OSM#9 Hackfest
Hackfest Scenario Overview
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I Just Want to Watch YouTube

- Cellular data continues to explode
- 5G gives us even more bandwidth
- Backhaul costs are expensive
- Management of all the software components is expensive
- Remote management is even more expensive

This week we show how OSM helps with the management and orchestration of Evolved Packet Core (EPC) and over-the-top services

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Cellular Data Path

Central Datacentre

Regional Datacentre

Router
Web Cache
EPC (PGW)

UE
eNB
SDN
Magma combines 3GPP functions into AGW

- **MME | Mobility Management Entity**
  - Keeps track of User Equipment registered on LTE network
  - Handles requests for network access - setting up and tearing down data sessions

- **SGW | Serving Gateway**
  - IP router with GTP support and charging functionality
  - Module for signalling between PGW and MME

- **PGW | Packet Data Network Gateway**
  - Provides access to external Packet Data Networks (ie: internet)
We will emulate in software...

- UE | User Equipment
  - This is the cell phone or device communicating over cellular network

- eNB | The evolved Node B
  - The Cell Phone Radio itself
  - Connected to the mobile phone network that communicates directly wirelessly with mobile handsets
Cellular Data Path

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Regional Datacentre

Router  Web Cache  EPC (PGW)

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SDN

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Cellular Data Path

- OSM
- Central Datacentre
- Regional Datacentre
  - VIM + K8s
  - Magma Orchestrator (KNF)
  - Magma vEPC vdu
  - Squid KNF

- Physical Router (PNF) - VyOS
- Web Cache
- EPC (PGW)

- Generic eNodeB + UE emulator vdu
- SDN

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Reality is messy and mixed
Orchestration

- Last mile workload-specific workflows and codepaths
  - Scripts, file changes, integration, config, backup etc
- How? OSM uses scripts that are packaged in a Charm
  - Proxy
    - PNF or existing fixed functions with limited integration options
    - Charm acts on NF from a distance over some network protocol
    - SSH or REST or NetConf-Yang from the proxy charm
  - Native
    - Charm has direct access to function
    - App that can be installed on Win/Ubuntu/RHEL/CentOS, or
    - Docker image that can be driven by a charm directly
    - No need for open management port - actions run locally
Cellular Data Path

- Central Datacentre
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  - VIM + K8s
  - Magma Orchestrator (KNF)
  - Proxy Charm
  - Squid KNF
  - Magma vEPC vdu
  - Physical Router (PNF) - VyOS
  - Native Charm
  - Web Cache
  - EPC (PGW)

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  + UE emulator vdu

- SDN

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Charms are packages of scripts to drive apps

Lifecycle scripts
- install
- config
- update
- remove
- scale

“Action” scripts are OSM Primitives
- “action: backup”
- “action: restore”
- “action: scan-viruses”
- “action: health-check”
- “action: add-repo”
- “action: ...”
- “action: ...”
- “action: ...”

Integration scripts
- relate-mysql
- relate-ldap
- relate-proxy
- relate-...

These are your operations primitives.
OSM Creates and Configures:

- Magma vEPC Combination K8s and VMs
  - [https://github.com/facebookincubator/magma](https://github.com/facebookincubator/magma)
  - Management of Magma is series of K8s containers
  - Magma AGW is in a VM
    - Uses SR-IOV, CPU pinning and huge pages
Software Components: Magma AGW

Configuration:

- Information needed:
  - An ID for this EPC: agw_01
  - A name for this EPC: AGW01
  - An IP address of the Magma Orchestrator
  - The network name to create in Magma Orchestrator: osmnet

- Demonstrated using Proxy orchestration charm
Software Components: PNF Router

- VyOS package, not customized
- Router already exists, no software to deploy
- Must be registered with OSM for orchestration

Configuration:

- Routing
  - Permit / Deny traffic from the Magma AGW to internet
- Demonstrated using Proxy orchestration charm
Software Components: eNodeB + UE

OSM will deploy and configure a VM with:

- srsLTE
  - Software Radio (eNodeB)
  - Software UE (Cellphone)
- Graphical Desktop with Firefox

https://github.com/srsLTE/srsLTE
Software Components: eNodeB + UE

Configuration:

- Information needed:
  - Where is EPC Core
  - Radio parameters (MCC, MNC, etc)
  - UE parameters (IMSI, encryption keys)
- Demonstrated using Native orchestration charm
Software Components: Web Cache

OSM Creates and Configures:

- Web Cache Container
  - Based on Squid
  - [http://www.squid-cache.org/](http://www.squid-cache.org/)
- Demonstrated using Native K8s orchestration charm
Magma EPC Network Slice

Evolved Packet Core Subnet

Orchestrator Subnet (shared)

Magma Orchestrator (KNF)

other kdu
nginx_proxy kdu
orc8r_proxy kdu

Magma AGW + Tester (VNF)

Magma vEPC

vdu

Generic eNodeB
+UE emulator

vdu

Physilcal Router (PNF)
- VyOS emulated -

Squid KNF

Physical Switches (Data Plane)

S1 interface
SGi interface
The EPC Network Slice
Our Cell Phone

- The VM that has the UE software is really an Ubuntu Desktop
- But... we are using that as if it were a Cell Phone
- Can log into the desktop using VNC - password srslte
- If VNC not available, use Horizon Dashboard
  - Desktop credentials: ubuntu / osm2020
User Provisioning

- Cell phone has SIM card with credentials
- Needs to be activated in Carrier’s EPC
  - Day 1 Primitive operation to provision the phone in Magma
- Cell phone needs a radio
  - Day 2 Primitive operation to start radio emulator
  - Day 2 Primitive operation to register cell on network
End to End, But First We Learn

The next 3 days we will be breaking down the deployment step by step and teaching how each part gets created.

Enjoy the Hackfest!

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