The Future OSS Vision towards 5G

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1. **5G**
   Requirement & Architecture

2. **SKT’s Journey**
   for Future OSS toward 5G

3. **Future OSS**
   Vision & Consideration
SK Telecom has always been the first-mover in mobile network evolution including 5G to enhance mobile subscriber’s experience.
5G Key Driving Factors

High Speed
More than 1Gbps data rate for VR/AR services

Low Latency
Less than 10ms latency for mission critical services

All Connectivity
Devices connected
- 2016: 6.4B (0.8 per person)
- 2020: 20.8B (2.8 per person)

Mobile Traffic Explosion
Exabytes per month
- 2016: 7EB
- 2020: 35EB
Rethinking operational transformation for 5G

Operational transformations is needed to realize 5G
Operational Challenges in Today’s Mobile Network

Aggressive and continuous network expansion and architectural changes leads to heterogeneous and complex network that is expensive and difficult to manage.

The 5G should be designed with network operating innovation in mind.
Vision on Future Telco Infrastructure: ATSCALE

SK Telecom have set the future evolution direction of Telco infrastructure mainly focusing on ‘Scalable’, ‘Cognitive’, ‘Automated’, ‘Lean’ and ‘End-to-end’

- **Scalable**
  - Efficient resource use
  - On-demand agility
  - Adoptive operation

- **Cognitive**
  - E2E network visibility
  - Real-time analytics
  - Intelligent optimal decisions

- **Automated**
  - Intelligent operations
  - Self-configuration
  - Self-optimization

- **Lean**
  - Open H/W, S/W
  - Open Interface
  - Modularized
  - Standardized

- **End-to-End**
  - E2E analytics
  - E2E optimization
  - E2E automation
  - E2E operation
End-to-end Architecture of ATSCALE

Technology domains of ATSCALE: COSMOS, SDRAN, vCore, uCTN, Unified-O, NG-OSS

COSMOS: Composable, Open, Scalable, Mobile-Oriented System
1 5G
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SK Telecom’s Journey for Future OSS

SK Telecom has implemented a phased operational strategy for evolving into 5G future OSS based on ATSCALE.

**Yesterday**

“Layered & Siloed OSS”

- Manual operation

**Today**

“Unified OSS”

- Manual & Rule-based operation with big data analytics

**Tomorrow**

“Autonomous OSS”

- Autonomous operation & Manual assistant with AI/ML

**Big barrier:** Difficulty of multi-vendor/purpose OSS integration in terms of DB, IF, Portal, Process

SKT’s NG-OSS called TANGO
TANGO Overview

TANGO is SKT Advanced Next Generation OSS to manage and optimize our networks in a cost-efficient and intelligent way.

- Improving investment efficiency
  - Optimized network investment analysis & process environment
- Reducing MTTR (mean time to repair)
  - End-to-end real-time network monitoring & correlation
- Leading service innovation
  - Innovative use case discovery environment
- Minimizing human error
  - Systemized operation knowledges & closed loop control
TANGO Architecture

TANGO consists of 6 components supporting overall operational domains of end-to-end network

Unified Operation, monitoring, statistics and work management

Real-time service analytics with network big data processing

Unified network planning and deployment

Physical/logical network resource data management

Network big data repository and data discovery

Unified OSS Platform with open source s/w and virtualized infra.
Use Cases of TANGO

<table>
<thead>
<tr>
<th>Network Operation</th>
<th>Network Operation</th>
<th>Customer Experience Mgmt.</th>
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<tbody>
<tr>
<td>“Rapid reaction support of network operator from single-view monitoring”</td>
<td>“Network configuration optimization based on traffic condition and performance”</td>
<td>“Customer experience optimization per subscriber with end-to-end data”</td>
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<tr>
<td>▪ Single-view monitoring &amp; fault correlation</td>
<td>▪ Root cause analysis &amp; neighbor optimization</td>
<td>▪ Near Real-time CE-Index measurement</td>
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<tr>
<td>▪ Service area quality monitoring</td>
<td>▪ Traffic Optimization based TPO</td>
<td>▪ In-depth CEI/KPI analysis</td>
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Bharti Airtel partners with SK Telecom about TANGO

TANGO was proven by global operator for absolutely appropriate solution for managing network capacities and optimizing mobile networks

“Telecom operator Bharti Airtel announced strategic partnership with SK Telecom, on September 13, 2017 known for using latest technologies, to build the most advanced telecom network in India.”

Source: Business Korea
Evolutionary Barriers for TANGO’s Next Step

Future OSS is expected for promising to overcome these barriers in 5G era

- Needs for Culture & Skillset Transformation
- Limited Data for AI/ML
- Lack of Standards (Data Model & API)
- Fears of Automation (service outage)
- Lack of Killer Use Case through Automation
- Hybrid NW Integration Complexity

Environments

Technologies
1  5G  
   Requirement & Architecture

2  SKT’s Journey  
   for Future OSS toward 5G

3  Future OSS  
   Vision & Consideration
Previous manual best-effort operational approach will be no longer sufficient for extreme flexible and dynamical requirements within dramatically reduced costs.

- More heterogeneous network mgmt.
- × 2.5 number of RANs at least with massive small cell
- More sophisticated beam mgmt.
- Fast-TTM in days/weeks not months
- All new architectures resulting in a more complex network e.g., 5G NSA, SA, SDN, NFV
- Different services support with their own requirements
Future OSS in 5G

The only way that these difficult goals can be achieved is Future OSS with vastly increased automation in management and operation of 5G network.

Future OSS

Manual Operations

Present OSS (LTE)

Evolved OSS (Early 5G)

Autonomous Operations

Self-mgmt. and optimization based on AI/ML

Zero-touch operation means extreme automation with seldom required manual intervention

Autonomous operations:
- Action recommendation from rapid root cause analysis
- Rule-based simple work execution

OSS Maturity

Ratio

100%
Future OSS Vision

Future OSS should be evolved toward providing ① Proactive operation, ② Zero-touch optimization, ③ Sophisticated CEM, through iterative learning and prediction of network behavior.
Future OSS in Action

Aspects of consideration

1. End-to-end network
   - Legacy
   - NFV / SDN

2. Real-time analytics
   - ML based Analytics
   - Pre-defined Rule
   - Use Case
   - Defined Case
     - Root Cause Analysis
     - Service Outage Prediction
     - CE Quality Predilection
     - Deployment Recommendation

3. Decision & Control
   - Next Best Action
   - Pre-defined Execution
   - N/W Control

4. Discovery analytics
   - Network Data
     - (Inventory, CE quality, Network quality, Log)
   - Knowledges
   - Experts
   - ML, AI

Non-real time zero-touch automation
- Undefined Case

Real time zero-touch automation
- Defined Case
- Real-time analytics
- Network Data Collection

AI Assistant
Considerations – Service Aspect

Sophisticated management and optimization is required to accommodate a wide range of horizontal or vertical network services such as network slicing management.

- **“Single efficient network”**
  - Today’s network serving all service and devices

- **“Horizontal Slicing”**
  - A few network slicing for macro objective

- **“NasS: Vertical Slicing”**
  - Several-hundreds vertical slicing for service specific customization
Considerations – Orchestration Technology Aspect

Hybrid network infra orchestration is required to implement gradually in order to minimize the impact of NFV/SDN integration.

**“Phase 1”**
- BSS
- Legacy OSS
- EMS
- MANO
- Legacy
- NFV

**“Phase 2”**
- BSS
- Evolved OSS
- EMS
- MANO
- Legacy
- NFV
- SDN

**“Phase 3”**
- BSS
- Future OSS (Converged Orchestration)
- EMS
- MANO
- Legacy
- NFV
- SDN

- **“No or limited interface with Independent MANO deployment”**
- **“Expanded interface with MANO supporting limited orchestration + Major EMS function support”**
- **“Fully integrated OSS supporting network and service aware autonomous orchestration”**
Considerations – AI/ML Technology Aspect

Both AI assistant and ML based analytics are required to automate and simplify network operation, through defining common data model.
Considerations – Open Ecosystem Aspect

Cooperation and alignment across the siloed industry is essential to achieve future OSS for realizing zero-touch management and operation.

- Applications
  - Cloud Foundry
  - WSC
  - IETF

- Analytics
  - Pando

- Orchestration, Mgmt., Policy
  - OpenMANO
  - OPEN-O
  - OPA
  - ARIA
  - CLOUDIFY

- Cloud & NFV Infra Mgmt.
  - OpenStack
  - CORD

- Network Control
  - ONAP
  - OpenDaylight
  - ONOS

- Open Source Initiatives
  - MEF
  - NIST
  - TMForum

- SDO & Fora
  - IEEE
  - IETF

- Supporting Associations
Conclusions

Future OSS is not just developing a new state of the art technology

It’s a journey with real paradigm shift in whole areas

Technology should automate operational tasks, enabling people to improve results rapidly

Technology should support the process and eliminate repetitive or tedious tasks
Thank you