Agenda

LTE Data Roaming

Role of IPX as defined by i3forum

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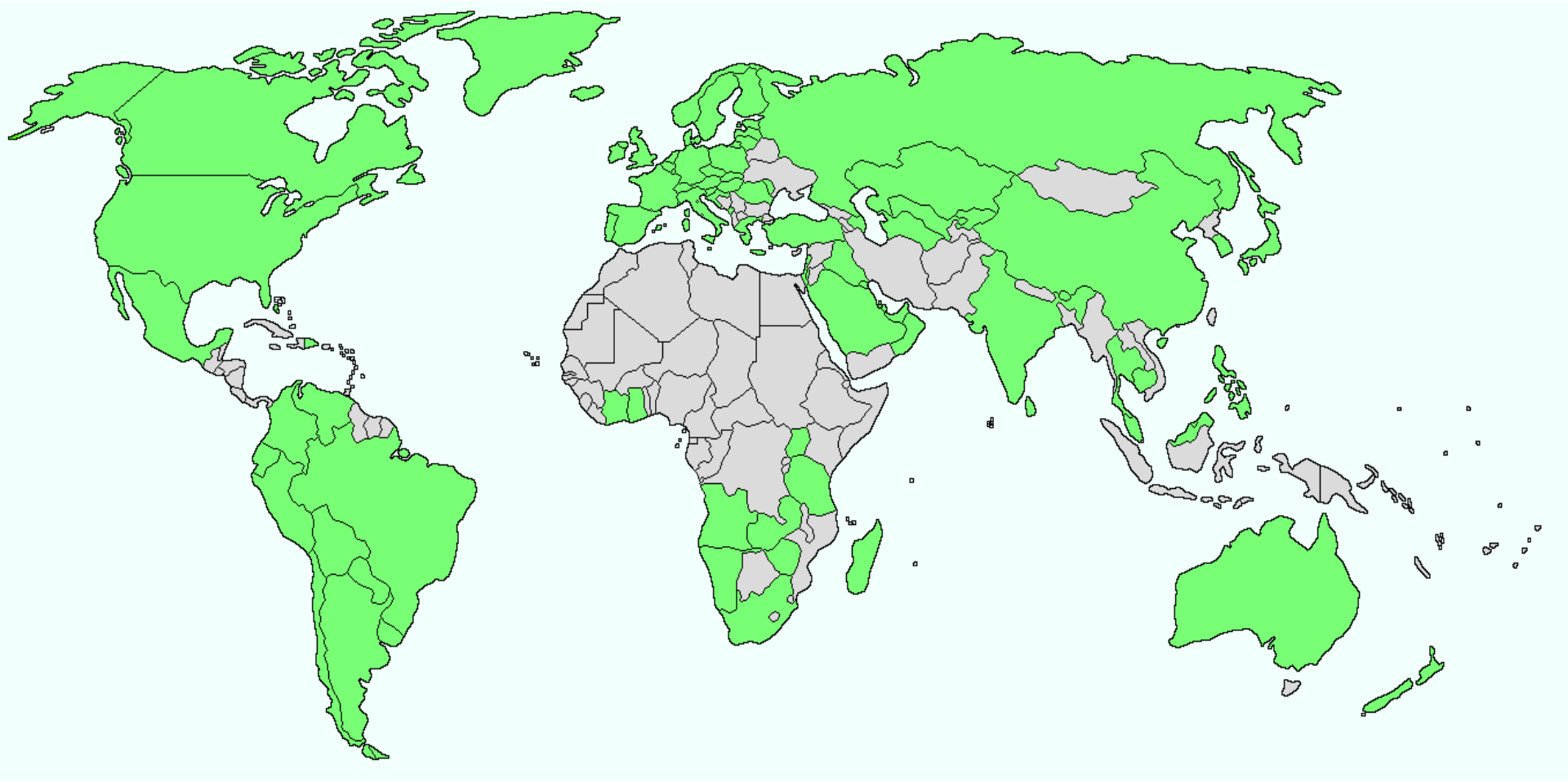
Disclaimer…

- I3 Forum is NOT a standards body.
- It relies on GSMA, 3GPP, IETF and other standards body for specifications.
- Its sole purpose is to help carriers and operators deploy various communication services in a most reliable fashion.
- It puts a “Common” language on paper for carriers to reference for interconnections using best practices.

LTE deployment today…more than 200 networks LIVE!!!



Example Carriers supporting LTE data roaming

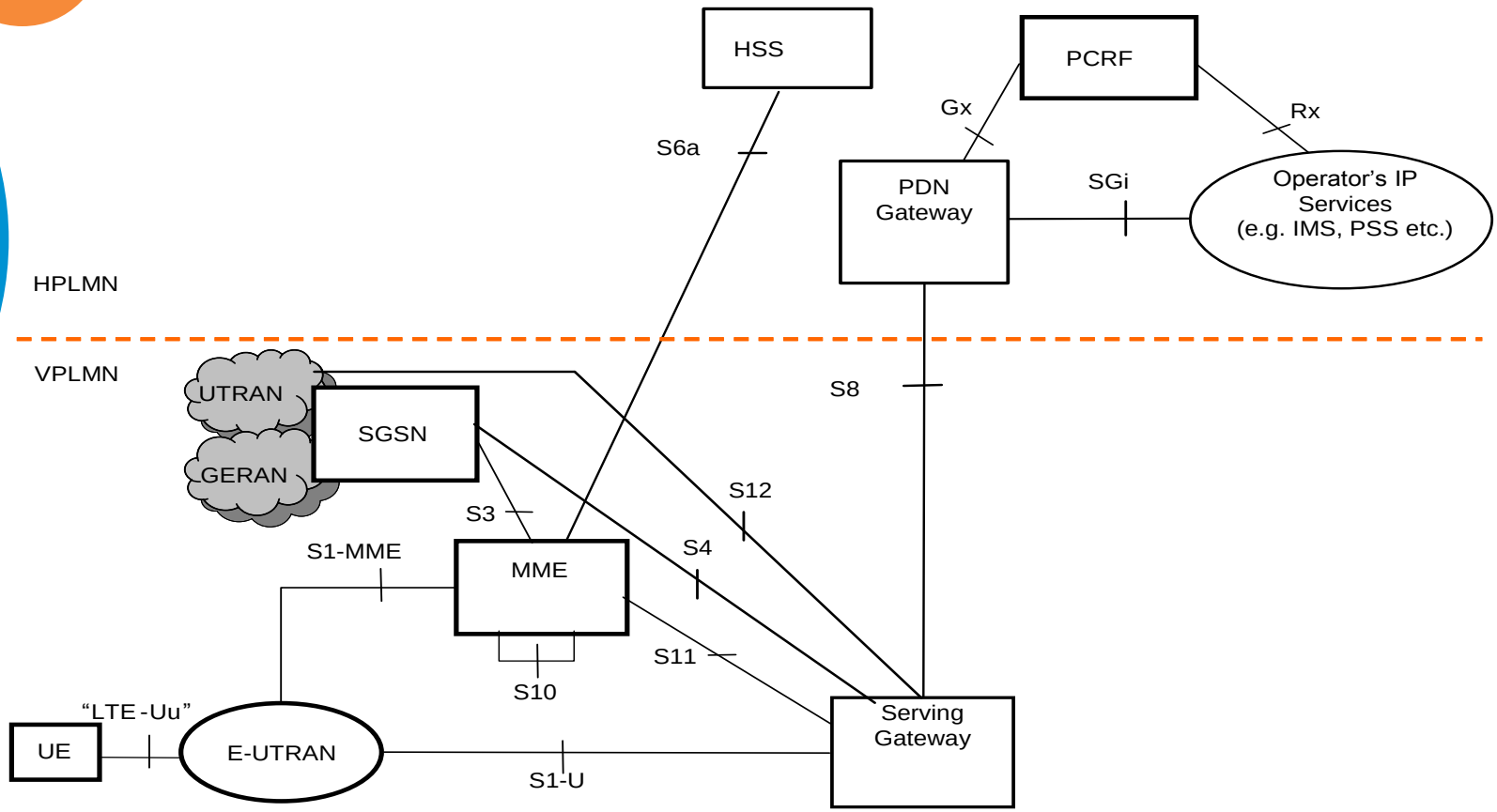
- iBasis
- BICS
- Aicent
- Tata
- TI Sparkle
- Etc.…

How does LTE data roaming work?

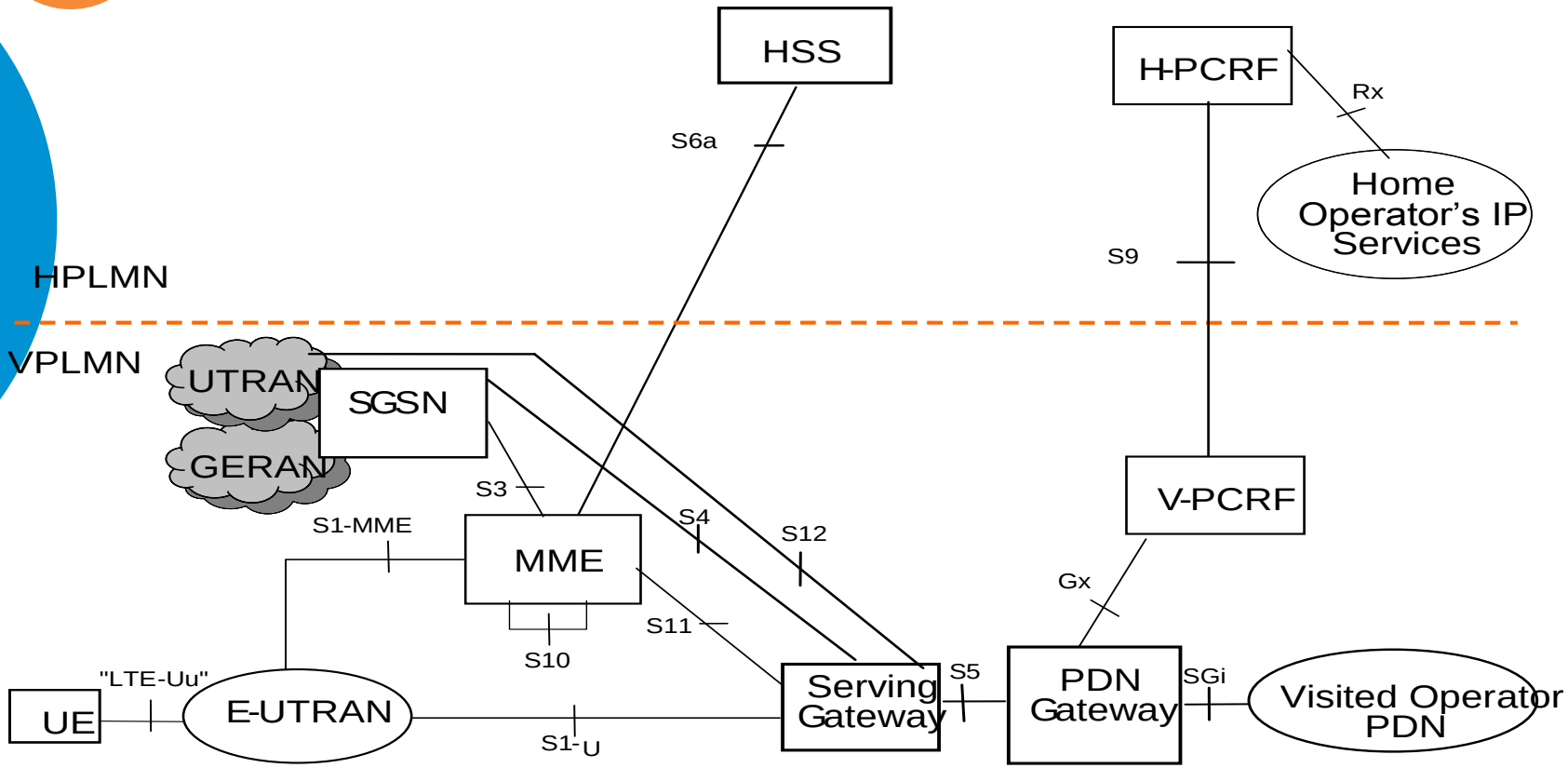
LTE data roaming reference model: S8/S6a/S9 Interface

- Home Routing
  - Home network provides packet data services
  - Home controls the policy and charging.
- Local Breakout
  - Visiting network provides packet data network access.
  - Policy control happens via S9 interface between HPCRF and VPCRF
  - Charging potentially done via a Gy interface between VPCEF and Online Charging system in HPMN.
- S6a interface does diameter routing for all user authentication and network attachment procedures.

Reference Architecture Home Routing: *Widely deployed*



Reference Architecture
Local Breakout



Why is IPX important for LTE data roaming?

Let's answer WHY

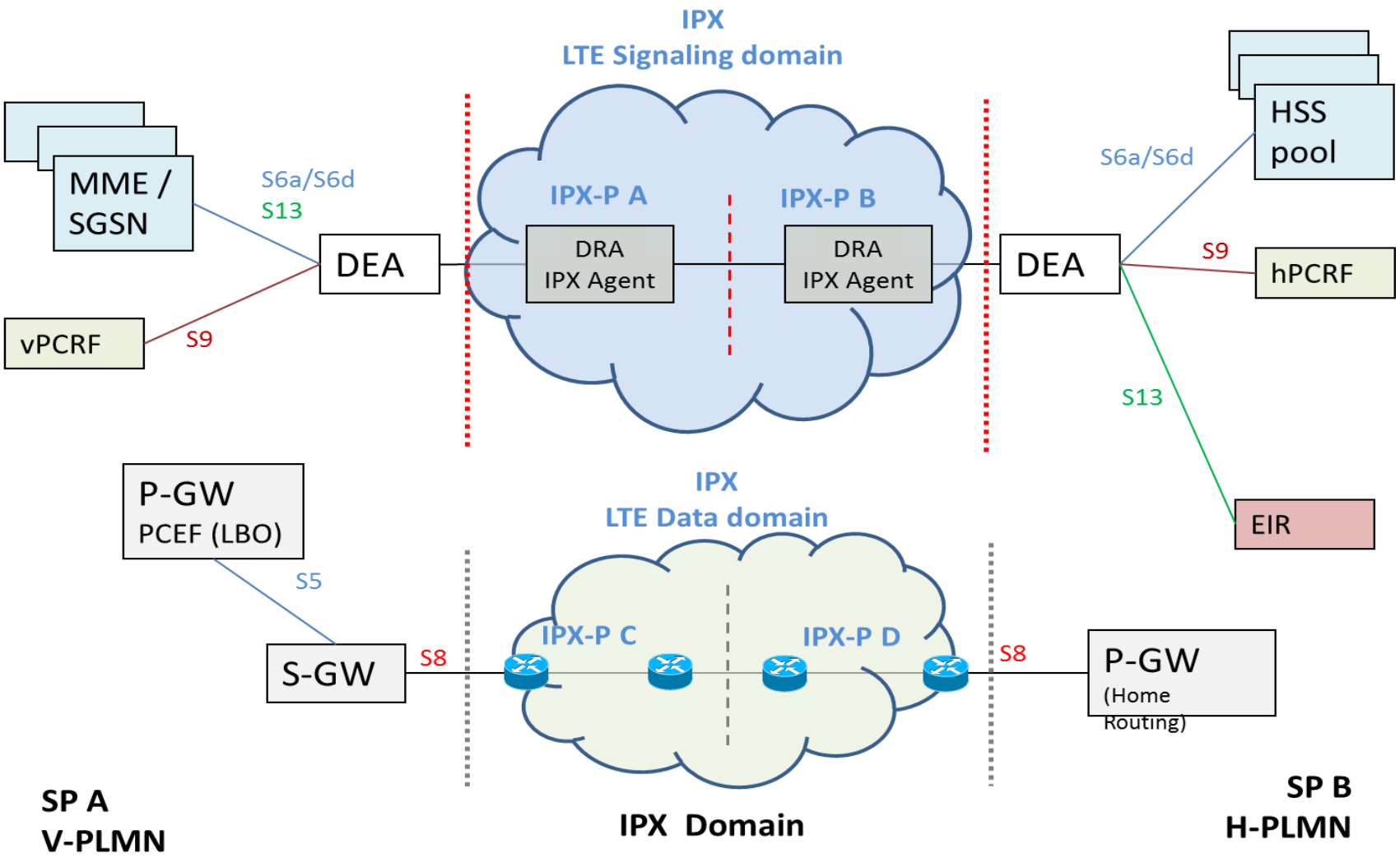
- Ability to provide global reach for an operator via a single connection.
  - Avoids having an operator to maintain interconnections to every other operator.
  - Similar to GRX model today.
  - One stop solution.
  - Either direct connection or via another IPX provider
    - 2 hop rule is not really mandated today
- Provides a reliable, secure and QoS enabled network for roaming services.
  - QoS by service type via packet marking. (different VLANs for signaling Vs data plane)
  - Not routable on the public internet.
  - Multi-homed SCTP connections.
  - Geographical redundancy.
  - KPIs for signaling services.

Continued..

- Ability to provide different charging models for signaling as well as data transport.
  - Multilateral hubbing model
  - Bilateral model.
- Ability to provide various functions in signaling space
  - DRA or DEA (hosting) functionality
  - Diameter signaling interworking between different vendor implementations.
  - Provide 3G/4G interworking to bridge both worlds.

Let’s look a little deeper

Typical IPX framework



Security in IPX

- IP layer security via:
  - MPLS based interconnection.
  - IPSEC tunnel for encryption
  - Point to point connection.
  - Not on global routing table.
- Application layer security:
  - Diameter message filtering to allow supported application IDs, Command Codes and AVPs
  - Message screening
  - Anti spoofing check
  - Topology hiding

QoS/Interworking in IPX

- Diameter signaling success ratios
  - Answered message/requested messages*100
  - Measured for both incoming and outgoing transactions
  - Message throttling and discarding malformed packets.
- Transport level parameters
  - Jitter, Round trip delay, packet loss
  - Service availability.

- IPX-P to provide signaling IWF functionality based on 3GPP TS 29.305 (MAP to Diameter interworking)

IPX Charging models

Signaling Services:

- Between IPX-P and SP
  - Flat fee or transaction based
  - Settlement free option.
- Between IPX-Ps.
  - settlement-free peerings paid peerings, e.g.
  - flat fee for a given capacity level
  - transit per outgoing or incoming transaction based on bilateral negotiations between the two IPX-Ps.

IPX Charging models

Data Services:

- Between IPX-P and SP
  - flat fee per installed/provisioned bandwidth
  - used bandwidth based fee
- Between IPX-Ps.
  - settlement-free peerings
  - paid peerings, e.g. based on destination

In all above models a different pricing per Class of Service can also be used.

What's the bottomline? I3F recommendations!!

- IPX to provide a full mesh environment with a one stop solution to operators for both LTE signaling and data.
- Fully redundant and fault tolerant solution for signaling and transport.
- Apply signaling level screening policies to avoid traffic storms, spoofing and other attacks.
- Offering QoS at service level via KPIs and handling packet marking for appropriate traffic handling.
  - *I3 is the only working body that has put a recommendation for QoS KPIs for service schedule over IPX*
  - *Reference document located at:*
    http://i3forum.org/wp-content/uploads/2014/05/i3F-LTE-Data-Roaming-over-IPX-Release-1-FINAL-2014-05-12.pdf

Thank You

Questions???