Updated Requirements for NRS in ICN

ICNRG Interim meeting in Seoul

Jungha Hong

ETRI
In Berlin meeting

• Two presentations on NRS requirements
  – One by ETRI
    • Jungha Hong, Taewan You, Young-gun Hong
  – One by Huawei
    • Lijun Dong, Cedric Westphal, Ravi Ravindran, GQ Wang

• We are merging them into one document
Table of Contents

1. Introduction ................................................................. 43
2. Conventions and Terminology ........................................... 52
3. Motivation .................................................................. 53
   3.1. Name Resolution Service in ICN ................................. 53
   3.2. Handling Heterogeneous Names in ICN ...................... 54
   3.3. Handling Dynamism in ICN ......................................... 64
4. Requirements for NRS in ICN ............................................ 64
   4.1. Requirements on Operability ...................................... 75
      4.1.1. Scalability ....................................................... 75
      4.1.2. Low latency/Delay sensitivity ............................ 75
      4.1.3. Fast update/Time transiency .............................. 75
      4.1.4. Locality/Minimum inter-domain traffic .................. 75
      4.1.5. Fault tolerance ............................................... 75
      4.1.6. Resolution guarantee ....................................... 76
      4.1.7. Accuracy/Data integrity .................................... 76
      4.1.8. Heterogeneity .................................................. 76
      4.1.9. Unspecified content name ................................... 76
   4.2. Requirements on Manageability ................................. 86
      4.2.1. Manageability .................................................. 86
      4.2.2. Deployability ................................................. 86
      4.2.3. Interoperability .............................................. 86
      4.2.4. Support for manifest ....................................... 86
      4.2.5. Resolution result selection or multiple result support . 86
   4.3. Requirements on Security .......................................... 86
      4.3.1. Access control/Accessibility ............................... 86
      4.3.2. Authentication ............................................... 87
      4.3.3. Data confidentiality ........................................ 87
      4.3.4. Privacy ......................................................... 87
5. Use cases of NRS .......................................................... 94
   5.1. Flat Name Routing Support ..................................... 94
   5.2. Publisher Mobility Support ...................................... 94
   5.3. Scalable Routing Support ....................................... 94
   5.4. Nameless Objects Support ...................................... 94
Use cases of NRS

• Flat name routing support
  – PURSUIT, SAIL, MobilityFirst
• Publisher Mobility support
  – Various projects in literatures
• Scalable routing support
  – NDN's LINK
• Nameless Objects support
  – CCNx’s Manifest
Use case 1: Flat name routing support

- Hierarchical and flat namespaces in ICN
  - Hierarchical name
    - Similar structure to current URIs
    - The hierarchy is rooted in a publisher prefix and enables aggregation of routing information
      - Improves scalability of the routing system
  - Flat name
    - It is not human readable and has a scalability issues to name routing
    - Thus names need to different service
      - NRS is one of the service for flat name routing
      - NRS stores the bindings from object names to topology-based locators pointing to corresponding storage locations in the network
Use case 2 : Provider mobility support (1/2)

• Mobility in ICN
  – Consumer mobility
    • How to return requested data to a moving consumer
    • Supported naturally
      • Mobile consumer can always re-express interests after moving
  – Provider mobility
    • How to forward Interest towards the data created by a moving provider
    • More difficult to support since the name resolution system (in the coupled approach) or the routing tables (in the decoupled approach) need to be updated
      • Even more difficult in CCN/NDN due to the hierarchical name
Use case 2: Provider mobility support (2/2)

• Solutions [ICNRG interim meeting, January 2016]
  – NDN
    • Design rendezvous mechanisms for interests to meet data generated by the moving provider
  – Forwarding-label draft in CCN
    • Proposed based separation between ID and Locator Names
      • The Mobility Service Controller (MSC) controls the Forwarding-Label Cache Table (FLT)
        • Caches the mapping between the name to the locator
Use case 3 : Scalable routing support

• Map-and-Encap system for NDN routing [TR, 2015]
  – Routing scalability issue in the DFZ of a NDN network
    • If a data producer’s prefix is not in the DFZ forwarding table, it needs to establish an association between its own name prefix (e.g., “/net/ndnsim”) and the globally routed prefixes of its Internet service providers (e.g., “/telia/terabits” and “/ucla/cs”) \(\rightarrow\) LINK lookup by NDNS (DNS for NDN)
Use case 4: Nameless Objects support

• Nameless objects in CCNx
  – Content Object without a name may be retrieved by an Interest with any name and a hash restriction
    • The name in the Interest could identify a location or an object
    • A specified method is needed for distributing those locator names to find nameless objects
      • Using NRS is a one way
      • Using the current manifest proposal, a consumer receives a manifest with the ContentObjectHashIDs and their respective locator information

2016-11-13
Questions?