Community Information-Centric Networking
Open Source Project
Linux Foundation/Fast Data IO/CICN

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26th of March 2017 – ICNRG - Chicago
Cisco actions to push ICN adoption

- PARC’s CCN acquisition
- CICN Open Source Project
- Hybdrid ICN
Cisco CCN acquisition: what changes?

- For IRTF and IETF if a WG is created
  - IPR clauses on CCN drafts has changed,
  - Under reasonable and non-discriminatory terms, with reciprocity, to implement and fully comply with the standard,

- Which means:
  - **RAND**: If standard is adopted Cisco will not assert any patents [...] against any party for making, using, selling, importing or offering for sale a product that implements the standard,
  - **Reciprocity**: Cisco retains the right to assert its patents against any party that asserts a patent it owns or controls [...] against Cisco in any IETF standard.
Adoption of ICN: roadmap

- Move forward with current draft towards experimental RFCs
- A starting point to involve other partners
- Do work!
- Improve the current draft and, with consensus, plan IETF WG
fd.io Intro
Introducing Fast Data: fd.io

• New project in Linux Foundation
  • Multi-party
  • Multi-project

• What does multi-party mean?
  • Multiple members - Open to all

• What does multi-project mean?
  • Multiple subprojects
  • Subproject autonomy
  • Cross project synergy
  • Open to new subprojects
  • Anyone can propose a subproject
  • Allows for innovation

fd.io Charter

Create a Platform that enables Data Plane Services that are:
  • Highly performant
  • Modular and extensible
  • Open source
  • Interoperable
  • Multi-Vendor

Platform fosters innovation and synergistic interoperability between Data Plane Services

Source of Continuous Integration resources for Data Plane services based on the Consortium’s project/subprojects
Community Information-Centric Networking (CICN)

- Several software components
  - VPP ICN forwarder
  - Socket based forwarder
  - ICN socket API
  - HTTP server
  - DASH video player
  - vICN for container based network deployment and orchestration
- Software is distributed under Apache 2.0 license
Packet processing in the Linux Kernel

- Packet processing in the Kernel is not efficient
  - Packets are processed one by one
  - Upstream new protocol takes long time
- User space networking projects are flourishing:
  - DPDK, Netmap, Open Fast Path others
- ICN plugin takes advantage of this framework
CICN module for VPP

- Written in C
- A run time loadable module
- Core design based on D. Oran at al. ACM/IEEE ANCS 2013
- Adjacency based on 5-tuple (ip-src-dst, udp, port-src-dst)
- Almost 1Mpps per core (5Gbps)
- Can use DPDK driver
- Can use AF-PACKET driver
Metis: socket based forwarder

- Written in C99
- Based on PARC’smetisforwarder
- Reference forwarder for end devices (Android, iOS, MacOS, Windows, Linux)
- Throughput at 300Mbps
- Can interconnect to VPP using AF-PACKET or a VPP bridge
ICN socket API (libicnet)

- Written C++11
- Provide a socket api for applications
- Consumer – Producer API
- L4 manifest,
- Segmentation and Reassembly
- Reliable
- Interest Flow control
- Congestion control
- Remote Adaptive Active Queue Management

Transport based on
Carofiglio et al. IEEE ICNP 2013
API based on
Moiseenko et al ACM ICN 2015
HTTP server

- Written in C++11
- One thread per HTTP request/reply
- It uses the ICN Socket API and TCP
- It implements the HTTP GET method
- HTTP POST method soon
VIPER: Video PlaER

- written in C++ with a QML frontend
- DASH compatible (uses libdash)
- Several rate adaptation: adaptec, bola, panda, and others
- Use ICNET or TCP
- Support Android, MacOS, Linux and iOS ongoing
Hybrid ICN in short
Deploying ICN into IP
hICN forwarding

- Put resource name in IPv6 addresses header fields
- data name as concatenation of L3 resource name and L4 segmentation names
- Define an Interest IP packet and a Named Data IP packet
- For some nodes introduce an IP packet cache
  - Implement an interest/data cache (PIT/CS)
  - Routing symmetry partially guaranteed
    - An hICN router guarantees local flow balance on an egress interface
    - An IP router does not
**hICN transport**

- ICNET socket API using TCP encapsulation
- Consumer Producer Socket API taken from ICN
- hICN enabled in clients as a VPN service
- ICNET socket in the server side as transport in user space
- PoC under development and testing at Cisco and partners