

# Deployment Configurations for ICN

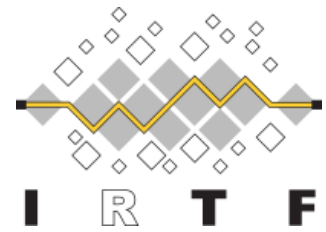
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IETF-98 (Chicago), March 2017



<https://tools.ietf.org/html/draft-rahman-icnrg-deployment-guidelines-00>

# Introduction



- ICNRG charter identifies deployment guidelines as an important topic area for the ICN community
- Specifically, the charter states that defining concrete migration paths for ICN deployments which avoid forklift upgrades, and defining practical ICN interworking configurations with the existing Internet paradigm, are key topic areas that require further investigation.
- However, not much progress thus far on this topic

# Definition



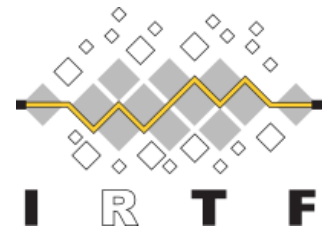
- Deployment - In the context of this document, deployment refers to the final stage of the process of setting up an ICN network that is:
  - 1) Integrated and interoperable with the rest of the Internet
  - 2) Ready for useful work (e.g. transmission of end user video and text) in a live environment

# Deployment Configurations (1/3)



1. Wholesale Replacement
  - “Clean-slate” approach where existing IP infrastructure (e.g. routers, services) is replaced
2. ICN-as-an-Overlay
  - Also referred to as “tunneling” approach
  - Support ICN over existing IP infrastructure, e.g.:
    - ICN-over-UDP
    - ICN names mapped to IPv6 addresses
    - Convergence layer to map ICN semantics to HTTP

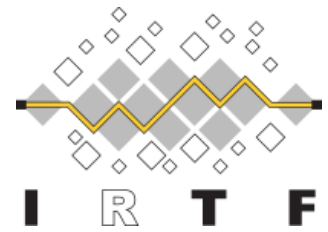
# Deployment Configurations (2/3)



## 3. ICN-as-an-Underlay

- Support ICN infrastructure islands (at the far edge or the core) that integrate with existing IP-based services and infrastructure through Network Attachment Points (NAPs)
- Protocol mapping at ingress/egress NAPs of, e.g.,
  - Edge HTTP/CoAP/IP onto core ICN messages
  - Edge ICN messages onto core HTTP/CoAP/IP messages
- Allows backward-compatible introduction of ICN infrastructure while reaping ICN benefits of multicast delivery, fast indirection, etc.

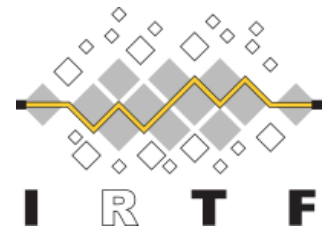
# Deployment Configurations (3/3)



## 4. ICN-as-a-slice

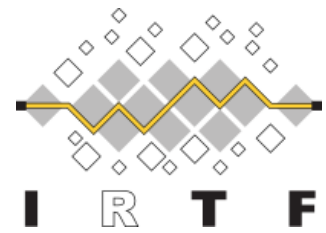
- With the introduction of network slicing (e.g. 5G), the deployment of ICN within such an virtualized network slice becomes a viable option
- ICN functions could be deployed as virtual functions as part of a service chain

# Deployment Migration Paths (1/2)



1. Application and service migration
  - ICN-as-an-Underlay provides backward compatibility
  - ICN-as-an-Overlay and ICN-as-a-Slice requires new interfaces but will allow more innovation in future
2. Content Delivery Network migration
  - ICN-as-an-Underlay provides a migration path

# Deployment Migration Paths (2/2)



## 3. Edge Network Migration

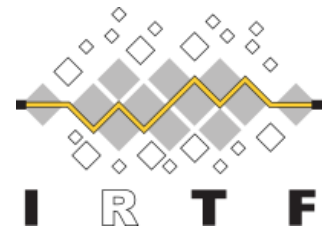
- ICN-as-an-Underlay provides a migration path through evolved gateways as commonly used in IoT networks
- ICN-as-a-Slice provides a migration path for 5G Radio Access Networks (RANs)

## 4. Core Network Migration

- ICN-as-a-Slice provides a migration path for 5G Core Networks (CN)
- ICN-as-an-Underlay provides a migration path on top of SDN

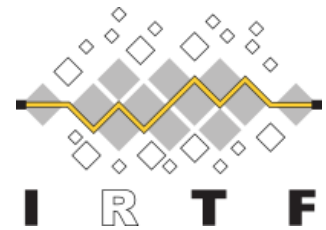


# Public Trial/Experiments Summary



- ICN-as-an-Overlay (tunneling over IP) configuration:
  - FP7 PURSUIT
  - FP7 SAIL
  - NDN Testbed
- ICN-as-an-Underlay (in discrete infrastructure islands) configuration:
  - H2020 POINT/RIFE
  - H2020 FLAME
  - CableLabs Content Delivery system
- Note: Not focusing on simulations in this summary

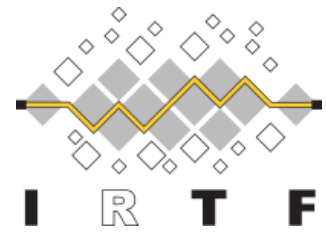
# Initial Ideas for Standardization



| ICN Protocol Gaps        | Potential IETF Group   |
|--------------------------|--|
| 1-Support of REST APIs   | HTTPBIS and CORE WG<br>(HTTP/CoAP support of ICN semantics)  |
| 2-Naming                 | New BoF/WG<br>(Dynamic naming of ICN data objects)   |
| 3-Multicast distribution | BIER or new BoF/WG<br>(Multicast enhancements for ICN)   |
| 4-In-network caching     | New BoF/WG<br>(Cache placement and sharing)  |
| 5-NFV/SDN Support        | SFC or New BoF/WG<br>(Integration of ICN with NFV/SDN)   |
| 6-ICN mapping            | New BoF/WG<br>(Mapping of HTTP and other protocols onto ICN message exchanges while preserving ICN message security) |

Table 1: Mapping of ICN Protocol Gaps to Potential IETF Groups

# Next Steps



- We are soliciting feedback from RG on any other public ICN trials/experiments that we can reference (i.e. for Section 5 – Deployment Trial Experiences)
  - E.g. CCN experiences
- Does the RG think the draft is useful?
  - We believe it addresses the charter objectives
- Any other feedback?