

Shaping a New Architecture by Architectural Principles

Alex Afanasyev

UCLA

ICNRG Interim Meeting

Yokohama, Japan, November 1, 2015

A Number of Ongoing Discussion Topics on Mailing List

- ◇ Important questions, seemingly confusing concepts
 - ID-locator separation
 - ~~routing is location~~
- ◇ To get right answers: Start from first principle
- ◇ **ICN: proposed as a new networking architecture**
 - **Must be a general one, to serve all future applications**

ICN as a New Architecture

- ◇ Must not only consider static content
 - At the time of IP design, had we tailed it only to support email, IP would not succeeded
- ◇ Must not only for infrastructure-supported environment
- ◇ Must be clear what is architecture, and what is engineering solutions for performance optimization
 - Those engineering solutions are not part of the architecture
 - ▷ e.g. LINKs, manifest

ICN and “ID-Locator Separation”

- ◇ IP: packets can only name communication endpoints
 - Since IP cannot identify other things that people want to talk about, hence “ID-locator separation”
- ◇ NDN: “The name in an NDN packet can name anything – an endpoint, a data chunk in a movie or a book, a command to turn on some lights, etc.”
 - This generalization removes the notion of “ID-locator separation”

Routing Announcement and “Location”

- ◇ Whether a given name prefix is/not announced in routing protocol does not change it from “name” to “locator”
 - When a producer announces its prefix (cnn.com), does that make CNN a locator?

- ◇ A prefix in the RIB helps steer interests toward where data is likely to be found
 - An interest is looking for data, not location
 - As soon as it finds the data (perhaps from a router cache), it brings data back, without going to the location

Power of ICN Comes From Names

- ◇ Name as defined by application, provides:
 - Scope (e.g., /localhost)
 - Context
- ◇ Only data with name can define which scope it belongs
 - manifest as name hash lost scope.
- ◇ Only data with name can define its application context
 - which can be used to set up security and reason about it

Engineering Solutions (Not Part of ICN Architecture)

- ◇ LINK is an engineering solution to assist Interest forwarding if Interest name not in RIB
 - non-popular data on global scale
 - mobile upload
 - NOT needed for popular data
 - ▷ /google, /netflix, /hulu, ...
 - NOT needed in many specialized environments
 - ▷ vehicular networks, sensor networks, IoT
- ◇ Name mapping service (NDNS) is an engineering solution to assist LINK lookup to retrieve non-popular data on the global scale

ICN: Using Names to Fetch Data

- ◇ Naming in ICN ties together 3 basic things
 - Application uses it to identify data
 - Security uses it in security policies
 - Forwarding uses it to decide where to forward
- ◇ Our 5-year experience with NDN research shows that naming is one fundamental piece of ICN research
 - Exploit naming and naming conventions
 - ▷ To ease application development
 - ▷ To achieve goals that are otherwise difficult to achieve