Achievement in 5G Network Deployment and Automation

Sangheon Lee
Head of NW Development Unit

LG U+ 5G Services

B2C Use cases and network requirements – eMBB (enhanced Mobile Broad Band) mainly for downlink

Fixed (mostly in-building)

U+VR 5G

Virtual Date with Celebrity

Exclusive Contents
- Circus, K-toons

U+AR 5G

Home Training

AR video with
K-pop star

Fixed and mobile

U+AR 5G

AR Shopping

5G Cloud Game

Mostly mobile

Live Stream
K-pop Concert

Live Stream
e-Sports Game

Live Stream Baseball Game

Live Stream Golf Game

LG U+ 5G Services

B2B Use cases and network requirements – eMBB (enhanced Mobile Broad Band) also for uplink

U+ Remote Control 5G

- Autonomous operation of construction equipment

U+ Smart Factory 5G

- OEMs and Manufacturers
- Reduce CAPEX in logistics, quality control with mobility
- Robotics, Vision inspection, 4K camera

U+ Industrial AR/VR 5G

- Facility/Equipment maintenance
- Remote support for field engineers using AR/VR

Key Challenging Points

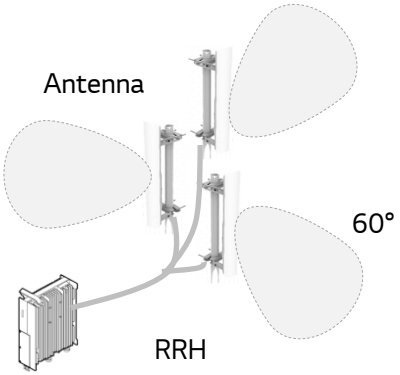
Difficulties as a “World First” pioneer

- New hardware specification with beamforming
- Cell planning criteria with new frequency band and new radio technology
- Limitation of Initial UE
- RF parameter optimization
- E2E optimization especially for enterprise users

5G Hardware Requirements

Consideration on Beamforming

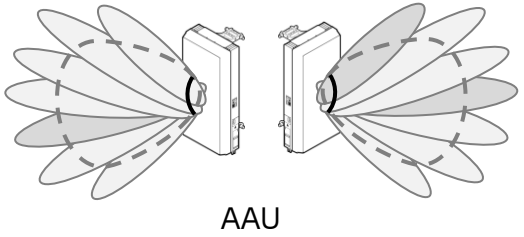
Legacy RRH Configuration



- Single Beam – less coverage
- 3 Branches of signal split from single RRH to cover 360°
- Reuse of existing cell planning

VS.

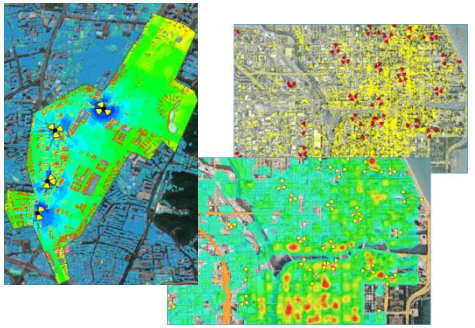
Beamforming Configuration



- Multiple Beam – better coverage
- 2 single signals w/o split to cover 360°
- New cell planning
- Heavy weight of AAU

5G Cell Planning

New way of cell planning with new radio technology



Readiness of cell planning tool

- Commercially not mature enough for 5G

Better performance with less gNBs

- Achievement of competitive advantage than other operators

Collaboration with partner

- Early drop of software package based on LTE radio model
- “in-house” calibration of 5G radio with field test information

Verification with various models

- Classification of radio model considering building, foliage, street
  → Dense urban(Residential/Commercial district), Urban, Rural etc
- “in-house” knowledge of grid based propagation model

Limitation of Initial UEs

Neighbor Relation without ANR

Manual neighbor relation based on defects of KPIs

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"in-house" topology based neighboring cell management system

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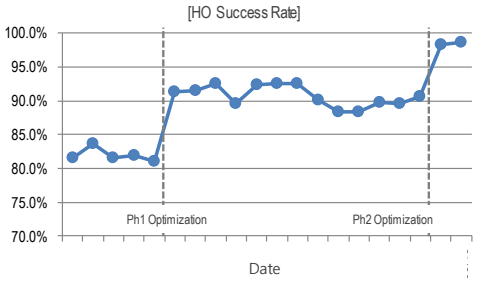
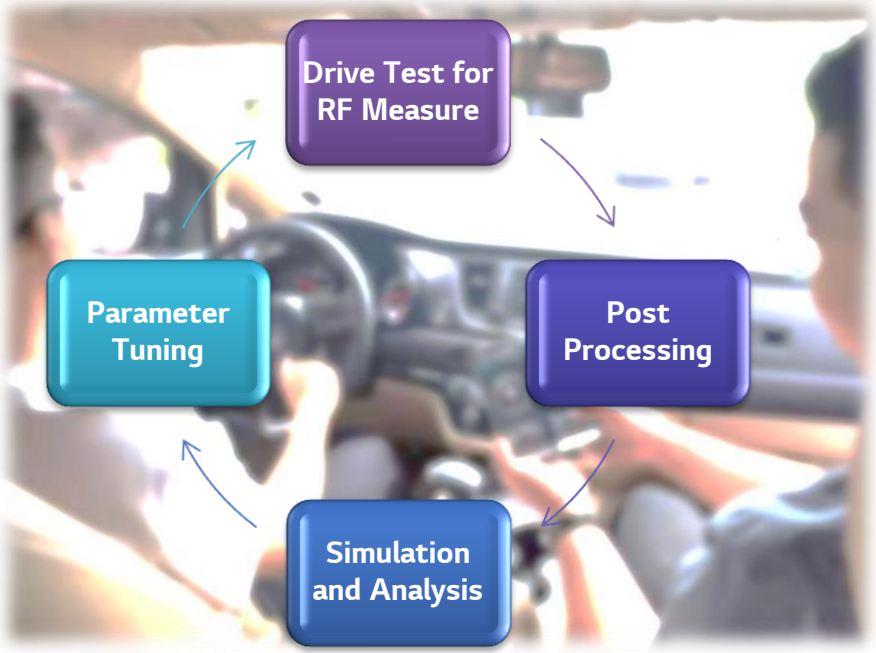
ANR (hopefully in the very near future)



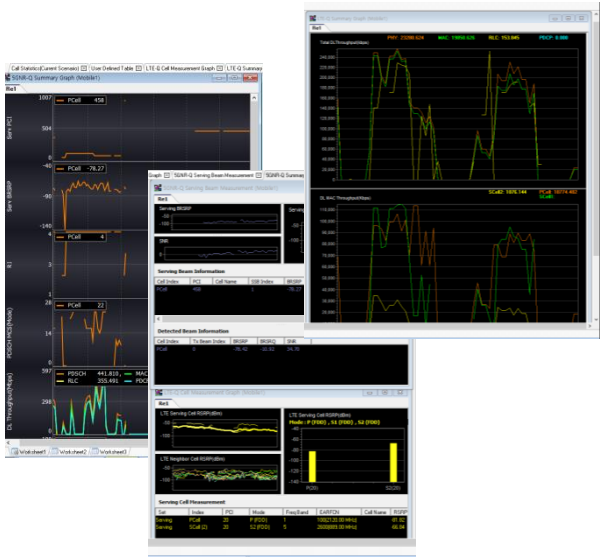
5G RF Optimization

Initial Phase: RF measurement during drive test for parameter optimization



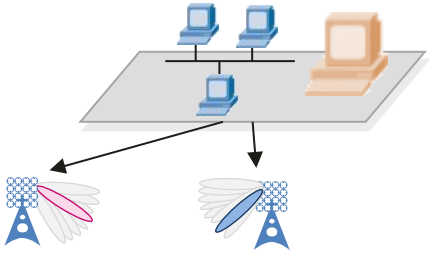
Design of New 5G DM Tool with Partner

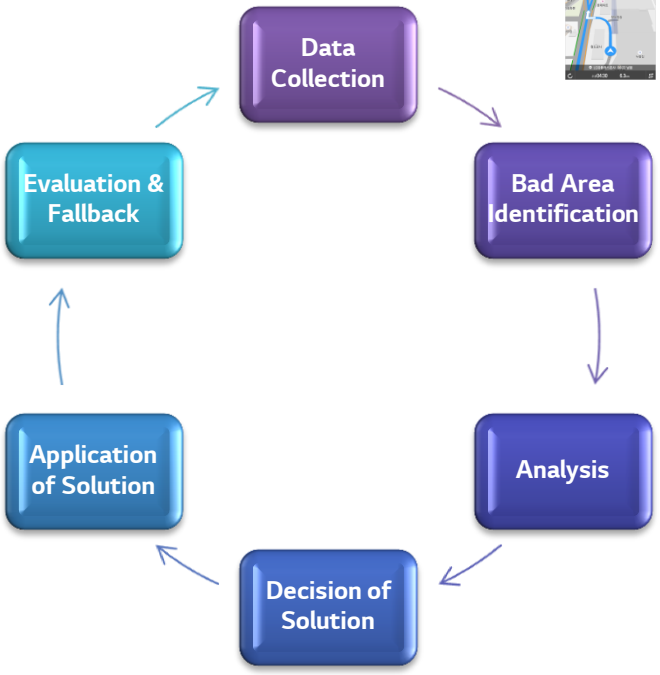
- Mobile DM for on-site measure
- PC DM for post processing

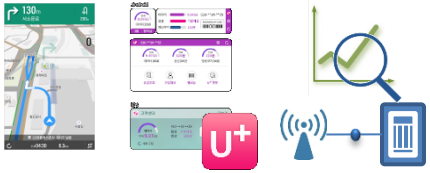


5G RF Optimization

Fully Automated performance enhancement as a next step – closed loop control







5G Requirements for Enterprise Customers

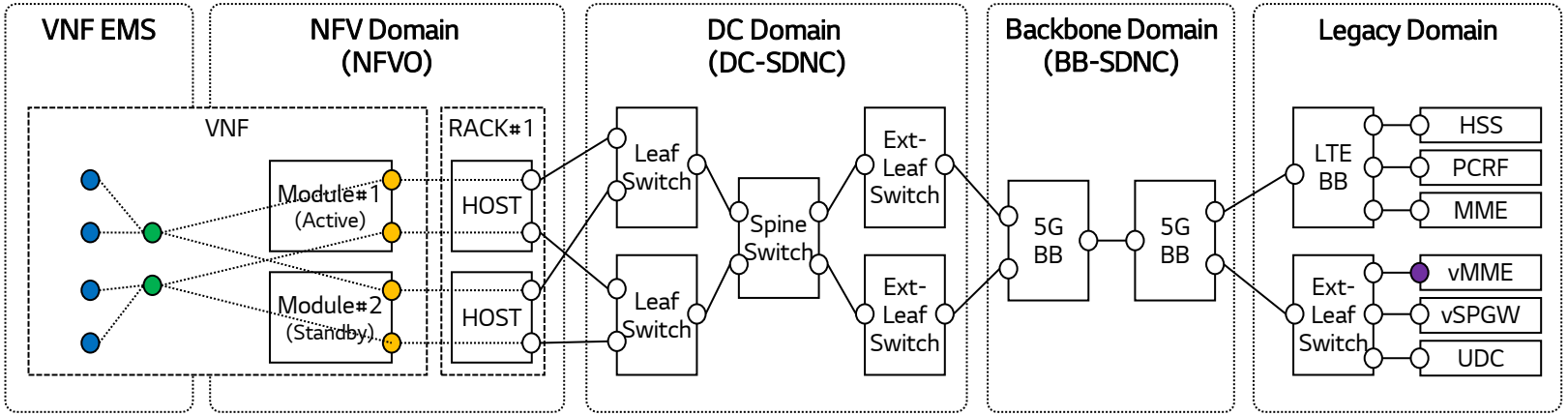
New network design criteria

Heavy uplink traffic - 4k Video for vision inspection, smart CCTV	⇨	**28GHz Frequency band** - Consideration of uplink centric TDD conf.
Low Latency - 4k Video for vision inspection, smart CCTV	⇨	**Mobile Edge Computing** - Tradeoff b/w cost and performance
Security - Independent dedicated resource management	⇨	**Network Slicing** - E2E management of network resources
Time-to-market - Faster service subscription and realization	⇨	**Fully automated E2E management** - E2E orchestrator for “as a Service” infra.

5G End-to-End Optimization

Automated optimization for end-to-end infrastructure

- Covers end-to-end system including RAN, virtualized core and IP/transport
- Automates lifecycle management of NFV components
- Supports various EMS/MANO interfaces including CLI/REST APIs



LG U+ NG-OSS

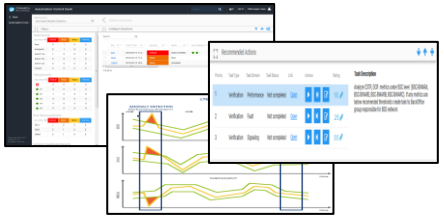
Next Generation OSS (NMS3.0)

- Digitalization of “expert’s know-how” for automatic analysis and operation
  - Efficient reorganization: Site engineers to developers of new algorithm for automation
- Management paradigm shift from network element level to customer/service level
- 5G network in initial stage, legacy mobile and home network systems in next stage

Big Data Analysis

Data Repository of FCAPS

Machine learning base AI



ACD (Automation Control Desk)

- Root Cause Detection
- Abnormal Performance Detection
- Recommended Action Support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5G for all
Thank You