



Open Source MANO

Deployment of OAI 5G using OSM
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Deployment steps and progression



- Task 1: OAI deployment on microk8s using Helm Charts -> **Monday + Tuesday**
- Task 2: OAI deployment with OSM using Juju Charms -> **Thursday afternoon**
 - Implement deployment descriptors
- Task 2 bis: Setup helm charts -> **Tuesday + Wednesday morning**
 - OAI with OSM using Helm Charts (Public Helm Repository Creation, VNFD Design, NSD Packages, IP Address Fix in values)
- Task 3: Automate a scale-up operation by deploying an additional gNB RF SIM -> **Thursday**
 - Alter the VNFD: number of instances min/max, scaling aspects
 - Add a gNB using CLI
- Task 4: Automate an upgrade of AMF -> **Thursday night**
 - Update Juju Charm: add action and modify charm python code
 - Update VNFD

Task 1

- Git clone OAI Helm Charts code
- Modify Helm Charts
 - Set Ip Address for AMF/ NRF/ GNB in `values.yaml` file
 - Modified tags in `values.yaml` file q
 - Used staticIP `cni.projectcalico.org/ipAddrs": "[\"10.1.21.77\"]`
(`deployment.yaml`)
 - Check Data network ‘Unify NSSAI’ for AMF /UPF and GNB
- Deploy on K8s
- Verify operation

Task2

- Task 2: OAI deployment with OSM using Juju Charms
 - Deployment without OSM
Use correct version of juju.. (2.9)
Using provided code deploy ok
 - Deployment with OSM
 - Implement deployment descriptors Deploy with OSM
 - Live demo

App	Status	Scale	Charm	Store	Actions
● amf	active	1	oai-amf	local	
● db	active	1	oai-db	local	
● gnb	active	2	oai-gnb	local	
● nr-ue	active	1	oai-nr-ue	local	
● nrf	active	1	oai-nrf	local	
● smf	active	1	oai-smf	local	
● spgwu-tiny	active	1	oai-spgwu-tiny	local	
Unit	Workload	Agent	Machine	Public Address / Address	Message
● amf/0 (Leader)	active	idle	-	10.1.21.120	
● db/0 (Leader)	active	idle	-	10.1.21.87	
● gnb/0	active	idle	-	10.1.21.121	
● gnb/1 (Leader)	active	idle	-	10.1.21.119	
● nr-ue/0 (Leader)	active	idle	-	10.1.21.123	
● nrf/0 (Leader)	active	idle	-	10.1.21.80	
● smf/0 (Leader)	active	idle	-	10.1.21.114	
● spgwu-tiny/0 (Leader)	active	idle	-	10.1.21.122	

Task2 bis

- Task 2 bis: Setup helm charts
 - Task follow the task 1
 - OAI with OSM using Helm Charts (Public Helm Repository Creation, VNFD Design, NSD Packages, IP Address Fix in values)

mysql	a3abdbe0-2a8a-4536-87db-8d81180b4757	mysql_ns			Done					Action ▾
...										

Task 3

- Task 3: Automate a scale-up operation by deploying an additional gNB RF SIM
 - Alter the VNFD: number of instances min/max, scaling aspects
 - Add a gNB using CLI

```
1 vnfds:  
2   description: KNF with KDUs oai using a juju bundle (team shark)  
3   df:  
4     - id: default-df  
5       kdu-resource-profile:  
6         - id: oai-scale  
7           kdu-name: oai-new-knf  
8           resource-name: gnb  
9           min-number-of-instances: 1  
10          max-number-of-instances: 5  
11   scaling-aspect:  
12     - id: scale-oai  
13       name: scale-oai  
14       max-scale-level: 10  
15       aspect-delta-details:  
16         deltas:  
17           - id: kdu-delta  
18             kdu-resource-delta:  
19               - id: oai-scale
```

Task 4 1/2

- Task 4: Automate an upgrade of AMF
 - Update Juju Charm: add action and modify charm python code
 - Share code screen
 - Update VNF D
 - Share code screen
 - Demo in OSM

Action.yaml

```
modify-oai-amf-image:
  description: Modify Image of AMF aoi pod
  params:
    oai-amf-image-name-with-tag:
      description: Name of tag
      type: string
      default: "rdefosseoaioai-nrf:v1.1.0"
      required:
        - oai-amf-image-name-with-tag
```

Charm.py

```
def _on_modify_aoi_amf_image_action(self, event):
    """Handle the modify_aoi_amf action """
    # Fetch the user parameter from the ActionEvent params dict
    image_name = event.params["oai-amf-image-name-with-tag"]
    # update amf image
    #send evenet up-grade charm
    #pgrade-charm

    cmd = ["/usr/bin/myapp", "roles", "system_admin", user]
    # Set a log message for the action
    event.log(f"Installing the image: {image_name}")

    container = self.unit.get_container(self.container_name)
    #is_running = (
    #    service_name in container.get_plan().services
    #    and container.get_service("amf").is_running()
    #)
    #_stop_service(container_name="amf", service_name="oai_amf")
    #if self.is_running:
    container.stop(self.service_name)
    #granted = subprocess.run(cmd, capture_output=True)
    #if granted.returncode != 0:
    #    # Fail the action if there is an error
    event.fail(f"Failed to update image (refused by Designer)\n Container was stopped")
    #else:
    # Set the results of the action
    #msg = f"Ran grant-admin-role for user '{user}'"
    #event.set_results({"result": msg})
```

	number-of-instances: 1 lcm-operations-configuration: operate-vnf-op-config: day1-2: - id: oai_new_knf config-primitive: - name: modify-oai-amf-image parameter: - data-type: STRING default-value: rdefosseoaioai-nrf:v1.1.0 name: oai-amf-image-name-with-tag modify-oai-amf-image: - name: modify-oai-amf-image parameter: - data-type: STRING name: oai-amf-image-name-with-tag value: rdefosseoaioai-nrf:v1.1.0 seq: 1
--	---

Task 4 2/2

- Task 4: Automate an upgrade of AMF
 - Update Juju Charm: add action and modify charm python code
 - Share code screen
 - Update VNFD
 - Share code screen
 - Demo in OSM

```
ubuntu@hackfest-microk8s-7:~/oai-cn5g-fed$ juju actions amf
Action          Description
modify-oai-amf-image  Modify Image of AMF aoi pod
ubuntu@hackfest-microk8s-7:~/oai-cn5g-fed$ juju show-action amf
modify-oai-amf-image
Modify Image of AMF aoi pod

Arguments
oai-amf-image-name-with-tag:
  type: string
  description: Name of tag
  default: rdefosse/oai/oai-nrf:v1.1.0
```

Difficulties and resolutions



- Task 1: json in yaml for deployment.yaml
- Task 2: version of juju
- task 2 bis : oai with osm using helm charts => we cant do day-1 and 2 with this method
- Task 3
- Task 4: little knowledge of charm/ interaction with kube..

With more time..

- Add day 1 operation to verify operation of OAI

- Scripts have been written
- Could be automated

- More actions

- With db
 - Action to dump db,
 - Add IMSI
- With GNB
- Instantiate Slice

```

ubuntu@hackfest-microk8s-7:~$ ./checkSMF.sh
Looking for smf-o
2021-09-16T21:03:17.718Z [oai_smf] [2021-09-16T23:03:17.718555] [smf] [smf_n4]
ubuntu@hackfest-microk8s-7:~$ ./checkGNBconnected.sh
Looking for amf-o
2021-09-16T21:05:09.382Z [oai_amf] [2021-09-16T23:05:09.382781] [AMF] [amf_app]
ubuntu@hackfest-microk8s-7:~$ ./checkSMF.sh
Looking for smf-o
2021-09-16T21:03:17.718Z [oai_smf] [2021-09-16T23:03:17.718555] [smf] [smf_n4]
ubuntu@hackfest-microk8s-7:~$ ./checkSPGW.sh
Looking for spgwu-tiny-o
2021-09-17T10:05:32.180Z [oai_spgwu_tiny] [2021-09-17T12:05:32.180689] [spgwu] [spgwu_sx] [info ] Received SX HEARTBEAT REQUEST
4695
ubuntu@hackfest-microk8s-7:~$ ./checkGNBconnected.sh
Looking for amf-o
021-09-16T21:05:09.382Z [oai_amf] [2021-09-16T23:05:09.382781] [AMF] [amf_app] [info ] | 1 | Connected | 0xe000 | gnb-r
ubuntu@hackfest-microk8s-7:~$ ./connectUE.sh
Looking for nr-ue-o
root@nr-ue-o:/opt/oai-nr-ue# ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=110 time=47.6 ms
[info ] Received N4 ASSOCIATION SETUP
[info ] | 1 | Connected | oxed
[info ] Received N4 ASSOCIATION SETUP
[info ] | 1 | Connected | oxed
[info ] Received SX HEARTBEAT REQUEST
[info ] | 1 | Connected | 0xe000 | gnb-r
[info ] Received N4 ASSOCIATION SETUP
[info ] | 1 | Connected | oxed
[info ] Received SX HEARTBEAT REQUEST
[info ] | 1 | Connected | 0xe000 | gnb-r

```

Conclusion

- Interesting Hacking week
 - Learned deployment of OAI 5G core
 - Investigated and practice automated deployment with OSM
 - Understood the power of juju bundle for deployment of operation
- Take away
 - OSM great open-source tool for deployment of Network Services
 - Benefits from other open-source projects (juju, charmcraft)
 - Great platform for experimentation



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LIVE DEMONSTRATION