NDN/CCN Harmonization: Identifying NDN/CCNx1.x Commonalties and Differences

A High-Level Discussion Summary

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2010: NSF funded Named Data Networking project

- PARC was part of the NDN team and received $1.8M
- Until Jacobson resigned in October 2012
Since then

♦ NDN team:
  ○ Jacobson continues leading NDN development
  ○ take application-driven architecture development direction: at the end of beginning now?

♦ PARC: simplifying implementation, optimizing performance

♦ Different goals → spec partied the way
CCNx 0.8 as common starting point

◊ binary XML format
◊ allow data fetching by prefix
◊ with Selectors support
◊ data packet carrying “FreshnessSecond”
  o relative time, not assuming sync’ed clock

◊ Packet Naming
  o Full name : “/foo/bar” + implicit digest
  o Exact name : “/foo/bar”, 0 components after
  o Prefix name : “/foo/*”, 0 or more components afterwards
PARC’s Protocol Changes

◊ Changed binary XML to fixed-header plus TLV
  ○ fixed header for end-to-end network layer with optional TLVs that can be added/modified HBH
  ○ followed by TLVs that describe ICN packet
    ● TLV with fixed length field

◊ Encoded Interest Selectors into name
  ○ implication on data naming

◊ Support data fetching with exact match between Interest and data packet names only
  ○ Assuming synchronized clocks among all routers
  ○ Changed CS semantics from fresh/stale Data packets (CS can keep stale) to alive/dead (CS must remove dead)

◊ Introduced heavy use of manifest
  ○ but nameless objects do have name (the hash)

◊ Intentionally use the same exact name for different data as the protocol needed

◊ Added HopLimit in Interest packets

◊ Removed Nonce from Interest packets
NDN’s progress

◇ Trying out the architecture by developing a wide range of apps
  ○ exploring new design patterns
  ○ fill in missing pieces (e.g. gaining further understanding of naming conventions)
  ○ identify new issues and develop solutions

◇ single out security effort: a great challenge, with great progress made

◇ intentionally did not emphasize optimization
  ○ NFD Guideline: “emphasize modularity over performance, to enable others to experiment with the new architecture by adding new modules or modify existing ones”
Protocol changes

◊ WashU early work showed Exact name match between Interest-Data, with what we know today, enables significant performance gain (INFOCOM 2014 paper)

● NDN team decided staying with fetching data by prefix, WashU developed new solutions