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“Whitepaper on IPX Transport Service ”

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Date	Rel.	Subject/Comment
		Earlier versions release for discussion and for alignment between GSMA and i3F
May 2014	1.0	First release of the Whitepaper on IPX Transport Service replacing previous i3 forum IPX Transport Service documents

1 CONTENTS

2 OBJECTIVES

This document categorises transport services that can be requested by Service Provider and/or offered by IPX Provider over an IPX network.

Based on this document players in the IPX ecosystem shall have a solid foundation and criteria when specifying, selecting and comparing transport services in an IPX environment. Players can be industry bodies like GSMA and i3Forum as well as individual IPX Provider and Service Provider.

This document focuses on transport services delivered to Service Provider and to other IPX Provider; it focuses on service specification, Service Level Agreement and charging models. This document does not define the technical transport functions of the IPX network.

3 BACKGROUND

GSMA established the idea and concept of the IPX ecosystem. Over the recent years, specifications were published and refined focussing on technical functions (e.g. IR.34) and the Voice over IPX service (e.g. AA.81).

The Transport Service was mentioned in many documents without being properly defined. Missing clarity was no major issue, as long as GRX and IPX Transport were seen as completely separate services. With the uptake of LTE data roaming the industry requests clarity and a proper definition of the IPX Transport service.

I3 Forum adopted the GSMA IPX concept and published the IPX Core specification. This specification defined the transport functions of an IPX network and a framework how to define services offered by carriers. As a follow-up activity i3F specified the Voice over IPX service. As a next step, i3F specified services required by mobile operator to implement LTE data roaming. At that point of time, i3F specified one flavour of the IPX Transport service. At that point of time it became obvious that many different flavours exist in the markets and a common industry understanding is required.

This document categorises transport services that can be requested by Service Provider and/or offered by IPX Provider over an IPX network. The key intention is twofold:

1. Establish a framework and define criteria suitable to differentiate transport services

2. Adapt this framework to distinguish several transport services that either exist in the market or will be implemented shortly.

This document does not intend to list and categorise all possible transport services. Further variations may evolve in the market over time.

This document does not intend to specify products. Carriers may implement different transport services very different. While one carrier decides to offer a GRX service and a IPX data roaming transport service as one product, another carrier may decide to offer the IPX data roaming transport service and the IPX Transit service as one product.

4 CRITERIA USED TO DIFFERENTIATE DIFFERENT TRANSPORT SERVICES

The following table lists and explains criteria used to differentiate different transport services.

	Criteria	Explanation
1.	Community	Specifies if the service is offered to a limited range of Service Provider or if it is open to any Service Provider.
2.	Connectivity	Specifies the type of connectivity between Service Provider
3.	Black- and/or whitelisting	Specifies if black- and/or whitelisting is in place for some traffic relations and which party implements such access control lists.
4.	Service Feature	Specifies if the service is fully unaware of transported data or if some limited awareness is requested. It also defines other service specifics.
5.	Transparency	Specifies to what extent routing within the IPX cloud is made transparent to Service Provider
6.	Demarcation point	Specifies the typical demarcation points of this service
7.	DNS or ENUM	Specifies if IPX Provider has to support access to Pathfinder DNS information, such that Service Provider can resolve FQDNs to find the correct IP address
8.	Quality of Service and SLA	Specifies the Quality of Service parameter committed for this service and the typical level of granularity target values are defined
9.	Commercial relationship between SP and IPXP	Specifies the commercial relationship between two directly connected parties, one Service Provider and one IPX Provider. End to end commercial relationships, e.g. between two Service Provider are out of scope
10.	Charging principle between SPs and IPXP	Specifies the charging principles applied between two directly connected parties, one Service Provider and one IPX Provider.
11.	Interworking charging between SPs	Specifies the charging principle applied end to end between two Service Providers

5 TRANSPORT SERVICES OVER IPX KNOWN IN THE INDUSTRY TODAY

Today, MNOs and other Service Provider request and carriers offer different services as transport over IPX. This section briefly explains and groups existing services. Common to all variations of these services is that the carrier is service unaware, i.e. the carrier does not (have to) understand the content and meaning of the data.

The table in section 6 distinguishes these services more formally along well defined criteria.

5.1 Mobile Services

5.1.1 GRX (over IPX) service

A carrier connects Mobile Operators to exchange 2G/3G data roaming payload without specific quality differentiation.

Today, the GRX (over IPX) service is also used to exchange many other data streams if agreed so between the mobile operators, examples being WiFi authentication, RCS interconnect, LTE data roaming payload, other interconnect services

5.1.2 IPX data roaming transport service

A carrier connects Mobile Operators to exchange 4G data roaming payload with or without specific quality differentiation.

The IPX data roaming transport (over IPX) service is expected to be used to exchange roaming data streams if agreed so commercially between the mobile operators. .

5.1.3 VLANs usage for mobile services

This section does not define another service; it shall clarify access service separation in case an IPX Provider offers both services, GRX and IPX data roaming transport. VLANs can be the same or different for GRX and IPX data transport as requested by the Mobile Operator. Depending on the core network technology deployed by the Mobile Operator, this MNO can or cannot differentiate between 2G/3G and 4G data roaming traffic; therefore the IPXP must offer both options.

5.2 IPX Transit service

A carrier connects Service Provider to exchange any kind of data with specific quality differentiation.

This IPX Transit service can be used to exchange any kind of data if agreed so between the Service Providers, examples being WiFi authentication, RCS interconnect, LTE data roaming payload, 2G/3G data roaming payload, online gaming services, video download, data storage upload, etc.

This IPX Transit service can be seen as a privately managed, secure, QoS enabled Internet between participating-connected parties.

5.3 Other Transport Services

5.3.1 Point-to-Point service

A carrier connects two locations, between one or two Service Providers. This is very similar to a leased line service delivered over IPX

5.3.2 Point- to-Multipoint service

A carrier connects different locations of a Service Provider or a limited group of Service Providers. This is very similar to a VPN service delivered over IPX

6 CLASSIFICATION OF DIFFERENT TRANSPORT SERVICES

The following table lists and explains criteria used to differentiate different transport services.

	IPX Transport Services				
Criteria	**GRX**	**IPX data roaming transport**	**IPX Transit**	**Point-to-Point service such as "Leased Line"**	**Point-to-Multipoint service such as "IP VPN"**
Definition	The GRX service, is an any-to-any IP network that provides IP connectivity between all GPRS operators also connected to the GRX network. GRX operators may choose to black list and block other operators to exchange traffic with themselves.	The IPX data roaming transport service, is an any-to-any IP network that provides IP connectivity between all LTE operators also connected to the LTE network. LTE operators may choose to black list and block other operators to exchange traffic with themselves.	The IPX Transit service is an any-to-any IP network that provides IP connectivity between any IPX SPs including Fixed Operators, MNOs, OSPs and Enterprises.	This is a point to point connection between any 2 SPs	This is a Point to Multi-Point connection where one SP can communicate with many SPs over a single connection.
Community	MNOs only	MNOs only	Open to all Service Provider (MNOs, FNOs, Cable Network Operators, OSPs and Enterprises)	Open to all Service Provider (MNOs, FNOs, Cable Network Operators, OSPs and Enterprises)	Open to all Service Provider (MNOs, FNOs, Cable Network Operators, OSPs and Enterprises)
Connectivity	Any-to-Any for MNOs that are connected to the Service.	Any-to-Any for MNOs that are connected to the Service.	Any-to-Any	1-to-1 (point-to-point)	1-to-many

Black- and/or whitelisting	Opt-Out for IP Connectivity Opt-In Model for Business roaming agreements (performed by MNO as part of his internal provisioning process)	Opt-Out for IP Connectivity Opt-In Model for Business roaming agreements (performed by MNO as part of his internal provisioning process)	Opt-out for IP Connectivity Opt-In Model for Commercial agreements Role of IPXP and/or SP to be defined by GSMA , e.g. which party implements white-list, what is meant by bilateral commercial activation	not applicable	not applicable
Service Feature	Must support GTP tunneling	Must support GTP tunneling Class Of Service available Note: Carriers are not required to analyse the priority of packets within a GTP tunnel and handle them differently	Class Of Service available	any	any
Transparency	not required	Disclose on-net versus off-net MNO routing	Report on routing between SPs (on-net, off-net) required	Built into the commercial agreement	Not required
Demarcation point	IPXP Edge router MNO specific port access interface (excludes the local loop unless otherwise negotiated)	IPXP Edge router MNO specific port access interface (excludes the local loop unless otherwise negotiated)	IPXP Edge router SP specific port access interface (excludes the local loop unless otherwise negotiated)	IPXP Edge router SP specific port access interface (excludes the local loop unless otherwise negotiated)	IPXP Edge router SP specific port access interface (excludes the local loop unless otherwise negotiated)
DNS or ENUM	Private DNS support requested by MNOs	Private DNS support requested by MNOs The LTE roaming will have a DNS function which can either be the same DNS than for	Optional Use of DNS and/or Pathfinder or other D/B Service (e.g. to retrieve Service Provider ID)	Not required	Not required

		GRX (assuming that LTE only operators can also access this DNS) or be a separate DNS dedicated to LTE operators. I3F understanding: The same private DNS will be used for GRX and IPX data roaming transport service			
Quality of Service and SLA	Typical KPIs: availability, delay, jitter, packet loss	Typical KPIs: availability, delay, jitter, packet loss	Typical KPIs: availability, delay, jitter, packet loss	Typical KPIs: availability, delay, jitter, packet loss	Typical KPIs: availability, delay, jitter, packet loss
	Traffic classes as defined in IR.34	Traffic classes as defined in IR.34	Traffic classes as defined in IR.34	Traffic classes as defined in IR.34	Traffic classes as defined in IR.34
	Target values typically per region (in line with IR.34)	Target values typically per region (in line with IR.34)	Target values typically per region (in line with IR.34)	Target values very specific to this 1-to-1 relation	Target values very specific to this 1-to-1 relation

	Measurement points: Edge router	The QoS will be guaranteed across up to 2 IPXP, and will represent the QoS of the IPXP Edge Router, excluding the access interface with the MNO (i.e the IP access port/vlan, plus the local loop if negotiated). Each IPXP can individually and bilaterally go beyond this minimum requirement and also include the IP port into its QoS SLAs Availability must include all equipment under control of the IPXP (P, PE, and Edge Router)	The QoS will be guaranteed across up to 2 IPXP, and will represent the QoS of the IPXP core backbone, excluding the access interface with the SP (i.e the IP access port/vlan, plus the local loop if negotiated). Each IPXP can individually and bilaterally go beyond this minimum requirement and also include the IP port into its QoS SLAs	The QoS will be guaranteed across up to 2 IPXP, and will represent the QoS of the IPXP core backbone.	The QoS will be guaranteed across up to 2 IPXP, and will represent the QoS of the IPXP core backbone.
	End-to-end SLA for on-net traffic	End-to-end SLA SLAs penalties will have two components one part for faults on the onnet network and another one for faults on the offnet networks Note: the Values contained within IR.34 and feasibility of KPIs measurements are currently under review.	End-to-end SLA SLAs penalties will have two components one part for faults on the onnet network and another one for faults on the offnet networks Note: the Values contained within IR.34 and feasibility of KPIs measurements are currently under review.	True end-to-end SLA full KPI measurements and enforcements	True end-to-end SLA full KPI measurements and enforcements

Commercial relationship between SP and IPXP	Contract between one MNO and one IPXP defines access to the service. Bilateral traffic relations are activated/provisioned by the MNOs over time.	Contract between one MNO and one IPXP defines access to the service. Bilateral traffic relations are activated/provisioned by the MNOs over time.	Contract between one SP and one IPXP defines access to the service. All traffic relations are open by default. To be clarified by GSMA: Bilateral commercial activation with bilateral Commercial Launch Letter, as charging may be bilateral	Defines two access points Can be one or two purchasing parties	Defines all access points and traffic relations Very often one party purchasing the service for all end points
Charging principle between SPs and IPXP	Both MNOs pay Typically per purchased bandwidth speed (Mbps) regardless of exchanged traffic volume (MB)	Both MNOs pay Typically per purchased bandwidth speed (Mbps) regardless of exchanged traffic volume (MB)Differentiation per CoS possible	Depends on Interworking charging between SPs (see below) May vary depending on either CoS, or destination/distance or volumes, or a combination of those. Consequently it may be possible that IPXP may charge for IPX Transit differently than using flat rate for bandwidth and destination agnostic like for GRX.	Typically per purchased bandwidth speed (Mbps) regardless of exchanged traffic volume (MB)	Typically per purchased bandwidth speed (Mbps) regardless of exchanged traffic volume (MB)
Interworking charging between SPs	There is nothing like a “termination fee” for the exchange of data traffic between MNOs Other agreements, e.g roaming agreements may be in place	There is nothing like a “termination fee” for the exchange of data traffic between MNOs Other agreements, e.g roaming agreements may be in place	Free Peering, SPP or PUNP may apply and any combination thereof	Both SP pay or one SP pays for the service	All SP Pay or one SP pays for the service

7 ADDITIONAL CLARIFICATIONS

Term	Explanation
On-Net	There is 1 x IPXP between 2 SPs; SP are directly connected to the same IPXP
Off-Net	There are 2 x IPXPs between 2 SPs; SP are connected to different IPXP, traffic passes the NNI between two IPXP
Black and Whitelisting	For instance for GRX and IPX data roaming transport, it is an opt out for connectivity (meaning that by default everybody that connect to the GRX sees everybody else also connected to the GRX), if MNO wants to exclude someone they need to ask for it purposely…. however on the roaming layer above GRX it is opt-in scenario, MNOs have to negotiate roaming agreements to allow roaming traffic, it is not enough to connect to a GRX and get IP connectivity.
“IPX Transit” vs “IPX Transport”	IPX transport is a function (like there is a transport function supporting VoIPX service etc.), IPX Transit is a service use case like the Internet IP transit connectivity. IPX data roaming transport and IPX Transit can be the same service but only if MNOs accept to combine features like "communities". If MNOs want to keep different transport features then there will be different transport services.
Measurement Points	Performance KPIs like Round Trip Delay, Packet Loss, Jitter may be measured on a subset of the IPXP's nodes for economic reasons. This subset, often referred to as the IPXP's backbone network, must represent the quality of this region (the edge router should be in reasonable distance (same metro area) from the closest measurement point of the IPX-P backbone)