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J. Hong
T. You
Y-G. Hong
ETRI

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CCNx Extension for Name Resolution Service
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Abstract

This document presents the CCNx extension for Name Resolution Service (NRS). It describes TLV-based CCNx messages for NRS and modification of CCNx forwarder where the messages for NRS are working.

Status of This Memo

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Table of Contents

1. Introduction 2
2. Conventions and Terminology 3
3. Mappig System for Name Resolution Service in CCN 3
4. CCNx Extension for Name Resolution 4
4.1. Interest 4
4.2. Content Object 5
4.3. Forwarder 6
5. CCNx Extension for Name Management 6
5.1. Interest 6
5.2. Content Object 6
5.3. Forwarder 6
6. IANA Considerations 6
7. Security Considerations 6
8. Acknowledgements 6
9. References 6
9.1. Normative References 6
9.2. Informative References 7
Authors' Addresses 7

1. Introduction

In Information Centric Networking (ICN)[RFC7927], the name resolution is defined as the first step of ICN routing along with content discovery and delivery, which translates a content name to locator(s) of providers/sources that can provide the content. However, the name resolution step can be omitted in the hierarchical name based routing.

NDN [NDN] and CCN [CCN] are representative projects of ICN which use the hierarchical name based routing. Nevertheless, in [Afanasyev], in order to address the routing scalability problem in NDN's DFZ, a distributed mapping system called NDNS was designed, which maintains and lookups the mapping information from a name to its globally routed prefixes. Here, NDNS is a kind of Name Resolution Service (NRS) in NDN.

Similarly, CCN also has a challlenge to address the routing scalability problem in CCN's DFZ even though CCN uses the hierarchical name based routing. Thus, NRS can be utilized in CCN for the scalable name based routing as well as the efficient mobility support.

This document presents the design of NRS-Mapping System (NRS-MS) which is a system that provides the name resolution service in CCN and its implementation by extending CCNx. It also describes TLV-

based CCNx messages for NRS and modification of CCNx forwarder where the messages for NRS are working.

2. Conventions and Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

This document uses the terminology of [CCNxSemantics] and [CCNxMessages] for CCNx entities.

The following terms are used in this document and defined as follows:

- Mapping Server (MS) : stores and maintains the actual mapping table which keeps the bindings of name to some information that is used for forwarding Interest. MS is a role of NRS resolver and all NRS messages are processed though the MS. In other words, CCN nodes such as consumer, provider communicate with only MS to get the name resolution service. Thus we design the MS using C CN protocol assuming that the NRS is served at the content router (CR) and each CR knows its default MS.

- Name List Server (NLS) : is constructed by the DNS-like tree according to the name hierarchy. NLS is 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. MS is located at the second level NLS and we have utilized the IP for the communications between MSs and NLSs.

3. Mappig System for Name Resolution Service in CCN

This document presents the new implementation of NRS-MS functions based on extension of CCNx to show usefulness of NRS in CCN. We design a simple scenario to maximize NRS usefulness and to understand NRS functionalities easily.

- Scenario : Similar with CDN approach, multiple media servers containing popular contents can be deployed in different areas, but all of media data in replica servers (RSs) 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 rplica servers. The nearest replica server can be chosen from the information resolved by NRS.

- Design choices : We design and implement a new entity named a Mapping Server (MS) by extension of content router (CR). The MS can be deployed by single network provider. Moreover, we assume that an ICN edge domain is required to have at least one MS. MS maintains mapping information between name and another name and processes a lookup request and its response. Consumer is not changed. The first hop content router (CR1) like a first hop router should have a communication channel toward a mapping server. We design new messages to implement NRS functionalities just by following the CCNx messages in TLV format [CCNxMessages] by extension of optional fields.

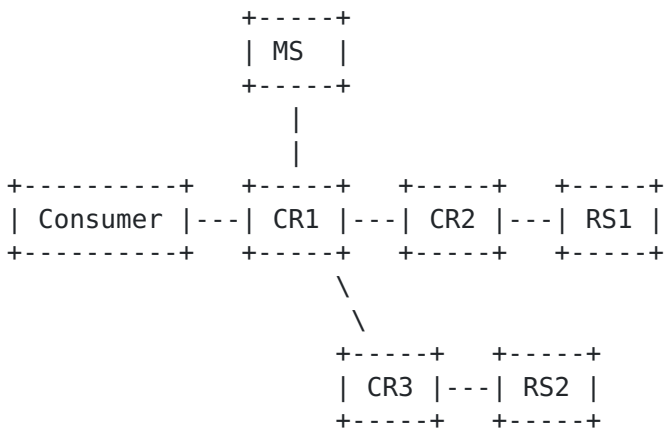

Figure 1: Replica server scenario

4. CCNx Extension for Name Resolution

We have implemented the NRS for CCN based on CCNx. This means that the name is resolved by Interest and Content Object packets defined in CCNx. We define two types of Interest packets for NRS: Interest for registration (I-reg) and Interest for lookup (I-get) which are sent from a proper CR to its default MS for name registration and lookup, respectively. We also define two types of Content Object (CO) packets: CO-reg and CO-get which are corresponding to the I-reg and I-get, respectively. We have utilized the nested header format used in CCNx [CCNxMessages] to enable the newly defined packets.

4.1. Interest

I-get is an Interest packet requesting the name resolution. It has the name of MS first where it needs to be sent.

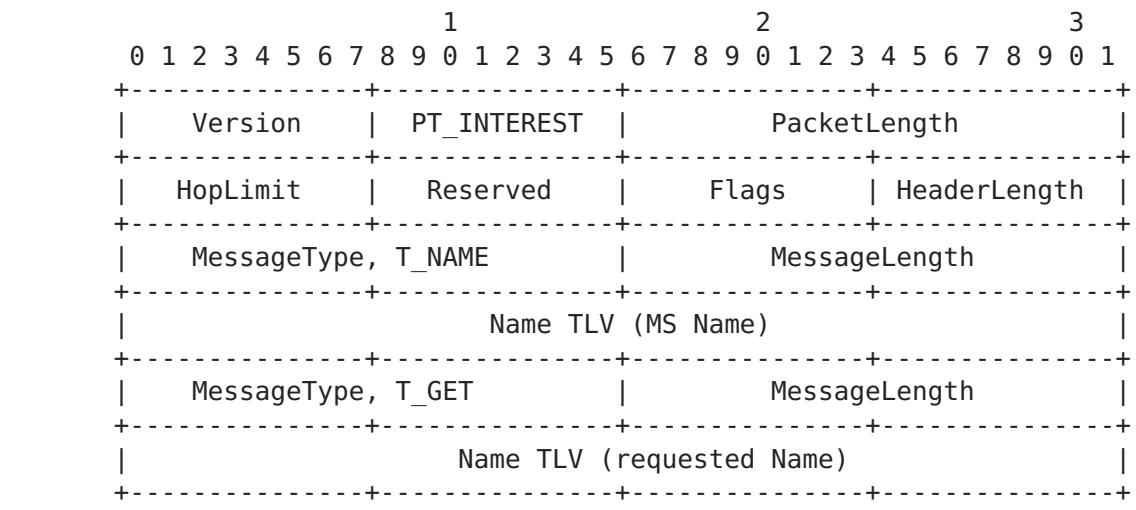

Figure 2: Interest packet format for name resolution request

[TBD]

4.2. Content Object

CO-get is a Content Object packet replying to the name resolution request, I-get.

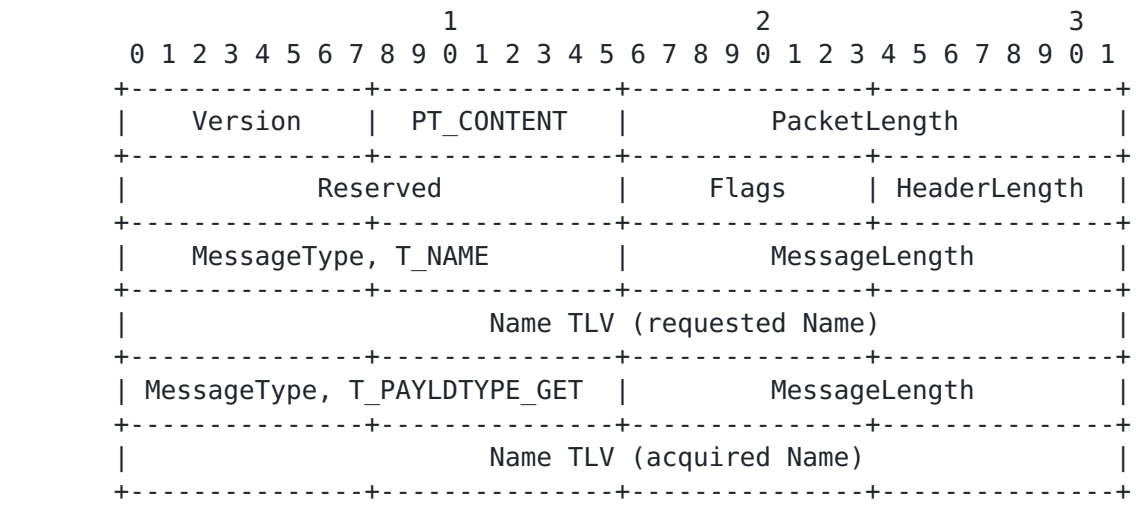

Figure 3: Content Object packet format for name resolution request

[TBD]

4.3. Forwarder

Forwarder has been modified to make the I-get and CO-get working properly. PIT is updated by the resolution requesting name.

[TBD]

5. CCNx Extension for Name Management

[TBD]

5.1. Interest

[TBD]

5.2. Content Object

[TBD]

5.3. Forwarder

[TBD]

6. IANA Considerations

There are no IANA considerations related to this document.

7. Security Considerations

[TBD]

8. Acknowledgements

[TBD]

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Authors' Addresses

Jungha Hong
ETRI
218 Gajeong-ro, Yuseung-Gu
Daejeon 34129
Korea

Phone: +82 42 860 0926
Email: jhong@etri.re.kr

Tae-Wan You
ETRI
218 Gajeong-ro, Yuseung-Gu
Daejeon 34129
Korea

Phone: +82 42 860 0642
Email: twyou@etri.re.kr

Yong-Geun Hong
ETRI
218 Gajeong-ro, Yuseung-Gu
Daejeon 34129
Korea

Phone: +82 42 860 6557
Email: yghong@etri.re.kr