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Building the Mobile Internet

NANOG51 Miami

Moderator: **Jim Cowie,** **Renesys**

Panelists: **Carlos Dasilva,** **Orange**

Eric Troyer, **Equinix**

Isn't the Mobile Internet .. Just .. Internet?

- **Large historical cultural gap** between voice (legacy circuit-switched networks) and data (packet-switched)
  - Fixed/mobile voice is finally converging on all-IP model
  - It **may not** be the all-IP model you'd expect
  - Vastly different starting assumptions about security, economics, openness, "intelligence" in the network
  - We may have to learn this foreign mindset if we want to interoperate with MNOs and their service industry
- Think of this panel as a travelogue to a strange country where the rules are a little different than you're used to

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Agenda

- Eric Troyer, Equinix
  - GRX, IPX, and MNO economics/engineering
- Carlos Dasilva, Orange
  - Takeaways for the IP world: What You Need To Know
- Audience Q&A

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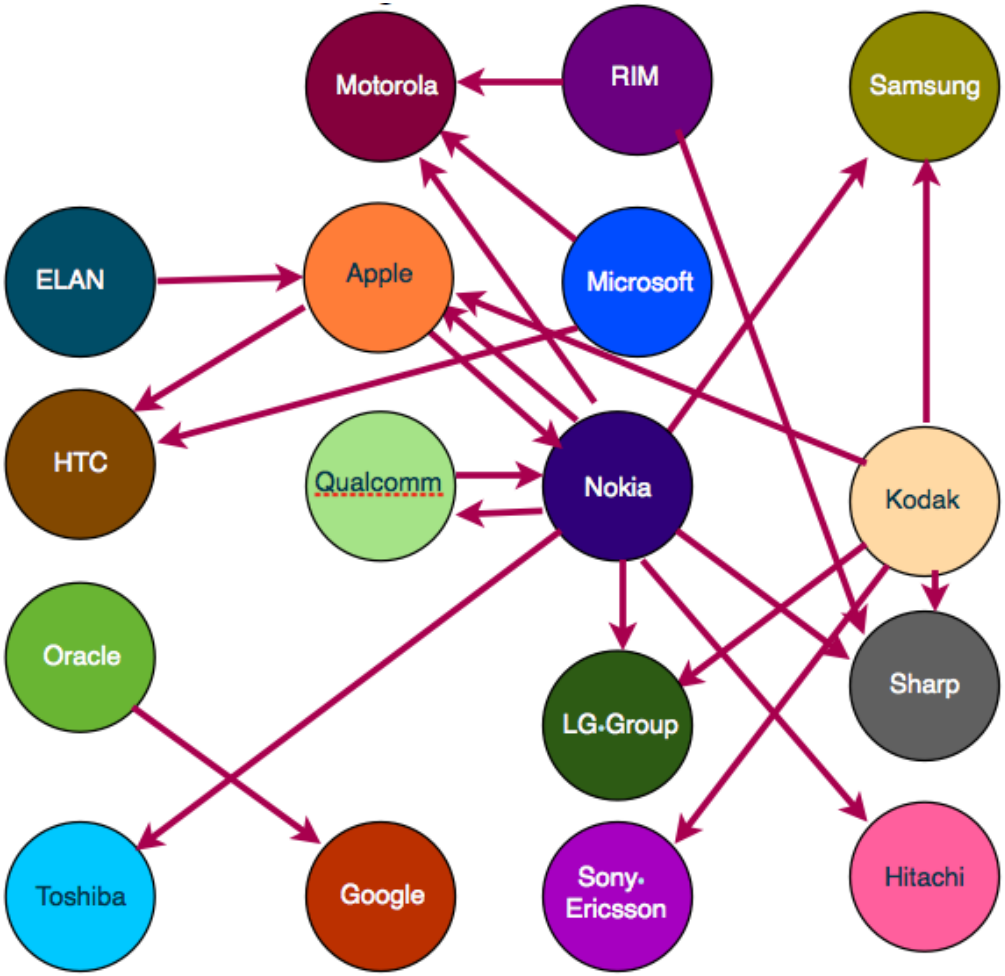
Eric Troyer

Global Director, Mobile Data and IP Peering

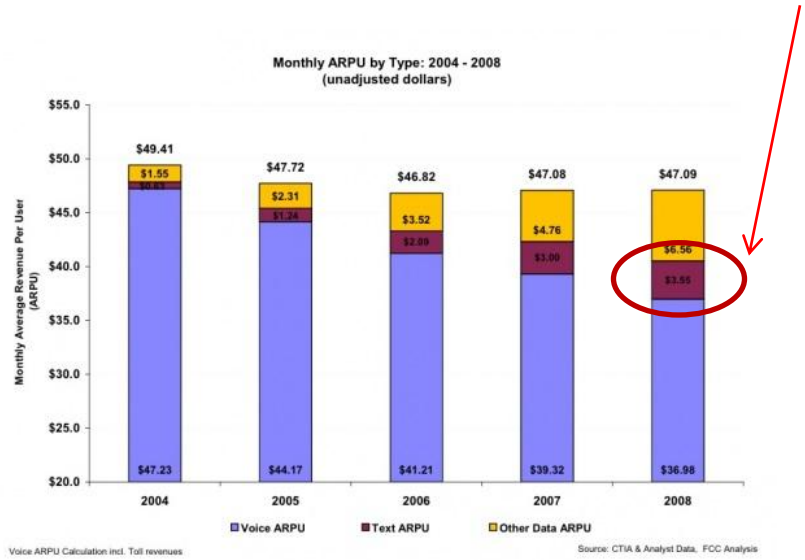
How do we know Mobile is important?

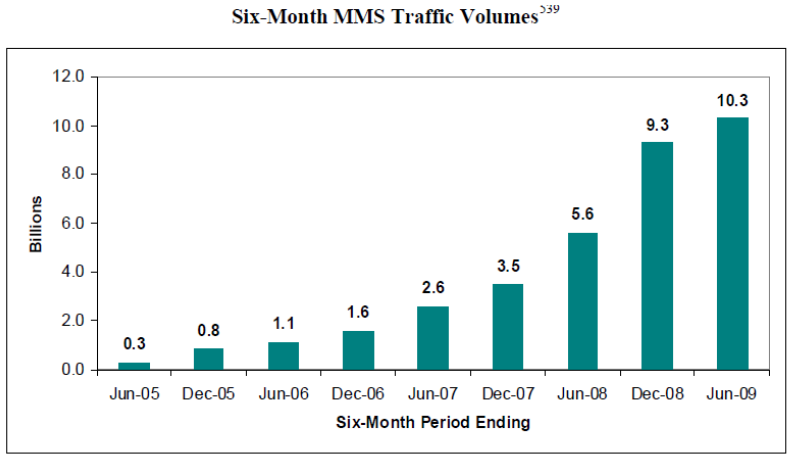
Who's Suing Who in Mobility?



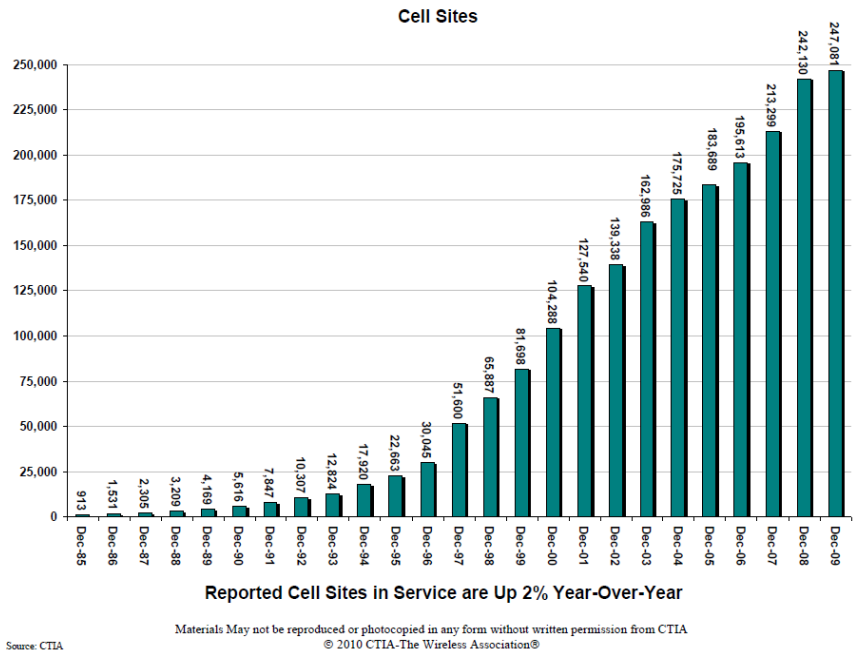
MNO Architecture – Commercial Drivers

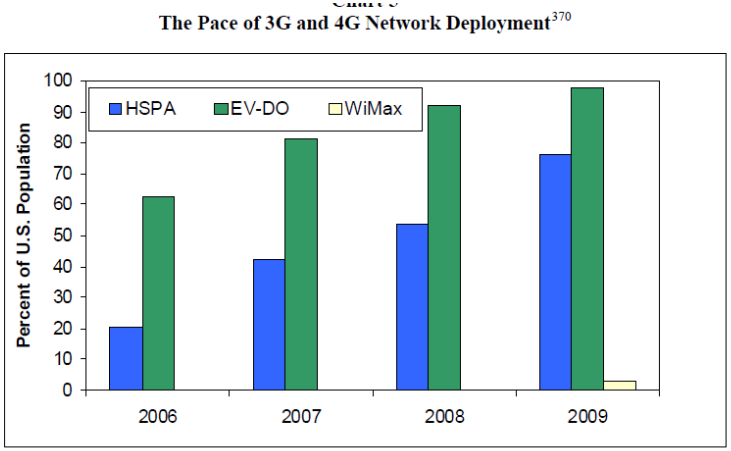
- Good or bad, right or wrong, there are commercial reasons Mobile networks look the way they do:
- Disparate regional “OpCos” glued by leased services
- Vendor proprietary services requiring interoperability schemes
- Prioritizing radio and spectrum upgrades
- Fear of commoditization and drive for ARPU
- Legacy, high margin services are still growing





Mobile Backhaul Growth



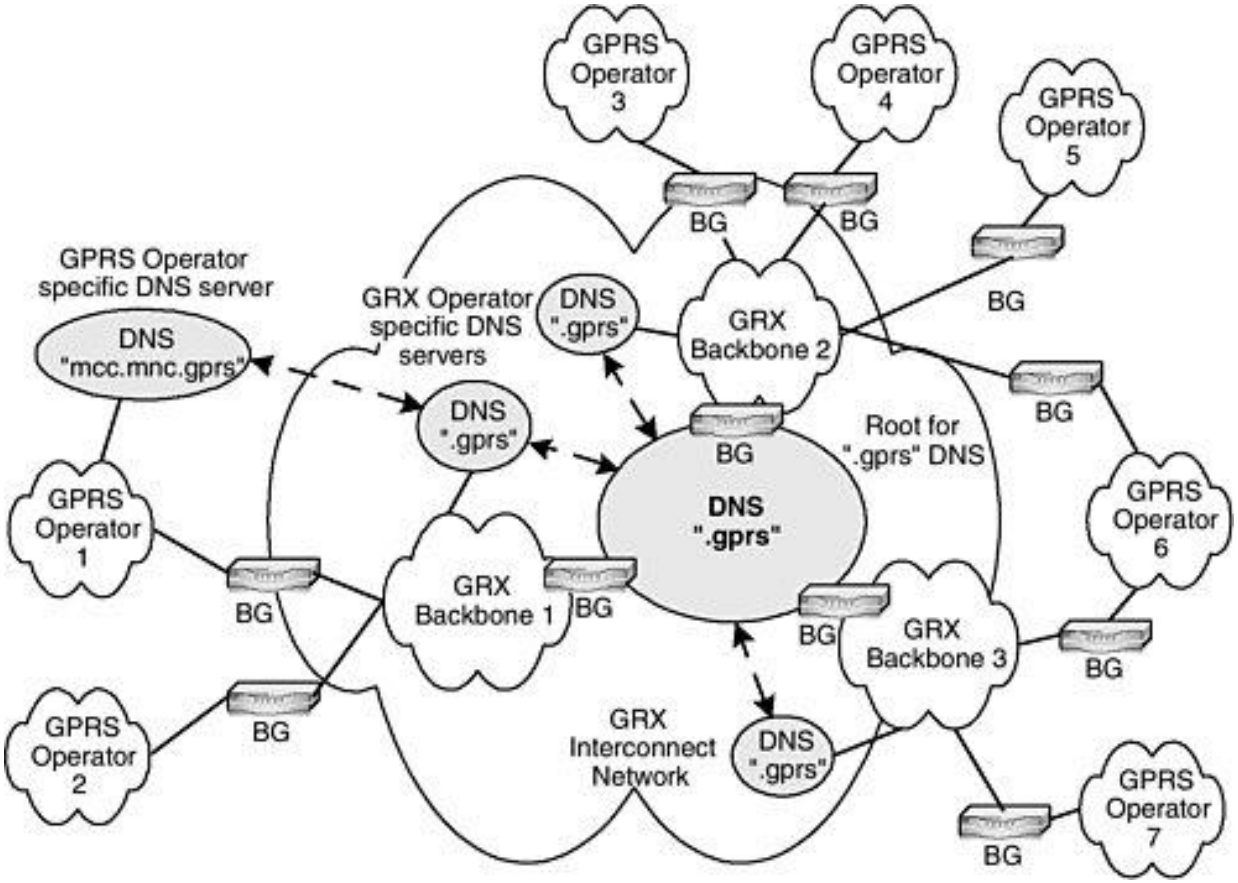


- Mobile backhaul growth driven increased number of “cell sites”, spectrum upgrades, and sub growth
- Time Warner Cable reported mobile backhaul as fastest growing business at 300% growth in 2009 – Bloomberg
- Comcast expects backhaul to become a $1 billion business over time – Comcast earnings call.
- $3.6B USD business in 2012 - GeoResults

GPRS Roaming Exchange - GRX

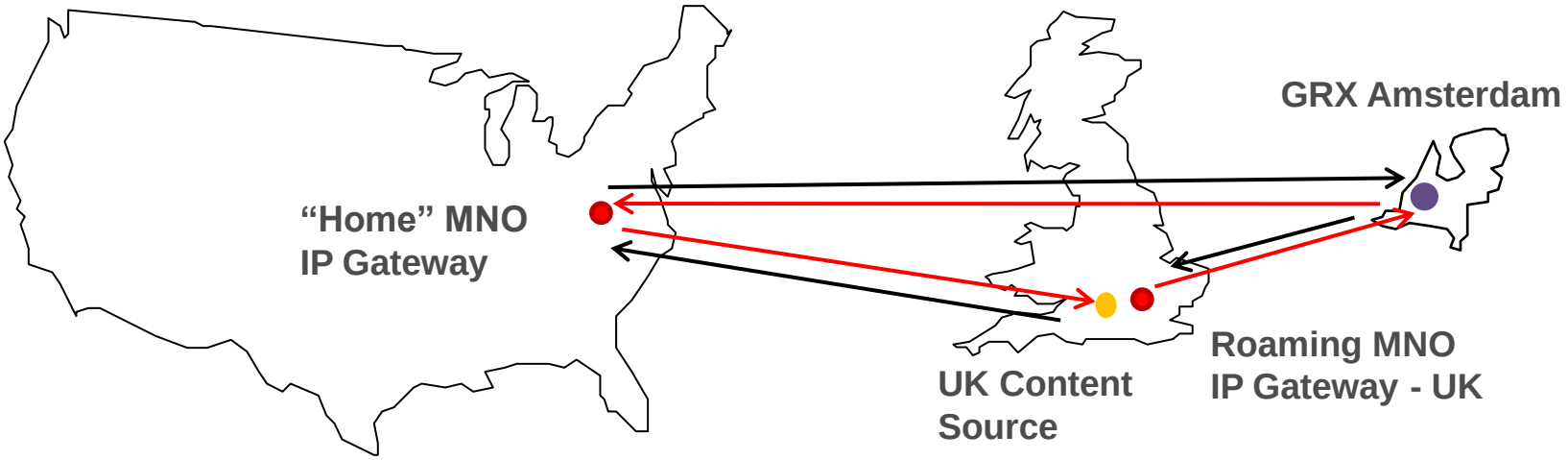
- Designed by GSMA's IREG Inter-Working, Roaming Expert Group
- GRX established in Amsterdam in 2000 for GPRS roaming by GSMA
- Intended to model GRX on IX standards - AMSIX
- Only GRX Network Operators are allowed to connect (typically MNOs and Systems Enablers about 35 out of 600+MNOs).
- Third party directory service component for routing information
- Limitations of BSS layer created architecture where routing of roaming traffic back to home network for traffic accounting purposes
- Additional services added overtime: UMTS roaming, MMS interworking, WLAN data roaming.
- GRX WG has been tasked to find interoperability for "IP Applications"

GRX Architecture



Example: High Level GRX Data Flow

An American roamer in London – requesting UK content

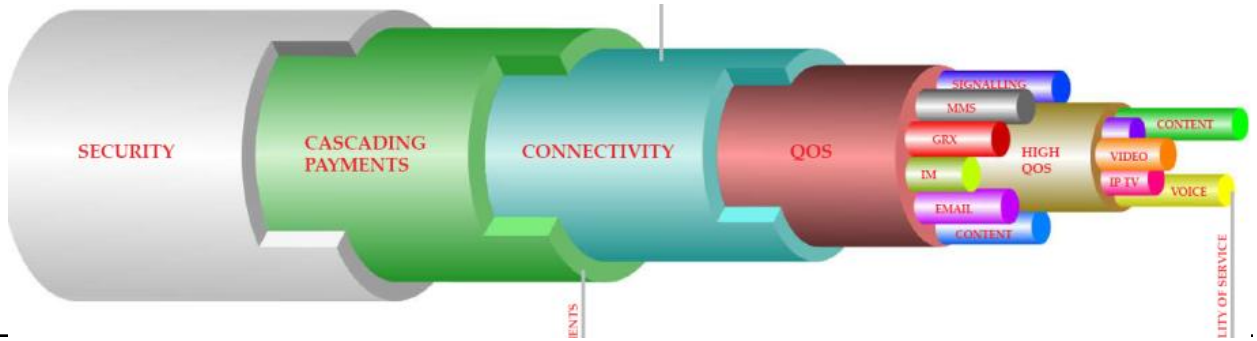


Roaming user data sent to nearest GRX to find a GRX Provider servicing Home Network
GRX Provider sends traffic to Home Network
Home Network requests content through IP Gateway
Content sent back to Home IP Gateway and Home Network passes traffic to GRX Provider
GRX Provider sends data back to GRX in Amsterdam and hands off to Roaming Network

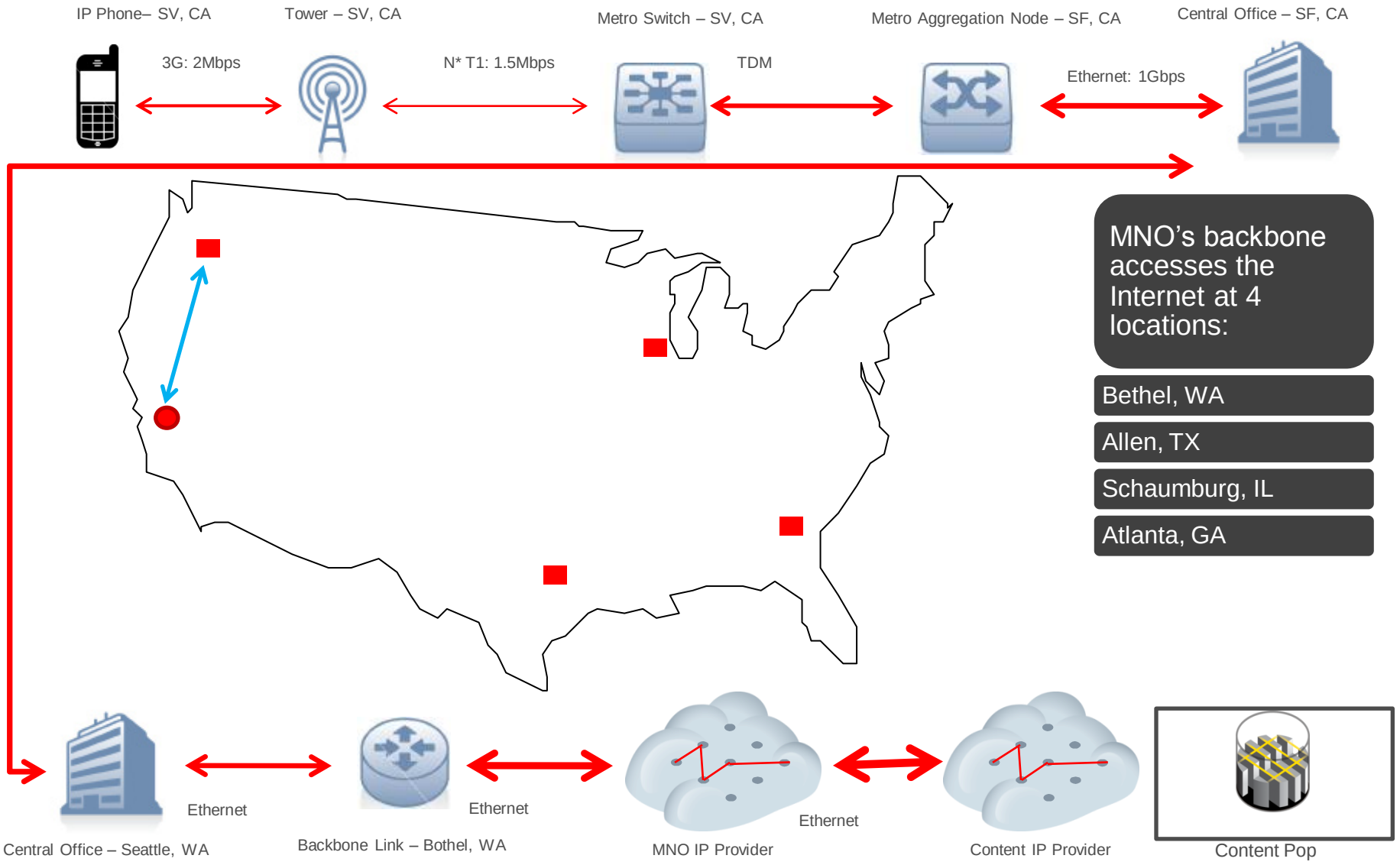
All done to account for total data sent/received

GSMA IP Interconnection - IPX

- Based on GRX architecture
- Closed network designed to bypass Internet and preserve QoS and enable cascading payments/settlement
- Discussion for letting non-MNOs participate
- Advances to original BSS layer may allow for local handoff of traffic for roaming customers
- KPI-focused with 3rd party validation
  - One way delay, round-trip delay, jitter, packet loss, service availability, and network availability
- Other current “IPX” offerings typically QoS over a transport network where different mobile network services are provided



Can IPX Help Drive Direct Interconnection at the Edge?



Evidence of few MNO GIs

- **From the Akamai "State of the Internet" Q1 2010 report:**
- As is evident in Figure 6, New Jersey once again tops the list, with a figure of over one unique IP per capita. In further analyzing the source data, we believe that this unusually high figure, and the significant growth seen over the last several quarters, is likely related to the growth in unique IP addresses associated with mobile carrier gateways located within the state. As such, it may be the case that traffic from mobile users in other states may actually be reaching the Internet through a gateway in New Jersey, thereby skewing the unique IP count, and as such, the unique IP per capita calculations.

	State	Unique IPs per Capita
1	New Jersey	1.44
2	Georgia	0.71
3	Washington	0.63
4	Illinois	0.59
5	Missouri	0.54
6	Colorado	0.47
7	Utah	0.46
8	Massachusetts	0.45
9	Rhode Island	0.45
10	Virginia	0.44

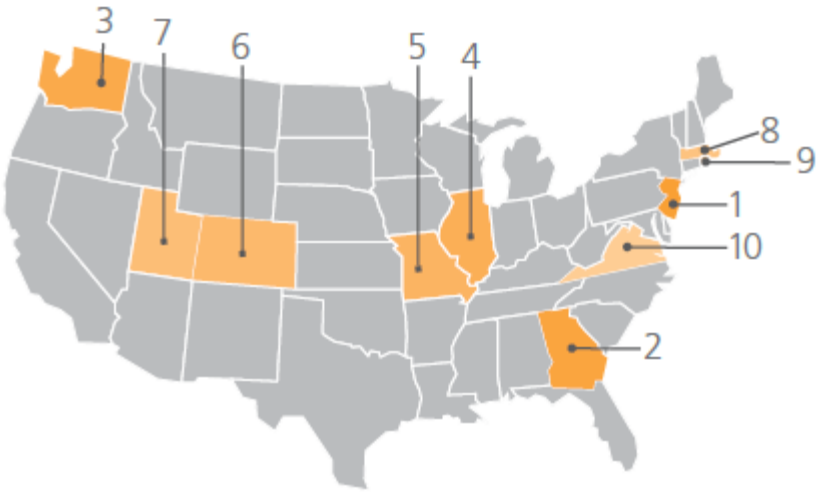


Figure 6: Internet Penetration in the United States

Thoughts on IPX's Impact

- IPX enablement at traditional peering sites MIGHT help drive traditional peering
- When traffic grows large enough, a more distributed architecture is necessary to scale and maintain performance
  - Complex Protocols + Distance + TCP = narrowed throughput and performance
  - Inflection point for distribution and direct interconnection of diminishing returns
  - One size does not fit all – architectures will vary by service offerings
- Mobile architecture will likely be a composite off IPX (closed network) + Distributed IP Interconnection (Internet-model)
- There will always be a need for aggregation services (Transport) for operators that will not build backbones networks to access the rest of world. This may be IPXs biggest use with differentiated traffic types.
- Larger MNOs have an opportunity to work closer with their parent networks and 3rd party network providers to reach broader interconnection site
- Now is a good time for GSMA IREG participants to engage Internet Operations Communities

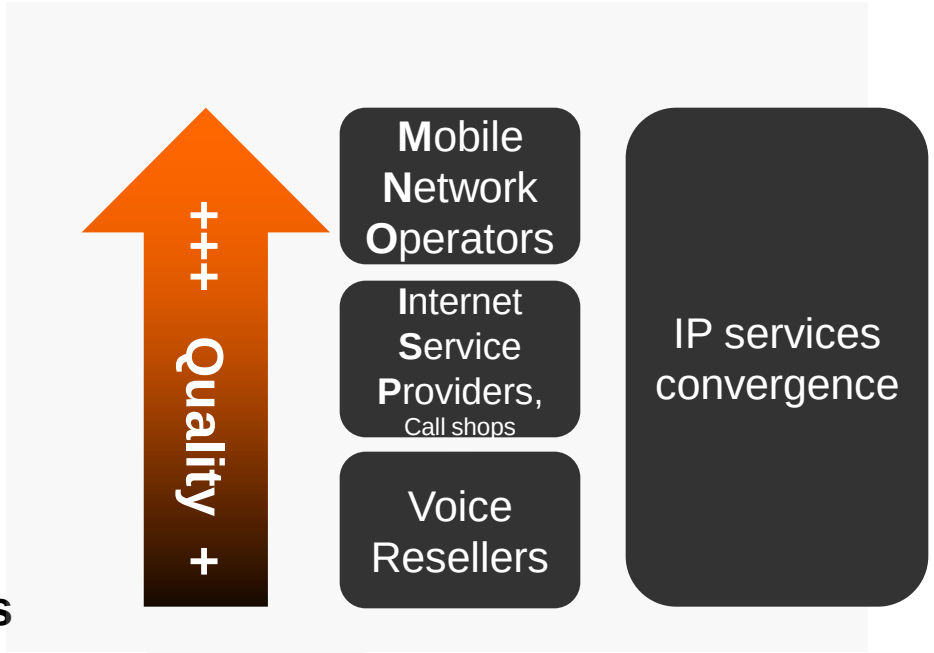
Orange Wholesale Towards IPX

NANOG Miami 2011

Carlos Dasilva, Strategic Marketing Senior Director

Genesis of IPX

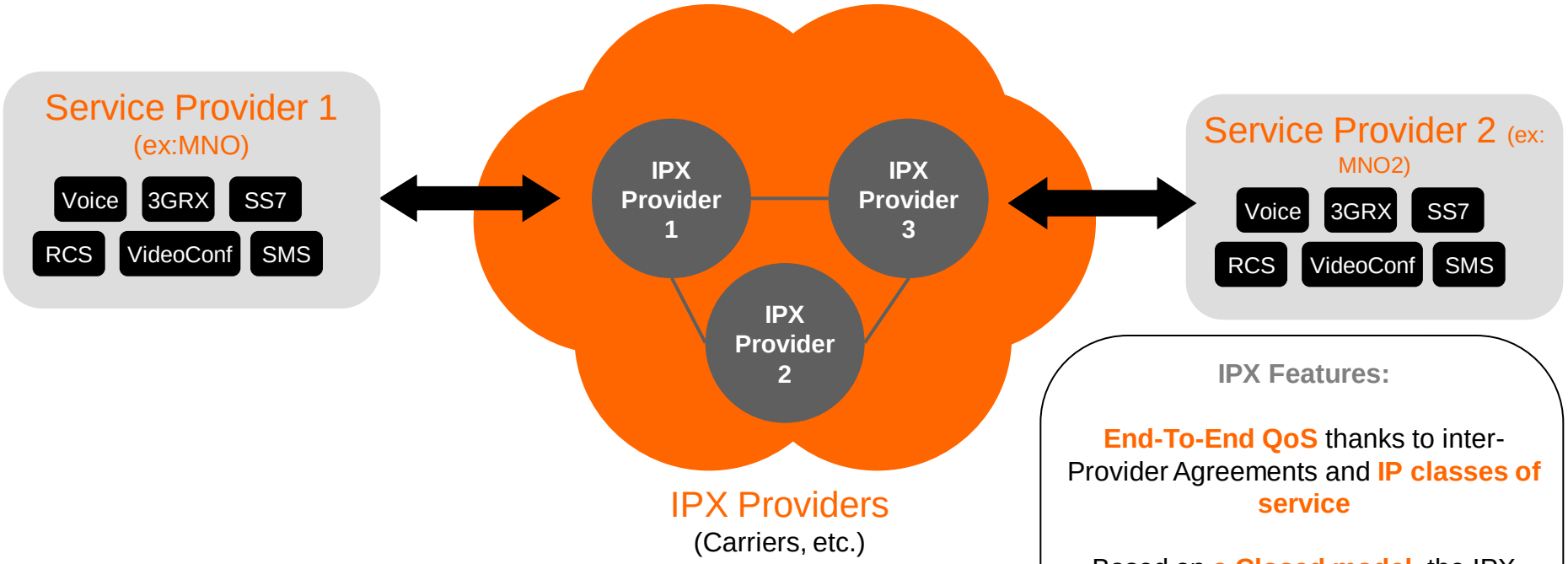
- The IPX **market opportunity** appeared with IP based services.
- **IP technology** is replacing former technologies (as TDM for Voice), however the use of Public Internet does not provide the **sufficient Quality** for some services/operators (for instance Mobile Network Operators)
- Brings **transparency and new Charging and QoS Cascading models** inexistent before
- IPX allows to leverage the **IP cost-effective** underlying transport with the **required end-2-end QoS**.



TDM
circuit-switched

IP
MSC R4, IMS Architecture

The IPX principles



IPX Providers
(Carriers, etc.)

IPX set of features, evolved from 3GRX aims at implementing **security**, **reliability** and **quality** for IP Services. The IPX Network is a **Private IP Network** with common technical & commercial specifications

orange was and **is a pro-active player in IPX** : participated to GSMA standardization works to design a **converging model** that answered these needs and with the i3forum

IPX Features:

End-To-End QoS thanks to inter-Provider Agreements and **IP classes of service**

Based on **a Closed model**, the IPX network is separate from the Public Internet

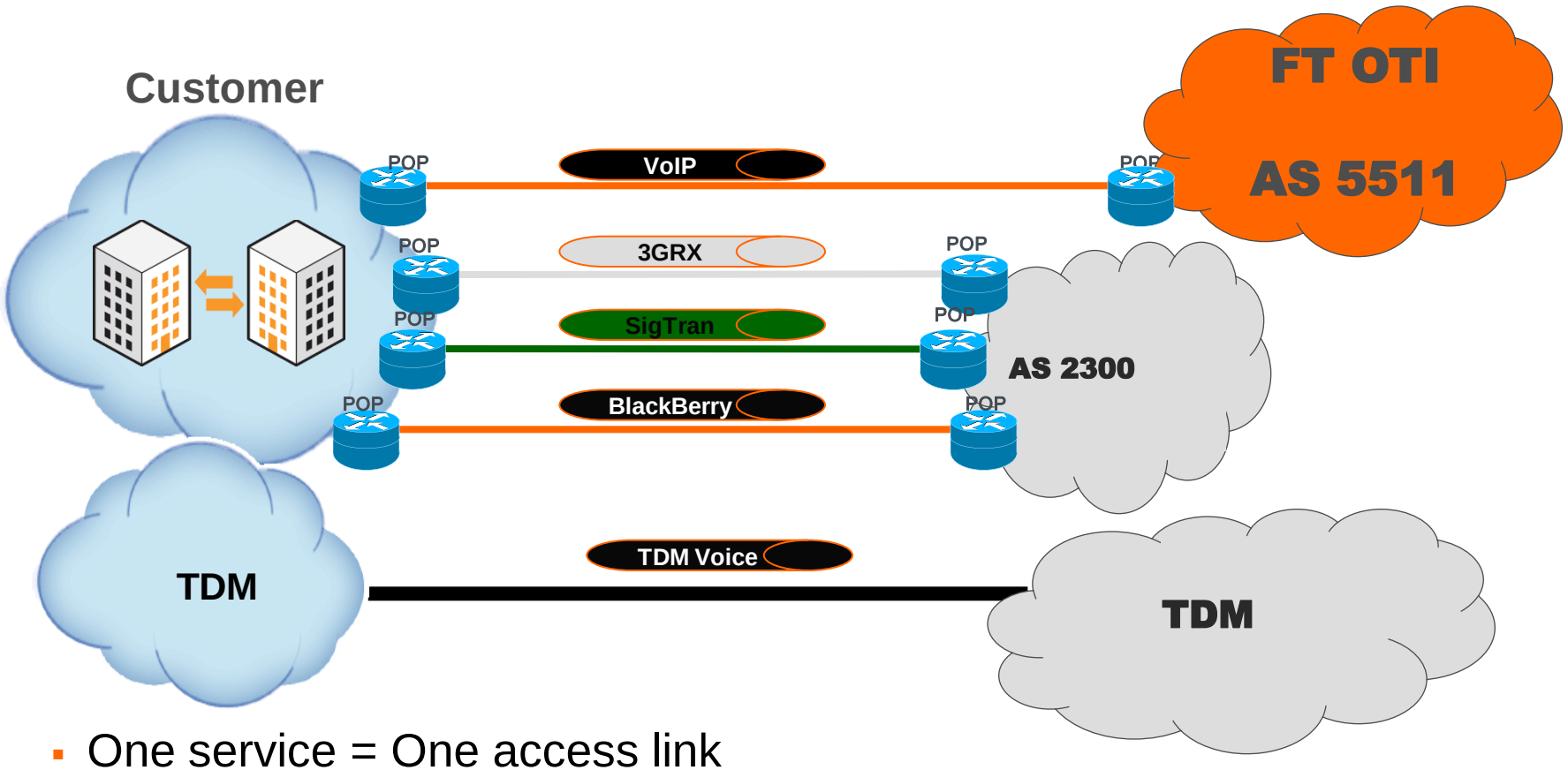
It supports new commercial features (Cascading Of Revenues)

It **Simplifies the connection for Customers** thanks to one single Gateway

While leveraging the flexibility of IP for upgrades of capacity, support of **real time and non real-time** services

Multi accesses

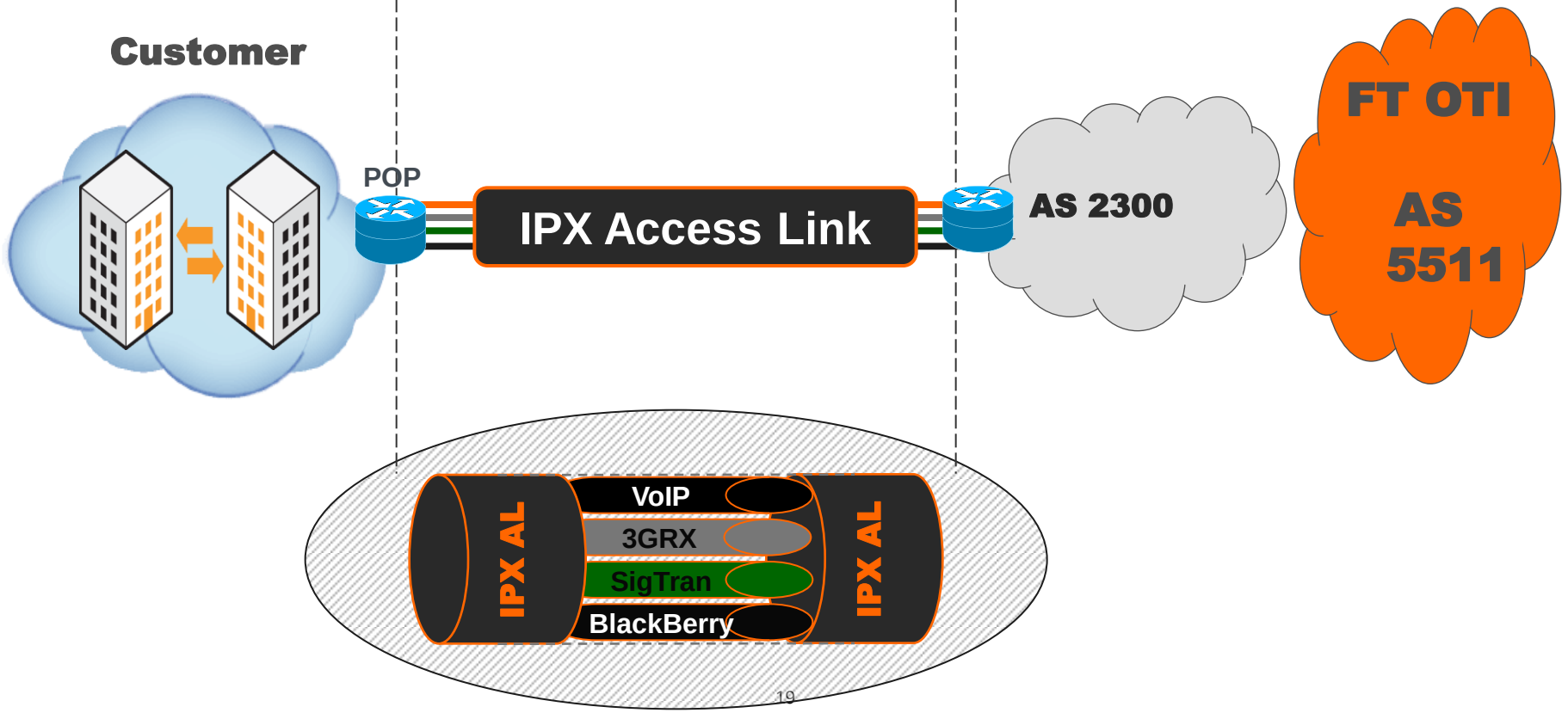
- Current situation



- One service = One access link

Migration to IP, convergence of access and networks

- IC's IPX Convergence on only ONE customer access link
  - Multi-services on one access link
    - Carrying most of Voice and Mobile Data products
  - Independent from access technology
    - Dedicated access link, IP VPN product, IEL product, Frame Relay, ATM, etc.



Challenges for the IP world, brought by old voice world

- Voice will be a major service over IPX at first (revenue wise)
- **Voice is not just an application over IP**
- QoS cascading for voice is much more than IP transport QoS
- Voice will **bend some IP rules**

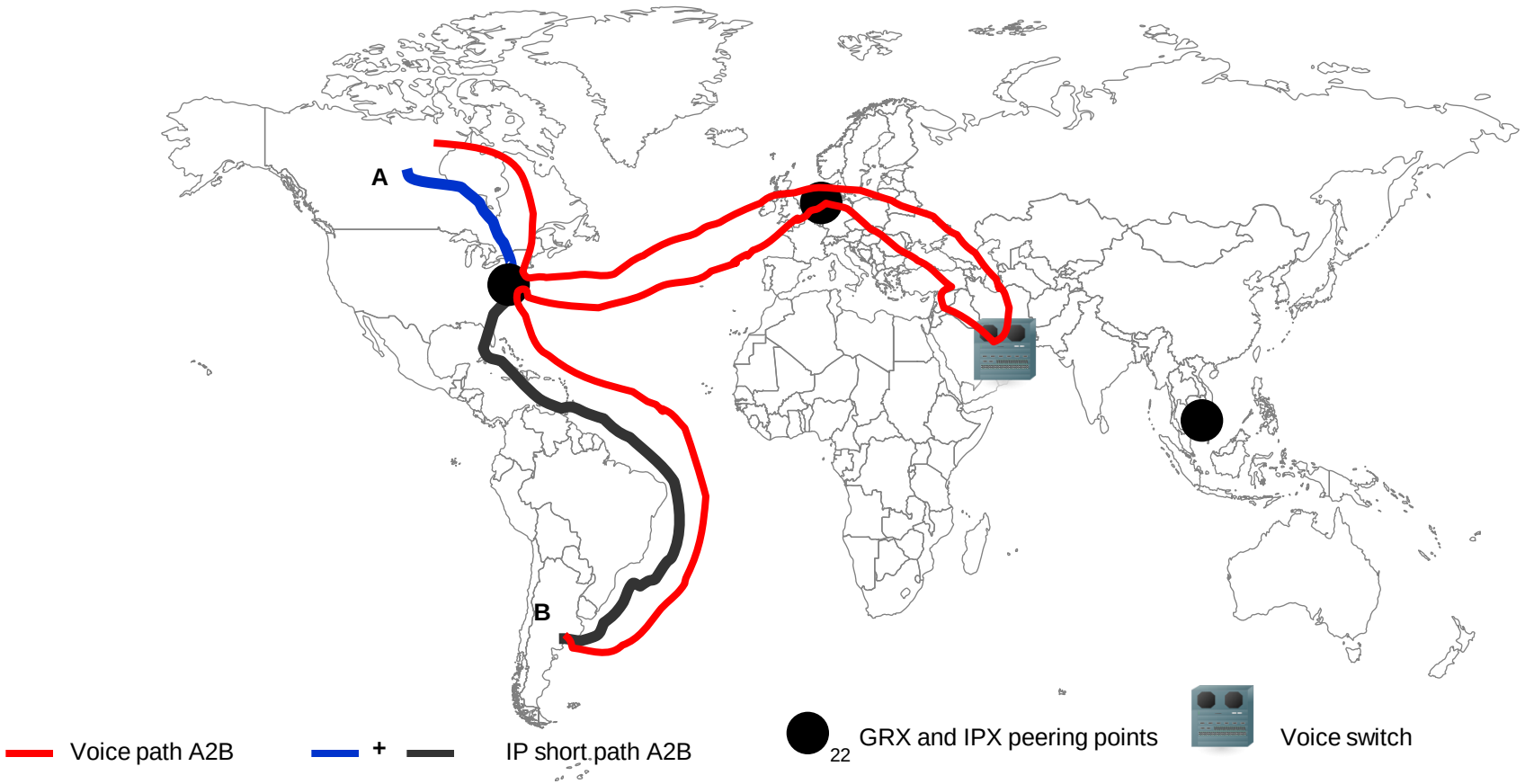
Voice routing and QoS

- The voice routing (path) is driven by QoS **AND BY BUSINESS RULES**
- Several levels of QoS are need for the voice business, not only one top QoS
- **NO Hot Potato routing** in the current voice model
- More than 95% of the international voice still originates or terminates in TDM….
- Voice QoS is very sensitive to transcoding and mouth-to-ear delay

Route quality	+	**Transport quality**	+	**Codecs quality**	+	**Signaling quality**	+	**Security quality**	=	**Interconnection quality**

Focus on Voice routing over IPX

- IPX IP packets will follow standard hot potato routing and will be the shortest path between two points
- The actual Voice packets will follow the voice switched path, which depends on voice equipments locations and business agreements



Some impacts of the Voice business within a multi IPX networks architecture

Limited availability of VoIP destinations in a ramp-up phase

- IPX cannot be an island, to call the world through an IPX connection, the IPX needs to physicaly be connected to other network (Internet and TDM)

IP sessions are broken by voice equipments

- No IP transparency, no way to know which IP@ or AS# originated the packet
- When RTCP is broken, RTD, PL, Jitter cannot be measured end-2-end

Voice call are routed to voice destinations not to networks

- Lack of #portability worldwide means that it is difficult to send a call to the right network, if it is possible in IP

Voice regulation imposes specifics constraints to terminate all calls

- It is difficult to filter IP addresses with white/black lists

Take aways for the IP world

IPX is a promising solution to address the market convergence and QoS needs

Voice will be a cornerstone of the IPX business model

Voice is not just another app over IP

Voice constraints will require to bend the IPX IP rules

Orange and the I3forum are working with GSMA to find pragmatic solutions, and enable a fast and efficient VoIP and IPX take-up

thank you !

www.orange.com/wholesalesolutions

Audience Q&A