Understanding the Role of Internet Technology in Innovation

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Map is needed to understand the relevant pillars of transformation

<table>
<thead>
<tr>
<th>Zero touch</th>
<th>Micro-services</th>
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<td>is the key factor to achieve the operational agility</td>
<td>provides a large part of the cloud native characteristics</td>
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<tr>
<th>Speed</th>
<th>Machine Learning</th>
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<td>of change increases rapidly when DevOps changes the current practices</td>
<td>shifts operational process focus to insights and context</td>
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Role of human-touch in telco is changing due to new innovations

From Network Operations Centers to Programmable Operations Centers

- Skillsets of the troubleshooting and problem solving experts transform rapidly to the *code experts of* operational processes
- New *code* replaces manual tasks being modular, re-usable, automatically tested

Operations Automation

Content creation by different parties

Vendors
Communities
Operators

Operation process playbooks

Execution runtime
Machine learning is mandatory in telco and it is happening now

From Programmable Operations Centers to Intelligent Operation Centers

- The knowledge provided by human insights and machine insights
- Many NOC’s transparently use applications with embed machine learning capabilities
- Operations programmers enable wider area usage of different use cases

Pre-packaged Machine learning
Transparent to operations

- Operational processes become more efficient by using new applications that leverage ML capabilities

Exploratory Machine learning
ML highly visible in operations

- Data science based operational processes
- Very demanding in terms of skill-sets

- Balancing the level of machine learning visibility to operations room
Latest IT is needed to support transition of operations

Driving cultural changes with introduction of latest IT technologies

- Several **preconditions** needed to be fulfilled in order to support machine learning functions within telcos
- Fast and flexible **service production** by full infrastructure programmability and open APIs
- Extreme **operations automation** requires through virtualized platforms and network functions
- **DevOps mentality** is needed also between operators and telecom infra vendors

Example toolbox used to support RAN optimization
Reality check: no consistent E2E automation – yet!

Independent automation development in different technology domains

Mobile network automation scope

- Radio access
- Backhaul
- RAN controllers
- IP/MPLS
- Transport
- CS Core
- RS Core
- Data centers

Examples of automation and virtualization

- **RAN planning**: SON functions
- **RAN operations**: Automated NOC functions, NetAct Advanced Configurator, Nokia Traffica
- **RAN optimization**: Elisa SON
- Backhaul and RAN controller operations: Automated NOC functions
- IP/MPLS service provisioning and orchestration: Elisa SDN
- **CS and PS core operations**: Automated NOC functions, Nokia Traffica
- **Core VNF**: Mobile network DNS, Nokia CloudBand, Ericsson vEPC for NB-IoT

Cloud and service platforms:
- Elisa services
- OTT services
- Internet
- Other PLMNs

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Continuous improvements in changing operational environment

Zero-touch operations with flexible technology platforms, extreme automation and cultural changes

Incidents vs Preventive measures over the years 2011 to 2017.