

# NSP 6.1 Network Configuration Guide

Ericsson Service-Aware Policy Controller

USER GUIDE

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# 1 NSP 6.1 Network Configuration Guide Introduction

This document provides information to define the network configuration needed to run the SAPC in a Network Server Platform (NSP).







## 2 NSP 6.1 Network Configuration Guide Overview

This section provides an overview of the hardware and software components used to configure the SAPC internal and external networks, as well as a general network description.

The configuration described here applies to NSP 6.1 Ericsson Blade System (EBS). For other vendor blade systems similar hardware functional elements must be considered:

### — Hardware components

- Gateway routers between the different blades and the external network.
- System Control Switches (SCXs) constitute the cluster backplane.
- Blade system with at least eight blades.

### — Software components

- SUSE Linux Enterprise Server, SLES with Kernel-based Virtual Machine (KVM).
- The SAPC software.

A blade system is a hardware system with one complete SAPC running. Each blade has one different role with the following distribution:

- SC-1 and SC-2 are the System Controllers (SC). The Operation and Maintenance (OAM) is done through these blades. These blades are virtualized.
- PL-x is a traffic payload. Policy Charging and Control (PCC) deployment traffic (such as Gx, Rx) is handled through these blades. These machines are not virtualized and run directly in the blade hardware.

The blade system can have a variable number of blades. In this network configuration guide, two scenarios are explained. The first scenario is a single subrack deployment with 12 blades and the OAM is in the SC blades. The other one is a cabinet scenario with two or three subracks (24 or 36 blades, respectively). Depending on the number of blades and the delivery needs (external database, geographical redundancy or traffic separation), follow the most adequate scenario. Gigabit interface is needed for internal and external connectivity.

For a detailed description of NSP 6.1, refer to [SAPC NSP 6.1 Hardware Description](#).

## 2.1 NSP 6.1 Single Subrack Network Configuration

In this first scenario, the fifth and sixth blades (slots 9 and 11, respectively) are SCs and the other blades are traffic payloads. Each blade has a different role depending on the needs.

### 2.1.1 System Controller Blades

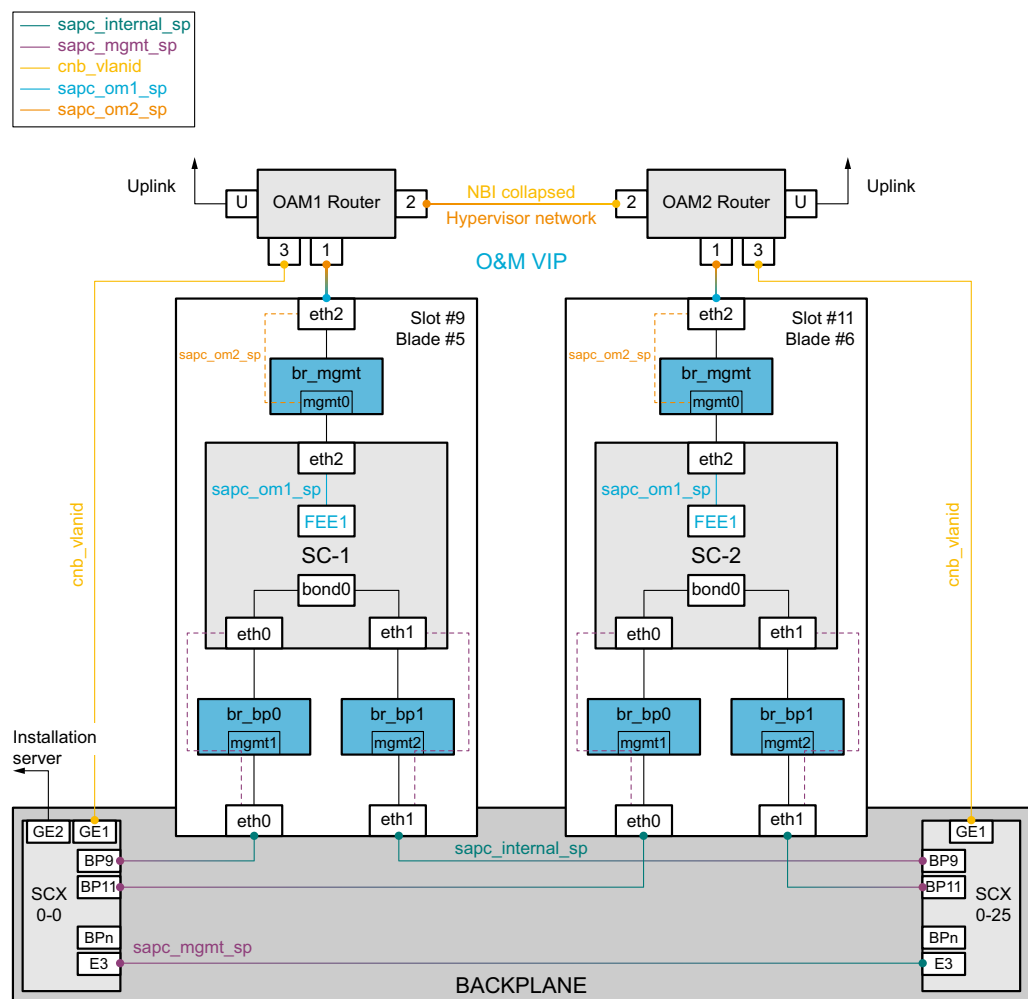


Figure 1 SCs in Single Subrack Scenario

SCs are virtualized, so virtual bridges are defined.

- Bridge **br\_mgmt** is used for both hypervisor management, through virtual interface **mgmt0**, and the SAPC Node management, connecting the **eth2** of the virtual machine with the **eth2** of the physical blades.
- Bridges **br\_bp0** and **br\_bp1** are the backplane bridges which connect **eth0** and **eth1** interfaces of the Virtual Machines with the corresponding interfaces



of the physical blades. A bond is created between **eth0** and **eth1** at Virtual Machine level to provide high availability for the backplane.

SCs are connected to the external network through VIP FEE. These connections are used for load balancing purposes through a VIP. For this purpose OAM VLANs are used. SCs also provide an external OAM IP address independent of the VIP-OAM.

### 2.1.2 Payload Blades

Payload blades follow different network configuration depending on the customer needs. This chapter describes a scenario with all functionality. Payload blades are configured according to the customer needs, taking the following as the recommended distribution.

- **PL-7 and PL-8** are used for traffic purposes in this scenario. All external diameter traffic is received through these two.
- In case external database is configured, **PL-3 and PL-4** are used for this purpose.
- In case GeoRed is configured, **PL-5 and PL-6** are used for this purpose.
- In case traffic separation is configured, **PL-9 and PL-10** are used for this purpose.
- Rest of the PLs have no external communication.

Payloads are not virtualized, so no virtual bridges are defined. A bond is created between **eth0** and **eth1** to provide high availability for the backplane.

Payloads are connected to the external network through VIP FEE. Four VIPs are defined for Traffic, External Database, GeoRed (Replication), and Traffic Separation in case that traffic exists, and additional FEEs can be defined. These connections are used for load balancing purposes through a VIP.



### 2.1.2.1 Traffic Payload Blades

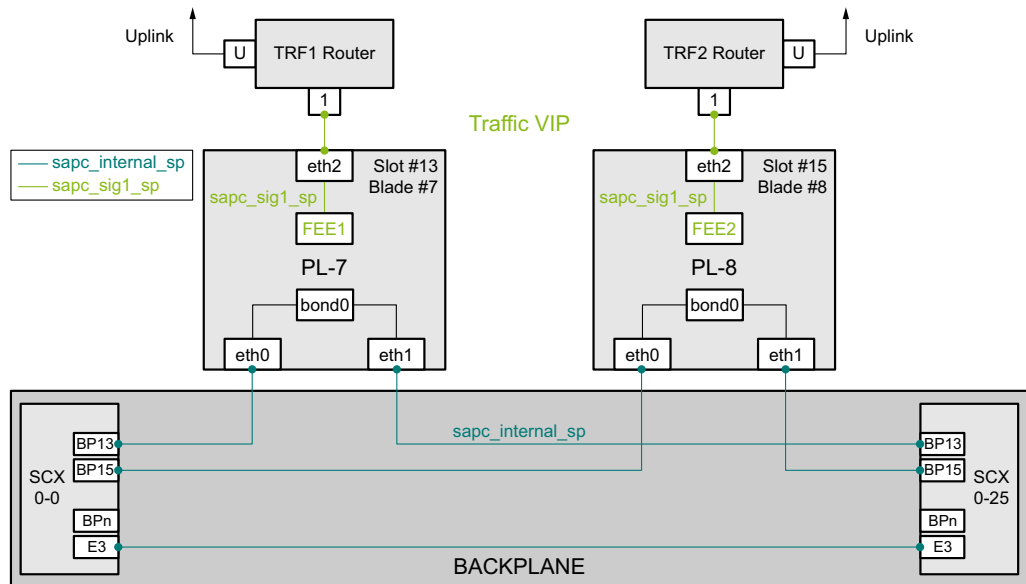


Figure 2 Subrack Configuration. Traffic Payloads

### 2.1.2.2 External Database Payload Blades

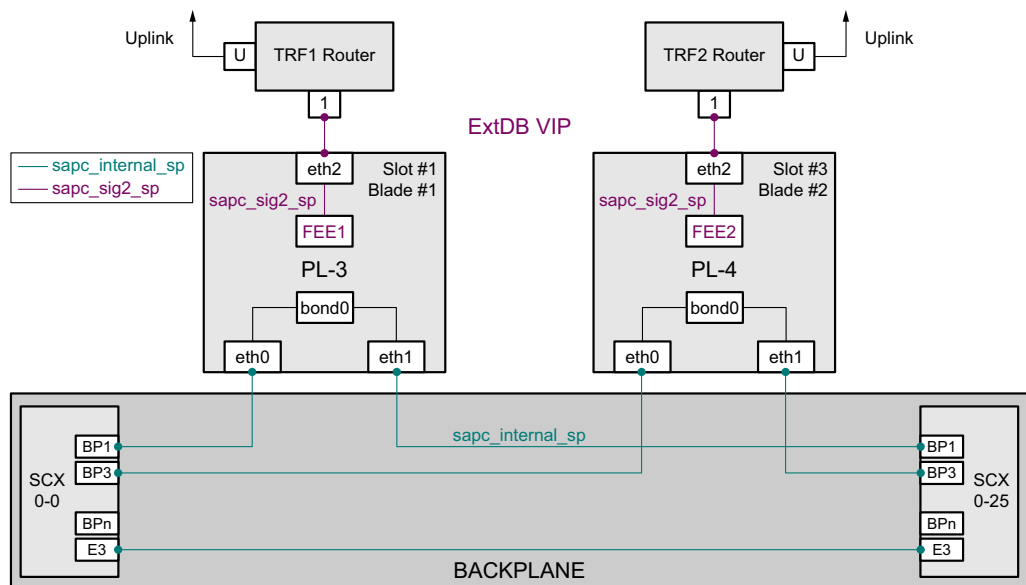


Figure 3 Subrack Configuration. External Database Payloads



### 2.1.2.3

### GeoRed Payload Blades

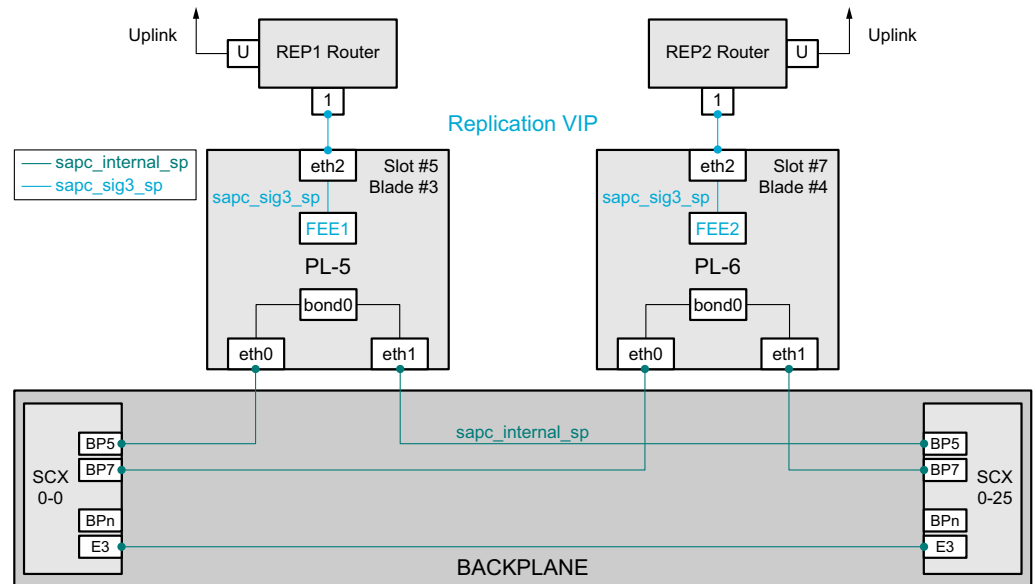


Figure 4 Subrack Configuration. GeoRed Payloads

### 2.1.2.4

### Traffic Separation Payload Blades

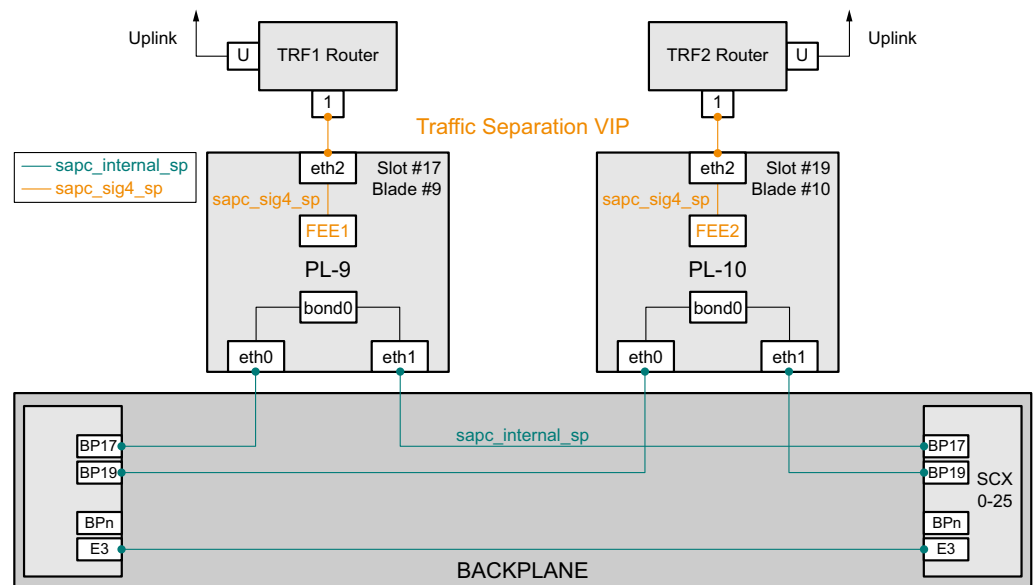


Figure 5 Subrack Configuration. Traffic Separation Payloads



### 2.1.2.5 Remaining Payload Blades

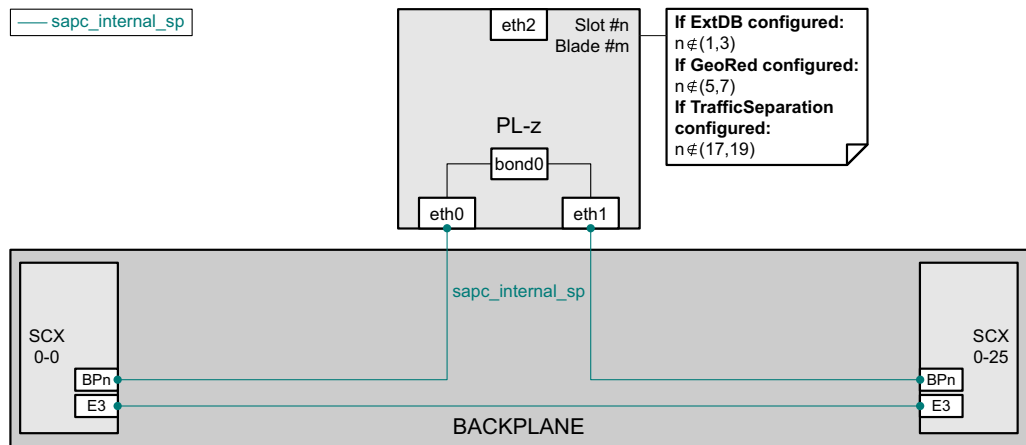


Figure 6 Subrack Configuration. Remaining Payload Blades

Remaining payloads are not virtualized, so no virtual bridges are defined. A bond is created between **eth0** and **eth1** to provide high availability for the backplane.

### 2.1.2.6 Logical Traffic Separation

In case no physical traffic separation is possible or chosen but traffic separation is required, it can be achieved by defining different ALBs and FEEs per traffic type through the same physical connection.

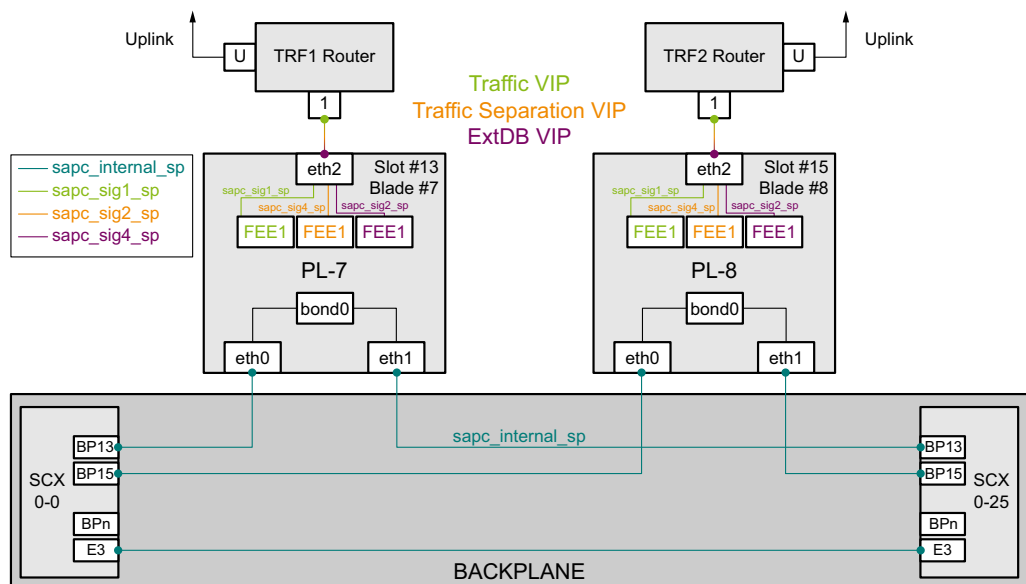


Figure 7 Subrack Configuration. Logical Traffic Separation



### 2.1.3

## TIPC Networks

For TIPC communication there are two separate VLANs defined. Each of these two VLANs is assigned to different interfaces on all blades (**eth0** VLAN **sapc\_tipc\_pdl** and **eth1** VLAN **sapc\_tipc\_pdr**) and does not make use of bonding.

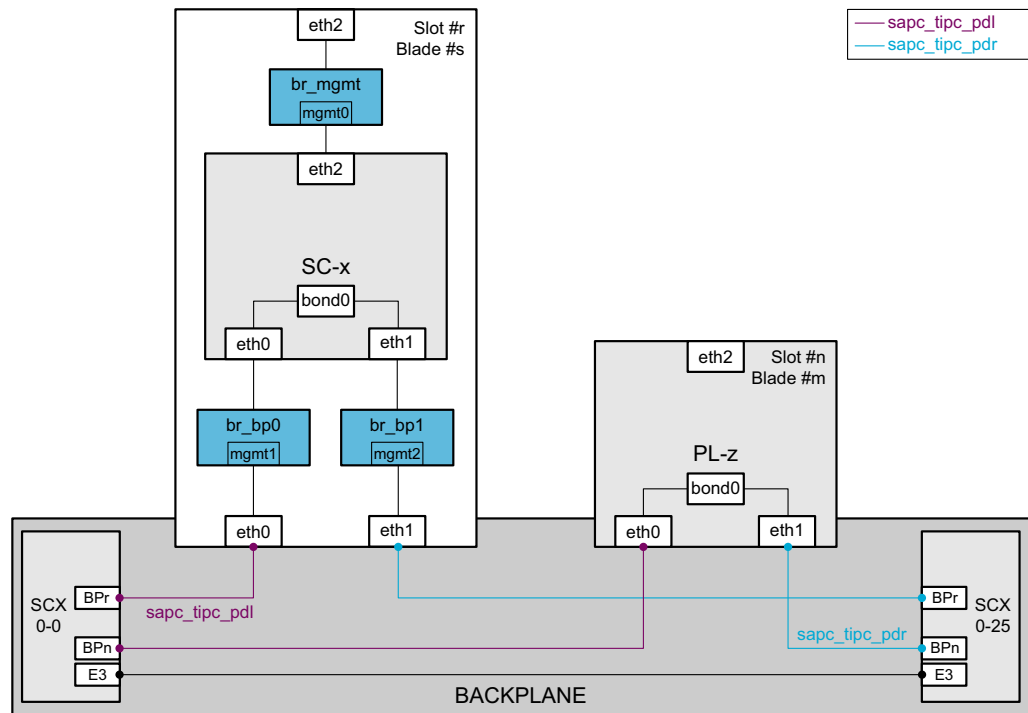


Figure 8 Subrack Configuration. TIPC Networks

## 2.2

## NSP 6.1 Extra Subracks Network Configuration

The fifth and sixth blades are SCs and the other blades are traffic payloads. The installation described in Section 2.1 on page 3 has to be done for the first subrack. In this chapter, additional networking is included for the additional second and third subrack.

Additional FEEs are needed for each type of traffic for the second and third subracks. For a second subrack, in a scenario with External Database, GeoRed, and Traffic Separation, apart from normal diameter traffic, PL-19 and PL-20 are used for Traffic FEEs, PL-15 and PL-16 for External Database FEEs, PL-17 and PL-18 for GeoRed FEEs, and PL-21 and PL-22 for Traffic Separation FEEs. For a third subrack, in a scenario with External Database, GeoRed, and Traffic Separation, apart from normal diameter traffic, PL-31 and PL-32 are used for Traffic FEEs, PL-27 and PL-28 for External Database FEEs, PL-29 and PL-30 for GeoRed FEEs, and PL-33 and PL-34 for Traffic Separation FEEs.



## 2.2.1 Traffic Blades

### 2.2.1.1 All Blades

For all blades, the following extra networking must be done.

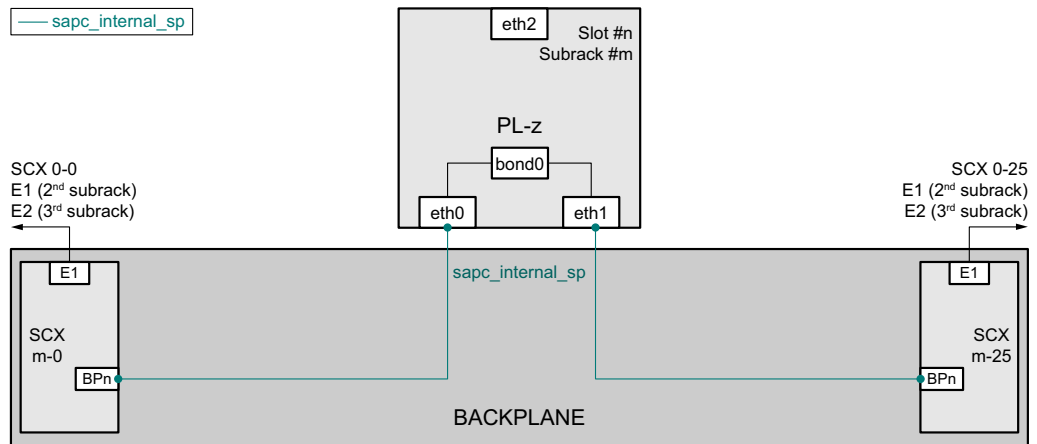


Figure 9 Extra Subracks Configuration. All Payloads

Payloads are not virtualized, so no virtual bridges are defined. A bond is created between **eth0** and **eth1** to provide high availability for the backplane.

### 2.2.1.2 FEE Payload Blades

Additional payload configuration is needed in the new subracks. New FEEs are created in that case as the figure shows.



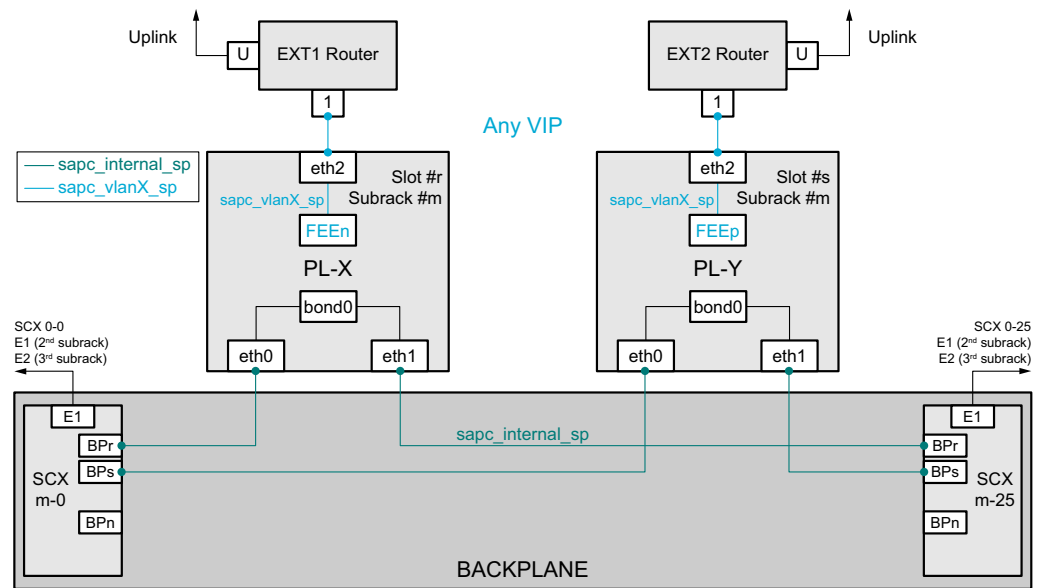


Figure 10 Extra Subracks Configuration. FEE Payloads

## 2.2.2

### TIPC Networks

For TIPC communication there are two separate VLANs defined. Each of these two VLANs is assigned to different interfaces on all blades (**eth0** VLAN **sapc\_tipc\_pdl** and **eth1** VLAN **sapc\_tipc\_pdr**) and does not make use of bonding.

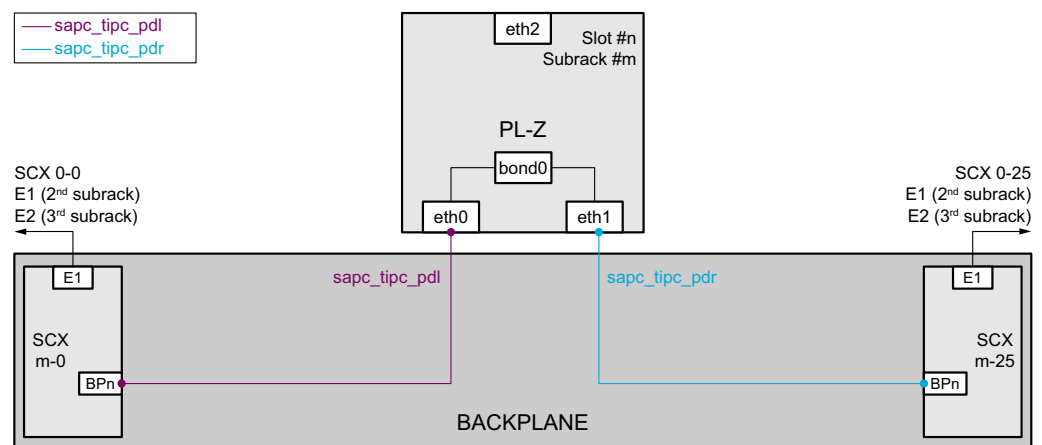


Figure 11 Extra Subracks Configuration. TIPC Networks





## 3 NSP 6.1 Networks Allocation

This section specifies how the SAPC is connected to the network, detailing all the VLANs and networks. The examples provided in this section are based on IPv4, but IPv6 is also supported for the external network. Before starting to configure the SAPC network, agree with the customer on all the details (IP addresses, Network, VLAN Tags, and so on) referenced in this section. Although most of the references in this document mention only one additional traffic separation network, there are no logical restrictions on the number of traffic networks and the corresponding ALBs to be defined.

All VLANs are tagged unless explicitly stated.

### 3.1 NSP 6.1 DMX Network Allocation

Table 1 Collapsed DMX Northbound OAM through SCX logical network settings

Address Type	Name/Tag	Example
Collapsed northbound IP address <sup>(1)</sup>	%{cnb}	172.21.20.186
Collapsed northbound default gateway IP address	%{cnb_defgw}	172.21.20.185
Collapsed northbound network netmask	%{cnb_netmask}	255.255.255.248
Collapsed northbound network VLAN identity	%{cnb_vlanid}	3122
External NTP server 1 for the DMX	%{ntp1_net}	9.9.9.9
External NTP server 2 for the DMX	%{ntp2_net}	9.9.9.10
External NTP server 3 for the DMX <sup>(2)</sup>	%{ntp3_net}	9.9.9.11

(1) For TSP legacy migrations, check section Section 3.4 on page 20 for network reuse considerations.

(2) Optional. The DMX can be configured with up to three time references. At least two time references must be configured.



## 3.2 NSP 6.1 VLANs

Table 2 VLANs for Single Subrack

VLAN Name	Interface	Ports	Comments
cnb_vlanid	N/A	SCX-0-X: GE1 LOCALHOST <sup>(1)</sup> REMOTEHOST <sup>(2)</sup>	Northbound Interface
sapc_internal_sp	bond0	SCX-0-X: BPn <sup>(3)</sup> , LOCALHOST <sup>(1)</sup> , E3 SCX-0-0: GE2 <sup>(4)</sup>	Cluster Internal
sapc_om2_sp	Blade: mgmt0	N/A	SCs only. Hypervisor Management
sapc_mgmt_sp	Blade: mgmt1, mgmt2 VM: bond0	SCX-0-X: BP9, BP11, E3	SCs only. System Management
sapc_tipc_pdl	eth0	SCX-0-0: BPn	Left TIPC
sapc_tipc_pdr	eth1	SCX-0-25: BPn	Right TIPC
sapc_om1_sp	eth2	N/A	VIP Router Link O&M Traffic
sapc_sig1_sp	eth2	N/A	VIP Router Link Signaling Traffic
sapc_sig2_sp	eth2	N/A	VIP Router Link LDAP Traffic
sapc_sig3_sp	eth2	N/A	VIP Router Link Replication Traffic
sapc_sig4_sp	eth2	N/A	VIP Router Link Signaling Traffic Separation
sapc_sig5_sp	eth2	N/A	VIP Router Link Signaling Traffic Separation

(1) LOCALHOST, link to own SCXB host processor.

(2) REMOTEHOST, cross-link to the host processor on the other SCXB.

(3) Untagged VLAN.

(4) Temporary untagged VLAN, set for installing the hypervisor.

Same VLAN configuration for the lower subrack than the single rack configuration, extending it for the lower subrack ports connected to the other subracks. Configuration for extending the lower subrack and configuring the other subracks according to the following tables.



Table 3 VLANs for Second and Third Subracks

VLAN Name	Interface	Ports	Comments
sapc_tipc_pdl	eth0	SCX-0-0: E1, E2	Left TIPC
		SCX-m-0: BPn, E1	
sapc_tipc_pdr	eth1	SCX-0-25: E1, E2	Right TIPC
		SCX-m-25: BPn, E1	
sapc_sig1_sp	eth2	N/A	VIP Router Link Signaling Traffic
sapc_sig2_sp	eth2	N/A	VIP Router Link LDAP Traffic
sapc_sig3_sp	eth2	N/A	VIP Router Link Replication Traffic
sapc_sig4_sp	eth2	N/A	VIP Router Link Signaling Traffic Separation
sapc_sig5_sp	eth2	N/A	VIP Router Link Signaling Traffic Separation

### 3.3 NSP 6.1 IP Addressing Example

Each SAPC Node requires a set of IP addresses agreed with the customer before configuring the SAPC Node.

Table 4 IPv4 Network and VLAN for SAPC

Network Address	Mask	Type	Usage	VLAN Name	VLAN ID
192.168.2 18.0	/29	Private	VIP Router Link for OAM Traffic	sapc_om1_sp	130
192.168.2 16.0	/28	Private	VIP Router Link for Signaling Traffic	sapc_sig1_sp	120
192.168.2 17.0	/28	Private	VIP Router Link for LDAP Traffic	sapc_sig2_sp	140



Network Address	Mask	Type	Usage	VLAN Name	VLAN ID
192.168.219.0	/28	Private	VIP Router Link for Replication Traffic	sapc_sig3_sp	150
192.168.220.0	/28	Private	VIP Router Link for Signaling Traffic Separation	sapc_sig4_sp	122
192.168.221.0	/28	Private	VIP Router Link for Signaling Traffic Separation	sapc_sig5_sp	124
192.168.100.0 <sup>(1)</sup>	/24	Private	System Management Network	sapc_mgmt_sp	138
sapc_om2_sp	/29	Public	Hypervisor Management Network	sapc_om2_sp	137
sapc_sig_cn_1_vip	/32	Public	VIP Signaling Address	N/A	N/A
sapc_om_cn_vip1	/32	Public	VIP OAM Address	N/A	N/A
sapc_om_cn_vip2	/32	Public	VIP Provisioning Address	N/A	N/A
sapc_sig_data_1_vip	/32	Public	VIP LDAP Address	N/A	N/A
sapc_sig_data_2_vip	/32	Public	VIP Replication Address	N/A	N/A
sapc_sig_cn_2_vip	/32	Public	VIP Signaling Separation Address	N/A	N/A
sapc_sig_cn_3_vip	/32	Public	VIP Signaling Separation Address	N/A	N/A

(1) This network can be reused, since is private and internal.



Table 5 Open Shortest Path First (OSPF) Stub Areas

Network	Gateways	VLAN	OSPF Area	Comments
192.168.218.0/29	192.168.218.1	130	0.1.1.1	O&M Traffic
	192.168.218.2			
192.168.216.0/28	192.168.216.1	120	0.0.1.1	Signaling Traffic
	192.168.216.2			
192.168.217.0/28	192.168.217.1	140	0.0.1.2	LDAP Traffic
	192.168.217.2			
192.168.219.0/28	192.168.219.1	150	0.0.1.3	Replication Traffic
	192.168.219.2			
192.168.220.0/28	192.168.220.1	122	0.0.1.4	Signaling Traffic Separation
	192.168.220.2			
192.168.221.0/28	192.168.221.1	124	0.0.1.5	Signaling Traffic Separation
	192.168.221.2			

**Note:** In OSPF, a backbone must be defined when routing a packet between two non-backbone areas. The OSPF backbone is the special OSPF Area 0 (written as Area 0.0.0.0, since OSPF Area IDs are typically formatted as IP addresses). The OSPF backbone always contains all Area Border Routers. The backbone is responsible for distributing routing information between non-backbone areas. This is mandatory as VIPs are published to the ABR and thus visible in the backbone only if OSPF Area 0 is defined.

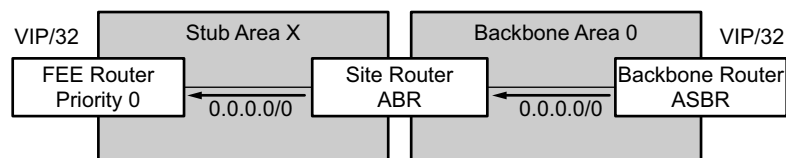


Figure 12 OSPF Backbone Area



### 3.3.1 NSP 6.1 IP Addresses of External Elements

This section covers all the IP addresses in the customer network that do not belong to the SAPC Node but needed when configuring it.

Table 6 IP Addresses of External Elements

IP Address	Network	Use
<NTP-SERVER>	<NTP-NETWORK>/<NTP-NETMASK>	NTP Server
<SNMP-SERVER>	<SNMP-NETWORK>/<SNMP-NETMASK>	SNMP Server
<DNS-SERVER> <sup>(1)</sup>	<DNS-NETWORK>/<DNS-NETMASK>	DNS Server

(1) Optional.

There can be several NTP servers.

SNMP servers are configured for Fault Management. For security reasons, it is highly recommended to use [Create SNMPv3 Target](#). Also, legacy versions can be used as [Create SNMPv2C Target](#) and [Create SNMPv1 Target](#).

Optionally, DNS servers can be defined in the SAPC.

### 3.3.2 NSP 6.1 Internal IP Addresses

This section covers all the IP addresses in the customer network that do not belong to the SAPC Node but needed when configuring it.

Table 7 IP Allocation of Internal Networks for SAPC

IP Address	Node	Interface	Comment
172.16.100.0/24	Network	N/A	VLAN sapc_internal_sp Cluster internal network (backplane)
.1	SCX-0-0	LOCALHOST <sup>(1)</sup>	IP address assigned on SCX-0-0 for ARP target and set by DMX
.2	SCX-0-25	LOCALHOST <sup>(1)</sup>	IP address assigned on SCX-0-25 for ARP target and set by DMX
.121	SC-1	bond0	





IP Address	Node	Interface	Comment
.122	SC-2	bond0	
.200 - .232	N/A	N/A	Temporary IP address pool for scaled blades
.n	PL-n	bond0	
.105	SC-1	bond0:3	LA-LDAP movable IP address
	SC-2		
.241	SC-1	bond0:4	uetrace movable IP address
	SC-2		
.242	SC-1	bond0:2	NFS movable IP address
	SC-2		
.243	SC-1	bond0:1	Boot movable IP address
	SC-2		
.244	One of the PL nodes	bond0:1	SS7CAF CPM movable IP address
192.168.100.0/24	Network	N/A	VLAN sapc_mgmt_sp System management network
.1	Hypervisor 1	mgmt1	IP address assigned on Host 1 mgmt1 interface for system management
.2	Hypervisor 2	mgmt1	IP address assigned on Host 2 mgmt1 interface for system management
.3	Hypervisor 1	mgmt2	IP address assigned on Host 1 mgmt2 interface for system management
.4	Hypervisor 2	mgmt2	IP address assigned on Host 2 mgmt2 interface for system management



IP Address	Node	Interface	Comment
.126	SC-1	bond0	IP address assigned on SC-1 for system management
.127	SC-2	bond0	IP address assigned on SC-2 for system management

(1) LOCALHOST, link to own SCXB host processor.

## 3.4 NSP 6.1 TSP Legacy Considerations

To achieve a maximum reuse of the existing elements, the DMX Collapsed northbound IP address can be one free IP address in subnetwork `sapc_om2_sp`, so that there is no need to provision and route additional networks to the existing ones in TSP configurations.

Table 8 Network Mapping for TSP Legacy

TSP Network	PNF Network	Use
<b>I/O Management</b>	<code>sapc_om2_sp</code>	Hypervisor 1 and 2, DMX northbound, gateway router 1, gateway router 2, and gateway router VRRP
<b>OAM VIP</b>	<code>sapc_om1_sp</code>	eVIP FEE1, eVIP FEE2, gateway router 1, gateway router 2
<b>Traffic VIP</b>	<code>sapc_sig1_sp</code>	eVIP FEE1, eVIP FEE2, gateway router 1, gateway router 2



# 4 NSP 6.1 Network Configuration Guide Annex

## 4.1 NSP 6.1 VLANs and Ports, Overview

This section shows the switch configuration, VLANs and ports in a graphical way. Readability is improved when printed in color.

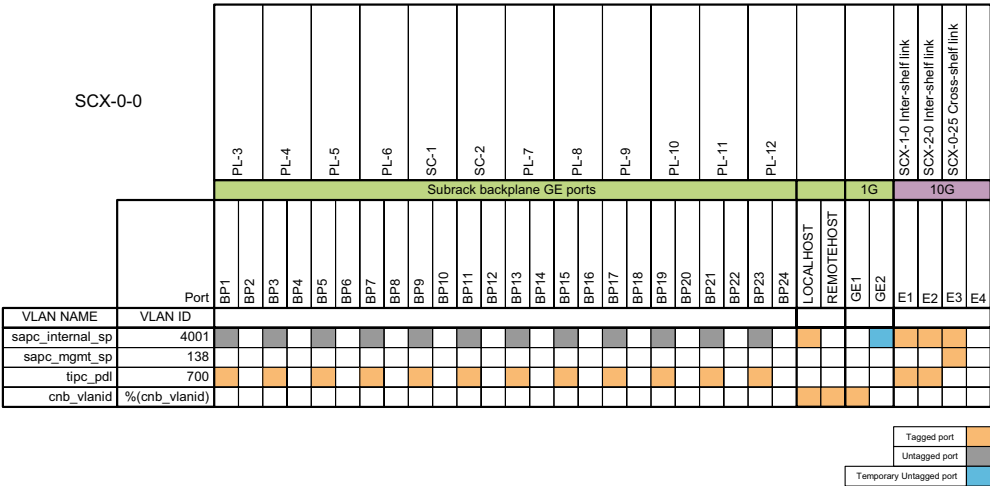


Figure 13 VLANs and Ports Overview. SCX-0-0

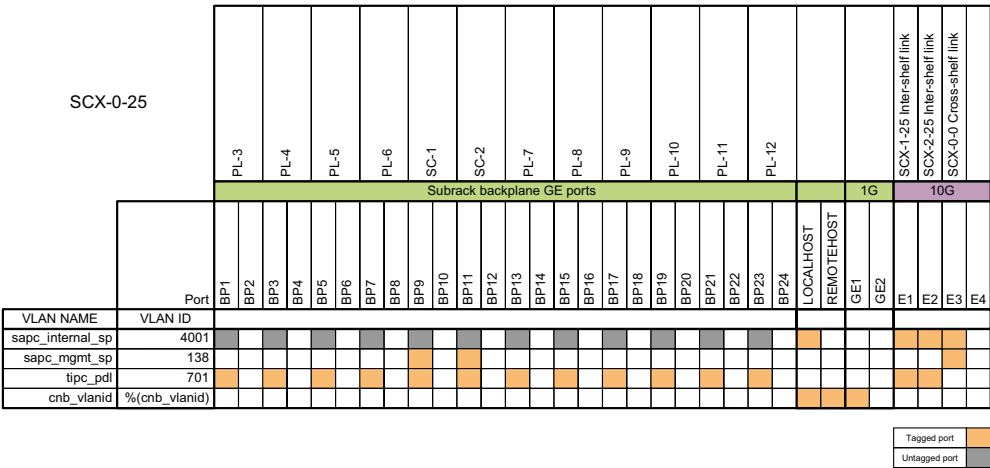


Figure 14 VLANs and Ports Overview. SCX-0-25



SCX-1-0																																					
		PL-13												PL-14																							
		PL-15												PL-16																							
		PL-17												PL-18																							
		PL-19												PL-20																							
		PL-21												PL-22																							
		PL-23												PL-24																							
		Subrack backplane GE ports																																			

Tagged port	
Untagged port	

Figure 17 VLANs and Ports Overview. SCX-2-0

Tagged port	
Untagged port	

Figure 18 VLANs and Ports Overview. SCX-2-25