Control Loops for O-RU Fronthaul Recovery usecase

This page describes how to create and run the control loops for the "Hello World" O-RU Fronthaul Recovery usecase. This can be done either in docker environment using docker-compose files (available in the nonrtric repo of OSC), or in kubernetes environment using the complete ONAP installation done via OOM. Moreover, the control loop for apex policy version of the usecase can be created using Policy participant, whereas the control loop for script version of the usecase can be created using Kubernetes participant (both participants available in policy/clamp repo of ONAP).

Control loops in kubernetes

This section is related to running the control loops in a kubernetes environment. Specifically, it describes how to deploy the control loops in a full-fledge installation of ONAP assuming that the installation was done in a cluster using 'istanbul' branch of OOM.

Firstly, the common steps for creating control loops for both apex policy and script versions of the usecase are described. This is followed by the steps that are unique for setting up and testing each version individually.

Create topic in DmaaP MR

In order to create the fault notification topic in DMaaP Message Router, the first step is to find out its NodePort and NodeIP. The NodeIP is the IP address of any k8s node in the cluster where ONAP has been installed, and it can be found using the command "kubectl get nodes -o wide". The NodePort can be found using the command "kubectl -n onap get svc | grep message-router-external". Next, the topic defined for this usecase can be created using:

```
curl -k -X POST -H "Content-Type: application/json" -d "{"topicName": "unauthenticated.SEC_FAULT_OUTPUT"}"
https://<NodeIP>:<NodePort-message-router>/events/unauthenticated.SEC_FAULT_OUTPUT
```

Run Policy GUI

The easiest way to create the control loops is via Policy GUI component of the clamp. The below steps describe how to start this GUI.

NOTE: At the time of writing this page (15 Dec 2021), there is a bug in the helm chart of policy/clamp in 'istanbul' branch of OOM. The bug should be fixed by the policy/clamp team. Until then, the following steps should be done to fix this problem. Run the command:

```
kubectl -n onap edit cm def-policy-clamp-be-configmap
```

(whereas "def" refers to the name of deployment and should be replaced with the name used when installing ONAP. The same should be done for all instructions given on this page that use "def" as deployment name)

and change http to https in clamp.config.controlloop.runtime.url under application.properties. Then, run this command:

```
kubectl rollout restart deployment def-policy-clamp-be
```

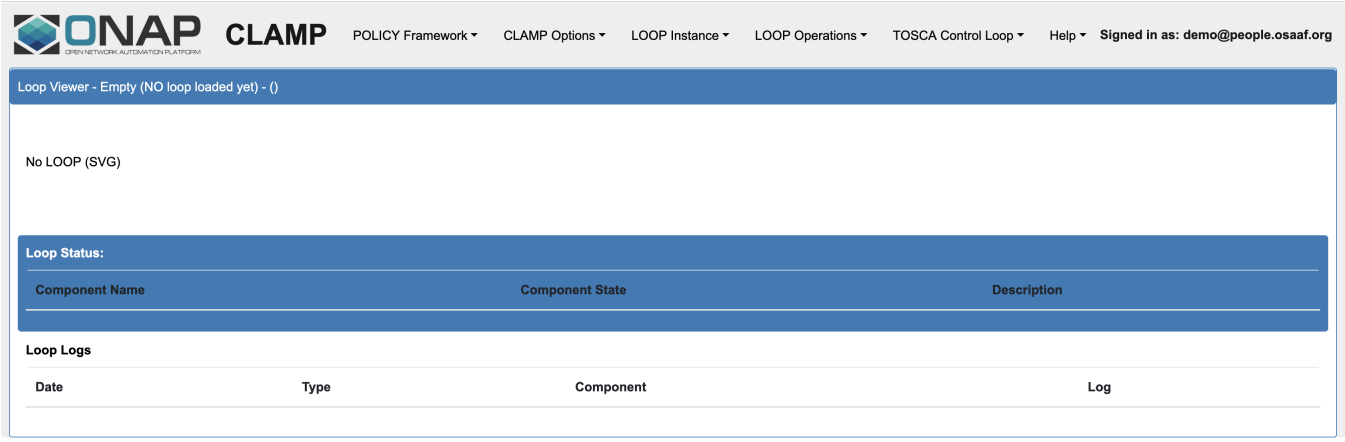
Next step is to find out the NodePort of policy-gui. This can be done by using the command "kubectl -n onap get svc | grep policy-gui".

Then, open a web browser and navigate to the url:

https://<NodeIP>:<NodePort-policy-gui>/clamp/

Use below credentials for the GUI:

username: demo@people.osaaf.org. password: demo123456!

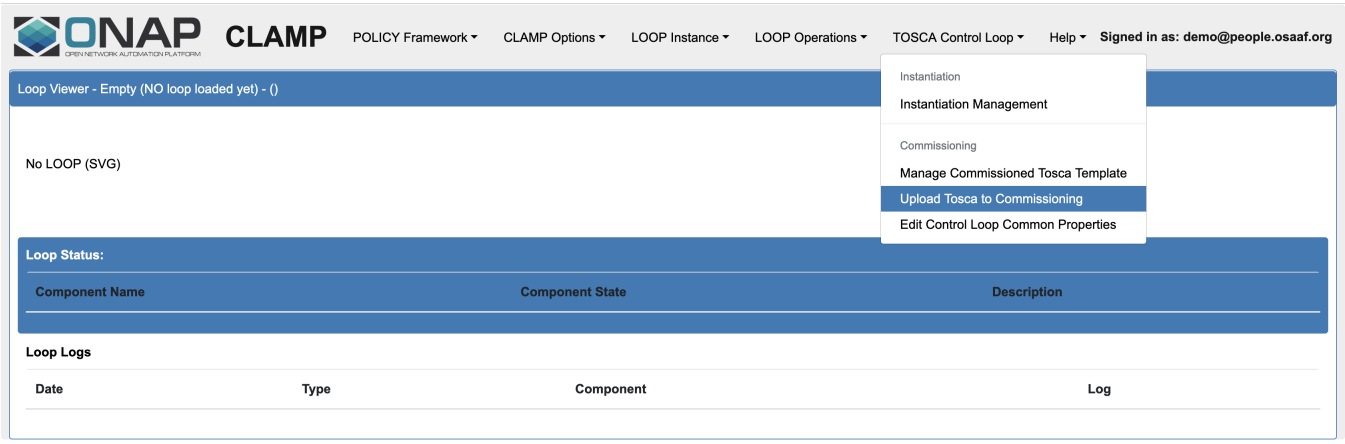


Start-up screen of the Policy GUI

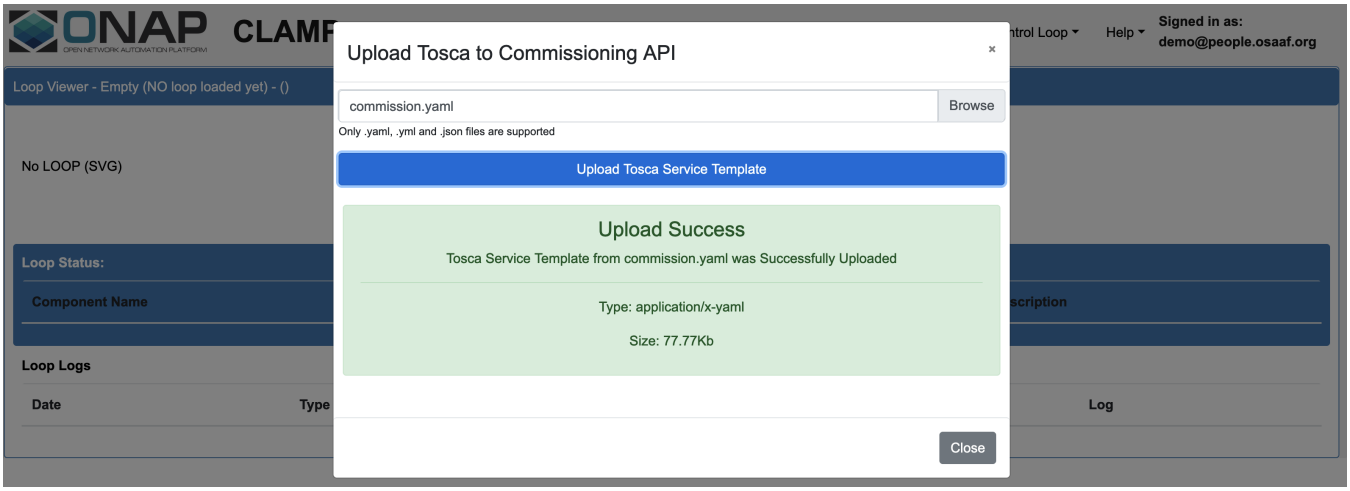
Commission/Instantiate control loop via GUI

This sub-section shows how to commission and instantiate the control loops via policy-gui. The individual tosca templates for each of the apex policy and script versions are provided later in the relevant sub-sections. The screenshots shown in this sub-section are general steps that are applicable for both versions.

Go to **Tosca Control Loop** pane, and select **Upload Tosca to Commissioning** in order to upload the tosca template (provided later in the relevant sub-section).

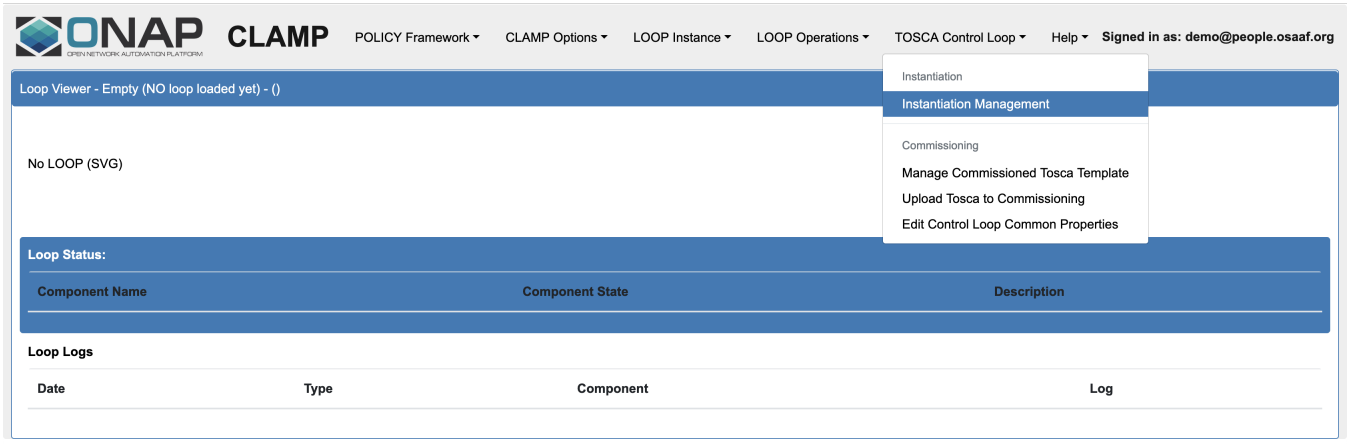


Upload tosca template for commissioning

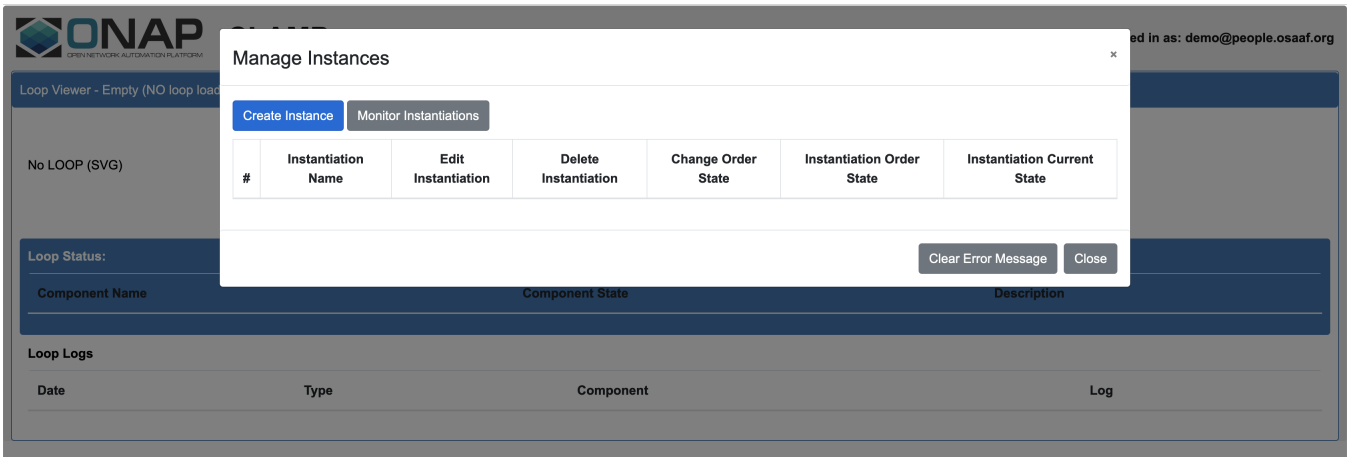


Tosca template uploaded successfully

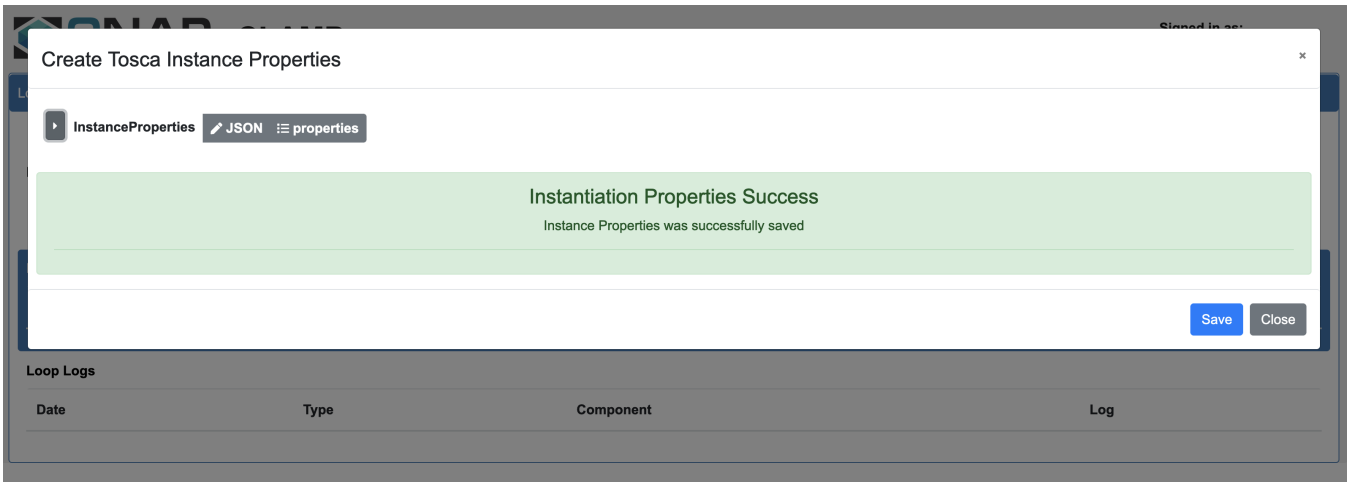
After commissioning the tosca template, the next step is to instantiate the control loop. Go to **Tosca Control Loop** pane, and select **Instantiation Management** and then press the **Create Instance** button. If no changes need to be made in the instance properties, press the **Save** button and it should show a message depicting that the instantiation operation was successful.



Instantiate the control loop

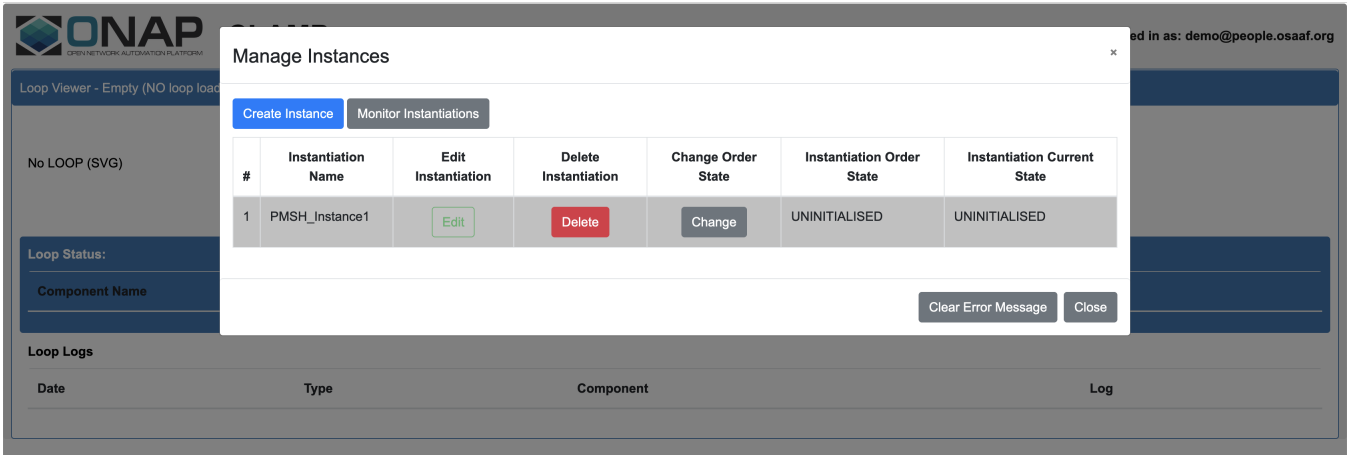


Create Instance dialog



Instantiation properties saved successfully

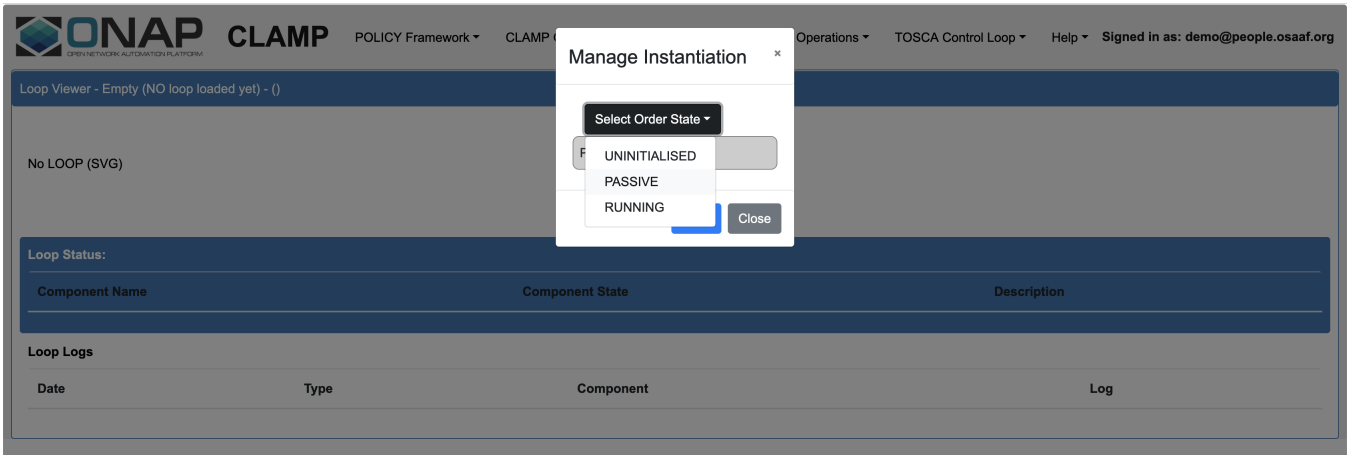
Go back again to **Instantiation Management** under **Tosca Control Loop** pane, and the newly created control loop instance in UNINITIALISED state will pop up. If nothing shows up, refresh the web browser and try again.



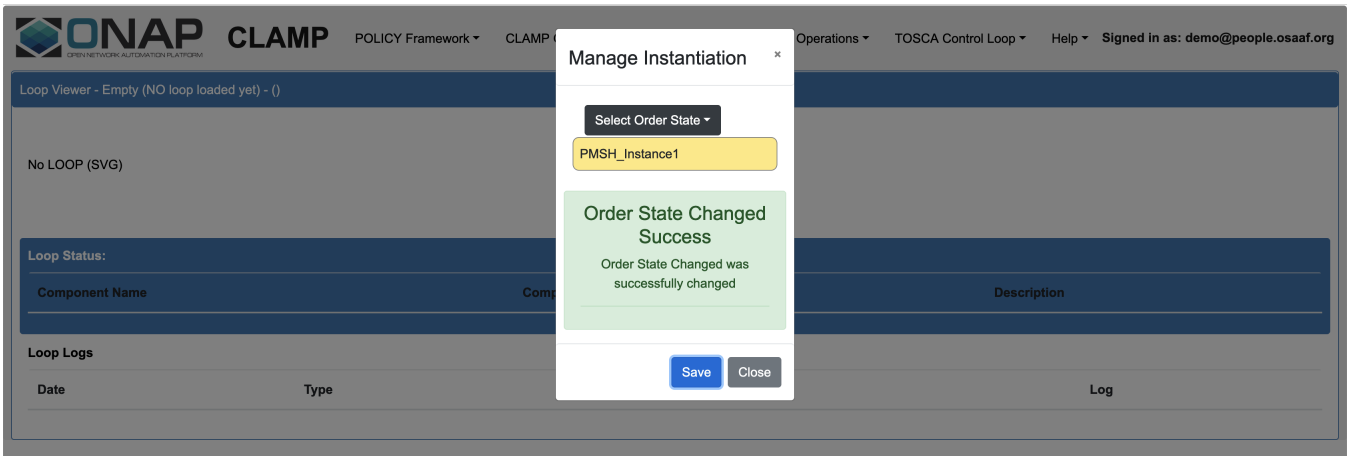
Newly created control loop instance in UNINITIALISED state

NOTE: There is a bug in the istanbul version of policy/clamp that each control loop instance is named as **PMSH_Instance1**. This should be fixed by the clamp team, however it can be ignored if the instance name is not important for the user.

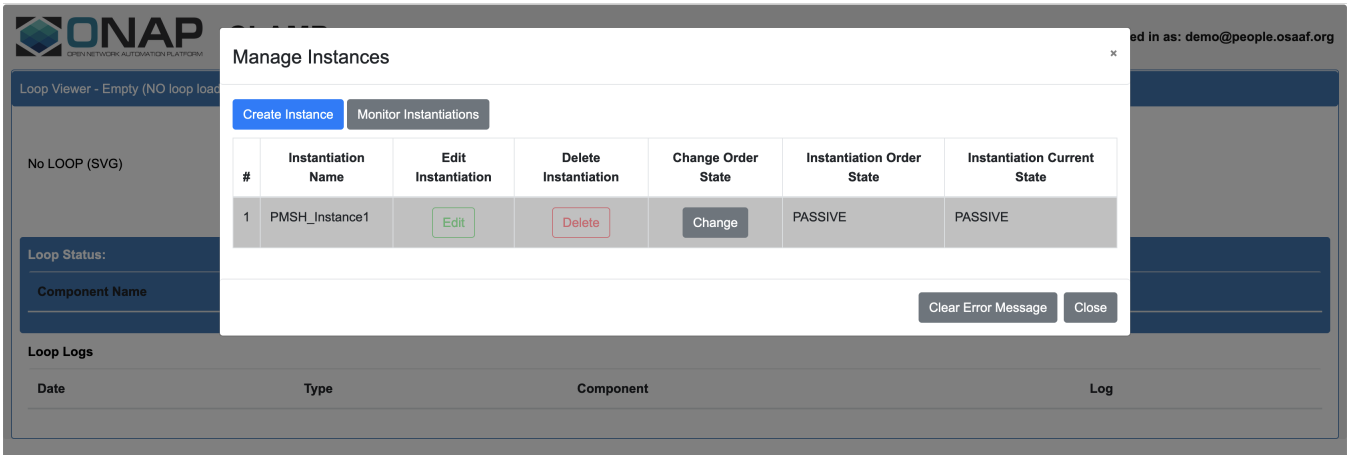
Press the **Change** button under **Change Order State**. Then, press the **Select Order State** drop-down menu, and select PASSIVE. Finally, press the **Save** button to change the control loop to PASSIVE state.



Changing the control loop to PASSIVE state

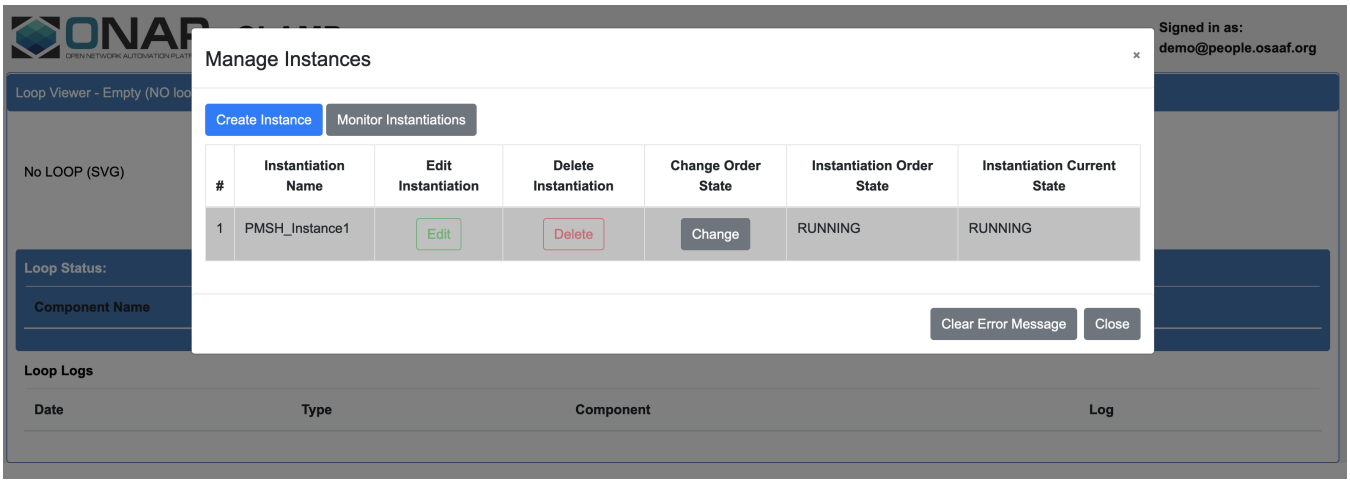


State changed successfully



Control loop changed to PASSIVE state

In a similar way, change the control loop state to RUNNING.

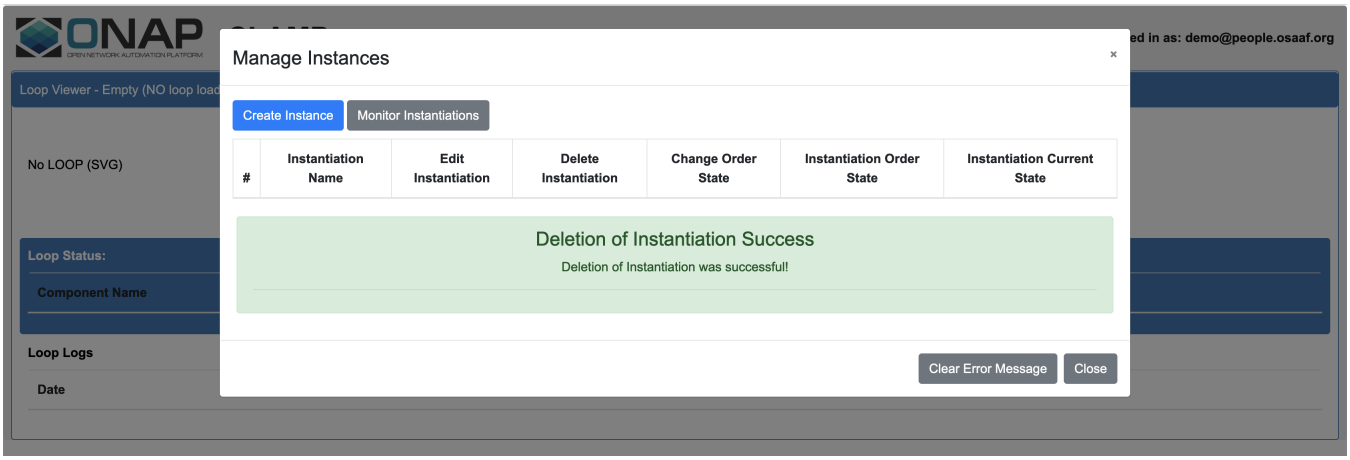


Control loop changed to RUNNING state

Once the control loop gets into the RUNNING state, the corresponding version of the usecase should be up and running.

NOTE: There is a limitation in the istanbul version of policy/clamp that only one tosca template can be commissioned at a time. So, always delete the currently commissioned template before trying a new one.

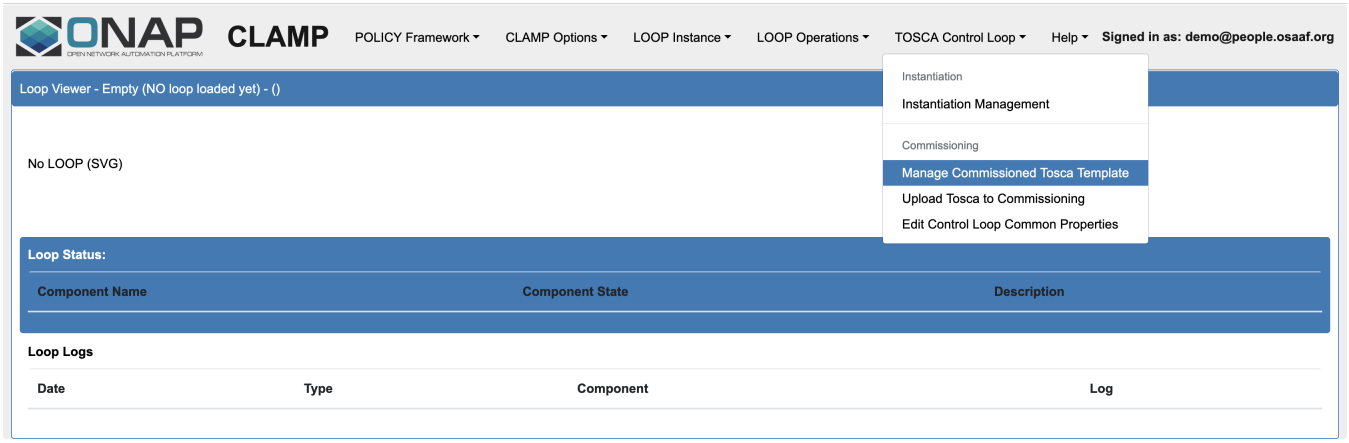
In order to delete the control loop instance, it should be first changed back to PASSIVE state and then to UNINITIALISED state. Once the instance shows PASSIVE under **Instantiation Current State**, press the **Delete** button under **Delete Instantiation**.



Control loop instance deleted

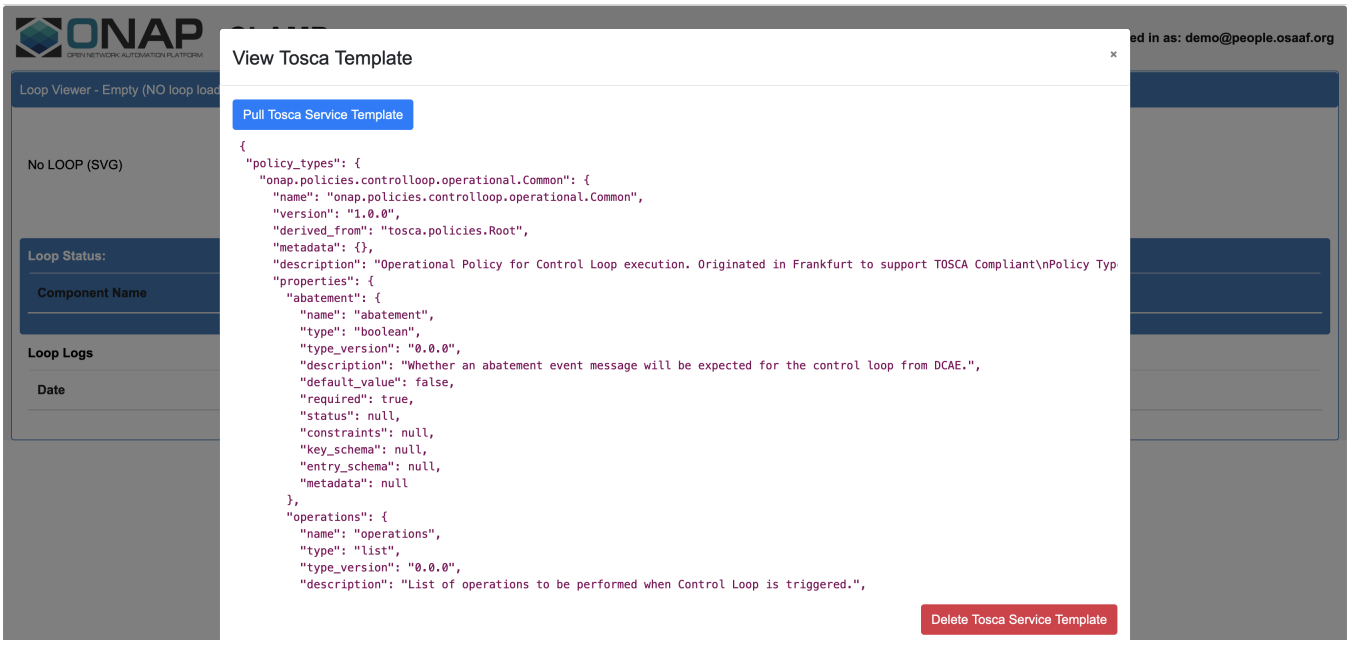
After deleting the control loop instance, the tosca template can be decommissioned as follows.

Go to **Tosca Control Loop** pane, and select **Manage Commissioned Tosca Template**.



Manage commissioned tosca template

Press the button **Pull Tosca Service Template** and it should show the commissioned tosca template. Once the template shows up, press the **Delete Tosca Service Template** button. This will be followed by a "Delete Successful" message.



Deleting the commissioned tosca template

Tosca template deleted successfully

a) Control loop for apex policy version

This sub-section describes the steps required for bringing up the control loop with apex policy version of the usecase. The tosca template to be used for commissioning this control loop is given below. The steps for commissioning are depicted in the previous sub-section.

commission.yaml

```
tosca_definitions_version: tosca_simple_yaml_1_1_0
data_types:
  onap.datatypes.ToscaConceptIdentifier:
    derived_from: tosca.datatypes.Root
    properties:
      name:
        type: string
        required: true
      version:
        type: string
        required: true
  onap.datatype.controlloop.Target:
    derived_from: tosca.datatypes.Root
    description: Definition for a entity in A&AI to perform a control loop operation on
    properties:
      targetType:
        type: string
        description: Category for the target type
        required: true
        constraints:
        - valid_values:
          - VNF
          - VM
          - VFMODULE
          - PNF
      entityIds:
        type: map
        description: |
          Map of values that identify the resource. If none are provided, it is assumed that the
          entity that generated the ONSET event will be the target.
        required: false
        metadata:
          clamp_possible_values: ClampExecution:CSAR_RESOURCES
```

```
        entry_schema:
          type: string
  onap.datatype.controlloop.Actor:
    derived_from: tosca.datatypes.Root
    description: An actor/operation/target definition
    properties:
      actor:
        type: string
        description: The actor performing the operation.
        required: true
        metadata:
          clamp_possible_values: Dictionary:DefaultActors,ClampExecution:CDS/actor
      operation:
        type: string
        description: The operation the actor is performing.
        metadata:
          clamp_possible_values: Dictionary:DefaultOperations,ClampExecution:CDS/operation
        required: true
      target:
        type: onap.datatype.controlloop.Target
        description: The resource the operation should be performed on.
        required: true
      payload:
        type: map
        description: Name/value pairs of payload information passed by Policy to the actor
        required: false
        metadata:
          clamp_possible_values: ClampExecution:CDS/payload
        entry_schema:
          type: string
  onap.datatype.controlloop.Operation:
    derived_from: tosca.datatypes.Root
    description: An operation supported by an actor
    properties:
      id:
        type: string
        description: Unique identifier for the operation
        required: true
      description:
        type: string
        description: A user-friendly description of the intent for the operation
        required: false
      operation:
        type: onap.datatype.controlloop.Actor
        description: The definition of the operation to be performed.
        required: true
      timeout:
        type: integer
        description: The amount of time for the actor to perform the operation.
        required: true
      retries:
        type: integer
        description: The number of retries the actor should attempt to perform the operation.
        required: true
        default: 0
      success:
        type: string
        description: Points to the operation to invoke on success. A value of "final_success" indicates and end
to the operation.
        required: false
        default: final_success
      failure:
        type: string
        description: Points to the operation to invoke on Actor operation failure.
        required: false
        default: final_failure
      failure_timeout:
        type: string
        description: Points to the operation to invoke when the time out for the operation occurs.
        required: false
        default: final_failure_timeout
```

```
      failure_retries:
        type: string
        description: Points to the operation to invoke when the current operation has exceeded its max retries.
        required: false
        default: final_failure_retries
      failure_exception:
        type: string
        description: Points to the operation to invoke when the current operation causes an exception.
        required: false
        default: final_failure_exception
      failure_guard:
        type: string
        description: Points to the operation to invoke when the current operation is blocked due to guard
policy enforcement.
        required: false
        default: final_failure_guard
policy_types:
  onap.policies.controlloop.operational.Common:
    derived_from: tosca.policies.Root
    version: 1.0.0
    name: onap.policies.controlloop.operational.Common
    description: |
      Operational Policy for Control Loop execution. Originated in Frankfurt to support TOSCA Compliant
      Policy Types. This does NOT support the legacy Policy YAML policy type.
    properties:
      id:
        type: string
        description: The unique control loop id.
        required: true
      timeout:
        type: integer
        description: |
          Overall timeout for executing all the operations. This timeout should equal or exceed the total
          timeout for each operation listed.
        required: true
      abatement:
        type: boolean
        description: Whether an abatement event message will be expected for the control loop from DCAE.
        required: true
        default: false
      trigger:
        type: string
        description: Initial operation to execute upon receiving an Onset event message for the Control Loop.
        required: true
      operations:
        type: list
        description: List of operations to be performed when Control Loop is triggered.
        required: true
        entry_schema:
          type: onap.datatype.controlloop.Operation
  onap.policies.controlloop.operational.common.Apex:
    derived_from: onap.policies.controlloop.operational.Common
    type_version: 1.0.0
    version: 1.0.0
    name: onap.policies.controlloop.operational.common.Apex
    description: Operational policies for Apex PDP
    properties:
      engineServiceParameters:
        type: string
        description: The engine parameters like name, instanceCount, policy implementation, parameters etc.
        required: true
      eventInputParameters:
        type: string
        description: The event input parameters.
        required: true
      eventOutputParameters:
        type: string
        description: The event output parameters.
        required: true
      javaProperties:
        type: string
```

```
        description: Name/value pairs of properties to be set for APEX if needed.
        required: false
node_types:
  org.onap.policy.clamp.controlloop.Participant:
    version: 1.0.1
    derived_from: tosca.nodetypes.Root
    properties:
      provider:
        type: string
        requred: false
  org.onap.policy.clamp.controlloop.ControlLoopElement:
    version: 1.0.1
    derived_from: tosca.nodetypes.Root
    properties:
      provider:
        type: string
        required: false
        metadata:
          common: true
        description: Specifies the organization that provides the control loop element
      participant_id:
        type: onap.datatypes.ToscaConceptIdentifier
        requred: true
        metadata:
          common: true
      participantType:
        type: onap.datatypes.ToscaConceptIdentifier
        required: true
        metadata:
          common: true
        description: The identity of the participant type that hosts this type of Control Loop Element
      startPhase:
        type: integer
        required: false
        constraints:
          - greater_or_equal: 0
        metadata:
          common: true
        description: A value indicating the start phase in which this control loop element will be started, the
          first start phase is zero. Control Loop Elements are started in their start_phase order and stopped
          in reverse start phase order. Control Loop Elements with the same start phase are started and
          stopped simultaneously
      uninitializedToPassiveTimeout:
        type: integer
        required: false
        constraints:
          - greater_or_equal: 0
        default: 60
        metadata:
          common: true
        description: The maximum time in seconds to wait for a state chage from uninitialized to passive
      passiveToRunningTimeout:
        type: integer
        required: false
        constraints:
          - greater_or_equal: 0
        default: 60
        metadata:
          common: true
        description: The maximum time in seconds to wait for a state chage from passive to running
      runningToPassiveTimeout:
        type: integer
        required: false
        constraints:
          - greater_or_equal: 0
        default: 60
        metadata:
          common: true
        description: The maximum time in seconds to wait for a state chage from running to passive
      passiveToUninitializedTimeout:
        type: integer
```

```
        required: false
        constraints:
          - greater_or_equal: 0
        default: 60
        metadata:
          common: true
        description: The maximum time in seconds to wait for a state chage from passive to uninitialized
  org.onap.policy.clamp.controlloop.ControlLoop:
    version: 1.0.1
    derived_from: tosca.nodetypes.Root
    properties:
      provider:
        type: string
        required: false
        metadata:
          common: true
        description: Specifies the organization that provides the control loop element
      elements:
        type: list
        required: true
        metadata:
          common: true
        entry_schema:
          type: onap.datatypes.ToscaConceptIdentifier
        description: Specifies a list of control loop element definitions that make up this control loop
definition
  org.onap.policy.clamp.controlloop.PolicyControlLoopElement:
    version: 1.0.1
    derived_from: org.onap.policy.clamp.controlloop.ControlLoopElement
    properties:
      policy_type_id:
        type: onap.datatypes.ToscaConceptIdentifier
        requred: true
      policy_id:
        type: onap.datatypes.ToscaConceptIdentifier
        requred: false
topology_template:
  node_templates:
    org.onap.domain.linkmonitor.LinkMonitorPolicyControlLoopElement:
      version: 1.2.3
      type: org.onap.policy.clamp.controlloop.PolicyControlLoopElement
      type_version: 1.0.1
      description: Control loop element for the Link Monitor
      properties:
        provider: Ericsson
        participant_id:
          name: org.onap.PM_Policy
          version: 1.0.0
        participantType:
          name: org.onap.policy.controlloop.PolicyControlLoopParticipant
          version: 2.3.1
        policy_type_id:
          name: onap.policies.controlloop.operational.common.Apex
          version: 1.0.0
        policy_id:
          name: operational.apex.linkmonitor
          version: 1.0.0
        pdpGroup: defaultGroup
    org.onap.domain.linkmonitor.LinkMonitorControlLoopDefinition0:
      version: 1.2.3
      type: org.onap.policy.clamp.controlloop.ControlLoop
      type_version: 1.0.0
      description: Control loop for Link Monitor
      properties:
        provider: Ericsson
        elements:
        - name: org.onap.domain.linkmonitor.LinkMonitorPolicyControlLoopElement
          version: 1.2.3
    org.onap.policy.controlloop.PolicyControlLoopParticipant:
      version: 2.3.1
      type: org.onap.policy.clamp.controlloop.Participant
```

```
      type_version: 1.0.1
      description: Participant for policy framework
      properties:
        provider: ONAP
  policies:
  - operational.apex.linkmonitor:
      type: onap.policies.controlloop.operational.common.Apex
      type_version: 1.0.0
      version: 1.0.0
      metadata:
        policy-id: operational.apex.linkmonitor
        policy-version: 1.0.0
      properties:
        engineServiceParameters:
          name: LinkMonitorApexEngine
          version: 0.0.1
          id: 101
          instanceCount: 1
          deploymentPort: 12345
          engineParameters:
            executorParameters:
              JAVASCRIPT:
                parameterClassName: org.onap.policy.apex.plugins.executor.javascript.
JavascriptExecutorParameters
            contextParameters:
              parameterClassName: org.onap.policy.apex.context.parameters.ContextParameters
              schemaParameters:
                Avro:
                  parameterClassName: org.onap.policy.apex.plugins.context.schema.avro.
AvroSchemaHelperParameters
            taskParameters:
            - key: ORU-ODU-Map
              value: |-
                {
                   "ERICSSON-O-RU-11220": "O-DU-1122",
                   "ERICSSON-O-RU-11221": "O-DU-1122",
                   "ERICSSON-O-RU-11222": "O-DU-1122",
                   "ERICSSON-O-RU-11223": "O-DU-1122",
                   "ERICSSON-O-RU-11224": "O-DU-1123",
                   "ERICSSON-O-RU-11225": "O-DU-1123",
                   "ERICSSON-O-RU-11226": "O-DU-1123",
                   "ERICSSON-O-RU-11227": "O-DU-1124",
                   "ERICSSON-O-RU-11228": "O-DU-1125",
                   "ERICSSON-O-RU-11229": "O-DU-1125"
                }
          policy_type_impl:
            apexPolicyModel:
              key:
                name: LinkMonitorModel
                version: 0.0.1
              keyInformation:
                key:
                  name: LinkMonitorModel_KeyInfo
                  version: 0.0.1
                keyInfoMap:
                  entry:
                  - key:
                      name: ApexMessageOutputEvent
                      version: 0.0.1
                    value:
                      key:
                        name: ApexMessageOutputEvent
                        version: 0.0.1
                      UUID: cca47d74-7754-4a61-b163-ca31f66b157b
                      description: Generated description for concept referred to by
                        key "ApexMessageOutputEvent:0.0.1"
                  - key:
                      name: CreateLinkClearedOutfieldsEvent
                      version: 0.0.1
                    value:
                      key:
```

```
      name: CreateLinkClearedOutfieldsEvent
      version: 0.0.1
    UUID: a295d6a3-1b73-387e-abba-b41e9b608802
    description: Generated description for concept referred to by
      key "CreateLinkClearedOutfieldsEvent:0.0.1"
- key:
    name: CreateLinkClearedOutfieldsTask
    version: 0.0.1
  value:
    key:
      name: CreateLinkClearedOutfieldsTask
      version: 0.0.1
    UUID: fd594e88-411d-4a94-b2be-697b3a0d7adf
    description: This task creates the output fields when link failure
      is cleared.
- key:
    name: CreateLinkFailureOutfieldsEvent
    version: 0.0.1
  value:
    key:
      name: CreateLinkFailureOutfieldsEvent
      version: 0.0.1
    UUID: 02be2b5d-45b7-3c54-ae54-97f2b5c30125
    description: Generated description for concept referred to by
      key "CreateLinkFailureOutfieldsEvent:0.0.1"
- key:
    name: CreateLinkFailureOutfieldsTask
    version: 0.0.1
  value:
    key:
      name: CreateLinkFailureOutfieldsTask
      version: 0.0.1
    UUID: ac3d9842-80af-4a98-951c-bd79a431c613
    description: This task the output fields when link failure is
      detected.
- key:
    name: LinkClearedTask
    version: 0.0.1
  value:
    key:
      name: LinkClearedTask
      version: 0.0.1
    UUID: eecfde90-896c-4343-8f9c-2603ced94e2d
    description: This task sends a message to the output when link
      failure is cleared.
- key:
    name: LinkFailureInputEvent
    version: 0.0.1
  value:
    key:
      name: LinkFailureInputEvent
      version: 0.0.1
    UUID: c4500941-3f98-4080-a9cc-5b9753ed050b
    description: Generated description for concept referred to by
      key "LinkFailureInputEvent:0.0.1"
- key:
    name: LinkFailureInputSchema
    version: 0.0.1
  value:
    key:
      name: LinkFailureInputSchema
      version: 0.0.1
    UUID: 3b3974fc-3012-3b02-9f33-c9d8eefe4dc1
    description: Generated description for concept referred to by
      key "LinkFailureInputSchema:0.0.1"
- key:
    name: LinkFailureOutputEvent
    version: 0.0.1
  value:
    key:
      name: LinkFailureOutputEvent
```

```
      version: 0.0.1
    UUID: 4f04aa98-e917-4f4a-882a-c75ba5a99374
    description: Generated description for concept referred to by
      key "LinkFailureOutputEvent:0.0.1"
- key:
    name: LinkFailureOutputSchema
    version: 0.0.1
  value:
    key:
      name: LinkFailureOutputSchema
      version: 0.0.1
    UUID: 2d1a7f6e-eb9a-3984-be1f-283d98111b84
    description: Generated description for concept referred to by
      key "LinkFailureOutputSchema:0.0.1"
- key:
    name: LinkFailureTask
    version: 0.0.1
  value:
    key:
      name: LinkFailureTask
      version: 0.0.1
    UUID: 3351b0f4-cf06-4fa2-8823-edf67bd30223
    description: This task updates the config for O-RU when link
      failure is detected.
- key:
    name: LinkMonitorModel
    version: 0.0.1
  value:
    key:
      name: LinkMonitorModel
      version: 0.0.1
    UUID: 540226fb-55ee-4f0e-a444-983a0494818e
    description: This is the Apex Policy Model for link monitoring.
- key:
    name: LinkMonitorModel_Events
    version: 0.0.1
  value:
    key:
      name: LinkMonitorModel_Events
      version: 0.0.1
    UUID: 27ad3e7e-fe3b-3bd6-9081-718705c2bcea
    description: Generated description for concept referred to by
      key "LinkMonitorModel_Events:0.0.1"
- key:
    name: LinkMonitorModel_KeyInfo
    version: 0.0.1
  value:
    key:
      name: LinkMonitorModel_KeyInfo
      version: 0.0.1
    UUID: ea0b5f58-eefd-358a-9660-840c640bf981
    description: Generated description for concept referred to by
      key "LinkMonitorModel_KeyInfo:0.0.1"
- key:
    name: LinkMonitorModel_Policies
    version: 0.0.1
  value:
    key:
      name: LinkMonitorModel_Policies
      version: 0.0.1
    UUID: ee9e0b0f-2b7d-3ab7-9a98-c5ec05ed823d
    description: Generated description for concept referred to by
      key "LinkMonitorModel_Policies:0.0.1"
- key:
    name: LinkMonitorModel_Schemas
    version: 0.0.1
  value:
    key:
      name: LinkMonitorModel_Schemas
      version: 0.0.1
    UUID: fa5f9b8f-796c-3c70-84e9-5140c958c4bb
```

```
        description: Generated description for concept referred to by
          key "LinkMonitorModel_Schemas:0.0.1"
      - key:
          name: LinkMonitorModel_Tasks
          version: 0.0.1
        value:
          key:
            name: LinkMonitorModel_Tasks
            version: 0.0.1
          UUID: eec592f7-69d5-39a9-981a-e552f787ed01
          description: Generated description for concept referred to by
            key "LinkMonitorModel_Tasks:0.0.1"
      - key:
          name: LinkMonitorPolicy
          version: 0.0.1
        value:
          key:
            name: LinkMonitorPolicy
            version: 0.0.1
          UUID: 6c5e410f-489a-46ff-964e-982ce6e8b6d0
          description: Generated description for concept referred to by
            key "LinkMonitorPolicy:0.0.1"
      - key:
          name: MessageSchema
          version: 0.0.1
        value:
          key:
            name: MessageSchema
            version: 0.0.1
          UUID: ac4b34ac-39d6-3393-a267-8d5b84854018
          description: A schema for messages from apex
      - key:
          name: NoPolicyDefinedTask
          version: 0.0.1
        value:
          key:
            name: NoPolicyDefinedTask
            version: 0.0.1
          UUID: d48b619e-d00d-4008-b884-02d76ea4350b
          description: This task sends a message to the output when an
            event is received for which no policy has been defined.
      - key:
          name: OduIdSchema
          version: 0.0.1
        value:
          key:
            name: OduIdSchema
            version: 0.0.1
          UUID: 50662174-a88b-3cbd-91bd-8e91b40b2660
          description: A schema for O-DU-ID
      - key:
          name: OruIdSchema
          version: 0.0.1
        value:
          key:
            name: OruIdSchema
            version: 0.0.1
          UUID: 54daf32b-015f-39cd-8530-a1175c5553e9
          description: A schema for O-RU-ID
  policies:
    key:
      name: LinkMonitorModel_Policies
      version: 0.0.1
    policyMap:
      entry:
      - key:
          name: LinkMonitorPolicy
          version: 0.0.1
        value:
          policyKey:
            name: LinkMonitorPolicy
```

```
  version: 0.0.1
template: Freestyle
state:
  entry:
  - key: LinkClearedState
    value:
      stateKey:
        parentKeyName: LinkMonitorPolicy
        parentKeyVersion: 0.0.1
        parentLocalName: 'NULL'
        localName: LinkClearedState
      trigger:
        name: CreateLinkClearedOutfieldsEvent
        version: 0.0.1
      stateOutputs:
        entry:
        - key: LinkClearedLogic_Output_Direct
          value:
            key:
              parentKeyName: LinkMonitorPolicy
              parentKeyVersion: 0.0.1
              parentLocalName: LinkClearedState
              localName: LinkClearedLogic_Output_Direct
            outgoingEvent:
              name: ApexMessageOutputEvent
              version: 0.0.1
            nextState:
              parentKeyName: 'NULL'
              parentKeyVersion: 0.0.0
              parentLocalName: 'NULL'
              localName: 'NULL'
      contextAlbumReference: []
      taskSelectionLogic:
        key: 'NULL'
        logicFlavour: UNDEFINED
        logic: ''
      stateFinalizerLogicMap:
        entry: []
      defaultTask:
        name: LinkClearedTask
        version: 0.0.1
      taskReferences:
        entry:
        - key:
            name: LinkClearedTask
            version: 0.0.1
          value:
            key:
              parentKeyName: LinkMonitorPolicy
              parentKeyVersion: 0.0.1
              parentLocalName: LinkClearedState
              localName: LinkClearedTask
            outputType: DIRECT
            output:
              parentKeyName: LinkMonitorPolicy
              parentKeyVersion: 0.0.1
              parentLocalName: LinkClearedState
              localName: LinkClearedLogic_Output_Direct
  - key: LinkFailureOrClearedState
    value:
      stateKey:
        parentKeyName: LinkMonitorPolicy
        parentKeyVersion: 0.0.1
        parentLocalName: 'NULL'
        localName: LinkFailureOrClearedState
      trigger:
        name: LinkFailureInputEvent
        version: 0.0.1
      stateOutputs:
        entry:
        - key: CreateLinkClearedOutfieldsLogic_Output_Direct
```

```
                              value:
                                key:
                                  parentKeyName: LinkMonitorPolicy
                                  parentKeyVersion: 0.0.1
                                  parentLocalName: LinkFailureOrClearedState
                                  localName: CreateLinkClearedOutfieldsLogic_Output_Direct
                                outgoingEvent:
                                  name: CreateLinkClearedOutfieldsEvent
                                  version: 0.0.1
                                nextState:
                                  parentKeyName: LinkMonitorPolicy
                                  parentKeyVersion: 0.0.1
                                  parentLocalName: 'NULL'
                                  localName: LinkClearedState
                              - key: CreateLinkFailureOutfieldsLogic_Output_Direct
                                value:
                                  key:
                                    parentKeyName: LinkMonitorPolicy
                                    parentKeyVersion: 0.0.1
                                    parentLocalName: LinkFailureOrClearedState
                                    localName: CreateLinkFailureOutfieldsLogic_Output_Direct
                                  outgoingEvent:
                                    name: CreateLinkFailureOutfieldsEvent
                                    version: 0.0.1
                                  nextState:
                                    parentKeyName: LinkMonitorPolicy
                                    parentKeyVersion: 0.0.1
                                    parentLocalName: 'NULL'
                                    localName: LinkFailureState
                              - key: NoPolicyDefinedLogic_Output_Direct
                                value:
                                  key:
                                    parentKeyName: LinkMonitorPolicy
                                    parentKeyVersion: 0.0.1
                                    parentLocalName: LinkFailureOrClearedState
                                    localName: NoPolicyDefinedLogic_Output_Direct
                                  outgoingEvent:
                                    name: ApexMessageOutputEvent
                                    version: 0.0.1
                                  nextState:
                                    parentKeyName: 'NULL'
                                    parentKeyVersion: 0.0.0
                                    parentLocalName: 'NULL'
                                    localName: 'NULL'
                            contextAlbumReference: []
                            taskSelectionLogic:
                              key: TaskSelectionLogic
                              logicFlavour: JAVASCRIPT
                              logic: |-
                                /*
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                                 */
```

```
    executor.logger.info("Task Selection Execution: '"+executor.subject.id+
        "'. InputFields: '"+executor.inFields+"'");

    var linkFailureInput = executor.inFields.get("LinkFailureInput");
    var commonEventHeader = linkFailureInput.get("event").get("commonEventHeader");
    var domain = commonEventHeader.get("domain");

    taskFailure = executor.subject.getTaskKey("CreateLinkFailureOutfieldsTask");
    taskCleared = executor.subject.getTaskKey("CreateLinkClearedOutfieldsTask");
    taskDefault = executor.subject.getDefaultTaskKey();

    if (domain == "fault") {
        var faultFields = linkFailureInput.get("event").get("faultFields");
        var alarmCondition = faultFields.get("alarmCondition");
        var eventSeverity = faultFields.get("eventSeverity");
        if (alarmCondition == "28" && eventSeverity != "NORMAL") {
            taskFailure.copyTo(executor.selectedTask);
        } else if (alarmCondition == "28" && eventSeverity == "NORMAL") {
            taskCleared.copyTo(executor.selectedTask);
        } else {
            taskDefault.copyTo(executor.selectedTask);
        }
    } else {
        taskDefault.copyTo(executor.selectedTask);
    }

    true;
stateFinalizerLogicMap:
  entry: []
defaultTask:
  name: NoPolicyDefinedTask
  version: 0.0.1
taskReferences:
  entry:
  - key:
      name: CreateLinkClearedOutfieldsTask
      version: 0.0.1
    value:
      key:
        parentKeyName: LinkMonitorPolicy
        parentKeyVersion: 0.0.1
        parentLocalName: LinkFailureOrClearedState
        localName: CreateLinkClearedOutfieldsTask
      outputType: DIRECT
      output:
        parentKeyName: LinkMonitorPolicy
        parentKeyVersion: 0.0.1
        parentLocalName: LinkFailureOrClearedState
        localName: CreateLinkClearedOutfieldsLogic_Output_Direct
  - key:
      name: CreateLinkFailureOutfieldsTask
      version: 0.0.1
    value:
      key:
        parentKeyName: LinkMonitorPolicy
        parentKeyVersion: 0.0.1
        parentLocalName: LinkFailureOrClearedState
        localName: CreateLinkFailureOutfieldsTask
      outputType: DIRECT
      output:
        parentKeyName: LinkMonitorPolicy
        parentKeyVersion: 0.0.1
        parentLocalName: LinkFailureOrClearedState
        localName: CreateLinkFailureOutfieldsLogic_Output_Direct
  - key:
      name: NoPolicyDefinedTask
      version: 0.0.1
    value:
      key:
        parentKeyName: LinkMonitorPolicy
```

```
                        parentKeyVersion: 0.0.1
                        parentLocalName: LinkFailureOrClearedState
                        localName: NoPolicyDefinedTask
                      outputType: DIRECT
                      output:
                        parentKeyName: LinkMonitorPolicy
                        parentKeyVersion: 0.0.1
                        parentLocalName: LinkFailureOrClearedState
                        localName: NoPolicyDefinedLogic_Output_Direct
              - key: LinkFailureState
                value:
                  stateKey:
                    parentKeyName: LinkMonitorPolicy
                    parentKeyVersion: 0.0.1
                    parentLocalName: 'NULL'
                    localName: LinkFailureState
                  trigger:
                    name: CreateLinkFailureOutfieldsEvent
                    version: 0.0.1
                  stateOutputs:
                    entry:
                    - key: LinkFailureLogic_Output_Direct
                      value:
                        key:
                          parentKeyName: LinkMonitorPolicy
                          parentKeyVersion: 0.0.1
                          parentLocalName: LinkFailureState
                          localName: LinkFailureLogic_Output_Direct
                        outgoingEvent:
                          name: LinkFailureOutputEvent
                          version: 0.0.1
                        nextState:
                          parentKeyName: 'NULL'
                          parentKeyVersion: 0.0.0
                          parentLocalName: 'NULL'
                          localName: 'NULL'
                  contextAlbumReference: []
                  taskSelectionLogic:
                    key: 'NULL'
                    logicFlavour: UNDEFINED
                    logic: ''
                  stateFinalizerLogicMap:
                    entry: []
                  defaultTask:
                    name: LinkFailureTask
                    version: 0.0.1
                  taskReferences:
                    entry:
                    - key:
                        name: LinkFailureTask
                        version: 0.0.1
                      value:
                        key:
                          parentKeyName: LinkMonitorPolicy
                          parentKeyVersion: 0.0.1
                          parentLocalName: LinkFailureState
                          localName: LinkFailureTask
                        outputType: DIRECT
                        output:
                          parentKeyName: LinkMonitorPolicy
                          parentKeyVersion: 0.0.1
                          parentLocalName: LinkFailureState
                          localName: LinkFailureLogic_Output_Direct
          firstState: LinkFailureOrClearedState
tasks:
  key:
    name: LinkMonitorModel_Tasks
    version: 0.0.1
  taskMap:
    entry:
    - key:
```

```
      name: CreateLinkClearedOutfieldsTask
      version: 0.0.1
    value:
      key:
        name: CreateLinkClearedOutfieldsTask
        version: 0.0.1
      inputFields:
        entry:
        - key: LinkFailureInput
          value:
            key: LinkFailureInput
            fieldSchemaKey:
              name: LinkFailureInputSchema
              version: 0.0.1
            optional: false
      outputFields:
        entry:
        - key: OruId
          value:
            key: OruId
            fieldSchemaKey:
              name: OruIdSchema
              version: 0.0.1
            optional: false
      taskParameters:
        entry: []
      contextAlbumReference: []
      taskLogic:
        key: TaskLogic
        logicFlavour: JAVASCRIPT
        logic: |-
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           */

          executor.logger.info("Task Execution: '"+executor.subject.id+"'. Input Fields:
'"+executor.inFields+"'");

          var linkFailureInput = executor.inFields.get("LinkFailureInput");
          var oruId = linkFailureInput.get("event").get("commonEventHeader").get("sourceName");

          executor.outFields.put("OruId", oruId);

          executor.logger.info(executor.outFields);

          true;
    - key:
        name: CreateLinkFailureOutfieldsTask
        version: 0.0.1
      value:
        key:
          name: CreateLinkFailureOutfieldsTask
          version: 0.0.1
        inputFields:
          entry:
```

```
                    - key: LinkFailureInput
                      value:
                        key: LinkFailureInput
                        fieldSchemaKey:
                          name: LinkFailureInputSchema
                          version: 0.0.1
                        optional: false
                  outputFields:
                    entry:
                    - key: OduId
                      value:
                        key: OduId
                        fieldSchemaKey:
                          name: OduIdSchema
                          version: 0.0.1
                        optional: false
                    - key: OruId
                      value:
                        key: OruId
                        fieldSchemaKey:
                          name: OruIdSchema
                          version: 0.0.1
                        optional: false
                  taskParameters:
                    entry: []
                  contextAlbumReference: []
                  taskLogic:
                    key: TaskLogic
                    logicFlavour: JAVASCRIPT
                    logic: |-
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                       */

                      executor.logger.info("Task Execution: '"+executor.subject.id+"'. Input Fields:
'"+executor.inFields+"'");

                      var returnValue = true;
                      var linkFailureInput = executor.inFields.get("LinkFailureInput");
                      var oruId = linkFailureInput.get("event").get("commonEventHeader").get("sourceName");
                      var oruOduMap = JSON.parse(executor.parameters.get("ORU-ODU-Map"));

                      if (oruId in oruOduMap) {
                          var oduId = oruOduMap[oruId];
                          executor.outFields.put("OruId", oruId);
                          executor.outFields.put("OduId", oduId);
                          executor.logger.info(executor.outFields);
                      } else {
                          executor.message = "No O-RU found in the config with this ID: " + oruId;
                          returnValue = false;
                      }

                      returnValue;
                - key:
                    name: LinkClearedTask
```

```
      version: 0.0.1
    value:
      key:
        name: LinkClearedTask
        version: 0.0.1
      inputFields:
        entry:
        - key: OruId
          value:
            key: OruId
            fieldSchemaKey:
              name: OruIdSchema
              version: 0.0.1
            optional: false
      outputFields:
        entry:
        - key: message
          value:
            key: message
            fieldSchemaKey:
              name: MessageSchema
              version: 0.0.1
            optional: false
      taskParameters:
        entry: []
      contextAlbumReference: []
      taskLogic:
        key: TaskLogic
        logicFlavour: JAVASCRIPT
        logic: |-
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          executor.logger.info("Task Execution: '"+executor.subject.id+"'. Input Fields:
'"+executor.inFields+"'");

          var oruId = executor.inFields.get("OruId");

          executor.outFields.put("message", "CLEARED link failure for O-RU: " + oruId);

          executor.logger.info(executor.outFields);

          true;
    - key:
        name: LinkFailureTask
        version: 0.0.1
      value:
        key:
          name: LinkFailureTask
          version: 0.0.1
        inputFields:
          entry:
          - key: OduId
            value:
```

```
                        key: OduId
                        fieldSchemaKey:
                          name: OduIdSchema
                          version: 0.0.1
                        optional: false
                    - key: OruId
                      value:
                        key: OruId
                        fieldSchemaKey:
                          name: OruIdSchema
                          version: 0.0.1
                        optional: false
                  outputFields:
                    entry:
                    - key: LinkFailureOutput
                      value:
                        key: LinkFailureOutput
                        fieldSchemaKey:
                          name: LinkFailureOutputSchema
                          version: 0.0.1
                        optional: false
                  taskParameters:
                    entry: []
                  contextAlbumReference: []
                  taskLogic:
                    key: TaskLogic
                    logicFlavour: JAVASCRIPT
                    logic: |-
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                      executor.logger.info("Task Execution: '"+executor.subject.id+"'. Input Fields:
'"+executor.inFields+"'");

                      var linkFailureOutput = executor.subject.getOutFieldSchemaHelper("LinkFailureOutput").
createNewInstance();

                      var oruId = executor.inFields.get("OruId");
                      var oduId = executor.inFields.get("OduId");

                      var unlockMessageArray = new java.util.ArrayList();
                      for (var i = 0; i < 1; i++) {
                          unlockMessageArray.add({
                            "id":"rrm-pol-1",
                            "radio_DasH_resource_DasH_management_DasH_policy_DasH_max_DasH_ratio":25,
                            "radio_DasH_resource_DasH_management_DasH_policy_DasH_members":
                                [
                                    {
                                        "mobile_DasH_country_DasH_code":"310",
                                        "mobile_DasH_network_DasH_code":"150",
                                        "slice_DasH_differentiator":1,
                                        "slice_DasH_service_DasH_type":1
                                    }
                                ],
```

```
                                "radio_DasH_resource_DasH_management_DasH_policy_DasH_min_DasH_ratio":15,
                                "user_DasH_label":"rrm-pol-1",
                                "resource_DasH_type":"prb",
                                "radio_DasH_resource_DasH_management_DasH_policy_DasH_dedicated_DasH_ratio":20,
                                "administrative_DasH_state":"unlocked"
                            });
                        }

                        linkFailureOutput.put
("o_DasH_ran_DasH_sc_DasH_du_DasH_hello_DasH_world_ColoN_radio_DasH_resource_DasH_management_DasH_policy_DasH_ra
tio", unlockMessageArray);
                        executor.outFields.put("LinkFailureOutput", linkFailureOutput.toString());

                        executor.getExecutionProperties().setProperty("OduId", oduId);
                        executor.getExecutionProperties().setProperty("OruId", oruId);

                        executor.logger.info(executor.outFields);

                        true;
                - key:
                    name: NoPolicyDefinedTask
                    version: 0.0.1
                  value:
                    key:
                      name: NoPolicyDefinedTask
                      version: 0.0.1
                    inputFields:
                      entry:
                      - key: LinkFailureInput
                        value:
                          key: LinkFailureInput
                          fieldSchemaKey:
                            name: LinkFailureInputSchema
                            version: 0.0.1
                          optional: false
                    outputFields:
                      entry:
                      - key: message
                        value:
                          key: message
                          fieldSchemaKey:
                            name: MessageSchema
                            version: 0.0.1
                          optional: false
                    taskParameters:
                      entry: []
                    contextAlbumReference: []
                    taskLogic:
                      key: TaskLogic
                      logicFlavour: JAVASCRIPT
                      logic: |-
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                         */
```

```
                        executor.logger.info("Task Execution: '"+executor.subject.id+"'. Input Fields:
'"+executor.inFields+"'");

                        executor.outFields.put("message", "No policy defined for this event");

                        executor.logger.info(executor.outFields);

                        true;
              events:
                key:
                  name: LinkMonitorModel_Events
                  version: 0.0.1
                eventMap:
                  entry:
                  - key:
                      name: ApexMessageOutputEvent
                      version: 0.0.1
                    value:
                      key:
                        name: ApexMessageOutputEvent
                        version: 0.0.1
                      nameSpace: org.onap.policy.apex.auth.clieditor
                      source: APEX
                      target: APEX
                      parameter:
                        entry:
                        - key: message
                          value:
                            key: message
                            fieldSchemaKey:
                              name: MessageSchema
                              version: 0.0.1
                            optional: false
                  - key:
                      name: CreateLinkClearedOutfieldsEvent
                      version: 0.0.1
                    value:
                      key:
                        name: CreateLinkClearedOutfieldsEvent
                        version: 0.0.1
                      nameSpace: org.onap.policy.apex.auth.clieditor
                      source: APEX
                      target: APEX
                      parameter:
                        entry:
                        - key: OruId
                          value:
                            key: OruId
                            fieldSchemaKey:
                              name: OruIdSchema
                              version: 0.0.1
                            optional: false
                  - key:
                      name: CreateLinkFailureOutfieldsEvent
                      version: 0.0.1
                    value:
                      key:
                        name: CreateLinkFailureOutfieldsEvent
                        version: 0.0.1
                      nameSpace: org.onap.policy.apex.auth.clieditor
                      source: APEX
                      target: APEX
                      parameter:
                        entry:
                        - key: OduId
                          value:
                            key: OduId
                            fieldSchemaKey:
                              name: OduIdSchema
                              version: 0.0.1
                            optional: false
```

```
            - key: OruId
              value:
                key: OruId
                fieldSchemaKey:
                  name: OruIdSchema
                  version: 0.0.1
                optional: false
      - key:
          name: LinkFailureInputEvent
          version: 0.0.1
        value:
          key:
            name: LinkFailureInputEvent
            version: 0.0.1
          nameSpace: org.onap.policy.apex.auth.clieditor
          source: DMAAP
          target: APEX
          parameter:
            entry:
            - key: LinkFailureInput
              value:
                key: LinkFailureInput
                fieldSchemaKey:
                  name: LinkFailureInputSchema
                  version: 0.0.1
                optional: false
      - key:
          name: LinkFailureOutputEvent
          version: 0.0.1
        value:
          key:
            name: LinkFailureOutputEvent
            version: 0.0.1
          nameSpace: org.onap.policy.apex.auth.clieditor
          source: APEX
          target: OAM
          parameter:
            entry:
            - key: LinkFailureOutput
              value:
                key: LinkFailureOutput
                fieldSchemaKey:
                  name: LinkFailureOutputSchema
                  version: 0.0.1
                optional: false
  schemas:
    key:
      name: LinkMonitorModel_Schemas
      version: 0.0.1
    schemas:
      entry:
      - key:
          name: LinkFailureInputSchema
          version: 0.0.1
        value:
          key:
            name: LinkFailureInputSchema
            version: 0.0.1
          schemaFlavour: Avro
          schemaDefinition: |-
            {
                "type": "record",
                "name": "Link_Failure_Input",
                "fields": [
                    {
                        "name": "event",
                        "type": {
                            "type": "record",
                            "name": "Event_Type",
                            "fields": [
                                {
```

```
"name": "commonEventHeader",
"type": {
    "type": "record",
    "name": "Common_Event_Header_Type",
    "fields": [
        {
            "name": "domain",
            "type": "string"
        },
        {
            "name": "eventId",
            "type": "string"
        },
        {
            "name": "eventName",
            "type": "string"
        },
        {
            "name": "eventType",
            "type": "string"
        },
        {
            "name": "sequence",
            "type": "int"
        },
        {
            "name": "priority",
            "type": "string"
        },
        {
            "name": "reportingEntityId",
            "type": "string"
        },
        {
            "name": "reportingEntityName",
            "type": "string"
        },
        {
            "name": "sourceId",
            "type": "string"
        },
        {
            "name": "sourceName",
            "type": "string"
        },
        {
            "name": "startEpochMicrosec",
            "type": "string"
        },
        {
            "name": "lastEpochMicrosec",
            "type": "string"
        },
        {
            "name": "nfNamingCode",
            "type": "string"
        },
        {
            "name": "nfVendorName",
            "type": "string"
        },
        {
            "name": "timeZoneOffset",
            "type": "string"
        },
        {
            "name": "version",
            "type": "string"
        },
        {
            "name": "vesEventListenerVersion",
```

```
                                    "type": "string"
                                }
                            ]
                        }
                    },
                    {
                        "name": "faultFields",
                        "type": {
                            "type": "record",
                            "name": "Fault_Fields_Type",
                            "fields": [
                                {
                                    "name": "faultFieldsVersion",
                                    "type": "string"
                                },
                                {
                                    "name": "alarmCondition",
                                    "type": "string"
                                },
                                {
                                    "name": "alarmInterfaceA",
                                    "type": "string"
                                },
                                {
                                    "name": "eventSourceType",
                                    "type": "string"
                                },
                                {
                                    "name": "specificProblem",
                                    "type": "string"
                                },
                                {
                                    "name": "eventSeverity",
                                    "type": "string"
                                },
                                {
                                    "name": "vfStatus",
                                    "type": "string"
                                },
                                {
                                    "name": "alarmAdditionalInformation",
                                    "type": {
                                        "type": "record",
                                        "name": "Alarm_Additional_Information_Type",
                                        "fields": [
                                            {
                                                "name": "eventTime",
                                                "type": "string"
                                            },
                                            {
                                                "name": "equipType",
                                                "type": "string"
                                            },
                                            {
                                                "name": "vendor",
                                                "type": "string"
                                            },
                                            {
                                                "name": "model",
                                                "type": "string"
                                            }
                                        ]
                                    }
                                }
                            ]
                        }
                    }
                ]
            }
        }
    ]
```

```
                    }
                - key:
                    name: LinkFailureOutputSchema
                    version: 0.0.1
                  value:
                    key:
                      name: LinkFailureOutputSchema
                      version: 0.0.1
                    schemaFlavour: Avro
                    schemaDefinition: "{\n  \"name\": \"Link_Failure_Output\",\n  \"type\": \"record\",\n  \"
fields\": [\n    {\n      \"name\": \"
o_DasH_ran_DasH_sc_DasH_du_DasH_hello_DasH_world_ColoN_radio_DasH_resource_DasH_management_DasH_policy_DasH_rati
o\",\n      \"type\": {\n        \"type\": \"array\",\n        \"items\": {\n          \"name\": \"
o_DasH_ran_DasH_sc_DasH_du_DasH_hello_DasH_world_ColoN_radio_DasH_resource_DasH_management_DasH_policy_DasH_rati
o_record\",\n          \"type\": \"record\",\n          \"fields\": [\n            {\n              \"name\": \"
id\",\n              \"type\": \"string\"\n            },\n            {\n              \"name\": \"
radio_DasH_resource_DasH_management_DasH_policy_DasH_max_DasH_ratio\",\n              \"type\": \"int\"
\n            },\n            {\n              \"name\": \"
radio_DasH_resource_DasH_management_DasH_policy_DasH_members\",\n              \"type\": {\n                \"
type\": \"array\",\n                \"items\": {\n                  \"name\": \"
radio_DasH_resource_DasH_management_DasH_policy_DasH_members_record\",\n                  \"type\": \"record\",
\n                  \"fields\": [\n                    {\n                      \"name\": \"
mobile_DasH_country_DasH_code\",\n                      \"type\": \"string\"\n                    },
\n                    {\n                      \"name\": \"mobile_DasH_network_DasH_code\",
\n                      \"type\": \"string\"\n                    },\n
{\n                      \"name\": \"slice_DasH_differentiator\",\n                      \"type\": \"int\"
\n                    },\n                    {\n                      \"name\": \"
slice_DasH_service_DasH_type\",\n                      \"type\": \"int\"\n                    }
\n                  ]\n                }\n              }\n            },\n            {\n              \"
name\": \"radio_DasH_resource_DasH_management_DasH_policy_DasH_min_DasH_ratio\",\n              \"type\": \"
int\"\n            },\n            {\n              \"name\": \"user_DasH_label\",\n              \"type\": \"
string\"\n            },\n            {\n              \"name\": \"resource_DasH_type\",\n              \"
type\": \"string\"\n            },\n            {\n              \"name\": \"
radio_DasH_resource_DasH_management_DasH_policy_DasH_dedicated_DasH_ratio\",\n              \"type\": \"int\"
\n            },\n            {\n              \"name\": \"administrative_DasH_state\",\n              \"
type\": \"string\"\n            }\n          ]\n        }\n      }\n    }\n  ]\n}"
                - key:
                    name: MessageSchema
                    version: 0.0.1
                  value:
                    key:
                      name: MessageSchema
                      version: 0.0.1
                    schemaFlavour: Java
                    schemaDefinition: java.lang.String
                - key:
                    name: OduIdSchema
                    version: 0.0.1
                  value:
                    key:
                      name: OduIdSchema
                      version: 0.0.1
                    schemaFlavour: Java
                    schemaDefinition: java.lang.String
                - key:
                    name: OruIdSchema
                    version: 0.0.1
                  value:
                    key:
                      name: OruIdSchema
                      version: 0.0.1
                    schemaFlavour: Java
                    schemaDefinition: java.lang.String
        eventOutputParameters:
          RestProducer:
            carrierTechnologyParameters:
              carrierTechnology: RESTCLIENT
              parameterClassName: org.onap.policy.apex.plugins.event.carrier.restclient.
RestClientCarrierTechnologyParameters
              parameters:
                url: http://sdnr-simulator.nonrtric:9990/rests/data/network-topology:network-topology
```

```
/topology=topology-netconf/node={OduId}/yang-ext:mount/o-ran-sc-du-hello-world:network-function/distributed-
unit-functions={OduId}/radio-resource-management-policy-ratio=rrm-pol-1
                httpMethod: PUT
                httpHeaders:
                - - Authorization
                  - Basic YWRtaW46S3A4Yko0U1hzek0wV1hsaGFrM2VIbGNzZTJnQXc4NHZhb0dHbUp2VXkyVQ==
            eventProtocolParameters:
              eventProtocol: JSON
              parameters:
                pojoField: LinkFailureOutput
            eventNameFilter: LinkFailureOutputEvent
          StdOutProducer:
            carrierTechnologyParameters:
              carrierTechnology: FILE
              parameters:
                standardIo: true
            eventProtocolParameters:
              eventProtocol: JSON
              parameters:
                pojoField: message
            eventNameFilter: ApexMessageOutputEvent
        eventInputParameters:
          DMaaPConsumer:
            carrierTechnologyParameters:
              carrierTechnology: RESTCLIENT
              parameterClassName: org.onap.policy.apex.plugins.event.carrier.restclient.
RestClientCarrierTechnologyParameters
              parameters:
                url: http://message-router:3904/events/unauthenticated.SEC_FAULT_OUTPUT/users/link-monitor-
nonrtric?timeout=15000&limit=100
            eventProtocolParameters:
              eventProtocol: JSON
              parameters:
                versionAlias: version
                pojoField: LinkFailureInput
            eventName: LinkFailureInputEvent
```

NOTE: The default hostname/port for sdnr-simulator and message-router are specified in lines 1547 and 1573 respectively of the above file. They should be replaced with actual values if using different hostname/port.

After commissioning the above tosca template, control loop can be instantiated using the steps described in previous sub-section. Once the control loop is in RUNNING state, the below steps can be done to test the correct working of the apex policy.

- First of all, deploy the sdnr-simulator in the cluster (if not using the real SDNR in ONAP). The sdnr simulator can be found in the nonrtric repo of OSC.

```
git clone "https://gerrit.o-ran-sc.org/r/nonrtric"
git checkout -b e-release --track origin/e-release

cd nonrtric/test/usecases/oruclosedlooprecovery/scriptversion/helm/sdnr-simulator/
helm package .

helm install sdnr-simulator sdnr-simulator-0.1.0.tgz --set image.repository=registry.nordix.org/onap/sdnr-
simulator --set image.tag=1.0.0 --set messagerouter.host="http://message-router.onap" --set messagerouter.port="
3904" --namespace nonrtric --create-namespace --wait
```

- In order to make sure that the apex policy has been deployed successfully, the REST APIs for policy-pap and policy-api components can be used. However, these components do not expose the NodePorts. Hence, a NodePort needs to be opened for accessing each of these APIs.

```
kubectl expose deployment def-policy-pap --type=NodePort --name=policy-pap-public

kubectl expose deployment def-policy-api --type=NodePort --name=policy-api-public
```

- Find the NodePort numbers allocated in the cluster for these two components.

```
kubectl -n onap get svc | grep policy-pap-public

kubectl -n onap get svc | grep policy-api-public
```

- Making this REST call to the policy-api component should return the deployed policy.

```
curl -k -u 'policyadmin:zb!XztG34' -X GET "https://<NodeIP>:<NodePort-policy-api>/policy/api/v1/policytypes
/onap.policies.controlloop.operational.common.Apex/versions/1.0.0/policies/operational.apex.linkmonitor/versions
/1.0.0"
```

- The status of deployed policy can be checked by making a REST call to policy-pap component.

```
curl -k -u 'policyadmin:zb!XztG34' -X GET "https://<NodeIP>:<NodePort-policy-pap>/policy/pap/v1/policies/status"
```

The above command should show a state of "SUCCESS" for the LinkMonitor policy.

- Finally, to test that the apex policy is actually working, an example LinkFailureEvent can be sent to the DmaaP MR.

```
cd nonrtric/test/usecases/oruclosedlooprecovery/apexpolicyversion/LinkMonitor

curl -k -X POST -H accept:application/json -H Content-Type:application/json "https://<NodeIP>:<NodePort-message-
router>/events/unauthenticated.SEC_FAULT_OUTPUT/" -d @./events/LinkFailureEvent.json
```

The logs of the sdnr-simulator should show that a PUT request has been successfully received.

"PUT /rests/data/network-topology:network-topology/topology=topology-netconf/node=HCL-O-DU-1123/yang-ext:mount/o-ran-sc-du-hello-world:network-function/du-to-ru-connection=ERICSSON-O-RU-11225 HTTP/1.1" 200

b) Control loop for script version

This sub-section describes the steps required for bringing up the control loop with script version of the usecase. The tosca template to be used for commissioning this control loop is given below. The steps for commissioning are depicted in the sub-section Commission/Instantiate control loop via GUI.

commission.yaml

```
tosca_definitions_version: tosca_simple_yaml_1_1_0
data_types:
  onap.datatypes.ToscaConceptIdentifier:
    derived_from: tosca.datatypes.Root
    properties:
      name:
        type: string
        required: true
      version:
        type: string
        required: true
node_types:
  org.onap.policy.clamp.controlloop.Participant:
    version: 1.0.1
    derived_from: tosca.nodetypes.Root
    properties:
      provider:
        type: string
        requred: false
  org.onap.policy.clamp.controlloop.ControlLoop:
    version: 1.0.1
    derived_from: tosca.nodetypes.Root
    properties:
      provider:
        type: string
        requred: false
      elements:
```

```
        type: list
        required: true
        entry_schema:
          type: onap.datatypes.ToscaConceptIdentifier
  org.onap.policy.clamp.controlloop.ControlLoopElement:
    version: 1.0.1
    derived_from: tosca.nodetypes.Root
    properties:
      provider:
        type: string
        requred: false
      participant_id:
        type: onap.datatypes.ToscaConceptIdentifier
        requred: true
  org.onap.policy.clamp.controlloop.K8SMicroserviceControlLoopElement:
    version: 1.0.1
    derived_from: org.onap.policy.clamp.controlloop.ControlLoopElement
    properties:
      chart:
        type: string
        required: true
      configs:
        type: list
        required: false
      requirements:
        type: string
        requred: false
      templates:
        type: list
        required: false
        entry_schema:
      values:
        type: string
        requred: true
topology_template:
  node_templates:
    org.onap.domain.linkmonitor.LinkMonitorControlLoopDefinition1:
      version: 1.2.3
      type: org.onap.policy.clamp.controlloop.ControlLoop
      type_version: 1.0.1
      description: Control loop for Link Monitor
      properties:
        provider: Ericsson
        elements:
        - name: org.onap.domain.linkmonitor.OruAppK8SMicroserviceControlLoopElement
          version: 1.2.3
        - name: org.onap.domain.linkmonitor.MessageGeneratorK8SMicroserviceControlLoopElement
          version: 1.2.3
        - name: org.onap.domain.linkmonitor.SdnrSimulatorK8SMicroserviceControlLoopElement
          version: 1.2.3
    org.onap.k8s.controlloop.K8SControlLoopParticipant:
      version: 2.3.4
      type: org.onap.policy.clamp.controlloop.Participant
      type_version: 1.0.1
      description: Participant for k8s
      properties:
        provider: ONAP
    org.onap.domain.linkmonitor.OruAppK8SMicroserviceControlLoopElement:
      version: 1.2.3
      type: org.onap.policy.clamp.controlloop.K8SMicroserviceControlLoopElement
      type_version: 1.0.1
      description: Control loop element for oru-app
      properties:
        provider: ONAP
        participant_id:
          name: K8sParticipant0
          version: 1.0.0
        participantType:
          name: org.onap.k8s.controlloop.K8SControlLoopParticipant
          version: 2.3.4
        chart:
```

```
      chartId:
        name: oru-app
        version: 0.1.0
      releaseName: oru-app
      repository:
         repoName: chartmuseum
      namespace: nonrtric
      overrideParams:
        image.repository: nexus3.o-ran-sc.org:10002/o-ran-sc/nonrtric-o-ru-closed-loop-recovery
        image.tag: 1.0.1
        messagerouter.host: http://message-router.onap
        messagerouter.port: 3904
        sdnr.host: http://sdnr-simulator
        sdnr.port: 9990
org.onap.domain.linkmonitor.MessageGeneratorK8SMicroserviceControlLoopElement:
  version: 1.2.3
  type: org.onap.policy.clamp.controlloop.K8SMicroserviceControlLoopElement
  type_version: 1.0.1
  description: Control loop element for message-generator
  properties:
    provider: ONAP
    participant_id:
      name: K8sParticipant0
      version: 1.0.0
    participantType:
      name: org.onap.k8s.controlloop.K8SControlLoopParticipant
      version: 2.3.4
    chart:
      chartId:
        name: message-generator
        version: 0.1.0
      releaseName: message-generator
      repository:
         repoName: chartmuseum
      namespace: nonrtric
      overrideParams:
        image.repository: registry.nordix.org/onap/message-generator
        image.tag: 1.0.0
        messagerouter.host: http://message-router.onap
        messagerouter.port: 3904
org.onap.domain.linkmonitor.SdnrSimulatorK8SMicroserviceControlLoopElement:
  version: 1.2.3
  type: org.onap.policy.clamp.controlloop.K8SMicroserviceControlLoopElement
  type_version: 1.0.1
  description: Control loop element for sdnr-simulator
  properties:
    provider: ONAP
    participant_id:
      name: K8sParticipant0
      version: 1.0.0
    participantType:
      name: org.onap.k8s.controlloop.K8SControlLoopParticipant
      version: 2.3.4
    chart:
      chartId:
        name: sdnr-simulator
        version: 0.1.0
      releaseName: sdnr-simulator
      repository:
         repoName: chartmuseum
      namespace: nonrtric
      overrideParams:
        image.repository: registry.nordix.org/onap/sdnr-simulator
        image.tag: 1.0.0
        messagerouter.host: http://message-router.onap
        messagerouter.port: 3904
```

This control loop will bring up three micro-services in the nonrtric namespace: oru-app (running the actual logic of the usecase), message-generator (sending the LinkFailure messages at random intervals), and sdnr-simulator (for receiving the REST calls made by oru-app). Make sure that the sdnr-simulator is not already running in the nonrtric namespace, otherwise the control loop instantiation might fail.

NOTE: The default hostname/port for sdnr and message-router are specified in **overrideParams** of the above file. They should be replaced with actual values if using different hostname/port.f

Before commissioning this tosca template, some preparations need to be done in the kubernetes-participant component of the clamp.

- First step is to copy the kube config file of the cluster inside the kubernetes-participant. Find the pod-name of this component using:

```
kubectl -n onap get pod | grep k8s-ppnt
```

Copy the config file using this command:

```
kubectl cp ~/.kube/config onap/<POD-NAME-k8s-ppnt>:/home/policy/.kube/config
```

In order to make sure that the kubernetes-participant is properly configured, get into the pod using "kubectl -n onap exec -it <POD-NAME-k8s-ppnt> sh" and run the following command:

```
kubectl get ns
```

This should show all the namespaces in the cluster where ONAP is deployed.

- Next step is to copy the helm charts of all three components into the kubernetes-participant. The helm charts are located in the nonrtric repo of OSC.

```
cd nonrtric/test/usecases/oruclosedlooprecovery/scriptversion/helm/sdnr-simulator/
helm package .
kubectl cp ./sdnr-simulator-0.1.0.tgz onap/<POD-NAME-k8s-ppnt>:/home/policy/local-charts/sdnr-simulator-0.1.0.
tgz

cd nonrtric/test/usecases/oruclosedlooprecovery/scriptversion/helm/message-generator/
helm package .
kubectl cp ./message-generator-0.1.0.tgz onap/<POD-NAME-k8s-ppnt>:/home/policy/local-charts/message-generator-
0.1.0.tgz

cd nonrtric/test/usecases/oruclosedlooprecovery/scriptversion/helm/oru-app/
helm package .
kubectl cp ./oru-app-0.1.0.tgz onap/<POD-NAME-k8s-ppnt>:/home/policy/local-charts/oru-app-0.1.0.tgz
```

- Finally, install chartmuseum into the kubernetes-participant and push the above helm charts into it. Get into the pod using "kubectl -n onap exec -it <POD-NAME-k8s-ppnt> sh" and run the following commands:

```
mkdir -p ~/helm3-storage
curl -LO https://s3.amazonaws.com/chartmuseum/release/latest/bin/linux/amd64/chartmuseum
chmod +x ./chartmuseum
./chartmuseum --storage local --storage-local-rootdir /home/policy/helm3-storage -port 8080 &

curl --data-binary "@local-charts/sdnr-simulator-0.1.0.tgz" http://localhost:8080/api/charts
curl --data-binary "@local-charts/message-generator-0.1.0.tgz" http://localhost:8080/api/charts
curl --data-binary "@local-charts/oru-app-0.1.0.tgz" http://localhost:8080/api/charts

helm repo add chartmuseum http://localhost:8080
helm repo update
```

Once the kubernetes-participant is set up, the tosca template can be commissioned. After that, the control loop can be instantiated using the steps described in the sub-section Commission/Instantiate control loop via GUI. Once the control loop is in RUNNING state, check that all three micro-services have been created in the nonrtric namespace.

```
kubectl -n nonrtric get pod
```

In order to test the correct working of the usecase, check logs in each of the three components. There should be messages flowing in this order:

message-generator oru-app sdnr-simulator

Control loops in docker

This section is related to running the control loops in a docker environment. Separate docker-compose files are available in the nonrtric repo of OSC for bringing up the apex policy as well as the script versions of the usecase.

a) Control loop for apex policy version

This sub-section describes the steps for running the control loop for apex policy version of the usecase using docker.

- The first step is to clone the nonrtric repo and start the DmaaP message-router. Then, two topics are created in the message-router: **POLICY-CLRUNTIME-PARTICIPANT** (to be used by controlloop-runtime component of policy/clamp) and **unauthenticated.SEC_FAULT_OUTPUT** (for handling fault notification events).

```
git clone "https://gerrit.o-ran-sc.org/r/nonrtric"
git checkout e-release --track origin/e-release

cd nonrtric/test/auto-test
./startMR.sh remote docker --env-file ../common/test_env-oran-e-release.sh

docker rename message-router onap-dmaap

curl -X POST -H "Content-Type: application/json" -d "{"topicName": "POLICY-CLRUNTIME-PARTICIPANT"}"
http://localhost:3904/events/POLICY-CLRUNTIME-PARTICIPANT

curl -X POST -H "Content-Type: application/json" -d "{"topicName": "unauthenticated.SEC_FAULT_OUTPUT"}"
http://localhost:3904/events/unauthenticated.SEC_FAULT_OUTPUT
```

- After creating the topics in the message-router, start the ONAP Policy Framework using the docker-compose file available in nonrtric repo.

```
cd nonrtric/docker-compose/docker-compose-policy-framework
docker-compose up -d
```

- The next step is to start the controlloop-runtime and policy-participant components of the clamp.

```
cd nonrtric/test/usecases/oruclosedlooprecovery/apexpolicyversion/LinkMonitor/docker-compose-controlloop
docker-compose up -d
```

Check the logs of policy-participant using the command "docker logs -f policy-participant" and wait until these messages start appearing in the logs:

"com.att.nsa.apiClient.http.HttpClient   : --> HTTP/1.1 200 OK"

- Once all the components get up and running, the control loop can be commissioned and instantiated. This can be done by making a REST call to the controlloop-runtime component of the clamp. The tosca template for commissioning and the instantiation payload are provided in this directory of the nonrtric repo:

```
cd nonrtric/test/usecases/oruclosedlooprecovery/apexpolicyversion/LinkMonitor/controlloop-rest-payloads
```

Commission the tosca template using this REST call:

```
curl -X POST -k -u 'healthcheck:zb!XztG34' -H Content-Type:application/yaml https://localhost:6969/onap
/controlloop/v2/commission/ --data-binary @commission.yaml
```

It should give the following response:

{"errorDetails":null,"affectedControlLoopDefinitions":[{"name":"org.onap.domain.linkmonitor.LinkMonitorPolicyControlLoopElement","version":"1.2.3"},{"name":"org.onap.domain.linkmonitor.LinkMonitorControlLoopDefinition0","version":"1.2.3"},{"name":"org.onap.policy.controlloop.PolicyControlLoopParticipant","version":"2.3.1"}]}

Make the following REST call to instantiate the control loop:

```
curl -X POST -k -u 'healthcheck:zb!XztG34' -H Content-Type:application/json https://localhost:6969/onap
/controlloop/v2/instantiation/ --data-binary @instantiation.json
```

It should give the following response:

{"errorDetails":null,"affectedControlLoops":[{"name":"LinkMonitorInstance0","version":"1.0.1"}]}

Change the control loop from default UNINITIALISED state to PASSIVE using the following REST call:

```
curl -X PUT -k -u 'healthcheck:zb!XztG34' -H Content-Type:application/json https://localhost:6969/onap
/controlloop/v2/instantiation/command/ --data-binary @instantiation-command.json
```

It should give the same response as above.

Next step is to change the control loop from PASSIVE to RUNNING state. Edit the "instantiation-command.json" file and replace PASSIVE with RUNNING. Making the above REST call once again will change the control loop to RUNNING state.

- Once the control loop is in RUNNING state, check whether the apex policy has been deployed successfully in the policy framework. Making the below REST call to policy-api component should return the deployed policy.

```
curl -u 'healthcheck:zb!XztG34' -X GET "http://localhost:6869/policy/api/v1/policytypes/onap.policies.
controlloop.operational.common.Apex/versions/1.0.0/policies/operational.apex.linkmonitor/versions/1.0.0"
```

Make the below REST call to policy-pap component and make sure that it returns a state of "SUCCESS" for the deployed policy.

```
curl -u 'healthcheck:zb!XztG34' -X GET "http://localhost:6868/policy/pap/v1/policies/status"
```

- Start the sdnr-simulator in a docker container that will receive the REST call made by apex policy when a link failure event is received.

```
docker run --rm --name sdnr-sim --network nonrtric-docker-net -e MR-HOST="http://onap-dmaap" -e MR-PORT="3904"
registry.nordix.org/onap/sdnr-simulator:1.0.0
```

- Send the example link failure event.

```
cd nonrtric/test/usecases/oruclosedlooprecovery/apexpolicyversion/LinkMonitor

curl -X POST -H accept:application/json -H Content-Type:application/json "http://localhost:3904/events
/unauthenticated.SEC_FAULT_OUTPUT/" -d @./events/LinkFailureEvent.json
```

The logs of sdnr-simulator should show that the following REST call is received:

"PUT /rests/data/network-topology:network-topology/topology=topology-netconf/node=HCL-O-DU-1123/yang-ext:mount/o-ran-sc-du-hello-world:network-function/du-to-ru-connection=ERICSSON-O-RU-11225 HTTP/1.1" 200 -

- In order to stop the docker containers and free up resources on the host machine, use the following commands:

```
cd nonrtric/docker-compose/docker-compose-policy-framework
docker-compose down

cd nonrtric/test/usecases/oruclosedlooprecovery/apexpolicyversion/LinkMonitor/docker-compose-controlloop
docker-compose down

docker stop sdnr-sim
docker rm sdnr-sim

docker volume rm docker-compose-policy-framework_db-vol
```

b) Control loop for script version

This sub-section describes the steps for running the control loop for script version of the usecase using docker. This version of the control loop will bring up four micro-services in the nonrtric namespace: oru-app (running the actual logic of the usecase), message-generator (sending the LinkFailure messages at random intervals), sdnr-simulator (for receiving the REST calls made by oru-app), and dmaap-mr (a message-router stub where the LinkFailure messages will be sent).

NOTE: The below instructions refer to bringing up the micro-services in a minikube cluster on the host machine, and it is assumed that the minikube is already up and running. The instructions should be modified accordingly when using a different environment.

- The first step is to clone the nonrtric repo and start the DmaaP message-router. Then, a topic named **POLICY-CLRUNTIME-PARTICIPANT** is created in the message-router (to be used by controlloop-runtime component of policy/clamp).

```
git clone "https://gerrit.o-ran-sc.org/r/nonrtric"
git checkout e-release --track origin/e-release

cd nonrtric/test/auto-test
./startMR.sh remote docker --env-file ../common/test_env-oran-e-release.sh

docker rename message-router onap-dmaap

curl -X POST -H "Content-Type: application/json" -d "{"topicName": "POLICY-CLRUNTIME-PARTICIPANT"}"
http://localhost:3904/events/POLICY-CLRUNTIME-PARTICIPANT
```

- Build a docker image for each of the four micro-services and make it available for use inside the minikube. Open a new terminal window (keep it separate and do not run any other commands except the ones given below) and run the following commands:

```
eval $(minikube docker-env)

cd nonrtric/test/usecases/oruclosedlooprecovery/scriptversion/app
docker build -t oru-app .

cd nonrtric/test/usecases/oruclosedlooprecovery/scriptversion/simulators
docker build -f Dockerfile-sdnr-sim -t sdnr-simulator .
docker build -f Dockerfile-message-generator -t message-generator:v2 .

cd nonrtric/test/mrstub/
docker build -t mrstub .
```

Make sure that all four docker images have been successfully created by running the "docker images" command.

- Next step is to prepare the kube config file of minikube for mounting it inside the k8s-participant component of policy/clamp. First of all, copy the kube config file inside the config directory used by docker-compose file that runs k8s-participant.

```
cd nonrtric/test/usecases/oruclosedlooprecovery/scriptversion/docker-compose-controlloop

cp ~/.kube/config ./config/kube-config
```

Open the copied kube-config file (located at nonrtric/test/usecases/oruclosedlooprecovery/scriptversion/docker-compose-controlloop/config/kube-config) and make the following changes:

1. replace everything under "cluster" with these two lines:
   server: https://host.docker.internal:<PORT>

   insecure-skip-tls-verify: true
2. replace <PORT> with the port in original kube-config file before editing (i.e., before doing the above step)
3. replace last two lines in the file with:

   client-certificate: /home/policy/.minikube/profiles/minikube/client.crt

   client-key: /home/policy/.minikube/profiles/minikube/client.key

- Open the docker-compose file (located at nonrtric/test/usecases/oruclosedlooprecovery/scriptversion/docker-compose-controlloop/docker-compose.yml) and replace the last line under volumes of k8s-participant with these two lines:

  - ./config/kube-config:/home/policy/.kube/config:ro

  - ~/.minikube/profiles/minikube:/home/policy/.minikube/profiles/minikube

- Start all the components using this docker-compose file:

```
docker-compose up -d
```

Check the logs of k8s-participant using the command "docker logs -f k8s-participant" and wait until these messages start appearing in the logs:

"com.att.nsa.apiClient.http.HttpClient : --> HTTP/1.1 200 OK"

- Once all the components get up and running, the control loop can be commissioned and instantiated. This can be done by making a REST call to the controlloop-runtime component of the clamp. The tosca template for commissioning and the instantiation payload are provided in this directory of the nonrtric repo:

```
cd nonrtric/test/usecases/oruclosedlooprecovery/scriptversion/controlloop-rest-payloads
```

Commission the tosca template using this REST call:

```
curl -X POST -k -u 'healthcheck:zb!XztG34' -H Content-Type:application/yaml https://localhost:6969/onap
/controlloop/v2/commission/ --data-binary @commission.yaml
```

It should give the following response:

*{"errorDetails":null,"affectedControlLoopDefinitions":[{"name":"org.onap.domain.linkmonitor.LinkMonitorControlLoopDefinition1","version":"1.2.3"},{"name":"
org.onap.k8s.controlloop.K8SControlLoopParticipant","version":"2.3.4"},{"name":"org.onap.domain.linkmonitor.
OruAppK8SMicroserviceControlLoopElement","version":"1.2.3"},{"name":"org.onap.domain.linkmonitor.
MessageGeneratorK8SMicroserviceControlLoopElement","version":"1.2.3"},{"name":"org.onap.domain.linkmonitor.
SdnrSimulatorK8SMicroserviceControlLoopElement","version":"1.2.3"},{"name":"org.onap.domain.linkmonitor.
DmaapMrK8SMicroserviceControlLoopElement","version":"1.2.3"}]}*

Make the following REST call to instantiate the control loop:

```
curl -X POST -k -u 'healthcheck:zb!XztG34' -H Content-Type:application/json https://localhost:6969/onap
/controlloop/v2/instantiation/ --data-binary @instantiation.json
```

It should give the following response:

{"errorDetails":null,"affectedControlLoops":[{"name":"LinkMonitorInstance1","version":"1.0.1"}]}

Change the control loop from default UNINITIALISED state to PASSIVE using the following REST call:

```
curl -X PUT -k -u 'healthcheck:zb!XztG34' -H Content-Type:application/json https://localhost:6969/onap
/controlloop/v2/instantiation/command/ --data-binary @instantiation-command.json
```

It should give the same response as above.

Next step is to change the control loop from PASSIVE to RUNNING state. Edit the "instantiation-command.json" file and replace PASSIVE with RUNNING. Making the above REST call once again will change the control loop to RUNNING state.

- Once the control loop is in RUNNING state, check that all four micro-services have been created in the nonrtric namespace.

  ```
  kubectl -n nonrtric get pod
  ```

  In order to test the correct working of the usecase, check logs in each of the four components. There should be messages flowing in this order:

  message-generator dmaap-mr oru-app sdnr-simulator

- In order to stop the docker containers and free up resources on the host machine, use the following commands:

```
cd nonrtric/test/usecases/oruclosedlooprecovery/scriptversion/docker-compose-controlloop
docker-compose down

docker volume rm docker-compose-controlloop_db-vol
```