

# 5G Service Automation

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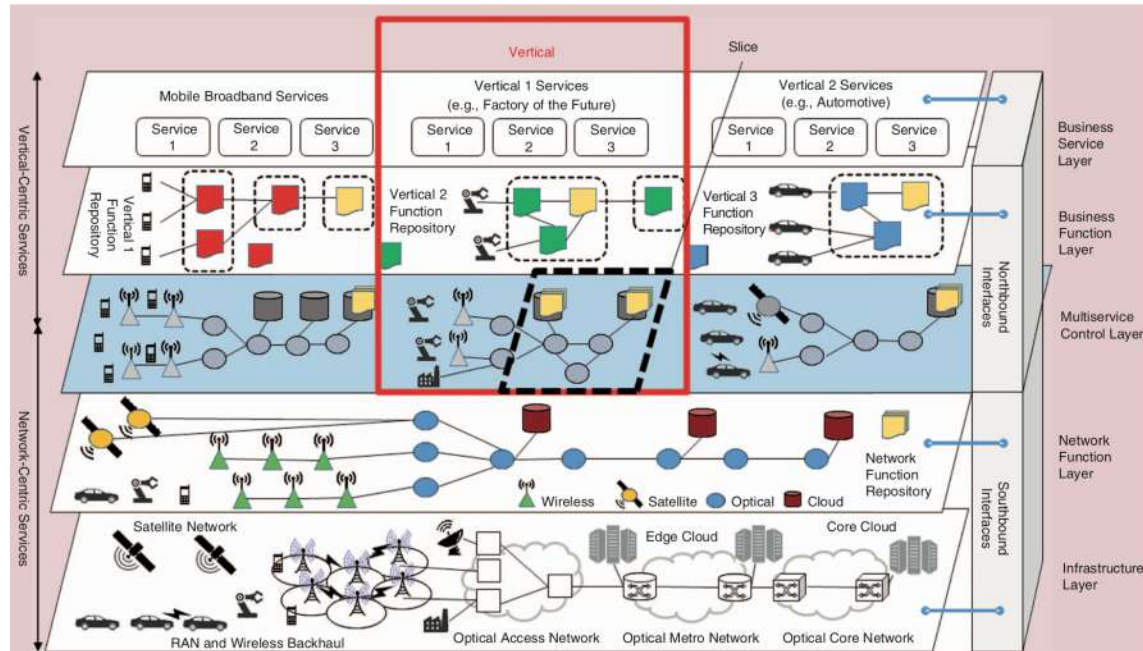
# Network Slicing

## Key ingredient in evolving networks

“5G slice is composed of a collection of 5G network functions and specific RAT settings that are combined together for the specific use case or business model”

Optimized service delivery for heterogenous use cases

Multiple independent instances on the same physical network



[Source: Wollschlaeger et al., 2017. The future of industrial communication: Automation networks in the era of the internet of things and industry 4.0. IEEE Industrial Electronics Magazine]

# Network Slicing for CPS

## CPS Communication in 5G Cellular Network



### Vertical Pilots (5Growth 5G-PPP ICT 19)

- **Industry 4.0**

1. Connected Worker Remote Operation of Quality Equipment (eMBB / URLLC)
2. Digital Twin Applications (eMBB / URLLC) ...

- **Energy**

3. Advanced critical signal and data exchange across wide smart metering and measurement infrastructures (mMTC / URLLC) ...

- **Transportation**

4. Non-Safety Critical Communications (eMBB / URLLC) ...



[Source: <https://www.i-scoop.eu/manufacturing-industry/>]

# Network Slicing

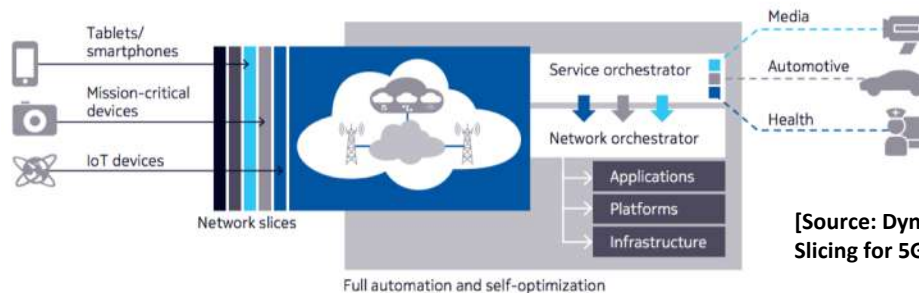
## Requirements and Features

Support for diverse business models  
Per slice customizability and optimization  
Isolation / Multi-tenancy

Reduce service creation and activation times  
Network agility  
Full programmability

Dynamic (re)configuration  
Massive elasticity  
Real time adaptability

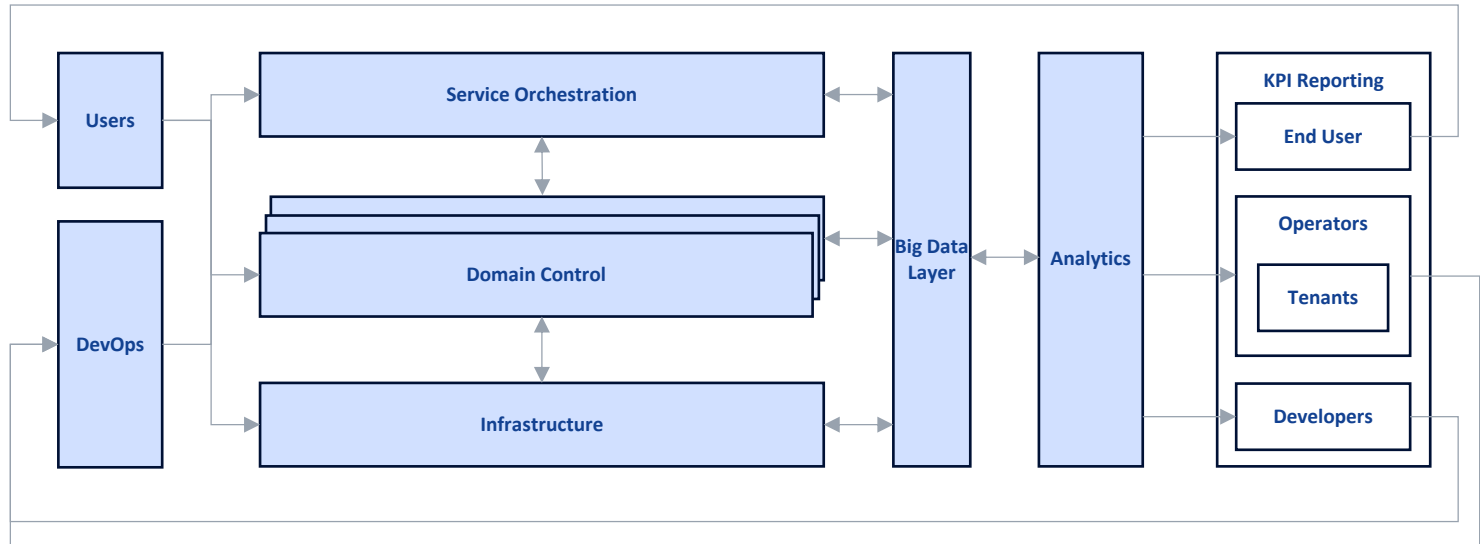
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[Source: Dynamic Network Slicing for 5G, NOKIA 2016]

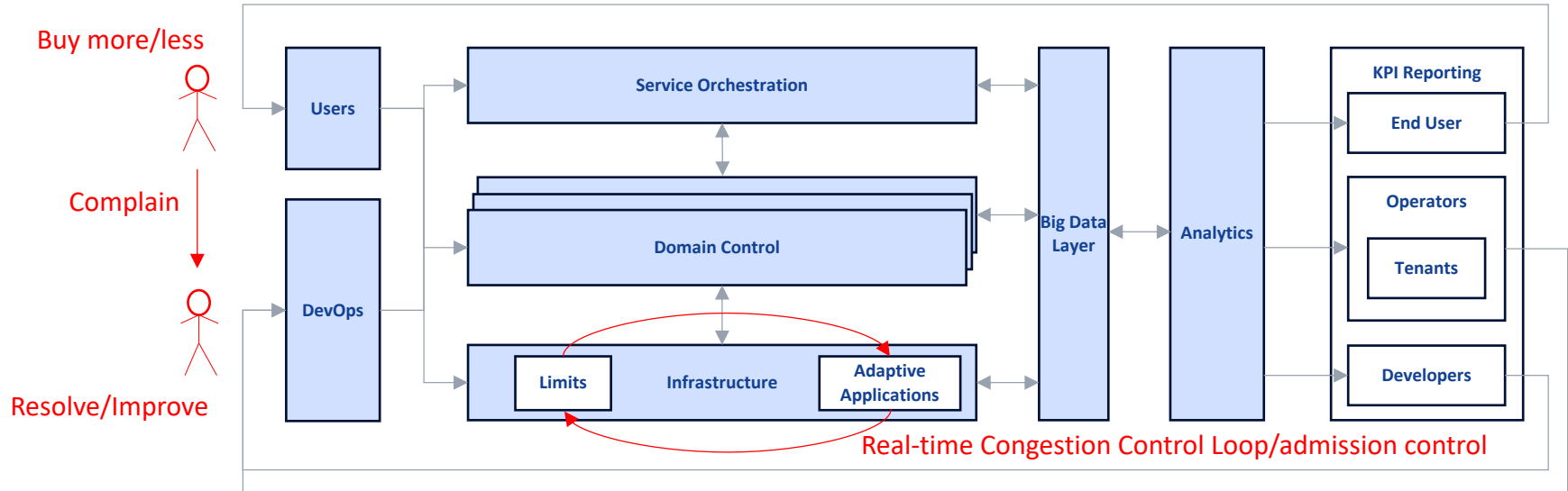
# Service Automation Architecture

## Fast On-Demand E2E Provisioning



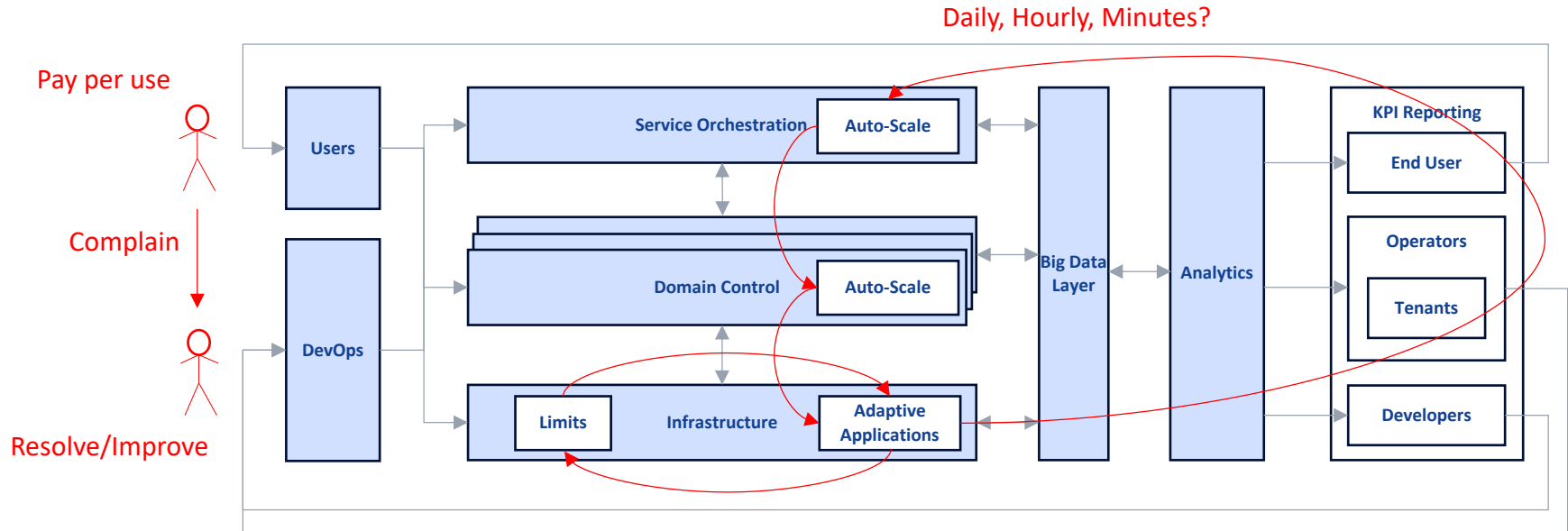
# Hard Isolation Service Automation

## Open Control Loop



# Hard Isolation Service Automation

## Auto-Scale Control Loop



# Service Automation

## Multiple Closed Control Loops

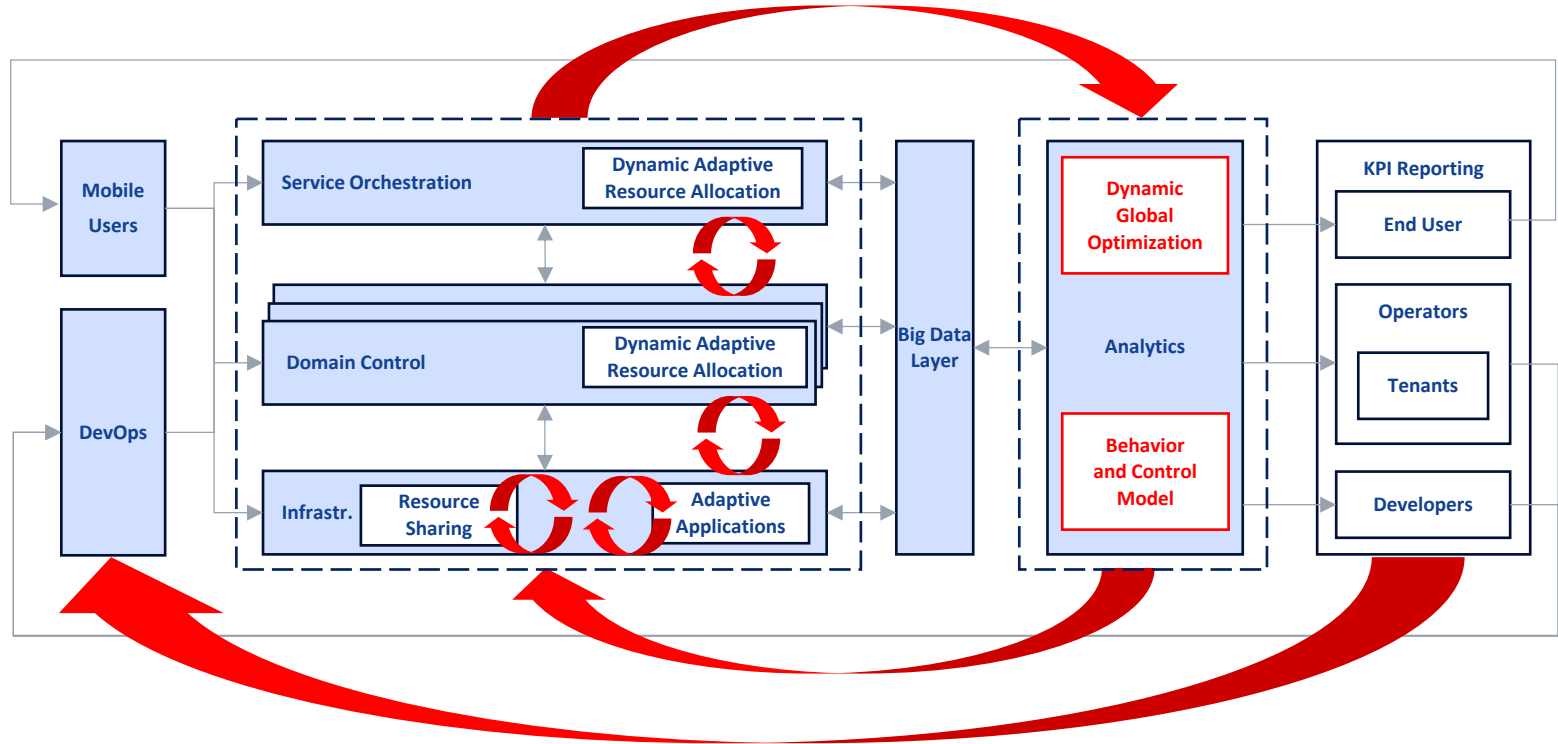
Intelligent Service Orchestration

Real Time Control

Pay as you use



Improve





## Multi-Level Control Loops Stability?



Will the **Hyper Flexible NW** become a **Bumpy Application Ride**?