VITAL 5G

Vertical Innovations in Transport And Logistics over 5G experimentation facilities

Experimenting with NetApps for Transport & Logistic in 5G testbeds

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OSM Ecosystem day
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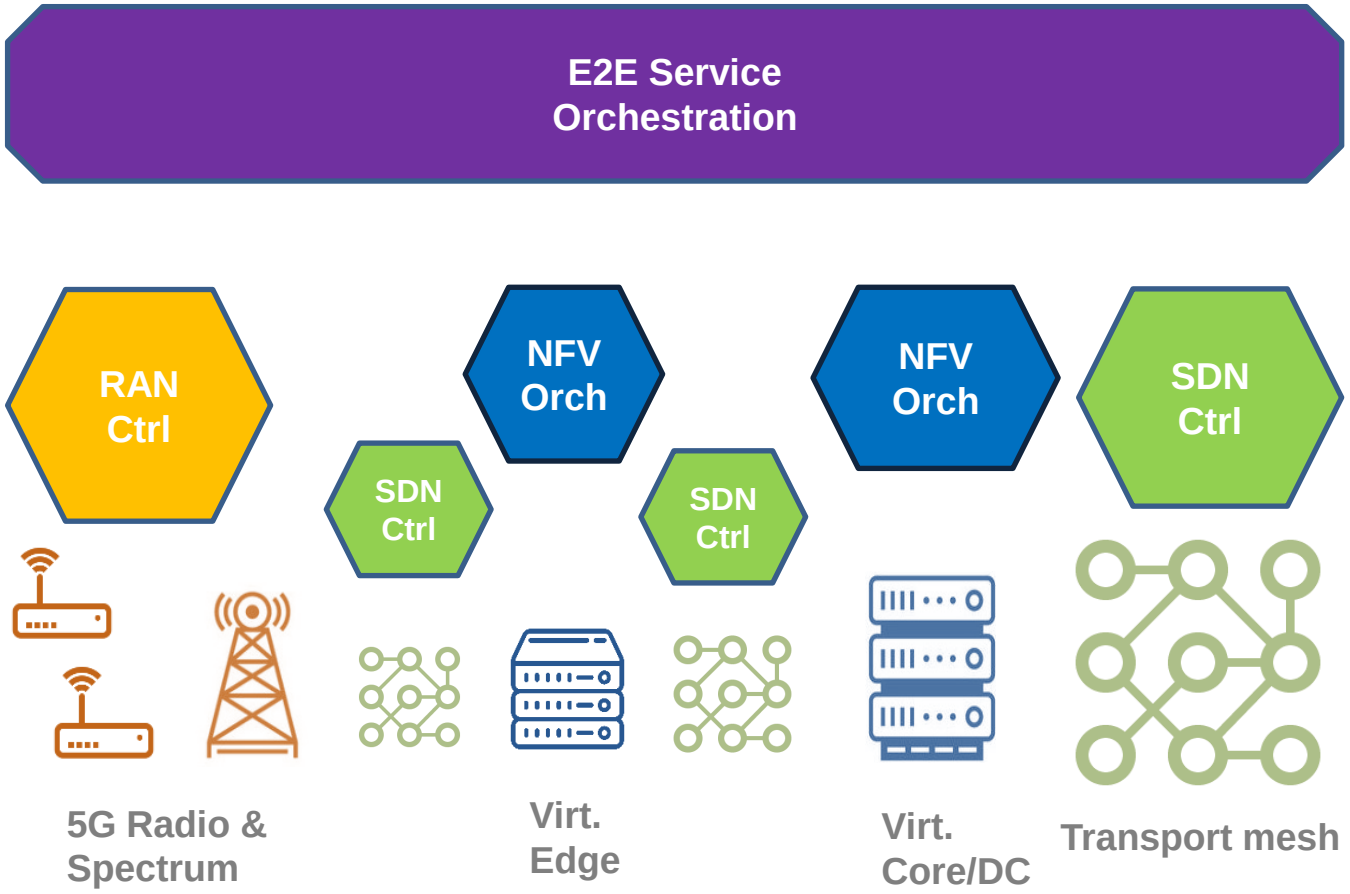
Contents

- VITAL-5G project overview
- VITAL-5G NetApp, Vertical Service and Experiment Concepts
- Role of OSM in VITAL-5G architecture

Background & rationale for VITAL-5G

- 5G networks (up to 3GPP Rel.16) are not yet at a mature stage
  - 5G deployments today are of limited scale (up to city-scope in various countries)
  - Good for eMBB services, still work to do on URLLC and/or mMTC (3GPP Rel.17?)
  - 3GPP network slicing and network monitoring with analytics not fully supported
  - Benefits for Verticals still under evaluation by non-Telco industry
- VITAL-5G focus is on **production-level 5G to support diverse applications for T&L Vertical**
  - Our work is in coordination with multiple research projects in 5G PPP Phase 3, https://5g-ppp.eu/5g-ppp-phase-3-projects/



Value proposition by VITAL-5G

Service Portal & Open Online Repository of NetApps [for T&L]

- release a flexible platform adapted to serve the specific needs of the Transport & Logistics (T&L) sector

3 state-of-the-art 5G experimentation facilities to validate T&L Vertical solutions and applications in real-life conditions

- **Port of Antwerp**, **Danube River**, **Athens logistics hub**
- Upgrades to support 3GPP Rel.16 and to extend radio coverage to the port and warehouse
- No cross-border service deployments

3 main use cases to showcase the capabilities of the VITAL-5G for T&L sector

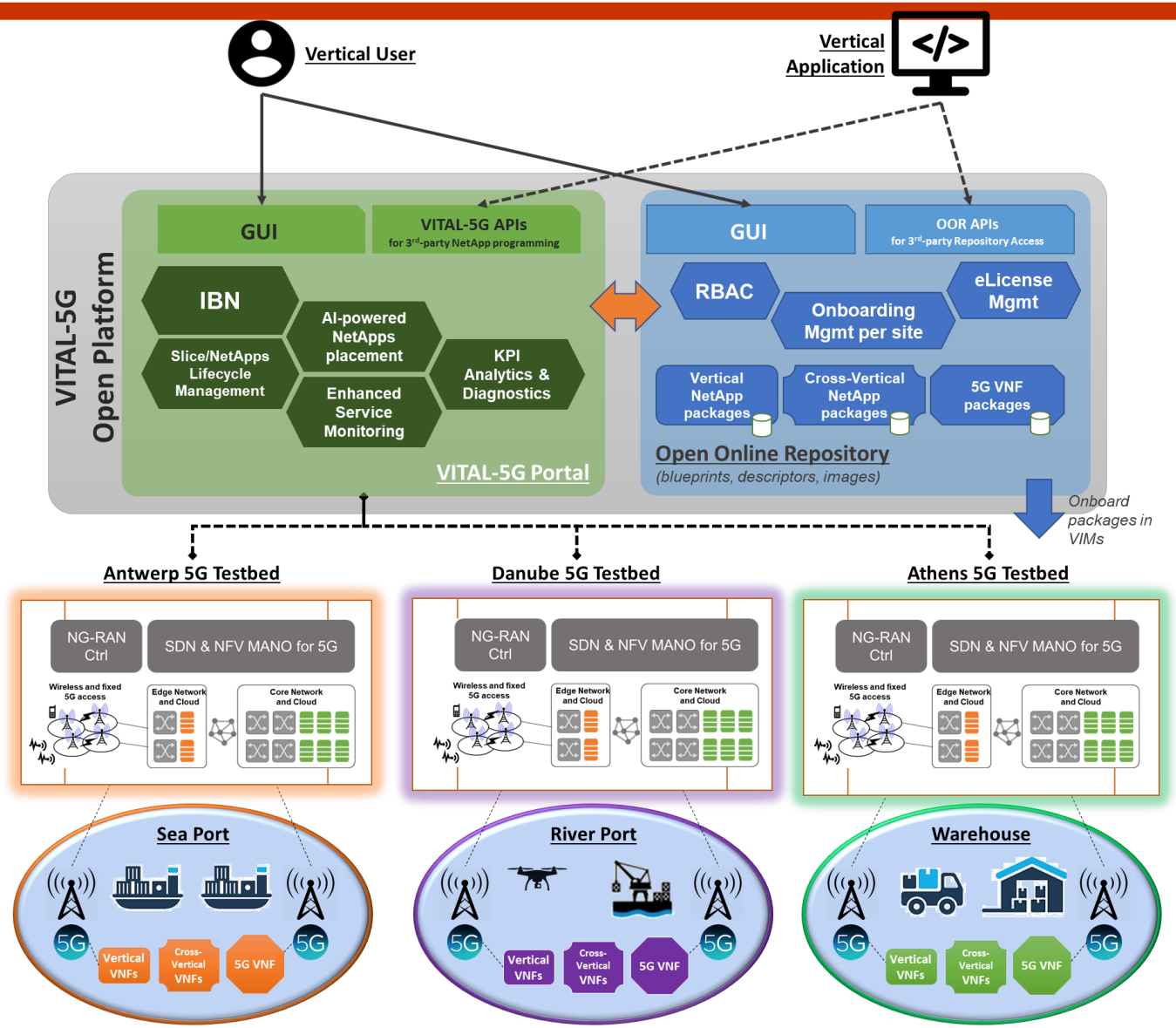
- UC#1: **Automated vessel transport**
- UC#2: **5G connectivity and data-enabled assisted navigation using IoT sensing and video cameras** (Galati Danube river port)
- UC#3: **Automation & remote operation of freight logistics** (Warehouse logistics)

3rd-party experimenters from the network of commercial contacts of the trial facility owners

- closer-to-market NetApp scenarios
- baseline for a T&L NetApp business ecosystem around the 3 facilities and other ports in Europe

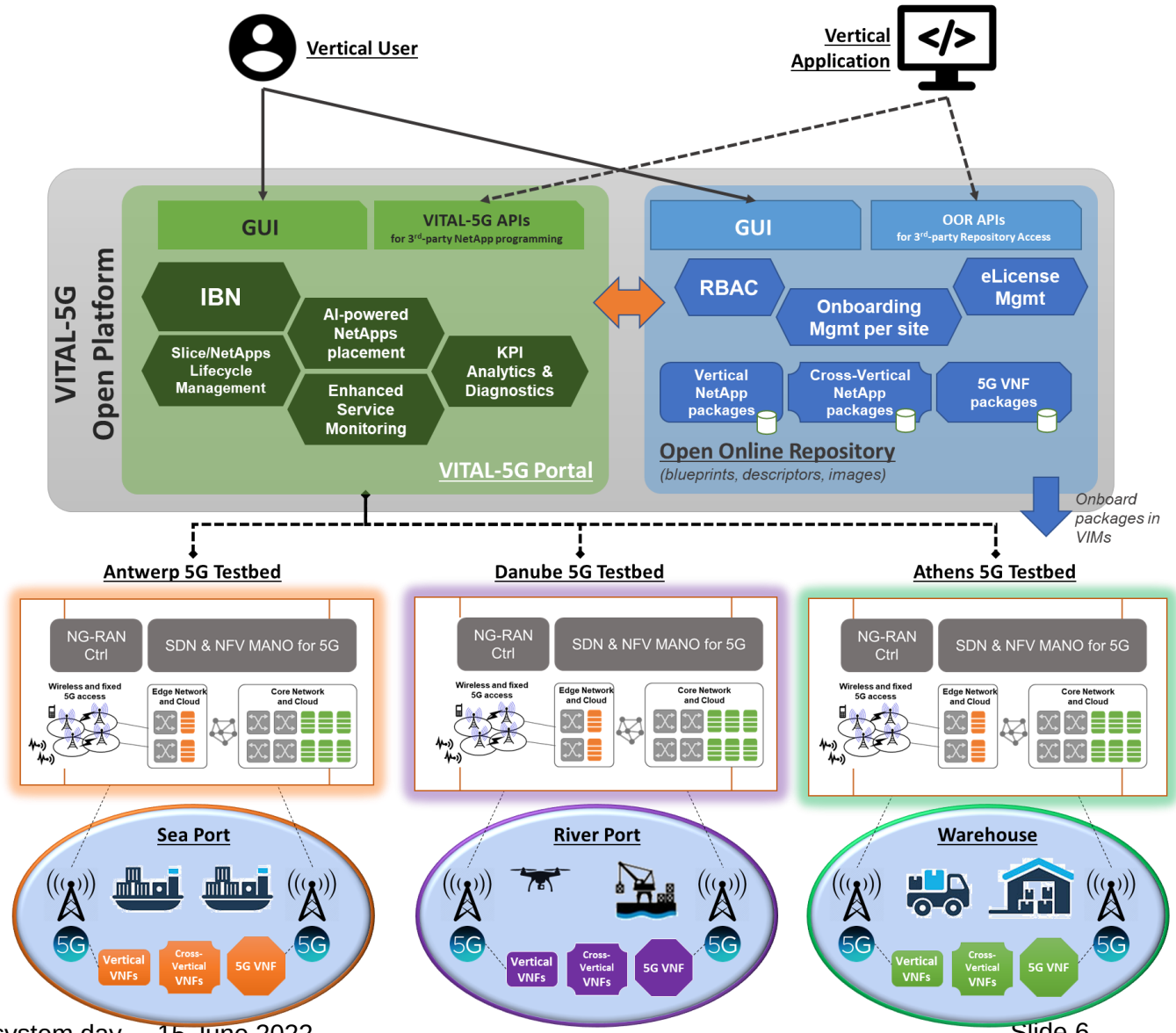
Overall concept & envisioned architecture

- **Open Online Repository**
  - Programmable APIs and GUI to on-board, query, retrieve and update
    - VxF/VNF packages
    - Network Slice
    - Network Service descriptors
    - Service and Experiment blueprints
  - Access Control to regulate access, view and actions permitted on catalogue resources
  - Mechanisms for license management for NetApp packages
- The aim is to **share open source NetApps developed** by VITAL-5G partners or taken from state of the art and packaged for the VITAL-5G repository



Overall concept & envisioned architecture

- **Service Portal for NetApps** lifecycle management
  - **design, onboard, instantiate, monitor/manage and benchmark** T&L NetApps
  - run experiments via dashboard or a programmatic API (**intent-based API**)
    - From service description by the Vertical to automatic transformations into 5G/NFV service descriptions and lifecycle management actions
  - **AI/ML-assisted placement** of VNFs/VxFs related to the NetApps and re-optimization of the instantiated services
  - Tools for **KPI monitoring and analysis**
  - interface to standard MANO (ETSI OSM) and NG-RAN control systems available at the trial facilities
    - network slice creation, resource instantiation and data collection for monitoring



NetApps Definition and Tools

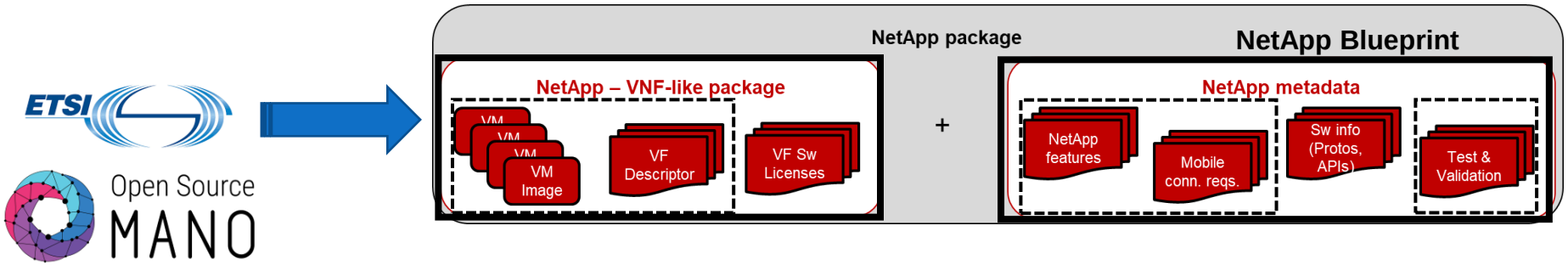
Network Applications (NetApps)

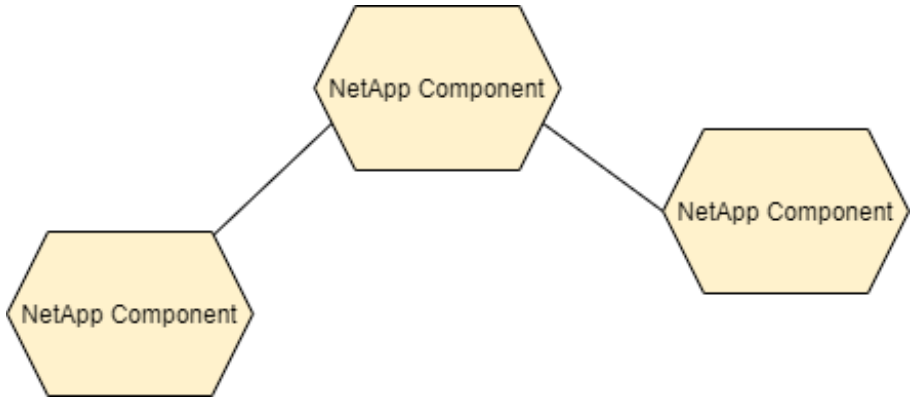
A NetApp is a 5G-enabled virtual application which provides its own set of functionalities when deployed as a stand-alone entity and that can cooperate and interact with other NetApps to deliver more complex vertical services. NetApps extend the concept of VNFs declaring (i) service level information to simplify their re-usage, sharing and composition in vertical services and (ii) mobile connectivity requirements in terms of 5G network slice profiles or consumed 5G core services to automate their instantiation in 5G network virtual infrastructures.

NetApps tools:

- NetApp **packages** and NetApp **blueprints** to **distribute and describe NetApps characteristics**
- NetApp catalogue in VITAL-5G Open Online Repository, to onboard, discover and browse NetApps for building T&L vertical services
- Validation tools to verify NetApps, wizards and intent-based interfaces to build NetApp-based services and experiments
- Tools for automated testing and experimental validation to evaluate NetApps performances in configurable 5G networks

NetApp package data models






```
{
   "blueprintId": "NetAppBlueprintId",
   "version": "1.0",
   "name": "NetApp Name",
   "description": "NetApp description"
   "specLevel": "vertical specific/agnostic"
   "type": "service/component-base"
   "atomicComponents": [],
   "connectivityServices": [],
   "endPoints": [],
   "applicationMetrics": [],
   "infrastructureMetrics": [],
   "interfaceSpec": [],
   "hwCompatibility": [],
   "required5GCoreServices": [],
   "licenseTemplates": []
}
```

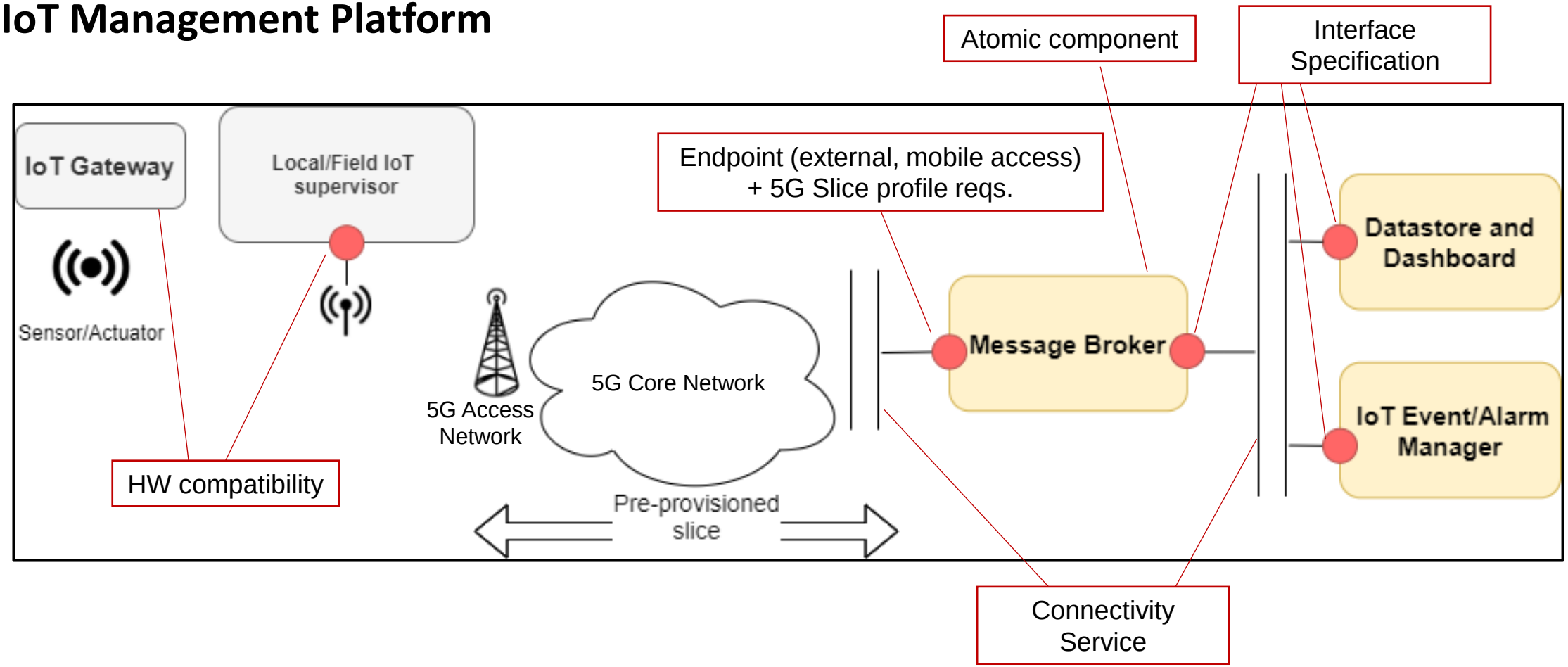
```
{
   "endPointID": "<endPointId>",
   "external": "true/false",
   "management": "true/false",
   "ranConnection": "true/false",
   "coverageArea": "<covera area id>"
   "sliceType": "EMBB/URRLC/..",
   "serviceProfileParams": "<Key, value>"
}
```

NetApp blueprint

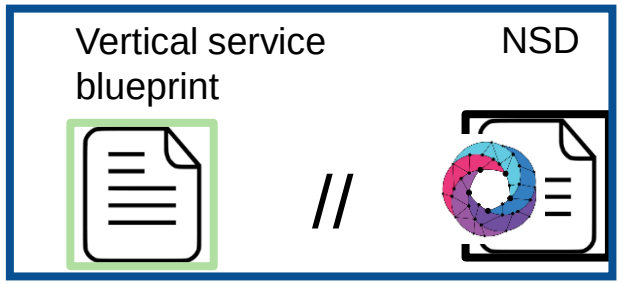
+ **5G slice profile** specification
+ **Metrics** for analytics and diagnostics
+ Required **5G Core services**

Example NetApp Blueprint

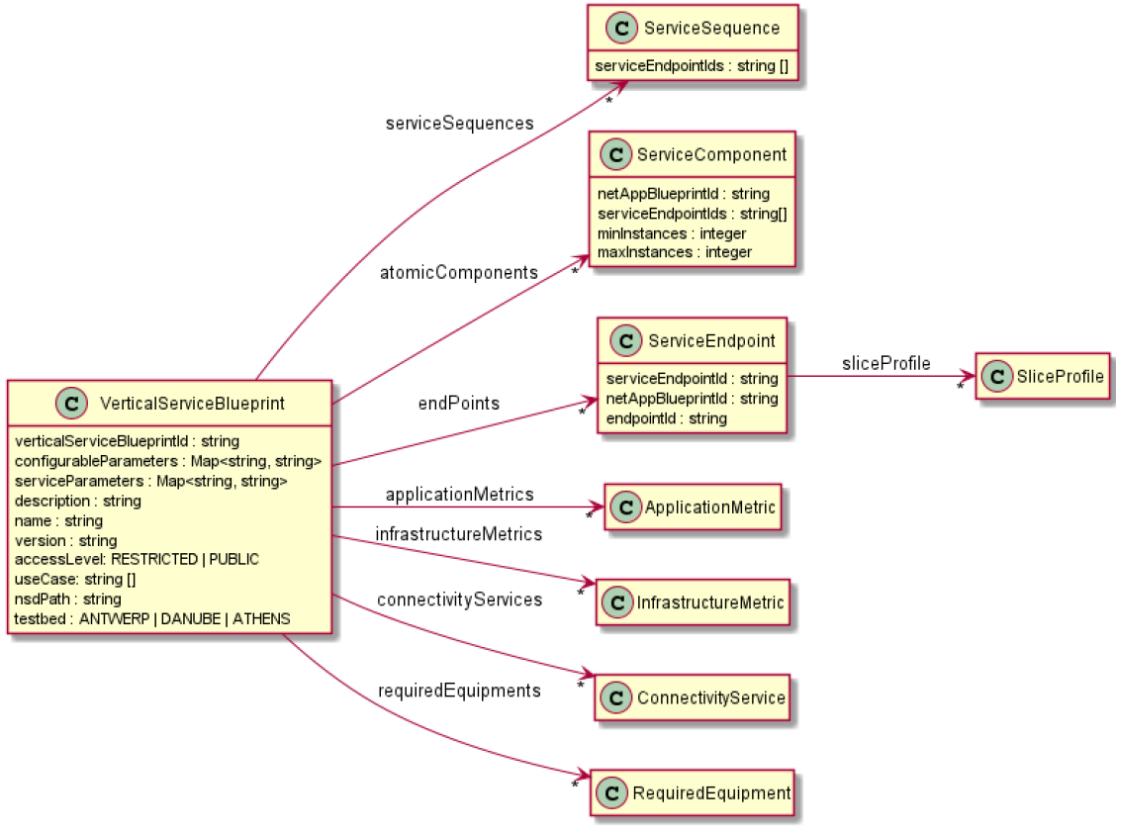
IoT Management Platform

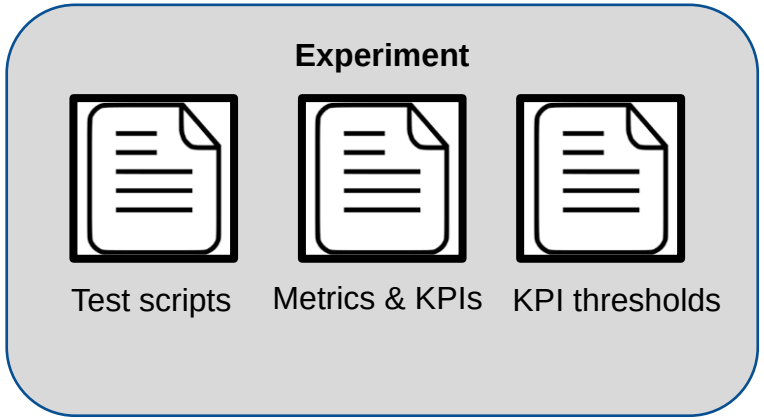


Vertical Services and Experiments



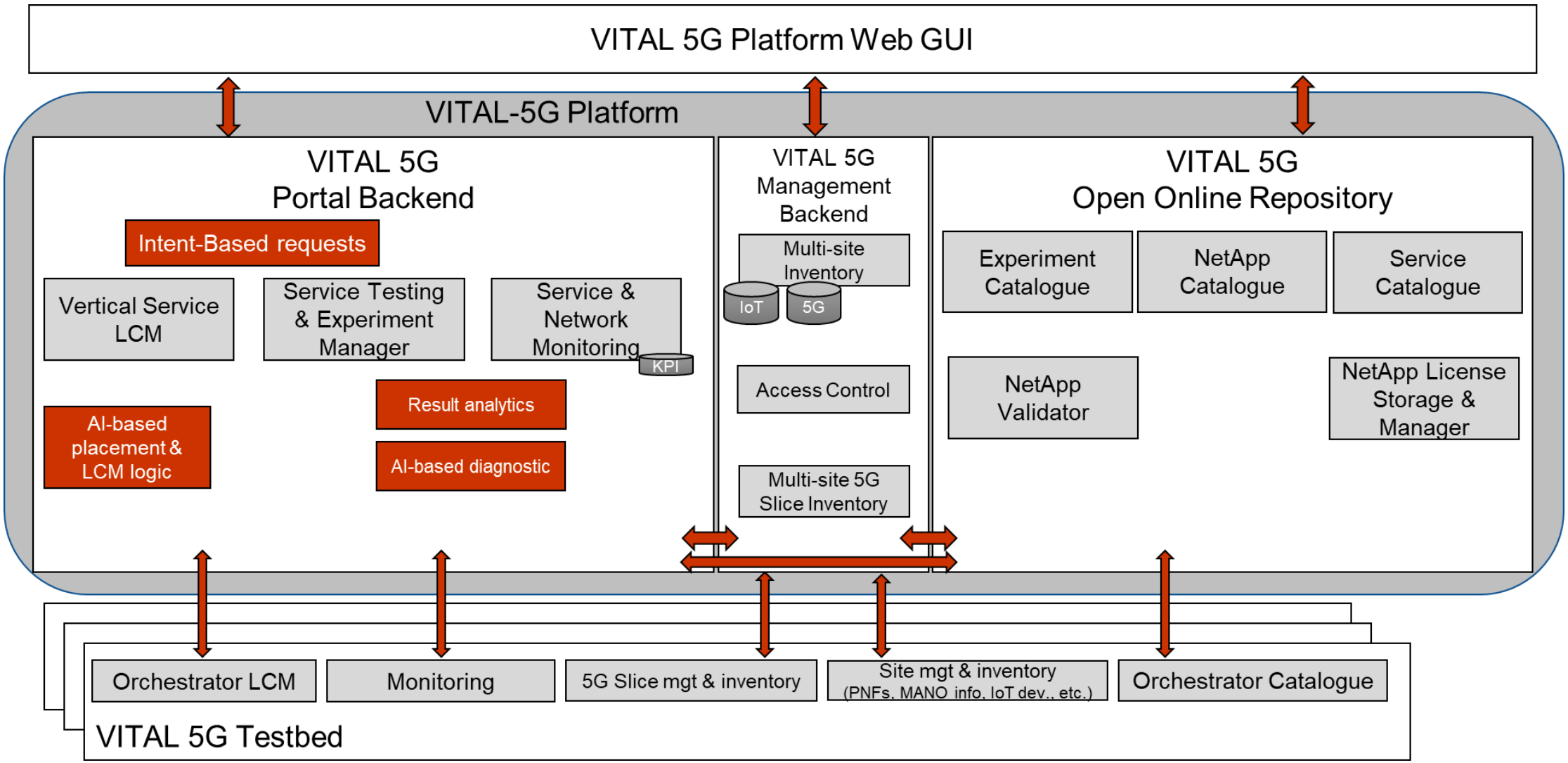
Vertical Services **group NetApps into complex service chains**



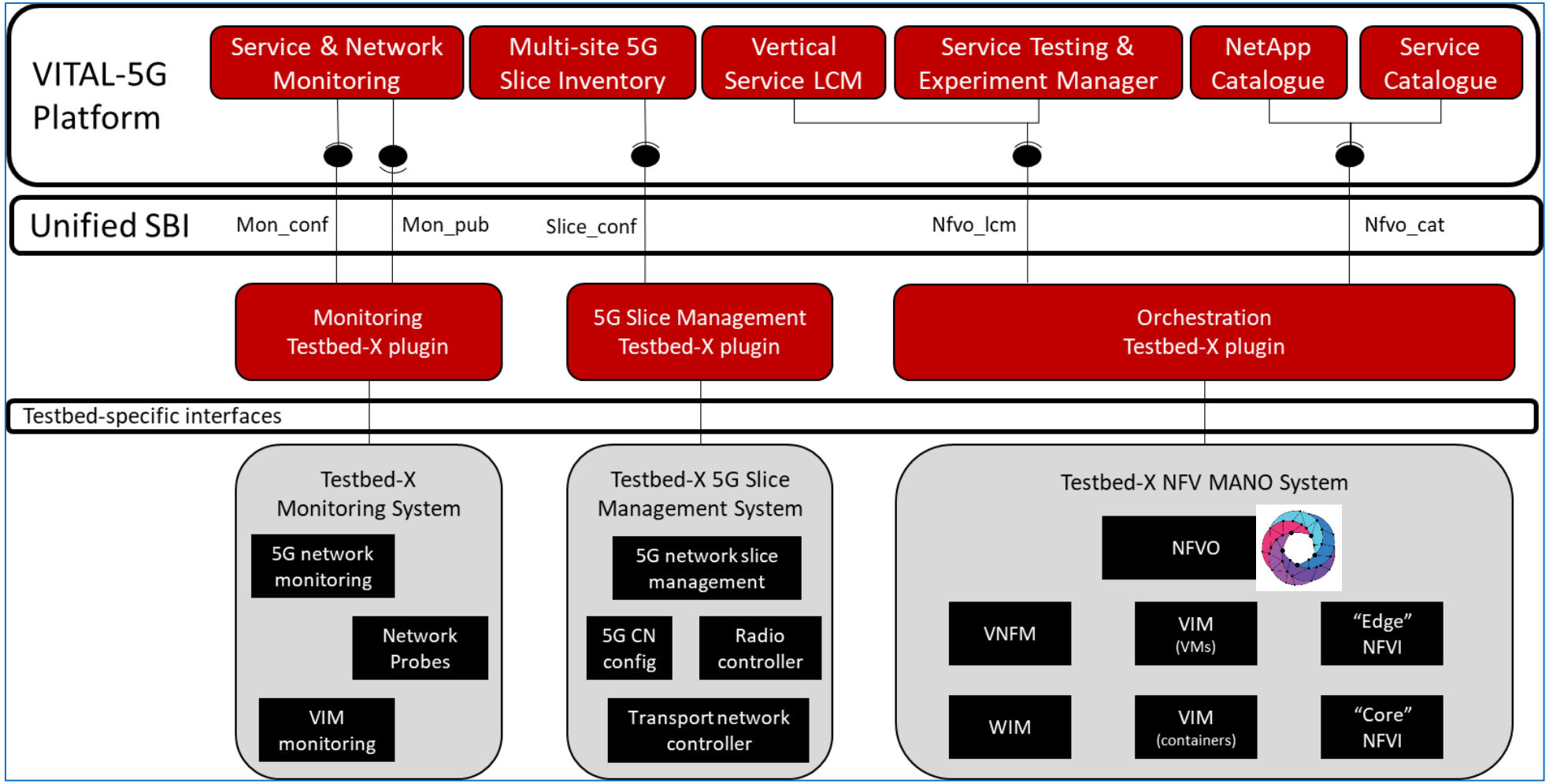


Experiments allow to **automate the execution and validation of tests** on top of service instances

VITAL-5G Platform Architecture



Unified interfaces towards 5G testbeds

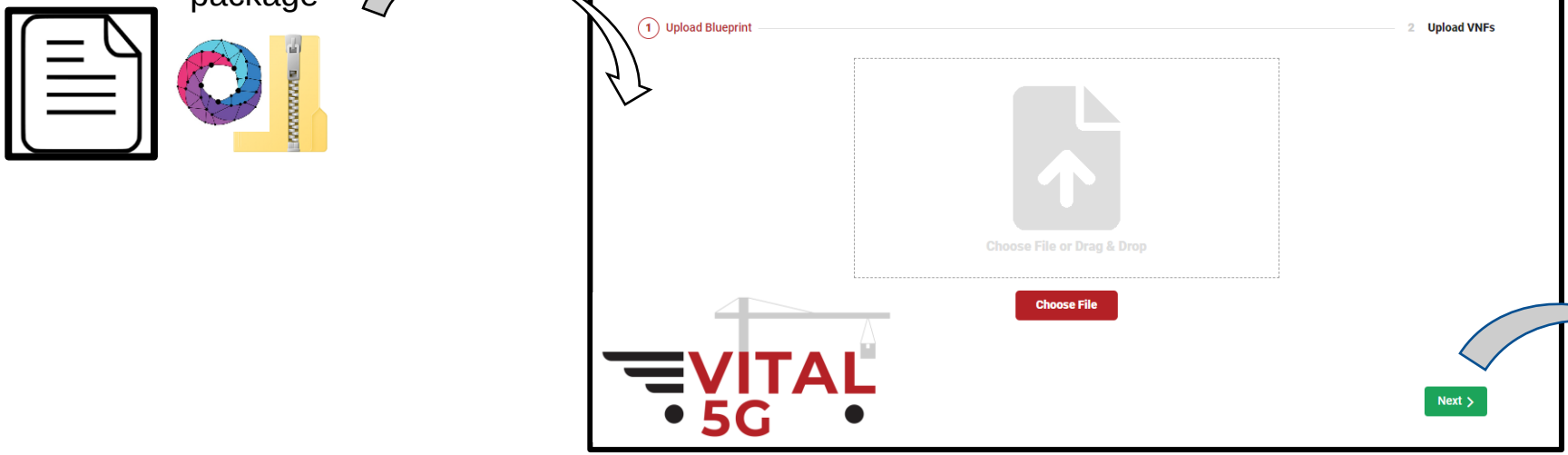


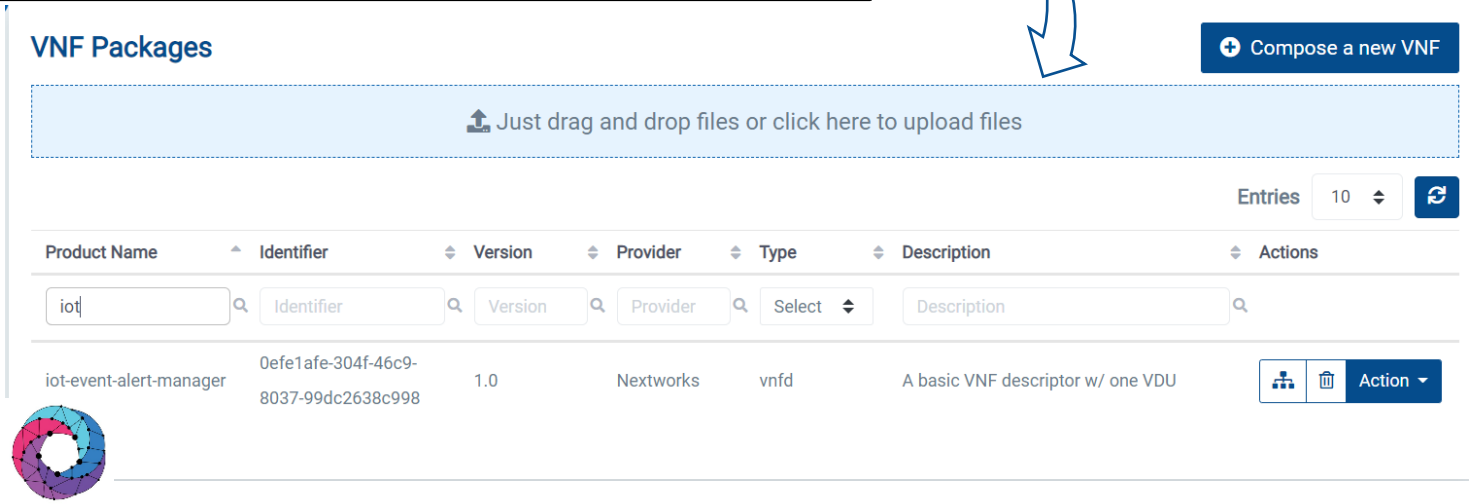
Unified interfacing approach between VITAL-5G platform and VITAL-5G testbeds

VITAL-5G NetApp package onboarding (I)

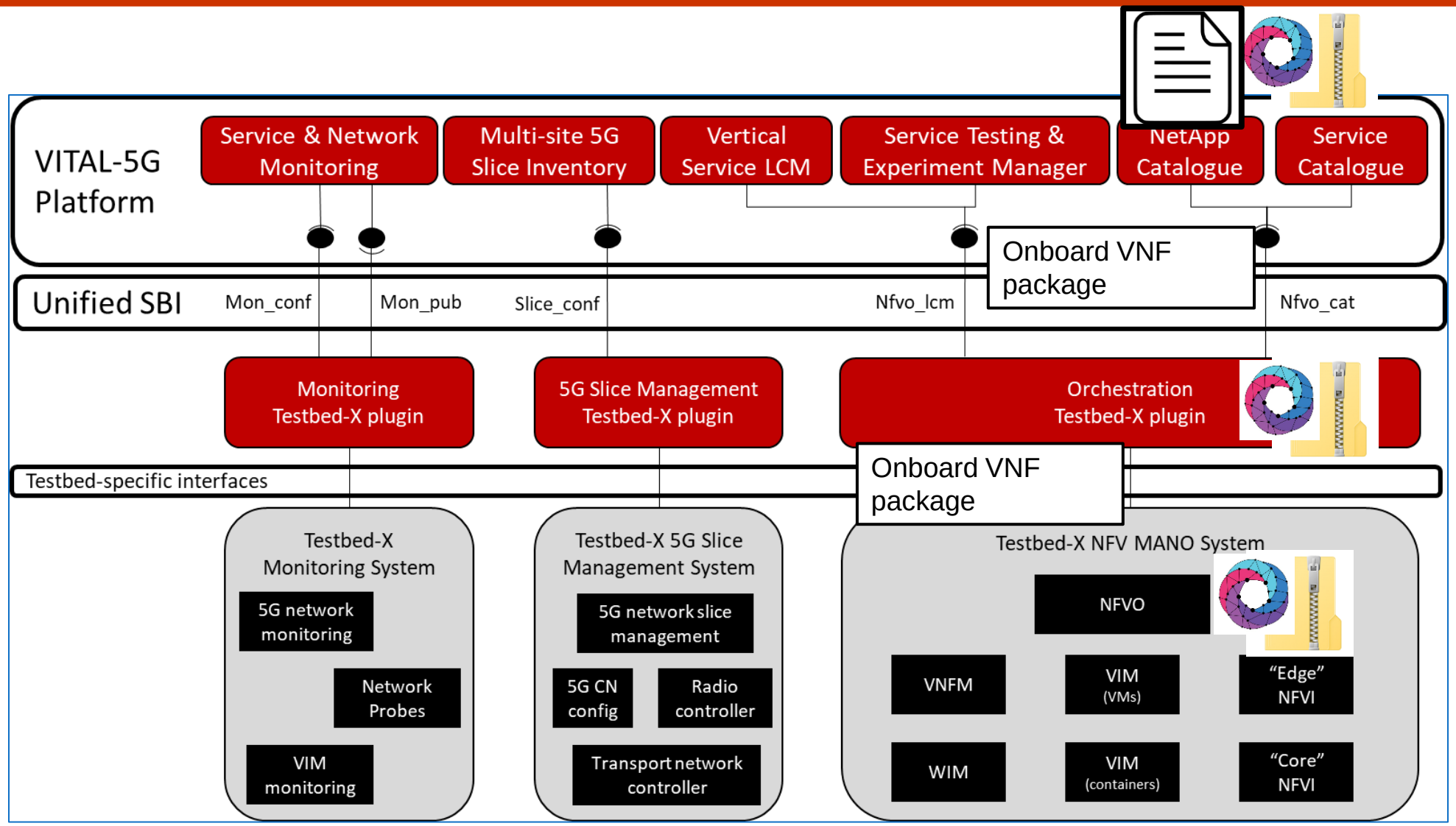
NetApp blueprint

VNF package





VITAL-5G Blueprint onboarding (II)



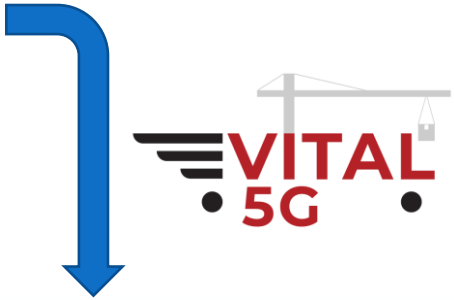
Service Lifecycle management (I)

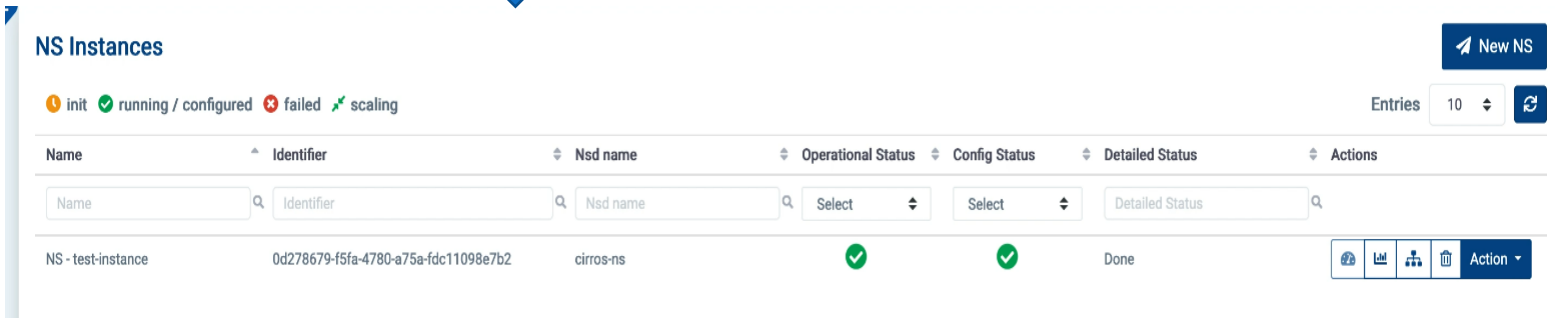
POST {{serviceLcmBaseUrl}}/portal/vslcm/

Params Authorization Headers (11) Body Pre-request Script Tests Settings

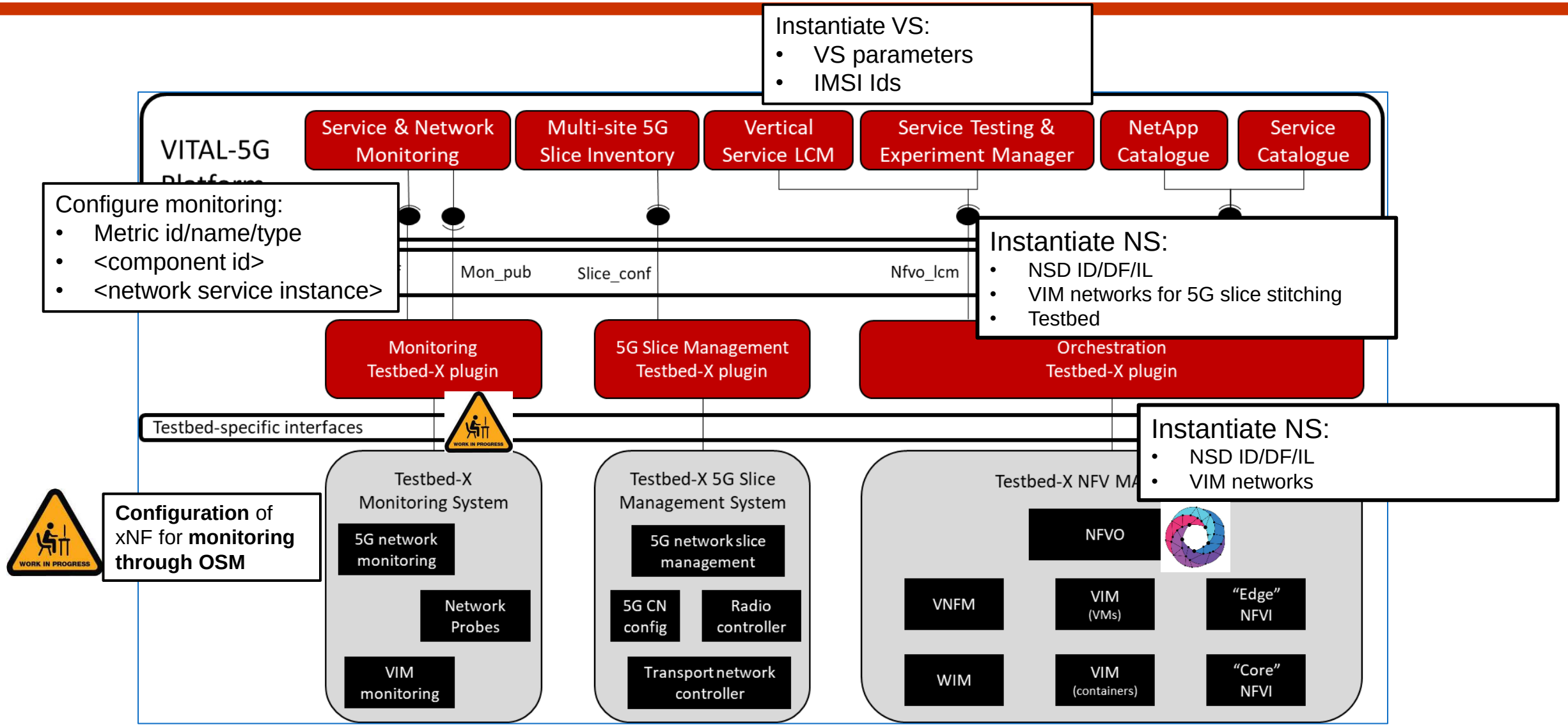
none form-data x-www-form-urlencoded raw binary GraphQL JSON

```
{
  "imsiIds": {

  },
  "description": "NXW IoT Event and Alert Manager for VITAL-5G webinar instance",
  "name": "nxw-iot-event-alert-instance",
  "tenantId": "NXW",
  "configurationParameters": {

  },
  "serviceParameters": {

  },
  "vsdId": "{{vsdid}}"
}
```

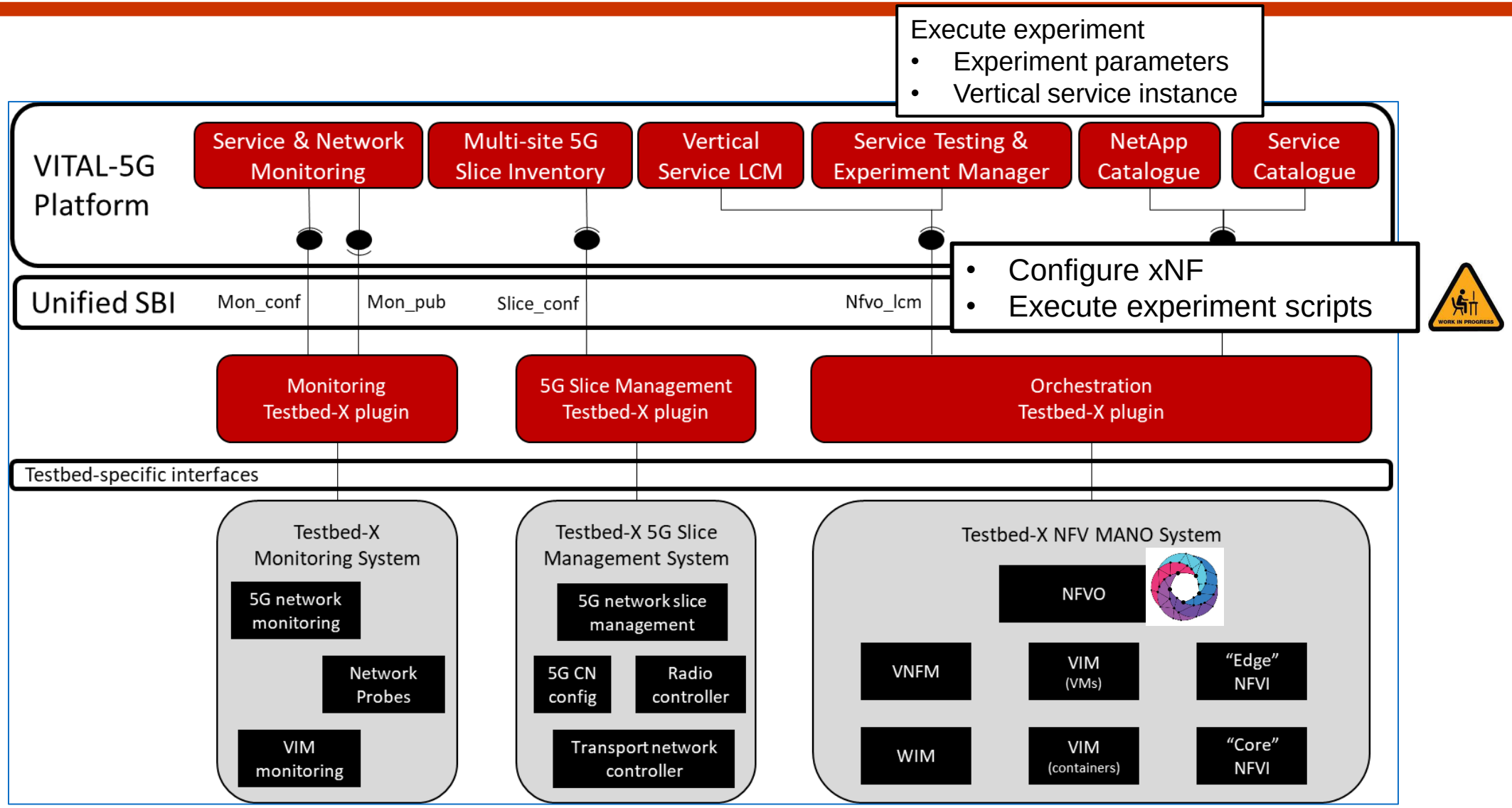




Service Lifecycle management (II)



Experiment execution



Thank you for you attention!

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