

IPX solutions for GTP-PMIP Roaming

Nortel, Verizon Wireless, Cisco

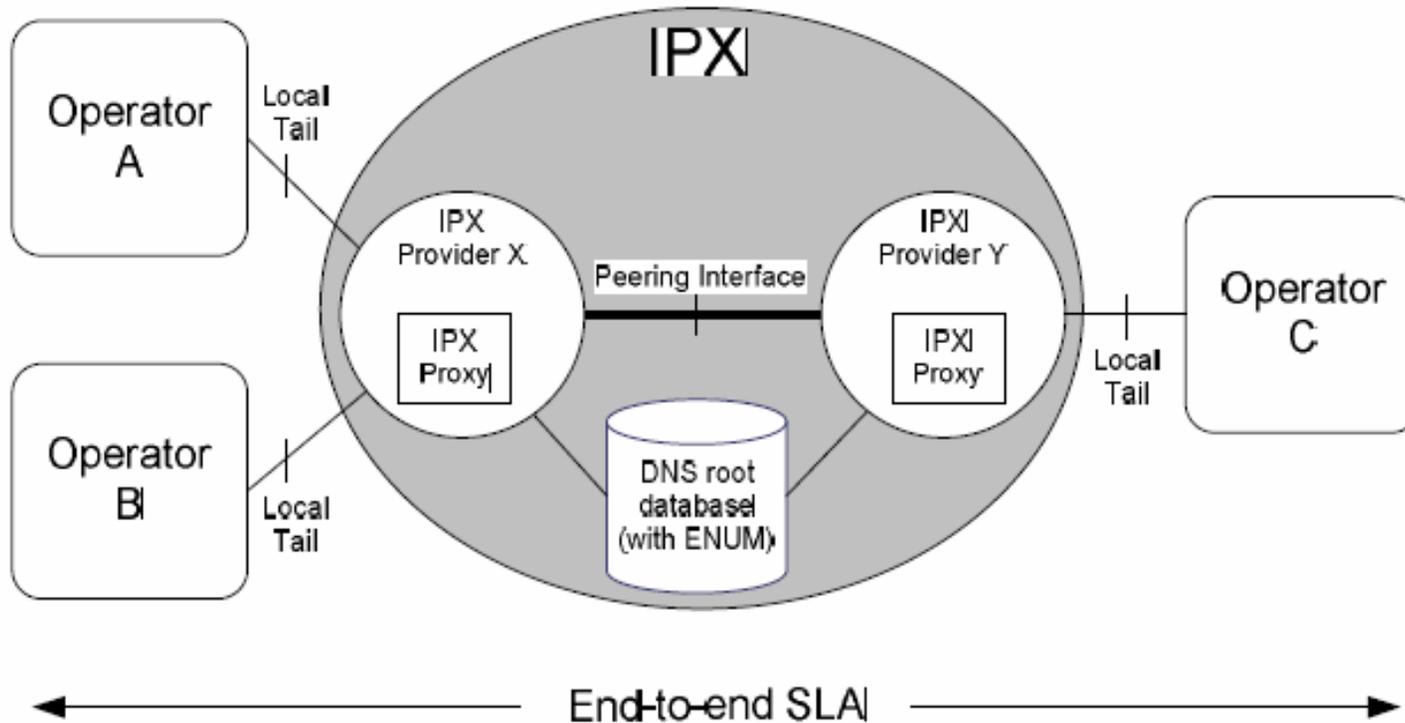
Outline

- > This presentation examines IPX-based solutions for roaming between EPC networks based on GTP and EPC network based on PMIP
 - IPX stands for IP Packet eXchange – an evolution of the GRX backbone
- > It is assumed that the QoS/Policy information for PMIP interfaces (S2a, S2b, S5/S8b) is signalled on per-SDF basis via the Diameter interfaces (S7a, S7b, S7c)
- > It is assumed that IPX Proxy services will be available before deployment of EPS/E-UTRAN networks

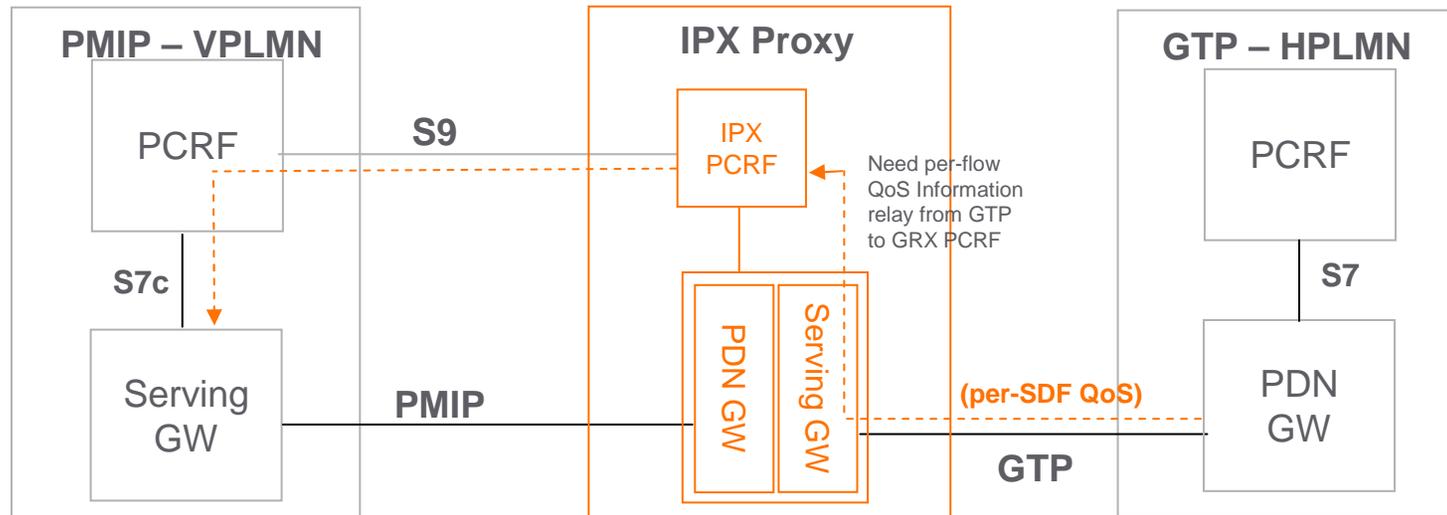
IP Packet Exchange (IPX - Evolved GRX)

- > Defined in GSMA IR.34
 - ongoing pre-commercial implementation trials
- > Building on the features of the GRX, the IPX also is able to support the following:
 - Connectivity between any type of Service Provider (MNOs, FNOs, ISPs, ASPs)
 - End-to-end QoS for roaming and interworking
 - Any IP services on a bilateral basis with end-to-end QoS and interconnect charging
- > An IPX may also use the service-aware functionality of the IPX Proxies to support:
 - Further interconnect charging models such as Service-Based Charging in addition to the volume-based model of GRX
 - Inter-operable interworking for specified IP services
 - Multilateral interworking support for these specified services over a single Service Provider to IPX connection

IPX Network Reference Model



GTP-based HPLMN and PMIP-based VPLMN



Mobility and Network Access:

- IP address sourced from HPLMN, registered with PDN GW interworking function in the IPX
- Mobility occurs across S8b as per normal operation

QoS:

- Need a method to convey per-SDF QoS information between GTP HPLMN and a PCRF function in the IPX

Charging:

- Flow-based charging remains in PDN GW
- In order to allow flow-based charging in the IPX Proxy, GTP needs to also carry charging rules

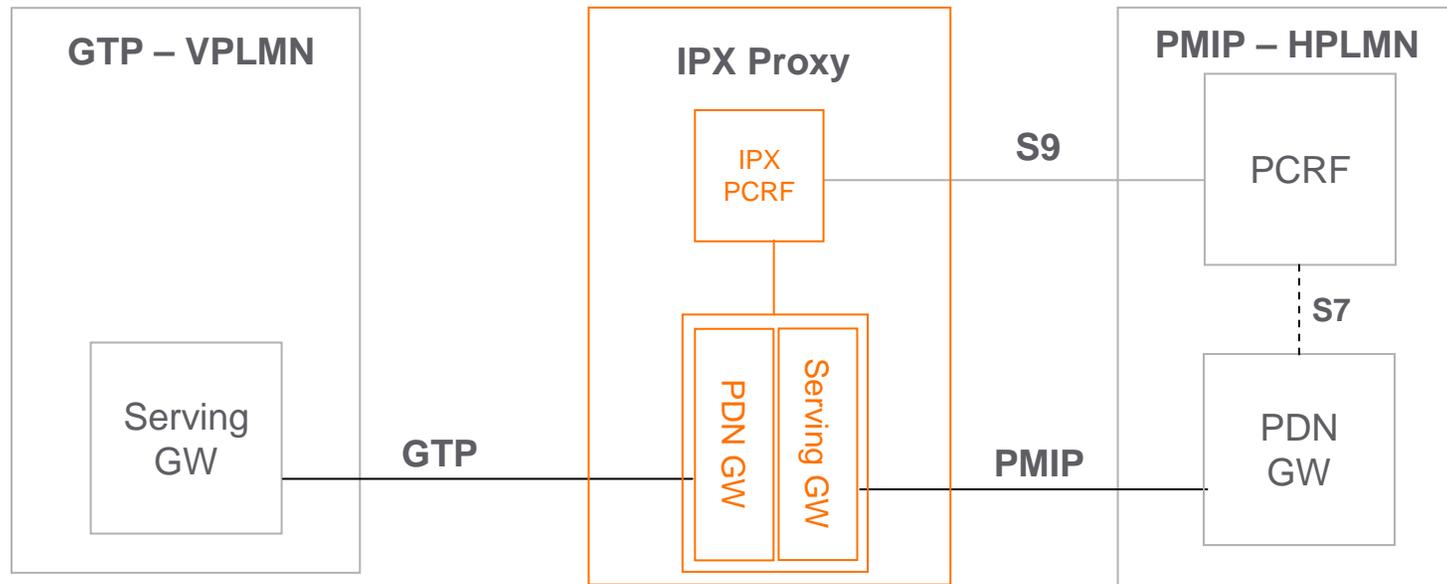
Advantages:

- Neither operator needs to redefine their selected network model
- An HPLMN operator would be motivated to do this since this option will work for non-3GPP access in the visited network as well. Solution for non-3GPP access could be aligned with roaming.

Drawbacks:

- Need to pay fees to IPX operator
- Need to adopt a forwarding of per-SDF QoS information inside GTP

PMIP-based HPLMN and GTP-based VPLMN



Mobility and Network Access:

- IP address sourced from HPLMN, registered with PDN GW interworking function in the IPX
- Mobility occurs across S8a as per normal operation

QoS:

- The IPX network retrieves the QoS information across the S9 interface

Charging:

- Flow-based charging remains in PDN GW
- In order to allow flow-based charging in the IPX Proxy, S9 needs to also carry charging rules

Advantages:

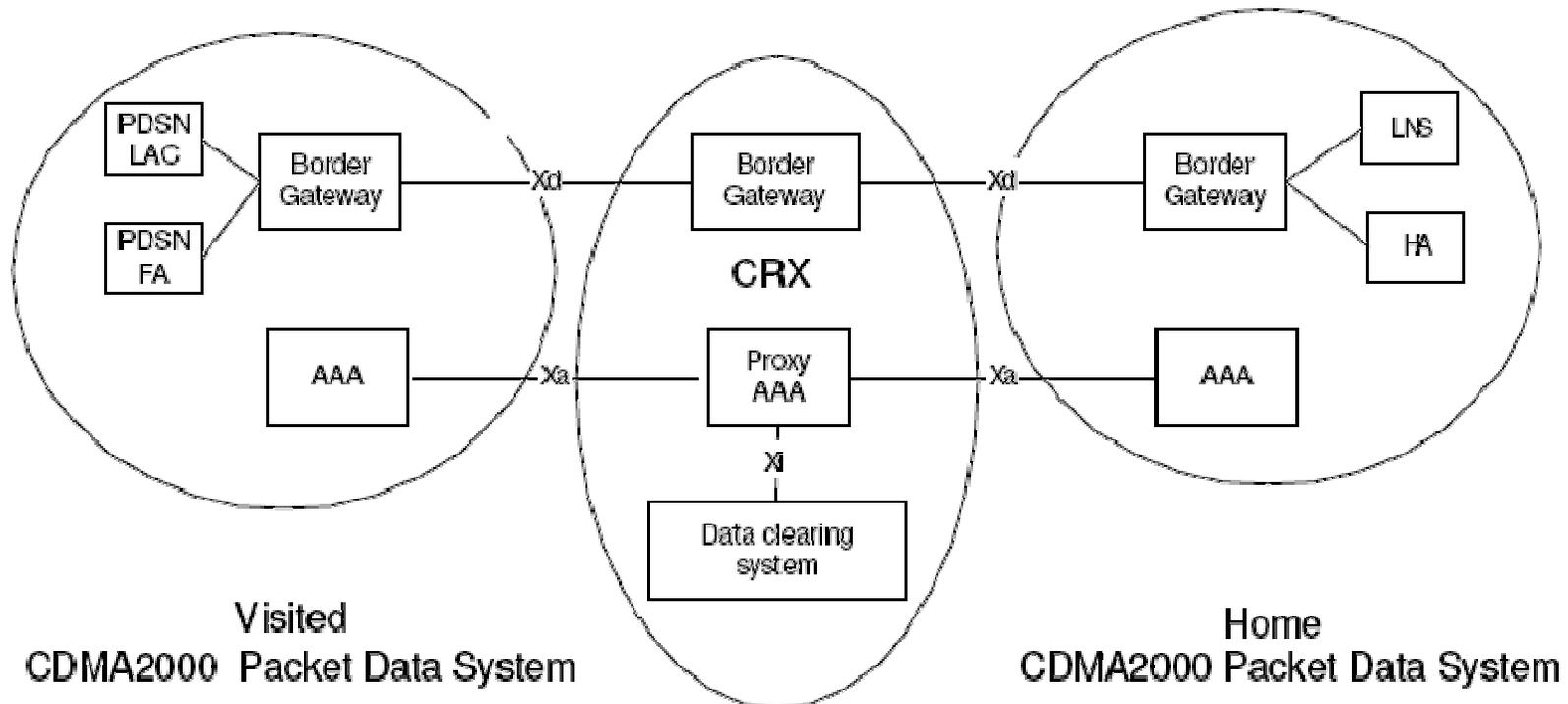
- Neither operator needs to redefine their selected network model
- No modifications to standards are required

Drawbacks:

- Need to pay fees to IPX operator

Backup slides...

CRX Reference Model

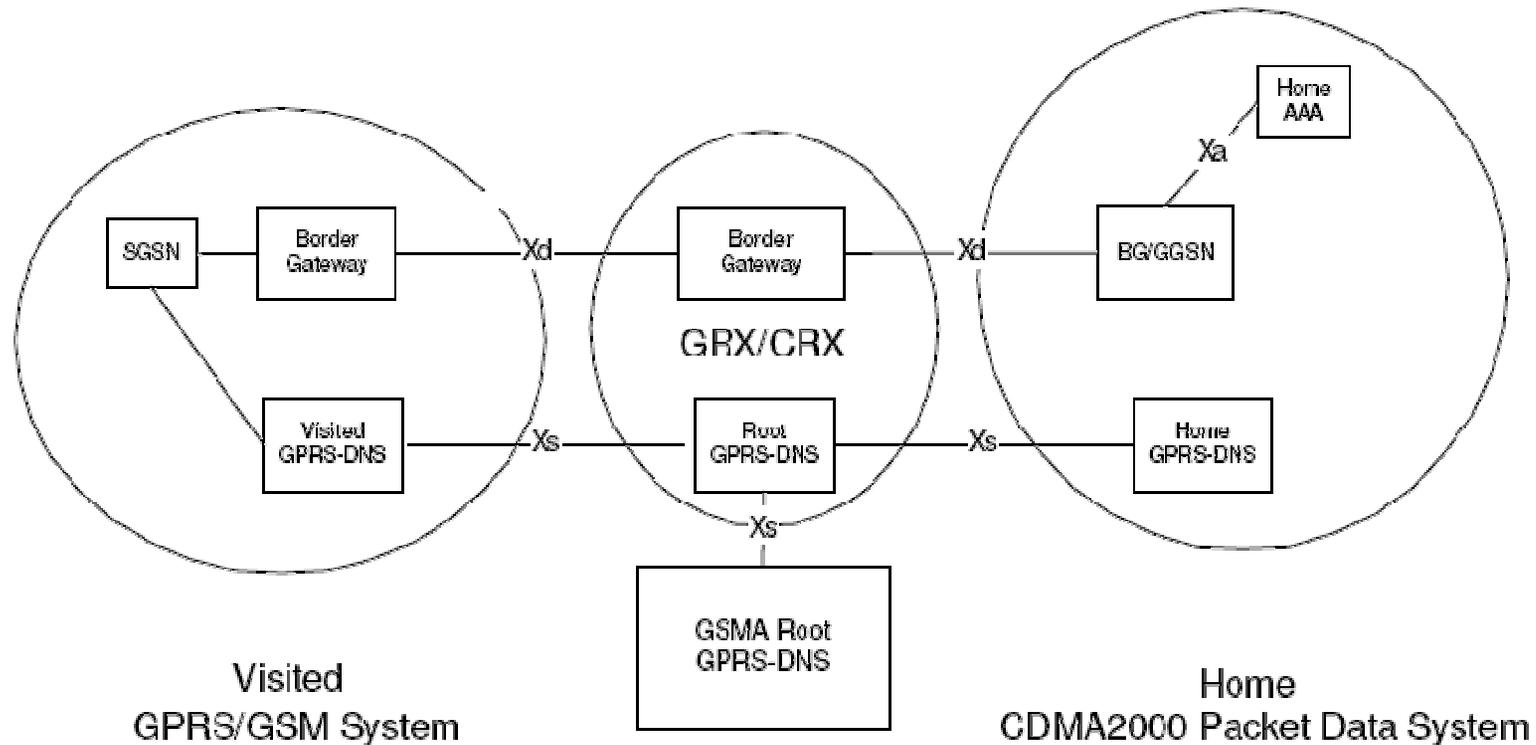


Xd: IP layer interface for IP data transport

Xa: Application layer interface for AAA messages

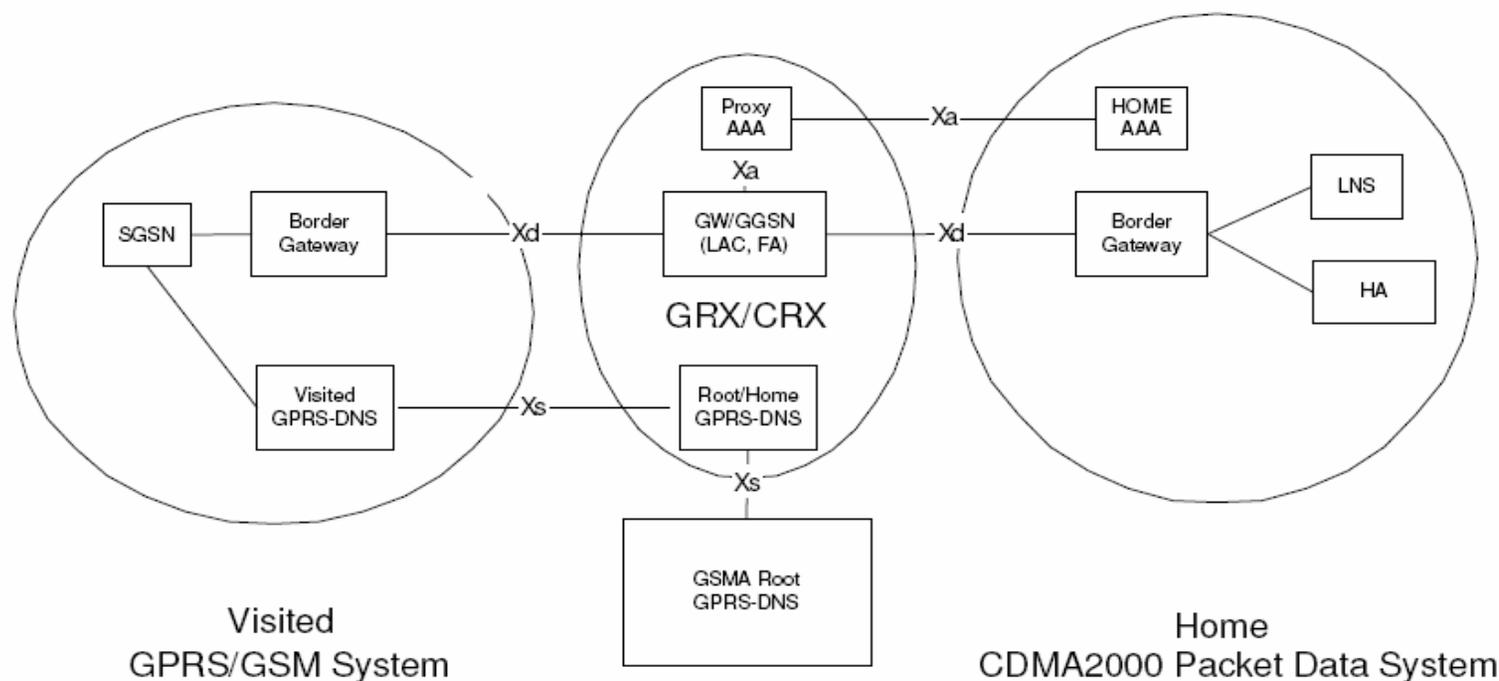
Xi: Application layer interface for accounting data to data clearing system

CRX: Inter-standard Roaming GGSN in home CDMA PDS



- Replicates the required 3GPP functionality in the CDMA2000 PDS
- CRX network is used to provide transit connectivity.
- The **Xs** interface is used to query the IP address of the home GGSN. This reference model requires the home GPRS-DNS server to maintain a record of the home GGSN's IP address, understand the GPRS domain, and comply with the GSMA PRD IR35 specification.

GGSN in GRX/CRX (Inter-working HUB)



- CRX provides the inter-working between the two domains
- CRX GGSN provides 'home' control, while at the same time provides 'visited' control through FA functionality
- No QoS defined for this solution, but should be easy to extend since TFTs made available to FA (PDSN) can be reused by the GGSN

From GSMA IR 34: IPX Connectivity Services

> Transport-Only Connectivity Option

- A bilateral agreement between two Service Providers using the IPX transport layer with guaranteed QoS end-to-end. As with the GRX, this model is not service aware and it can be used to transport any protocol between the two Service Providers (provided compliance with security requirements is maintained)

> Bilateral Service Transit Connectivity Option

- A bilateral agreement between two Service Providers using the IPX Proxy functions and the IPX transport layer with guaranteed QoS end-to-end. This model provides the opportunity to include **service-based interconnect charging** in addition to the transport charging of the transport-only model

> Multilateral Service Hub Connectivity Option

- A model providing multilateral interconnect with guaranteed end-to-end QoS and including service-based interconnect charging. Hubbing/multilateral connectivity is where traffic is routed from one Service Provider to many destinations or interworking partners via a single agreement with the IPX Provider. The hub functionality is provided by **IPX Proxies**.

From GSMA IR 34: IPX Proxy Services

- > Interworking between Service Providers can be established without proxy services when using the Transport-Only Connectivity Option. However proxy services are required to support the hub and transit connectivity models described above, where they facilitate a Service Provider's configuration and agreement management and the cascading of charging
- > The IPX will include a number of proxies that support specified IP service interworking. IPX Proxies are not mandatory but will be needed to support Service Transit and Hubbing Connectivity options. Note that the use of an IPX Proxy does not necessarily imply the adoption of a multilateral connectivity model; Proxies may also be used to support services on a bilateral basis.