5G Network Complexity: Automation is key

2021 Intelligence Maintenance Conference

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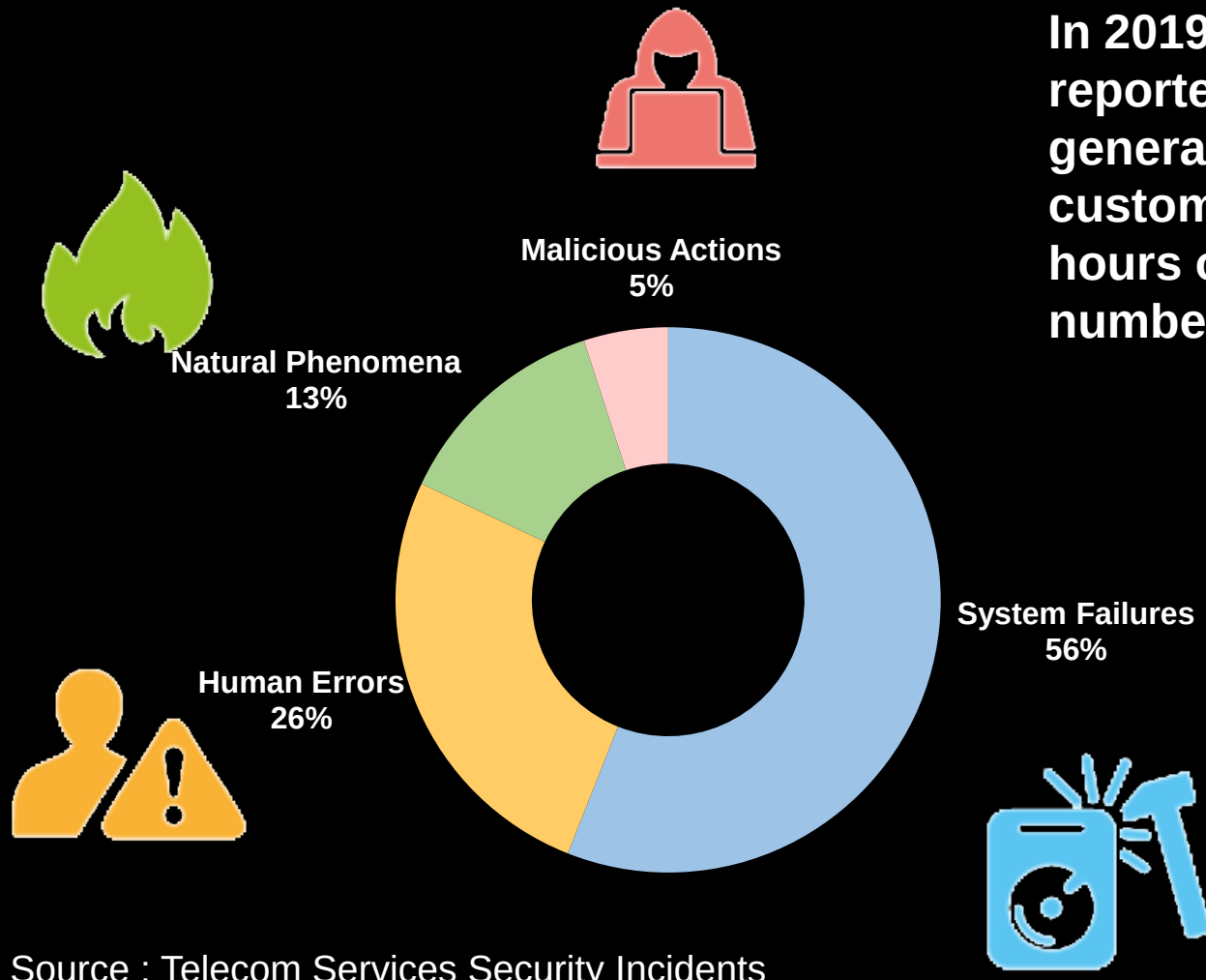
Agenda

1. Resilience main challenges
2. 5G architecture is complex
3. Automation is key to operate 5G network : what automation?
4. Key Messages

#1 Resilience main challenges

Root Causes of incidents and their impact

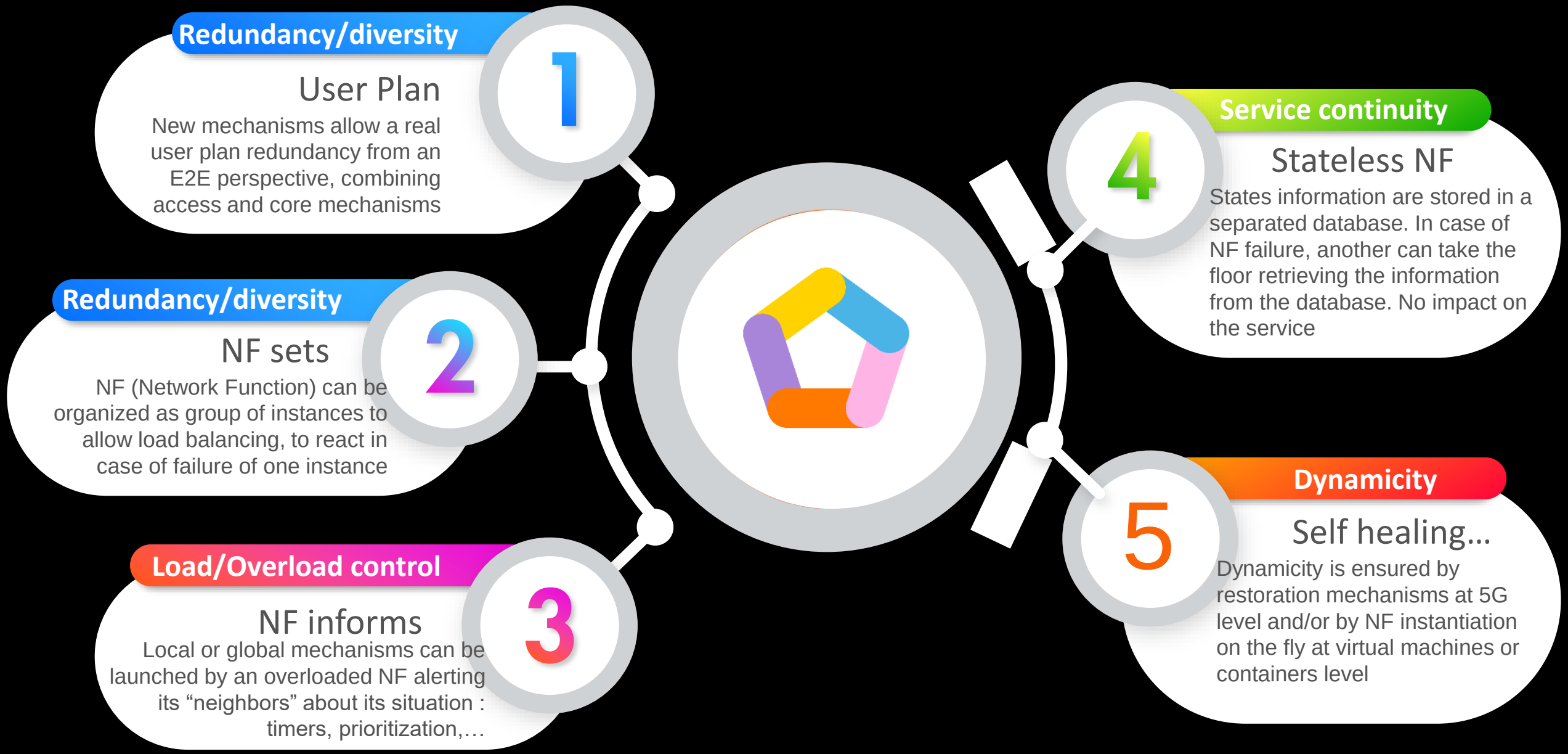


In 2019, 153 major incidents were reported by 26 EU Member States, generating around 1000 million customer hours lost (number of hours of service interruption x number of customers impacted)

Percentage of lost customer hours by root cause

Source : Telecom Services Security Incidents 2019, ENISA

5G learned lessons from the past incidents, but is it sufficient…



…to face these challenges

1

Growing complexity of the network

5G complexity : orchestration, virtualisation, new locations for key functions

multi-access

Automation

2

“verticals” requirements

Requirements associated with new 5G services are very high in terms of latency, reliability, availability

3

Critical infrastructures interdependencies are growing

Electricity/Telecommunications

Transport/Telecommunications

Industry/Telecommunications…

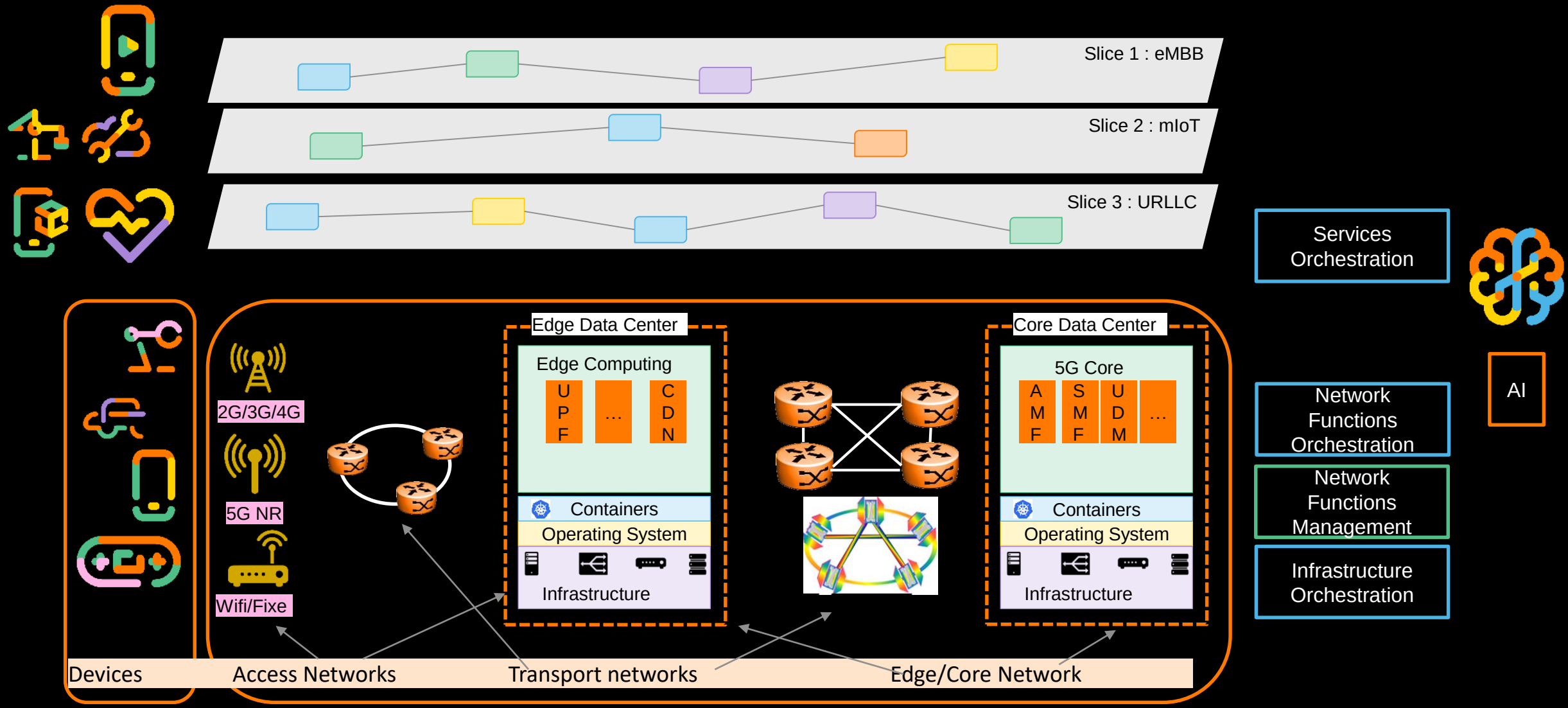
4

Climate changes

#2 5G architecture is complex

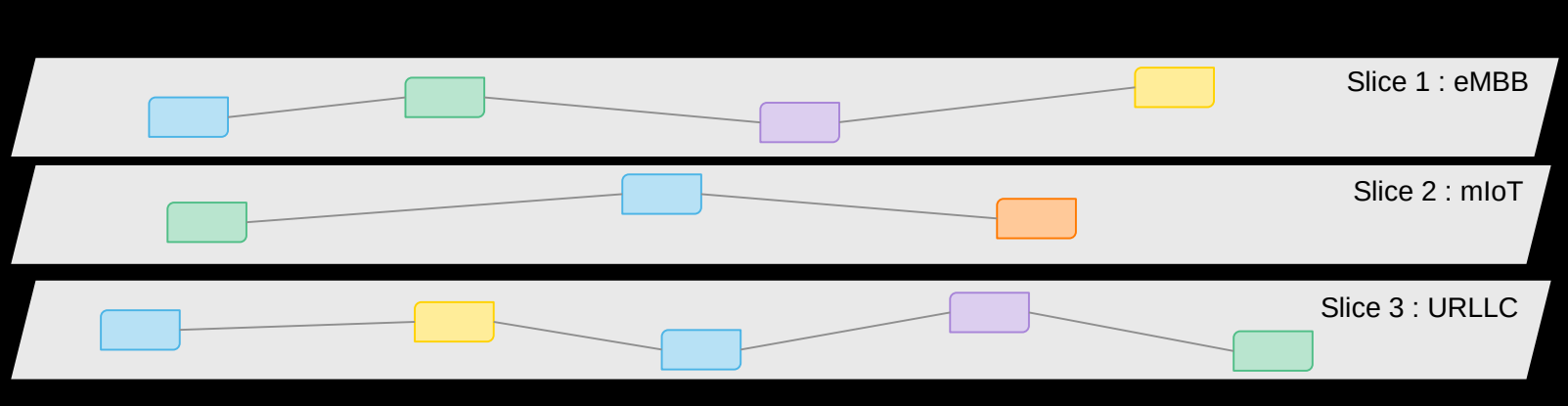
5G Architecture is complex

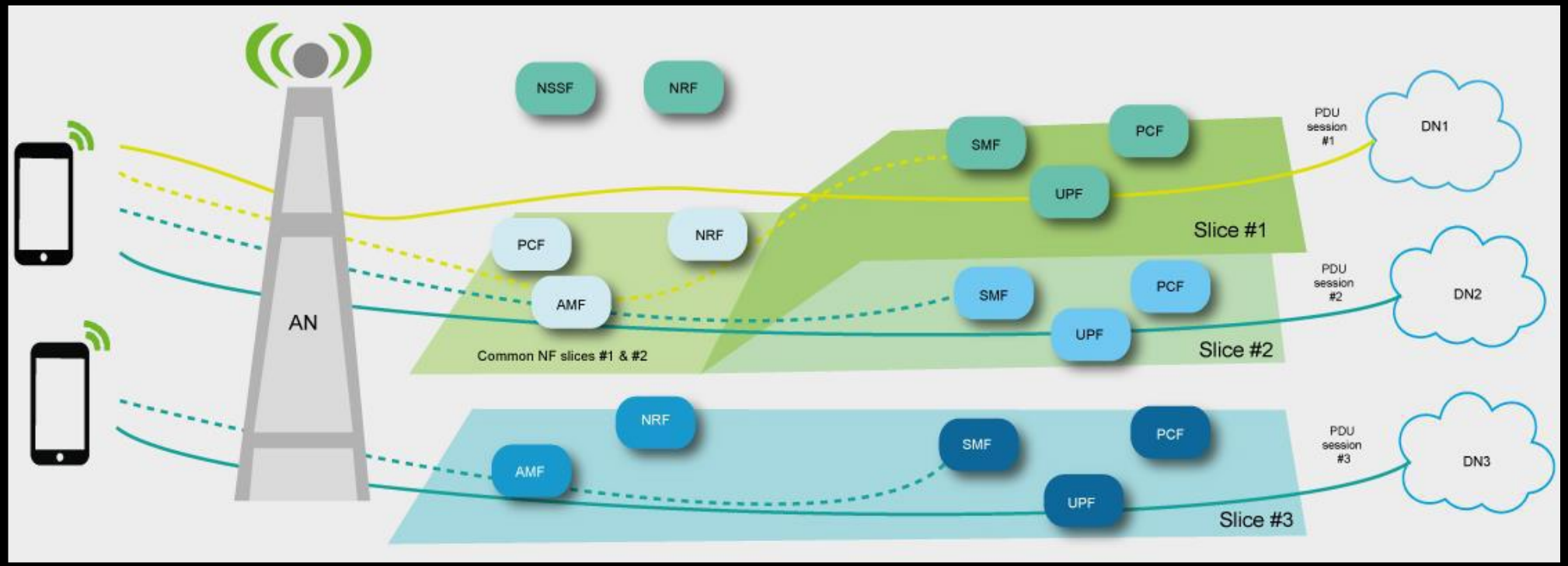
eMBB : enhanced Mobile Broadband
mIoT : massive Internet of Things
URLLC : Ultra Reliable Low Latency Communication



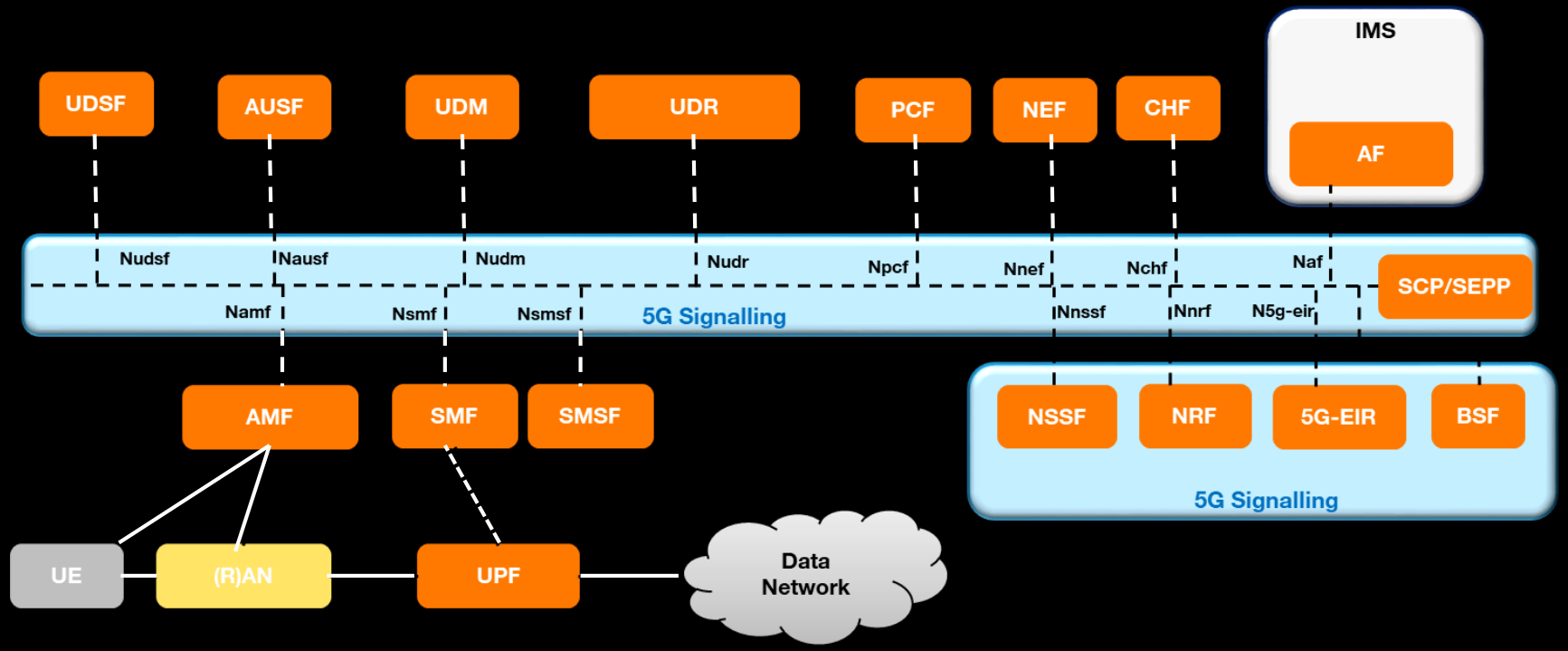
Slicing

eMBB : enhanced Mobile Broadband
mIoT : massive Internet of Things
URLLC : Ultra Reliable Low Latency Communication

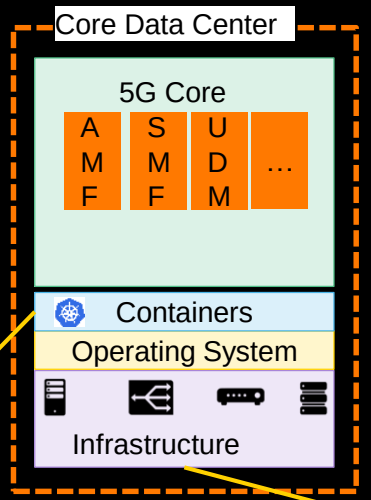


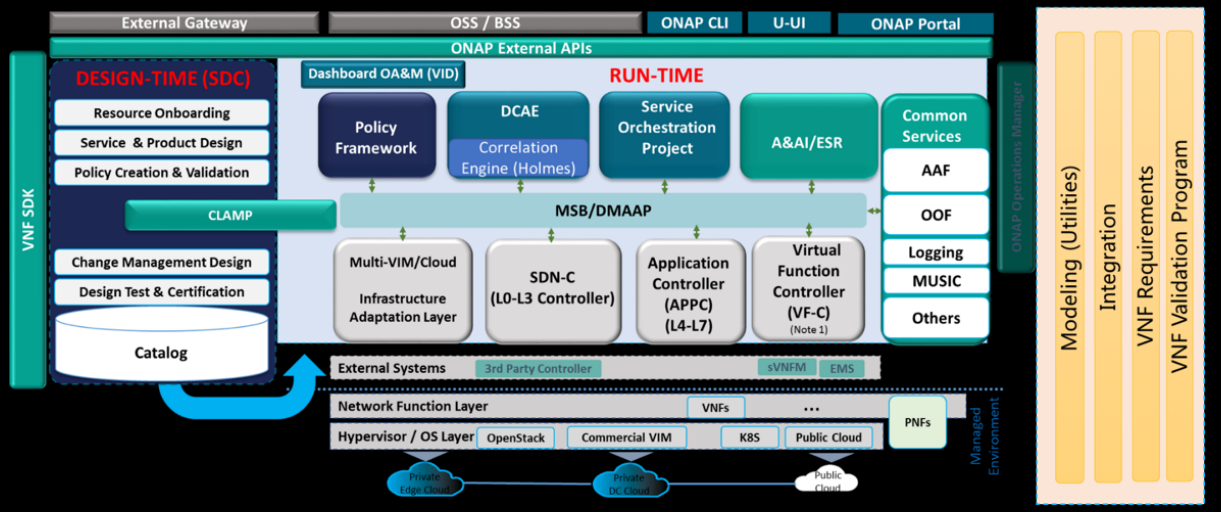


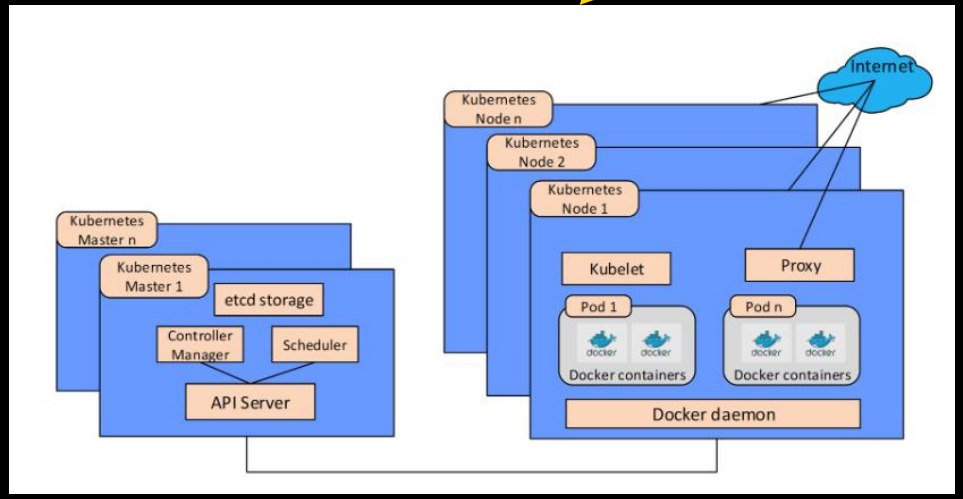
5G Network: Service based architecture

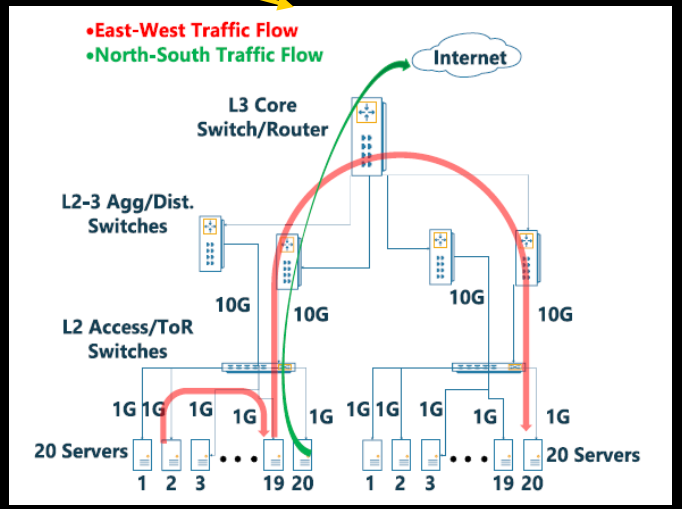


Inside a datacenter









#3 Automation is key to operate 5G network

What automation?

Automation can be based on scripts, on policy rules, on Artificial Intelligence

Automation is required at different level:

- To create a new service/slice
- by translating an intent into a network service
- by checking/complete configuration files
- by instantiating required virtualized functions
- by building service function chain
- by ensuring end-to-end connectivity
- To ensure network evolution
- When upgrading any « network » software
- When adding a node
- To supervise network
- Through anomaly detection, maintenance (preventive/predictive),root cause analysis,…
- Through cockpits with assistant for decision aid
- To validate new functions
- Through functional, performance, resilience, security and E2E tests
- …

Which role for AI in the management of networks and services?

Information → Actuation

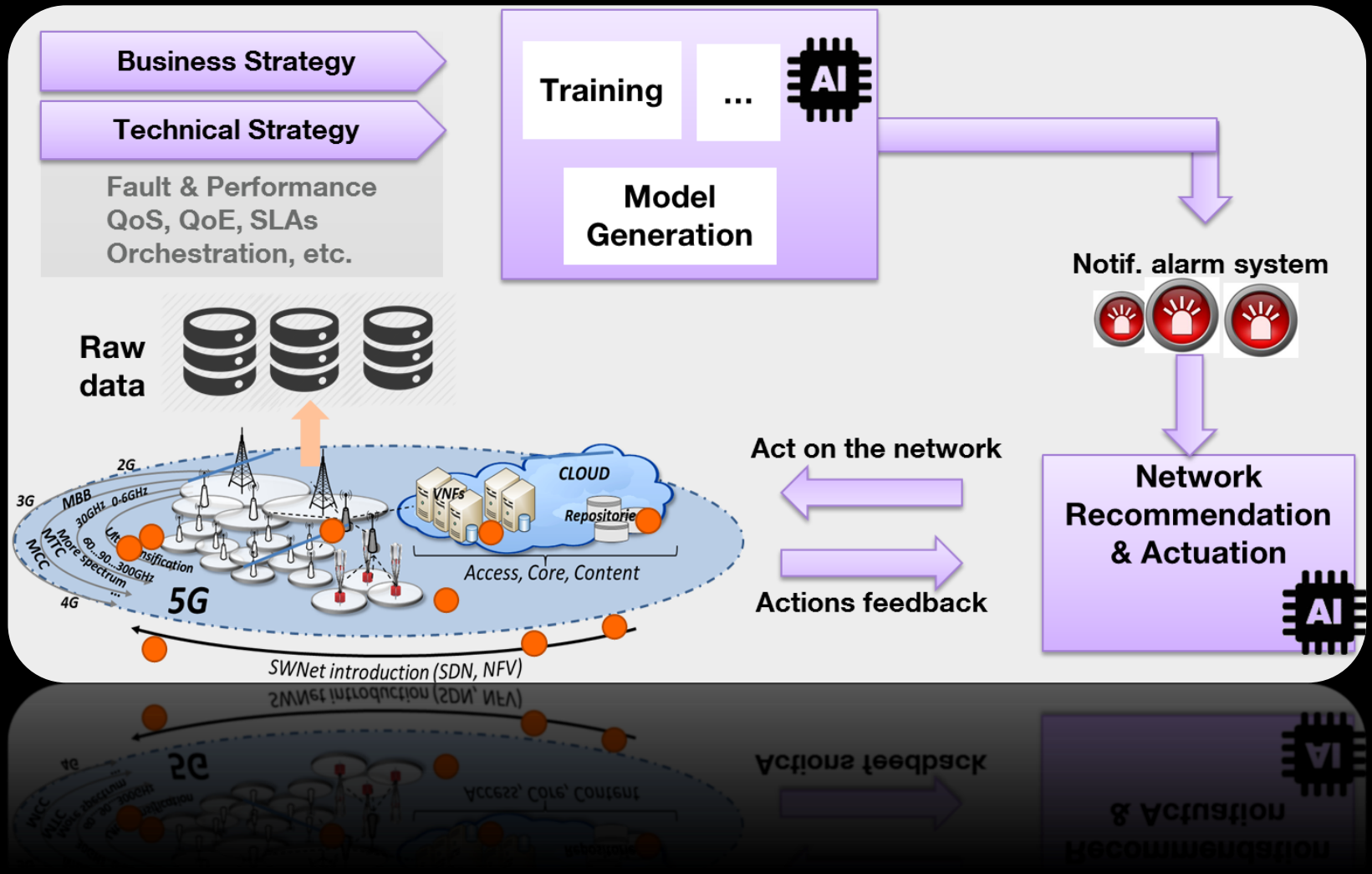
Observe/Describe	Understand/Diagnose	Predict/Forecast	Decide/Act
Characterize normal behavior → Detect anomalies, observe trends, detect context shifts	Analyze correlations between KPIs Analyze the sensitivity of KPIs to parameters Determine the most impacting parameters Root cause analysis	Forecast an event in the future, such as a congestion Predict spatial distribution of metrics based on geo-localized measurements	Decision making based on acquired knowledge Online decision: try (and may fail) to enhance future decisions

Decision support

Decision making

Knowledge creation

AI for networks : simplified view



Example of automation within Orange

Policy Based Management at Orchestration Level

- Policy Engine in ONAP
- Security Rules

Scripting

- Functional Testing
- Continuous Integration (with Open Source tools like Xtesting, Jenkins, Ansible,…)

Artificial Intelligence

- Code Mining to complete configuration files
- Anomaly/Fraud detection
- Root cause Location
- Predictive Maintenance
- Decision entity reputation
- QoE / QoS prediction

#4 Conclusion

Key messages

1. 5G architecture is very complex and introduces many new technologies
2. Automation is key to operate 5G network
3. AI techniques anticipation is a challenge
    1. No data are available : 5G is not yet fully (access+core) deployed
    2. End-to-end lab chains are not ready yet
    3. Location of data collection (at 5G or orchestration level) is not decided yet. It can impact the way to retrieve data.
    4. …

Thank you

"Our greatest glory is not in never falling, but in rising every time we fall."

Nelson Mandela