

Adapt Cluster Tool

Ericsson Service-Aware Policy Controller

USER GUIDE

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1 Overview of the Adapt Cluster Tool

The SAPC configuration can be customized to be adapted to the customer network through the Adapt Cluster Tool. It is possible to modify, for example, the VIP addresses for O&M and traffic, the configuration of the SAPC as Diameter peer, or the IP addresses for the NTP servers.

The purpose of this document is to describe how to set up the Adapt Cluster Tool for the SAPC customization.





2 Prerequisites

- Good understanding and knowledge about networking and routing.
- Good understanding and knowledge about the SAPC networking. Refer to [SAPC Network Description](#) and, depending on the type of deployment (Physical Network Function (PNF) or Virtual Network Function (VNF)), [BSP 8100 Network Configuration Guide](#), [NSP 6.1 Network Configuration Guide](#), or [SAPC VNF Network Configuration Guide](#).
- General knowledge about Linux systems and shell commands.
- General knowledge about virtualization and cloud concepts.
- For VNF deployments, the same machine referred in the [SAPC VNF Descriptor Generator Tool](#) as preparation server is needed to create the Adapt Cluster Tool configuration file.





3 Customization Tool Execution

The Adapt Cluster Tool execution depends on the SAPC deployment type. The tool needs a configuration file as input for its execution. This configuration file is called `adapt_cluster.cfg` and the way to create it also depends on the deployment type.

3.1 PNF Deployments

The Adapt Cluster Tool is automatically executed during the SAPC deployment.

Before the procedure execution is explained during this section, the **PL_interfaces** file has been properly generated.

The **adapt_cluster_PNF_BSP.cfg** and **adapt_cluster_PNF_NSP.cfg** configuration files are contained as examples inside the SAPC Virtual Delivery Package (VDP). For further details, refer to [SAPC PNF Deployment Instruction](#). An `adapt_cluster.cfg` file is used (and also a previously generated **PL_interfaces** file) as input to generate the `adapt_cluster.iso` file, which is finally injected to the SAPC **SC-1** virtual machine in a CD-ROM/DVD device.

The `adapt_cluster.iso` file is injected to the SAPC **SC-1** virtual machine through the Config-Drive mechanism during deployment time. The Adapt Cluster Tool recognizes internally the injected `adapt_cluster.cfg` and **PL_interfaces** files inside the CD-ROM/DVD device and automatically starts its execution taking them as input, during the **SC-1** boot-up to perform the customization.

1. In the physical blade where the **SC-1** virtual machine is going to be hosted, create the file `adapt_cluster.cfg` by making a copy of the proper example available in the VDP.

Attention!

At this stage, the procedure depends on the hardware.

a. **BSP 8100**

```
Host_1:# cp /mnt/images/adapt_cluster_PNF_BSP.cfg  
/mnt/images/adapt_cluster.cfg
```

b. **NSP 6.1**

```
Host_1:# cp /mnt/images/adapt_cluster_PNF_NSP.cfg  
/mnt/images/adapt_cluster.cfg
```



2. Modify the `adapt_cluster.cfg` file, with the values explained in Section 4 on page 11:

```
Host_1:# vi adapt_cluster.cfg
```

3. Generate the `adapt_cluster.iso` file by executing the following command:

```
Host_1:# genisoimage -r -joliet-long -o /mnt/images/adapt_cluster.iso /mnt/images/adapt_cluster.cfg /mnt/images/PL_interfaces
```

The resulting ISO file (`/mnt/images/adapt_cluster.iso`) already contains the configured `adapt_cluster.cfg` file and the generated `PL_interfaces` file, both of them mentioned as prerequisites to this step. The ISO file is ready to be injected to the SAPC **SC-1** virtual machine during its boot. No additional intervention is needed to perform this injection.

4. The customizations are automatically performed during the SAPC deployment, to be more precise, during the **SC-1** boot.

3.2 VNF Deployments

The Adapt Cluster Tool is automatically executed during the SAPC deployment.

The following configuration files are contained as examples inside the SAPC Virtual Delivery Package (VDP). For further details, refer to [SAPC VNF Deployment Instruction for VMware](#) or [SAPC VNF Deployment Instruction for OpenStack](#) according to the specific configuration:

- ☐ `adapt_cluster_template.cfg`
- ☐ `adapt_cluster_template_georedActiveActive_noVr.cfg`
- ☐ `adapt_cluster_template_network_separation.cfg`
- ☐ `adapt_cluster_template_noVr.cfg`
- ☐ `adapt_cluster_template_noVr_network_separation.cfg`
- ☐ `adapt_cluster_template_noVr_upgrade.cfg`
- ☐ `adapt_cluster_template_noVr_network_separation_upgrade.cfg`
- ☐ `adapt_cluster_template_upgrade.cfg`
- ☐ `adapt_cluster_template_network_separation_upgrade.cfg`

An `adapt_cluster_template.cfg` file is used as input and template by the Descriptor Generator Tool to generate, automatically, the `adapt_cluster.cfg/.iso` file, which is finally included in either the OVF package (`.ova` file) or the HOT package. See [SAPC VNF Descriptor Generator Tool](#) for details about how to use the tool.



For further details about the VDP content and the OVA/HOT package generation process, refer to [SAPC VNF Descriptor Generator Tool](#).

The `adapt_cluster.cfg` contained in the OVF/HOT package file is injected to the SAPC vApp through the Config-Drive mechanism during deployment time. The Adapt Cluster Tool recognizes internally the injected `adapt_cluster.cfg` file and automatically starts its execution taking it as input, during the **SC-1** boot-up to perform the customization. An analogous procedure is also started in the Virtual Routers (VR) Virtual Machines (when deployed), which are also receiving the `adapt_cluster.cfg` through Config-Drive to perform internal customizations.

1. In the preparation server, save a copy of the original template configuration file which is chosen to the editing, before any changes are applied, and previous to the package generation:

```
PreparationServer:# cp adapt_cluster_template.cfg
adapt_cluster_template.cfg_orig
```

2. Modify the `adapt_cluster_template.cfg` configuration file, with the values explained in Section 4 on page 11:

```
PreparationServer:# vi adapt_cluster_template.cfg
```

3. Generate the deployment package according to the [SAPC VNF Descriptor Generator Tool](#) document. The resulting deployment package already contains the `adapt_cluster.cfg/.iso` file to be injected to the proper Virtual Machines in the SAPC.
4. The customizations are automatically performed during the SAPC deployment.

`adapt_cluster_template_noVr_upgrade.cfg` and `adapt_cluster_template_noVr_network_separation_upgrade.cfg` apply when upgrade by replacement procedure is used to update the system.

3.3 Add Geographical Redundancy to a Live SAPC

Once the SAPC deployment has been performed and the Adapt Cluster Tool automatically executed as explained in Section 3.1 on page 5 and Section 3.2 on page 6, the tool can be manually executed in a live SAPC to add Geographical Redundancy.

For further details, refer to [Add Active-Active Geographical Redundancy to a Live SAPC](#) and [Add Active-Standby Geographical Redundancy to a Live SAPC](#).

3.4 Adapt Cluster Tool Execution Verification

Once the SAPC has been deployed, it is recommended to check and verify that the Adapt Cluster Tool has performed a correct execution. In any other case, a wrong execution could lead to an improper customization of the SAPC. One of



the symptoms is that, for example, there is no connectivity towards the SAPC VIP addresses from external machines.

To verify that the Adapt Cluster Tool has been properly executed and all the configuration parameters have been correctly customized:

— Access the SAPC **SC-1** console using the **root** user-Id and **password**:

- For PNF deployments:

— Accessing to the physical blade hosting the **SC-1** virtual machine, and running a command like:

```
Host_1:~ # virsh console <SC-1>
```

- For VNF deployments:

— From the Ericsson Cloud Manager (ECM), Atlas or Director GUIs for deployments over OpenStack based Network Function Virtualization Infrastructures (NFVIs).

— From the VMware vSphere Client for VMware deployments.

— Check that the output file generated by the Adapt Cluster Tool has been properly generated. The resulting file is:

```
SC-1:~ # ls -lrt /cluster/storage/no-backup/adapt/adapt_cluster.cfg.processed
```

```
-r--r--r-- 1 root root 1117 Nov 13 11:47 /cluster/storage/no-backup/adapt/adapt_cluster.cfg.processed
```

If the previous file is not listed, there are two possible reasons:

- The Adapt Cluster Tool execution was erroneous.
- The Adapt Cluster Tool execution has not finished yet.

— Check the log generated by the Adapt Cluster Tool:

```
SC-1:~ # vi /var/log/adapt_cluster/adapt_cluster.log
```

- If more lines are being raised to the `adapt_cluster.log` file, this means that the Adapt Cluster Tool is still executing. Therefore, wait some minutes more for it to finish.

This progress can be checked by executing:

```
SC-1:~ # tail -F /var/log/adapt_cluster/adapt_cluster.log
```

- If this file contains one or more lines like this:

```
SC-1:~ # ERROR: result code 1
```



And the following lines do not appear at the end of the file:

```
2016-11-13 11:47:02 Configuration file has been processed
2016-11-13 11:47:02 Rebooting the cluster ...
2016-11-13 11:47:47 See logs at: /var/log/adapt_cluster/logs
```

And the final line is:

Exiting ...

This means that there was an error during the Adapt Cluster Tool execution. Therefore, a new execution is manually forced:

```
SC-1:~ # adapt_cluster start
```

Wait for the Adapt Cluster Tool execution to finish, and then, repeat this whole procedure. If something is still wrong and the problem was not fixed, contact your next support level.

- Also check and read carefully this log file, looking for possible error messages reporting an incorrect configuration in the `adapt_cluster.cfg` file used for its execution. In this case, there is a configuration issue:

— For PNF deployments:

- From the blade hosting the **SC-1**, bring down all guests.

```
Host_1:# /mnt/store/SAPC/host-config/scripts/management/sapc_vm-manager_cxp9030138.sh -c stop
```

- Delete the erroneous `adapt_cluster.iso`.

```
Host_1:# rm -rf /mnt/images/adapt_cluster.iso
```

- Repeat the steps described in section Section 3.1 on page 5, setting the right configuration in the `adapt_cluster.cfg` file, and generating the `adapt_cluster.iso` file again.

- Bring up all guests.

```
Host_1:# /mnt/store/SAPC/host-config/scripts/management/sapc_vm-manager_cxp9030138.sh -c restart
```

— For VNF deployments:

- Correct the configuration issue in your `adapt_cluster_template.cfg` file.

- A new `.ova` file is generated containing a correct `adapt_cluster.cfg`, and then, a new SAPC deployment is performed using the new `.ova` file.

- If the Adapt Cluster Tool execution is correct, the final lines in the `adapt_cluster.log` file are:



```
2017-12-20 11:15:00 Configuration file has been processed
2017-12-20 11:15:00 Rebooting the cluster ...
2017-12-20 11:15:32 See logs at: /var/log/adapt_cluster/logs
2017-12-20 11:18:23 CLUSTER ADAPTATION PROCEDURE
2017-12-20 11:18:23 Starting cluster adaptation ...
2017-12-20 11:18:23 Cluster adaptation configuration search priority: fi
2017-12-20 11:18:23 CEE version: /media/ec2/latest/user-data
2017-12-20 11:18:23 VMWare version: /media/adapt_cluster.cfg
2017-12-20 11:18:23 PNF version: /cluster/storage/no-backup/adapt/adapt_
2017-12-20 11:18:23 Detected version: /media/ec2/latest/user-data
2017-12-20 11:18:23 Same adaptation already took place. Nothing more to
2017-12-20 11:18:23 Exiting ...
```

Finally, contact your next support level if the `adapt_cluster.cfg` file seems to be correct according to the desired customizations by the customer, and the Adapt Cluster Tool has been properly executed but there are still connectivity problems or any other issues in the SAPC.



4 Adapt Cluster Configuration File Parameters

The Adapt Cluster Tool needs a configuration file as input for its execution. This configuration file is called `adapt_cluster.cfg`.

The `adapt_cluster.cfg` configuration file uses `.ini` format. On this section, the sub-sections and parameters to be configured in the `adapt_cluster.cfg` are detailed.

Some characteristics provided for each parameter are explained here:

- **Configurable:** Some parameters are included in the Adapt Cluster Tool configuration file but their value is not configurable. A parameter can be configurable or not, depending on the deployment type (VNF/PNF) or, sometimes, the parameter is included in the configuration file just for information about its value but it cannot be modified.
- **Mandatory:** A parameter is considered mandatory when it must be explicitly included in the configuration file. For some mandatory parameters, a default value is included in the template configuration files.
- **Optional:** A parameter is considered optional when it is not necessary that it is included in the configuration file. This is because it has a default value automatically applied by the Adapt Cluster Tool or because it is not necessary for the deployment.

See Section 5 on page 53 to check the templates provided as an example of this file. All the provided examples use IPv4 network, IPv6-only is also supported. Any IPv6 valid format according to RFC 4291 can be used for the input parameters.

— [Customer] Section

This section is mandatory in the `adapt_cluster.cfg` file.

Table 1 `adapt_cluster.cfg` [Customer] Section Parameters

Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
TIMEZONE	Yes	All deployments	M	The time zone to be considered by the SAPC as uniform standard time.	TIMEZONE = Europe/Madrid	The default value configured in the configuration files provided as examples is: Europe/Madrid
ORIGIN_REALM	Yes	All deployments	O	Realm used by the SAPC in the Diameter messages.	ORIGIN_REALM = operatorRealm.com	The default value is: operatorRealm.com



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
ORIGIN_HOST	Yes	All deployments	O	Hostname used by the SAPC in the Diameter messages.	ORIGIN_HOST = sapcOwnHostId.operatorRealm.com	The default value is: sapcOwnHostId.operatorRealm.com
DIAMETER_GX_PORT	Yes	All deployments	O	Port used to listen to Diameter messages both in TCP and SCTP transport layers, for the Gx interface.	DIAMETER_GX_PORT = 3868	The default value is: 3868
DIAMETER_RX_PORT	Yes	All deployments	O	Port used to listen to Diameter messages both in TCP and SCTP transport layers, for the Rx interface.	DIAMETER_RX_PORT = 3869	The default value is: 3868
DIAMETER_SX_PORT	Yes	All deployments	O	Port used to listen to Diameter messages SCTP transport layers, for the Smp interface.	DIAMETER_SX_PORT = 3869	The default value is: 3869
NTP_SERVER_IP	Yes	VNF deployments only	O	<p>The IP address of the Network Time Protocol (NTP) server to be configured in the SAPC.</p> <p>Several NTP servers can be configured. Their IP addresses must be configured in the same line by space-separated.</p> <p>For PNF deployments, the configuration of NTP servers follows a different procedure detailed in SAPC PNF Deployment Instruction.</p>	NTP_SERVER_IP = 8.8.8.8 9.9.9.9 10.10.10.10	No default value is provided.



Table 2 adapt_cluster.cfg [Customer] Section Internal-Use Only Parameters

Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
TIPC_TIMER	Yes	All deployments	O	TIPC heartbeat. Default and recommended value is 9000 ms	TIPC_TIMER = 1500	The default value is: 9000 milliseconds.

— [Cluster] Section

This section is mandatory in the adapt_cluster.cfg file.

Table 3 adapt_cluster.cfg [Cluster] Section Parameters

Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
INITIAL_PLS	No	All deployments	M	Number of Payload nodes deployed in the SAPC base installation.	INITIAL_PLS = 2	The default and always delivered value is: 2

— [Interface] Section

This section is mandatory in the adapt_cluster.cfg file.



Table 4 adapt_cluster.cfg [Interface] Section Parameters

Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
SC_IFACE_INDEX	<ul style="list-style-type: none">PNF deployments: NoVNF deployments: Yes	All deployments	M	<p>Number of network interfaces available in the System Controller nodes.</p> <p>In the case of PNF BSP 8100 deployments, there are four network interfaces.</p> <p>In the case of PNF NSP 6.1 deployments, there are three network interfaces.</p> <p>In the case of VNF deployments, this number is equal to $2 + n$, where n is the number of Abstract Load Balancers (ALBs) deployed in System Controller nodes.</p>	<ul style="list-style-type: none">PNF BSP 8100 deployments: <code>SC_IFACE_INDEX = 4</code>PNF NSP 6.1 deployments: <code>SC_IFACE_INDEX = 3</code>VNF deployments with no traffic separation: <code>SC_IFACE_INDEX = 3</code>VNF deployments with System Controller traffic separation (one additional network interface is needed for a new traffic separation, for example, OAM traffic separated from provisioning traffic): <code>SC_IFACE_INDEX = 4</code>	<p>The default value is included in the configuration files provided as examples. It must be left unchanged in PNF BSP 8100 and PNF NSP 6.1 deployments.</p> <p>It can be modified in VNF deployments only.</p>



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
PL_IFACE_INDEX	<ul style="list-style-type: none"> PNF deployments: No VNF deployments: Yes 	All deployments	M	<p>Number of network interfaces available in the Payload nodes.</p> <p>In the case of PNF BSP 8100 deployments, there are four network interfaces.</p> <p>In the case of PNF NSP 6.1 deployments, there are three network interfaces.</p> <p>In the case of VNF deployments, this number is equal to 2 + n, where n is the number of Abstract Load Balancers (ALBs) deployed in Payload nodes.</p>	<ul style="list-style-type: none"> PNF BSP 8100 deployments: PL_IFACE_INDEX = 4 PNF NSP 6.1 deployments: PL_IFACE_INDEX = 3 VNF deployments with no payload traffic separation: PL_IFACE_INDEX = 3 VNF deployments with payload traffic separation (one additional network interface is needed for a new payload traffic separation, for example, Rx traffic separated from Gx traffic): PL_IFACE_INDEX = 4 	<p>The default value is included in the configuration files provided as examples. It must be left unchanged in PNF BSP 8100 and PNF NSP 6.1 deployments.</p> <p>It can be modified in VNF deployments only.</p>



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
SC_MAC_PREFIX	Yes	All deployments	<ul style="list-style-type: none">PNF deployments: MVNF deployments: O	<p>The initial four octets to be configured in the MAC addresses of the System Controller nodes.</p> <p>In the case of VNF deployments, this parameter is optional.</p> <p>If not included, System Controllers will be configured with MAC addresses provided by NFVI.</p> <p>If included, System Controllers will be configured with MAC addresses starting with the value of SC_MAC_PREFIX.</p>	SC_MAC_PREFIX = 02:10:20:3C	The default value is included in the configuration files provided as examples. ⁽¹⁾



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
PL_MAC_PREFIX	Yes	All deployments	<ul style="list-style-type: none"> PNF deployments: M VNF deployments: O 	<p>The initial four octets to be configured in the MAC addresses of the PayLoad nodes.</p> <p>In the case of VNF deployments, this parameter is optional.</p> <p>If not included, PayLoad nodes will be configured with MAC addresses provided by NFVI.</p> <p>If included, PayLoad nodes will be configured with MAC addresses starting with the value of PL_MAC_PREFIX.</p>	PL_MAC_PREFIX = 02:10:40:3C	The default value is included in the configuration files provided as examples. ⁽¹⁾
BACKPLANE_HA	No	PNF deployments only	O	NIC bonding at LDE level for the backplane interfaces to guarantee High Availability.	BACKPLANE_HA = true	The default and mandatory value is: true

(1) In some cloud deployments, this value will not be finally set, and the cloud infrastructure will determine the MAC addresses to be used.

— [Network] Section

This section is mandatory in the `adapt_cluster.cfg` file.



Table 5 adapt_cluster.cfg [Network] Section Parameters: VIPs Definition

Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
OAM_VIP	Yes	All deployments	M	The Virtual IP address (VIP) configured for OAM traffic, followed, space-separated, named the Abstract Load Balancer (ALB) to handle this traffic internally in the SAPC node.	OAM_VIP = 10.58.31.7 ALB_OAM	The default value configured in the configuration files provided as examples is: 10.58.31.7 ALB_OAM
PROV_VIP	Yes	All deployments	O	The Virtual IP address (VIP) configured for provisioning traffic, followed, space-separated, by the Abstract Load Balancer (ALB) to handle this traffic internally in the SAPC node.	PROV_VIP = 10.58.31.8 ALB_OAM	If this parameter does not exist, the OAM_VIP is used instead.
GX_VIP	Yes	All deployments	M	<p>The Virtual IP address (VIP) configured for payload traffic, followed, space-separated, by the Abstract Load Balancer (ALB) to handle this traffic internally in the SAPC node.</p> <p>If no traffic separation is desired, configure only this VIP address. All the payload traffic from all the available interfaces (Gx, Rx, Sy, and so on) is handled through this VIP.</p>	GX_VIP = 10.58.31.137 ALB_TRF_1	<p>For no traffic separation scenarios, the default value configured in the configuration files provided as examples is: 10.58.31.137 ALB_TRF</p> <p>For traffic separation scenarios, the default value configured in the configuration files provided as examples is: 10.65.112.52 ALB_TRF_1</p> <p>See ⁽¹⁾ for description of how the name of the ALB is used in conjunction with other parameters</p>



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
RX_VIP	Yes	All deployments	O	<p>The Virtual IP address (VIP) configured for payload Rx traffic, followed, space-separated, by the Abstract Load Balancer (ALB) to handle this traffic internally in the SAPC node.</p> <p>This parameter is configured only if traffic separation is desired using different VIP addresses and ALBs for different diameter applications.</p>	RX_VIP = 10.58.31.142 ALB_TRF_2	<p>For no traffic separation scenarios, there is no default value.</p> <p>For traffic separation scenarios, the default value configured in the configuration files provided as examples is: 10.58.31.142 ALB_TRF_2</p> <p>See ⁽¹⁾ for description of how the name of the ALB is used in conjunction with other parameters</p>
SD_VIP	Yes	All deployments	O	<p>The Virtual IP address (VIP) configured for payload Sd traffic, followed, space-separated, by the Abstract Load Balancer (ALB) to handle this traffic internally in the SAPC node.</p> <p>This parameter is configured only if traffic separation is desired using different VIP addresses and ALBs for different diameter applications.</p>	SD_VIP = 10.58.31.142 ALB_TRF_2	<p>For no traffic separation scenarios, there is no default value.</p> <p>For traffic separation scenarios, the default value configured in the configuration files provided as examples is: 10.58.31.142 ALB_TRF_2</p> <p>See ⁽¹⁾ for description of how the name of the ALB is used in conjunction with other parameters</p>



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
SX_VIP	Yes	All deployments	O	<p>The Virtual IP address (VIP) configured for payload Smp traffic, followed, space-separated, by the Abstract Load Balancer (ALB) to handle this traffic internally in the SAPC node.</p> <p>This parameter is configured only if traffic separation is desired using different VIP addresses and ALBs for different diameter applications. The ALB used here shall match the one configured in SCTP_ALB as Smp protocol only supports SCTP.</p>	SX_VIP = 10.58.31.142 ALB_TRF_2	<p>For no traffic separation scenarios, there is no default value.</p> <p>For traffic separation scenarios, the default value configured in the configuration files provided as examples is: 10.58.31.142 ALB_TRF_2</p> <p>See ⁽¹⁾ for description of how the name of the ALB is used in conjunction with other parameters</p>
SY_VIP	Yes	All deployments	O	<p>The Virtual IP address (VIP) configured for payload Sy traffic, followed, space-separated, by the Abstract Load Balancer (ALB) to handle this traffic internally in the SAPC node.</p> <p>This parameter is configured only if traffic separation is desired using different VIP addresses and ALBs for different diameter applications.</p>	SY_VIP = 10.58.31.142 ALB_TRF_2	<p>For no traffic separation scenarios, there is no default value.</p> <p>For traffic separation scenarios, the default value configured in the configuration files provided as examples is: 10.58.31.142 ALB_TRF_2</p> <p>See ⁽¹⁾ for description of how the name of the ALB is used in conjunction with other parameters</p>
GEO_VIP	Yes	All deployments	O	<p>The Virtual IP address (VIP) configured for replication traffic between both Geographical Redundancy nodes, followed, space-separated, by the Abstract Load Balancer (ALB) to handle this traffic internally in the SAPC node.</p> <p>This parameter is mandatory for Active-Active Geographical</p>	GEO_VIP = 200.200.200.201 ALB_REP_1	<p>There is no default value in the configuration files provided.</p>



Table 6 adapt_cluster.cfg [Network] Section Parameters: Internal Network Definition

Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
SAPC_OM_SC_SH3_NETWORK	Yes	PNF deployments only	M	Management network which connects the physical blades to their hosted System Controller Virtual Machines. The size of this network is fixed to /24 owing to a limitation in the software.	SAPC_OM_SC_SH3_NETWORK = 192.168.100.0/24	The default value configured in the configuration files provided as examples is: 192.168.100.0/24
SAPC_OM_SC_SH3_GATEWAY	Yes	PNF deployments only	O	IP address for the gateway in the management network (SAPC_OM_SC_SH3_NETWORK). In case this parameter is not configured, the first IP address in the management network is considered as gateway.	SAPC_OM_SC_SH3_NETWORK = 192.168.100.1	No value is configured in the configuration files provided as examples. In case this parameter is not configured, the first IP address in the management network is considered as gateway.



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
SAPC_BOOT_SPSH_NETWORK	Yes	PNF deployments only	O	LDE booting and scaling network. For PNF NSP 6.1 deployments, it is the internal network (SAPC_INT_SH_NETWORK). The size of this network is fixed to /24 owing to a limitation in the software.	SAPC_BOOT_SPSH_NETWORK = 169.254.69.0/24	No value is configured in the configuration files provided as examples. For PNF BSP 8100 deployments, the default value is 169.254.69.0/24 For PNF NSP 6.1 deployments, the default value is the internal network (SAPC_INT_SH_NETWORK).
SAPC_INT_SH_NETWORK	Yes	All deployments	M	The IP network range and mask assigned to the Internal0 network in the SAPC node for internal communication among all the Virtual Machines. The size of this network is fixed to /24 owing to a limitation in the software.	SAPC_INT_SH_NETWORK = 172.16.100.0/24	The default value configured in the configuration files provided as examples is: 172.16.100.0/24

Table 7 adapt_cluster.cfg [Network] Section Parameters: OAM VIP Networks

Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
<OAM>_FEE_NODE ⁽¹⁾	No	All deployments	M	The identifiers of the SAPC nodes with Front-End Elements (FEE) for OAM traffic. This parameter is referred to the System Controllers: SC-1 and SC-2.	OAM_FEE_NODE = 1 2	The default value configured in the configuration files provided as examples is: <ul style="list-style-type: none">All deployments: 1 2



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
<code><OAM>_FEE_IFZ_INDEX⁽¹⁾</code>	<ul style="list-style-type: none"> PNF deployments: No VNF deployments: Yes 	All deployments	M	<p>The interface index in the System Controller (SC) nodes attached to the target <code><OAM>_FEE_NETWORK</code>. (For example the interface index is 0 for nic0, 1 for nic1, and n for nicn.)</p> <p>For VNF deployments, index 0 and index 1 are reserved for Internal0 and Internal1 networks respectively.</p> <p>For VNF deployments, the interface index must match with the number of interfaces defined in <code>SC_INTERFACE_INDEX</code>.</p>	<ul style="list-style-type: none"> PNF BSP 8100 deployments: <code>OAM_FEE_IFZ_INDEX = 0</code> PNF NSP 6.1 deployments: <code>OAM_FEE_IFZ_INDEX = 2</code> VNF deployments: <code>OAM_FEE_IFZ_INDEX = 2</code> 	The default value is included in the configuration files provided as examples.



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
<OAM> FEE_VLAN_TAG ^(tt)	Yes	PNF deployments only	M	<p>VLAN tags for the Front-End Element (FEE) networks for OAM traffic.</p> <p>If the parameter OAM_FEE_HA is configured to true, then, High Availability for the FEEs for OAM traffic is desired. Two VLAN tags must be configured. This implies that two FEEs are created in each node configured in OAM_FEE_NODE, each one of the FEEs using one of the VLAN tags configured in this parameter.</p> <p>If the parameter OAM_FEE_HA is configured to false:</p> <ul style="list-style-type: none">• If one VLAN tag is configured in this parameter, then one FEE is created in each node configured in OAM_FEE_NODE using that VLAN tag.• If two VLAN tags are configured in this parameter, then, one FEE is created for the first node configured in OAM_FEE_NODE using the first VLAN tag defined. Another FEE is created for the second node configured in OAM_FEE_NODE, using the second VLAN tag configured.	<ul style="list-style-type: none">• High Availability configured: OAM_FEE_VLAN_TAG = 130 131• High Availability is not configured: OAM_FEE_VLAN_TAG = 130	<p>The default value configured in the configuration files provided (only for PNF deployments) as examples is:</p> <ul style="list-style-type: none">• PNF BSP 8100 deployments: 130 131• PNF NSP 6.1 deployments: 130



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
<code><OAM>_FEE_HA⁽¹⁾</code>	No	All deployments	O	<p>If this parameter is configured to true, two Front-End Elements (FEE) are created to guarantee High Availability (HA). In this case, two OAM FEE Networks must be configured (see <code>OAM_FEE_NETWORK</code> parameter).</p> <p>If configured value is false, HA is not guaranteed for this FEE.</p> <p>The parameter is configurable for legacy purposes, but internally it is considered to be always false and it is not recommended to change it.</p>	<code>OAM_FEE_HA = false</code>	<p>The default value is:</p> <ul style="list-style-type: none"> All deployments: false
<code><OAM>_FEE_NETWORK⁽¹⁾</code>	Yes	All deployments	M	<p>The IP network ranges and masks, space-separated, assigned to the <code>OamVip0</code> and <code>OamVip1</code> networks respectively.</p> <p>This network range needs enough IP addresses available for all the defined nodes in <code>OAM_FEE_NODE</code> and for the gateways defined in <code>OAM_FEE_GATEWAY</code>.</p>	<ul style="list-style-type: none"> PNF BSP 8100 deployments: <code>OAM_FEE_NETWORK = 192.168.218.0/29 192.168.218.8/29</code> PNF NSP 6.1 deployments: <code>OAM_FEE_NETWORK = 192.168.218.0/29</code> VNF deployments: <code>OAM_FEE_NETWORK = 172.16.213.0/29</code> 	<p>The default value configured in the configuration files provided as examples is:</p> <ul style="list-style-type: none"> PNF BSP 8100 deployments: <code>192.168.218.0/29 192.168.218.8/29</code> PNF NSP 6.1 deployments: <code>192.168.218.0/29</code> VNF deployments: <code>172.16.213.0/29</code>



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
<OAM> ₍₁₎ FEE_GATEWAY	Yes	All deployments	O	<p>The IP addresses of the gateways for the SAPC Front-End Elements (FEE) used in the OAM networks (OamVip0 and OamVip1).</p> <p>These IP addresses are respectively valid IPs in the network ranges configured in OAM_FEE_NETWORK.</p>	<ul style="list-style-type: none"> PNF deployments: OAM_FEE_GATEWAY = 192.168.218.1 192.168.218.2 192.168.218.9 192.168.218.10 VNF deployments: OAM_FEE_GATEWAY = 172.16.213.1 	<p>As default value, the Adapt Cluster Tool reserves the first address from each network to the correspondent gateway, so, considering the default networks, the default value is:</p> <ul style="list-style-type: none"> PNF BSP 8100 deployments: 192.168.218.1 192.168.218.2 192.168.218.9 192.168.218.10 VNF deployments: 172.16.213.1
<OAM> ₍₁₎ _OSPF_AREA	Yes	All deployments	O	<p>The Open Shortest Path First (OSPF) area defined to include the SAPC OAM networks (OamVip0 and OamVip1) defined in OAM_FEE_NETWORK.</p> <p>For PNF BSP 8100 deployments, this OSPF area is internal. Therefore the default value can be used.</p> <p>For PNF NSP 6.1 deployments, this OSPF area is not internal only. Therefore, the value is configured to a different one from the default.</p> <p>For VNF deployments, this parameter is not applicable with static routing.</p>	<ul style="list-style-type: none"> PNF deployments: OAM_OSFPF_AREA = 0.1.1.1 VNF deployments (with OSPF): OAM_OSFPF_AREA = 10.1.13.1 	<p>The default value configured in the configuration files provided as examples is:</p> <ul style="list-style-type: none"> PNF deployments: 0.1.1.1 VNF deployments (with OSPF): 10.1.13.1

(1) The tag <OAM> must match the name given to the ALB, that is ALB_<OAM>.



Table 8. When different ALBs for traffic are configured during the VIPs configuration, for example, in traffic separation scenarios, the parameters included in next table must be configured for each ALB

Table 8 adapt_cluster.cfg [Network] Section Parameters: Traffic VIP Networks

Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
<TRF>_FEE_NODE ⁽¹⁾	Yes	All deployments	M	<p>The identifiers of the SAPC nodes with Front-End Elements (FEE) for payload traffic.</p> <p>This parameter is referred to the Payload (PL) processors in which traffic FEEs are configured after initial deployment: PL-3, PL-4, PL-5, PL-6, PL-7, and PL-8.</p>	<p>Example for no traffic separation:</p> <p>TRF_FEE_NODE = 3 4 5 6 7 8</p> <p>Example for traffic separation:</p> <p>TRF_1_FEE_NODE = 3 4 5 6 7 8</p> <p>TRF_2_FEE_NODE = 3 4 5 6 7 8</p>	<p>The default value configured in the configuration files provided as examples is:</p> <ul style="list-style-type: none"> PNF BSP 8100 deployments: 3 15 27 4 16 28 PNF NSP 6.1 deployments: 7 8 VNF deployments: 3 4 5 6 7 8



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
<code><TRF>_FEE_IFZ_INDEX⁽¹⁾</code>	<ul style="list-style-type: none">PNF deployments: NoVNF deployments: Yes	All deployments	M	<p>The interface index in the Payload (PL) nodes attached to the target <code><TRF>_FEE_NETWORK</code>. (For example the interface index is 0 for <code>nic0</code>, 1 for <code>nic1</code>, and <code>n</code> for <code>nicn</code>.)</p> <p>For VNF deployments, index 0 and index 1 are reserved for <code>Internal0</code> and <code>Internal1</code> networks respectively.</p> <p>For VNF deployments, the interface index must match with the number of interfaces defined in <code>PL_INTERFACE_INDEX</code>.</p>	<ul style="list-style-type: none">PNF BSP 8100 deployments: <code>TRF_FEE_IFZ_INDEX = 0</code>PNF NSP 6.1 deployments: <code>TRF_FEE_IFZ_INDEX = 2</code>VNF deployments: <code>TRF_FEE_IFZ_INDEX = 2</code> <p>Additional examples to illustrate traffic separation in VNF deployments:</p> <ul style="list-style-type: none">Traffic separation. Index of interfaces attached to the <code>TrafficVip0</code> network: <code>TRF_1_FEE_IFZ_INDEX = 2</code>.Index of interfaces attached to the <code>TrafficVip1</code> network: <code>TRF_2_FEE_IFZ_INDEX = 3</code>	The default value is included in the configuration files provided as examples.



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
<TRF>_FEE_VLAN_TAG ⁽¹⁾	Yes	PNF deployments only	M	<p>VLAN tags for the Front End Element (FEE) networks for <TRF> traffic.</p> <p>If the parameter <TRF>_FEE_HA is configured to true, then, High Availability for the FEEs for <TRF> traffic is desired. Two VLAN tags must be configured. This implies that two FEEs are created in each node configured in <TRF>_FEE_NODE, each one of the FEEs using one of the VLAN tags defined in this parameter.</p> <p>If the parameter <TRF>_FEE_HA is configured to false:</p> <ul style="list-style-type: none"> If one VLAN tag is configured in this parameter, then one FEE is created in each node configured in <TRF>_FEE_NODE using that VLAN tag. If two VLAN tags are configured in this parameter, then, the nodes defined in <TRF>_FEE_NODE are split in several groups equal to the number of networks configured in <TRF>_FEE_VLAN_TAG; for each node of each group, one FEE is created using the VLAN tag mapped to that group. For instance, if <TRF>_FEE_NODE = 3 15 27 4 16 28 and <TRF>_FEE_VLAN_TAG = 120 121, then FEEs for nodes 3, 15 and 27 are created 	<ul style="list-style-type: none"> High Availability configured: TRF_FEE_VLAN_TAG = 120 121 High Availability is not configured: TRF_FEE_VLAN_TAG = 120 	<p>The default value configured in the configuration files provided (only for PNF deployments) as examples is:</p> <ul style="list-style-type: none"> PNF BSP 8100 deployments: <TRF>_FEE_VLAN_TAG = 120 121 PNF NSP 6.1 deployments: <TRF>_FEE_VLAN_TAG = 120



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
<TRF>_FEE_HA (1)	No	All deployments	O	<p>If this parameter is configured to true, two Front-End Elements (FEE) are created to guarantee High Availability (HA).</p> <p>If configured value is false, HA is not guaranteed for this FEE.</p> <p>The parameter is configurable for legacy purposes, but internally it is considered to be always false and it is not recommended to change it.</p>	<p>Example for no traffic separation: TRF_FEE_HA = true</p> <p>Example for traffic separation: TRF_1_FEE_HA = true TRF_2_FEE_HA = true</p>	<p>The default value is:</p> <ul style="list-style-type: none">• All deployments: false



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
<TRF>_FEE_NETWORK⁽¹⁷⁾	Yes	All deployments	M	<p>The IP network ranges and masks, space-separated, assigned to the Traffic VIP networks respectively.</p> <p>This network range needs enough IP addresses available for all the defined nodes in <TRF>_FEE_NODE and an extra one for the gateway defined in <TRF>_FEE_GATEWAY.</p> <p>For PNF BSP 8100 deployments, this network is internal. Therefore the default value can be used.</p> <p>For PNF NSP 6.1 deployments, this network is not internal only. Therefore, the value is configured to a different one from the default.</p> <p>In OpenStack cloud deployments, this network is created with a fixed name, IP address assignment, and a wider netmask, that might differ from the setting in adapt_cluster.cfg; this is intended to avoid scaling out errors because of limitations in networking management on the cloud infrastructure. For more information, refer to SAPC VNF Network Configuration Guide.</p>	<p>Example for no traffic separation:</p> <p>Network ranges assigned to the TrafficVip0-0 and TrafficVip0-1 networks:</p> <pre>TRF_FEE_NETWORK = 172.16.113.0/28 172.16.113.16/28</pre> <p>Example for traffic separation:</p> <pre>TrafficVip0-0 and TrafficVip0-1 networks: TRF_1_FEE_NETWORK = 172.16.113.0/28 172.16.113.16/28 TrafficVip1-0 and TrafficVip1-1 networks: TRF_2_FEE_NETWORK = 172.16.113.32/28 172.16.113.48/28</pre>	<p>The default value configured in the configuration files provided as examples is:</p> <ul style="list-style-type: none"> PNF BSP 8100 deployments: <TRF>_FEE_NETWORK = 192.168.216.0/27 PNF NSP 6.1 deployments: <TRF>_FEE_NETWORK = 192.168.216.0/29 VNF deployments: 172.16.113.0/28 <p>If there is traffic separation, the default value configured in the configuration files provided as examples (for VNF deployments), for the secondary Traffic ALB is: 172.16.113.16/28</p>



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
<TRF>_FEE_GATEWAY⁽¹⁷⁾	No	All deployments	O	<p>The IP addresses of the gateways for the SAPC Front-End Elements (FEE) used in the traffic VIP networks.</p> <p>These IP addresses are respectively valid IPs in the network ranges configured in <TRF>_FEE_NETWORK.</p>	<ul style="list-style-type: none"> PNF BSP 8100 deployments: TRF_FEE_GATEWAY = 192.168.218.1 192.168.218.2 192.168.218.3 192.168.218.34 VNF deployments: TRF_FEE_GATEWAY = 172.16.213.1 <p>Additional examples to illustrate the difference when traffic separation is desired (in this case, for VNF deployments):</p> <p>Example for no traffic separation:</p> <p>The IP address for the gateway in the traffic VIP network (TrafficVip0):</p> <p>TRF_FEE_GATEWAY = 172.16.113.1</p> <p>Example for traffic separation:</p> <p>The IP address for the gateway in the traffic VIP network (TrafficVip0):</p> <p>TRF_1_FEE_GATEWAY = 172.16.113.1</p> <p>The IP address for the gateway in the traffic VIP network (TrafficVip1):</p> <p>TRF_2_FEE_GATEWAY = 172.16.113.17</p>	<p>As default value, the Adapt Cluster Tool reserves the first address from each network to the correspondent gateway, so, considering the default networks, the default value is:</p> <ul style="list-style-type: none"> PNF BSP 8100 deployments: 192.168.218.1 192.168.218.2 192.168.218.33 192.168.218.34 VNF deployments: 172.16.113.1 <p>If there is traffic separation, the default value configured in the configuration files provided as examples (for VNF deployments), for the secondary Traffic ALB is: 172.16.113.17</p>



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
<TRF>_OSPF_AREA⁽¹⁾	Yes	All deployments	O	<p>The Open Shortest Path First (OSPF) area defined to include the SAPC traffic VIP networks configured in <TRF>_FEE_NETWORK.</p> <p>For PNF BSP 8100 deployments, this OSPF area is internal. Therefore the default value can be used.</p> <p>For PNF NSP 6.1 deployments, this OSPF area is not internal only. Therefore, the value is configured to a different one from the default.</p> <p>For VNF deployments, this parameter is not applicable with static routing.</p>	<ul style="list-style-type: none"> PNF deployments: TRF_0_OSPF_AREA = 0.0.1.1 VNF deployments: TRF_0_OSPF_AREA = 10.1.13.2 <p>Additional examples to illustrate the difference when traffic separation is desired (in this case, for VNF deployments with OSPF):</p> <p>Example for no traffic separation:</p> <p>TRF_1_OSPF_AREA = 10.1.13.2</p> <p>Example for traffic separation:</p> <p>TRF_1_OSPF_AREA = 10.1.13.2</p> <p>TRF_2_OSPF_AREA = 10.1.13.3</p>	<p>The default value configured in the configuration files provided as examples is:</p> <ul style="list-style-type: none"> PNF deployments: 0.0.1.1 VNF deployments (with OSPF): 10.1.13.2 <p>If there is traffic separation, the default value configured in the configuration files provided as examples (for VNF deployments with OSPF), for the secondary Traffic ALB is: 10.1.13.3</p>
SCTP_ALB	Yes	All deployments (with traffic separation)	M	<p>The name of the ALB for SCTP traffic.</p> <p>As Smp traffic is only supported for SCTP, this parameter shall always point to the ALB used for SX_VIP.</p>	SCTP_ALB = ALB_TRF_2	The default value configured in the configuration files provided as examples is: SCTP_ALB = ALB_TRF_2

(1) The tag <TRF> must match the name given to the ALB, i. e., ALB_<TRF>.

Table 9. When different ALBs for traffic are configured during the VIPs configuration, for example, in traffic separation scenarios, the parameters related to these ALBs must be configured for each of them.



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Table 9 describes advanced parameters for Internal-Use only. It is recommended not to use them except for specific purposes.

Table 9 adapt_cluster.cfg [Network] Section Internal-Use Only Parameters

Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
TIPC_TAG	Yes	PNF deployments only	O	VLAN tag for the internal networks for TIPC.	TIPC_TAG = 100 101	The default value configured in the configuration files provided (only for PNF deployments) as examples is: TIPC_TAG = 100 101
MGMT_TAG	Yes	PNF deployments only	M	VLAN tag for the internal network for management. For PNF deployments, this VLAN is internal. Therefore the default value can be used.	MGMT_TAG = 138	The default value configured in the configuration files provided (only for PNF deployments) as examples is: MGMT_TAG = 138
OAM_FEE_ADDRESS	Yes	All deployments	O	The IP addresses, space-separated, assigned to the FEE nodes in the OamVip0 and OamVip1 networks respectively.	OAM_FEE_ADDRESS = 172.16.213.2 172.16.213.18 172.16.213.3 172.16.213.19	If the parameter is not defined, the Adapt Cluster Tool reserves the first address from each network to the correspondent gateway and from that point, assigns consecutively IP addresses from each OAM network to each FEE node, that is, 172.16.213.2 172.16.213.18 172.16.213.3 172.16.213.19



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
OAM_OSPF_HELLO	Yes	All deployments	O	<p>The HELLO interval in seconds for Open Shortest Path First (OSPF) configured in the FEE nodes for the OamVip0 and OamVip1 networks.</p> <p>If modified, the OSPF configuration in the Virtual Routers must be manually updated accordingly.</p>	OAM_OSPF_HELLO = 3	The default value is: 3 seconds.
OAM_OSPF_DEAD	Yes	All deployments	O	<p>The DEAD interval in seconds for Open Shortest Path First (OSPF) configured in the FEE nodes for the OamVip0 and OamVip1 networks.</p> <p>Its value must be at least the double plus one second of the value configured in the OAM_OSPF_HELLO parameter.</p> <p>If modified, the OSPF configuration in the Virtual Routers must be manually updated accordingly.</p>	OAM_OSPF_DEAD = 9	The default value is: 9 seconds.



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
OAM_OSPF_RETRANS	Yes	All deployments	O	The RETRANSMIT interval in seconds for Open Shortest Path First (OSPF) configured in the FEE nodes for the OamVip0 and OamVip1 networks. If modified, the OSPF configuration in the Virtual Routers must be manually updated accordingly.	OAM_OSPF_RETRANS = 5	The default value is: 5 seconds.
OAM_OSPF_DELAY	Yes	All deployments	O	The initial schedule DELAY in seconds for Open Shortest Path First (OSPF) configured in the FEE nodes for the OamVip0 and OamVip1 networks. If modified, the OSPF configuration in the Virtual Routers must be manually updated accordingly.	OAM_OSPF_DELAY = 1	The default value is: 1 second.
<TRF>_FEE_ADDRESS ⁽¹⁾	Yes	All deployments	O	The IP addresses, space-separated, assigned to every FEE node defined <TRF>_FEE_NODE in each of the Traffic VIP networks.	<TRF>_FEE_ADDRESS = 172.16.113.2 172.16.113.18 172.16.113.3 172.16.113.19	If the parameter is not defined, the Adapt Cluster Tool reserves the first address from each network to the correspondent gateway and from that point, assigns consecutively IP addresses from each Traffic network to each FEE node, that is, 172.16.113.2 172.16.113.18 172.16.113.3 172.16.113.19



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
<TRF>_OSPF_ HELLO ⁽¹⁷⁾	Yes	All deployments	O	The HELLO interval in seconds for Open Shortest Path First (OSPF) configured in the FEE nodes for the Traffic VIP Networks. If modified, the OSPF configuration in the Virtual Routers must be manually updated accordingly.	<TRF>_OSPF_ HELLO = 3	The default value is: 3 seconds.
<TRF>_OSPF_ DEAD ⁽¹⁷⁾	Yes	All deployments	O	The DEAD interval in seconds for Open Shortest Path First (OSPF) configured in the FEE nodes for the Traffic VIP Networks. Its value must be at least the double plus one second of the value configured in the OAM_OSPF_HELLO parameter. If modified, the OSPF configuration in the Virtual Routers must be manually updated accordingly.	<TRF>_OSPF_ DEAD = 9	The default value is: 9 seconds.



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
<TRF>_OSPF_ RETRANS ⁽¹⁾	Yes	All deployments	O	The RETRANSMIT interval in seconds for Open Shortest Path First (OSPF) configured in the FEE nodes for the Traffic VIP Networks. If modified, the OSPF configuration in the Virtual Routers must be manually updated accordingly.	<TRF>_OSPF_RETRANS = 5	The default value is: 5 seconds.
<TRF>_OSPF_ DELAY ⁽¹⁾	Yes	VNF deployments only	O	The initial schedule DELAY in seconds for Open Shortest Path First (OSPF) configured in the FEE nodes for the Traffic VIP Networks. If modified, the OSPF configuration in the Virtual Routers must be manually updated accordingly.	<TRF>_OSPF_DELAY = 1	The default value is: 1 second.

(1) The tag <TRF> must match the name given to the ALB, i. e., ALB_<TRF>

— [GeoRed] Section

This section is only mandatory in the `adapt_cluster.cfg` file for GeoRed configurations for both VNF and PNF deployments.



Table 10 adapt_cluster.cfg [GeoRed] Section Parameters

Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
LOCAL_REP_VIP	Yes	All deployments	M	<p>The local Virtual IP address (VIP) configured for replication traffic between both GeoRed nodes, followed, space-separated, by the Abstract Load Balancer (ALB) to handle this traffic internally in the SAPC node.</p> <p>The ALB name is not configurable, only the VIP address.</p> <p>If a dedicated ALB is desired for replication traffic between both GeoRed nodes, to be created it must be configured according to the explanations provided in Table 8.</p>	<p>LOCAL_REP_VIP = 200.200.201</p> <p>ALB_REP_1</p> <p>ATTENTION</p> <p>ALB_REP_1 must be previously configured according to the explanations provided in Table 8.</p>	No default value is assigned. Execution ended if not configured for GeoRed configurations.
PEER_REP_IP	Yes	All deployments	M	The remote Virtual IP address (VIP) used for traffic replication between both GeoRed nodes.	PEER_REP_IP = 200.200.200.202	No default value is assigned. Execution ended if not configured for GeoRed configurations.
PREFERRED	Yes	All deployments	M	<p>The GeoRed node elected as preferred to maintain its database in case of situations when it is not possible to know the node that holds the most up-to-date data.</p> <p>The preferred one is configured with the value 1 and the other one with 0.</p>	<p>Preferred node in the GeoRed system to be the active one:</p> <p>PREFERRED = 1</p> <p>In other case:</p> <p>PREFERRED = 0</p>	No default value is assigned. Execution ended if not configured for GeoRed configurations.



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
ACT_ACT	Yes	All deployments	O	<p>If this parameter is configured to true, Active-Active Geographical redundancy solution is selected.</p> <p>If this parameter is not present, Active-Standby Geographical redundancy solution is selected.</p>	ACT_ACT = true	No default value is assigned, so Active-Standby Geographical redundancy solution is the default.
LOCAL_APP_VIP	Yes	All deployments	O	<p>Only for Active-Active Geographical Redundancy configurations.</p> <p>The local Virtual IP address (VIP) configured for geographical redundancy supervision and control in the Traffic Channel link, followed, space-separated, by the Abstract Load Balancer (ALB) to handle this traffic internally in the SAPC.</p> <p>The VIP address and the ALB name are not configurable, select the VIP address and ALB configured for payload traffic in Table 5.</p>	LOCAL_APP_VIP = 10.58.31.137 ALB_TRF_1	No default value is assigned. Execution ended if not configured for Active-Active Geographical Redundancy configurations.
PEER_APP_IP	Yes	All deployments	O	<p>Only for Active-Active Geographical Redundancy configurations.</p> <p>The remote Virtual IP address (VIP) used for geographical redundancy supervision and control in the Traffic Channel link between both SAPCs.</p>	PEER_APP_IP = 10.58.31.138	No default value is assigned. Execution ended if not configured for Active-Active Geographical Redundancy configurations.



— [extDB] Section

This section is only mandatory in the `adapt_cluster.cfg` file for External database configurations for both VNF and PNF deployments.

Table 11 `adapt_cluster.cfg` [extDB] Section Parameters

Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
EXTDB_VIP	Yes	All deployments	M	<p>The Virtual IP address (VIP) configured for external database traffic, followed, space-separated, by the Abstract Load Balancer (ALB) to handle this traffic internally in the SAPC node.</p> <p>If a dedicated ALB is desired for external database traffic, to be created it must be configured according to the explanations provided in Table 8.</p>	<p>EXTDB_VIP = 10.51.83.51 ALB_TRF_1</p> <p>ATTENTION ALB_TRF_1 must be previously configured according to the explanations provided in Table 8.</p>	<p>No default value is configured given that it depends on a configuration using External Database.</p> <p>If not provided, no External Database VIP is configured in the system.</p>

— [BusinessEvents] Section

This section is only mandatory in the `adapt_cluster.cfg` file for EBM configurations for both VNF and PNF deployments.



Table 12 adapt_cluster.cfg [BusinessEvents] Section Parameters

Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O)	Description	Example	Default Value
EBM_VIP	Yes	All deployments	M	<p>The Virtual IP address (VIP) configured for EBM notification streaming, followed, space separated, by the Abstract Load Balancer (ALB) to handle this traffic internally in the SAPC node.</p> <p>A dedicated ALB is desired for the EBM traffic because of the recommendation of configuring an IPSec tunnel between the SAPC and the EBM Server.</p>	<p>EBM_VIP = 10.51.83.52 ALB_TRF_2</p> <p>ATTENTION ALB_TRF_2 must be previously configured according to the explanations provided in Table 8.</p>	<p>No default value is configured as it depends on the configuration that uses EBM.</p> <p>If not provided, no EBM VIP is configured in the system.</p>

— [VirtualRouters] Section

This section is only mandatory in the adapt_cluster.cfg file for VNF deployments, only if virtual routers are to be deployed.

Table 13 adapt_cluster.cfg [VirtualRouters] Section Parameters

Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O), Conditional (C)	Description	Example	Default Value
EXT_OAM_NETWORK	Yes	VNF deployments only	M	The External OAM traffic network and mask defined from the Virtual Routers (VR) for OAM to the border gateway.	EXT_OAM_NETWORK = 10.41.30.224/29	The default value configured in the configuration files provided as examples is: 10.41.30.224/29



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O), Conditional (C)	Description	Example	Default Value
EXT_OAM_GATEWAY	Yes	VNF deployments only	O	<p>The IP address of the border gateway that connects the Virtual Routers (VR) for OAM towards outside.</p> <p>This IP address is a valid IP in the network range configured in EXT_OAM_NETWORK.</p>	EXT_OAM_GATEWAY = 10.41.30.225	Only the EXT_OAM_NETWORK definition is mandatory. Remaining parameters to specify the IPs for the gateway, the VRRP and the external interfaces of the VRs are optional. If none of them is statically assigned, then the Adapt Cluster Tool automatically reserves the first free IP address of the network for the gateway, the second for the VRRP between the virtual routers, and the third and fourth for the external interfaces of the Virtual Routers. If any of the parameters is assigned, then this order is modified accordingly. For example, if the gateway is statically assigned, then, the first free IP address of the network is reserved for the VRRP, the second and third for the external interfaces and so on.
EXT_OAM_VRRP_VR	Yes	VNF deployments only	O	<p>The IP address for the VRRP between both Virtual Routers (VR) for OAM.</p> <p>This IP address is a valid IP in the network range configured in EXT_OAM_NETWORK.</p>	EXT_OAM_VRRP_VR = 10.41.30.226	See Page 43



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O), Conditional (C)	Description	Example	Default Value
EXT_OAM_IP_VR	Yes	VNF deployments only	O	The IP addresses for the external interfaces of the Virtual Routers (VR) for OAM. This IP address is a valid IP in the network range configured in EXT_OAM_NETWORK.	EXT_OAM_IP_VR = 10.41.30.229 10.41.30.230	See Page 43
EXT_OAM_OSPF_AREA	Yes	VNF deployments only	M	The Open Shortest Path First (OSPF) area defined among the Virtual Routers (VR) for OAM and the border gateway.	EXT_OAM_OSPF_AREA = 0.0.0.0	<p>The default value configured in the configuration files provided as examples is: 0.0.0.0</p> <p>There are three possible uses of this parameter:</p> <ul style="list-style-type: none">• The virtual routers are part of the backbone in the customer OSPF network: 0.0.0.0• The virtual router are not part of the backbone: this value must patch the value of OAM_OSPF:AREA• No connection to customer OSPF network: the value shall be empty (remove the line in adapt_cluster.cfg). In this case, the OSPF backbone will be automatically created during deployment in an internal interlink between the two virtual routers



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O), Conditional (C)	Description	Example	Default Value
EXT_OAM_OSPF_HELLO	Yes	VNF deployments only	O	The HELLO interval in seconds for Open Shortest Path First (OSPF) in the Virtual Routers External OAM traffic network.	EXT_OAM_OSPF_HELLO = 3	The default value is: 3 seconds.
EXT_OAM_OSPF_DEAD	Yes	VNF deployments only	O	The DEAD interval in seconds for Open Shortest Path First (OSPF) in the Virtual Routers External OAM traffic network.	EXT_OAM_OSPF_DEAD = 9	The default value is: 9 seconds.
EXT_OAM_OSPF_RETRANS	Yes	VNF deployments only	O	The RETRANSMIT interval in seconds for Open Shortest Path First (OSPF) in the Virtual Routers External OAM traffic network.	EXT_OAM_OSPF_RETRANS = 5	The default value is: 5 seconds.
EXT_OAM_OSPF_DELAY	Yes	VNF deployments only	O	The initial schedule DELAY in seconds for Open Shortest Path First (OSPF) in the Virtual Routers External OAM traffic network.	EXT_OAM_OSPF_DELAY = 1	The default value is: 1 second.
EXT_<TRF>_NETWORK ⁽¹⁾	Yes	VNF deployments only	M	The External traffic network and mask defined from the Virtual Routers (VR) for payload traffic to the border gateway.	<p>Example for no traffic separation:</p> <p>EXT_TRF_1_NETWORK = 10.41.70.224/29</p> <p>Example for traffic separation:</p> <p>EXT_TRF_1_NETWORK = 10.41.70.224/29</p> <p>EXT_TRF_2_NETWORK = 10.41.90.224/29</p>	<p>The default value configured in the configuration files provided as examples is: 10.41.70.224/29</p> <p>If there is traffic separation, the default value configured in the configuration files provided as examples, for the secondary Traffic network is: 10.41.90.224/29</p>



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O), Conditional (C)	Description	Example	Default Value
EXT_<TRF>_GATEWAY⁽¹⁾	Yes	VNF deployments only	O	<p>The IP address of the border gateway that connects the Virtual Routers (VR) for payload traffic towards outside.</p> <p>This IP address is a valid IP in the network range configured in EXT_<TRF>_GX_NETWORK.</p>	<p>Example for no traffic separation:</p> <p>EXT_TRF_1_GATEWAY = 10.41.70.225</p> <p>Example for traffic separation:</p> <p>EXT_TRF_1_GATEWAY = 10.41.70.225</p> <p>EXT_TRF_2_GATEWAY = 10.41.90.225</p>	<p>Only the EXT_<TRF>_NETWORK definition is mandatory. Remaining parameters to specify the IPs for the gateway, the VRRP and the external interfaces of the VRs are optional. If none of them is statically assigned, then the Adapt Cluster Tool automatically reserves the first free IP address of the network for the gateway, the second for the VRRP between virtual routers and the third and fourth for the external interfaces of the Virtual Routers. If any of the parameters is assigned, then this order is modified accordingly. For example, if the gateway is statically assigned, then, the first free IP address of the network is reserved for the VRRP, the second and third for the external interfaces and so on.</p>



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O), Conditional (C)	Description	Example	Default Value
<code>EXT_<TRF>_VRRP_VR⁽¹⁾</code>	Yes	VNF deployments only	O	The IP address for the VRRP between both Virtual Routers (VR) for Traffic. This IP address is a valid IP in the network range configured in <code>EXT_<TRF>_NETWORK</code> .	Example for no traffic separation: <code>EXT_TRF_1_VRRP_VR = 10.41.70.226</code> Example for traffic separation: <code>EXT_TRF_1_VRRP_VR = 10.41.70.226</code> <code>EXT_TRF_2_VRRP_VR = 10.41.90.226</code>	See Page 46
<code>EXT_<TRF>_IP_VR⁽¹⁾</code>	Yes	VNF deployments only	O	The IP addresses for the external interfaces of the Virtual Routers (VR) for Traffic. This IP address is a valid IP in the network range configured in <code>EXT_<TRF>_NETWORK</code> .	Example for no traffic separation: <code>EXT_TRF_1_IP_VR = 10.41.70.229</code> <code>10.41.70.230</code> Example for traffic separation: <code>EXT_TRF_1_IP_VR = 10.41.70.229</code> <code>10.41.70.230</code> <code>EXT_TRF_2_IP_VR = 10.41.90.229</code> <code>10.41.90.230</code>	See Page 46



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O), Conditional (C)	Description	Example	Default Value
EXT_<TRF>_OSPF_AREA ⁽¹⁾	Yes	VNF deployments only	M	The Open Shortest Path First (OSPF) area defined among the Virtual Routers (VR) for payload traffic and the border gateway.	EXT_TRF_1_OSPF_AREA = 0.0.0.0	<p>The default value configured in the configuration files provided as examples is: 0.0.0.0</p> <p>If there is traffic separation, the default value configured in the configuration files provided as examples, for the secondary Traffic network is: 0.0.0.0</p> <p>There are three possible uses of this parameter:</p> <ul style="list-style-type: none">• The virtual routers are part of the backbone in the customer OSPF network: 0.0.0.0• The virtual router are not part of the backbone: this value must patch the value of <TRF>_OSPF:AREA• No connection to customer OSPF network: the value shall be empty (remove the line in adapt_cluster.cfg). In this case, the OSPF backbone will be automatically created during deployment in an internal interlink between the two virtual routers



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O), Conditional (C)	Description	Example	Default Value
EXT_<TRF>_OSPF_HELLO⁽¹⁾	Yes	VNF deployments only	O	The HELLO interval in seconds for Open Shortest Path First (OSPF) in the Virtual Routers External payload traffic network.	EXT_TRF_1_0 OSPF_HELLO = 3	The default value is: 3 seconds.
EXT_<TRF>_OSPF_DEAD⁽¹⁾	Yes	VNF deployments only	O	The DEAD interval in seconds for Open Shortest Path First (OSPF) in the Virtual Routers External payload traffic network.	EXT_TRF_1_0 OSPF_DEAD = 9	The default value is: 9 seconds.
EXT_<TRF>_OSPF_RETRANS⁽¹⁾	Yes	VNF deployments only	O	The RETRANSMIT interval in seconds for Open Shortest Path First (OSPF) in the Virtual Routers External payload traffic network.	EXT_TRF_1_0 OSPF_RETRANS = 5	The default value is: 5 seconds.



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O), Conditional (C)	Description	Example	Default Value
<code>EXT_<TRF>_OSPF_DELAY⁽¹⁾</code>	Yes	VNF deployments only	O	The initial schedule DELAY in seconds for Open Shortest Path First (OSPF) in the Virtual Routers External payload traffic network.	<code>EXT_TRF_1_0 OSPF_DELAY = 1</code>	The default value is: 1 second.
<code>EXT_<TRF>_ROUTES⁽²⁾</code>	Yes	VNF deployments only	C	In case of using traffic separation this parameter is needed to configure the routes in the Virtual Routers to reach external entities.	Example of just one OCS node in the Sy interface, and Sy traffic separated in a second external traffic network: <code>EXT_TRF_2 ROUTES = 136.225.72.33/32</code> Example of just three external databases nodes in redundancy, and traffic separated in a third external traffic network: <code>EXT_TRF_3 ROUTES = 136.225.72.9/32 136.225.72.17/32 136.225.72.25/32</code>	No default value is provided. If the parameter is not present in the configuration file, no additional routes are configured in the Virtual Routers during deployment time.

(1) The variable corresponds with the tag assigned to the corresponding ALB_<TRF>

— [Upgrade] Section

This section is only mandatory in the `adapt_cluster.cfg` file for VNF deployments, when an upgrade by replacement is to be performed.



Table 14 adapt_cluster.cfg [Upgrade] Section Parameters

Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O), Conditional (C)	Description	Example	Default Value
LOCAL_UPGRADE_VIP	Yes	VNF deployments only	M	The Virtual IP address (VIP) configured for OAM traffic in the destination SAPC, followed, space-separated, named the Abstract Load Balancer (ALB) to handle this traffic internally in the SAPC node (ALB_OAM).	LOCAL_UPGRADE_VIP = 10.200.64.154 ALB_OAM	No default value is provided.
PEER_UPGRADE_VIP	Yes	VNF deployments only	M	The Virtual IP address (VIP) configured for OAM traffic in the origin SAPC, followed, space-separated, named the Abstract Load Balancer (ALB) to handle this traffic internally in the SAPC node (ALB_OAM).	PEER_UPGRADE_VIP = 10.200.81.47 ALB_OAM	No default value is provided.



Attribute	Configurable	VNF Deployments Only, PNF Deployments Only, All Deployments	Mandatory (M), Optional (O), Conditional (C)	Description	Example	Default Value
LOCAL_REP_VIP	Yes	VNF deployments only	M	The local Virtual IP address (VIP) configured for replication traffic between both local (destination SAPC) and peer (origin SAPC) nodes, followed, space-separated, by the Abstract Load Balancer (ALB) to handle this traffic internally in the SAPC node (ALB_TRF).	LOCAL_REP_VIP = 200.200.200.220 ALB_TRF	No default value is provided.
PEER_REP_VIP	Yes	VNF deployments only	M	The remote Virtual IP address (VIP) configured for replication traffic between both local (destination SAPC) and peer (origin SAPC) nodes, followed, space-separated, by the Abstract Load Balancer (ALB) to handle this traffic internally in the SAPC node (ALB_TRF).	PEER_REP_VIP = 200.200.200.219 ALB_TRF	No default value is provided.



5 Adapt Cluster Template Examples

Some examples of configuration files for the Adapt Cluster Tool are provided within the SAPC VDP. Once the VDP content is extracted, the `adapt_cluster_<descriptive_message>.cfg` files are provided to illustrate how a correct template looks, and to be taken as base to start the configuration according to the desired customizations.





Reference List

Standards

- [1] [IP Version 6 Addressing Architecture](#), RFC 4291