# Native Deployment of ICN in 4G/LTE Mobile Networks

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https://tools.ietf.org/html/draft-suthar-icnrg-icn-lte-4g-02
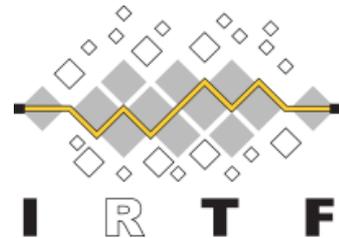
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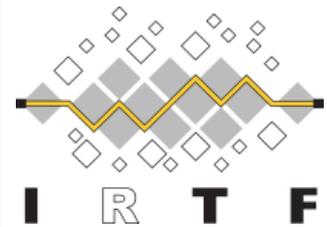
Objectives: Provide ICN deployment scenarios for 4G/LTE mobile networks

Because current research/projects covers

- ICN as an overlay (assuming consumer is attached to the network with IP address and requesting data using ICN messages).

- ICN scenarios to date are either in fixed wireline or WiFi network without involving cellular network.

- Majority of video content consumed by mobile devices and cellular mobile network have different characteristics

Version 0: March 2017 (initial draft at IETF-98)
Version 1: May 2017 (Feedback from IETF-98)
Version 2: June 2017 (Additional in-depth review and feedback at IETF-99)

ICN Deployment Options in UE - Dual Stack or Native

Applications (existing)

Transport Selector (new)

Select the transport (e.g. ICN or IP) and radio interface (e.g. LTE, WiFi or both), preference (e.g. content location, content type, content publisher, congestion, cost, QoS etc.)

ICN Function (new)

IP Function (existing)

ICN forwarder (co-exists with IP) for ICN packets, e.g. Interest packet to eNodeB or response "data packet" from eNodeB to the application

(native)

(overlay)

PDCP (updated to support ICN)

PDCP modified to support ICN for RLC (sequencing, drop detection, retransmission), ROHC header compression, ciphering/ deciphering

RLC (existing)

MAC Layer (existing)

Physical Layer (existing)

ICN Deployment in Base Station
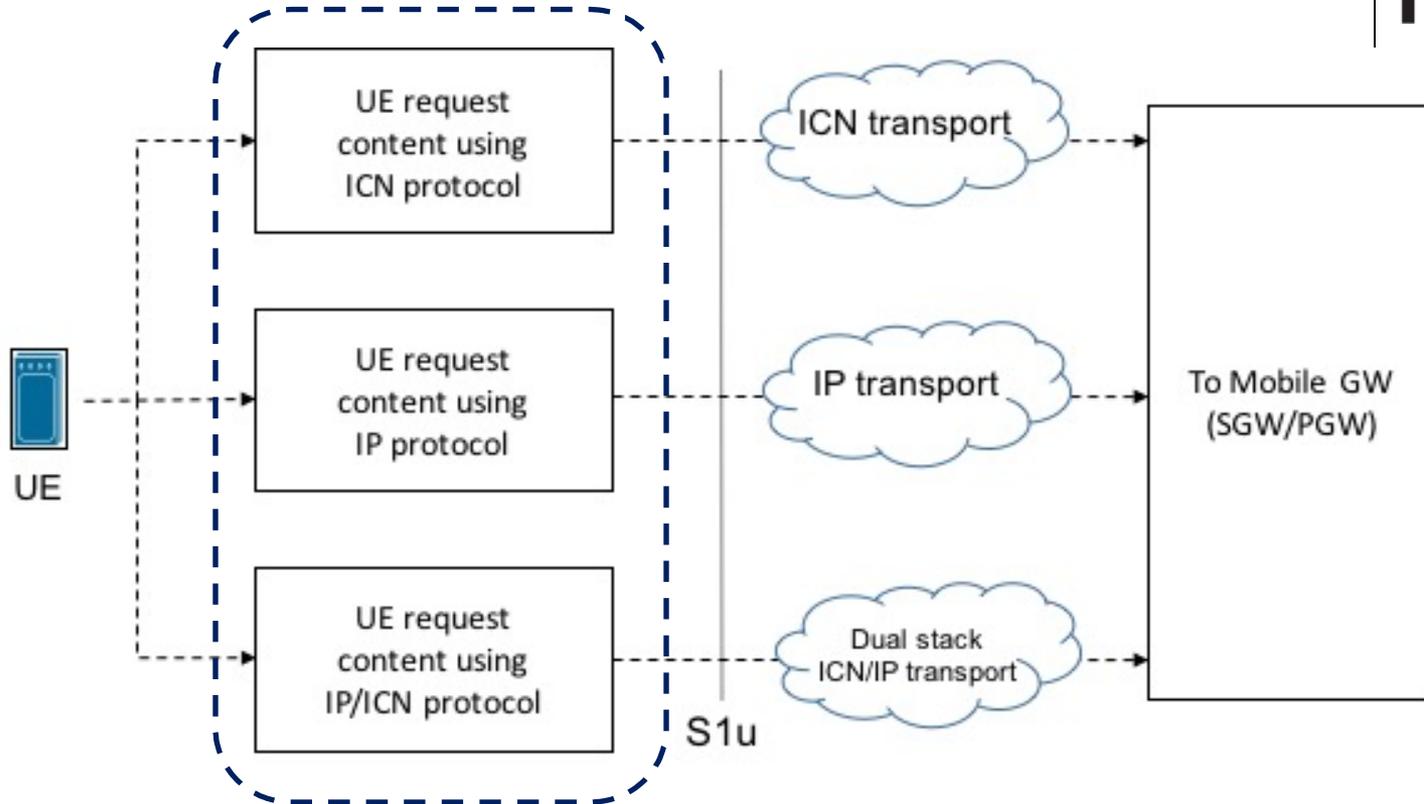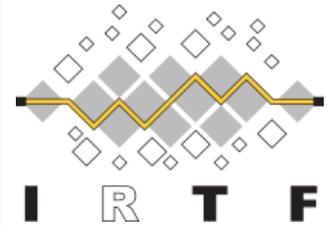
eNodeB (ICN forwarder)

- UE preference and transport availability (IP, dual stack, native ICN)
- Application Programming Interface (API) from management systems

ICN Deployment in Transport
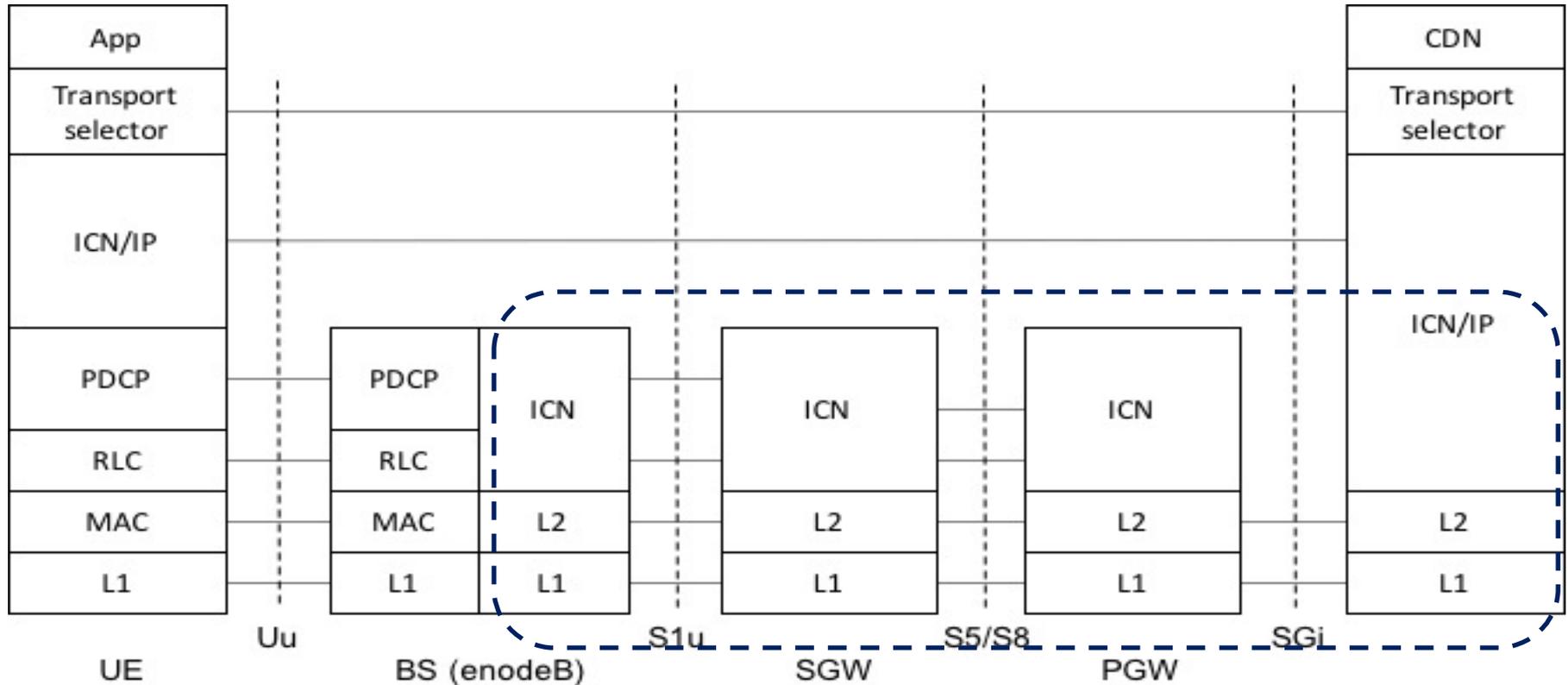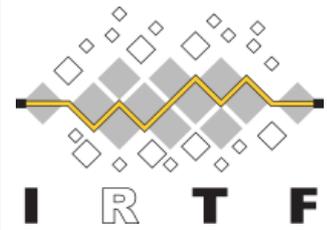
Routers and Mobile Gateways (ICN forwarders)

- Removing GTP tunnel with native ICN
- Forwarding strategy and transport availability (IP, dual stack, native ICN)
- Application Programming Interface (API) from management systems

ICN Security Considerations
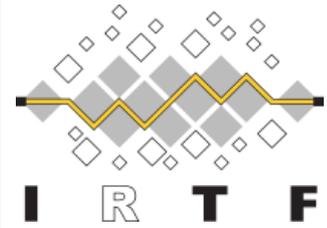
7 Key security domains

1. UE authentication and authorization
2. Radio or air interface security
3. Denial of service attacks on mobile gateway, services

Existing/revised security spec TS33.310, TS33.320

4. Content positioning either in transport or servers
5. Content cache pollution attacks
6. Secure naming, routing, and forwarding

ICN research/drafts

7. Application security

Further research is underway Security related encrypted content, mobile gateway capabilities for deep packet inspection (DPI), lawful intercept (LI), etc.
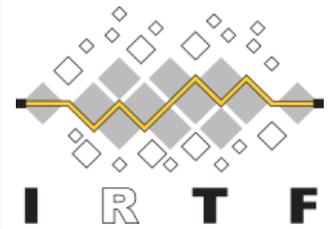
Next steps

1. Additional input and ICNRG/IETF community Collaborations

2. Adopting as ICNRG working draft

For additional collaborations contact psuthar@cisco.com

BACKUP

# Deploying ICN in Mobile Gateway - Modified Attach Procedures
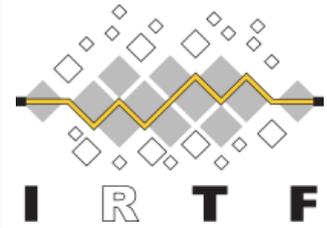
3GPP TS 23.401 V13.6.1 (2016-03) section 5.3.2.1 covers attach procedure. This require modification is step 12 to 22 (because of additional parameters ICN capability is populated in PCO IE TLV. Modified steps will support enhanced capabilities in PGW to support ICN attach in addition to normal IP attach procedures.

1. UE sends initial attach request. ICN capable device will send PCO IE field populated (Details provided in previous section) with ICN capability

2. BS (eNB) will forward attach request to MME. NAS signaling (step 3 to 6) will be performed to authenticate the UE. There is no modification for steps 7 to 11.

12. When attach request is successful, PGW/GGSN assigns identity to UE and creates session using PDN types. Type of attach is communicated to UE in step-16.

16. For UE requesting attach using PDN Type=IP, PGW will assign either IPv4 or IPv6 (Link local) in create session response (CSR). For PDN type = ICN, PGW will register UE with named identity. This will be used for creation of session and all context related function (billing, mediation, enhanced charring function/deep packet inspection, lawful intercept etc.) in function.
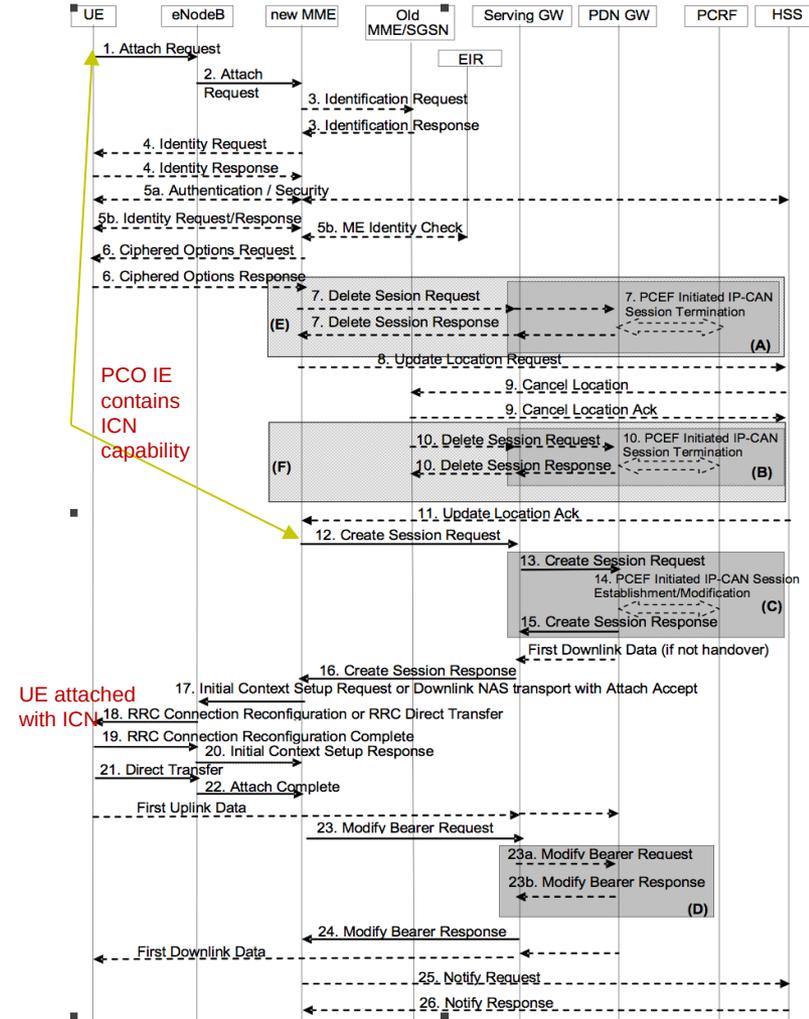
LTE Network Architecture – ICN User Plane Impact
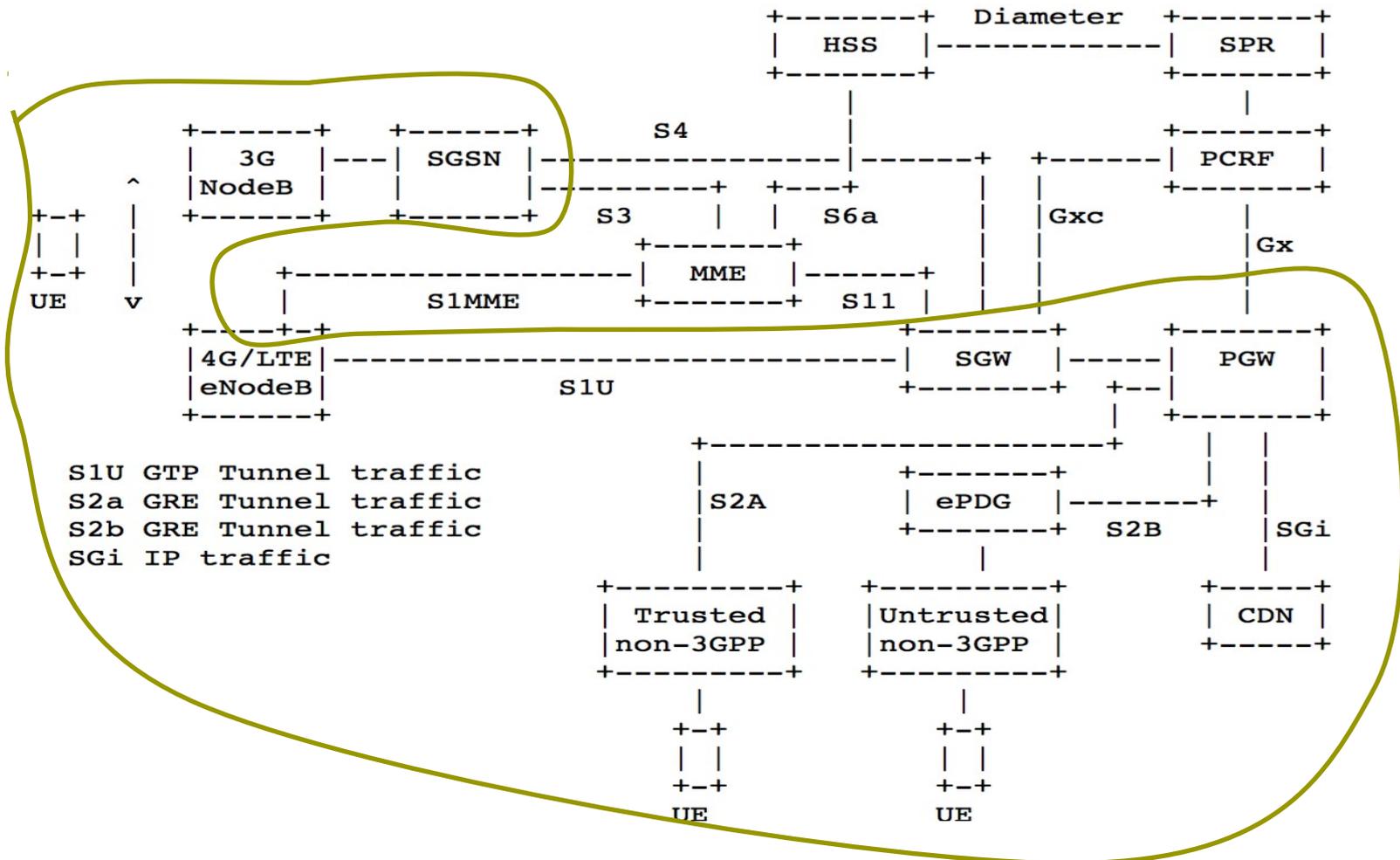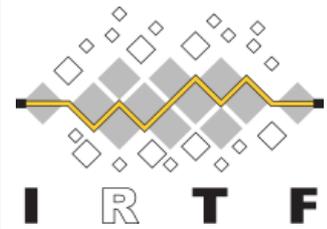
LTE Signaling Messages
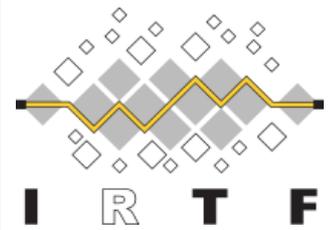
NAS Event Type	MME	HSS	SGW	PGW	PCRF
Attach	10	2	3	2	1
Additional default bearer	4	0	3	2	1
Dedicated bearer	2	0	2	2	1
Idle-to-connect transition	3	0	1	0	0
Connect-to-idle	3	0	1	0	0
X2-based handover	2	0	1	0	0
S1-based handover	8	0	3	0	0
Tracking area update	2	0	0	0	0
Total	34	2	14	6	3