Future of Network and Service Automation

IEEE NOMS Distinguished Expert Panel

Taipei // Taiwan // 26 April 2018
Laurent Ciavaglia
Network Slicing - The foundation for future value creation

Service Request
- Slice Request Attributes
  - Latency:
  - Throughput:
  - Reliability:
  - Mobility:
  - Geography:
  - Security:
  - Analytics:
  - Cost profile:
  - ...

Composable Network & Service Resources
- Application Logic
- Augmented Services
- Virtual Network Functions
- SW-Defined Connectivity
- Cloud Infrastructure

Network & Cloud Orchestration
- Automated composition & operations
- Service Specific Network Slices

Service Delivery
- High performance localized delivery

E2E virtual network optimized for specific tenant, service or service class with dynamic adaption and automated monitoring and control

Network slices are end-to-end ‘virtual private services’
Network and Service Automation are essential to DSP economics

Without E2E automation NFV/SDN & network slicing add significant cost and complexity
Perspective: Evolution of network management architectures
From silos and custom integration to full multi-domain automation

Increasing operational complexity

Single-Vendor Domains
1980 - 2000

Multi-Vendor Domains
2000 - 2012

Network Virtualization
2012 - 2018

Network Automation
Beyond 2018

A new architecture is required to enable network and service automation
Network automation

Multi-level automation

Automation: the action of making a task executable without human intervention

Automation applies from individual functions to orchestration of entire chain of automation i.e. workflows

Automation must apply inside and across domains e.g. enabling end-to-end slice provisioning

Automation challenges

Diversity. How to design automation patterns applicable to the heterogeneity of devices and components

Reliability. How to avoid massive error propagation when extreme automation is deployed

Uncertainty. How to automate when faced with lack of knowledge or variability of the environment or conditions

Automation means

Means for automating Measurement by using streaming telemetry and analytics to generate actionable insights

Means for automating Learning by using machine learning to identify patterns and enable predictive operations

Means for automating Decision by using cognitive and adaptive closed control loops to produce effective (re)action plans

Means for automating Management by using powerful, declarative abstractions (e.g. intents)
## Perspective: Evolution of network management automation

### From reactivity to zero-touch automation

<table>
<thead>
<tr>
<th></th>
<th><strong>Past</strong></th>
<th><strong>Present</strong></th>
<th><strong>Future</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Network/service operations</strong></td>
<td><strong>Reactive</strong></td>
<td><strong>Proactive</strong></td>
<td><strong>Zero-Touch</strong></td>
</tr>
<tr>
<td><strong>Level of automation</strong></td>
<td>Low: single task</td>
<td>Partially automated processes</td>
<td>Closed-loop network and service automation</td>
</tr>
<tr>
<td><strong>Intelligence</strong></td>
<td>Descriptive &amp; diagnostic analytics, for example anomaly detection</td>
<td>Predictive analytics, e.g. for maintenance/repair</td>
<td>Prescriptive analytics &amp; machine intelligence</td>
</tr>
<tr>
<td><strong>Network agility</strong></td>
<td>Static network</td>
<td>More dynamic with partial software control overlay</td>
<td>Fully programmable with embedded software control</td>
</tr>
</tbody>
</table>

*Source: adapted from Analysis Mason*
Industry alignment: ETSI ZSM has a central role in the automation ecosystem

- ETSI Zero touch network and Service Management (ZSM) has a pivotal role in bridging between holistic end-end automation and other standardization bodies or open source projects
  - Requirements derived from use cases
  - Architecture for management/automation
- Open-source projects like ONAP should focus on implementation and validation
- Alignment discussion with LNF and ONAP already started
ETSI Zero touch network and Service Management (ZSM) group

ZSM objectives:
- Define an end-to-end automated network and service management architecture
- Support both legacy and virtualized network infrastructures
- Collaborate with relevant open-source projects, standardization bodies and fora
- Create a foundation for diverse open source groups to produce interoperable solutions

The ZSM group continues growing in a steady pace

ZSM leadership:
- Chair: Klaus Martiny, DT
- Vice chairs:
  - Nurit Sprecher (Nokia)
  - Christian Toche (Huawei)
- NOC Advisory Group Chair: Ashiq Khan (DOCOMO)
ZSM deliverables and milestones

<table>
<thead>
<tr>
<th>Work item number</th>
<th>Title</th>
<th>Rapporteur</th>
<th>Early draft</th>
<th>Stable draft</th>
<th>Final draft for approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZSM 001</td>
<td>Use cases and requirements (specification)</td>
<td>Michael Klotz (DT)</td>
<td>March 2018</td>
<td>Oct 2018</td>
<td>Nov 2018</td>
</tr>
<tr>
<td>ZSM 002</td>
<td>Reference Architecture (specification)</td>
<td>Uwe Rauschenbach (Nokia)</td>
<td>Feb 2018</td>
<td>Jul 2018</td>
<td>Sep 2018</td>
</tr>
<tr>
<td>ZSM 003</td>
<td>End to end management and orchestration of network slicing (specification)</td>
<td>Zou Lan (Huawei)</td>
<td>Jun 2018</td>
<td>Sep 2018</td>
<td>Nov 2018</td>
</tr>
<tr>
<td>ZSM 004</td>
<td>ZSM Landscape (report)</td>
<td>Wu Jinhua (ZTE)</td>
<td>Jun 2018</td>
<td>Sep 2018</td>
<td>Nov 2018</td>
</tr>
<tr>
<td>ZSM 005</td>
<td>Means for Automation (report)</td>
<td>Andreas Krichel (HPE)</td>
<td>May 2018</td>
<td>May 2018</td>
<td>June 2018</td>
</tr>
<tr>
<td>ZSM 006</td>
<td>Proof of Concept Framework (specification)</td>
<td>Klaus Martiny (DT)</td>
<td>March 2018</td>
<td>March 2018</td>
<td>April 2018</td>
</tr>
</tbody>
</table>
Epilogue:

We have just embarked on an exciting journey towards the automation transformation that will help operators to meet user expectations for service agility and create new business opportunities.

All network domains are impacted and re-architecting of the service and management software layers is required.

Key success factors:
- An industry environment that works with full synergy and alignment, converging around a single architecture
- Seamless integration of existing and new automation techniques to enable autonomous networks (driven by intents), automated service order management and service optimization.