Release G: Automation Composition for O-DU Slice Assurance use case

This page describes how to create and run the control loops for the "Hello World" O-DU Slice Assurance usecase. This is done in kubernetes environment using the complete ONAP installation done via OOM. This use case is created using Kubernetes participant available in ONAP

The use case implementations are located in the "nonrtric/rapp/ransliceassurance" repo.

Configuring SMO and Automation Compositions

This section describes the configuration required in SMO setup for this use case.

Instructions for the SMO installation can be found here. After the installation onap, nonrtric and network namespaces in Kubernetes should be running with the respective containers.

VES collector configuration

Ves collector should be configured with the stream details to receive events. The following should be done to configure,

```
kubectl -n onap edit cm onap-dcae-ves-collector-application-config-configmap
```

Add the configuration as shown below in application_config.yaml

```
collector.dmaap.streamid: .........|o-ran-sc-du-hello-world-pm-streaming-oas3=ves-oran-pm-stream
....
streams_publishes:
       .....
        ves-oran-pm-stream:
                dmaap_info:
                        topic_url: http://message-router:3904/events/unauthenticated.
VES_O_RAN_SC_HELLO_WORLD_PM_STREAMING_OUTPUT
                        type: message_router
```

Then restart the deployment with the following command

```
kubectl rollout restart deployment onap-dcae-ves-collector
```

After the restart ves collector should be up and running.

Policy clamp runtime and Kubernetes participant version

Policy clamp runtime and k8sparticipant had several issues fixed recently and it is expected to have this version at the time of writing this document

```
Kubernetes Participant: nexus3.onap.org:10001/onap/policy-clamp-ac-k8s-ppnt:6.3.0
Clamp runtime: nexus3.onap.org:10001/onap/policy-clamp-runtime-acm:6.3.1
```

Creating service required by SDNC

SDNC requires a service named onap-dmaap to be running, It has been renamed as message-router, but being in place under some SDNC configuration.

There is no configuration/environment variables using which this can be configured, In order to solve this issue, A service with the name onap-dmaap should be created as shown below,

onap-dmaap-service.yaml

```
apiVersion: v1
kind: Service
metadata:
  annotations:
    meta.helm.sh/release-name: onap-dmaap
    meta.helm.sh/release-namespace: onap
    msb.onap.org/service-info: '[ { "serviceName": "onap-dmaap", "version": "v1",
      "url": "/", "protocol": "REST", "enable_ssl": false, "port": "3904", "visualRange":"1"
      } ]'
  creationTimestamp: "2022-10-20T13:50:35Z"
  labels:
    app.kubernetes.io/instance: onap
    app.kubernetes.io/managed-by: Helm
    app.kubernetes.io/name: onap-dmaap
    helm.sh/chart: message-router-10.0.0
  name: onap-dmaap
  namespace: onap
  resourceVersion: "9186544"
  selfLink: /api/v1/namespaces/onap/services/onap-dmaap
  uid: 4be149fd-af76-49a3-94e2-466623d2d0be
spec:
  internalTrafficPolicy: Cluster
  ipFamilies:
  - IPv4
  ipFamilyPolicy: SingleStack
  ports:
  - name: https-api
    port: 3905
    protocol: TCP
    targetPort: api
  - name: http-api
    port: 3904
    protocol: TCP
    targetPort: api-plain
  selector:
    app.kubernetes.io/instance: onap
    app.kubernetes.io/name: message-router
  sessionAffinity: None
  type: ClusterIP
status:
  loadBalancer: {}
```

Then run the following command

```
kubectl apply -f onap-dmaap-service.yaml
```

Configuring stream and job to collect the Events

Stream and job needs to be configured for the VES collector to get the required events. This can be configured using the commands below,

Configuring Event stream

```
curl -k -v -X PUT -H "Content-Type: application/yang-data+json" -H "Accept: application/yang-data+json" -d
'{"subscription-streams":{"id":"stream-1","administrative-state":"unlocked","user-label":"stream1","ves-
endpoint-protocol":"https","ves-endpoint-auth-method":"basic-auth","ves-endpoint-ip":"dcae-ves-collector.onap","
ves-endpoint-port":"8443","ves-endpoint-username":"sample1","ves-endpoint-password":"sample1"}}' -u admin:
Kp8bJ4SXszM0WXlhak3eHlcse2gAw84vaoGGmJvUy2U https://<SDNC_HOST>:<SDNC_PORT>/rests/data/network-topology:network-
topology/topology=topology-netconf/node=o-du-1122/yang-ext:mount/o-ran-sc-du-hello-world:network-function
/subscription-streams=stream-1
```

Payload required for configuring the job

payload.json

```
{
    "performance-measurement-jobs": {
        "id": "pm-1",
        "administrative-state": "unlocked",
        "user-label": "pm",
        "job-tag": "my-job-tag",
        "performance-metrics": [
            "/o-ran-sc-du-hello-world:network-function/o-ran-sc-du-hello-world:distributed-unit-functions[o-ran-
sc-du-hello-world:id='o-du-1122']/o-ran-sc-du-hello-world:cell[o-ran-sc-du-hello-world:id='cell-1']/o-ran-sc-du-
hello-world:supported-measurements[o-ran-sc-du-hello-world:performance-measurement-type='user-equipment-average-
throughput-uplink']/o-ran-sc-du-hello-world:supported-snssai-subcounter-instances[o-ran-sc-du-hello-world:slice-
differentiator='1'][o-ran-sc-du-hello-world:slice-service-type='1']"
        ],
        "granularity-period": 30,
        "stream-target": "stream-1"
    }
}
```

Configuring event collection job

```
curl -k -v -X PUT -H "Content-Type: application/yang-data+json" -H "Accept: application/yang-data+json" -d
@payload.json -u admin:Kp8bJ4SXszM0WXlhak3eHlcse2gAw84vaoGGmJvUy2U https://<SDNC_HOST>:<SDNC_PORT>/rests/data
/network-topology:network-topology/topology=topology-netconf/node=o-du-1122/yang-ext:mount/o-ran-sc-du-hello-
world:network-function/performance-measurement-jobs=pm-1
```

Configuring NONRTRIC and Slice Assurance

Couple of NONRTRIC components should be configured as shown below

Configuring dmaap adapter producer

Dmaapadapter should be configured with new producer type using the steps below

```
kubectl -n nonrtric edit cm dmaapadapterservice-configmap-data
```

Add the configuration as shown below in application_configuration.json

application_configuration.json

```
{
   "types": [
     ...
     {
            "id": "Performance_Measurement_Streaming",
            "dmaapTopicUrl": "/events/unauthenticated.VES_O_RAN_SC_HELLO_WORLD_PM_STREAMING_OUTPUT/myG/C1",
            "useHttpProxy": false
           }
        ...
   ]
}
```

Then restart the statefulset with the following command

```
kubectl rollout restart statefulset dmaapadapterservice
```

Configuring simulator name in Slice Assurance

Stub version uses the node name as "O-DU-1122". It is different from the network simulators run by OOM. So the node name should be configured in helm values as shown below

Rapp simulator node name configuration

```
...
simulator:
  node: o-du-1122
...
```

Configuration with http port of SDNC

Slice assurance doesn't supports the https calls to SDNC as of now.

OOM installation doesn't have the http port enabled for SDNC.

So It can be configured with pod's ClusterIP/Nodeport using the helm values as shown below.

Rapp sdnc configuration

```
...
sdnr:
  address: http://10.1.49.120:8181
...
```

Automation Composition Deployment

Tosca template used for commission is shown below,

commission.yaml

```
#  Copyright (C) 2022 Nordix Foundation. All rights reserved.
#  ============================================================================
#  Licensed under the Apache License, Version 2.0 (the "License");
#  you may not use this file except in compliance with the License.
#  You may obtain a copy of the License at
#
#       http://www.apache.org/licenses/LICENSE-2.0
#
```

```
#  Unless required by applicable law or agreed to in writing, software
#  distributed under the License is distributed on an "AS IS" BASIS,
#  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
#  See the License for the specific language governing permissions and
#  limitations under the License.
#  ============LICENSE_END=========================================================
#
tosca_definitions_version: tosca_simple_yaml_1_3
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.acm.Participant:
    version: 1.0.1
    derived_from: tosca.nodetypes.Root
    properties:
      provider:
        type: string
        required: false
  org.onap.policy.clamp.acm.AutomationCompositionElement:
    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 automation composition element
      participant_id:
        type: onap.datatypes.ToscaConceptIdentifier
        required: 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 Automation Composition Element
      startPhase:
        type: integer
        required: false
        constraints:
          - greater_or_equal: 0
        metadata:
          common: true
        description: A value indicating the start phase in which this automation composition element will be
started, the
          first start phase is zero. Automation Composition Elements are started in their start_phase order and
stopped
          in reverse start phase order. Automation Composition 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.acm.AutomationComposition:
    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 automation composition element
      elements:
        type: list
        required: true
        metadata:
          common: true
        entry_schema:
          type: onap.datatypes.ToscaConceptIdentifier
        description: Specifies a list of automation composition element definitions that make up this
automation composition definition
  org.onap.policy.clamp.acm.PolicyAutomationCompositionElement:
    version: 1.0.1
    derived_from: org.onap.policy.clamp.acm.AutomationCompositionElement
    properties:
      policy_type_id:
        type: onap.datatypes.ToscaConceptIdentifier
        required: true
      policy_id:
        type: onap.datatypes.ToscaConceptIdentifier
        required: false
  org.onap.policy.clamp.acm.CDSAutomationCompositionElement:
    version: 1.0.1
    derived_from: org.onap.policy.clamp.acm.AutomationCompositionElement
    properties:
      cds_blueprint_id:
        type: onap.datatypes.ToscaConceptIdentifier
        required: true
  org.onap.policy.clamp.acm.K8SMicroserviceAutomationCompositionElement:
    version: 1.0.1
    derived_from: org.onap.policy.clamp.acm.AutomationCompositionElement
    properties:
      chart:
        type: string
        required: true
      configs:
        type: list
```

```
        required: false
      requirements:
        type: string
        required: false
      templates:
        type: list
        required: false
        entry_schema:
      values:
        type: string
        required: true
topology_template:
  node_templates:
    org.onap.policy.clamp.acm.KubernetesParticipant:
      version: 2.3.4
      type: org.onap.policy.clamp.acm.Participant
      type_version: 1.0.1
      description: Participant for K8S
      properties:
        provider: ONAP
    org.onap.domain.sample.SliceAssurance_K8SMicroserviceAutomationCompositionElement:
      version: 1.2.3
      type: org.onap.policy.clamp.acm.K8SMicroserviceAutomationCompositionElement
      type_version: 1.0.1
      description: Automation composition element for the K8S microservice for O-DU Slice Assurance
      properties:
        provider: ONAP
        participant_id:
          name: K8sParticipant0
          version: 1.0.0
        participantType:
          name: org.onap.policy.clamp.acm.KubernetesParticipant
          version: 2.3.4
        uninitializedToPassiveTimeout: 180
        podStatusCheckInterval: 10
        chart:
          chartId:
            name: odu-app
            version: 1.0.0
          namespace: nonrtric
          releaseName: odu-app
          repository:
            repoName: chartmuseum
            address: http://10.0.1.1:18080
    org.onap.domain.sample.SliceAssuranceIcsVersion_K8SMicroserviceAutomationCompositionElement:
      version: 1.2.3
      type: org.onap.policy.clamp.acm.K8SMicroserviceAutomationCompositionElement
      type_version: 1.0.1
      description: Automation composition element for the K8S microservice for O-DU Slice Assurance Ics Version
      properties:
        provider: ONAP
        participant_id:
          name: K8sParticipant0
          version: 1.0.0
        participantType:
          name: org.onap.policy.clamp.acm.KubernetesParticipant
          version: 2.3.4
        uninitializedToPassiveTimeout: 180
        podStatusCheckInterval: 10
        chart:
          chartId:
            name: odu-app-ics-version
            version: 1.0.0
          namespace: nonrtric
          releaseName: odu-app-ics-version
          repository:
            repoName: chartmuseum
            address: http://10.0.1.1:18080
    org.onap.domain.sample.GenericK8s_AutomationCompositionDefinition:
      version: 1.2.3
      type: org.onap.policy.clamp.acm.AutomationComposition
```

```
    type_version: 1.0.1
    description: Automation composition for O-DU Slice Assurance
    properties:
      provider: ONAP
      elements:
        - name: org.onap.domain.sample.SliceAssurance_K8SMicroserviceAutomationCompositionElement
          version: 1.2.3
        - name: org.onap.domain.sample.SliceAssuranceIcsVersion_K8SMicroserviceAutomationCompositionElement
          version: 1.2.3
```

Build and Upload Helm charts for Slice Assurance

Helm chart for Sliceassurance smo and ics version needs to be built and uploaded into the chartmuseum server running as part of OOM installation using the commands below,

Helm Build and Upload

```
cd ransliceassurance/smoversion/helm
helm package .
curl --data-binary "@odu-app-1.0.0.tgz" http://<NodeIP>:18080/api/charts

cd ransliceassurance/icsversion/helm
helm package .
curl --data-binary "@odu-app-ics-version-1.0.0.tgz" http://<NodeIP>:18080/api/charts
```

Commission/Instantiate Automation Composition via GUI

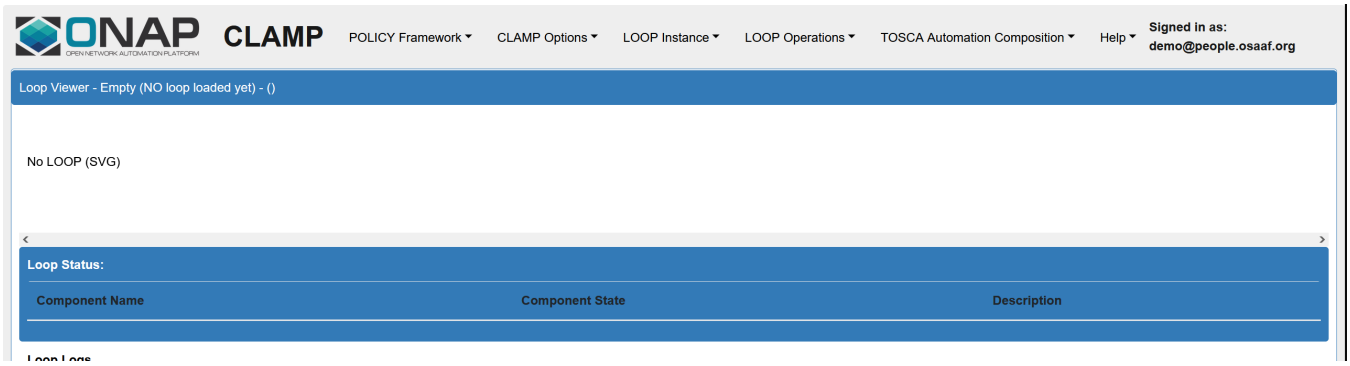
NodePort of policy-gui can be done by using the command "kubectl -n onap get svc | grep policy-gui".

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

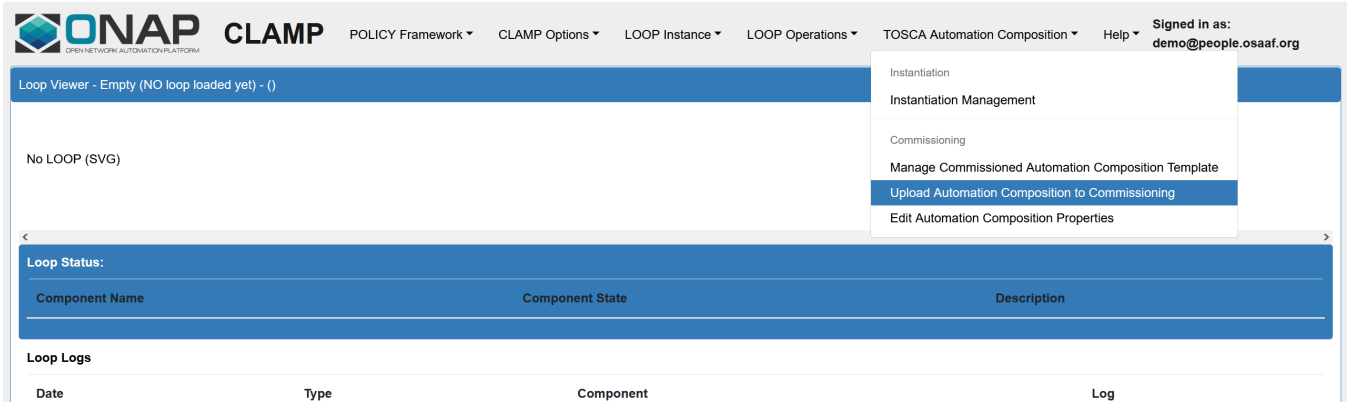
https://<NodeIP>:<NodePort-policy-gui>/clamp/

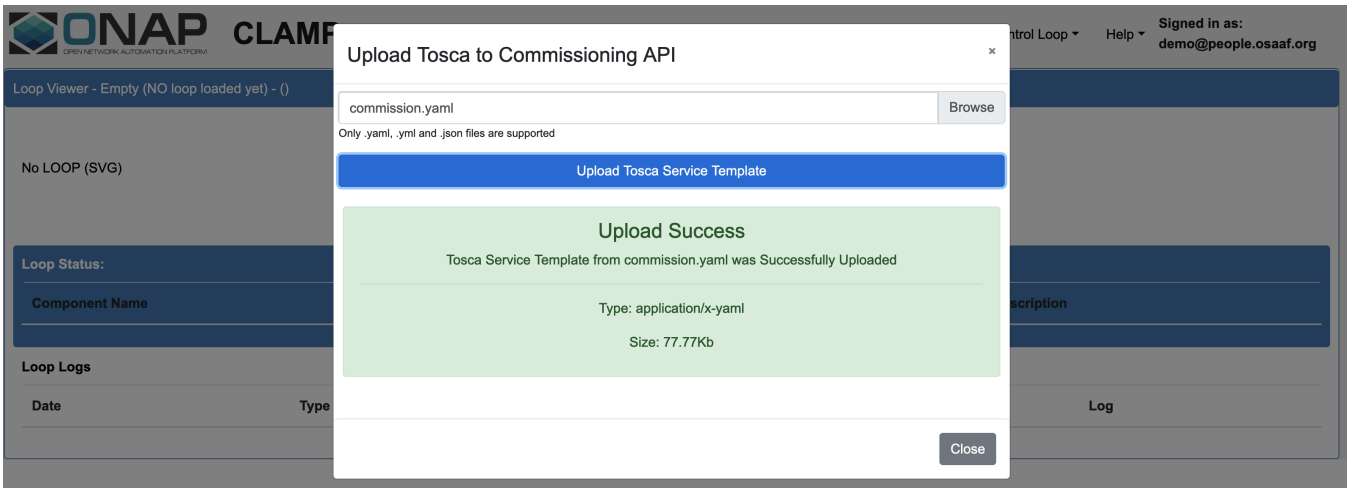
Use below credentials for the GUI:

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

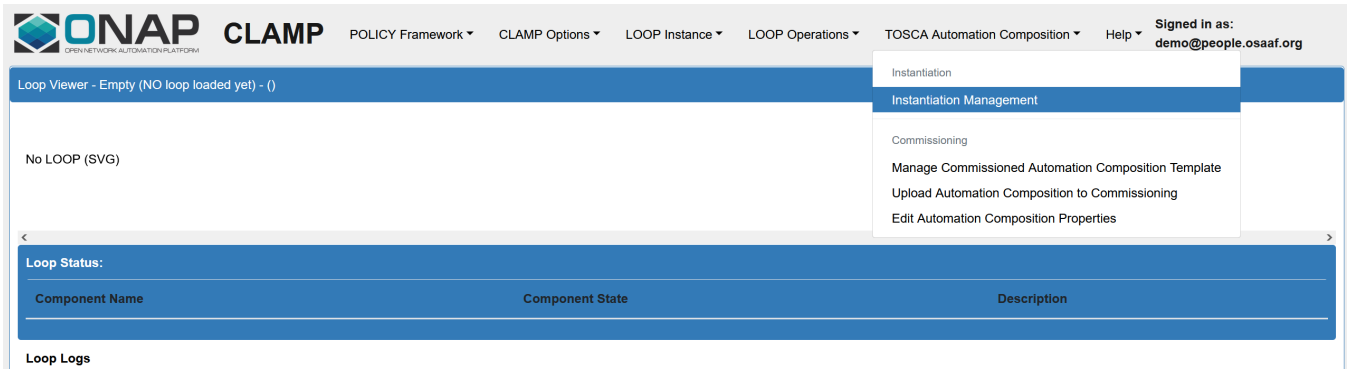


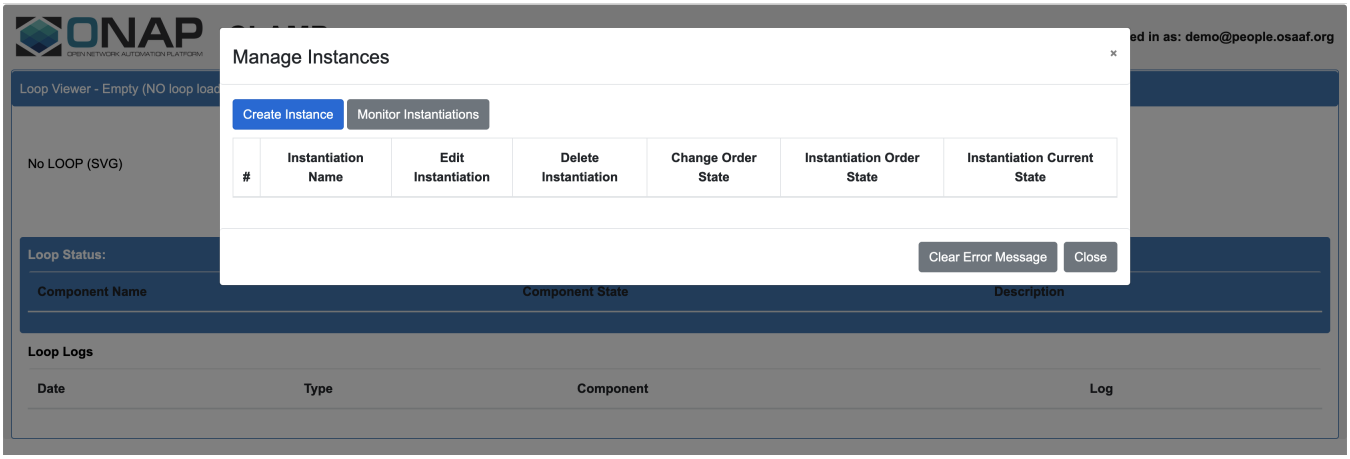
Go to **Tosca Automation Composition** pane, and select **Upload Tosca to Commissioning** in order to upload the tosca template (provided later in the relevant sub-section).

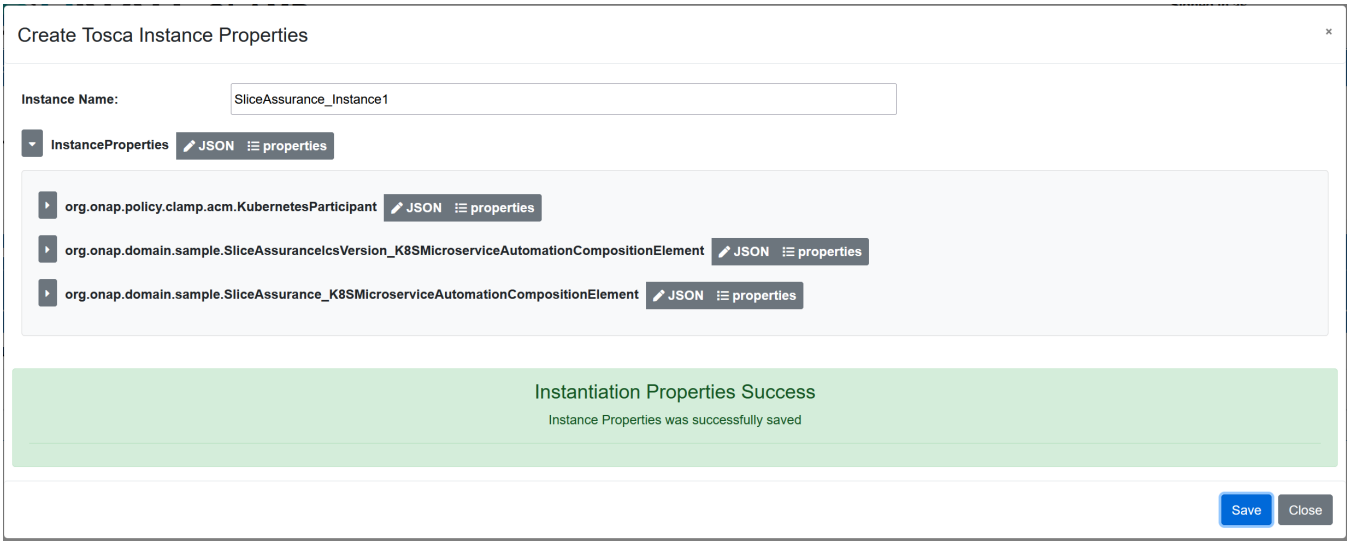


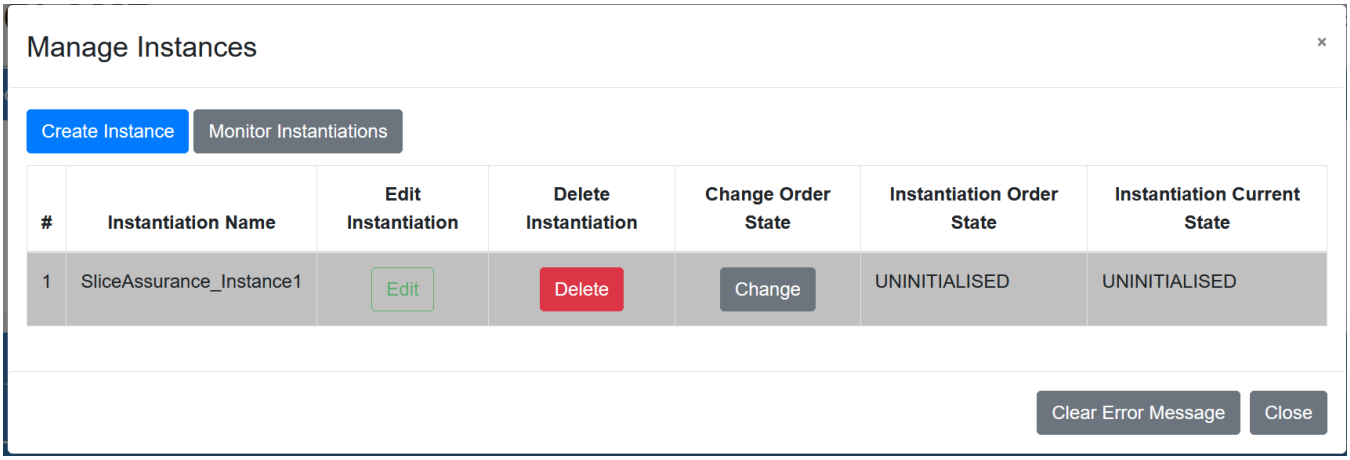


After commissioning the tosca template, the next step is to instantiate the control loop. Go to **Tosca Automation Composition** pane, and select **Instantiat ion Management** and then press the **Create Instance** button. If no changes need to be made in the instance properties, press the **Save** button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

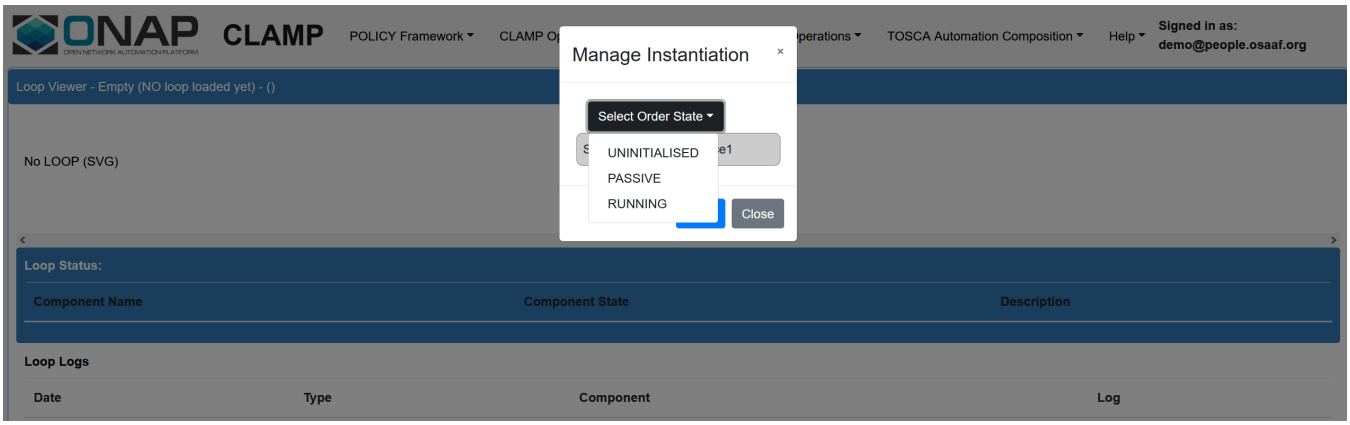


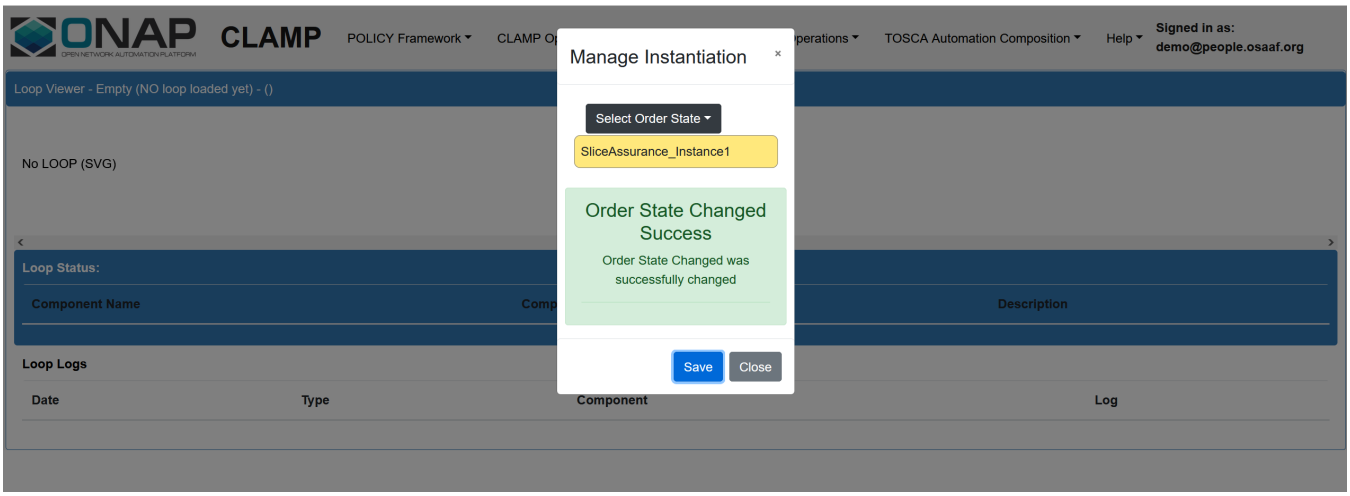


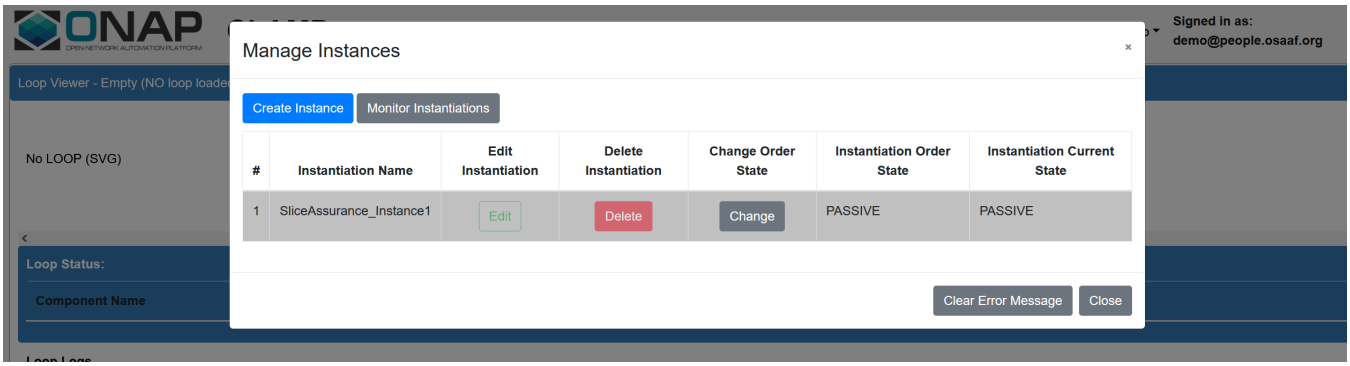




Press the **Change** button under **Change Order State**. Then, press the **Select Order State** drop-down menu, and select PASSIVE. Finally, press the **Save** button to change the control loop to PASSIVE state.







Once the control loop gets into the PASSIVE state, the corresponding version of the use case should be up and running (State of the Instance can be updated to RUNNING via the GUI).

```
root@kubeflow-poc-vm-1:/home/ubuntu# helm ls -n nonrtric
NAME                    NAMESPACE       REVISION        UPDATED                                 STATUS          CHART                           APP VERSIO
N
odu-app                 nonrtric        1               2022-11-03 12:06:57.973580887 +0000 UTC deployed        odu-app-1.0.0                   1.0.0

odu-app-ics-version     nonrtric        1               2022-11-03 12:07:31.375085508 +0000 UTC deployed        odu-app-ics-version-1.0.0       1.0.0
```

Commission/Instantiate Automation Composition via commands

Automation composition can be commissioned and initiated using commands as below,

Uploading the commission as shown below,

Upload commission Yaml

```
curl -v -X POST -k -u 'runtimeUser:ZiboTipdZeyt9]' -H Content-Type:application/yaml
https://<POLICY_RUNTIME_HOST>:6969/onap/policy/clamp/acm/v2/commission/ --data-binary @commission.yaml
```

It should give the below response,

Upload commission response


```
{
    "errorDetails": null,
    "affectedAutomationCompositionDefinitions": [
        {
            "name": "org.onap.domain.sample.GenericK8s_AutomationCompositionDefinition",
            "version": "1.2.3"
        },
        {
            "name": "org.onap.domain.sample.
SliceAssuranceIcsVersion_K8SMicroserviceAutomationCompositionElement",
            "version": "1.2.3"
        },
        {
            "name": "org.onap.domain.sample.SliceAssurance_K8SMicroserviceAutomationCompositionElement",
            "version": "1.2.3"
        },
        {
            "name": "org.onap.policy.clamp.acm.KubernetesParticipant",
            "version": "2.3.4"
        }
    ]
}
```


Create an instance of automation composition

Create automation composition instance

```
curl -v -X POST -k -u 'runtimeUser:ZiboTipdZeyt9]' -H Content-Type:application/json
https://<POLICY_RUNTIME_HOST>:6969/onap/policy/clamp/acm/v2/instantiation/ --data-binary @instantiation.json
```

Payload file as follows,

instantiation.json


```
{
    "automationCompositionList": [
        {
            "name": "SliceAssuranceInstance",
            "version": "1.0.1",
            "definition": {
                "name": "org.onap.domain.sample.GenericK8s_AutomationCompositionDefinition",
                "version": "1.2.3"
            },
            "state": "UNINITIALISED",
            "orderedState": "UNINITIALISED",
            "description": "Slice Assurance SMO version",
            "elements": {
                "709c62b3-8918-41b9-a747-d21eb79c6c12": {
                    "id": "709c62b3-8918-41b9-a747-d21eb79c6c12",
                    "definition": {
                        "name": "org.onap.domain.sample.
SliceAssurance_K8SMicroserviceAutomationCompositionElement",
                        "version": "1.2.3"
                    },
                    "participantType": {
                        "name": "org.onap.policy.clamp.acm.KubernetesParticipant",
                        "version": "2.3.4"
                    },
                    "participantId": {
                        "name": "K8sParticipant0",
                        "version": "1.0.0"
                    },
                    "state": "UNINITIALISED",
                    "orderedState": "UNINITIALISED",
                    "description": "Odu App smo version k8s Control Loop Element"
                },
                "709c62b3-8918-41b9-a747-d21eb79c6c13": {
                    "id": "709c62b3-8918-41b9-a747-d21eb79c6c13",
                    "definition": {
                        "name": "org.onap.domain.sample.
SliceAssuranceIcsVersion_K8SMicroserviceAutomationCompositionElement",
                        "version": "1.2.3"
                    },
                    "participantType": {
                        "name": "org.onap.policy.clamp.acm.KubernetesParticipant",
                        "version": "2.3.4"
                    },
                    "participantId": {
                        "name": "K8sParticipant0",
                        "version": "1.0.0"
                    },
                    "state": "UNINITIALISED",
                    "orderedState": "UNINITIALISED",
                    "description": "Odu App ics version k8s Control Loop Element"
                }
            }
        }
    ]
}
```


Instantiation should give the below response,

Instance creation response

```
{
    "errorDetails": null,
    "affectedAutomationCompositions": [
        {
            "name": "SliceAssuranceInstance",
            "version": "1.0.1"
        }
    ]
}
```

Update instance status to PASSIVE using the below command

Instance status update Request

```
curl -v -X POST -k -u 'runtimeUser:ZiboTipdZeyt9]' -H Content-Type:application/json
https://<POLICY_RUNTIME_HOST>:6969/onap/policy/clamp/acm/v2/instantiation/command/ --data-binary @instantiation-
command.json
```

Payload file as follows,

instantiation-command.json

```
{
    "orderedState": "PASSIVE",
    "automationCompositionIdentifierList": [
        {
            "name": "SliceAssuranceInstance",
            "version": "1.0.1"
        }
    ]
}
```

Instance update status is as follows,

Response of instance status update

```
{
    "errorDetails": null,
    "affectedAutomationCompositions": [
        {
            "name": "SliceAssuranceInstance",
            "version": "1.0.1"
        }
    ]
}
```

Status can be updated to RUNNING using the above request with the updated payload.

The container should be up and running after this state and it can be verified using the below command.

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