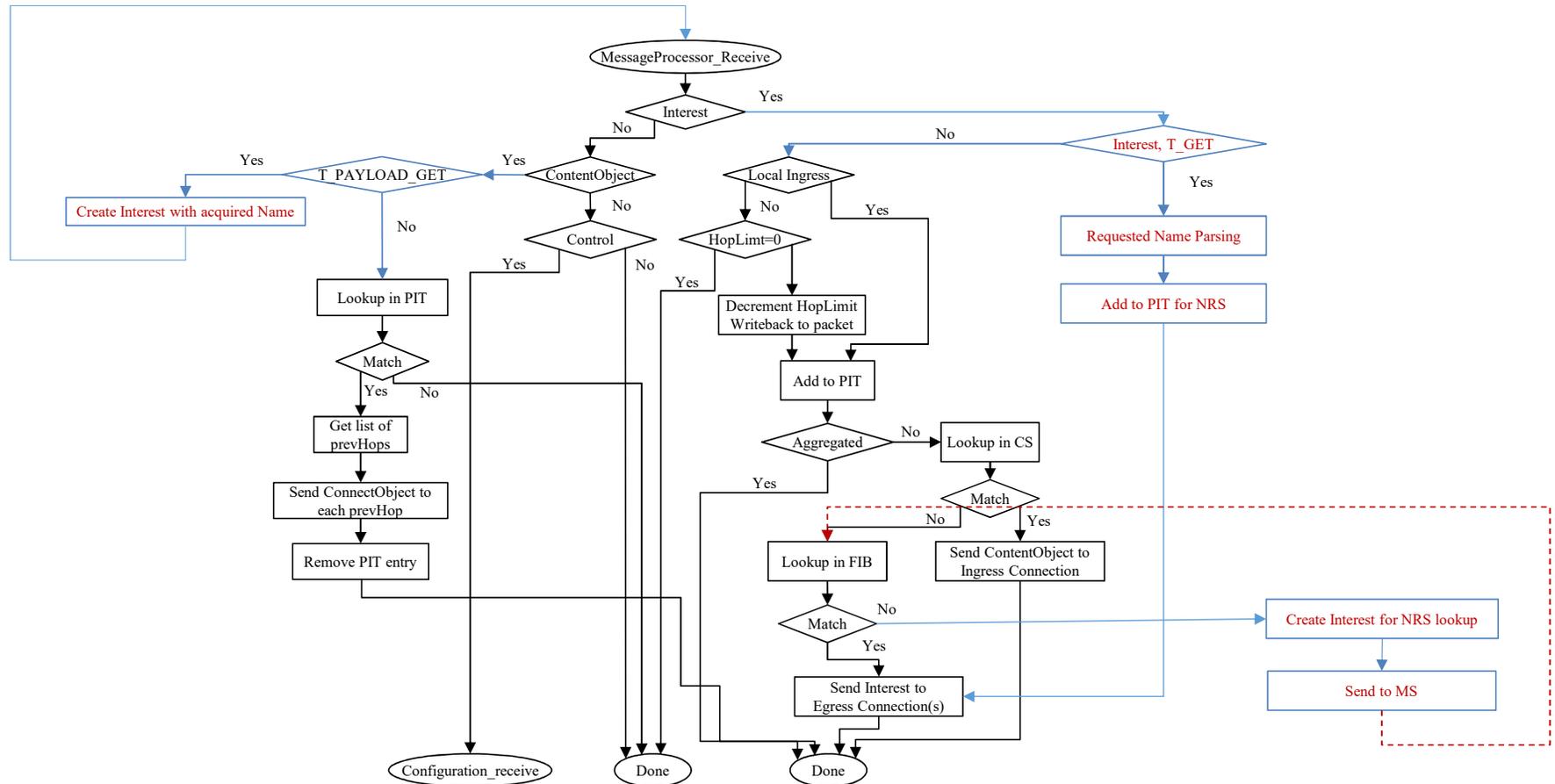
CCNx Content Object format



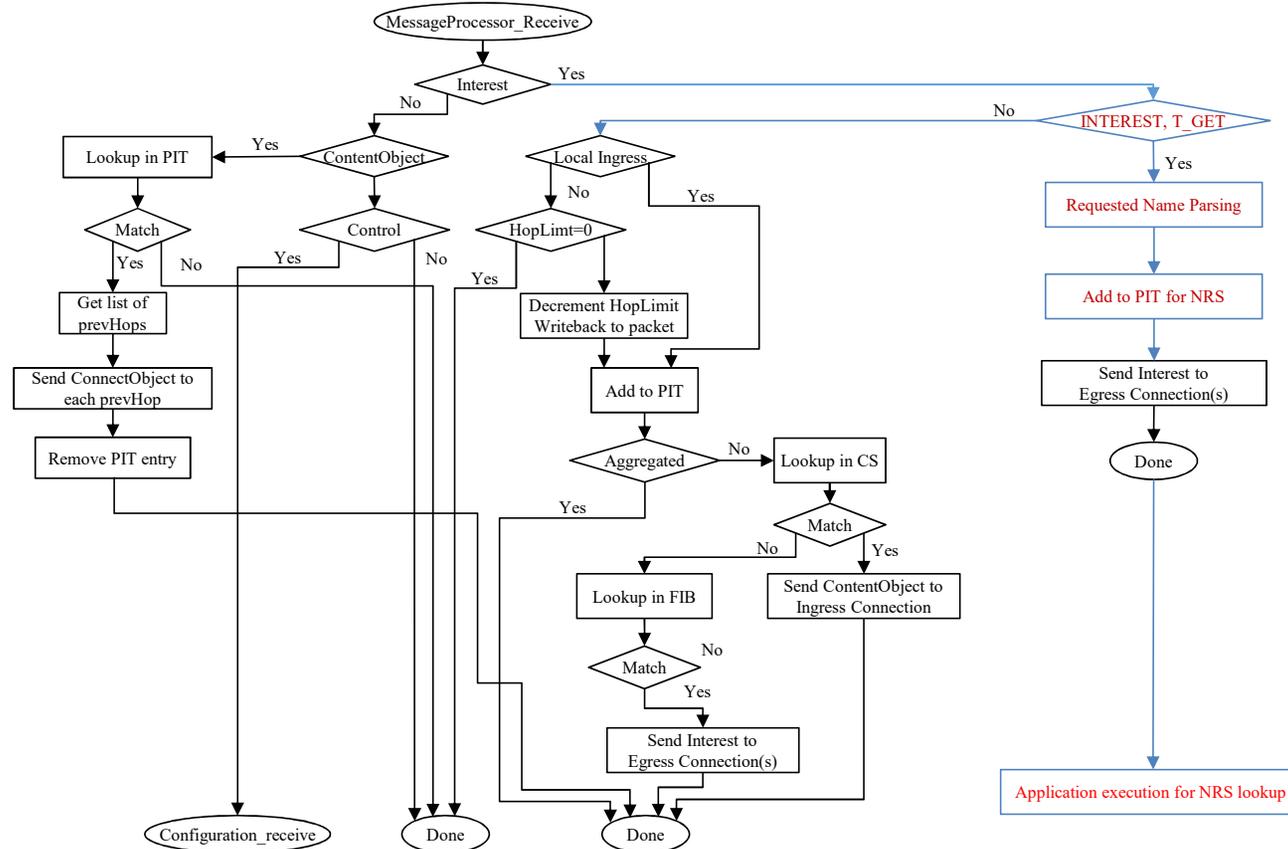
Content Object format for resolved response



Modification of forwarder in CR



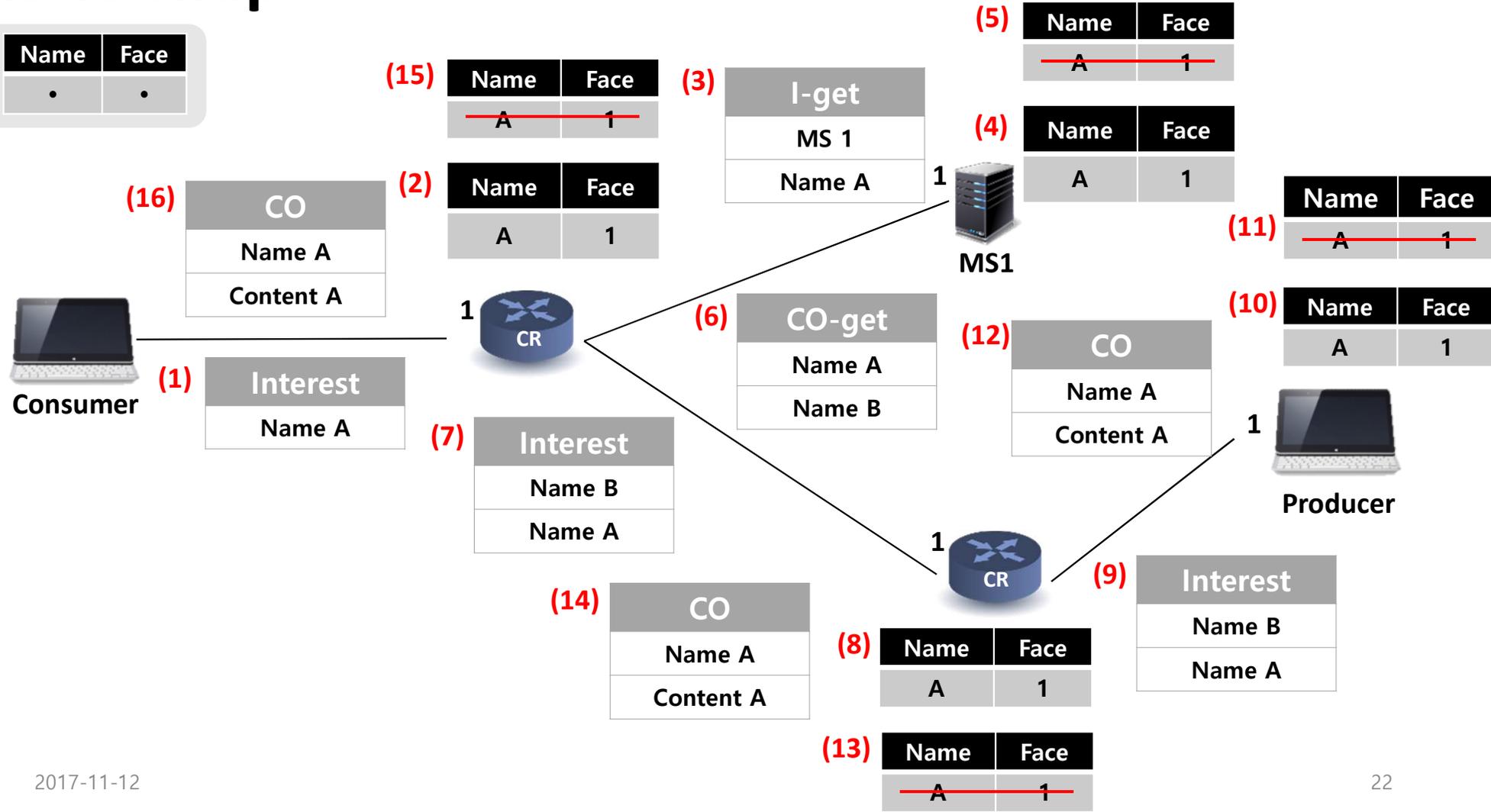
Modification of forwarder in MS



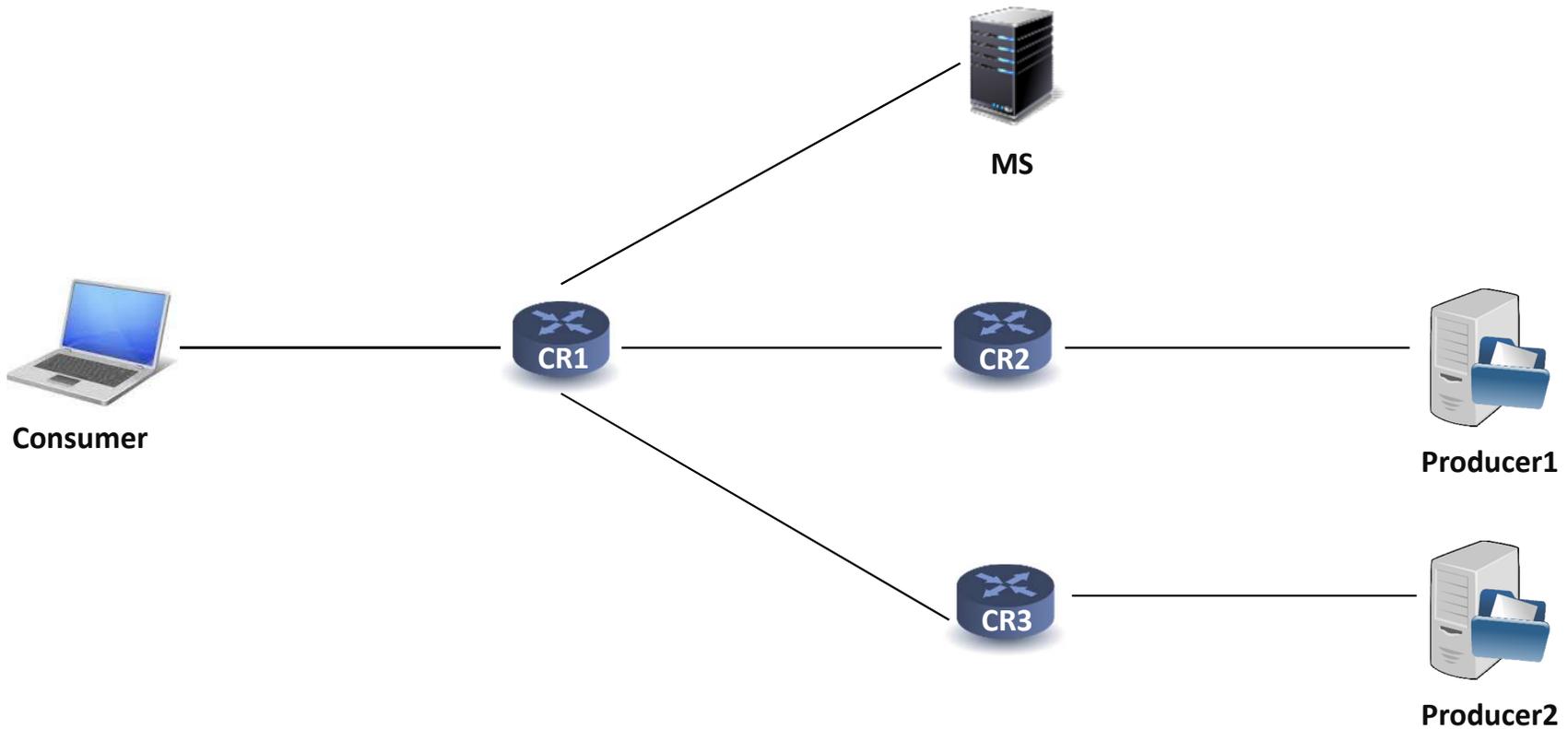
NRS-lookup

PIT :

Name	Face
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Demo system configuration



Thanks!

Questions and comments?