



5G Service Operations: Real-time Service Operations Connected Factories Use Case

TM Forum Catalyst

Nice, TM Forum Live! 2017

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5G Operations Challenges

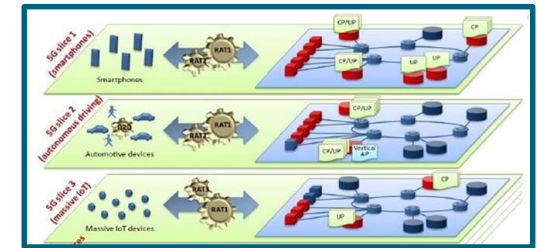
5G Operations Challenges

• 5G Service Management and Orchestration

- Many POCs and research on 5G radio aspects but very little on operations and management
- No clear agreement on what needs to be managed or how the management should be organised
- Expectation of radical change in how 5G operations is organised and the OSS IT systems to support them
- Impact of 5G on service orchestration for slices not fully explored
- Create, manage and automate end-to-end service-specific network slices that cross legacy, SDN, mobile and fixed networks
- SDN/NFV operations platforms need enhancement to deliver new services
- Full automation from fulfilment to assurance processes to support billions of IoT connections

• New 5G services

- Assigning specific network characteristics for each type of service across the network
- Defining services with specific attributes such as latency, bandwidth, etc. by creation of network slices
- Assuring and guaranteeing service performance and SLAs per network slice



• 5G Network slicing

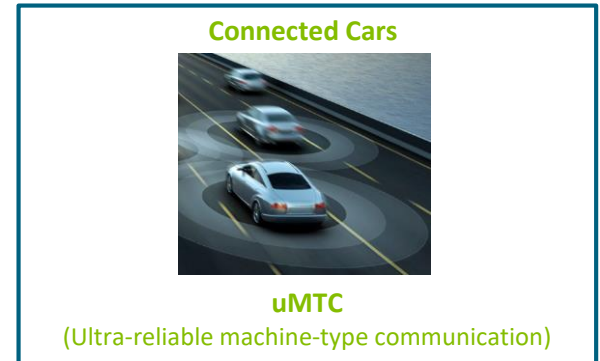
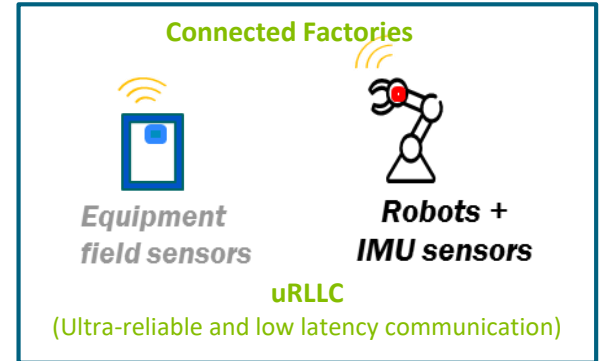
- Currently on a service class basis with services mapped into 3-4 network slices manually
- 5G based IoT services (with different attributes) need to be treated individually for better network utilization
- Tens of thousands of Slices require the entire process to be automated



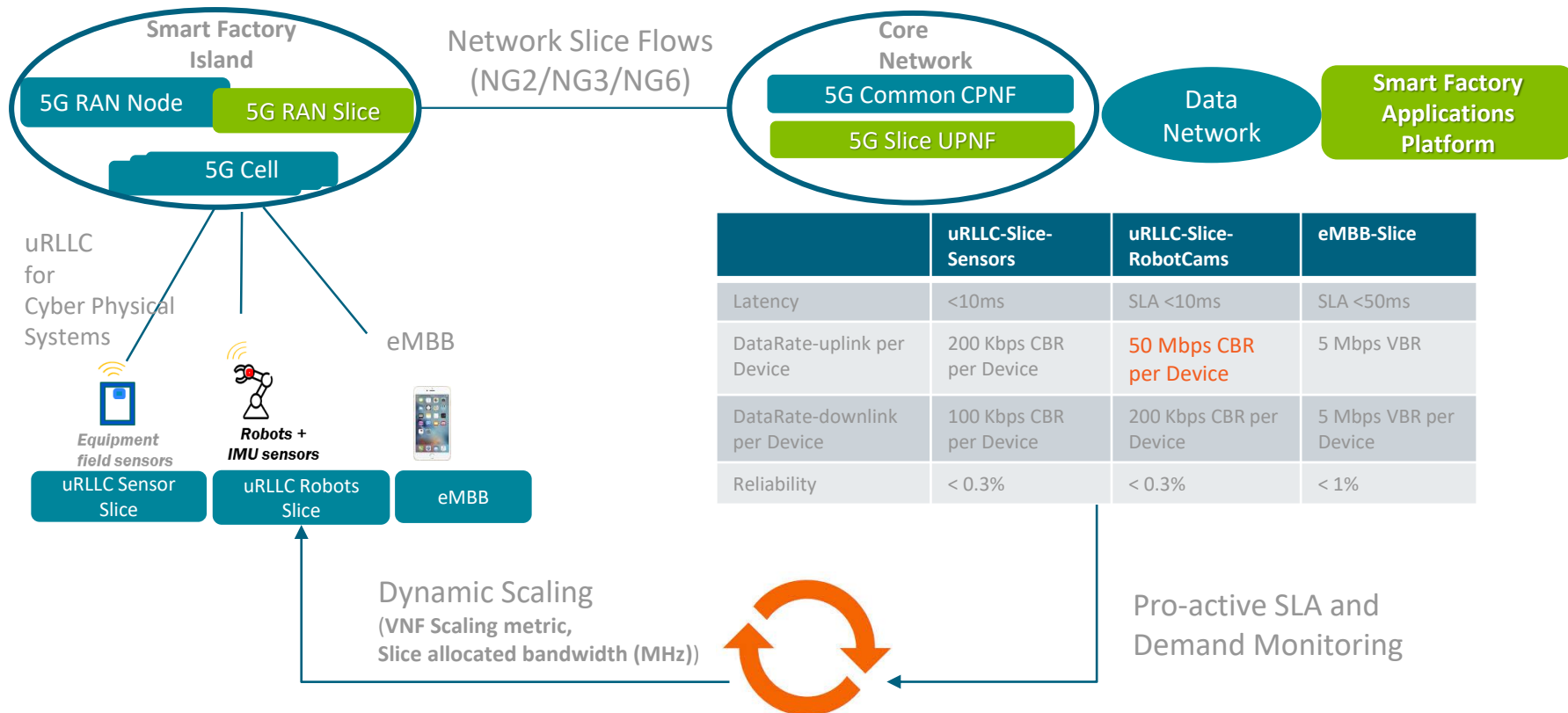
MYCOM OSI Catalyst Solution

Catalyst Scope

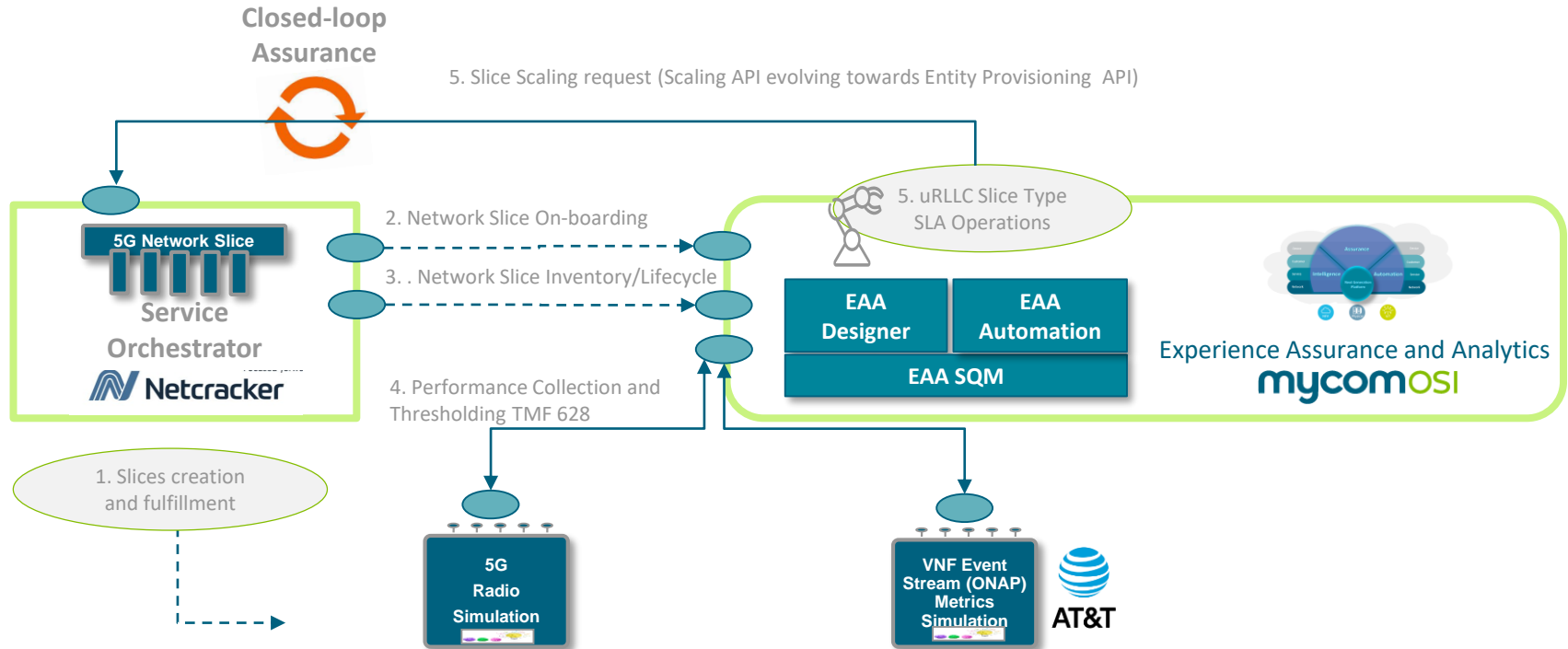
- **Focus on two 5G based IoT use cases** with the goal of:
 - Composing repeatable services for industry verticals in hours
 - Zero friction integration into OSS / BSS Operations Center of the Future
 - Dynamically and autonomously fulfilling and assuring numerous concurrent slice instances (in parallel) with total isolation and security to meet carrier-grade standards
- **Explore the impact of 5G networks and network slicing on operations** in creating and automating many parallel end-to-end network slices that cross multiple network types to:
 - Explore technology readiness and close potential gaps in 5G operations
 - Enable CSP to automate the creation and modification of specific network slices for new IoT services with specific SLAs and characteristics
 - Leverage open source to address the needs of IoT and to accelerate innovation



Connected Factory – uRLLC Slice Operations



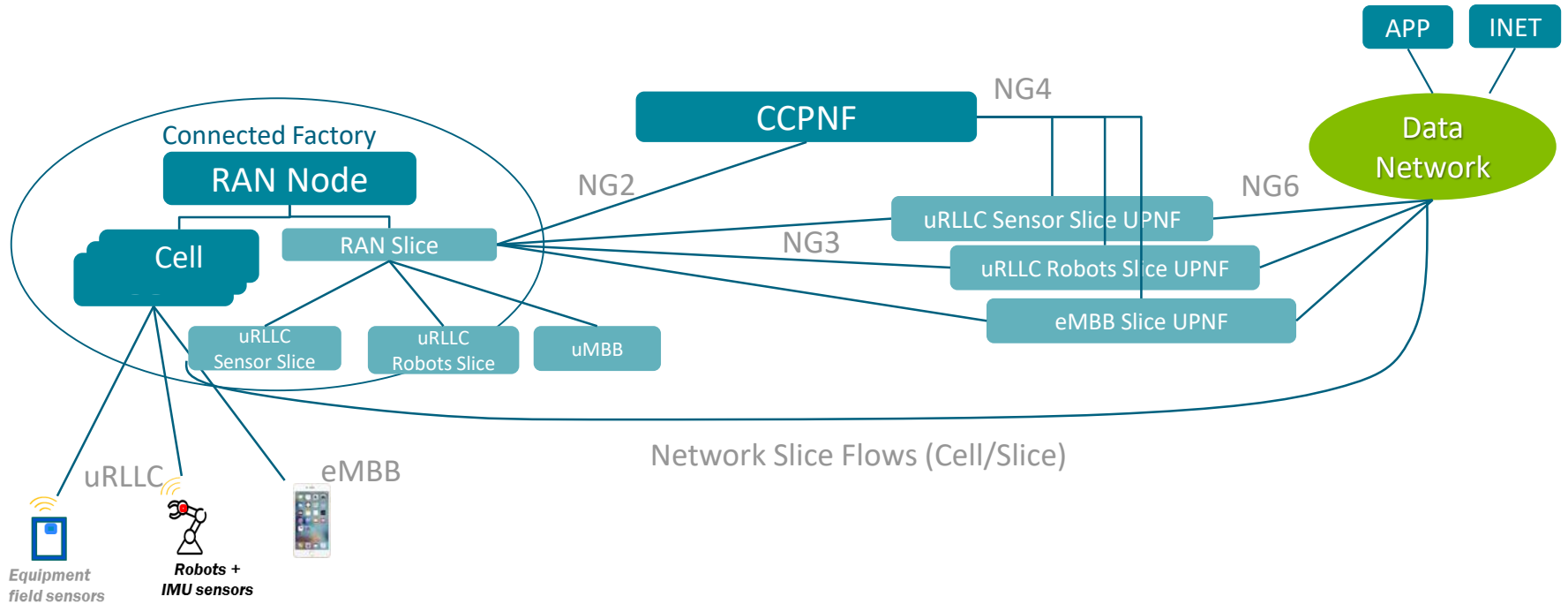
5G Operation – Management Platforms and Flow





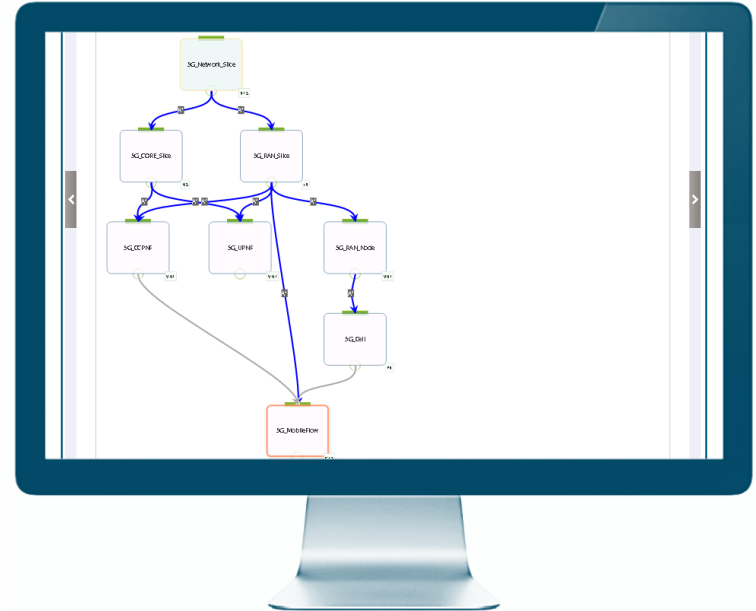
Assurance On-boarding Process

Connected Factory Network Topology



Service Designer – Slice Modelling and Collection Policies

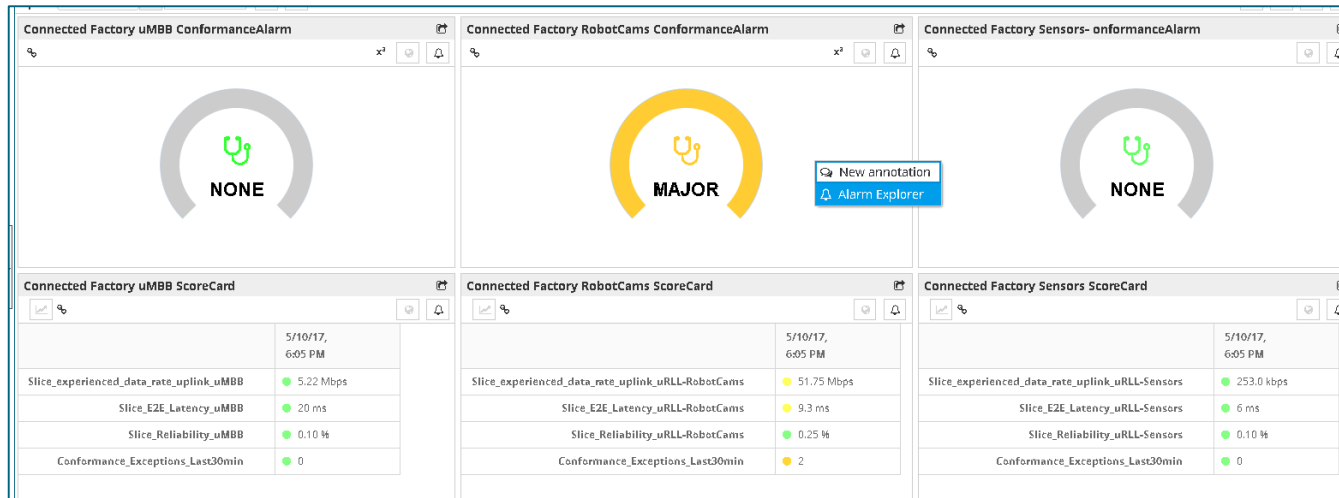
- TOSCA Template Import
- Instantiation
- TMF 628 based measurements discovery and collection policies



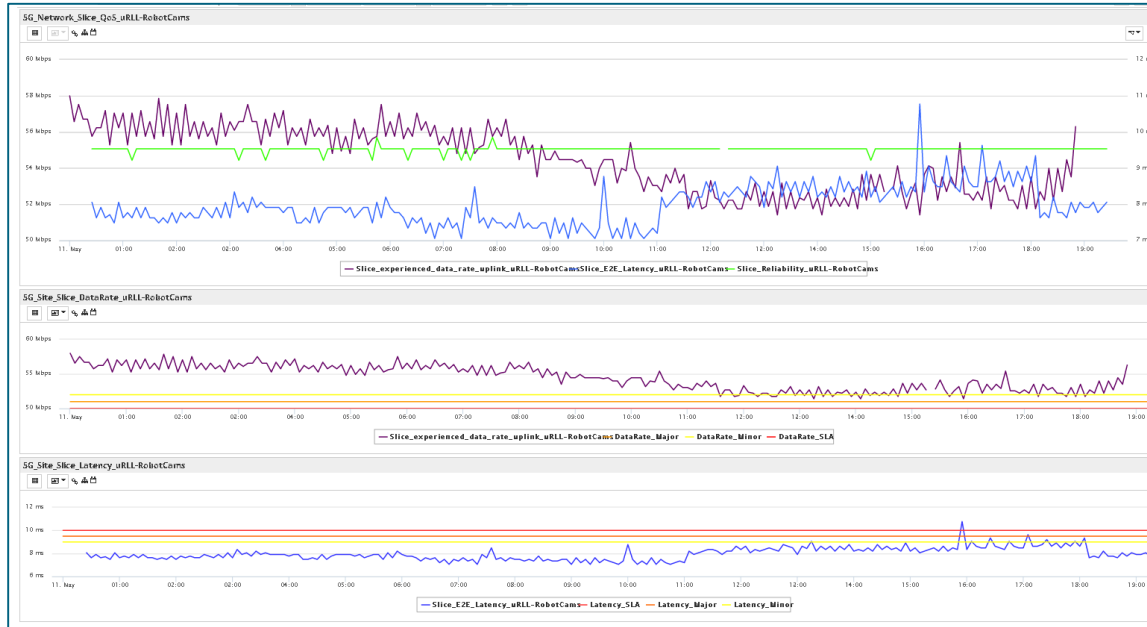


Pro-active SLA Monitoring

Connected Factory Scenario – Degradation Identification



Dashboard - Connected Factory Robot Cameras



RCA - Connected Factory Robot Cameras

Root Cause Analysis (RCA) to fix RAN Slice and Core Slice

- As the Orchestrator is allocated more resources to the RAN Slice (radio + processing unit), the Slice utilization reverts to acceptable values
- The RAN Node is also allocated more resources, as VNF utilization metrics reverts to acceptable values

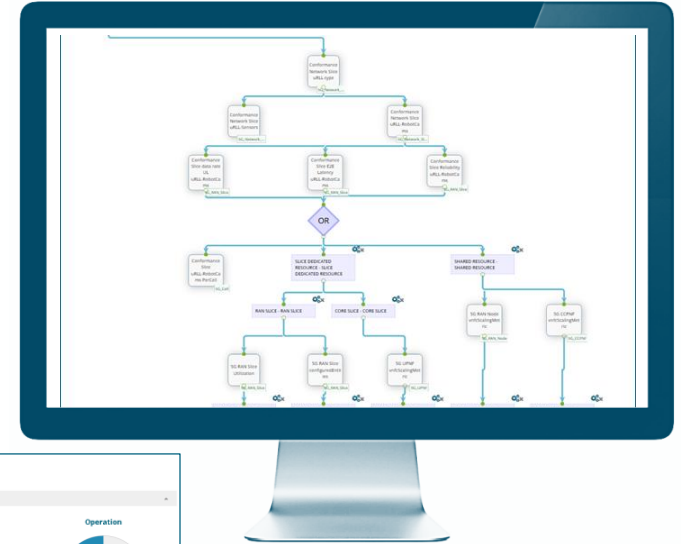




Policy-based Automation

QoS Policy-based Automation Scenario

- A Policy Decision Tree is executed as a result of a Conformance alarm trigger
- Analysis is carried out to check if the problem originated from Radio, dedicated Slice resources (RAN Slice, UPNF) or shared resources (RAN Node, CCPNF)
- An action for Scale out is launched if the Slice congestion is responsible for the reported degradation



AutoFlow Actions

Summary

2 Total Actions

Recommendation: 1 (100%)

Parameter discrepancy: 0 (0%)

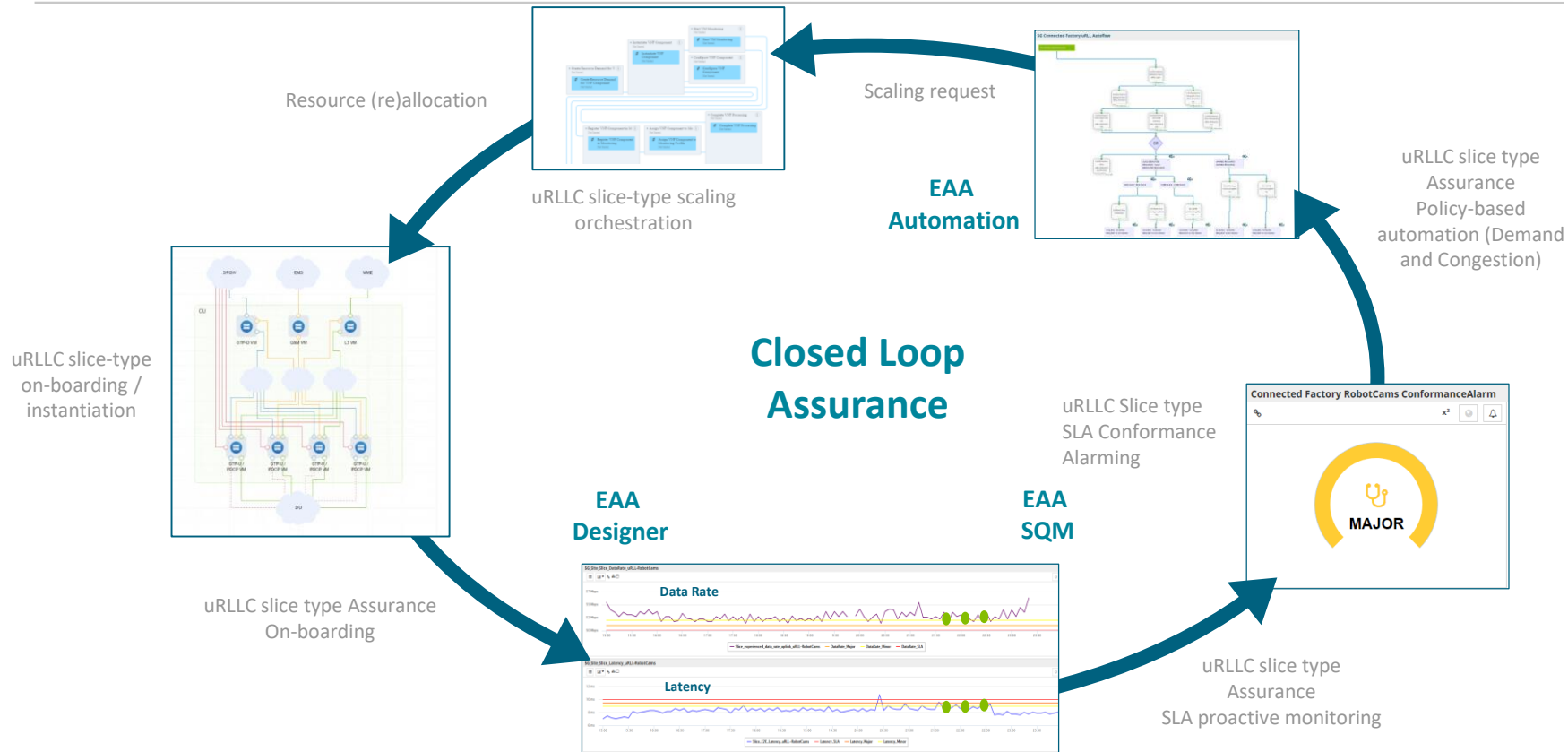
Operation: 1 (100%)

MO Name	AutoFlow Name	Mode Name	Type	Parameter / Note	PreBus	Reac	Timestamp	Status	Actions
ComFactorySite UPLink-RANResource	5G Connected Factory UPLink-AutoFlow	SCALING	Operation	MacroCeller Scale Out	N/A	N/A	2017-05-11 10:11:05	EJECTED	
ComFactorySite UPLink-CCP	5G Connected Factory UPLink-AutoFlow	Policy	Recommendation	Scaling Policy needs to be defined	N/A	N/A	2017-05-11 10:11:03	EDNE	



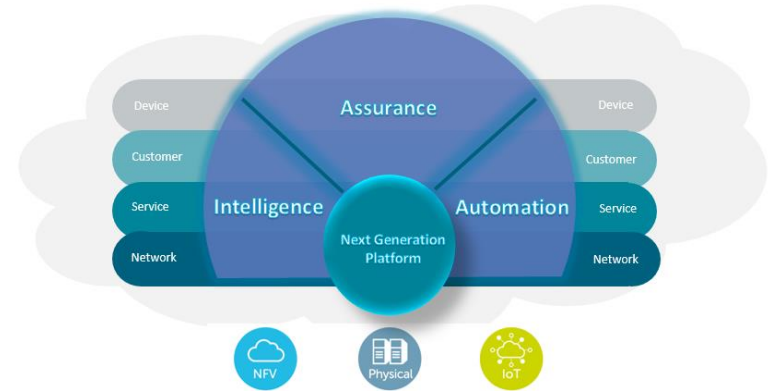
Catalyst Summary

5G Connected Factory uRLLC Use Case



Outcome

- Devised an efficient system to operationalize 5G slices using:
 - Closed loop assurance
 - Policy-based automation
 - Domain/Service Orchestration
- Tested the system for dynamic and autonomous Fulfilment and Assurance for concurrent 5G Slices
- Gained clarity on QoS requirements for 5G service category: uRLLC
- Established the role of APIs in the 5G ecosystem: how to leverage open source to address the needs of IoT
- Demonstrated how 5G ecosystem integration can be carried out through TM Forum concepts and API operations in:
 - TM 628 Performance Management API
 - TR 255 Entity Provisioning API (aka Resources Function Configuration and Activation API)
 - Service Assurance using intent based SLA/OLA approach
- Validated the ZOOM TR 262 Hybrid Infrastructure Platform principles and requirements



Experience Assurance and Analytics



Thank you

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