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Driving the roadmap to digital success
Catalyst:
5G Service Operations – Real Time Service Assurance
Theatre Presentation
Catalyst Problem Statement

Milind Bhagwat- BT
Massimo Banzi-TIM
5G benefits

- A step change in performance and economics
  - Ultra high speed
  - Ultra high capacity
  - Ultra reliable connectivity
  - Ubiquitous coverage
  - Low latency
  - Massive numbers of connections
  - Low energy usage

- 5G will transform lives: autonomous connected cars, smart cities, remote health care etc.
5G 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.
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
Catalyst Solution
Yoann Foucher-MYCOM OSI
Valentin Plotnichenko- NetCracker
Daniel Itzigsohn- TEOCO
Network-Operations-Consumer Scenario

Consumer Scenario

Smart Devices - uRLLC

Vehicle Monitoring and Assistance - uMTC

Operations Scenario

uRLLC Ops

Resource Utilisation Ops

uMTC Ops

Network Scenario

Closed Control Loop

RAN

Core Network

Data Network

Applications

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Connected Factory – uRLLC slice operations

<table>
<thead>
<tr>
<th></th>
<th>uRLLC-Slice-Sensors</th>
<th>uRLLC-Slice-RobotCams</th>
<th>uMBB-Slice</th>
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</thead>
<tbody>
<tr>
<td>Latency</td>
<td>&lt;10ms</td>
<td>&lt;10ms</td>
<td>SLA &lt;50ms</td>
</tr>
<tr>
<td>DataRate-uplink</td>
<td>200 Kbps CBR per Device</td>
<td>50 Mbps CBR per Device</td>
<td>5 Mbps VBR</td>
</tr>
<tr>
<td>per Device</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DataRate-downlink</td>
<td>100 Kbps CBR per Device</td>
<td>200 Kbps CBR per Device</td>
<td>5 Mbps VBR</td>
</tr>
<tr>
<td>per Device</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reliability</td>
<td>&lt; 0.3%</td>
<td>&lt; 0.3%</td>
<td>&lt; 1%</td>
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</table>

Dynamic Scaling (vnfcScalingMetric, Slice allocated bandwidth (MHz))

Pro-active SLA and Demand Monitoring

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Connected Car - uMTC slice operations

Network Slice Flows (NG2/NG3/NG6)

Core Network
- 5G Common CPNF
- 5G Slice UPNF

Data Network

Car Companies
Connected Car Platforms & apps
Proactive Network Monitoring

<table>
<thead>
<tr>
<th></th>
<th>uMTC for V2x communications</th>
<th>mBB-Slice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latency (ms)</td>
<td>SLA &lt; 10ms</td>
<td>SLA &lt; 50ms</td>
</tr>
<tr>
<td>Availability (%)</td>
<td>SLA &gt; 99%</td>
<td>&gt; 95%</td>
</tr>
<tr>
<td>Reliability (%)</td>
<td>SLA &gt; 99.99%</td>
<td>&gt; 98%</td>
</tr>
<tr>
<td>Slice Utilization (%)</td>
<td>&lt; 75%</td>
<td>&lt; 85%</td>
</tr>
<tr>
<td>User Experienced Data Rate (UL/DL) (Mbps)</td>
<td>DL &gt; 5 UL &gt; 1</td>
<td>DL &gt; 30 UL &gt; 5</td>
</tr>
</tbody>
</table>

Proactive Alarming, Correlation
Closed Loop Automation

Dynamic Scaling
(vnfScalingMetric, Slice allocated bandwidth (MHz))
5G Operation – Management platforms and flow.

- Network Slice On-boarding
- Network Slice Inventory/Lifecycle
- Performance Collection and Thresholding
- Slice Scaling request (Scaling API evolving towards Entity Provisioning API)
- Closed-loop Assurance

1. Slices creation and fulfillment
2. Network Slice On-boarding
3. Network Slice Inventory/Lifecycle
4. Performance Collection and Thresholding TMF 628
5. uRLLC Slice Type SLA Operations
6. uMTC Slice Type Operations

5G Network Slice
Service Orchestrator

Service Assurance

VNF Event Stream (ONAP) Metrics Simulation

5G Radio Simulation

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Outcome
Yoann Foucher - MYCOM OSI
Valentin Plotnichenko - NetCracker
Daniel Itzigsohn - TEOCO
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 Fulfillment and Assurance for concurrent 5G Slices

Gained clarity on QoS requirements for 5G service categories: uRLLC and uMTC

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
5G Connected Factory uRLLC Use Case

Connected Factories

- Equipment field sensors
- Robots + IMU sensors

uRLLC (Ultra-reliable and low latency communication)

uRLL Slice type Orchestration Tasks

Closed Loop Assurance

Scaling request

uRLL Slice type Assurance policy Based Automation (Demand and Congestion)

uRLL Slice type SLA Conformance Alarming

uRLL Slice type Assurance On-boarding

On-boarding / Instantiation

uRLL Slice type Orchestration Tasks

Tasks

Data Rate

Latency

MAJOR

uRLL Slice type SLA ProActive Monitoring

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5G Connected Cars uMTC Use Case

Closed Loop Assurance

Connected Cars

Rule-based Automated activation of scale-out and scale-in commands per monitored slice(s)

Application of smart thresholds and correlation to proactively monitor SLA conformance

uMTC slice type Orchestration tasks

Scaling request

uMTC slice type Assurance On-boarding

uMTC slice type Orchestration tasks

uMTC slice type Assurance Orchestration tasks

uMTC (V2X)
Integrated monitoring of contextual car data

Integrated monitoring of contextual car data

uMTC slice type Assurance On-boarding

On-boarding / Instantiation

uMTC (Ultra-reliable machine-type communication)
Next Steps

Yoann Foucher-MYCOM OSI
Valentin Plotnichenko- NetCracker
Daniel Itzigsohn- TEOCO
Call for Action

- Network slice Modelling and Assurance on-boarding templates to include metrics and thresholds (ETSI and TMF bridging)
- Extend and complete API project work (TMF 628, TMF 524 and TR 255)
- Integrate with new sources of data i.e., event streaming for metrics/counters using Open Source vES (OPNFV/ONAP), VES and TMF Bridging
- Identify proprietary APIs as well as Open APIs
- Need for a real NEV for end-to-end live demo