i3 Forum
Focus on
Service & Business, Technology and Migration Workstream Activities

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Agenda

▶ **Introduction, basic questions**

▶ **Interconnections models**

▶ **Signaling, Codecs, Security, Ring-back-tone**

▶ **Quality of Service**

▶ **Deliverables**

▶ **Reference for migrating TDM services over IP**

▶ **Next working phase**

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Basic Questions

▶ **Why do I need to promote and facilitate a move to IP?**

- 70 % of the international voice traffic is carried over bilaterals
- Most of high quality retail voice traffic is still transported over TDM.
- Carriers/Operators have begun a progressive phasing out of TDM in favor of IP

▶ **What solutions for building and migrating a TDM link over IP?**

- Solutions capable to address the whole international voice market (e.g. private as well based on public internet) *with a high level of security*
- Solutions capable to guarantee all the services transported over TDM
   - ✓ the standard hubbing voice quality as well as high retail or mobile voice quality.
   - ✓ classic telephony, but also special calling services, ISDN, SS7, Fax, ISUP ..

▶ **How to facilitate the migrations?**

- Efficient forms and procedures for migrating tens, hundreds of interconnections in the most efficient manner (without reinventing the wheel for every single one of them)

▶ **Looking forward?**

- New international IP services (e.g. wideband codec) and QoS guarantees

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Objective of Workstreams

▶ Mission and Vision

All the issues and topics relevant to the definition of a network architecture and interfaces (based on existing standards & recommendations) capable of supporting a number of interconnection models for the implementation of trusted, secure and QoS compliant international IP-based interconnection for the voice international services as well as other multimedia services

accomplishing a guide for selecting the proper standard among multiple alternatives: "*how to put the pieces together*"

▶ Position vs. other existing industry fora/bodies

i3 Forum is NOT a standardization body. Open to liaise with other industry body (e. g. GSMA, IPIA). It makes use of existing standards (from e.g. ITU-T, ETSI TISPAN, IETF, 3GPP) for specifying how to achieve IP-based international interconnections

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"Technical Interconnection Model for International Voice service", Rel. 2.0

▶ **Objective**

To allow a worldwide and unrestrained migration to IP of existing TDM International voice interconnections **selecting**, on the basis of existing standards/recommendations issued by international bodies **a unique network architecture capable to support one (or a limited number of) interconnection model(s) for the implementation of trusted, secure and QoS compliant voice over IP interconnection between International Wholesale Carriers**

Areas Covered

- **Transport protocols/capabilities**
- **Signalling protocols**
  - ✓ **with Sigtran for mobile applications**
  - ✓ **with ISDN support**
- **Media codec schemes**
- **Management of Early Media**

- **QoS parameters**
- **E.164-based addressing schemes**
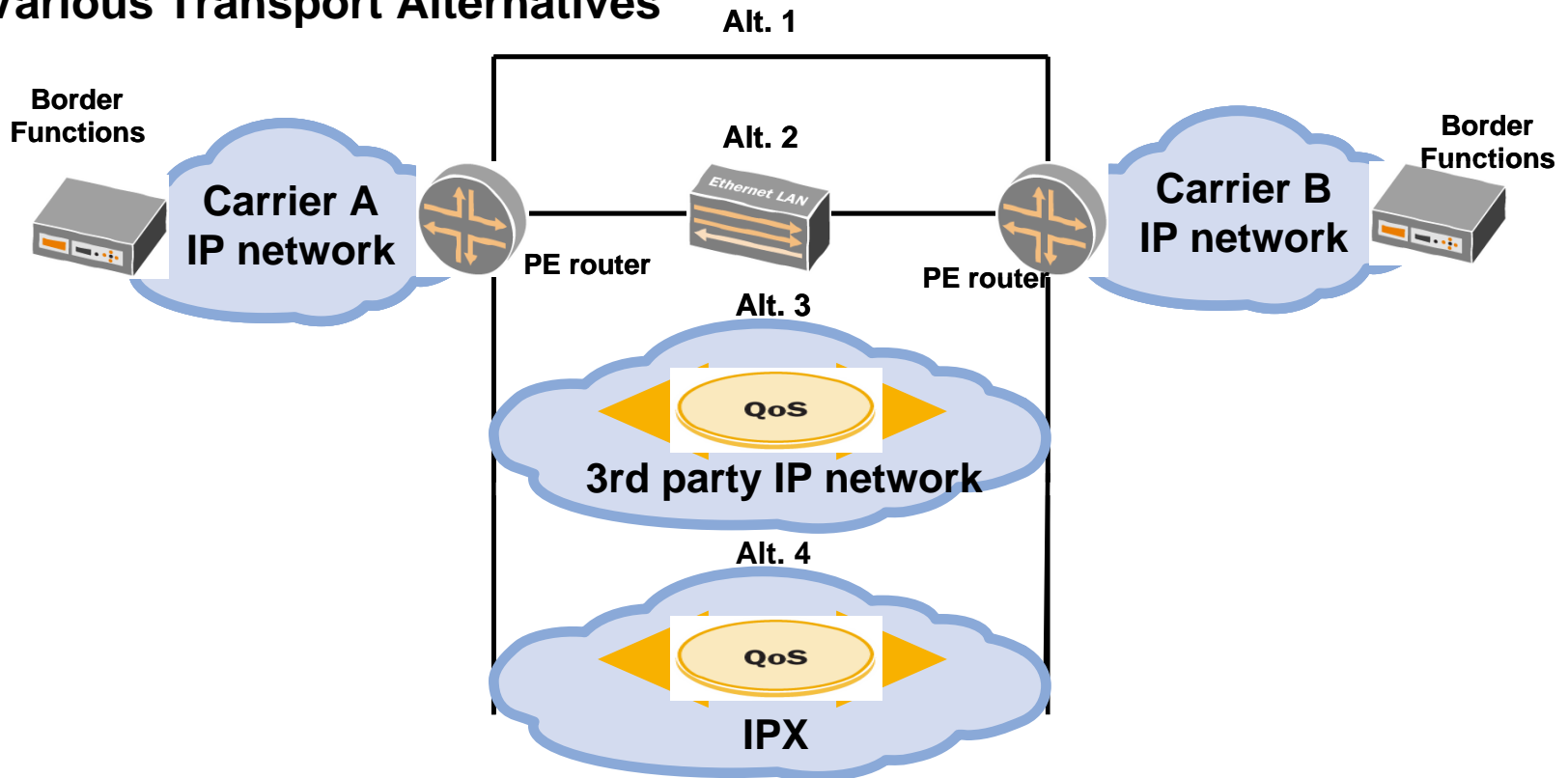- **Security issues**
- **Accounting and Charging issues**

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General Configuration
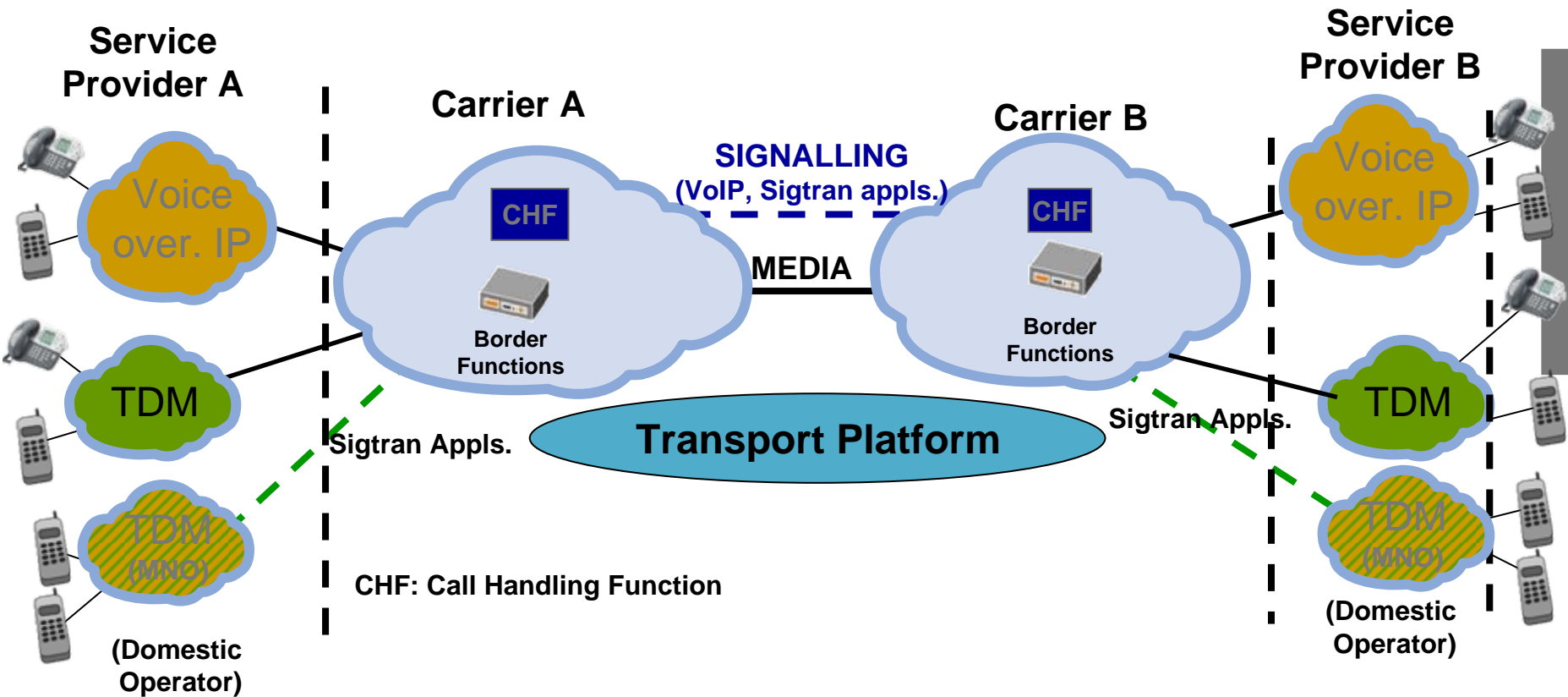
The definition of domestic interconnections (TDM/IP; IP/IP) is out of scope

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Private Interconnection Configurations

▶ **Private-oriented interconnection**: no unidentified third party is able to affect the voice over IP service.

- **Various Transport Alternatives**

Alt. 1

Border Functions

Carrier A IP network

PE router

Alt. 2

Ethernet LAN

PE router

Carrier B IP network

Border Functions

Alt. 3

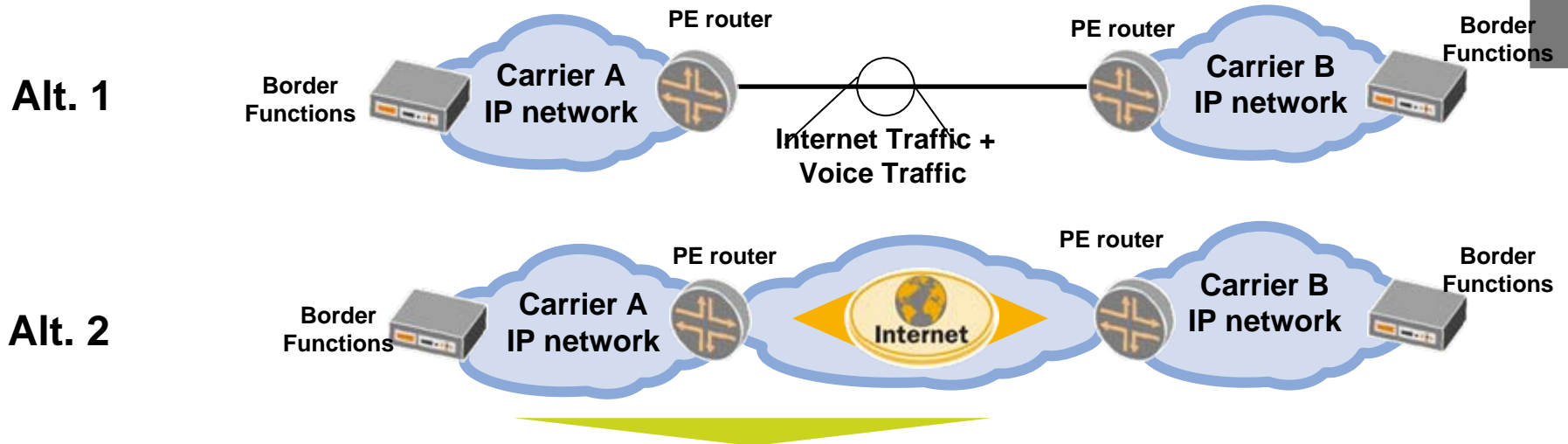QoS

3rd party IP network

Alt. 4

QoS

IPX

Private interconnections can replace existing TDM-based ones and, as a result, guarantee the highest level of quality both in terms of voice call quality, service quality, network availability and network security.

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Public Interconnection Configurations

▶ **Public-oriented interconnection**: when the voice over IP traffic is mixed with other IP traffic coming from the Public Internet, thus allowing the gateways' interfaces to be reached from unidentified third parties which can affect the service performance and quality.

  ■ **Transport Alternatives**:
  - ✓ Alt. 1: Layer 1 / Layer 2 direct interconnection sharing data and voice over IP traffic
  - ✓ Alt. 2: via Public Internet: non direct interconnection

Alt. 1

PE router · PE router · Border Functions · Carrier A IP network · Carrier B IP network · Border Functions · Internet Traffic + Voice Traffic

Alt. 2

PE router · PE router · Border Functions · Carrier A IP network · Internet · Carrier B IP network · Border Functions

This interconnection implies a lower cost (resources shared with other services) and, in general, lower provisioning time

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Joint work i3 Forum / IPIA on Voice over IPX

▶ **Topics being discussed**
- IPX and Voice over IPX definitions
- Basic Requirements
- Scope of IPX interconnection
- Connectivity options
- Signalling protocols
- Charging transparency
- Reachability / Coverage
- Management of some QoS parameter
- Routing transparency
- Break-in / Break-out rules
- Opt-in / Opt-out rules
- Number portability management and Enum resolution

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Signalling Protocols: optimize transition

▶ **Signalling Protocols for Voice services: two protocols selected**

- <u>SIP protocol</u> (IETF RCF 3261): a specific profile has been defined
- <u>SIP-I protocol</u> ISUP enabled SIP profile (ITU-T Q.1912.5 Annex C Profile C), selected also for the support of ISDN services

▶ **Support of Sigtran for Mobile appl.s (SMS, Camel and roaming mobile)**

- SCTP between IP layer and SIGTRAN adaptation layers
- via M2PA or M3UA (the latter when no relaying capability is needed)

Codecs: optimize diversity and quality

▶ **Media Functions ensure transport (with transcoding when needed) for:**

- Voice phone calls using different codecs and DTMF support;
- Fax connections based on T.38 protocol and Modem connections

▶ **Selected codecs**

- Mandatory: G.711 and G.729 family
- A number of optional codecs

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Routing, Addressing and Security issues

▶ **IP Routing, IP Addressing, IP Packet Marking**
  - based on standard IP networking protocols as well as IPv4 addressing scheme.
  - specific markings of the TOS field of the IP packet is recommended

▶ **Security Aspects**
  - *It is strongly recommended that Border Functions be always implemented*, achieving topology hiding and NAT/NAPT translation
  - *Encryption*: for public-oriented interconnection only via IPSec to be applied only to signaling information

▶ **Numbering and Addressing Scheme based on ITU-T E.164 scheme**
  - to be used in either in the Tel-URI or SIP-URI format
  - ENUM application to be examined in the next phase of activity

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Ring-back-tone paradigm

▶ *Early media* is the media information heard before the call is picked-up. In most case it is the *ringing tone,* ring-back-tone (in TDM networks, more than 10% of the invested network infrastructure is (on a permanent basis) occupied for the purpose of transporting ring-back tone).

▶ In full IP, only the signaling of the ring-back-tone is provided. The calling IP operator needs to generate a ring-back-tone locally hence
  ▪ the ring-back-tone is no longer country specific
  ▪ there are no network resources occupied to transport the media;

▶ Analysis carried out for all interconnecting scenarios for "Early Media" information:
  ▪ lack of clarity among standards
  ▪ risk of not sending a ring-back-tone or early media information to the calling customer.

▶ Default i3forum guideline: *to send ringing signaling information only to IP calling carriers and forward (generating if needed) a local ring-back-tone to TDM calling carriers.*

▶ The guarantee of providing or transporting transparently the ring-back tone and other early media information in voice over IP will need to be commercially agreed.

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Quality of Service parameters: myth versus reality

▶ **Scope**

  ▪ **Service Provider <-> Carrier relationship**

  ▪ **Carrier <-> Carrier relationship**

▶ **Identification and relevant definition**

_Transmission/IP parameters__:_
✓RTP round-trip delay
✓RTP jitter
✓RTP packet loss

Network parameters
✓MOS_{CQE} / R-Factor
✓ALOC
✓ASR
✓NER
✓PGRD

Call Attributes
✓CLI Transparency
✓One Way Speech

▶ **Purpose**

  ▪ Monitoring (supervision) against given thresholds and Troubleshooting

  ▪ Help choosing and measuring parameters that can form part of SLA subject to commercial agreements

    ✓ Indicators for potential QoS guarantees : RTD, Jitter, PL, NER, PGRD, CLI, one way speech

    ✓ Indicators for reporting and quality management only: MOS, ALOC, ASR

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Quality of Service parameters

Reference Model for QoS
for Service Provider <-> Carrier relationship
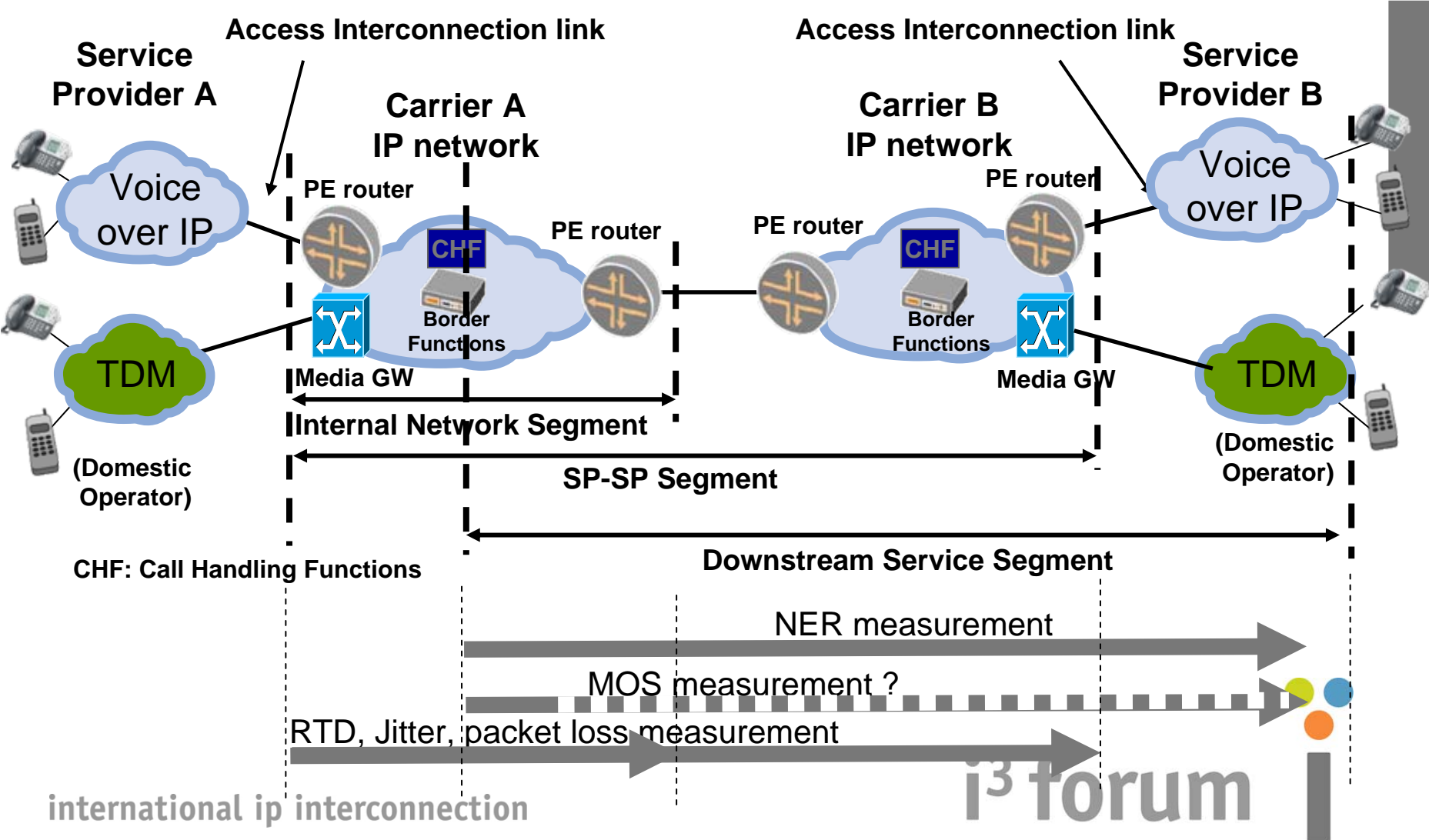
"Interoperability Test Plan for International Voice service", Rel. 2.0: Bringing simplicity and efficiency

▶ **Objective: to provide testing guidance to guarantee**
  - ▪ **signaling compatibility**
  - ▪ **quality and performance levels that meet customer quality expectations**.

▶ **covering**
  - ▪ the test approach, specific functionality, assumptions;
  - ▪ test cases (in both directions) to be performed for the pre-service inter-operability

▶ **by means of**
  - ▪ capturing and recording call traces for each of the test call scenarios
  - ▪ collecting and exchange CDRs for the test calls for billing verification.

▶ **Out of scope of the document**
  - ▪ how the call traces and Call Detail Records are captured
  - ▪ what equipment is used to capture call traces and CDR

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White Paper "Optimal codec selection in international IP-based voice networks" Rel. 1.0

▶ **Scope**

- codec basics and engineering;
- MOS_{CQE} / R- factor / E-model
- quality planning basics and the significance of proper codec choice

▶ **Objective**

- **to assist engineers in selecting correct codec in different IP interconnect configurations**
- **to predict IP based voice interconnect configurations which will have unacceptable voice quality degradation signaling compatibility**.

▶ **By means of**

- Methodology, spreadsheets and a calculation template useful to evaluate codec choice(s) for specific network configuration

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White Paper "Mapping of Signalling Protocols ISUP to/from SIP, SIP-I " Rel. 2.0

▶ **Scope**

- ▪ signalling interworking issues converting form TDM (ISUP) to IP (SIP, SIP-I)

▶ **Objective**

- ▪ **informative, outlining to the carrier industry that inconsistencies do exist under some conditions and may lead to undesired network behaviour**

▶ **Covered Interworking Issues (analysis based on ITU-T, IETF, 3GPP standards)**

- ▪ Messages mapping
- ▪ Parameter mapping
- ▪ Disconnect causes and response codes mapping

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"Interconnection Form for International Voice Services", Rel. 2.0

▶ **Objective**

  ▪ **To provide a form that International Wholesale Carriers can use to exchange interconnect information and speed up the whole process.**

Details Covered

- **IP interconnect model**
- **Signalling protocols**
- **Media parameters**
  - ✓ **Codecs**
  - ✓ **Fax**
  - ✓ **DTMF**

- **Numbering format**
- **Capacity**
- **Security**
- **Platform information**

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Implementing TDM services in IP

TDM Service	Signaling Protocol	Codec
TDM Voice	SIP or SIP-I	Can use many different codecs but to avoid transcoding loss G.711 is preferred
TDM Data (modem)	SIP or SIP-I	G.711
TDM Fax	SIP or SIP-I	G.711 or T.38
ISDN Voice (including ISDN supplementary services)	SIP-I	G.711
ISDN Data	SIP-I	G.711 64 kbit/s unrestricted RFC 4040
ISDN Video	SIP-I	G.711 64 kbit/s unrestricted RFC 4040
DTMF Tones	SIP or SIP-I	G.711 RFC 2833
Ring-back-tone and other early media	Unless otherwise commercially agreed: send ringing signaling information only to IP calling carriers and forward or create a local ring-back-tone to TDM calling carriers.	
SMS/Roaming Signalling/Camel	SIGTRAN	
Other Special international voice services such as: International Freephone and Universal International Freephone (E.152), Country Direct (E.153) and others…	As for TDM Voice/Data/Fax but reverse charged. Identified through B-Numbers.	

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New Activities for next working phase (Sept.'09 – May '10)

▶ **Enhancements to existing deliverables for:**
- ■ Signalling and ISDN supplementary services support
- ■ Media (wideband codec, T.38 communication, management of transcoding)
- ■ QoS (including how to exchange QoS data)

▶ **Operational processes related to Voice over IP and migrations**
- ■ Troubleshooting
- ■ Ticketing system information needs
- ■ Migration processes and resources

▶ **New deliverables on architectures and service models for routing and addressing services (such as ENUM)**
- ■ Addressing the definition of services and models
- ■ Addressing architectures and relevant interfaces between information databases

▶ **And beyond voice:**
- ■ Telepresence, RCS..

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List of Deliverables; available at www.i3forum.org

▶ **Enhancing 2008 Deliverables**

- *"Technical Interconnection Model for International Voice Services", Rel. 2.0*

- *"Interoperability Test Plan for International Voice service", Rel. 2.0*

- *"Interconnection Form for International Voice Services", Rel. 2.0*

▶ **New 2009 Deliverables**

- *"IP international interconnections for voice and other related services", Rel 1.0*

- *White Paper "Optimal Codec Selection in International IP based Voice Network", Rel. 1.0*

- *White Paper "Mapping of Signalling Protocols ISUP to/from SIP, SIP-I", Rel. 1.0*

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