Leveraging an Ecosystem of 5G services
What is JoX?

An Event-Driven Juju-based Orchestrator Core for 5G Network Slicing
JoX objectives

- Support network slicing orchestration on the top of Juju VNFM
- Create a set of services to operate and control each network slice/subslice
- Provide the interplay among orchestration, VNFM and VIMs as defined by ETSI MANO
- Offer network slices isolation including new policies for services call and placement
JoX features

- **Network Slicing and subslicing Support**
  - Deploy network slices and subslices with different end-to-end logical networks
  - Different network slices are isolated from each other in the management plane
  - Slices operate over common VNFM and VIM systems
    - Juju VNFM framework, Charm Store

- **Template manager and onboarding**
  - TOSCA compliant for slice and subslice templates
  - package generator to generate JoX package, to be later onboarded via Northbound NBI

- **Optimize the operational environment**
  - Slice-specific logic: Optimization in VNFs scheduling and network slicing

- **Northbound APIs**
  - Expose a REST northbound API to enable monitoring, control, and programming of each slice
  - Aligned with the basic operations defined by 3GPP (TR 28.801)
  - Slice-specific life-cycle: Preparation, Instantiation, Configuration, Activation, Run-time monitoring, Decommissioning
JoX schema

- **JoX**: orchestrates the E2E service lifecycle according to the slice manifest
  - Network slice and subslice Templates
  - Application APIs
  - Template manager
  - Slice/subslice manager
  - Plugins
- **Juju / JaaS**: manages the services over the infrastructure
  - Model-driven VNFM
  - Multi-cloud multi-models
- **Cloud Infrastructure**
  - LXD, KVM, Manual
JoX architecture
Jox API: provides NB APIs

Slice Manager: handles vertically network slices and interact mainly with subslice manager to create/update subslice(s)

Subslice Manager: handles network subslices and interacts with all other modules and retrieves network function/applicator from the store

VNF manager: in charge of the entire VNF lifecycle

Template manager: translates and maps the templates of slice and subslice across different network elements, in particular juju templates

Monitoring manager: Monitoring the slices and subslices and automatically retrieve all related information on the slices and subslice to be stored in elasticsearch (es)

Plugins: provides juju pass-through for the underlying network element and cloud infrastructure
JoX Slices and subslices example

JoX Slices and subslices

Juju model
JoX implementation

- **JoX Platform**
  - Event-driven orchestration software based on Juju VNFM
  - Support a 4G/5G plugin framework
  - Python 3.6: Flask, RabbitMQ, Pika, and asyncio libraries
  - Apache V2.0 license

- **Charms and Bundles**
  - Charms
    - Encapsulate a VNF as a service
    - Contain the hooks to manage the entire lifecycle of the VNF
  - Bundles:
    - Composition of charms: include their relationships to describe a service chain
    - Mosaic5G charms and bundles are available in the Juju store
JoX apps

- Mobile Network Virtualization
- Network Service Automation
- SLA-based Network Slicing
- Content-based Service Orchestration
- Service Auto Placement & Scaling
- Shared & Dedicated Provisioning
- Business Modelling
- Dynamic Service Placement & Scaling
- Slice/Service Access Control
JoX implications & extensions

- Slice and subslice runtime & configuration recovery, to repair and provide temporary services
- Auto-action & event mechanisms to adjust the network slice behavior and characteristics in runtime
- Negotiation routine with VIM/VNFM during slice preparation to exploit at most the offered infrastructure
- Support cloud technologies like e.g. Docker, OpenStack, and kubernetes plugins
- Interaction with SDN controller
- JoX as a NFVO for the purpose of Multi-access Edge Computing (MEC) platform deployment
Useful links

- JoX platform
- Slicing Cloud RAN
- Slicing and orchestration in service oriented 5G architecture
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