

# *The Technical Interconnect Model for IP-based voice services*

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I3 Forum, 1st Technical Workshop  
Warsaw, June 15th – 16th 2010  
Ver. 1 (2010-6-02)

international ip interconnection



# “Technical Interconnection Model for Int. Voice service”, Rel. 3.0 (May 2010)

## ▶ Objective

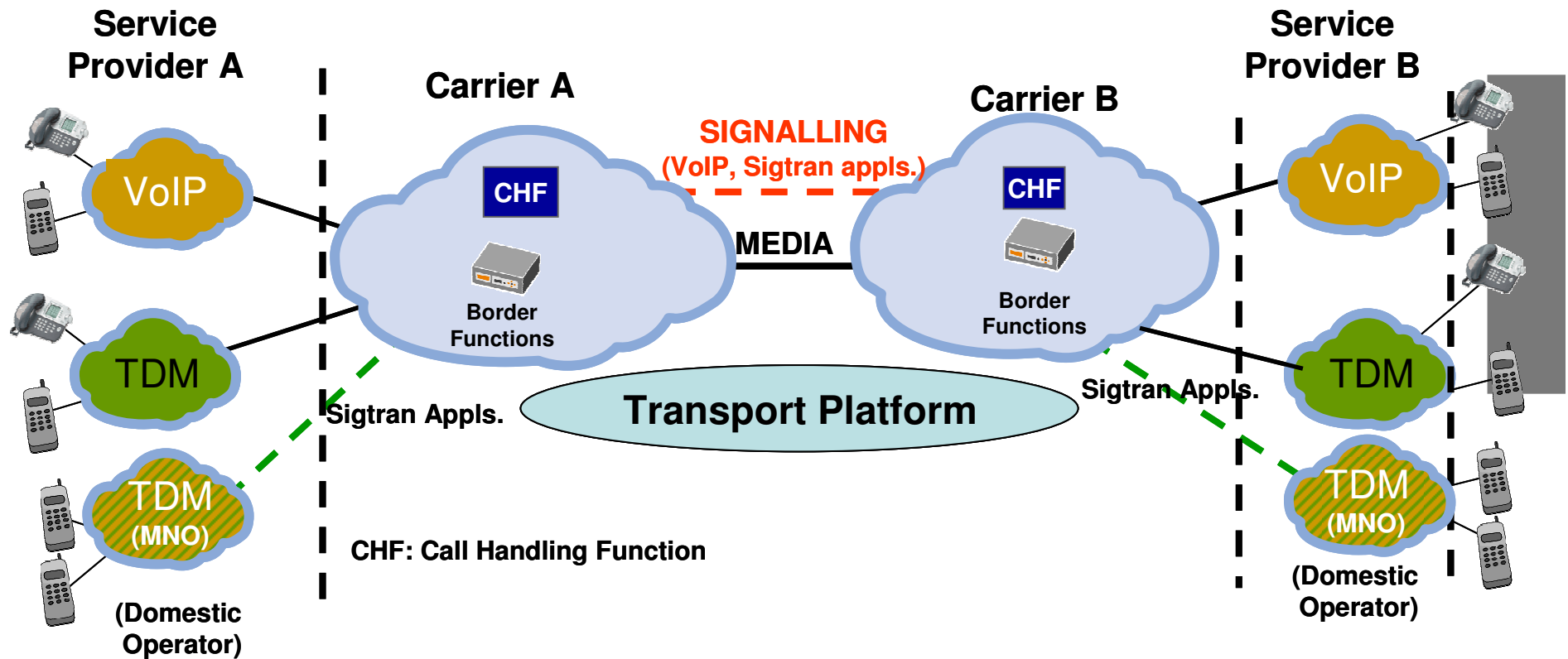
To technically allow a worldwide and unrestrained migration to IP of existing TDM International voice interconnections selecting, on the basis of existing standards/recommendations issued by international bodies, a unique network architecture capable to support one (or a limited number of) interconnection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

## Areas Covered

- ▶ Interconnection configurations
- ▶ IP 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

# General Reference Configuration

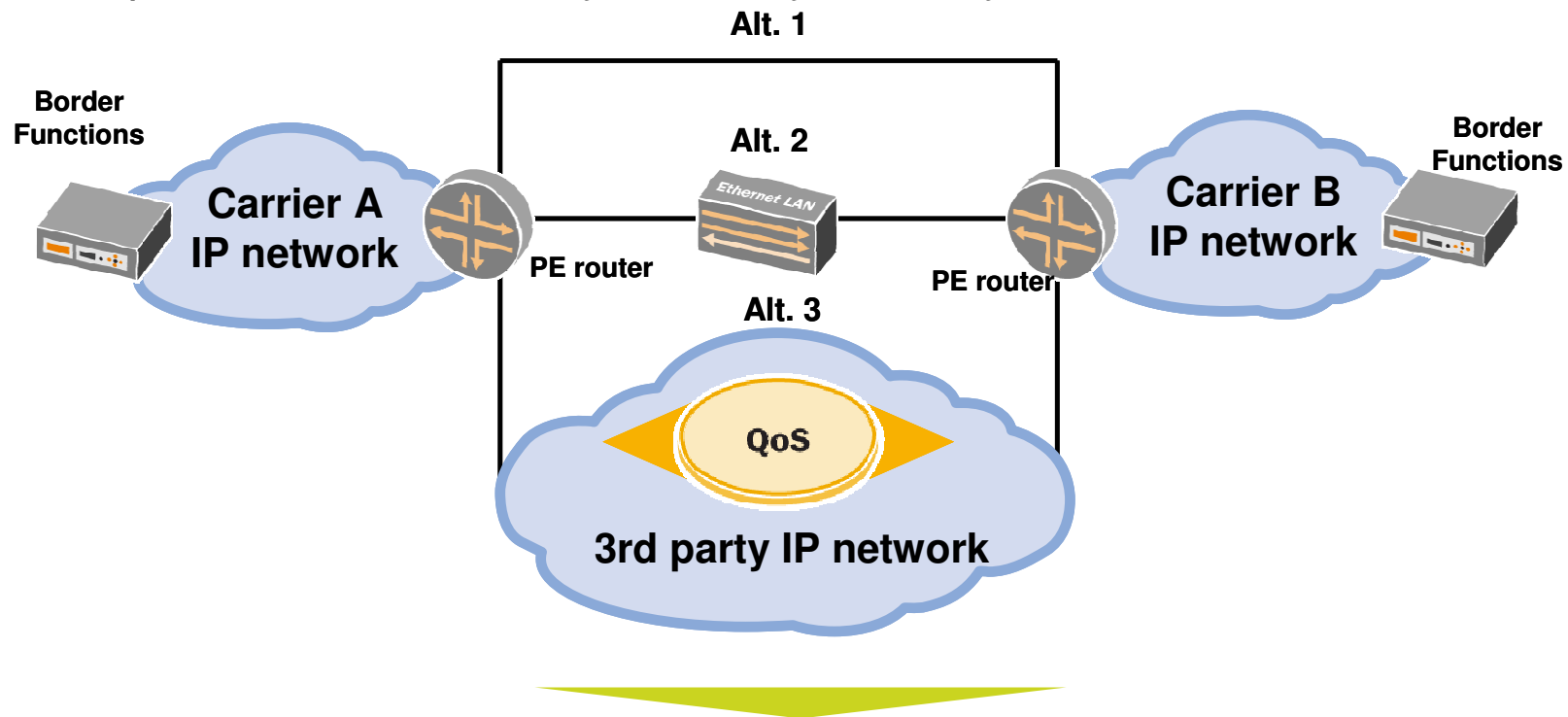


The definition of domestic interconnections (TDM/IP; IP/IP) is out of scope

# Private Interconnection Configurations

## ► Private-oriented interconnection

- ✓ no unidentified third party is able to affect the VoIP service
- ✓ Transport Alternatives at Layer 1 / Layer 2 / Layer 3

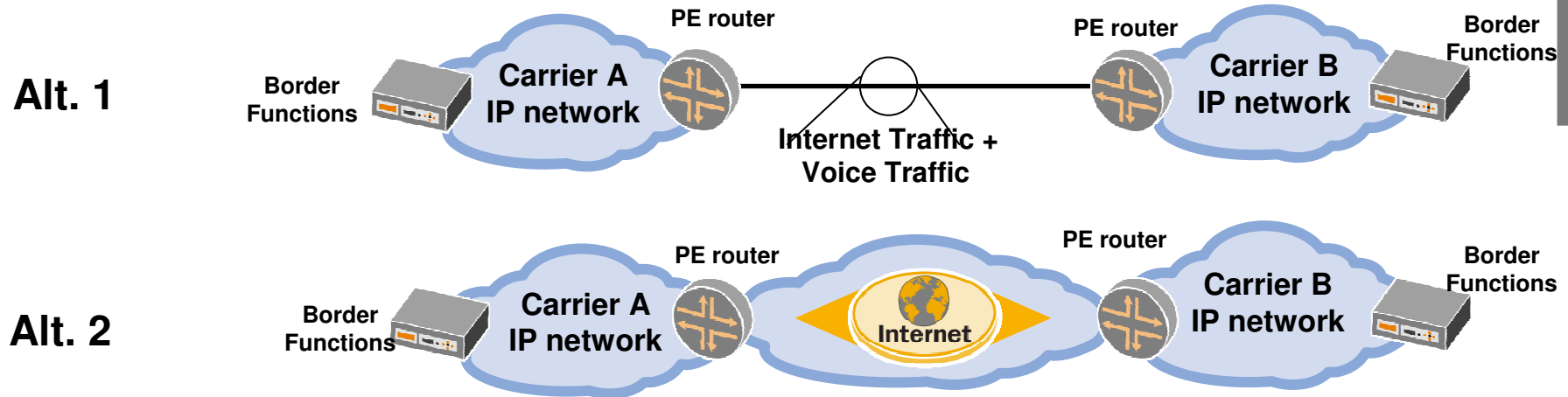


Private interconnections can replace existing TDM-based ones guaranteeing the highest level of quality both in terms of voice call quality, service quality, network availability and network security.

# Public Interconnection Configurations

## ► Public-oriented interconnection

- ✓ when the VoIP traffic is mixed with other IP traffic coming from the Public Internet, thus allowing the gateways' interfaces to be reached from unidentified third parties. VPN IP Sec encryption required for signalling
- ✓ Transport Alternatives:
  - Alt. 1: Layer 1 / Layer 2 direct interconnection sharing data and VoIP traffic
  - Alt. 2: via Public Internet: non direct interconnection



Public interconnections imply lower cost (resources shared with other services) and, in general, lower provisioning time

# Signalling Protocols

- ▶ **Signalling Protocols for Voice services: 2 protocols selected**
  - ✓ SIP protocol (IETF RFC 3261): a specific profile has been defined
  - ✓ SIP-I protocol 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)
- ▶ **Mapping of ISUP RC  $\leftrightarrow$  SIP, SIP-I**
  - ✓ Lack of convergence among ITU Q.1912.5, IETF RFC3398, 3GPP TS 29.163
  - ✓ Impact on routing and QoS (NER) control
  - ✓ Adoption of Reason Header as temporary and partial fix

Need to achieve asap a converged, unique mapping among all interested bodies

# Media Codecs

## ▶ Selected Narrow-band codecs

Group 1. Mandatory Narrow Band codecs	Group 2. Optional
G.711 A-law, $\mu$ -law 64 kbit/s	G.723.1 (quality impairments have to be considered using this codec)
G.729, G.729a, G.729b, G.729ab 8kbit/s	G.726
	AMR-NB

## ▶ Selected Wide-band codecs

Group 1. Mandatory Wideband codecs	Group 2. Optional Wideband codecs
G.722 (generally used by fixed network operators)	
AMR-WB (generally used by mobile network operators)	

## ▶ Selected Low bit rate codecs

Group 1. Mandatory LBR codecs	Group 2. Optional LBR codecs
G.729a with VAD/DTX	AMR-NB with VAD/DTX

## ▶ Selected Fax, Modem codecs

- ✓ Fax: G.711 and T.38
- ✓ Modem: G.711

# IP Routing, Numbering and Addressing

## ▶ IP Routing, IP Addressing, IP Packet Marking

- ✓ based on standard IP networking protocols as well as IPv4 addressing scheme
  - Dynamic BGP or static routing can be used
- ✓ specific markings of the TOS field of the IP packet is recommended

## ▶ Numbering and Addressing Scheme based on ITU-T E.164

- ✓ to be used in either in the Tel-URI or SIP-URI format
- ✓ alternative routing and addressing scheme dealt with in the document
- ✓ *“White Paper on Techniques for Carriers’ Advanced Routing and Addressing Schemes, Rel. 1 , May 2010”*

# Management of Early Media information

## ▶ Interconnecting scenarios for “Early Media” information

- ✓ Analysis carried out for all encompasses announcement, ringback tones, in general, any type of media different than user-to user communication



# Security issues

## ▶ **Border Functions (e.g. Session Border Controller)**

- ✓ It is strongly recommended that Border Functions be always implemented, achieving topology hiding and NAT/NAPT translation

## ▶ **Security Features and Capabilities**

- ✓ Topology hiding and NAT/NAPT translation
- ✓ Encryption for public-oriented interconnection only via IPSec to be applied only to signaling information
- ✓ Source authentication
- ✓ Access Control List via router
- ✓ Traffic Policer
- ✓ Deep Packet Inspection
- ✓ Media Traffic Filtering
- ✓ Internet control message protocol packet suppression

# Quality of Service parameters

## ▶ Scope

- ✓ Service Provider <-> Carrier relationship
- ✓ Carrier <-> Carrier relationship

## ▶ Identification and relevant definition

### Transmission/IP parameters:

- ✓ RTP round-trip delay
- ✓ RTP jitter
- ✓ RTP packet loss

### Service parameters

- ✓ MOS<sub>CQE</sub> / R-Factor
- ✓ ALOC
- ✓ ASR
- ✓ NER
- ✓ PGRD

- ✓ CLI transparency not considered a KPI however, it is strongly recommended that international carriers will pass on CLI unaltered.

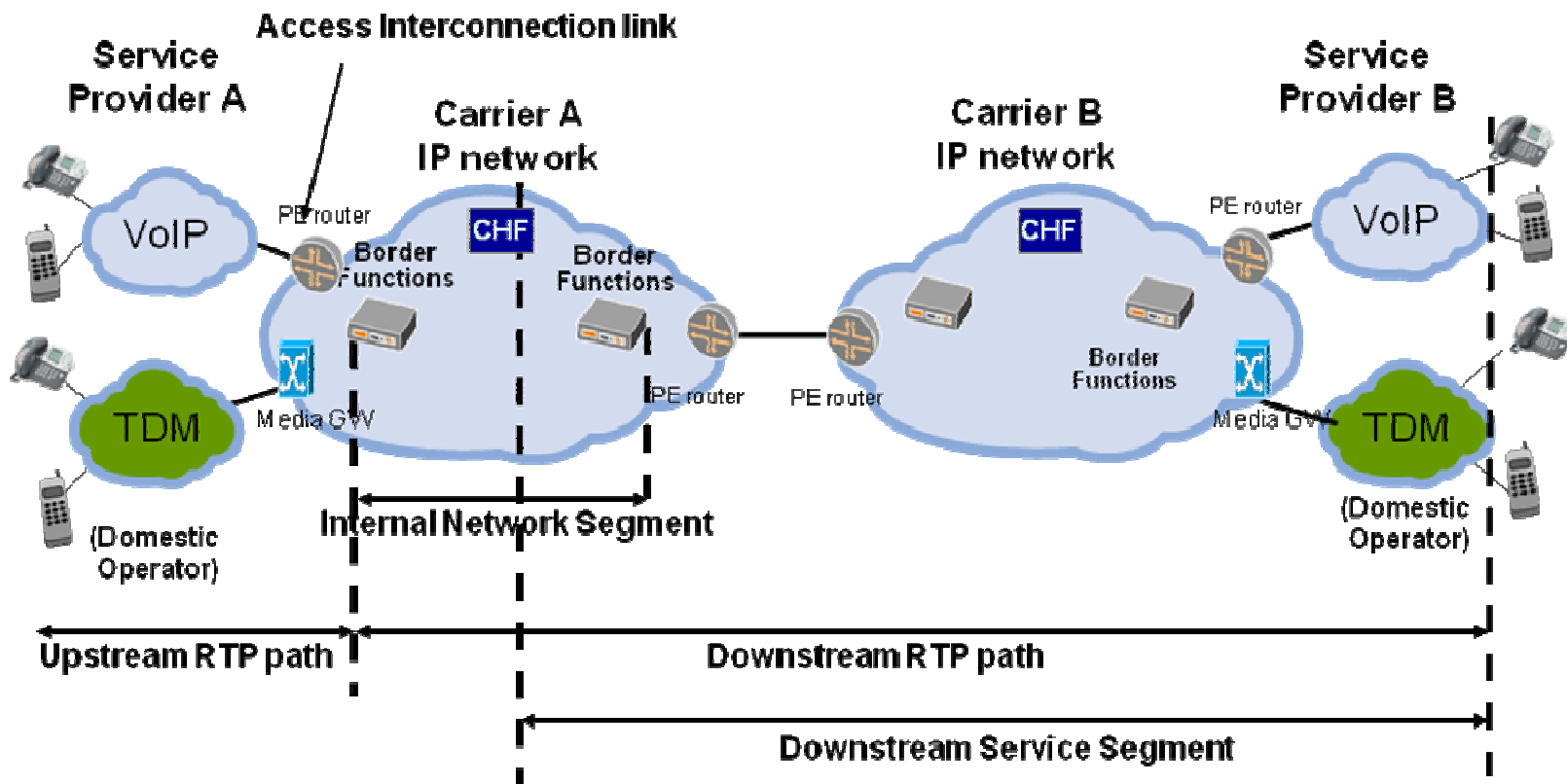
## ▶ Purpose

- ✓ Monitoring (supervision) against given thresholds
- ✓ Troubleshooting
- ✓ Service Level Agreement (SLA) and Quality of Service reporting



# Quality of Service Control

## Reference Configuration for QoS for Service Provider <-> Carrier relationship



**CHF: Call Handling Functions**

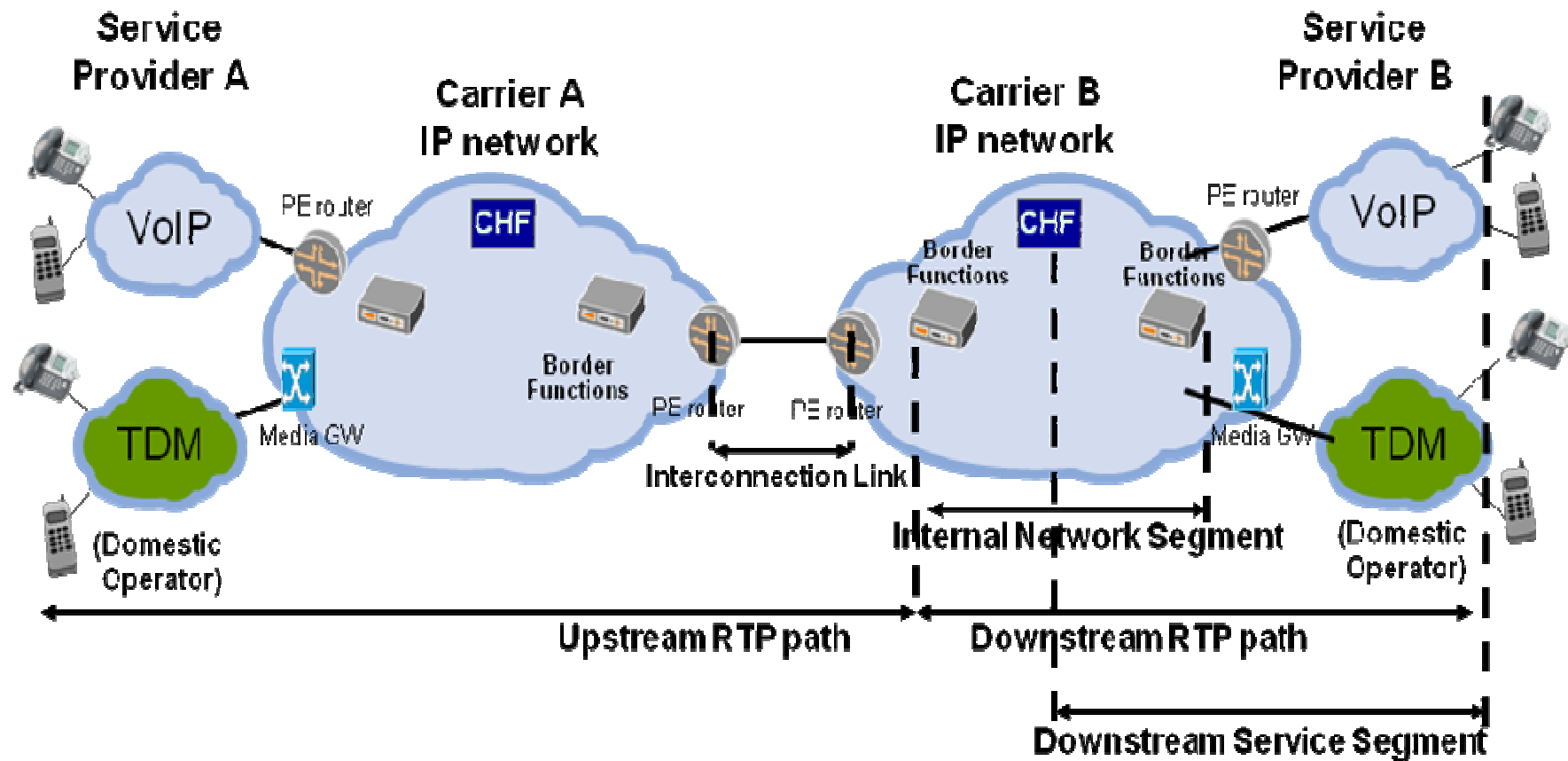
Note: it is possible that more than two Carriers can be involved in the Service Provider-to-Service Provider communication.

If more than two Carriers are involved, Carrier B is meant to be the last in the path,

i.e. the Carrier interconnecting to Service Provider B. Consequently, Carrier A and Carrier B may not have a direct relationship.

# Quality of Service Control

## Reference Configuration for QoS for Carrier <-> Carrier relationship



CHF: Call Handling Functions  
CBF: Call Border Functions

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# Quality of Service Control

## ▶ Two main alternatives for performing QoS control

- ✓ via Border Functions (on real traffic, along the real RTP path)
- ✓ via Router / external probe (via fake traffic, along a path different than the RTP ones)

i3 Forum selected the Border Functions approach since it provides more correct data

## ▶ under the following conditions

- ✓ RTCP flow has to be enabled in the downstream networks
- ✓ No IP  $\leftrightarrow$  TDM conversion has to take place
- ✓ Border Function might not be co-located with the PE router -> identifying an internal network segment shorter than the real carrier's network domain

## ▶ Other specified topics

- ✓ Measurement points
- ✓ KPI computation for SLA / QoS reporting
- ✓ Exchange of QoS Data in "*Service Value and Process of Measuring QoS KPIs*" Rel. 1.0, May 2010" from WS "Service Requirements"

# Accounting/Charging

## ▶ General Principles

- ✓ The information flow to be exchanged from the transport and switching platforms with the relevant OSS/BSS systems is out of scope
- ✓ The information in the CDR shall support settlement and performance.
- ✓ The format of the CDR and the collecting method is out of scope.
- ✓ Since calls may be originated or terminated in TDM or VoIP network, the CDR shall support data attributes for these two types of calls and services.



The minimum set of information to be recorded in CDR are specified

# List of i3f WS “Technical Aspects” Deliverables

Delivered in May 2010:

- 1) **Technical Interconnection Model for International Voice Services (Rel. 3)**
- 2) **White Paper on Optimal Codec Selection in International IP based Voice Networks (Rel. 2).**
- 3) **White Paper on Mapping Signalling Protocols ISUP to/from SIP, SIP-I (Rel.2)**
- 4) **White Paper on Techniques for Carriers’ Advanced Routing and Addressing Schemes (Rel. 1)**

jointly with WS “Operations”

- 5) **Interoperability Test Plan for International Voice services (Rel. 3)**

To be delivered

- 6) **Technical Specification for Fax Over IP service (Rel. 1) (in Oct. '10)**

Advanced Drafting Status

- 7) **Technical Specification for Voice over IPX service (Rel. 1)**