Anchorless Mobility Management through Hybrid Information Centric Networking (hICN-AMM)

draft-auge-dmm-hicn-mobility-00

draft-auge-dmm-hicn-mobility-deployment-options-00

IETF 102 Montreal

July 15-20, 2018

J. Augé, G. Carofiglio, L. Muscariello, M. Papalini

Rationale for ID-native routing

- Forwarding typically based on locators & mobility added on top (M-IP, GTP)

- Loc/ID separation has been proven to simplify mobility management
  - still it requires a (distributed) mapping system for Loc/ID binding
  - challenging to operate at scale : latency, cache consistency, etc. [Evolving5GRouting]

- Move Loc/ID one step further...
  - remove ID-Loc mapping by forwarding directly using IDs
  - native ID-oriented routing suggested in [draft-vonhugo-5gandip-ip-issues-03]
  - no data plane anchors, no control plane anchor

- ... by applying ICN principles
  - Hybrid ICN (hICN) = ICN within IPv6 [draft-muscariello-intarea-hicn-00]

[Evolving5GRouting] https://www.ietf.org/mail-archive/web/ila/current/pdfsTy2hnL69I.pdf

Overview of Hybrid ICN (hICN)

- hICN = ICN within IPv6 (all ICN features, names into IPv6 addresses)
  - Transparent integration within IP network
  - Insertion via a few selected nodes

- A request/reply communication paradigm
  - Requests are forwarded by name (ID) using FIBs
  - Replies are forwarded on the reverse path using state left by requests (label swapping) see [draft-muscariello-intarea-hicn-00]

- Mobility of consumers is natively supported
  - Simply reissue pending requests (support from packet caches)

- The draft describes how producer mobility is supported
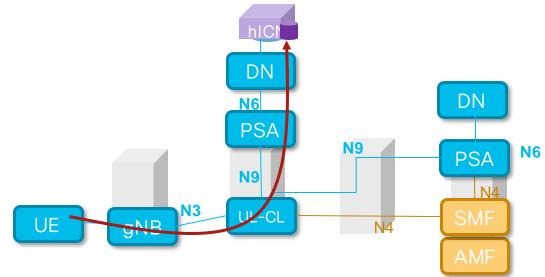 - See [draft-auge-dmm-hicn-mobility-00]

Ensuring connectivity via data plane mechanisms[*]

- Use distributed forwarding updates to manage mobility
  - MAP-Me protocol [draft-irtf-icnrg-mapme]
  - Repair path to producer through data plane mechanisms (previously proposed to handle link failures)
  - Lightweight FIB update process
  - Both forward **and mobility** management are purely ID/name-based

- No interaction with control plane
  - No mapping to contact or update, no new node to deploy and provision
  - No caching staleness / latency tradeoff

- Fully anchorless, mobility handled at L3 (HetNet)
  - Pointers to analysis of scaling, flow performance, offloading capabilities
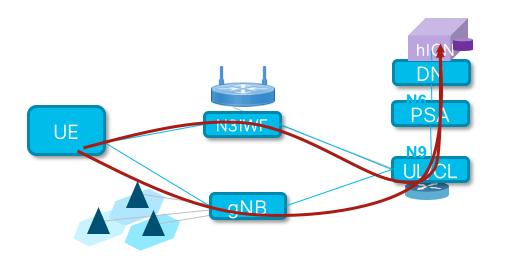 - Optimizations for latency-sensitive traffic

* [Liu2013] Liu, Junda, et al. "Ensuring Connectivity via Data Plane Mechanisms." NSDI'13.

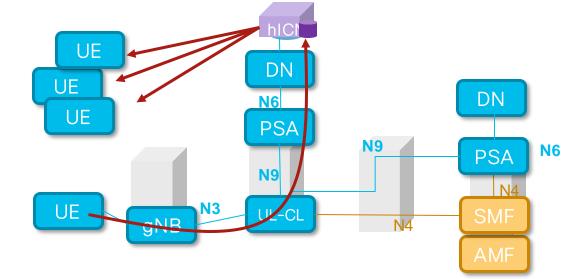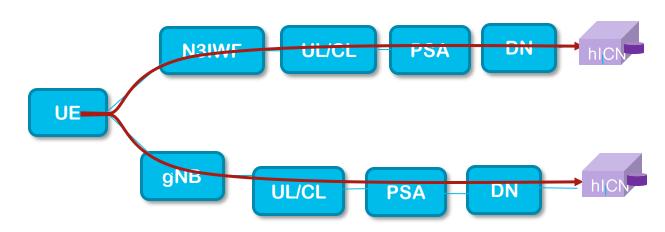# Benefits of hICN deployment (MEC deployment)

Edge caching : Low latency

Edge caching : Multicast delivery

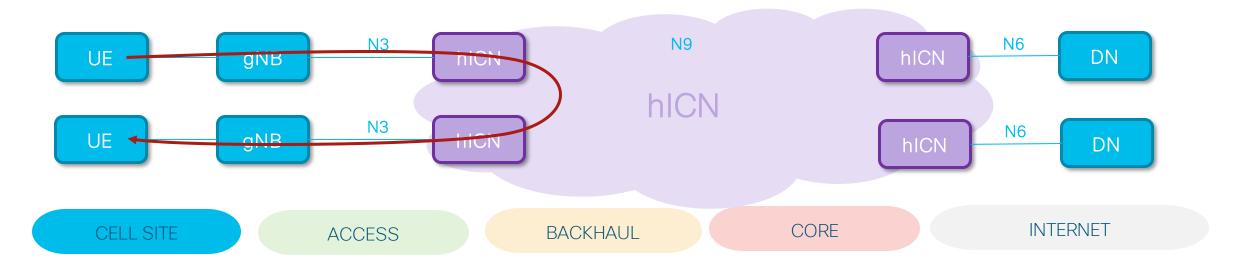## Seamless mobility across HetNet

Bandwidth aggregation - Multi-source

Benefits of N9 replacement

- Anchorless mobility & Offloading of local communications
  - Resulting from ID-based forwarding & mobility
  - No traffic towards the core
- Dynamic UPF selection

Benefits & deployment trade-offs

From hICN transport

- Edge caching : low-latency, multicast
- Seamless mobility across HetNet
- Bandwidth aggregation
- Multihoming / multisource / multipath

In 5G: integration in MEC / UPFs

- Partial hICN insertion strategy
  - few selected nodes at edge
  - use SRv6 data plane for increasing reach
- Requires hICN in endpoints
  - userspace agent / brower plugin
  - or proxies

From ID/name-based forwarding

- Anchorless mobility
- Offloading D2D communications
- Dynamic hop-by-hop forwarding policies
- Localized mobility (disaster recovery)

In 5G: N9 replacement (+N3)

- Non-hICN traffic also benefits from anchorless mobility

[draft-auge-dmm-hicn-mobility-deployment-options-00]

Conclusion

- New forwarding and mobility paradigm purely based on ID

- Build on Hybrid ICN: an incremental deployment within IPv6
  - Consumer mobility is native and comes at no cost
  - Producer mobility through lightweight, ID-based, data plane updates

- Benefits from ID-native & hICN mechanisms
  - Several deployment strategies and trade-off analyzed in draft
  - 3GPP 5G perspective

- A general purpose forwarding & mobility architecture
  - Anchorless; Support from HetNet
  - Opportunities to insert hICN transport (userspace networking, TAPS, etc)

Overview of Internet drafts

Submitted drafts:

`draft-auge-dmm-hicn-mobility-00`

- New mobility management paradigm based on (h)ICN

- Benefits of ID-native routing + hICN transport

- In particular Anchorless Mobility / HetNet support

`draft-auge-dmm-hicn-mobility-deployment-options-00`

- Options & tradeoffs for deployment in 3GPP 5G architecture

+ Contributions to:

`draft-bogineni-dmm-optimized-mobile-user-plane-01`