

## IP interconnect interface for SIP/SIP-I

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## 0 DOCUMENT HISTORY

Revision	Date	Amendments
1.0	2013-12-16	New document
2.0	2014-03-24	New version/Hans Ahlsmo
3.0	2014-06-13	Small update and separate IP addresses used for signalling and media./Hans Ahlsmo
4.0	2015-11-02	MD5 password made optional/Hans Ahlsmo
5.0	2017-03-16	TeliaSonera logo changed to Telia Operator Business./Hans Ahlsmo&Stefan Tjernell
6.0	2018-10-23	TeliaSonera logo changed to Telia Wholesale. REQ7 and 9 changed. /Hans Ahlsmo&Stefan Tjernell

## 1 SCOPE

This specification is to be used between a national fixed or mobile operator in Sweden using SIP/IP or SIP-I/IP interconnects towards Telia fixed network (PSTN). Both originating/terminating and transit call scenarios are supported based on ref. [1, 2 and 3]. The signalling and media information is transported using IP network.

The requirements are defined using following principles/meaning:

- (M) Mandatory requirement
- (R) Nice to have requirement
- (O) Optional requirement

## 2 REFERENCES

Documents referred to in this specification are listed below:

[1]	8211-A353 SIP-I signalling interface for Sweden
[2]	8211-A354 Media interconnect interface for SIP/SIP-I
[3]	8211-A356 Address formats for Swedish national SIP/SIP-I interconnection
[4] Mandatory and recommended IETF RFCs	RFC 768: (M) UDP RFC 791: (M) IP RFC 792: (M) ICMP RFC 793: (M) TCP RFC 826: (M) An Ethernet Address Resolution Protocol RFC 894: (M) A Standard for the Transmission of IP Datagrams over Ethernet Networks RFC 1042: (M) A Standard for the Transmission of IP Datagrams

	over IEEE 802 Networks RFC 2474: (M) Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers (updated by 3168 and 3260) RFC 2475: (M) An Architecture for Differentiated Services (updated by 3260) RFC 2597: (M) Assured Forwarding PHB Group RFC 2598: (M) Expedited Forwarding PHB RFC 3140: (M) Per Hop Behaviour Identification Codes RFC 5080: (R) Bidirectional Forwarding Detection (BFD) RFC 5081: (R) Bidirectional Forwarding Detection (BFD) for IPv4 and IPv6 (Single Hop) BGP - RFC 4271: (M) A Border Gateway Protocol 4 (BGP-4) RFC 4277: (M) Experience with the BGP-4 Protocol
[5] Mandatory and recommended IEEE specifications	802.3ae (R) 10 Gigabit Ethernet over optical fibre 802.3z (M) 1000BASE-LX Gigabit Ethernet over optical fibre 802.2 (M) Logical Link Control 802.1q (M) Virtual Bridged Local Area Networks
[6] Regulatory req.	LEK: Lag (2003:389) om elektronisk kommunikation
[7]	8211-A357 SIP signalling interface for Sweden

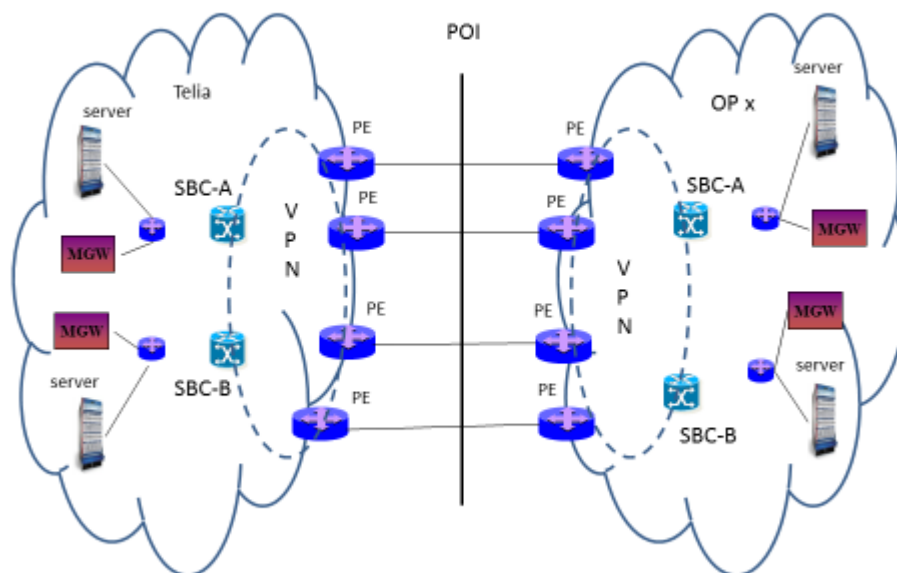
### 3 DEFINITIONS/ACRONYMS

AS	Autonomous System
ASBR	AS Border Router
BFD	Bidirectional Forwarding Detection
BGP	Border Gateway Protocol
BW	Bandwidth
DSCP	Differentiated Services Control Point
E-BGP	External BGP
FQDN	Fully Qualified Domain Name
ICMP	Internet Control Message Protocol
IPDV	IP Delay
IPLR	IP Loss Rate
IPP	IP precedence bits
IPTD	IP Transfer Delay
LAN	Local Area Network
MD5	Message Digest 5
MED	Multi-Exit Discriminator
MPLS	Multi-Protocol Label Switching
MTU	Maximum Transfer Unit
NSF	Non-Stop Forwarding
NSR	NSF Router
PE	Provider Edge
POI	Point Of Interconnect – This is a physical interface which means that the Operator fibre is terminated in Telia ODF.
RD	Route Distinguisher
RT	Route Target
RTP	Real-Time Protocol

SBC	Session Border Controller
SIP	Session Initiation Protocol
SIP-I	Encapsulated ISUP in SIP
SMF	Single Mode Fibre
TCP	Transport Control Protocol
UDP	User Datagram Protocol
VLAN	Virtual LAN
VPN	Virtual Private Network
VRF	VPN Routing and Forwarding instance

## 4 IP INTERCONNECT SPECIFICATION

The IP interconnect (POI) is based on direct physical cables between PE routers in the other operator network and PE routers in the Telia network. It is preferred to have geographical redundant links to achieve high availability. The signalling and media information from/to the PE router is then routed in a secure network (typically L3 VPN) to the corresponding SBC (optional) or Telephony network where the call is terminated. The POI is described in the following figure:



The figure shows an example of a SIP/IP or SIP-I/IP interconnects between Telia and Operator X. The design/implementation could be different compared to the figure.

### 4.1 Physical connection

The following physical connection alternatives shall apply:

1 Gbit/s optical fibre (SMF) link according to 1000BASE-LX IEEE 802.3z.	REQ 01
10 Gbits/s optical fibre (SMF) link according to IEEE 802.3ae.	REQ 02

Depending on the distance between the PE routers 10GBASE-LR, 10GBASE-ER or 10GBASE-ZR optics may be used.	
In both cases the physical connection shall be based on: <ul style="list-style-type: none"> <li>a) Network Sales Operatörsförbindelse.</li> <li>b) Skanova Fibre 2009 (SMF) according to ITU-T G.652.</li> <li>c) Fibre pairs in an Operator trunk.</li> </ul>	REQ 03
The IP interconnect (POI) shall be based on direct physical cables between PE routers in the other operator network and PE routers in the Telia network.	REQ 04
It is preferred (option) to have geographical redundant links to achieve high availability.	REQ 05

## 4.2 IP interface specification

The following shall apply for the IP interface specification in the PE router:

Telia will use a unique VRF defined per operator.	REQ 06
The IP interface in the PE shall use the following parameter values: <ul style="list-style-type: none"> <li>a) IP addresses using IPv4 standard specified in RFC 791.</li> <li>b) IP addresses at the peering link is recommended to use public IP addresses if possible but private IP addresses will be accepted after agreement with TELIA.</li> <li>c) The peering connection owner shall provide IP addresses.</li> <li>d) Subnet /31 is recommended to be used if possible (Option) for the peering links.</li> <li>e) The MTU size shall be <math>\leq 1500</math> bytes.</li> <li>f) Required BW capacity shall be based on telephony traffic volumes.</li> <li>g) If BW capacity (or rate limit) is exceeded the overflow packets shall be dropped.</li> <li>h) IP packets shall not be reordered or fragmented.</li> <li>i) BFD should be used on the IP link (Optional but preferred if used mutually) with the preferred settings interval 300 min_rx 300 multiplier 3.</li> <li>j) If BFD is used no BFD echo shall be sent.</li> <li>k) ICMP (PING) messages shall be allowed in the IP network between the PE routers but will not be allowed in the Telia SBC.</li> <li>l) Traceroute messages shall be allowed in the IP network all the way except last hop to the SBC.</li> <li>m) Multicast traffic shall not be supported.</li> <li>n) Incoming DSCP value will be trusted and shall have the correct QoS marking (defined by each operator).</li> <li>o) Remarking of DSCP in packets from/to the other operator will be made in the Telia SBC.</li> </ul>	REQ 07

### 4.2.1 Ethernet specification

<ul style="list-style-type: none"> <li>• Ethernet specification (frame according to Ethernet II) according to IEEE 802.3 with 802.2 headers.</li> </ul>	REQ 08
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## 4.2.2 Other IP addresses

SBC shall use public IP addresses (IP address have to be unique to be able to monitor the connection).	REQ 09
IP addresses for SBC, FQDN, RTP and SIP/SIP-I shall be provided by each party.	REQ 10
FQDN is not used for routing and public IP addresses are used instead.	REQ 11
One IP-address is used on the Telia side for SIP/SIP-I signalling. One IP-address (other than used for SIP/SIP-I) is used on the Telia side for RTP.	REQ 12
IPv6 Addresses are not supported.	REQ 13
DNS is not used for translation of FQDNs to IP addresses.	REQ 14

## 4.3 Routing protocols

The following routing protocols and options shall be used:

<ul style="list-style-type: none"> <li>a) E-BGP according to BGPv4: RFC 4271 shall be supported and required extensions.</li> <li>b) E-BGP shall be used between ASBR without MPLS and using Inter-AS option A.</li> <li>c) E-BGP graceful restart, NSF or NSR shall not be used.</li> <li>d) E-BGP communities shall be used with local significance.</li> <li>e) E-BGP MD5 password is optional to be used between ASBR.</li> <li>f) timers (default)</li> </ul>	REQ 15
<p>Hot Potato routing according to RFC 4277: Where traffic flows between a pair of destinations, each is connected to two transit networks, each of the transit networks has the choice of sending the traffic to the peering closest to another transit provider. Hot potato routing/Closest exit routing is accomplished by not passing the EBGp-learned MED into the IBGP. This minimizes transit traffic for the provider routing the traffic.</p> <p>The traffic will be routed internally (own network) using lowest cost/shortest path and then routed to the closest ASBR where the packet is handed over to the other Operator.</p>	REQ 16

## 4.4 QoS marking

The following QoS marking of IP packets shall be used:

Each operator is responsible for the correct QoS marking of IP packets when sending the packets to the destination PE router.	REQ 17
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## 4.5 SLA

The following SLA parameter values shall be used as guidelines for the transport of signalling and media packets in each IP network:

<ul style="list-style-type: none"> <li>a) IPLR (IP packet drop rate) &lt; 0.02%.</li> <li>b) IPTD (IP Transfer delay) &lt; 50ms (one-way delay).</li> <li>c) IPDV (IP Delay Variation &lt; 4ms.</li> </ul>	REQ 18
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## 4.6 IP security

The transport of signalling and media information must be secure and conform to ref. [6] document. In order to implement a “secure network/transport” the following guidelines applies:

The operator (also includes Telia) is not allowed to advertise received public/private IP addresses to the open public Internet. (This means that the received public/private IP addresses must be kept inside the VPNs to hide them for being accessible from the public Internet.)	REQ 19
Each operator is also responsible for a secure transport of signalling and media information. (The signalling and media information from/to the PE router is then routed in a secure network (typically L3 VPN) to the corresponding SBC (optional) or Telephony network where the call is terminated.)	REQ 20
If the operator route the signalling and media information over an IP network which is not controlled/owned by the operator the operator is then responsible for that this transport is secure and complies with ref. [6] and quality guidelines according to ITU-T Y.1540 and Y.1541.	REQ 21
A unique VRF is defined per operator.	REQ 22
The operator is connected with direct physical links to the Telia PE routers.	REQ 23
Existing ACL filters in PE and SBC (optional) shall be configured to only allow agreed traffic.	REQ 24
No encryption of signalling or media is allowed.	REQ 25

## 5 INFLUENCED NODE TYPES AND EQUIPMENT

The equipment affected is Telia fixed transit network nodes and Operator X network nodes.