HPE NFV Director

On-Boarding Guide Operations: Deploy of a Firewall

Release 4.1
Second Edition

Hewlett Packard Enterprise

Notices

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Preface

About this guide

This Guide is intended to explain and guide the user through the deployment of a Firewall.

Audience

This document is targeting any user level of NFV Director: Domain users, Organization Users, Tenant Users, Group Users and Datacenter users.

For On boarding VNFs please refer to VNF On-Boarding Guide

Document history

Table 1: Document history

Edition	Date	Description
1.0	30 August 2016	First Edition

Chapter 1 Deploy of a VNF Firewall.

From now on, and to make easier the understanding of the TLDs, we are going to explain the functionality of each set of TASK_LIST_DEFINITION:GENERIC, and the number of TASK_DEFINITION:GENERIC children of the previously mentioned TASK_LIST_DEFINITION:GENERIC.

Basically, the TASK_LIST_DEFINITION:GENERIC connect what we can consider "units of execution", those are the TASK_DEFINITION:GENERIC, that have a WORKFLOW assigned to be executed when the execution of the TLD reach them.

If you like to have a more deep knowledge about the workflows mentioned through this document please refer to the specific document.

✳✳ If in the category FIND, the attribute Path is present, the attribute FIND.ArtifactType will be the starting artifact for the Path, but the FIND.Status attribute refers to the last artifact on the Path.

FIND.ArtifactType ==   VIRTUAL_MACHINE.
FIND.Status==   INSTANTIATED.
FIND.Path==

VIRTUAL_MACHINE>**VIRTUAL_CORE<CORE<CPU<SERVER<AVAILABILITY_ZONE<REGION**

>**COMPUTE>**FLAVOR

In this example, we are looking for a FLAVOR in status INSTANTIATED, we do not expect to get a VIRTUAL_MACHINE, in status INSTANTIATED.

✳✳If during the use of the TLDs, the "Regenerate UUIDs" option is used, the user should check the Id of the tree that brings all the elements of the TLD, this "id" is specific and it will be the same for all the tree groups in all the TLDs.

✳✳ The two modes available are "Default" and "Simulated", the second one is only available if it is configured previously, by defect, and the mode that will be used is "Default".

Chapter 2 Specific Elements of the TLD Deploy Firewall

In this chapter the different elements of the specific TLD will be explained conscientiously.

2.1 TLD QUOTA ASSIGMENT: Quota Assignment.

Figure 1: Quota Assignment.

The TDs that have present in the their names "Assignment", are Task Definitions responsible of the assignation of resources for an specific artifact, in the case of the quotas, the TLD it is going to assign an amount of each resource needed for the correct execution of the deployment.

Once finished, our VNF should have every quota needed for a successful deployment assigned, having taken in consideration all the rules for the assignment. This is crucial, because our component consume quotas during the execution of the TLD.

Targets of the TASK DEFINITION: STATUS of the TD: ENABLED

      GENERAL.Name ==   QUOTA ASSIGNMENT
      SET.Running_Status ==   INSTANTIATED.
      SET.Status ==   INSTANTIATED.
      EXECUTE.Workflow ==
          "WF_NFVD_ASSIGNMENT_QUOTA"
      EXECUTE.Inactive==   false
      EXECUTE.OrderBy ==
      ROLLBACK.Behaviour_on_error ==   ROLLBACK
      ROLLBACK.Number_of_retries ==   0
      DATA.Lock ==   true
      INPUT_MAPPING.MAPPING_LIST==
      assignmentRelationshipID=Quota_Assignment;
      resourceTreeID=nfvd#quotaResourceID;
      cacheLevel=full;

The Workflow present in EXECUTE.Workflow it is going to seek a firewall in Status INSTANTIATED in the DDBB, when the WF find it, it will start. This workflow assign all the resources needed by the VNF:FW to get a successful Deploy, it will check the available resources and decide which one should be assigned.

The Workflow also check the affinity policies , in case our TLD has it, the way the assignation it is going to behave depends also of this policies, once checked, we launch the assignation of resources. The assignation of resources it uses another WF that it is called from our workflow, "WF_NFVD_ASSIGN_RESOURCES".

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, the attribute "number_of_retries" set the number of rollback attempts. In this case, the TLD has not assigned a rollback workflow, so only the status of the artifact will change.

2.2 TLD RESOURCE ASSIGNMENT: Resource Assignment.

Figure 2: Resource Assignment.

The TDs that have present in their names "Assignment", are Task Definitions responsible of the assignation of resources for a specific artifact or deploy, in this case, we are looking for a VNF:FW to assign the resources needed for the future deployment. In order to have a successful assignation we must have in our TLD Deploy VNF:FW an artifact POLICY: ASSIGMENT_RELATIONSHIP, with a GENERAL.Name=="Resource_Assigment", also this artifact must be related with the OPERATION_GROUP: GENERIC of our TLD with a relationship of type PROVIDES and status ENABLED.

Once finished, our VNF:FW should have every resources needed for a successful deployment assigned, having taken in consideration all the rules for the assignment.

Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	RESOURCE_ASSIGNMENT.
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	INSTANTIATED.
EXECUTE.Workflow ==	**"WF_NFVD_ASSIGNMENT"**
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	ROLLBACK
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true
INPUT_MAPPING.MAPPING_LIST== **assignmentRelationshipID=Resource_Assignment; resourceTreeID=resourceArtifactID;**	

The Workflow present in EXECUTE.Workflow it is going to seek a RESURRECTION_ASSIGNMENT in Status INSTANTIATED in the DDBB, when the WF find it, it will start. This workflow assign all the resources needed by the VNF:FW to get a successful Deploy, it will check the available resources and decide which one should be assigned.

The Workflow also check the affinity policies , in case our TLD has it, the way the assignation it is going to behave depends also of this policies, once checked, we launch the assignation of resources.

The assignation of resources it uses another WF that it is called from our workflow, "WF_NFVD_ASSIGN_RESOURCES".

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, the attribute "number_of_retries" set the number of rollback attempts.

2.3 TLD CREATE_FLAVOR_AND_MGMT: CREATE_FLAVOR.

This TD it is going to create the FLAVORS needed for each VMs to be activated later on, this means, the WFs implied in this TLD are going to check each element of our VMs to gather all the information needed to create a specific FLAVOR artifact, during the execution of the TD, the ENTITY_SCALE Policies are going to be consulted, the situation of these policies are required for the correct creation of the FLAVOR.

Once finished, we will have a number of FLAVORS bonded to a VM or VMs, prepare to be activated with these FLAVORS.

Targets of the TASK DEFINITION: STATUS of the TD:
ENABLED

GENERAL.Name ==	CREATE_FLAVOR.
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	INSTANTIATED.
EXECUTE.Workflow ==	
"WF_NFVD_CREATE_FLAVOR_INSTANCES"	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	ROLLBACK
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

Figure 3: Create Flavor.

The Workflow present in EXECUTE.Workflow it is going to seek a VNF:FW with Running_Status INSTANTIATED in the DDBB, if the WF find some artifact that fill all the conditions, it will start.

This workflow will start another two more, the one that check if the FLAVOR needs Extra_Specs, a special set of configurations for the FLAVOR, "WF_NFVD_CREATE_FLAVOR_EXTRA_INVENTORY", and the one that will create the Flavor Instance in OPENSTACK platform, "WF_NFVD_CREATE_FLAVOR_OS_INSTANCE".

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, the attribute "number_of_retries" set the number of rollback attempts.
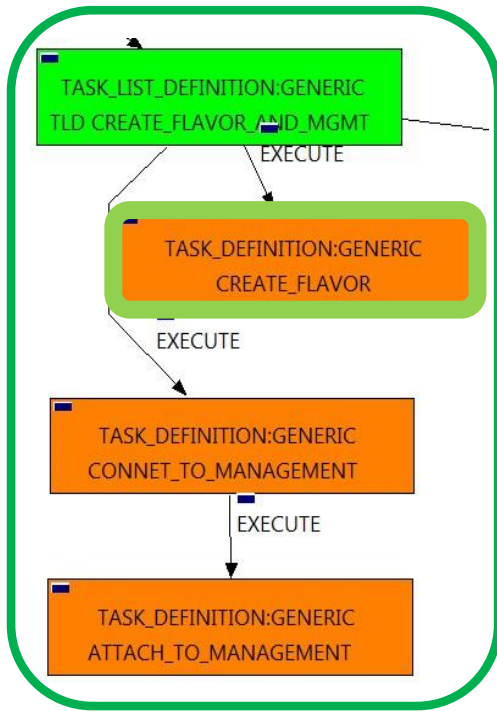
2.4 TLD CREATE_FLAVOR_AND_MGMT: CONNECT_TO_MANAGEMENT.

The TDs that have present in the their names "Connect", are Task Definitions responsible of the connection between artifacts, this means, this TDs will create relationship of specific kind between concrete artifacts, in this case, it will create relationships of type USES and status ENABLED between a specific VIRTUAL_PORT, and the SUBNETWORKS (or the subnetworks's IPADDRESS:GENERIC) related as children of our VIRTUAL_LINK:MANAGEMENT that we are using.

Once finished, we should have all SUBNETWORKs related as children of our VL:MANAGEMENT bonded with a relationship of type USES and status ENABLED with the VIRTUAL_PORT found by the conditions of the TD.

Targets of the TASK DEFINITION: STATUS of the TD:
 ENABLED

GENERAL.Name ==   CONNET_TO_MANAGEMENT.
FIND.MainArtifact ==
 VNF:FW>VNF_COMPONENT>VIRTUAL_MACHINE>VIRTUAL_PORT#INFO.NetworkType=MANAGEMENT
SET.Running_Status ==   INSTANTIATED.
SET.Status ==   INSTANTIATED.
EXECUTE.Workflow ==
           "WF_TS_CONNECT_MANAGEMENT_NETWORK"
EXECUTE.Inactive==   false
EXECUTE.OrderBy ==
ROLLBACK.Behaviour_on_error ==   ROLLBACK
ROLLBACK.Number_of_retries ==   0
DATA.Lock ==   true
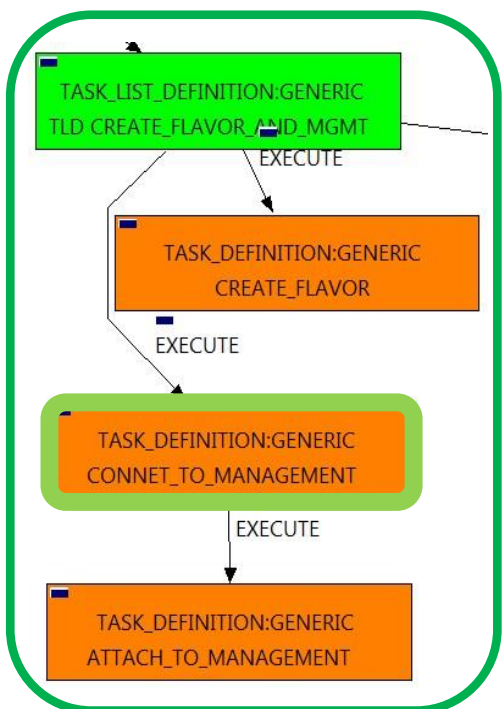
Figure 4: Connect to Management.

The Workflow present in EXECUTE.Workflow it is going to seek a VIRTUAL_PORT that match the FIND.MainArtifact attribute with value INFO.NetworkType == MANAGEMENT and with Running_Status INSTANTIATED in the DDBB, if the WF find some artifact that fill all the conditions, it will start. If the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. This workflow it is going to create a relationship of type USES and status INSTANTIATED between the VIRTUAL_PORT found and each SUBNETWORK of our VL:MANAGEMENT, in case that the SUBNETWORKS have IPADDRESS as children, the relationship would be created between these IPs and the VP.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have not a workflow present in the attribute, so no Rollback it is going to be initiated, so the execution it is going to end here in case of error.

2.5 TLD CREATE_FLAVOR_AND_MGMT: ATTACH_TO_MANAGEMENT.

Figure 5: Attach to management.

The TDs that have present in the their names "Attach", are Task Definitions responsible of the connection between artifacts, this means, this TDs will create relationship of specific kind between concrete artifacts, in this case, it will create relationships of type ALLOCATED and status ENABLED between a specific VIRTUAL_PORT, and the SUBNETWORKS:DCN (or the subnetworks's IPADDRESS:GENERIC) related as children of our NETWORK:DCN that belongs to the VIRTUAL_LINK:MANAGEMENT that we are using, and the SUBNETWORK:OS of Management.

Once finished, we should have all SUBNETWORK: DCN and SUBNETWORK: OS related as children of our VL:MANAGEMENT bonded with a relationship of type ALLOCATED and status ENABLED with the VIRTUAL_PORT found by the conditions of the TD.

| Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	ATTACH_TO_MANAGEMENT.
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	INSTANTIATED.
EXECUTE.Workflow ==	**"WF_TS_CONNECT_MGMT_NET_VPORT"**
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	ROLLBACK
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow it is going to seek a VIRTUAL_PORT that match the FIND.MainArtifact attribute with value INFO.NetworkType == MANAGEMENT and with Running_Status INSTANTIATED in the DDBB, notice that this attributes are not present in this TD, but are present and available in the parent TD. If the WF find some artifact that fill all the conditions, it will start. If the activation it is successful we set the status of the artifact as the SET.Status attribute dictates.

This workflow it is going to create a relationship of type ALLOCATED and status INSTANTIATED between the VIRTUAL_PORT found and each SUBNETWORK:DCN and SUBNETWORK:OS of our VL:MANAGEMENT, in case that the SUBNETWORKS have IPADDRESS as children, the relationship would be created between these IPs and the VP.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, the attribute "number_of_retries" set the number of rollback attempts.

Due to that the value of the attribute DATA.Lock is true, when the Task Definition has finished the artifact that was used in the workflow executed will be set as "Locked".

2.6 TLD CREATE_IMAGE_SERVICE_KEYPAIR: CREATE_SERVICE_NET.
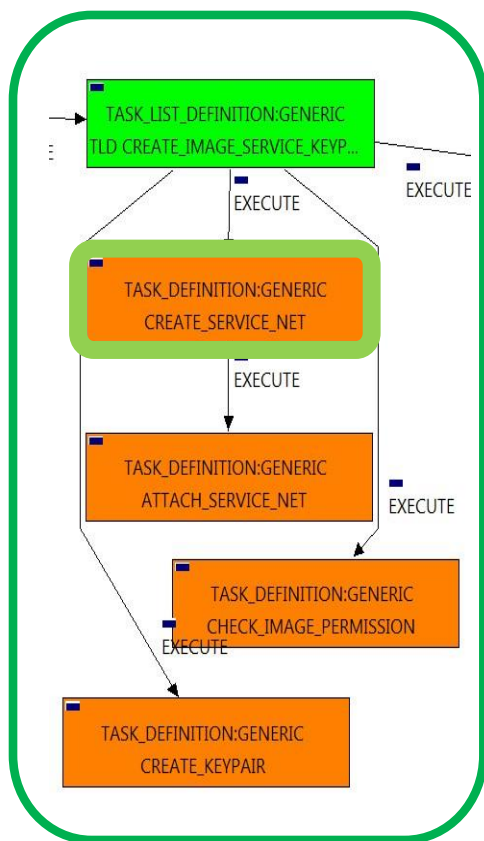
Figure 6: Create Service Network

The TDs that have present in the their names "Create", are Task Definitions responsible of the creation in the platform targeted and the updating of the status in the platform and the DDBB, in this case, the artifacts that are going to be provisioned are a number of NETWORKs and SUBNETWORKs. This artifacts are going to become the Service Net.

Once finished, we should have a ZONE:DCN and a SUBNETWORK:DCN related to the previous ZONE:DCN, both labeled as with a name that should have concatenated "Service_", also, we should have at the end of the execution of the TD, a NETWORK:OPENSTACK and a SUBNETWORK:OPENSTACK related to the previous NETOWRK:OPENSTACK, also we must have all the relationship needed for the correct behavior of the Service Net. All of the elements related to the entity given.

Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	CREATE_SERVICE_NET.
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	INSTANTIATED.
EXECUTE.Workflow ==	
"WF_TS_PROVISION_NETWORK_FW"	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	ROLLBACK
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek an artifact identified by an Id, in this case, the id will represent a VNF:FW in Status INSTANTIATED in the DDBB. Once found, the WF will start the provision of the Service Network for the Firewall, if the provision it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, the attribute "number_of_retries" set the number of rollback attempts.

In this case, there is not a workflow designated for the Rollback process, so in case of error the TD will change the status of the artifact identified by the specific ID which it is been used during the execution of the Workflow.

2.7 TLD CREATE_IMAGE_SERVICE_KEYPAIR:: ATTACH_SERVICE_NET.
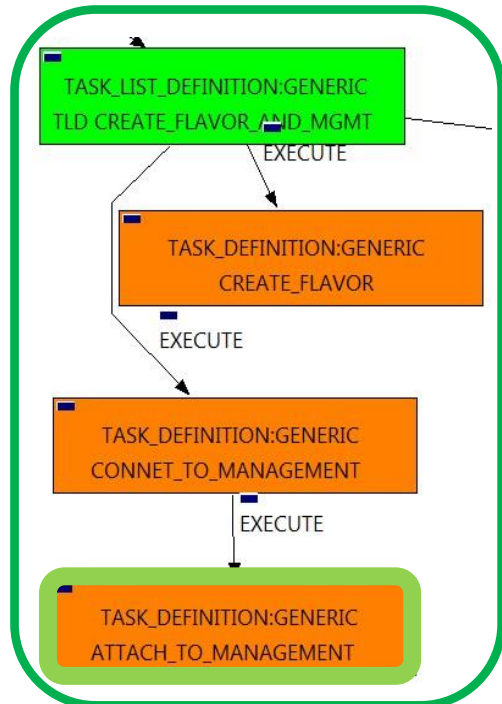
The TDs that have present in the their names "Attach", are Task Definitions responsible of the connection between artifacts, this means, this TDs will create relationship of specific kind between concrete artifacts, in this case, it will create relationships of type ALLOCATED and status ENABLED between a specific VIRTUAL_PORT, and the SUBNETWORKS:DCN and SUBNETWORK:OPENSTACK that the TLD recently has provisioned, as part of our Service Net.

Once finished, we should have all SUBNETWORK: DCN and SUBNETWORK: OS related as children of our VNF:FW bonded with a relationship of type ALLOCATED and status ENABLED with the VIRTUAL_PORT found by the conditions of the WF.

Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	ATTACH_SERVICE_NET.
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	INSTANTIATED.
EXECUTE.Workflow ==	**"WF_TS_CONNECT_FW_VPORT"**
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	ROLLBACK
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

Figure 7: Attach Service Network.

The Workflow present in EXECUTE.Workflow attribute it is going to seek an artifact identified by an Id, in this case, the id will represent a VNF:FW in Status INSTANTIATED in the DDBB. if the WF find some artifact that fill all the conditions, it will start. If the creation of the relationships it is successful we set the status of the artifact as the SET.Status attribute dictates.

This workflow it is going to create a number of relationships of type ALLOCATED and status INSTANTIATED between the VIRTUAL_PORT found and each SUBNETWORK:DCN and SUBNETWORK:OS of our VNF:FW.

This workflow will start another two more, the one that provision in SDN, "WF_TS_PROVISION_NETWORK_SDN" and the one that provision in the OpenStack platform, "WF_TS_PROVISION_NETWORK_OPENSTACK".

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, the attribute "number_of_retries" set the number of rollback attempts.

In this case, there is not a workflow designated for the Rollback process, so in case of error the TD will change the status of the artifact identified by the specific ID which it is been used during the execution of the Workflow.

2.8 TLD
      CREATE_IMAGE_SERVICE_KEYPAIR:CHECK_IMAGE_PERMISSION.
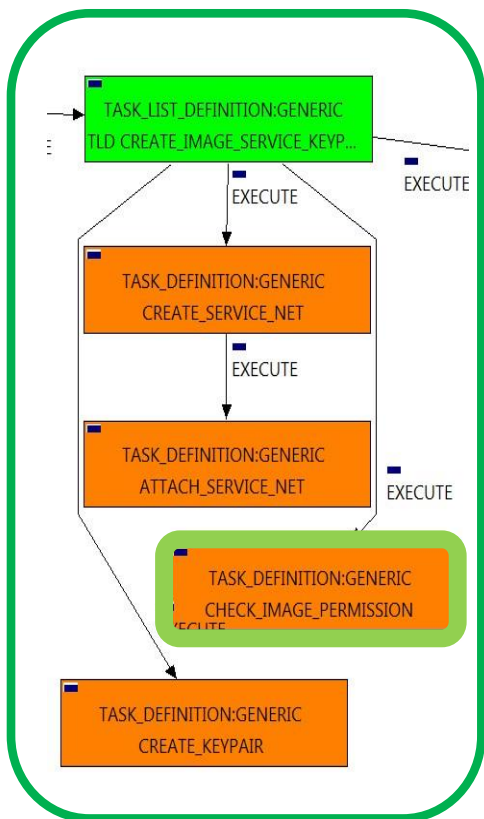
The TDs that have present in their names "Check", are Task Definitions that validate the configuration of an artifact, in this case, the configuration of the IMAGE present in our DCs, the workflow will check, validate, and in case of need, deploy the IMAGE related with the VMs present in our DC.

Targets of the TASK DEFINITION: STATUS of the TD:
 ENABLED

GENERAL.Name ==   CHECK_IMAGE_PERMISSION.
FIND.mainArtifact == VNF:FW>VNF_COMPONENT>VIRTUAL_MACHINE
SET.Running_Status ==   INSTANTIATED.
SET.Status ==   INSTANTIATED.
EXECUTE.Workflow ==
                      "WF_TS_CHECK_VM_IMAGE"
EXECUTE.Inactive==   false
EXECUTE.OrderBy ==
ROLLBACK.Behaviour_on_error ==   ROLLBACK
ROLLBACK.Number_of_retries ==   0
DATA.Lock ==   true

Figure 8: Check Image Permission.

The Workflow present in EXECUTE.Workflow it is going to seek a VIRTUAL_MACHINE in Status INSTANTIATED in the DDBB, when the WF find it, it will start. This workflow will start another two more, the one that check the permissions of the IMAGE, "WF_TS_CHECK_IMAGE_PERMISSIONS", and the one that will deploy our IMAGE if it is not deployed, "WF_TS_DEPLOY_IMAGE".

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, the attribute "number_of_retries" set the number of rollback attempts if the first launch attempt fails.

In this case, there is not a workflow designated for the Rollback process, so in case of error the TD will change the status of the artifact identified by the specific ID which it is been used during the execution of the Workflow.
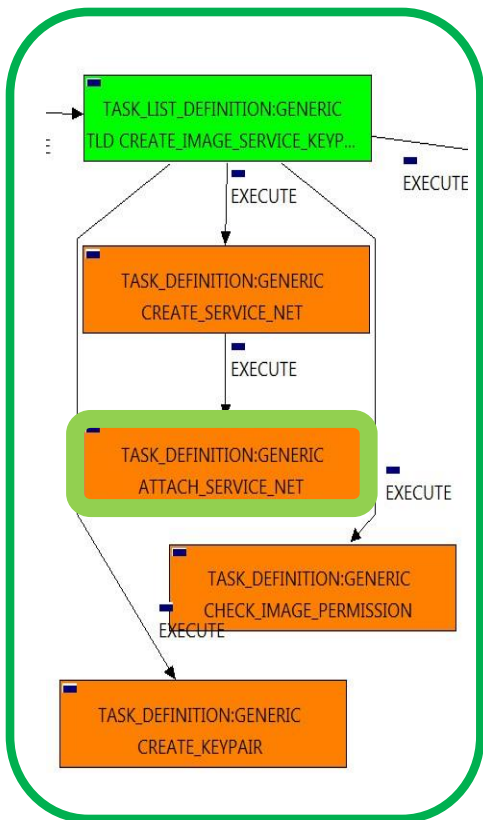
2.9 TLD CREATE_IMAGE_SERVICE_KEYPAIR:CREATE_KEYPAIR.

Figure 9: Create Keypair.

The TDs that have present in the their names "Activate", are Task Definitions responsible of the activation in the platform targeted and the updating of the status in the platform and the DDBB, in this case, the artifact that is going to be activated is a "TENANT:OPENSTACK", this means, when this workflow finish, we will have a TENANT:OPENSTACK with status ACTIVE in our Openstack platform, also the TD will update the status and other attributes of the instance that represents the artifact TENANT:OS in the DDBB and in the platform, creating all the relationships needed for a correct activation.

Targets of the TASK DEFINITION: STATUS of the TD:
 ENABLED

GENERAL.Name ==   CREATE_KEYPAIR
FIND.MainArtifact == VNF:FW>VNF_COMPONENT>VIRTUAL_MACHINE
FIND.Condition ==
          KEYPAIR.Pubkey_Data != null || KEYPAIR.Pubkey_Path != null
SET.Running_Status ==   INSTANTIATED.
SET.Status ==   INSTANTIATED.
EXECUTE.Workflow ==
          "WF_TS_NFVD_CREATE_KEY_PAIR_INVENTORY"
EXECUTE.Inactive==   false
EXECUTE.OrderBy ==
ROLLBACK.Behaviour_on_error ==   ROLLBACK
ROLLBACK.Number_of_retries ==   0
DATA.Lock ==   true

The Workflow present in EXECUTE.Workflow it is going to seek a VIRTUAL_MACHINE in Status INSTANTIATED in the DDBB, also the artifact which we are looking for have to match the FIND.Condition, means, that our VM must have as KEYPAIR.Pubkey_Data a not null value, neither can be null the value in KEYPAIR.Pubkey_Path, if the TD find some artifact that fill all the conditions, the WF will start the creation of the KEY_PAIR.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, the attribute "number_of_retries" set the number of rollback attempts.

In this case, there is not a workflow designated for the Rollback process, so in case of error the TD will change the status of the artifact identified by the specific ID which it is been used during the execution of the Workflow.

The attribute "DATA.Lock" is set with a true value, so when the WF has finished its execution, the TLD will lock the artifact identified by the ID used in the execution of the workflow.

2.10 TLD ACTIVATE_DCN_ZONE: Activate_DCN_Zone Task.

Figure 10: Activation of a DCN Network.
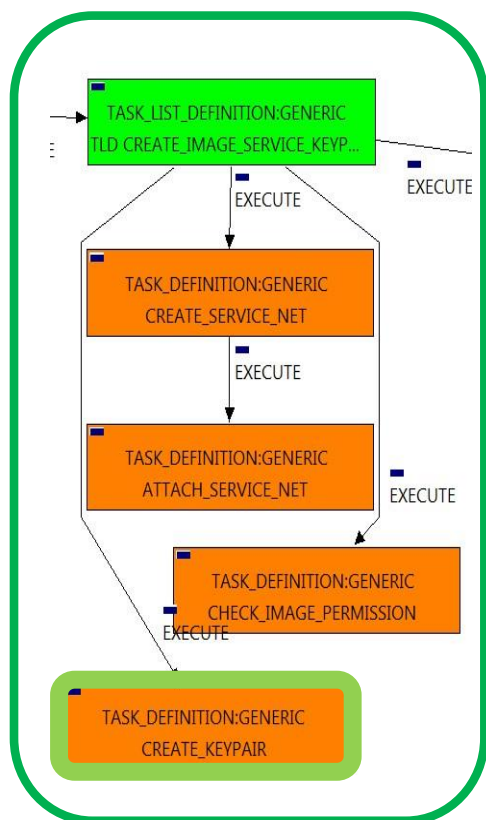
The TDs that have present in the their names "Activate", are Task Definitions responsible of the activation in the platform targeted and the updating of the status in the platform and the DDBB, in this case, the artifact that is going to be activated is a "ZONE:DCN", this means, when this workflow finish, we will have a ZONE(Network) with status ACTIVE identified as part of the Service Network.

Targets of the TASK DEFINITION:	STATUS of the TD:	ENABLED
GENERAL.Name ==	Activcate_DCN_Zone Task	
FIND.MainArtifact ==		
VNF:FW>VNF_COMPONENT>VIRTUAL_MACHINE>VIRTUAL_PORT		
<SUBNETWORK:GENERIC>		
SUBNETWORK:TEMPLATE>		
SUBNETWORK<ZONE@status=INSTANTIATED		
SET.Running_Status ==	INSTANTIATED.	
SET.Status ==	ACTIVE.	
EXECUTE.Workflow ==		
"WF_TS_ACTIVATE_SDN_ZONE"		
EXECUTE.Inactive==	false	
EXECUTE.OrderBy ==		
ROLLBACK.Behaviour_on_error ==	STOP	
ROLLBACK.Number_of_retries ==	0	
DATA.Lock ==	true	

The Workflow present in EXECUTE.Workflow attribute it is going to seek a "ZONE" in Status INSTANTIATED in the DDBB. Notice that we are not trying to get a VIRTUAL_MACHINE in status INSTANTIATED. The query it is going to use the Path present in the category FIND.MainArtifact. Once found, the WF will start the activation of the "ZONE"(Network), if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, so only the status of the artifact identified by the id will be changed.

 The attribute "DATA.Lock" is set with a true value, so when the WF has finished its execution, the TLD will lock the artifact identified by the ID used in the execution of the workflow.

2.11 TLD ACTIVATE_DCN_SUBNET: Activate_DCN_Subnet Task

The TDs that have present in the their names "Activate", are Task Definitions responsible of the activation in the platform targeted and the updating of the status in the platform and the DDBB, in this case, the artifact that is going to be activated is a "SUBNETWORK:DCN", this means, when this workflow finish, we will have a SUBNETWORK:DCN with status ACTIVE identified as part of the Service Network.

Figure 11: Activation of a DCN Subnetwork.

Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	Activcate_DCN_Zone Task
FIND.MainArtifact ==	
VNF:FW>VNF_COMPONENT>VIRTUAL_MACHINE>VIRTUAL_PORT <SUBNETWORK:GENERIC> SUBNETWORK:TEMPLATE> SUBNETWORK@status=INSTANTIATED	
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	ACTIVE.
EXECUTE.Workflow ==	
"WF_TS_ACTIVATE_SDN_SUBNETWORK"	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek a "SUBNETWORK" in Status INSTANTIATED in the DDBB. Notice that we are not trying to get a VIRTUAL_MACHINE in status INSTANTIATED. The query it is going to use the Path present in the category FIND.MainArtifact. Once found, the WF will start the activation of the Subnetwork in SDN, if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, so only the status of the artifact identified by the id will be changed.

The attribute "DATA.Lock" is set with a true value, so when the WF has finished its execution, the TLD will lock the artifact identified by the ID used in the execution of the workflow.

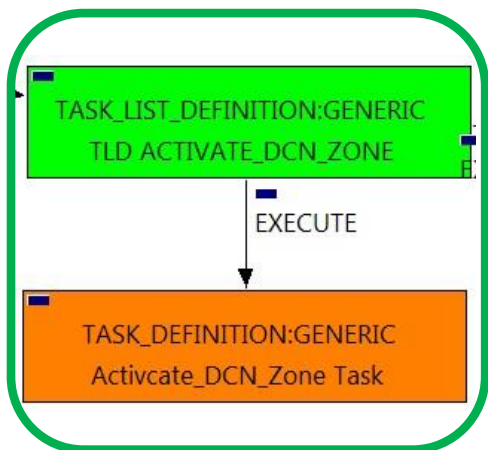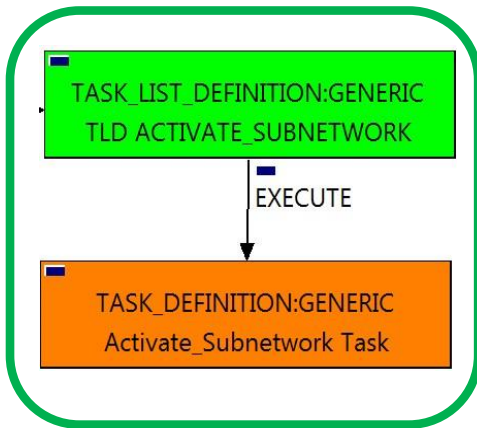## 2.12 TLD ACTIVATE_NETWORK: Activate_Network Task

Figure 12: Activation of an Openstack Network.

The TDs that have present in the their names "Activate", are Task Definitions responsible of the activation in the platform targeted and the updating of the status in the platform and the DDBB, in this case, the artifact that is going to be activated is a "NETWORK:OPENSTACK", this means, when this workflow finish, we will have a NETWORK:OPENSTACK with status ACTIVE .

| Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	Activcate_DCN_Zone Task
FIND.MainArtifact ==	
VNF:FW>VNF_COMPONENT>VIRTUAL_MACHINE>VIRTUAL_PORT <SUBNETWORK:OPENSTACK<NETWORK:OPENSTACK@status=INSTANTIATED	
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	ACTIVE.
EXECUTE.Workflow ==	
"WF_TS_ACTIVATE_NETWORK"	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek a "NETWORK:OPENSTACK" in Status INSTANTIATED in the DDBB. Notice that we are not trying to get a VIRTUAL_MACHINE in status INSTANTIATED. The query it is going to use the Path present in the category FIND.MainArtifact.

Once found, the WF will start the activation of the Network in the Openstack Platform, if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, so only the status of the artifact identified by the id will be changed.

The attribute "DATA.Lock" is set with a true value, so when the WF has finished its execution, the TLD will lock the artifact identified by the ID used in the execution of the workflow.

2.13 TLD ACTIVATE_NETWORK: Activate_Network Task

Figure 13: Activation of an Openstack Subnetwork.

The TDs that have present in the their names "Activate", are Task Definitions responsible of the activation in the platform targeted and the updating of the status in the   platform and the DDBB, in this case, the artifact that is going to be activated is a "SUBNETWORK:OPENSTACK", this means, when this workflow finish, we will have a SUBNETWORK:OPENSTACK with status ACTIVE identified as part of the Service Network.

Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	Activcate_DCN_Zone Task
FIND.MainArtifact == **VNF:FW>VNF_COMPONENT>VIRTUAL_MACHINE>VIRTUAL_PORT <SUBNETWORK:OPENSTACK@status=INSTANTIATED**	
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	ACTIVE.
EXECUTE.Workflow ==	**"WF_TS_ACTIVATE_SUBNETWORK"**
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek a "SUBNETWORK:OPENSTACK" in Status INSTANTIATED in the DDBB. Notice that we are not trying to get a VNF:FW in status INSTANTIATED. The query it is going to use the Path present in the category FIND.MainArtifact.

Once found, the WF will start the activation of the subnetwork in the platform Openstack, if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, so only the status of the artifact identified by the id will be changed.

 The attribute "DATA.Lock" is set with a true value, so when the WF has finished its execution, the TLD will lock the artifact identified by the ID used in the execution of the workflow.

2.14 TLD CREATE_POLICY_ENTRIES: Create_RT Task.
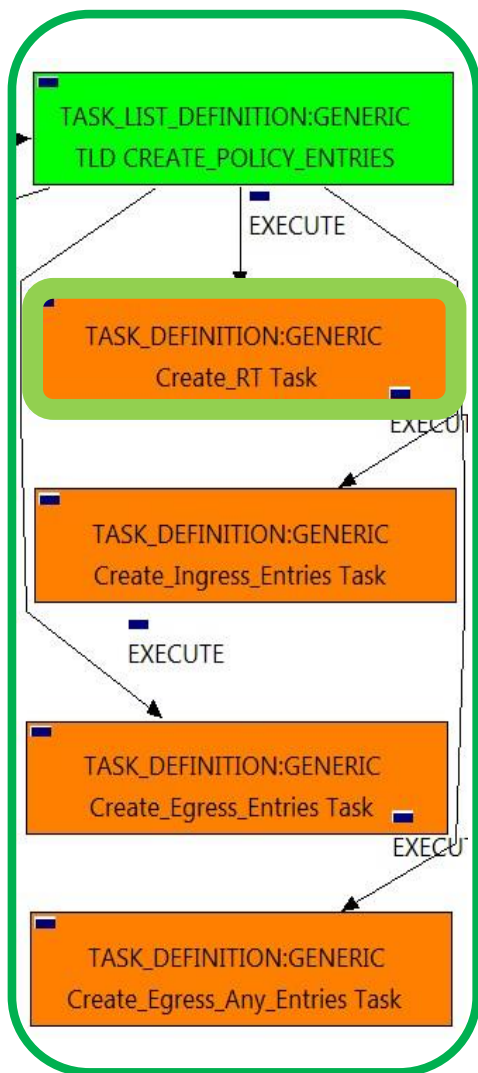
This TD it is going to provision a REDIRECTION_TARGET:DCN, this means, the WF implied in this TLD is going to query the policies of the TENANT and the artifact L3DOMAIN of our Management Network in order to create the artifact REDIRECTION_TARGET over this L3DOMAIN artifact, and related to it.

Once finished, we will have provisioned a REDIRECTION_TARGET:DCN with status INSTANTIATED and all the relationship needed for the correct behavior of the artifact, prepare to be activated when required. In this case, the relationship it is going to be only between the L3DOMAIN and the newly created REDIRECTION_TARGE, it will be a relationship of type MANAGE and Status ENABLED.

Targets of the TASK DEFINITION: STATUS of the TD: ENABLED

GENERAL.Name ==	Create_RT Task
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	INSTANTIATED.
EXECUTE.Workflow ==	
"WF_TS_PROVISION_SDN_REDIRECTION_TARGET"	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

Figure 14: Creation Redirection Target.

The Workflow present in EXECUTE.Workflow attribute it is going to seek the artifact identified by the id given to the TLD, in this case this artifact will be a "VNF:FW" in Running Status INSTANTIATED in the DDBB.

Once found, the WF will start the provison of the new RedirectionTarget artifact, if the provision it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, so only the status of the artifact identified by the id will be changed.

The attribute "DATA.Lock" is set with a true value, so when the WF has finished its execution, the TLD will lock the artifact identified by the ID used in the execution of the workflow.

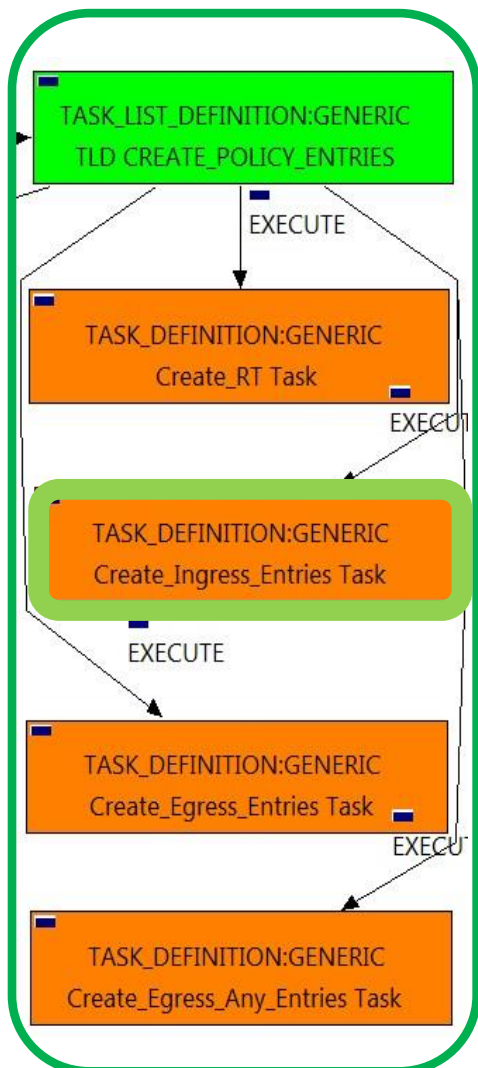## 2.15 TLD CREATE_POLICY_ENTRIES: Create_Ingress_Entries task.

Figure 15: Creation of Ingress Entries policies.

This TD it is going to provision a INGRESSACLENTRY:TEMPLATE:DCN for each INGRESSACL:TEMPLATE:DCN, this means, the WF implied in this TLD is going to query from VNF:FW to the artifact L3DOMAIN of our Management Network , and to the INGRESSACL policy related to the L3DOMAIN artifact, in order to create the policy INGRESSACLENTRY:TEMPLATE:DCN over the policy INGRESSACL:TEMPLATE:DCN with a relationship of type DEFINE and status ENABLED.

Once finished, we will have provisioned an INGRESSACLENTRY:TEMPLATE:DCN with status INSTANTIATED and all the relationship needed for the correct behavior of the artifact, prepare to be activated when required. In this case, the relationship it is going to be created only between the INGRESSACL:TEMPLATE:DCN and the newly created INGRESSACLENTRY:TEMPLATE:, it will be a relationship of type DEFINE and Status ENABLED.

Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	Create_Ingress_Entries Task
FIND.MainArtifact ==	**VNF:FW>NETWORK:GENERIC**
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	INSTANTIATED.
EXECUTE.Workflow ==	
"WF_TS_PROVISION_SDN_ZONE_ANY_INGRESSACL_ENTRY"	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
ROLLBACK.Workflow ==	
"WF_TS_PROVISION_SDN_ZONE_ANY_INGRESSACL_ENTRY_UNDO"	
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek a "NETWORK:GENERIC" in Running Status INSTANTIATED in the DDBB. Once found, the WF will start the provision of the Ingress Entries policies, if the provision it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK.workflow, if our TD fails, the TD executed the rollback workflow **"WF_TS_PROVISION_SDN_ZONE_ANY_INGRESSACL_ENTRY_UNDO".**

If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked.

The execution of the TLD continues with the next TLD or TD.

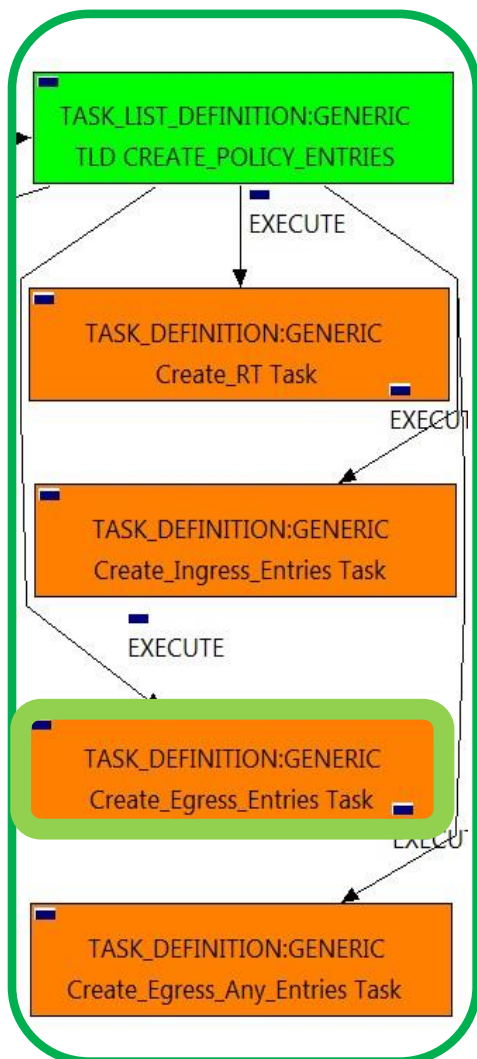## 2.16 TLD CREATE_POLICY_ENTRIES: Create_Egress_Entries task.

This TD it is going to provision a EGRESSACLENTRY:TEMPLATE:DCN for each EGRESSACL:TEMPLATE:DCN, this means, the WF implied in this TLD is going to query from VNF:FW to the artifact L3DOMAIN of our Management Network , and to the EGRESSACL policy related to the L3DOMAIN artifact, in order to create the policy EGRESSACLENTRY:TEMPLATE:DCN over the policy EGRESSACL:TEMPLATE:DCN with a relationship of type DEFINE and status ENABLED.

Once finished, we will have provisioned a EGRESSACLENTRY:TEMPLATE:DCN with status INSTANTIATED and all the relationship needed for the correct behavior of the artifact, prepare to be activated when required. In this case, the relationship it is going to be created only between the EGRESSACL:TEMPLATE:DCN and the newly created EGRESSACLENTRY:TEMPLATE:, it will be a relationship of type DEFINE and Status ENABLED.

Targets of the TASK DEFINITION: ENABLED	STATUS of the TD:
GENERAL.Name ==	Create_Ingress_Entries Task
FIND.MainArtifact ==	**VNF:FW>NETWORK:GENERIC**
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	INSTANTIATED.
EXECUTE.Workflow ==	
"WF_TS_PROVISION_SDN_ZONE_ANY_EGRESSACL_ENTRY"	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
ROLLBACK.Workflow ==	
"WF_TS_PROVISION_SDN_ZONE_ANY_EGRESSACL_ENTRY_UNDO"	
DATA.Lock ==	true

Figure 16: Creation of Egress Entries policies.

The Workflow present in EXECUTE.Workflow attribute it is going to seek a "NETWORK:GENERIC" in Running Status INSTANTIATED in the DDBB. Once found, the WF will start the provision of the Ingress Entries policies, if the provision it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK.workflow, if our TD fails, the TD executed the rollback workflow **"**WF_TS_PROVISION_SDN_ZONE_ANY_INGRESSACL_ENTRY_UNDO", but this specific case the attribute ROLLBACK.Behaviour_on_error is set with the value "STOP", so the execution will only change the status of the artifact specified.

If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked.

The execution of the TLD continues with the next TLD or TD.

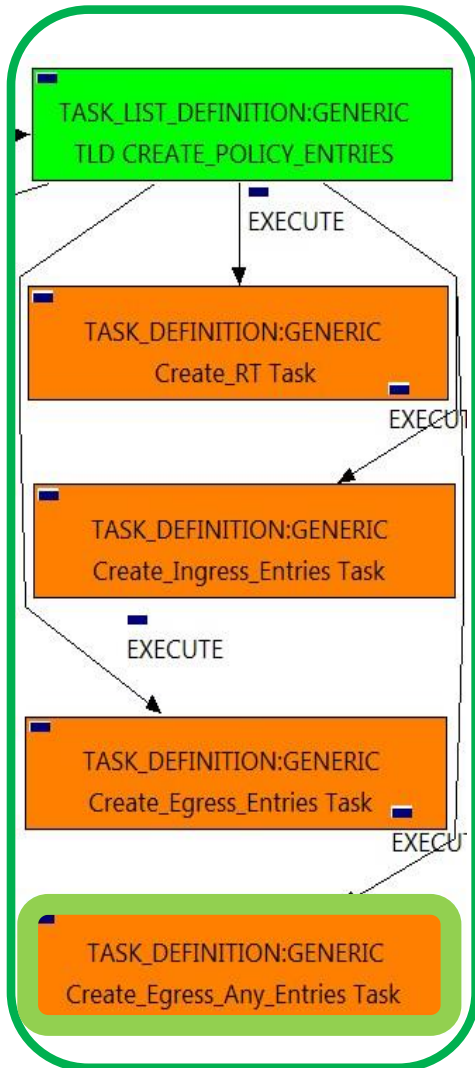2.17 TLD CREATE_POLICY_ENTRIES: Create_Egress_Any_Entries task.

Figure 17: Creation of Egress Entry
policies, Zone to Any.

This TD it is going to provision a EGRESSACLENTRY:TEMPLATE:DCN for each EGRESSACL:TEMPLATE:DCN, this means, the WF implied in this TLD is going to query from VNF:FW to the artifact L3DOMAIN of our Management Network , and to the EGRESSACL policy related to the L3DOMAIN artifact, in order to create the policy EGRESSACLENTRY:TEMPLATE:DCN over the policy EGRESSACL:TEMPLATE:DCN with a relationship of type DEFINE and status ENABLED.

Once finished, we will have provisioned a EGRESSACLENTRY:TEMPLATE:DCN with status INSTANTIATED and all the relationship needed for the correct behavior of the artifact, prepare to be activated when required. In this case, the relationship it is going to be created only between the EGRESSACL:TEMPLATE:DCN and the newly created EGRESSACLENTRY:TEMPLATE:, it will be a relationship of type DEFINE and Status ENABLED.

Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	Create_Egress_Any_Entries Task
FIND.MainArtifact ==	**VNF:FW>NETWORK:GENERIC**
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	INSTANTIATED.
EXECUTE.Workflow ==	
"WF_TS_PROVISION_SDN_ZONE_ANY_EGRESSACL_ENTRY"	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
ROLLBACK.Workflow ==	
"WF_TS_PROVISION_SDN_ZONE_ANY_EGRESSACL_ENTRY_UNDO"	
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek a "NETWORK:GENERIC" in Running Status INSTANTIATED in the DDBB. Once found, the WF will start the provision of the Egress policies "Zone to Any", if the provision it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK.workflow. As is plain to see, in this case, the TD will execute in a ROLLBACK case the workflow "**WF_TS_PROVISION_SDN_ZONE_ANY_EGRESSACL_ENTRY_UNDO**".

If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked.

The execution of the TLD continues with the next TLD or TD.

2.18 TLD CREATE_FORWARDING_POLICIES:Crete_FW_Entry_Policies Task
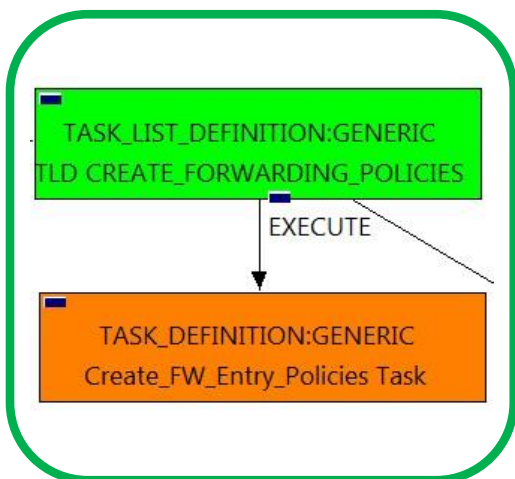

Figure 18: Creation Forwarding Entry Policies.

This TD it is going to provision a INGRESSADVFORWARDENTRY:TEMPLATE:DCN for each NETWORK on each VIRTUAL_LINK that we have in our DC, this means, the WF implied in this TLD is going to query from VNF:FW through the firewall's END_POINT to the VIRTUAL_LINK trying to reach the NETWORKS on the VL component. Once the TD has the list it is going to validate some attributes present in those Networks in order to create the policy INGRESSADVFORWARDENTRY:TEMPLATE:DCN related to policy INGRESSADVFORWARD:TEMPLATE:DCN with a relationship of type DEFINE and status ENABLED.

Also, this TD should create a relationship of type USE between the REDIRECTION_TARGET   provisioned previously and each of the policies INGRESSADVFORWARDENTRY:TEMPLATE:DCN the TD has just created.

Once finished, we will have provisioned an INGRESSADVFORWARDENTRY:TEMPLATE:DCN with status INSTANTIATED and all the relationship needed for the correct behavior of the artifact, prepared to be activated when required, a relationship of type USE between our REDIRECTION_TARGET and each policy INGRESSADVFORWARDENTRY recently created, and on last place, the TD must change the relationship between the END_POINT of the VNF:FW and the VIRTUAL_LINK's END_POINT of the state "TO_BE_CONNECTED" to "CONNECTED" .

Targets of the TASK DEFINITION: ENABLED	STATUS of the TD:
GENERAL.Name ==	Create_FW_Entry_Policies Task
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	INSTANTIATED.
EXECUTE.Workflow ==	
"WF_TS_PROVISION_SDN_FWDENTRIES_POLICIES"	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek for an artifact identified by the id passed to the TD at the beginning of its execution, in this case the artifact will be a VNF:FW in Running Status INSTANTIATED in the DDBB.

Once found, the WF will start the provision of the Forwarding Entries policies, if the provision it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK.workflow. As is plain to see, in this case, the TD will not have any workflow assigned for the rollback process so the TD only is going to change the status of the artifact which was used during the execution of the TD.

If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked.

The execution of the TLD continues with the next TLD or TD.

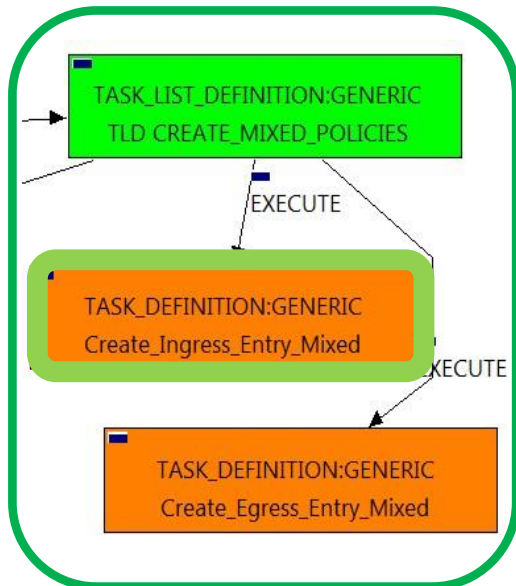## 2.19 TLD CREATE_MIXED_POLICIES : CREATE_INGRESS_ENTRY_MIXED

Figure 19: Creation of Ingress Entry Mixed policies.

This TD it is going to provision a INGRESSACLENTRY:TEMPLATE:DCN for each NETWORK or SUBNETWORK on each VIRTUAL_LINK that we have in our DC,this means, the WF implied in this TLD is going to query from END_POINT:FW to the VIRTUAL_LINK trying to reach the NETWORKS on the VL component. Once the TD has the list it is going to validate some attributes present in those Networks or Subnetworks in order to create the policy INGRESSACLENTRY:TEMPLATE:DCN related to policy INGRESSACL:TEMPLATE:DCN with a relationship of type DEFINE and status ENABLED.

Once finished, we will have provisioned an INGRESSACLENTRY:TEMPLATE:DCN artifact with status INSTANTIATED for each NETWORK or SUBNETWORK(depends on the validation of the cited attributes) with all the relationship needed for the correct behavior of the artifact, prepared to be activated when required, which is a relationship of type DEFINE between each policy created and the INGRESSACL:TEMPLATE:DCN that is unique and it is acting as parent in the relationship.

Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	CREATE_INGRESS_ENTRY_MIXED
FIND.MainArtifact==	VNF:FW>VNF_COMPONENT>VIRTUAL_MACHINE<FW_ENDPOINT
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	INSTANTIATED.
EXECUTE.Workflow ==	
"WF_TS_PROVISION_SDN_INGRESSACLENTRIES_POLICIES_MIXED"	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek a "FW_ENDPOINT" in Running Status INSTANTIATED in the DDBB, using the path present in the attribute FIND.MainArtifact : "**VNF:FW>VNF_COMPONENT>VIRTUAL_MACHINE<FW_ENDPOINT** ".

Once found, the WF will start the provision of the Ingress Entry Mixed policies, if the provision it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK.workflow. If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked once the execution has finished.

2.20 TLD CREATE_MIXED_POLICIES : CREATE_EGRESS_ENTRY_MIXED
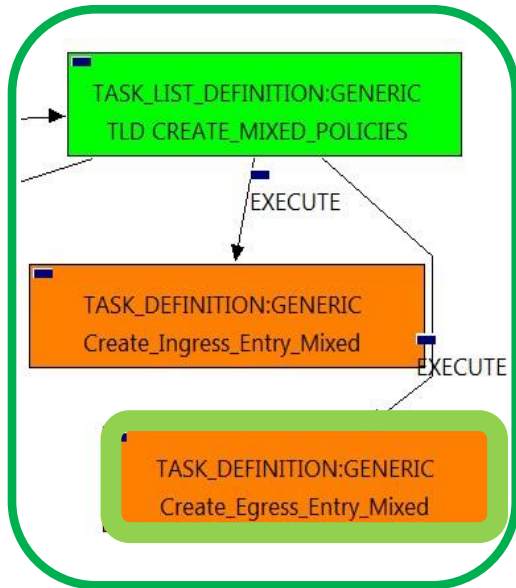

Figure 20: Creation of Egress Entry Mixed policies.

This TD it is going to provision a EGRESSACLENTRY:TEMPLATE:DCN for each NETWORK or SUBNETWORK on each VIRTUAL_LINK that we have in our DC,this means, the WF implied in this TLD is going to query from END_POINT:FW to the VIRTUAL_LINK trying to reach the NETWORKS on the VL component. Once the TD has the list it is going to validate some attributes present in those Networks or Subnetworks in order to create the policy EGRESSACLENTRY:TEMPLATE:DCN related to policy EGRESSACL:TEMPLATE:DCN with a relationship of type DEFINE and status ENABLED.

Once finished, we will have provisioned an EGRESSACLENTRY:TEMPLATE:DCN artifact with status INSTANTIATED for each NETWORK or SUBNETWORK(depends on the validation of the cited attributes) with all the relationship needed for the correct behavior of the artifact, prepared to be activated when required, which is a relationship of type DEFINE between each policy created and the EGRESSACL:TEMPLATE:DCN that is unique and it is acting as parent in the relationship.

Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	CREATE_EGRESS_ENTRY_MIXED
FIND.MainArtifact==	VNF:FW>VNF_COMPONENT>VIRTUAL_MACHINE<FW_ENDPOINT
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	INSTANTIATED.
EXECUTE.Workflow ==	
"WF_TS_PROVISION_SDN_EGRESSACLENTRIES_POLICIES_MIXED"	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek a "FW_ENDPOINT" in Running Status INSTANTIATED in the DDBB, using the path present in the attribute FIND.MainArtifact : "VNF:FW>VNF_COMPONENT>VIRTUAL_MACHINE<FW_ENDPOINT ".

Once found, the WF will start the provision of the Egress Entry Mixed policies, if the provision it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK.workflow.
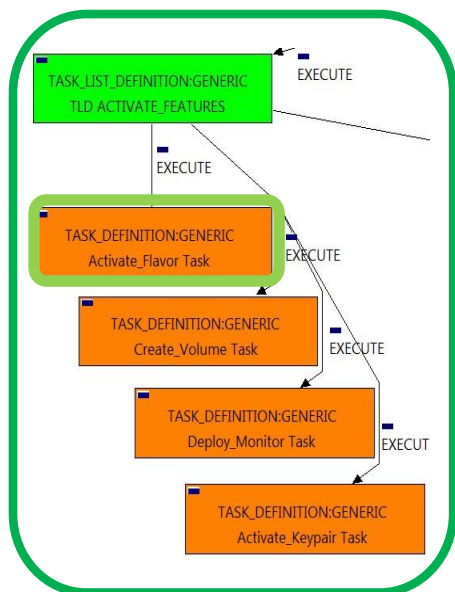
2.21 TLD ACTIVATE FEATURES: Activate_Flavor Task.

The TDs that have present in the their names "Activate", are Task Definitions responsible of the activation in the platform targeted and the updating of the status in the platform and the DDBB, in this case, the artifact that is going to be activated is a "FLAVOR", this means, when this workflow finish, we will have a FLAVOR with status ACTIVE associated to the VIRTUAL_MACHINE that it is going to use it in the activation.
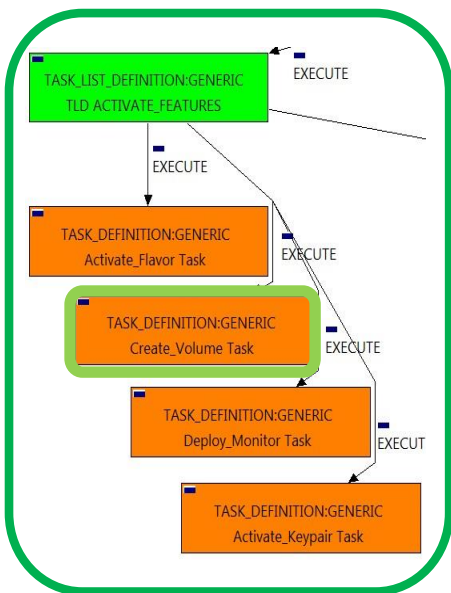
Targets of the TASK DEFINITION:	STATUS of the TD:
	ENABLED

GENERAL.Name ==	Activate_Flavor Task
FIND.MainArtifact==	
VNF:FW>VNF_COMPONENT>VIRTUAL_MACHINE> VIRTUAL_CORE<CORE<CPU<SERVER<AVAILABILITY_ZONE<REGION> COMPUTE>FLAVOR@status=INSTANTIATED	
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	ACTIVE.
EXECUTE.Workflow ==	
"WF_TS_ACTIVATE_FLAVOR"	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

Figure 21: Activation Flavor.

The Workflow present in EXECUTE.Workflow attribute it is going to seek a FLAVOR in Status INSTANTIATED in the DDBB, as from the path given by the attribute FIND.MainArtifact. Notice that we are not trying to get a VNF:FW in status INSTANTIATED. Once found, the WF will start the activation of the Flavor specified, if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, so once finished the TD only have changed the status of the FLAVOR specified.

2.22 TLD ACTIVATE FEATURES: Create_Volume Task.

The TDs that have present in the their names "Activate", are Task Definitions responsible of the activation in the platform targeted and the updating of the status in the platform and the DDBB, in this case, the artifact that is going to be activated is a "VOLUME", this means, when this workflow finish, we will have a VOLUME with status CREATED

Targets of the TASK DEFINITION: ENABLED	STATUS of the TD:
GENERAL.Name ==	Create_Volume Task
FIND.MainArtifact==	
VNF>VNF_COMPONENT>VIRTUAL_MACHINE>VIRTUAL_LUN@status=INSTANTIATED	
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	CREATED.
EXECUTE.Workflow ==	
	"WF_TS_CREATE_VOLUME"
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

Figure 22: Creation of a Volume.

The Workflow present in EXECUTE.Workflow attribute it is going to seek a VIRTUAL_LUN in Status INSTANTIATED in the DDBB, usinf the path given by the attribute "FIND.MainArtifact". Once found , the WF will start the provision of the Volume, if the provision it is successful the TD will set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK.workflow. . If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked once the execution has finished.
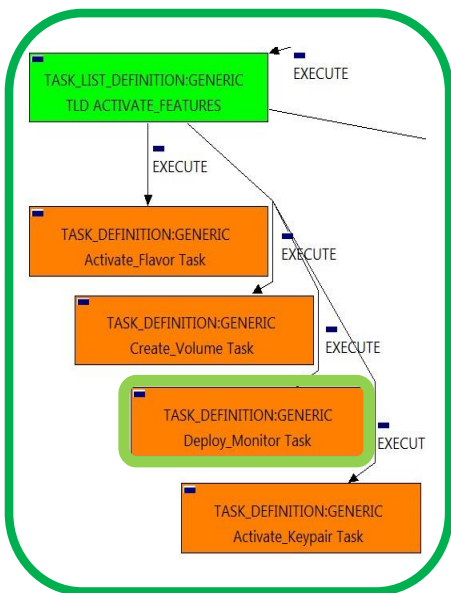
2.23 TLD ACTIVATE FEATURES: Deploy_Monitor task

The TDs that have present in the their names "Deploy" are Task Definitions responsible of the deployment in the platform targeted and the updating of the status in the platform and the DDBB , these deployments are slightly different to the ones we launch for our entities, as a rule, they are small components as the MONITORs. In this case, the artifact that is going to be deployed is a "MONITOR", this means, when this workflow finish, we will have a MONITOR deployed with status DEPLOYED.

Targets of the TASK DEFINITION: ENABLED

STATUS of the TD:

GENERAL.Name ==   Deploy_Monitor Task
FIND.MainArtifact==   MONITOR
FIND.Condition ==   status==constant:INSTANTIATED
SET.Running_Status ==   INSTANTIATED.
SET.Status ==   DEPLOYED.
EXECUTE.Workflow ==
                        "WF_TS_MONITOR_DEPLOY"
EXECUTE.Inactive==   false
EXECUTE.OrderBy ==
ROLLBACK.Behaviour_on_error ==   STOP
ROLLBACK.Number_of_retries ==   0
DATA.Lock ==   true

Figure 23: Deployment of a Monitor.

The Workflow present in EXECUTE.Workflow attribute it is going to seek a MONITOR in Status INSTANTIATED in the DDBB, both of the condifitons for the search are described by the attributes FIND.MainArtifact, and FIND.Condition. Once found , the WF will start the deployment, if the deployment is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, the only change that the execution is allowed to perform, it is the change of the status of the Monitor artifact used during the execution of the TD and Workflow. If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked once the execution has finished.
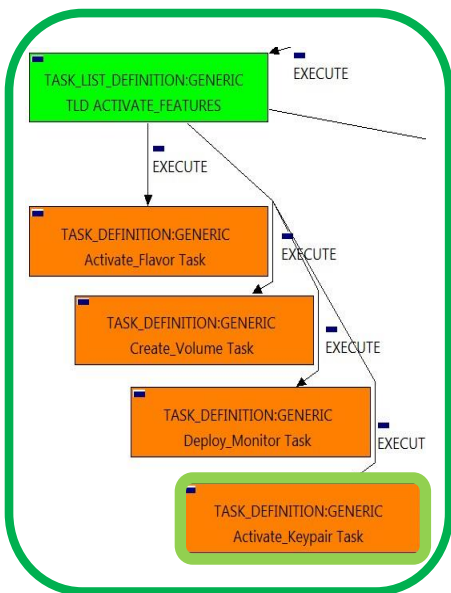
2.24 TLD ACTIVATE FEATURES: Activate_Keypair task

The TDs that have present in the their names "Activate", are Task Definitions responsible of the activation in the platform targeted and the updating of the status in the platform and the DDBB, in this case, the artifact that is going to be activated is a "KEYPAIR", this means, when this workflow finish, we will have a KEYPAIR with status ACTIVE.

Figure 24: Activation of the Keypair.

Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	Activate_Keypair Task
FIND.MainArtifact == **VNF>VNF_COMPONENT>VIRTUAL_MACHINE> VIRTUAL_CORE<CORE<CPU<SERVER<AVAILABILITY_ZONE <REGION>COMPUTE>KEY_PAIR@status=INSTANTIATED**	
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	ACTIVE.
EXECUTE.Workflow ==	**"WF_TS_CREATE_KEY_PAIR"**
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek a KEYPAIR as from the path described by the FIND.MainArtifact attribute with value "**VNF>VNF_COMPONENT>VIRTUAL_MACHINE>VIRTUAL_CORE<CORE<CPU<SERVER<AVAILABILITY_ZONE<REGION>COMPUTE>KEY_PAIR@status=INSTANTIATED**" in Status INSTANTIATED in the DDBB, notice that we are not trying to get a VNF in status INSTANTIATED.

Once found , the WF will start the activation, if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, the only change that the execution is allowed to perform, it is the change of the status of the Monitor artifact used during the execution of the TD and Workflow. If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked once the execution has finished.

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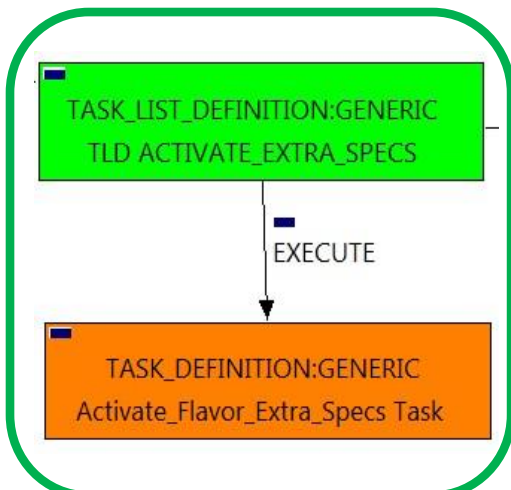## 2.25 TLD ACTIVATE_EXTRA_SPECS: Activate Task

Figure 25: Activation of a Flavor with Extra Specs.

The TDs that have present in the their names "Activate", are Task Definitions responsible of the activation in the platform targeted and the updating of the status in the platform and the DDBB, in this case, the artifact that is going to be activated is a "FLAVOR" with EXTRA_SPECS, this means, when this workflow finish, we will have a FLAVOR with EXTRA_SPECS with status Active.

Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	Activate_Flavor_Extra_Specs Task
FIND.MainArtifact == **VNF>VNF_COMPONENT>VIRTUAL_MACHINE> VIRTUAL_CORE<CORE<CPU<SERVER<AVAILABILITY_ZONE <REGION>COMPUTE>FLAVOR>EXTRA_SPECS:HELION_CG@status=INSTANTIATED**	
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	ACTIVE.
EXECUTE.Workflow == **"WF_TS_ACTIVATE_ATTACH_EXTRA_SPECS"**	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek a "HELION_CG" in Status INSTANTIATED in the DDBB. Notice that we are not trying to get a VNF in status INSTANTIATED. The query it is going to use the Path present in the category FIND.MainArtifact. Once found , the WF will start the activation, if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, only the status of the artifact which is been used in the execution will change. If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked once the execution has finished.

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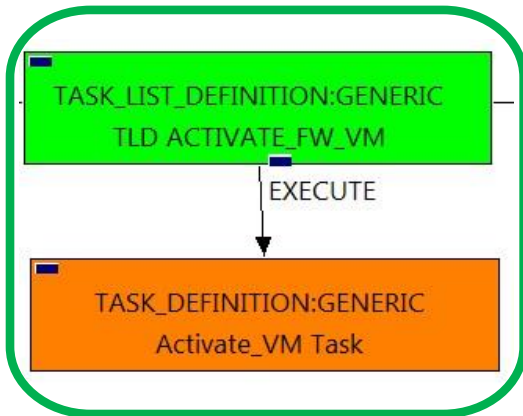## 2.26 TLD CHANGE STATUS: Tenant_Status_Change Task

The TDs that have present in the their names "Activate", are Task Definitions responsible of the activation in the platform targeted and the updating of the status in the platform and the DDBB, in this case, the artifact that is going to be activated is a "VIRTUAL_MACHINE, this means, when this workflow finish, we will have a VIRTUAL_MACNIHE with status ACTIVE.

Figure 26: Activation of a Virtual Machine.

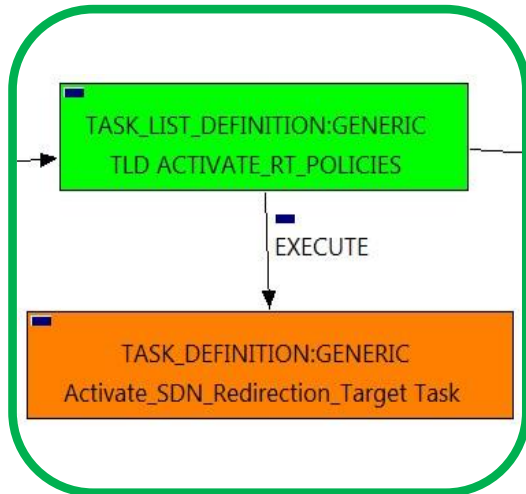| Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	Activate_VM Task
FIND.MainArtifact ==	
VNF>VNF_COMPONENT>VIRTUAL_MACHINE@status=INSTANTIATED	
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	ACTIVE.
EXECUTE.Workflow ==	
	"WF_TS_ACTIVATE_VM"
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek a "VIRTUAL_MACHINE" in Status INSTANTIATED in the DDBB, using the path given by the attribute FIND.MainArtifact.

Once found , the WF will start the activation, if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

This TD could launch different workflows depending on the type of the VM that it is going to be activated, the main kinds of our VIRTUAL_MACHINEs are CG and HELION, and so two of the WFs that are going to be used in this activation are: "WF_TS_ACTIVATE_VM_CARRIER_GRADE" and "WF_TS_ACTIVATE_VM_HELION".

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, only the status of the artifact which is been used in the execution will change. If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked once the execution has finished.

2.27 TLD ACTIVATE_RT_POLICIES: Activate_SDN_Redirection_Target Task

Figure 27: Activation of a Redirection Target.

The TDs that have present in the their names "Activate", are Task Definitions responsible of the activation in the platform targeted and the updating of the status in the platform and the DDBB, in this case, the artifact that is going to be activated is a "VIRTUAL_MACHINE, this means, when this workflow finish, we will have a VIRTUAL_MACNIHE with status ACTIVE.
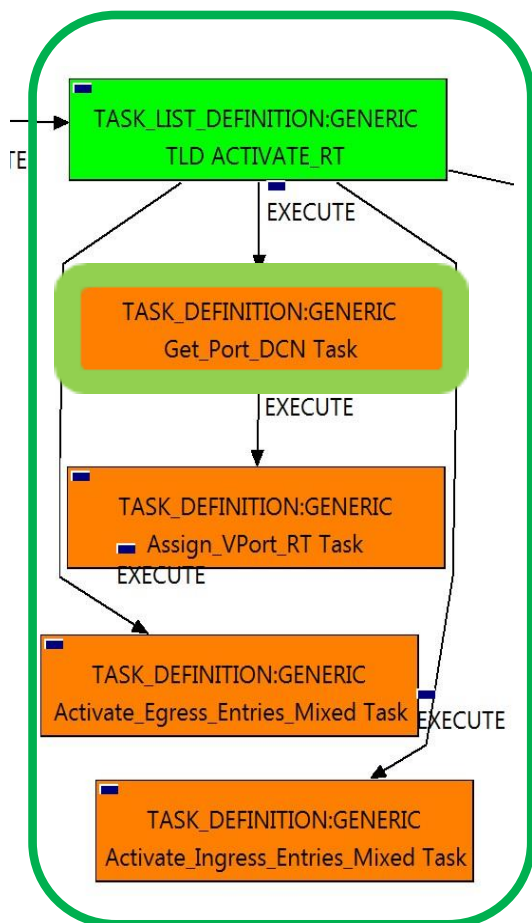
Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	Activate_SDN_Redirection_Target Task
FIND.MainArtifact == **VNF:FW>NETWORK:GENERIC>ZONE:TEMPLATE>ZONE:DCN <L3DOMAIN:DCN>INGRESSADVFORWARD> INGRESSADVFORWARDENTRY<REDIRECTION_TARGET@status=INSTANTIATED**	
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	ACTIVE.
EXECUTE.Workflow == **"WF_TS_ACTIVATE_SDN_REDIRECTION_TARGET"**	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek a "REDIRECTION_TARGET" in Status INSTANTIATED in the DDBB. Notice that we are not trying to get a VNF:FW in status INSTANTIATED. The query it is going to use the Path present in the category FIND.MainArtifact. Once found , the WF will start the activation, if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, only the status of the artifact which is been used in the execution will change. If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked once the execution has finished.

2.28 TLD ACTIVATE_RT: Get_Port_DCN Task

The TDs that have present in the their names "Get", are Task Definitions responsible of the harvest of an specific artifact, attribute or element in the DDBB or in the platform targeted, in this case, the artifact that is going to be harvested is the VIRTUAL_PORT:DCN, and more specifically a set of attributes of the VIRTUAL_PORT that need to be updated in this stage of the execution, when this workflow finish, we will have the artifact VIRTUAL_PORT given updated, remaining its status ACTIVE.

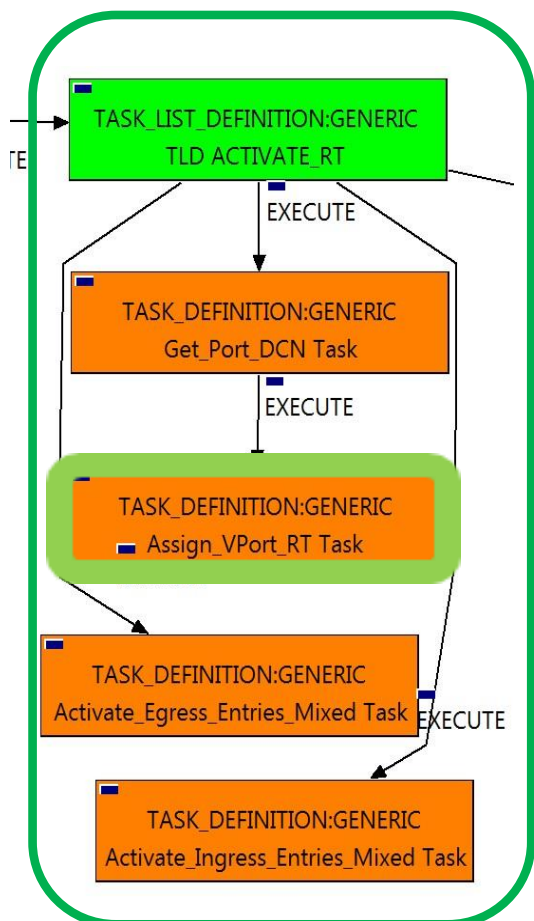| Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	Get_Port_DCN Task
FIND.MainArtifact == **VNF>VNF_COMPONENT>VIRTUAL_MACHINE> VIRTUAL_PORT<FW_ENDPOINT>VIRTUAL_PORT@status=ACTIVE**	
SET.Running_Status ==	ACTIVE.
SET.Status ==	ACTIVE.
EXECUTE.Workflow ==	**"WF_TS_DCN_GET_VPORT"**
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

Figure 28: Getting port DCN.

The Workflow present in EXECUTE.Workflow attribute it is going to seek a "VIRTUAL_PORT" in Status ACTIVE in the DDBB. Notice that we are not trying to get a VNF in status ACTIVE. The query it is going to use the Path present in the category FIND.MainArtifact. Once found , the WF will start the activation, if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, only the status of the artifact which is been used in the execution will change. If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked once the execution has finished.

2.29 TLD ACTIVATE_RT: Assign_VPort_RT Task

Figure 29: Assignation of Virtual Port to
              Redirection Target

The TDs that have present in the their names "Get", are Task Definitions responsible of the harvest of an specific artifact, attribute or element in the DDBB or in the platform targeted, in this case, the artifact that is going to be harvested is the VIRTUAL_PORT:DCN, and more specifically a set of attributes of the VIRTUAL_PORT that need to be updated in this stage of the execution, when this workflow finish, we will have the artifact VIRTUAL_PORT given updated, remaining its status ACTIVE.
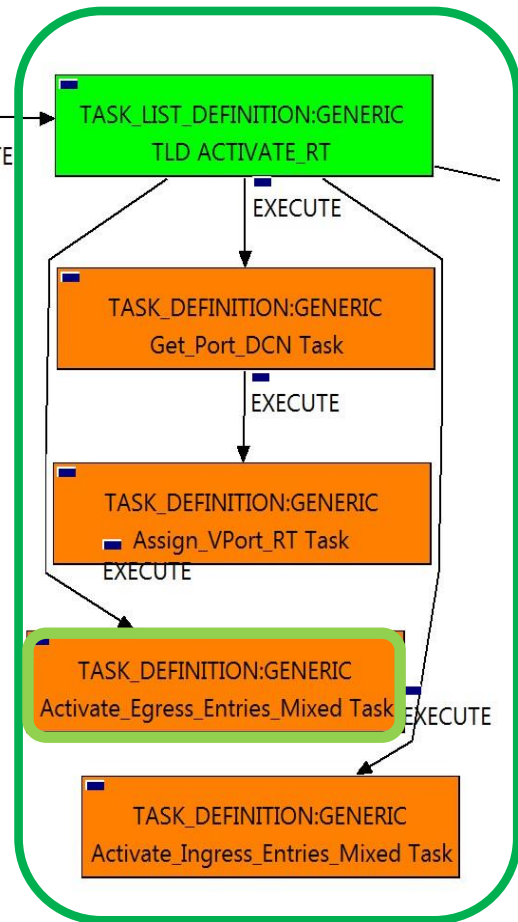
Targets of the TASK DEFINITION:	STATUS of the TD:
ENABLED	
GENERAL.Name ==	Assign_VPort_RT Task
SET.Running_Status ==	ACTIVE.
SET.Status ==	ACTIVE.
EXECUTE.Workflow ==	
"WF_TS_ASSIGN_VPORT_RT"	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek a "VIRTUAL_PORT" in Status ACTIVE in the DDBB, this port its going to be the same used in the parent TD. Once found , the WF will start the activation, if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, only the status of the artifact which is been used in the execution will change. If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked once the execution has finished.

2.30 TLD ACTIVATE_RT: Activate_Egress_Entries_Mixed Task

Figure 30: Activation of an Egress Entry
        Mixed policies.

The TDs that have present in the their names "Activate", are Task Definitions responsible of the activation in the platform targeted and the updating of the status in the platform and the DDBB, in this case, the artifact that is going to be activated is a "EGRESSACLENTRY mixed", this means, when this workflow finish, we will have a EGRESSACLENTRY with status ACTIVE associated to the EGRESSACL policy, and finally related to the VNF:FW that it is going to be used it in the activation.

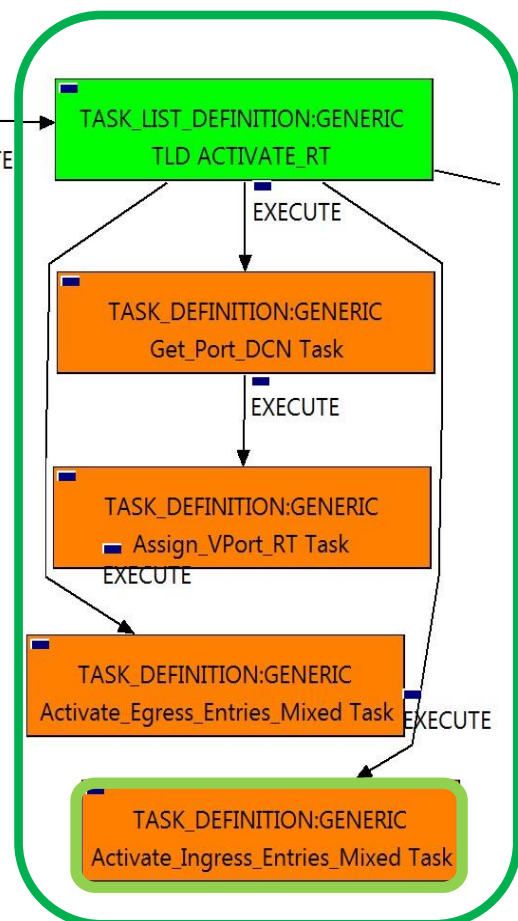| Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	Activate_Egress_Entries_Mixed Task
FIND.MainArtifact == **VNF:FW>NETWORK:GENERIC>ZONE:TEMPLATE>ZONE:DCN <L3DOMAIN:DCN>EGRESSACL> EGRESSACLENTRY@status=INSTANTIATED**	
FIND.Condition == **ACLENTRY.NetworkType==ACLENTRY.LocationType && ACLENTRY.NetworkID!=ACLENTRY.LocationID**	
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	ACTIVE.
EXECUTE.Workflow == **"WF_TS_ACTIVATE_SDN_EGRESSACLENTRY_POLICY"**	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek an EGRESSACLENTRY that match the FIND.Condition attribute with value: "ACLENTRY.NetworkType==ACLENTRY.LocationType &&ACLENTRY.NetworkID!=ACLENTRY.LocationID ",in Status INSTANTIATED in the DDBB, notice that we are not trying to get a VNF:FW in status INSTANTIATED.

The TD it is going to use the Path present in the category FIND.MainArtifact, "VNF:FW>NETWORK:GENERIC>ZONE:TEMPLATE>ZONE:DCN<L3DOMAIN:DCN>EGRESSACL>EGRESSACL ENTRY@status=INSTANTIATED".

Once found , the WF will start the activation, if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, only the status of the artifact which is been used in the execution will change. If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked once the execution has finished.

2.31 TLD ACTIVATE_RT: Activate_Ingress_Entries_Mixed Task

The TDs that have present in the their names "Activate", are Task Definitions responsible of the activation in the platform targeted and the updating of the status in the platform and the DDBB, in this case, the artifact that is going to be activated is a "INGRESSACLENTRY mixed", this means, when this workflow finish, we will have a INGRESSACLENTRY with status ACTIVE associated to the INGRESSACL policy, and finally related to the VNF:FW that it is going to be used it in the activation.

Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	Activate_Ingress_Entries Task
FIND.MainArtifact == **VNF:FW>NETWORK:GENERIC>ZONE:TEMPLATE>ZONE:DCN <L3DOMAIN:DCN>INGRESSACL> INGRESSACLENTRY@status=INSTANTIATED**	
FIND.Condition == **ACLENTRY.NetworkType==ACLENTRY.LocationType && ACLENTRY.NetworkID!=ACLENTRY.LocationID**	
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	ACTIVE.
EXECUTE.Workflow == **"WF_TS_ACTIVATE_SDN_INGRESSACLENTRY_POLICY"**	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

Figure 31: Activation of an Ingress Entry Mixed policies.

The Workflow present in EXECUTE.Workflow attribute it is going to seek an INGRESSACLENTRY that match the FIND.Condition attribute with value: "ACLENTRY.NetworkType==ACLENTRY.LocationType &&ACLENTRY.NetworkID!=ACLENTRY.LocationID ",in Status INSTANTIATED in the DDBB, notice that we are not trying to get a VNF:FW in status INSTANTIATED.

The TD it is going to use the Path present in the category FIND.MainArtifact, "VNF:FW>NETWORK:GENERIC>ZONE:TEMPLATE>ZONE:DCN<L3DOMAIN:DCN>INGRESSACL>INGRESSA CLENTRY@status=INSTANTIATED".

Once found , the WF will start the activation, if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, only the status of the artifact which is been used in the execution will change. If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked once the execution has finished.

2.32 TLD ACTIVATE_POLICY_ENTRIES:
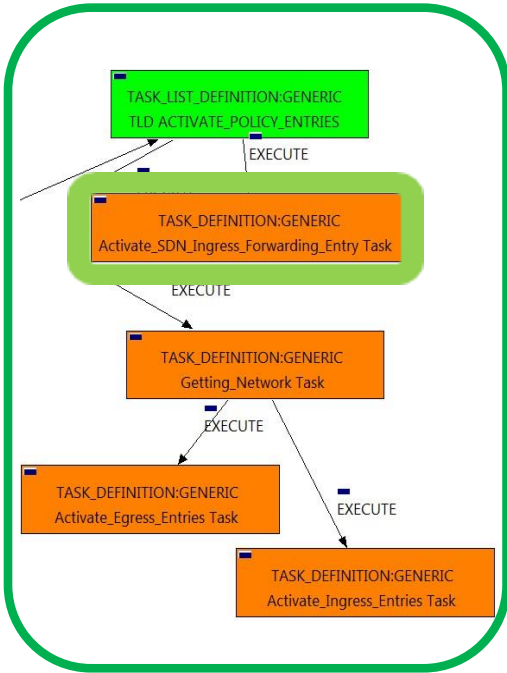### Activate_SDN_Ingress_Forwarding_Entry Task

Figure 32: Activation of Ingress Forwarding Entry policy.

The TDs that have present in the their names "Activate", are Task Definitions responsible of the activation in the platform targeted and the updating of the status in the platform and the DDBB, in this case, the artifact that is going to be activated is a "INGRESSADVFORWARDENTRY" linked to our REDIRECTION_TARGET artifact, this means, when this workflow finish, we will have a INGRESSADVFORWARDENTRY with status ACTIVE associated to the INGRESSADVFORWARD policy, and finally related to the VNF:FW that it is going to be used it in the activation.

Targets of the TASK DEFINITION: STATUS of the TD:
 ENABLED

GENERAL.Name ==
Activate_SDN_Ingress_Forwarding_Entry Task
FIND.MainArtifact ==
VNF:FW>NETWORK:GENERIC>ZONE:TEMPLATE>ZONE:DCN
<L3DOMAIN:DCN>INGRESSADVFORWARD>
INGRESSADVFORWARDENTRY@status=INSTANTIATED
SET.Running_Status ==   INSTANTIATED.
SET.Status ==   ACTIVE.
EXECUTE.Workflow ==
"WF_TS_ACTIVATE_SDN_INGRESS_ADVANCED_FORWARDING_ENTRY"
EXECUTE.Inactive==   false
EXECUTE.OrderBy ==
ROLLBACK.Behaviour_on_error ==   STOP
ROLLBACK.Number_of_retries ==   0
DATA.Lock ==   true

The Workflow present in EXECUTE.Workflow attribute it is going to seek a "INGRESSADVFORWARDENTRY" in Status INSTANTIATED in the DDBB. Notice that we are not trying to get a VNF:FW in status INSTANTIATED. The query it is going to use the Path present in the category FIND.Path. Once found , the WF will start the activation, if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, only the status of the artifact which is been used in the execution will change. If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked once the execution has finished.

2.33 TLD ACTIVATE_POLICY_ENTRIES: Getting Network Task
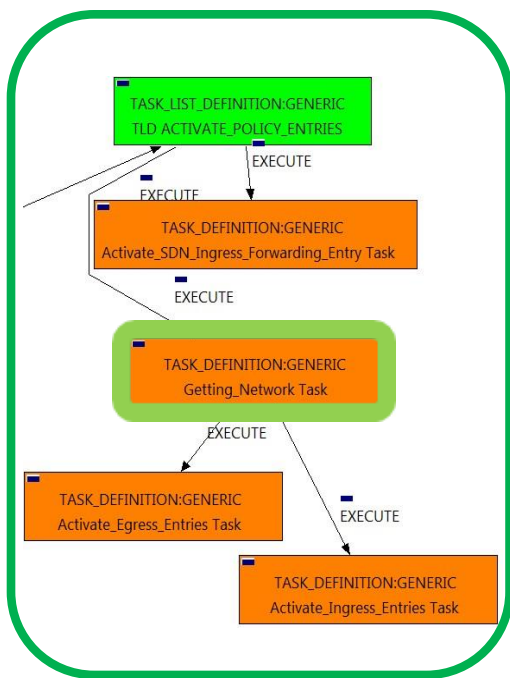
This TD it is going to assure the selection of the correct artifact that later on will be used by the workflow executed. Once finished, we will have assured that all the policies of types INGRESSACLENTRY and EGRESSACLENTRY are prepared to be activated when required.

Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	Getting_Network Task
FIND.MainArtifact ==	
VNF:FW>NETWORK:GENERIC@status=INSTANTIATED	
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	INSTANTIATED
EXECUTE.Workflow ==	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

Figure 33: Getting Network for activation
             of policies.

The Workflow present in EXECUTE.Workflow attribute it is going to Seek a "NETWORK:GENERIC" in Status INSTANTIATED in the DDBB. Notice that we are not trying to get a VNF:FW in status INSTANTIATED. The query it is going to use the Path present in the category FIND.Path. Once found , the WF will start the activation, if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, only the status of the artifact which is been used in the execution will change. If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked once the execution has finished.

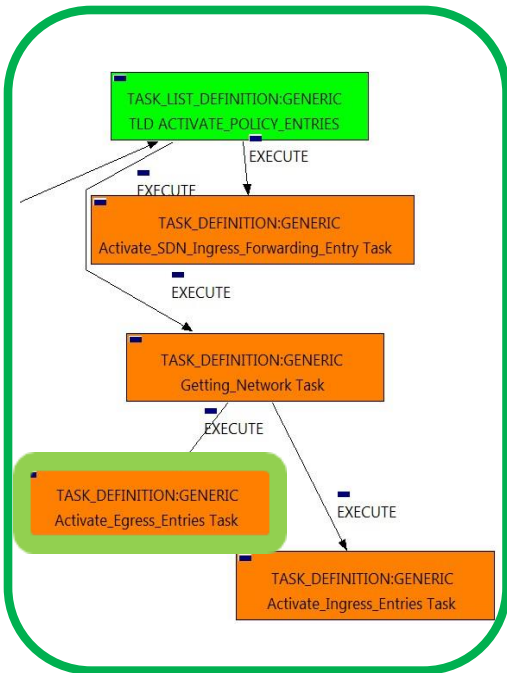## 2.34 TLD ACTIVATE_POLICY_ENTRIES: Getting Network Task

Figure 34: Activation of Egress Entries policies.

The TDs that have present in the their names "Activate", are Task Definitions responsible of the activation in the platform targeted and the updating of the status in the platform and the DDBB, in this case, the artifact that is going to be activated is a "EGRESSACLENTRY", this means, when this workflow finish, we will have a EGRESSACLENTRY with status ACTIVE associated to the EGRESSACL policy, and finally related to the VNF:FW that it is going to be used it in the activation.

Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	Activate_Egress_Entries Task
FIND.Condition ==	
GENERAL.Name==EGRESSACL_%GENERAL.Name%_ANY‖	
GENERAL.Name==EGRESSACL_ANY_%GENERAL.Name%	
FIND.Path ==	
NETWORK:GENERIC>ZONE:TEMPLATE>ZONE:DCN	
<L3DOMAIN:DCN>EGRESSACL>	
EGRESSACLENTRY@status=INSTANTIATED	
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	ACTIVE
EXECUTE.Workflow ==	
"WF_TS_ACTIVATE_SDN_EGRESSACLENTRY_POLICY"	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek an EGRESSACLENTRY that match the FIND.Condition attribute with value:

GENERAL.Name==EGRESSACL_%GENERAL.Name%_ANY‖
GENERAL.Name==EGRESSACL_ANY_%GENERAL.Name%

, in Status ACTIVE in the DDBB, notice that we are not trying to get a NETWORK:GENERIC in status ACTIVE.

The query it is going to use the Path present in the category FIND.Path,

NETWORK:GENERIC>ZONE:TEMPLATE>ZONE:DCN<L3DOMAIN:DCN>EGRESSACL>
EGRESSACLENTRY@status=INSTANTIATED

Once found , the WF will start the activation, if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, only the status of the artifact which is been used in the execution will change. If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked once the execution has finished.

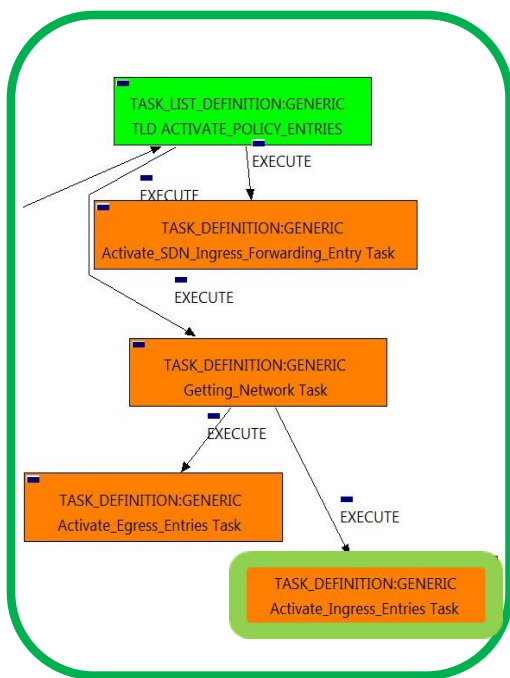## 2.35 TLD ACTIVATE_POLICY_ENTRIES: Getting Network Task

Figure 35: Activation of Ingress Entries policy.

The TDs that have present in the their names "Activate", are Task Definitions responsible of the activation in the platform targeted and the updating of the status in the platform and the DDBB, in this case, the artifact that is going to be activated is a "INGRESSACLENTRY", this means, when this workflow finish, we will have a INGRESSACLENTRY with status ACTIVE associated to the INGRESSACL policy, and finally related to the VNF:FW that it is going to be used it in the activation.

Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	Activate_Egress_Entries Task
FIND.Condition ==	
GENERAL.Name==INGRESSACL_%GENERAL.Name%_ANY‖	
GENERAL.Name==INGRESSACL_ANY_%GENERAL.Name%	
FIND.Path ==	
NETWORK:GENERIC>ZONE:TEMPLATE>ZONE:DCN	
<L3DOMAIN:DCN>INGRESSACL>	
INGRESSACLENTRY@status=INSTANTIATED	
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	ACTIVE
EXECUTE.Workflow ==	
"WF_TS_ACTIVATE_SDN_INGRESSACLENTRY_POLICY"	
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek an INGRESSACLENTRY that match the FIND.Condition attribute with value:

GENERAL.Name==INGRESSACL_%GENERAL.Name%_ANY‖
GENERAL.Name==INGRESSACL_ANY_%GENERAL.Name%

, in Status ACTIVE in the DDBB, notice that we are not trying to get a NETWORK:GENERIC in status ACTIVE.

The query it is going to use the Path present in the category FIND.Path,

NETWORK:GENERIC>ZONE:TEMPLATE>ZONE:DCN<L3DOMAIN:DCN>INGRESSACL>
INGRESSACLENTRY@status=INSTANTIATED

Once found, the WF will start the activation, if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, only the status of the artifact which is been used in the execution will change. If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked once the execution has finished.
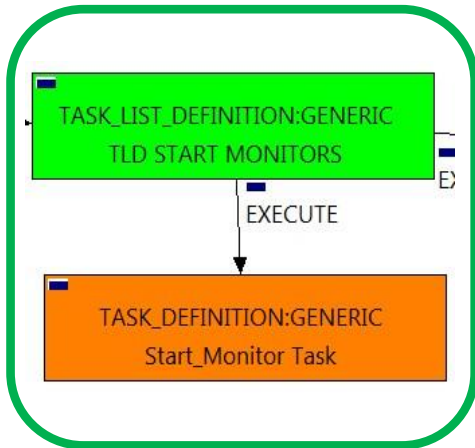
2.36 TLD START MONITORS: Start_Monitor Task

Figure 36: Start of a Monitor.

The TDs that have present in the their names "Start" are Task Definitions responsible of the launching of the component in the platform targeted and the updating of the status in the platform and the DDBB , these deployments are slightly different to the ones we launch for our entities, as a rule, they are small components as the MONITORs. In this case, the artifact that is going to be deployed is a "MONITOR", this means, when this workflow finish, we will have a MONITOR deployed with status STARTED ready to monitories.
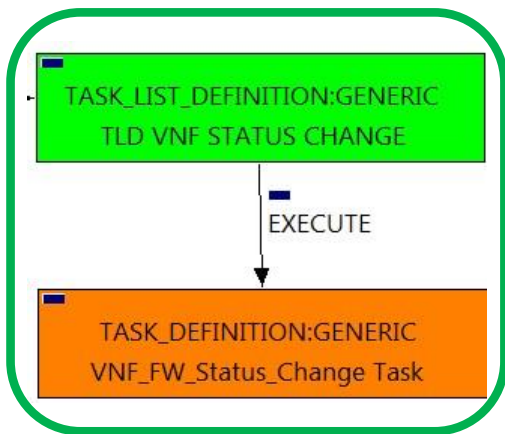
Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	Start_Monitor Task
FIND.MainArtifact ==	MONITOR
FIND.Condition ==	**status==constant:DEPLOYED**
SET.Running_Status ==	DEPLOYED.
SET.Status ==	STARTED.
EXECUTE.Workflow ==	**"WF_TS_MONITOR_START"**
EXECUTE.Inactive==	false
EXECUTE.OrderBy ==	
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The Workflow present in EXECUTE.Workflow attribute it is going to seek a MONITOR with Status DEPLOYED.

Once found , the WF will start the MONITOR, if the activation it is successful we set the status of the artifact as the SET.Status attribute dictates. The attribute SET.Running_Status concern about the temporal status that the artifact it is going to maintain until the final change of status that comes from SET.Status.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, only the status of the artifact which is been used in the execution will change. If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked once the execution has finished.

2.37 TLD VNF STATUS CHANGE: VNF_FW_Status_Change Task

Figure 37: VNF:FW Change of the status.

The TDs that have present in their names "Status Change", are Task Definitions responsible of the change in the status of the entity associated, in this case a VNF:FW. When the WF has finished we will have an VNF:FW with status ACTIVE in case of successful execution, or status ERROR in case of error, or simply not any change in the status because a ROLLBACK during the execution.

Targets of the TASK DEFINITION:	STATUS of the TD: ENABLED
GENERAL.Name ==	VNF_FW_Status_Change Task
FIND.Condition ==	**status==constant:INSTANTIATED**
SET.Running_Status ==	INSTANTIATED.
SET.Status ==	ACTIVE.
EXECUTE.Inactive==	false
ROLLBACK.Behaviour_on_error ==	STOP
ROLLBACK.Number_of_retries ==	0
DATA.Lock ==	true

The TASK_DEFINITION do not execute any workflow, with the attributes present in the categories it is enough to change the status of the entity.

In case of error during the execution, the workflow jump to the ROLLBACK category. If the "Behaviour_on_error" attribute its set on "ROLLBACK" the WF will start the execution of the Workflow present in the attribute with the same name in the category ROLLBACK, but in this case, we have a "STOP" set as behavior, so no Rollback it is going to be initiated, only the status of the artifact which is been used in the execution will change. If the execution of the TD was successful the DATA.Lock attribute is set with the value "true", because of this the artifact which was used in the execution will be locked once the execution has finished.