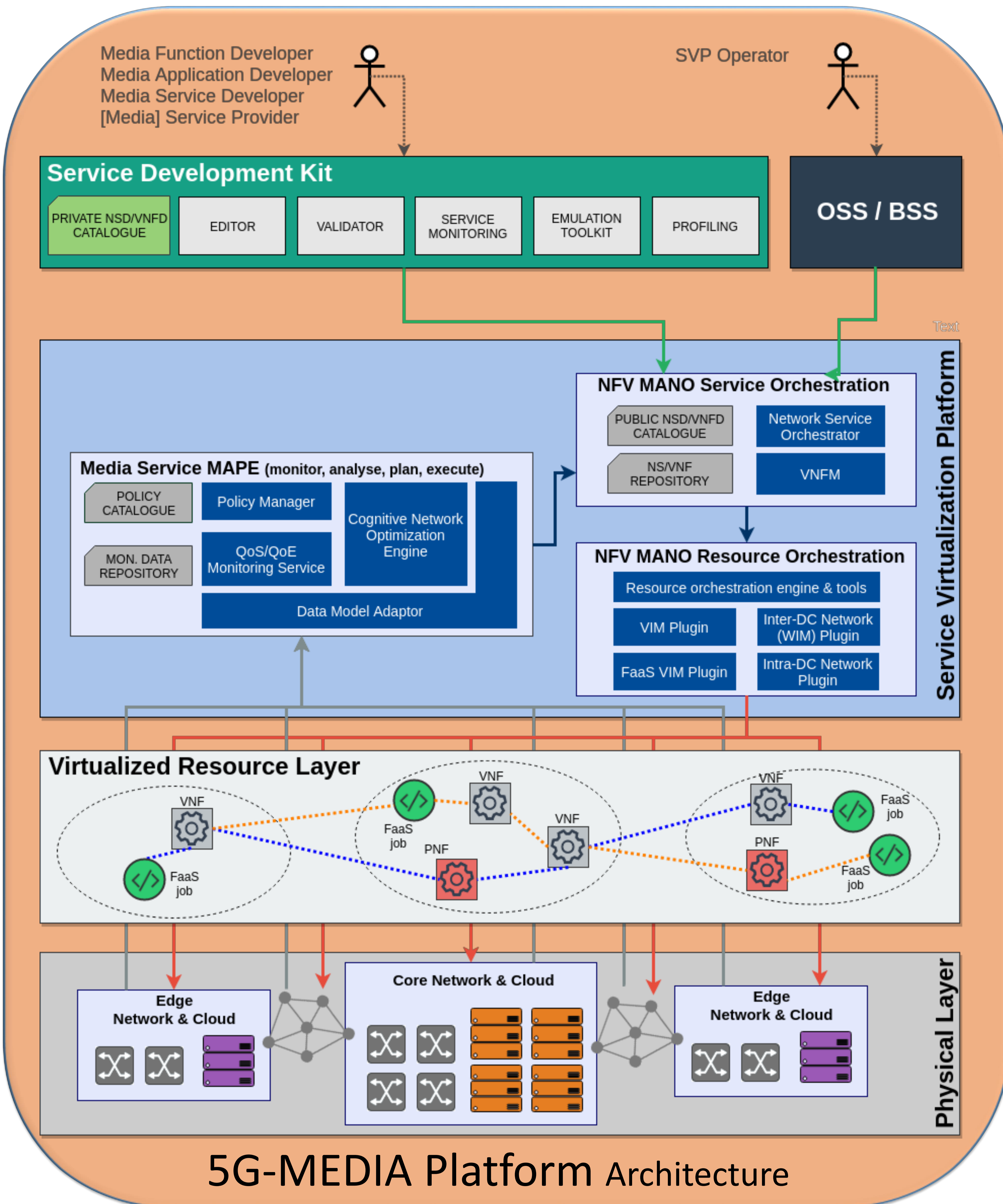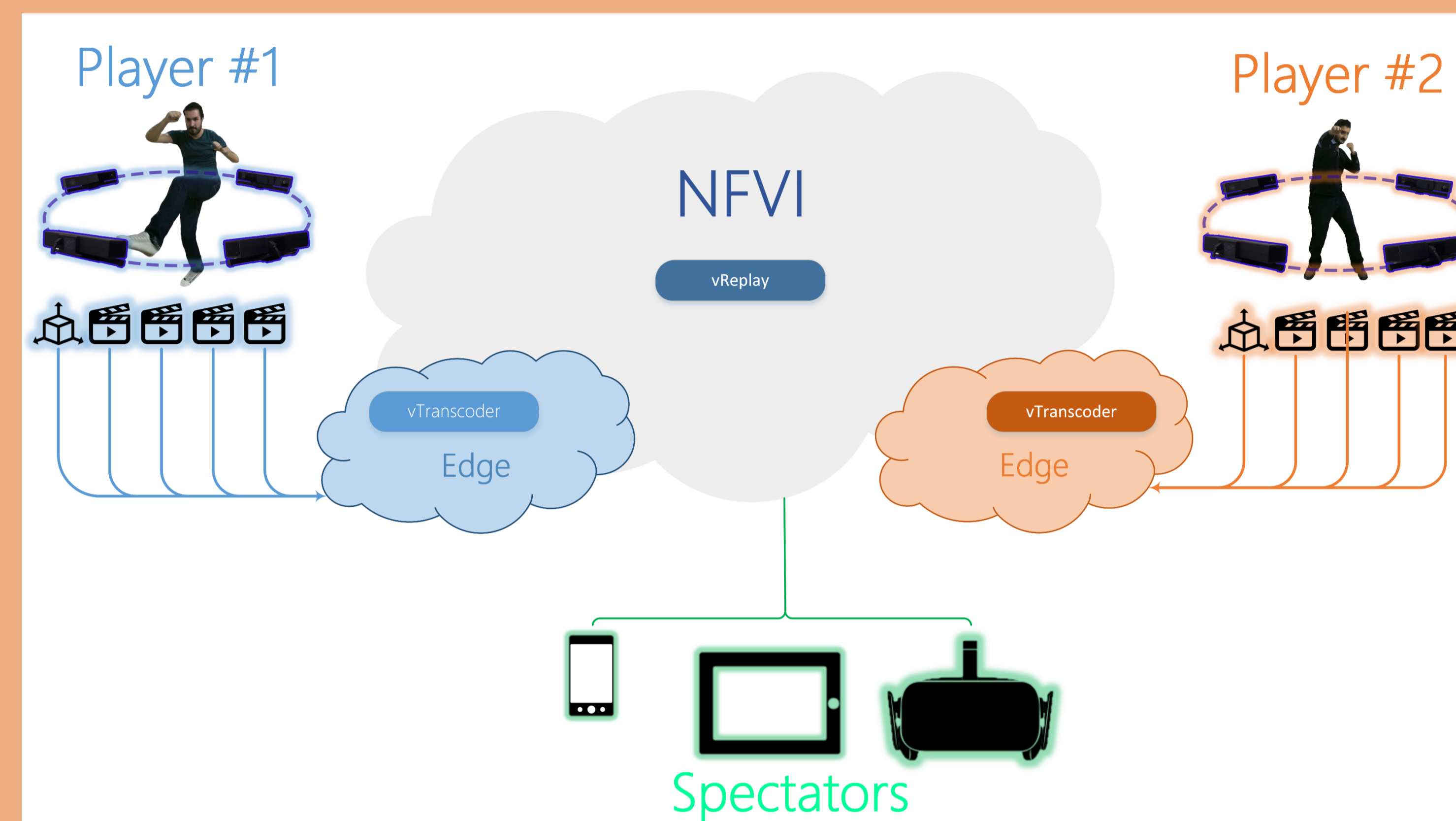# Towards Serverless Network Functions Virtualization (NFV) for 5G Media Applications

**5G Media: Programmable edge-to-cloud virtualization fabric for the 5G Media industry**
5G-MEDIA delivers an integrated programmable service platform seamlessly spanning cloud and edge for development, design and operations of media applications in 5G networks. 5G-MEDIA emphasizes (a) user QoE, (b) fast development cycle, (c) scalability, and (d) cost-efficiency.
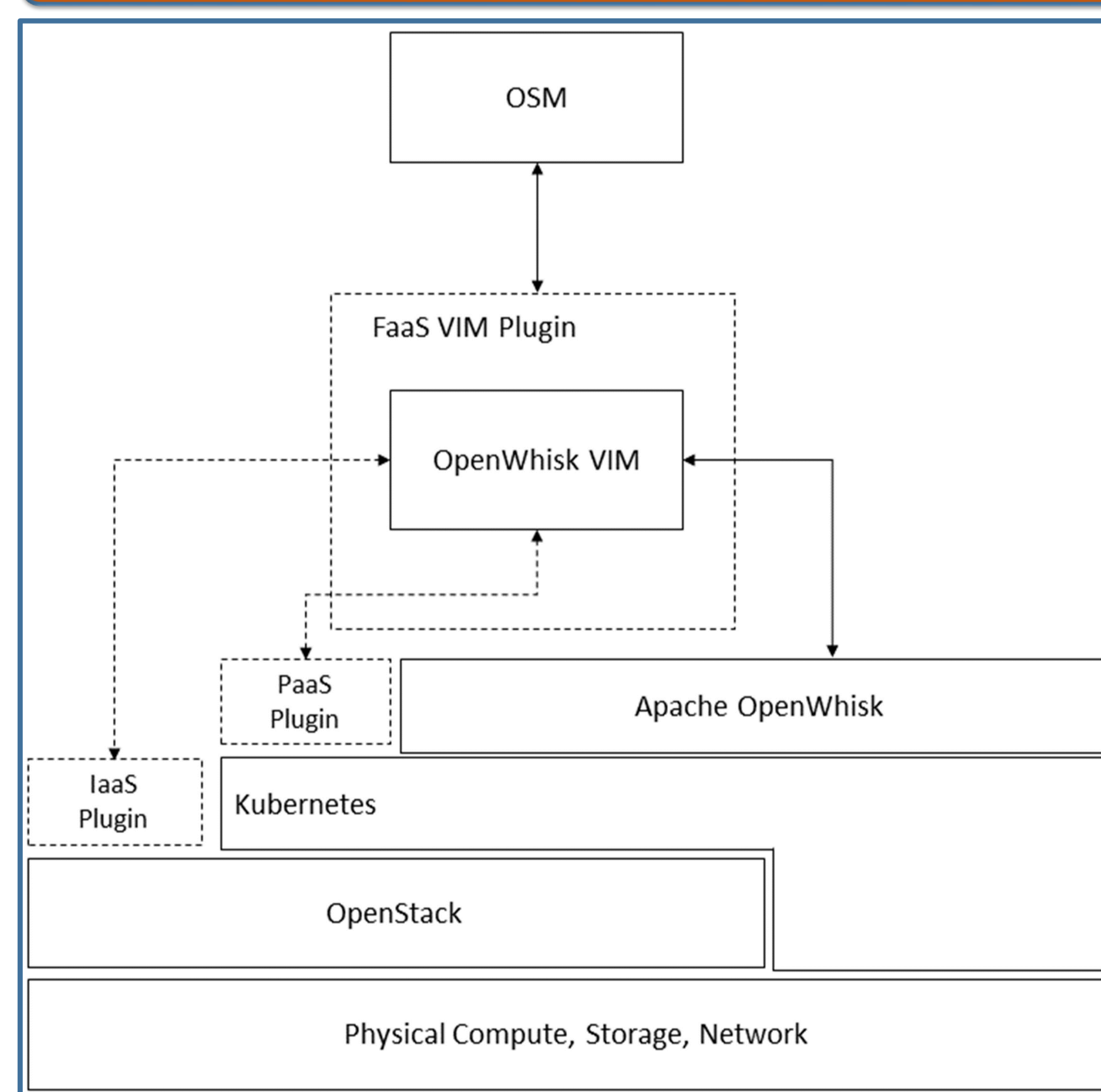
Media Function Developer
Media Application Developer
Media Service Developer
[Media] Service Provider

SVP Operator

## Service Development Kit

| PRIVATE NSD/VNFD CATALOGUE | EDITOR | VALIDATOR | SERVICE MONITORING | EMULATION TOOLKIT | PROFILING |

OSS / BSS

### Service Virtualization Platform

**NFV MANO Service Orchestration**
- PUBLIC NSD/VNFD CATALOGUE
- NS/VNF REPOSITORY
- Network Service Orchestrator
- VNFM

**Media Service MAPE** (monitor, analyse, plan, execute)
- POLICY CATALOGUE
- MON. DATA REPOSITORY
- Policy Manager
- QoS/QoE Monitoring Service
- Cognitive Network Optimization Engine
- Data Model Adaptor

**NFV MANO Resource Orchestration**
- Resource orchestration engine & tools
- VIM Plugin
- FaaS VIM Plugin
- Inter-DC Network (WIM) Plugin
- Intra-DC Network Plugin

### Virtualized Resource Layer

VNF
FaaS job
VNF
FaaS job
PNF
VNF
VNF
PNF
FaaS job
FaaS job

### Physical Layer

Edge Network & Cloud

Core Network & Cloud

Edge Network & Cloud

## 5G-MEDIA Platform Architecture

## Motivational Use Case: tele-immersive gaming



Player #1
NFVI
vReplay
Player #2
vTranscoder
Edge
vTranscoder
Edge
Spectators

- Full $360^0$ view of the virtual environment
- Spectators freely navigate inside the environment
- Requirements on latency and bandwidth can only be offered by 5G
- Bouts are short
- Start and end time are unpredictable
- Events of interest are asynchronous

Other use cases include mobile journalism and UHD content distribution

## Cost-efficiency: Function-as-a-Service (FaaS) to the rescue!



OSM
FaaS VIM Plugin
OpenWhisk VIM
PaaS Plugin
Apache OpenWhisk
IaaS Plugin
Kubernetes
OpenStack
Physical Compute, Storage, Network

- Requirements
  - Mix "regular" and "serverless" VNFs within the same media forwarding graph
  - ETSI MANO compatibility
  - High performance
  - Instantaneous elasticity
  - Serverless VNFs (OpenWhisk actions) communicate over network
  - Application specific configuration
  - Portability
- Challenges
  - From disperse actions to coordinated action groups
  - Without microservices complexity