SOFTFIRE

SoftFIRE: Constructing a Federated and Orchestrated Multi-Testbed Virtualisation Infrastructure

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EUCNC

Objectives

- The main objective of the SoftFIRE project is to demonstrate and assess the level of maturity of adopted solutions and to show how they can support the full potential of these properties in a real world infrastructure by creating, nurturing and supporting an ecosystem of third parties able to make use of the SoftFIRE testbed and to functionally extend it.

- Three key elements are considered: **interoperability**, **programmability**, and **security**. These properties are essential to drive advanced solutions towards industrial adoption.

During the Project Lifecycle …

- We are building
  - A large federated testbed comprising now 5 large local testbeds
  - A proper middleware infrastructure to run experiments offering virtualization, security, programmability, monitoring and management of virtualized resources

- We are going to support
  - Three Open Calls
    - We executed one, a second is underway, the third will be launched soon
  - Three Hackathons
    - One executed, the others under preparation
  - One Big Challenge
    - It will be launched soon .. To be accomplished in January 2018

- We are aiming at building a NFV/SDN/5G community

Expected Impacts

- The creation and support of a rich SDN/NFV ecosystem
- A better integration between NFV and SDN
- The strong integration of Security with platform development.
- The creation of a Federated Platform that can foster the studies towards 5G
- The definition of KPIs and the initial proposition of best practices
- The possibility to interact and create further linkages with similar initiatives in USA, ASIA and elsewhere
- Interaction with FIRE community
- Influence and feedbacks to standards (ETSI, others …)
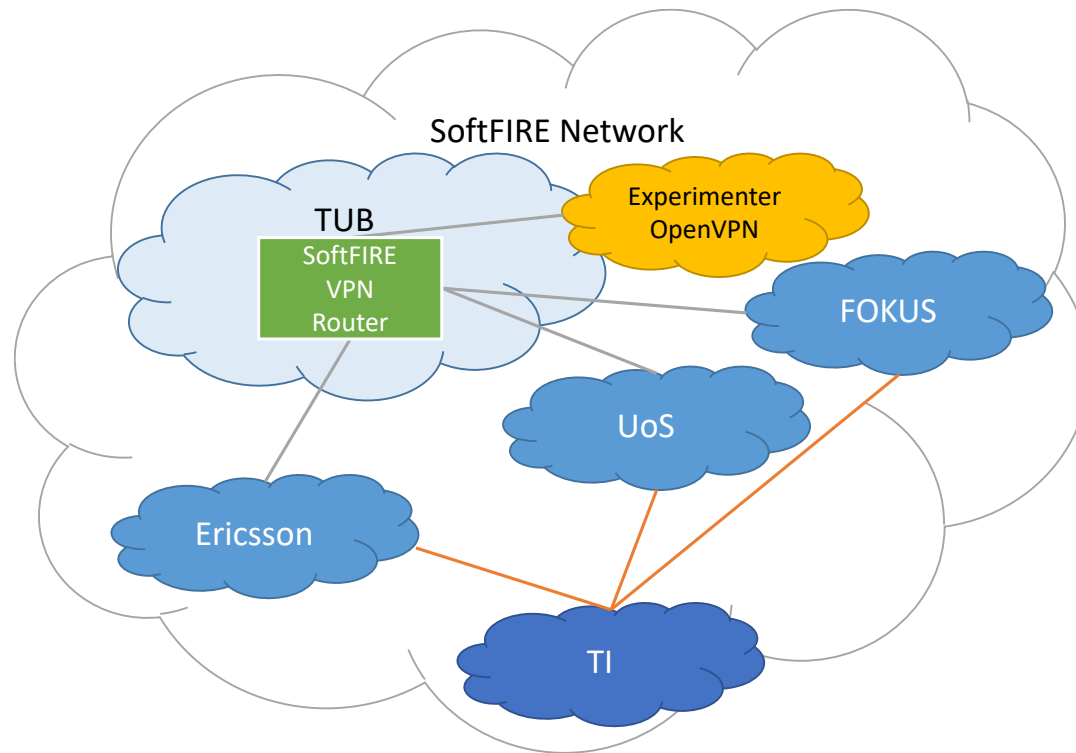
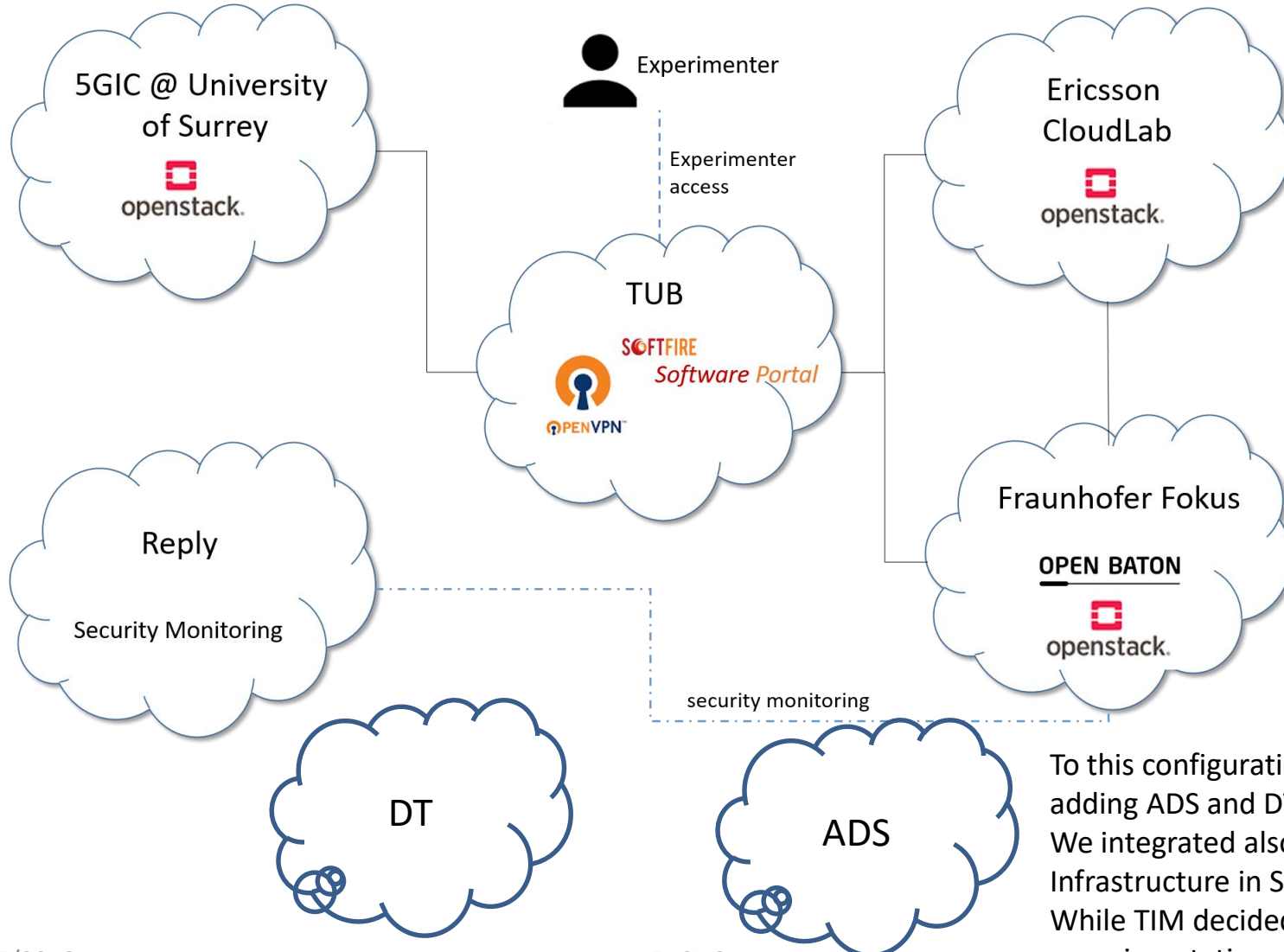# SoftFIRE Architecture v. 1.0

(used for the first Open Call)

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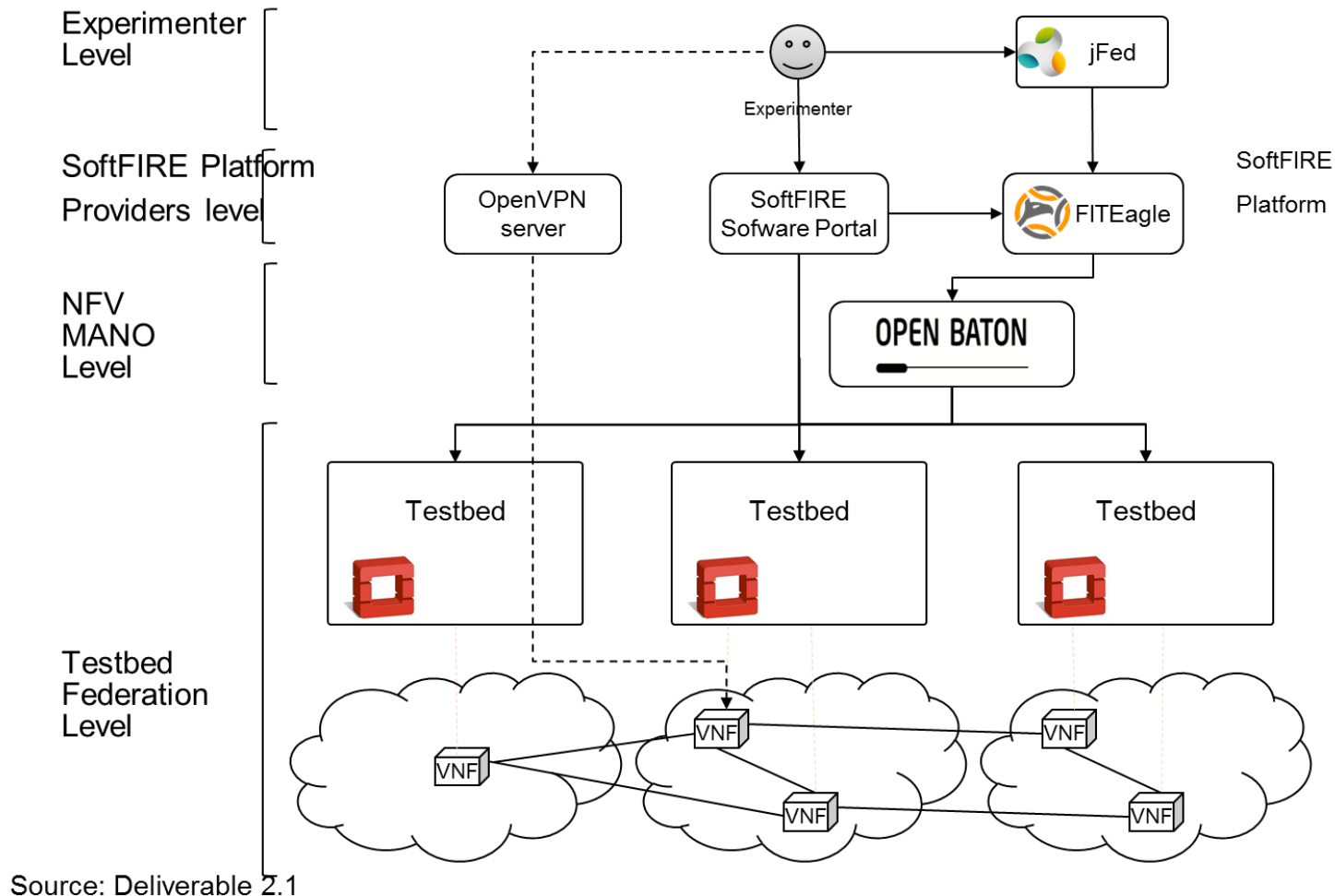
TESTBEDS

Overview of the initial configuration

SoftFIRE Network

TUB
SoftFIRE VPN Router

Experimenter OpenVPN

FOKUS

UoS

Ericsson
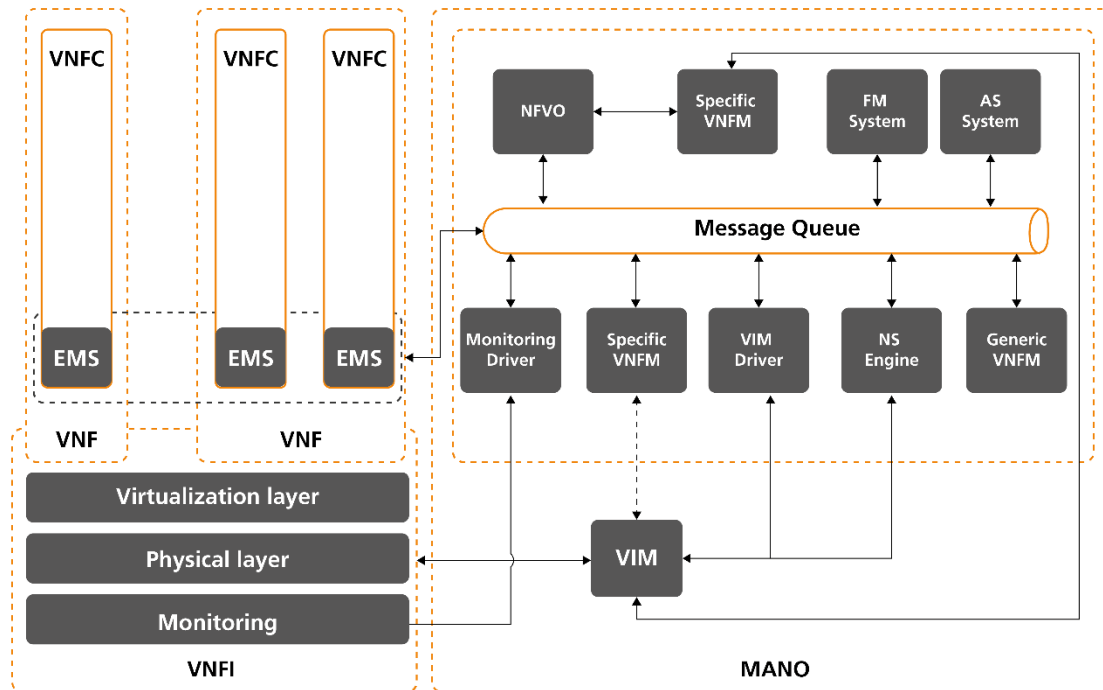
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Current Configuration

To this configuration we are adding ADS and DT testbeds
We integrated also EIT Digital Infrastructure in Silicon Valley
While TIM decided to leave the experimentations

NFV MANO LAYER

NFV MANO

Open Baton has been selected as the ETSI NFV MANO framework for SoftFIRE

Open Baton as the SoftFIRE NFV Framework

Open Baton provided the NFV MANO APIs to the upper layers (FITeagle). Its main functionalities provided:

- Lifecycle management of the Network Services including installation, deployment and configuration.
- Management of multiple Point of Presence (PoP)
- Identity management and user separation
- Multiple and independent Network Service slicing
- Supporting interoperability of VNF Managers (VNFMs)
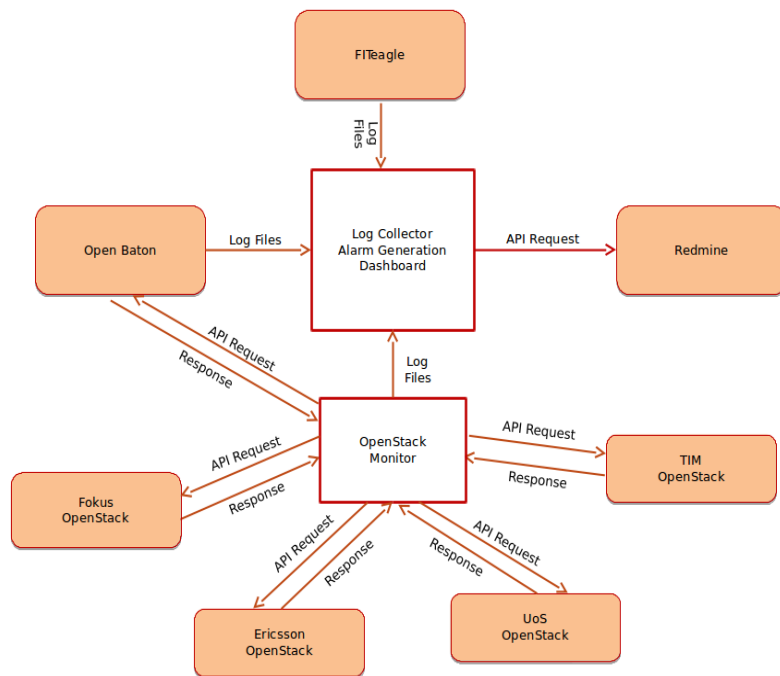- VNF Package management
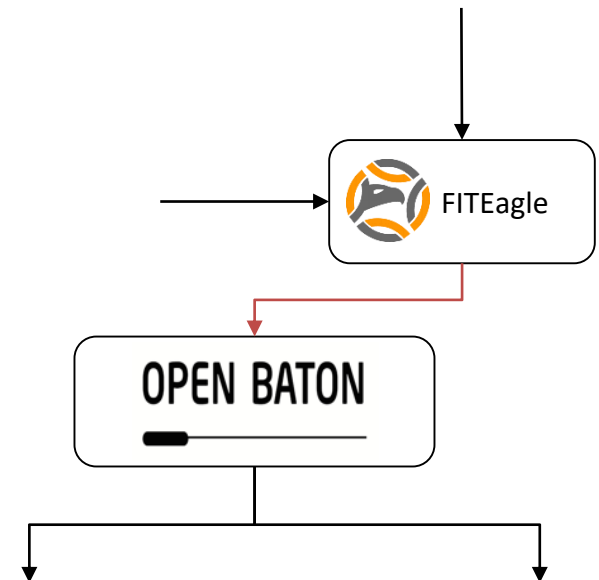
PLATFORM PROVIDERS

Why did we need FIRE APIs and Tools   SOFTFIRE

- Resource discovery
- Experiment definition
- Resource reservation
- Resource provisioning
- Experiment control during execution
- Experiment Monitoring
- User Authentication
- User Authorization

- jFED and FITeagle were the FIRE Tools choosen

Security Enhancements of the SoftFIRE Infrastructure

LESSON LEARNT AFTER THE FIRST WAVE OF EXPERIMENTATION

First Wave of Experimentation

- **Experimenters selection**
  - 26 proposals received - 6 were selected
  - Feasibility checks are needed
  - Need to increase the community participation
- **Issues with the platform**
  - Some bugs to be solved
  - Some issues with the usage of Fire Tools
    - We needed to offer direct access to OpenBaton API ➔ seeking for a new solution
- **Issues with Experimenters**
  - None ☺
  - One withdraw, the other were satisfactorily using the infrastructure
- **Issues with the approach**
  - A huge burden for monitoring and debugging the platform
  - Management of Experimenters (we appointed one Mentor for Each)
  - The need to have educational tools
- **Security: everybody wants it, but nobody enables it**
  - Each testbed has its own security policy. It is difficult to harmonize them and to integrate both at the technical and the cooperation level!!!

A NEW MIDDLEWARE FOR SOFTFIRE

Limitations encountered

- SoftFIRE enabled access to the platform adopting the Slice Federation Architecture (SFA) APIs
  - SFA main objective is to provide access to federated testbeds exposing heterogeneous resources
  - RSpec Schemas used for describing resources
- SFA/RSpec is not NFV/SDN oriented:
  - Resources could be of any type, however it is most of the time required an adapter for translating from SFA to a specific information model
- Limited programmability of the actual resources:
  - Perfect for basic virtual resources (i.e. VMs)
  - Not the best choice for NFV resources (VNF, NSD)
- Any modifications to the underneath infrastructure requires changes to multiple layers of the old SoftFIRE middleware

Feedbacks from experimenters (call 1)

- jFED does not provide enough information in case of ERRORS occurring at the infrastructure level during deployment Troubleshooting costs were very high for both experimenters and SoftFIRE team.

- Some experimenters preferred the MANO APIs directly since they were providing more powerful capabilities:
  - The MANO APIs already federate a large number of testbeds
  - they provide to the experimenter the flexibility and the freedom to upload their (shared/private) resources

The NEW High Level Architecture

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Experimenter

Experiment setup

It includes SoftFIRE software tools used by experimenters to interact with the Virtualization infrastructure

Experiment Manager

Resources instantiation

Describe and Define Resources (TOSCA)

It exposes NFV Management and Orchestration (MANO) functionalities to the upper levels

NFV MANO (OpenBaton)

Resources interactions

Instantiation and activation of requested services and resources on the federated testbeds

It represents the collection of multiple interconnected testbeds and the OpenStack environment

OpenStack (Testbeds)

SFA   VS

Tosca

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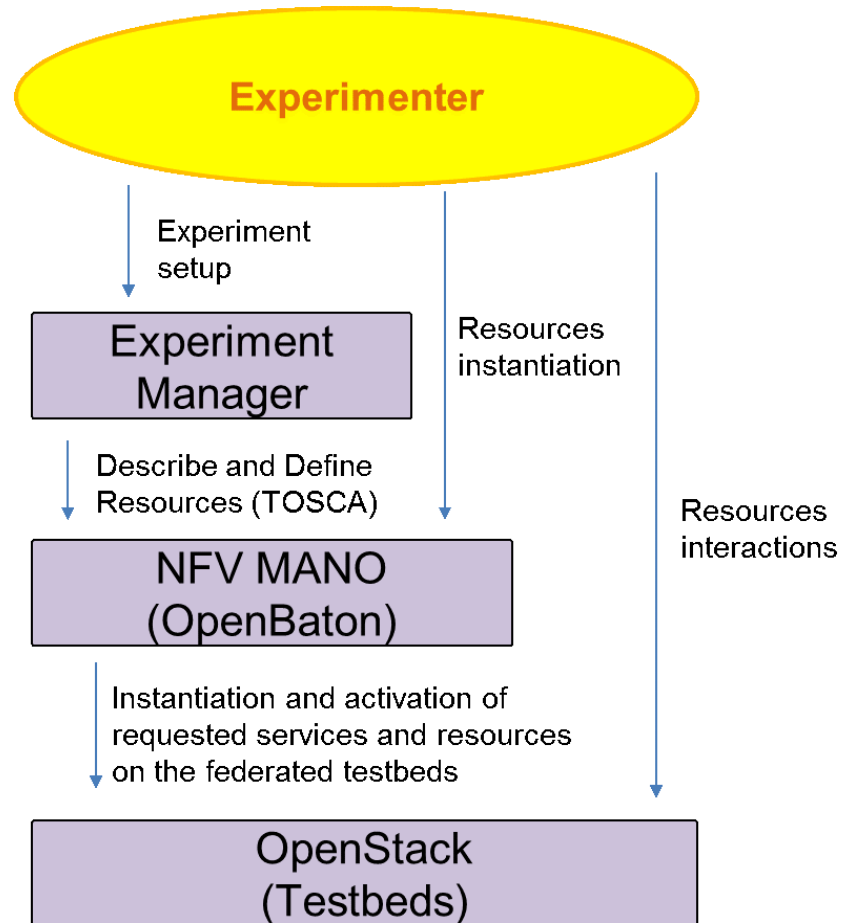
```
<node client_id="dummy-server" exclusive="false"
component_manager_id="urn:publicid:IDN+localhos
t+authority+cm"
component_id="urn:publicid:IDN+localhost+node+ht
tp%3A%2F%2Flocalhost%2Fresource%2FOpenBaton-
Server-1+Gateway">

  <sliver_type name="http://open-
multinet.info/ontology/resource/openbaton#dummy
-server" />

<interface client_id="dummy-server:if0">
</node>

…

<link client_id="link1">
  <component_manager
name="urn:publicid:IDN+localhost+authority+cm" />
  <interface_ref client_id="Gateway:if0" />
  <interface_ref client_id="ENodeB:if1" />
  <link_type name="lan" />
</link>
```

```yaml
dummy-server:
        type: openbaton.type.VNF
        properties:
          vendor: Fokus
          version: 0.1
          endpoint: dummy
          type: server
          configurations:
            name: config_name
            configurationParameters:
              - key: value
              - key2: value2
          vnfPackageLocation: https://github.com/openbaton/
          deploymentFlavour:
            - flavour_key: m1.small
        requirements:
          - virtualLink: private
          - vdu: VDU2
        interfaces:
          lifecycle: # lifecycle
            instantiate:
                - install.sh
                - start-srv.sh
```
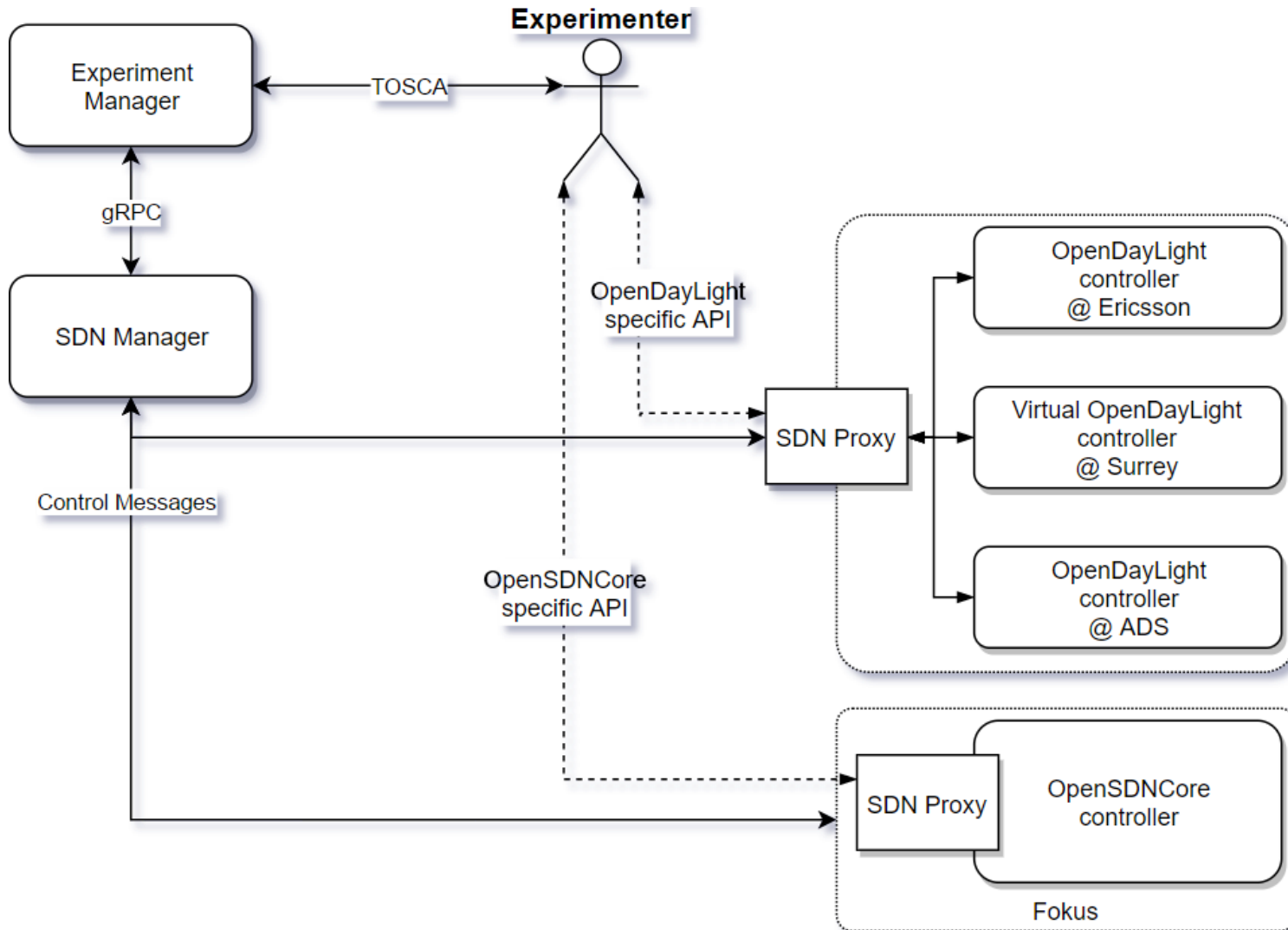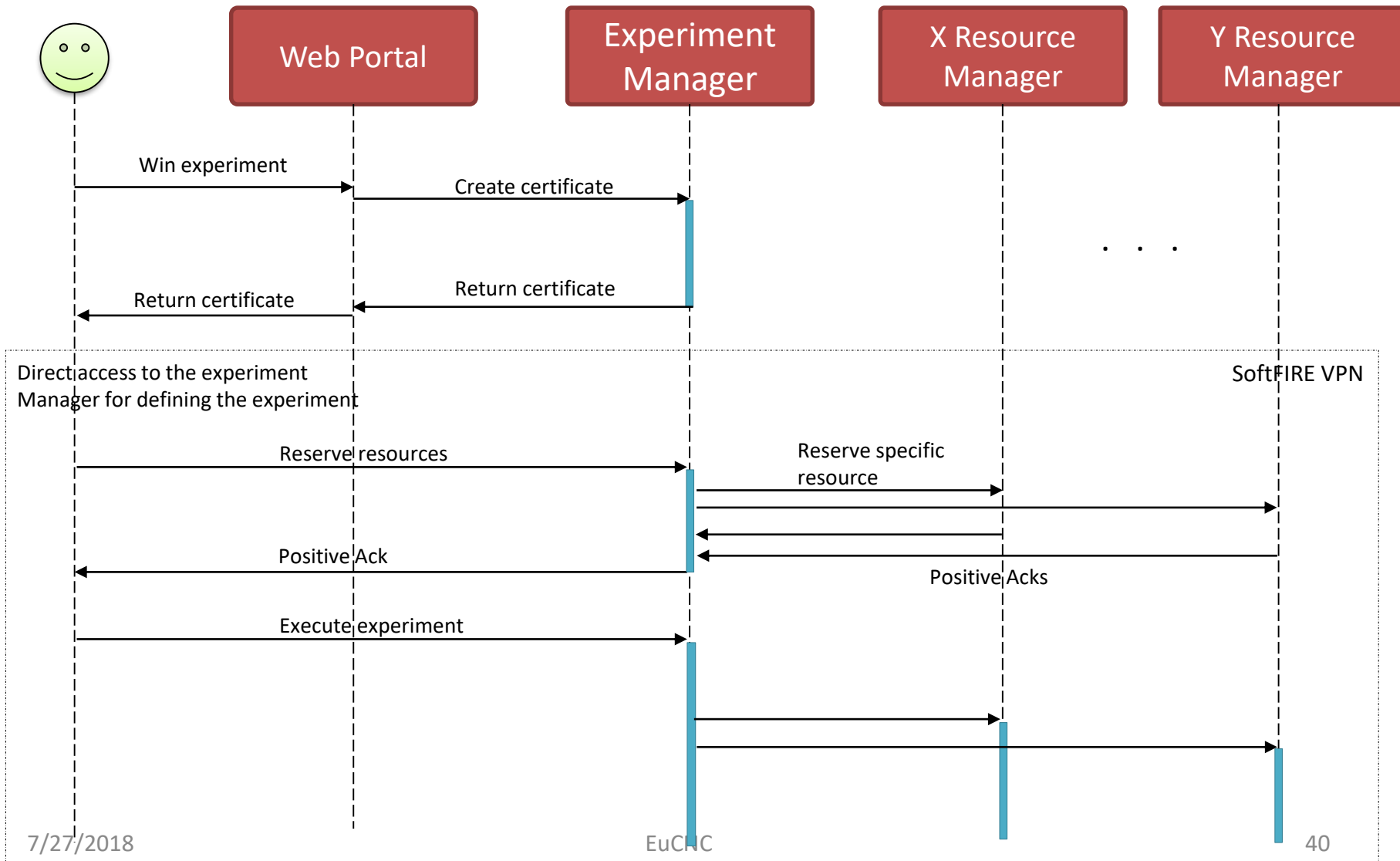
SoftFIRE v2.0 architecture
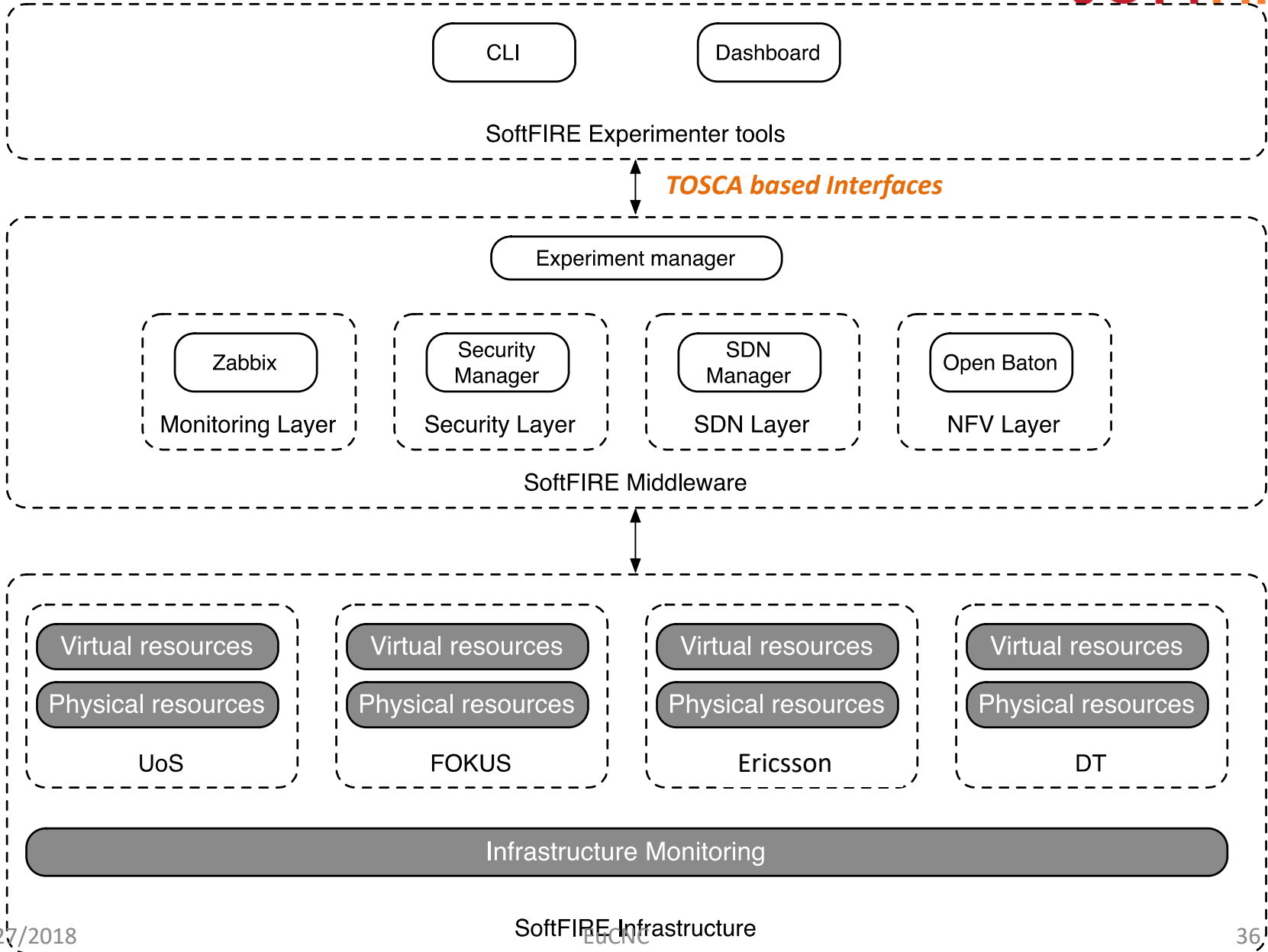
SDN Manager

Proposed Scenario (v2.0 architecture)

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Benefits

- Flexible middleware for managing NFV/SDN technologies based on industry oriented open APIs (TOSCA)
- Integration of security and monitoring capabilities
- Possibility of integrating also physical resources
- Provide the means to the experimenters that choose only particular kind of resources in a particular location for a dedicated amount of time

- A SoftFIRE White Paper will be issued soon about these results and shared with the community

Next Step

- July 1st to start the second Wave with the new Experiment Manager

- Introduction of basic SDN functionalities and Monitoring features

- Then … Security and Physical Resource management

- More experiments in parallel (expected)

Questions!?

www.softfire.eu

June 12th 2017

EUCNC - OULU, FINLAND