ITU-T Workshop on
Bridging the Standardization Gap
and Interactive Training Session

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LTE and Network Evolution

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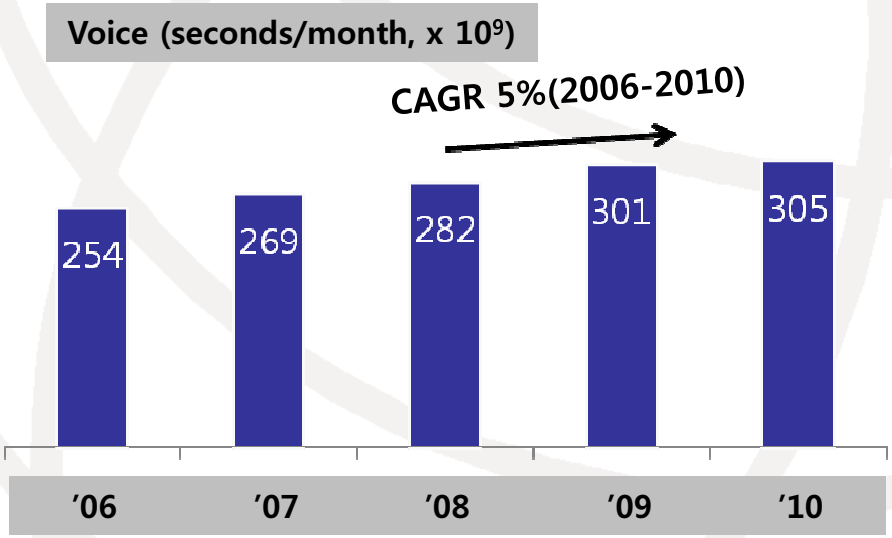
Contents

In recent years, SKT's analysis shows small increase in voice traffic, but explosive increase in data traffic due to popularization of smart devices.

Voice Traffic Trend

○ **Voice Traffic Saturation**

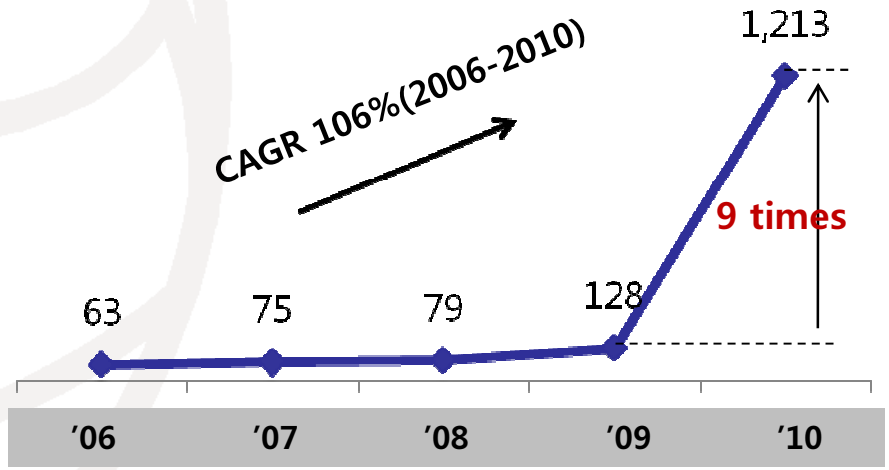
- CAGR for voice traffic increases by 5%
- Increasing rate diminishes after '09



Data Traffic Trend

○ **Data Traffic Explosion**

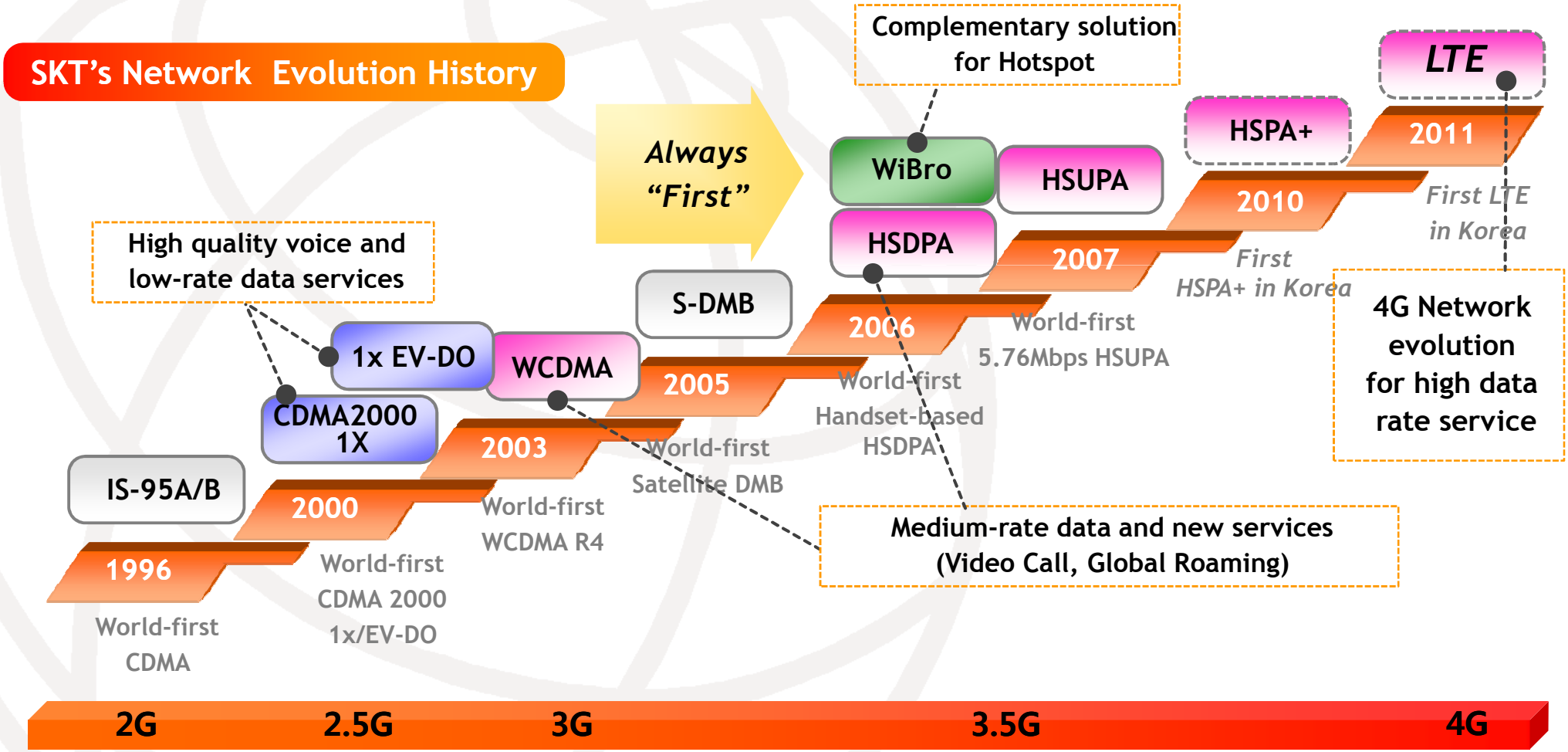
- CAGR for data traffic increases by 106%
- Data traffic explosion after '09
  (About 9 times increase from '09 to '10)



Data Traffic Explosion is "World-wide Trend"

SKT's Network Evolution

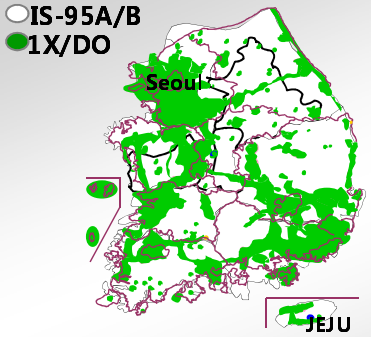
SKT's mobile network has evolved by rapid adoption of new technologies, and LTE-based evolution is on-going to offer top-class services continuously in the era of data explosion.



Ⅰ. SKT's Network Strategy and LTE

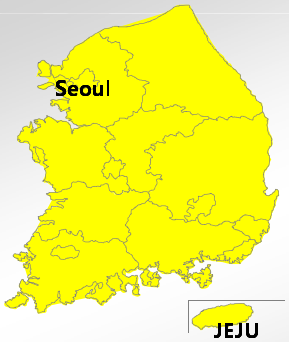
SKT's network portfolio efficiently copes with the data traffic explosion by hierarchical multi-solution considering the traffic characteristics

IS-95A/B, CDMA 1X/EVDO



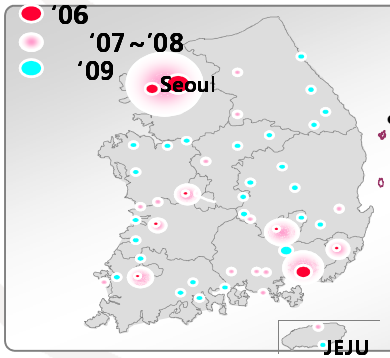
- IS-95A/B: Nationwide
  1X/DO: 92% Population
- 800MHz (BW 15MHz)
- 38% of total subscribers

WCDMA (HSPA)



- Nationwide coverage
- 2.1GHz (BW 30MHz)
- 62% of total subscribers

WiBro (Mobile WiMax)

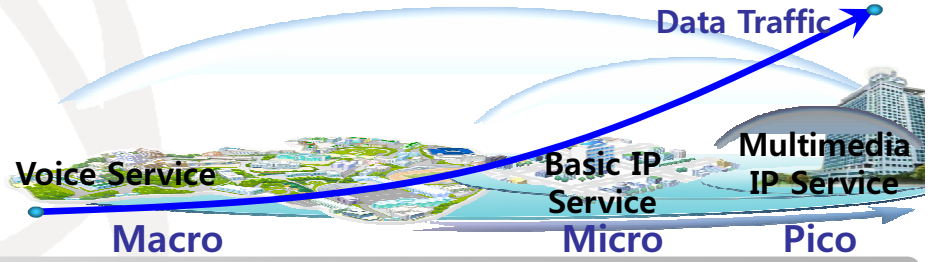


- Metropolitan area (Seoul)
  Hot zones in major cities
- 2.3GHz (BW 27MHz)

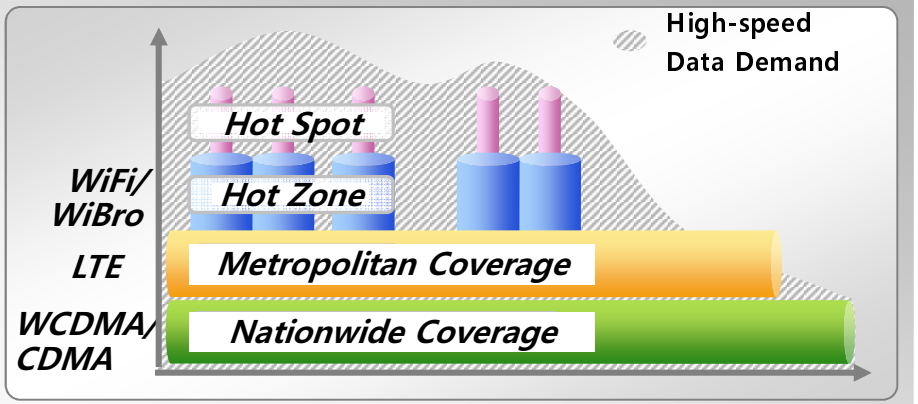
SKT's strategy for Mobile Broadband

- **Data Demand in Hot Zone**
  (Campus, Home, Office, etc.)
- **Cell Coverage Reduction for Higher Data Rate**

→ ***New Deployment Concept for Mobile Broadband***



Optimal Network Portfolio



Ⅰ. SKT's Network Strategy and LTE

In July of 2011, SKT will provide the First LTE Service in Korea.

LTE will be used for dealing with high data traffic in metropolitan area over nationwide WCDMA/HSPA ('11/'12), then extended to nationwide coverage ('13).

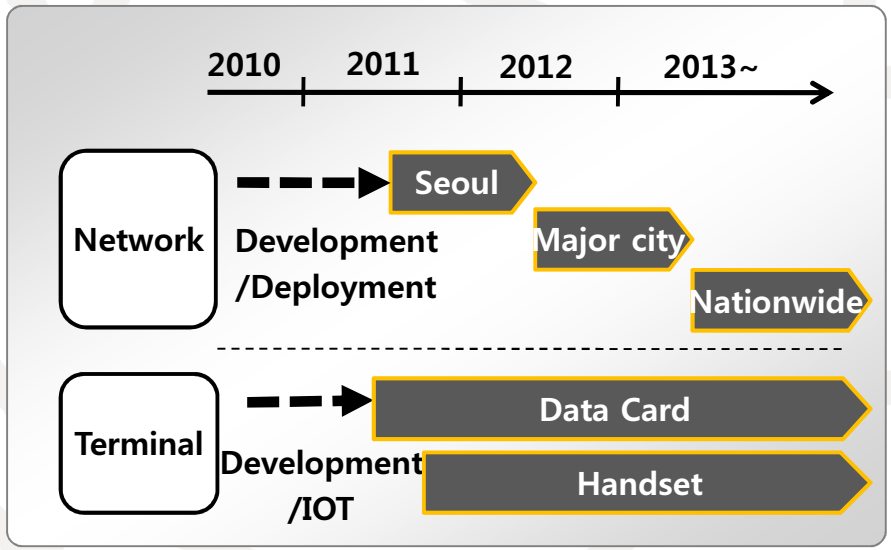
SKT's LTE Plan

2011: First LTE service in Korea ('11, July)

with data card type terminal (Handset type terminal will be available in 2nd half of '11)

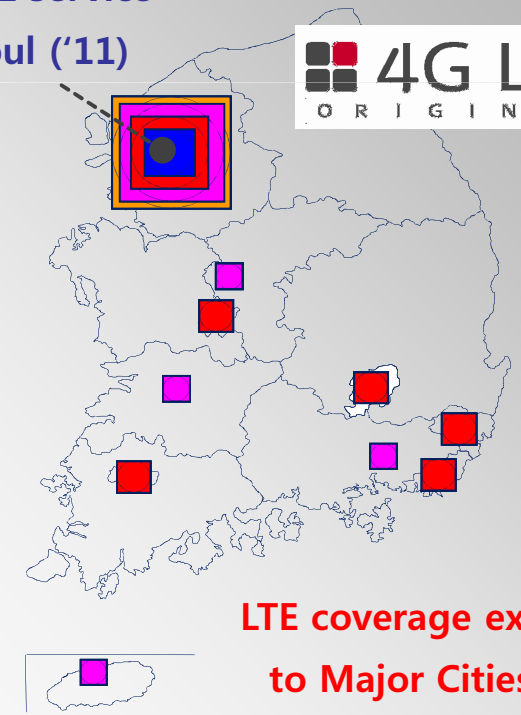
2012: Coverage extension to major cities

2013: Nationwide coverage



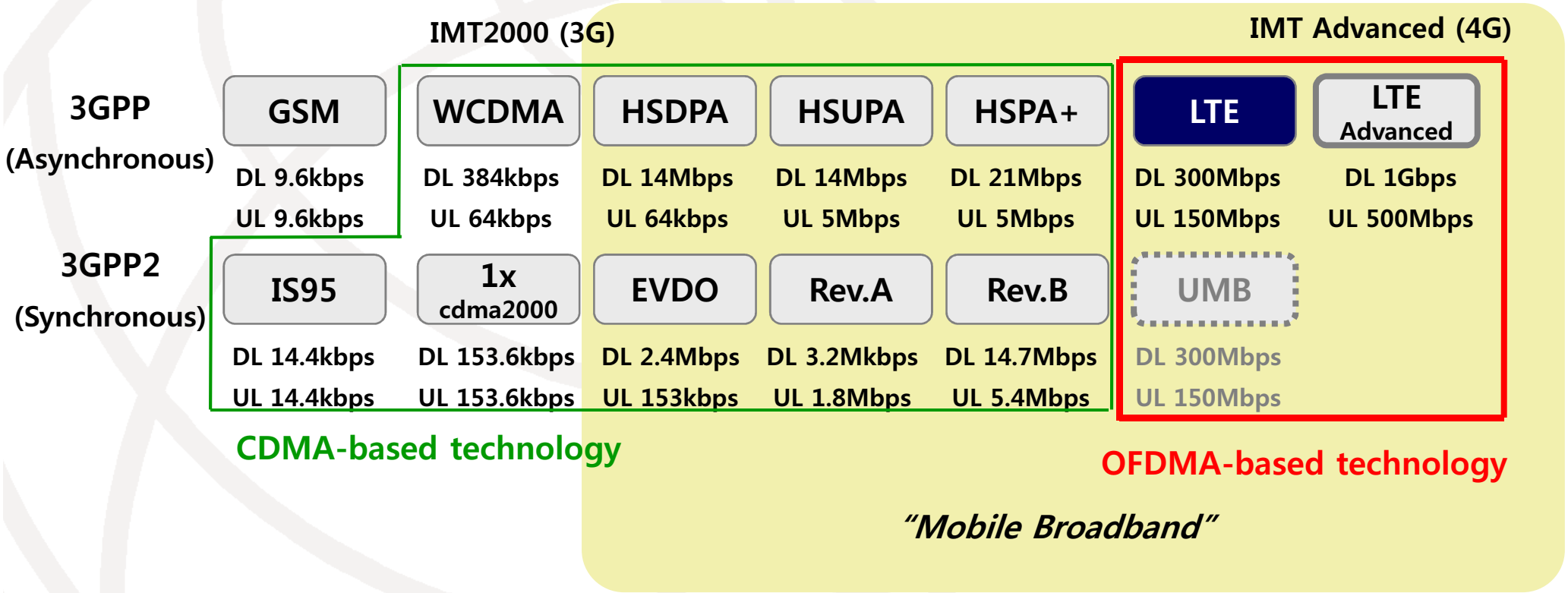
SKT's LTE Deployment

First LTE service in Seoul ('11)



LTE coverage extension to Major Cities ('12)

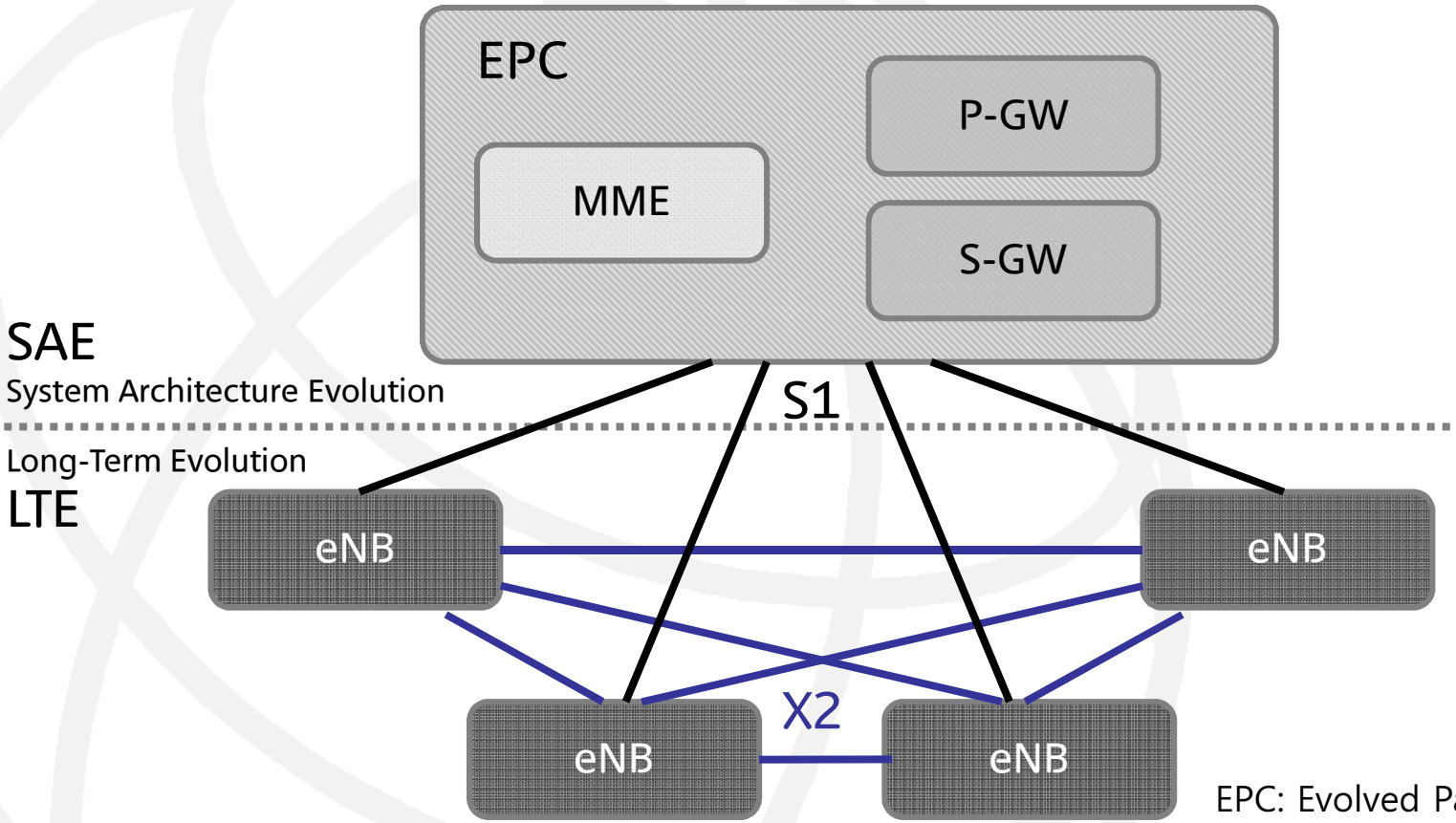
CDMA-based mobile technology is evolving to OFDMA-based technology for high data rate service. LTE will provide 3~15 times peak data rate as compared to HSPA



- **CDMA(Voice-oriented):** Connectivity, Circuit, Soft Handover
- **OFDMA(Data-oriented):** Wider Bandwidth, Packet, Less Interference

- **Peak data rate**
  - 100 Mbps DL/ 50 Mbps UL within 20 MHz bandwidth
    (DL : 5bps/Hz, UL : 2.5bps/Hz, 2x2 MIMO default)
- **Capacity**
  - Up to 200 active users in a cell (5 MHz)
- **Latency**
  - Less than 100 ms on control-plane(Idle to Active)
  - Less than 5ms on user plan(Unload condition, one-way transmit time bw UE ~ RAN Edge node)
- **Mobility**
  - Optimized for 0 ~ 15 km/h, 15 ~ 120 km/h supported with high performance
  - Supported up to 350 km/h or even up to 500 km/h
- **Handover**
  - Hard Handover
- **Spectrum**
  - Flexibility: 1.4 , 3, 5, 10, 15, 20 MHz
- **User Equipment**
  - Support up to 20 MHz
- **Duplex**
  - FDD, TDD

LTE Network Architecture



EPC: Evolved Packet Core

MME: Mobility Management Entity

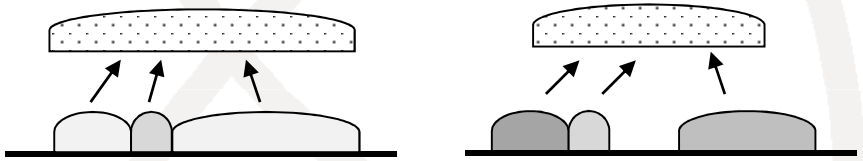
P-GW: Packet Data Network Gateway

S-GW: Serving Gateway

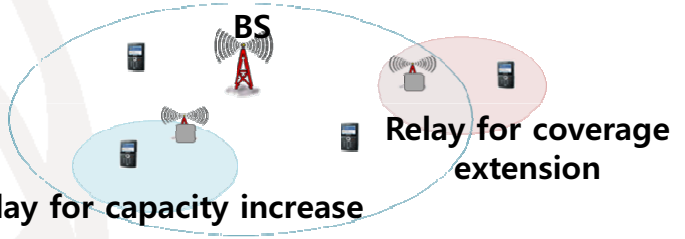
LTE will evolve to LTE-A(Advanced) to enhance the capacity, QoS, and N/W flexibility.
SKT will provide LTE-A service in 2013-14.

LTE-A Technology

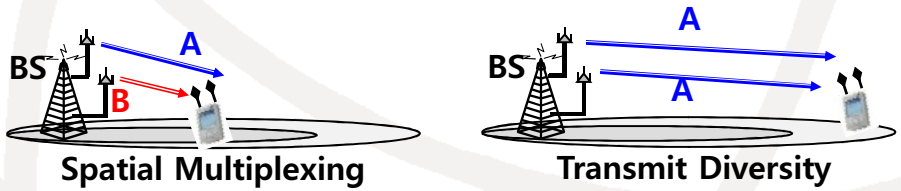
Carrier Aggregation (Up to 100Mhz)



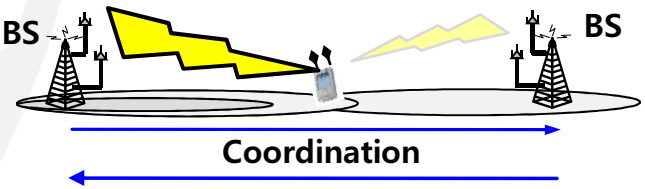
Relay Station



MIMO (up to 8×8)

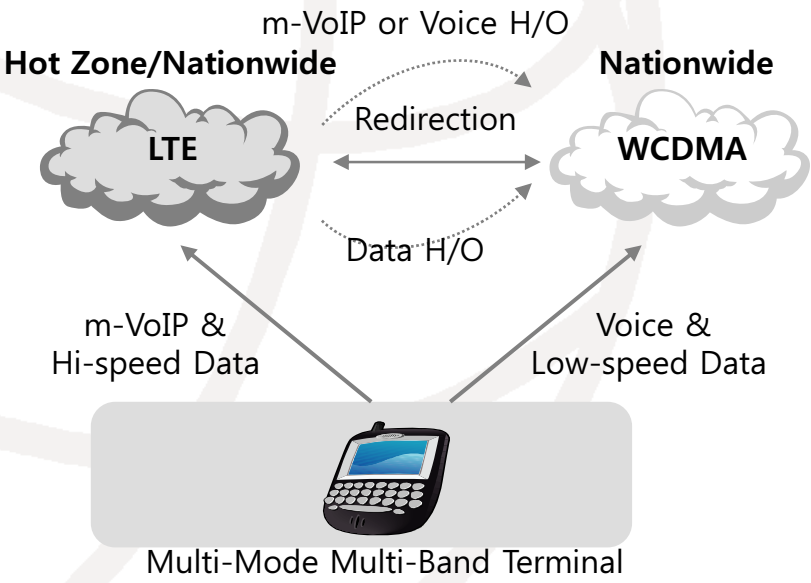


CoMP(BS Cooperation)



Seamless operation is one of most important issues for LTE deployment in multi-N/W environment

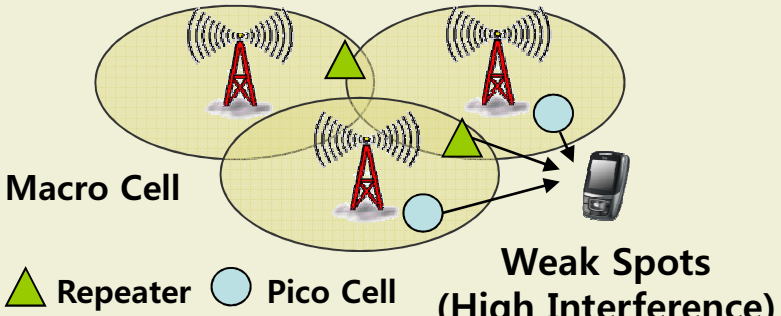
N/W Selection	**Selecting serving N/W based on customer profiles, operator policy and terminal types**
N/W Redirection	**Redirecting requested calls into other N/W (e.g., CS Fallback)**
Seamless Handover	**Supporting continuity and mobility of voice/data calls**
Seamless Voice Service	**CS Fallback based on 3GPP-R9 standard/ IMS-based mVoIP**



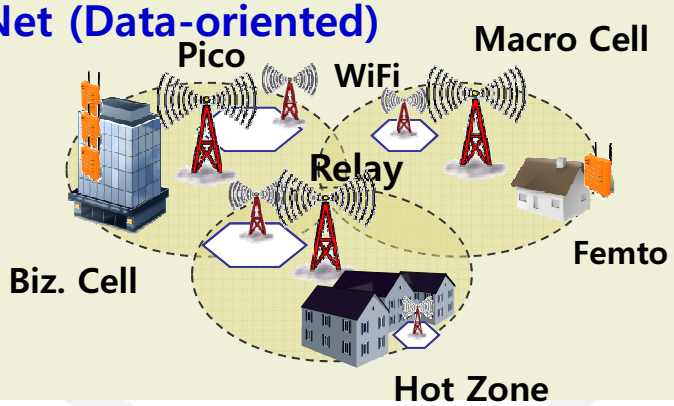
Heterogeneous Network

Heterogeneous network maximizes the spatial reuse gain, and deals with non-uniform traffic.

Conventional (Voice-oriented)



HetNet (Data-oriented)



Network Automation (SON)

Network operation and management can be automated by SON technologies.

Self-Configuration

Plug and Play
Automated setup and configuration

SON(Self Organizing Network)

Self-Optimization

Auto Tune
Real-time network optimization

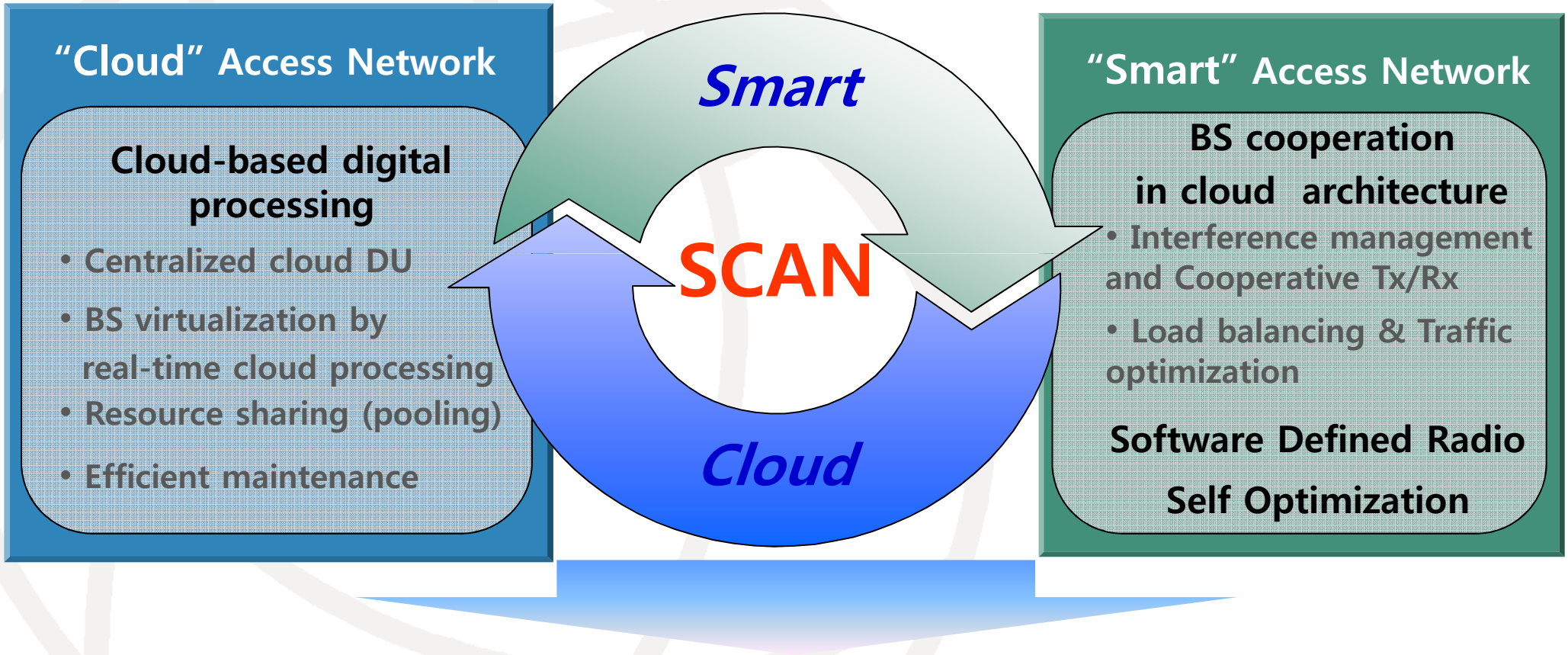
Self-Healing

Auto Repair
Fast, autonomous failure mitigation

IV. SKT's RAN Evolution : SCAN

Smart Cloud Access Network

SKT's RAN(Radio Access Network) architecture is evolving to *"SCAN"*
in order to reduce the network cost and enhance the capacity



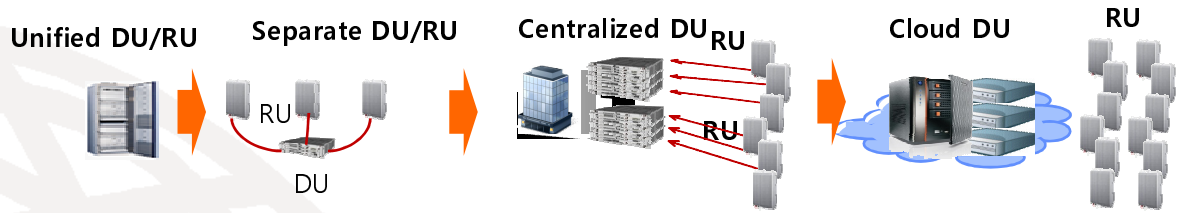
Network Cost Reduction
Flexible Network Architecture

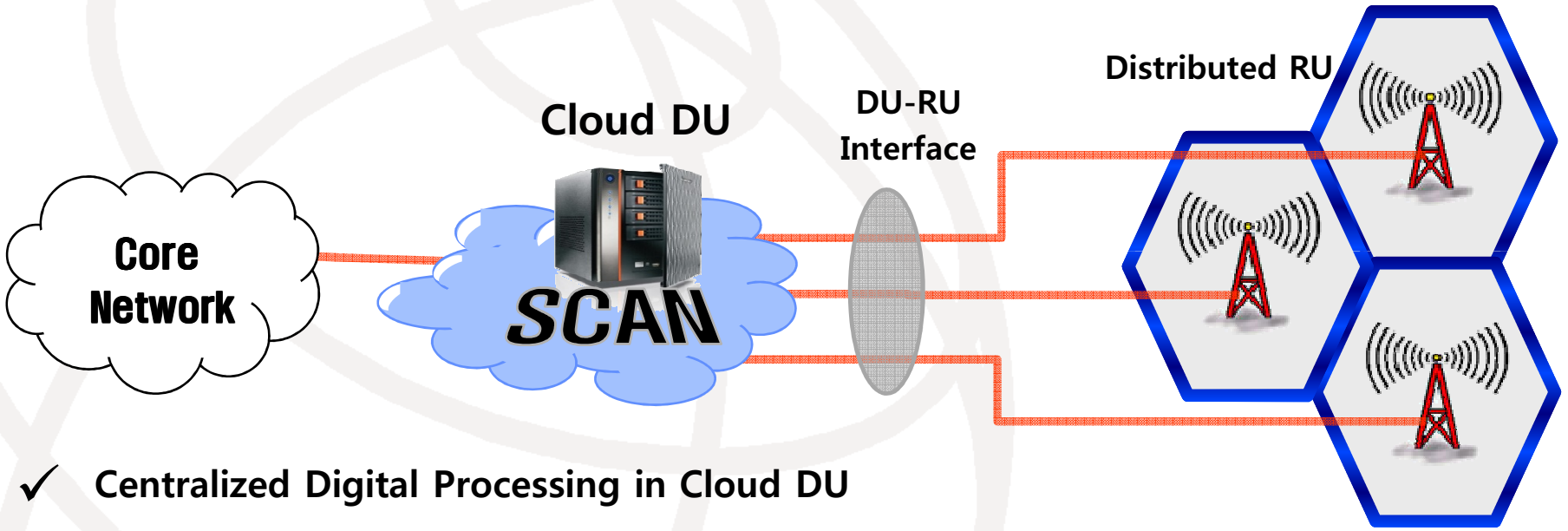
Capacity Improvement
Eco-Friendly Technology

IV. SKT's RAN Evolution : SCAN

Cloud Architecture

✓ Evolution to Cloud Architecture





✓ **Centralized Digital Processing in Cloud DU**

- First step: Separate DU/RU & Centralized DU
- Second step: BS virtualization by real-time cloud processing

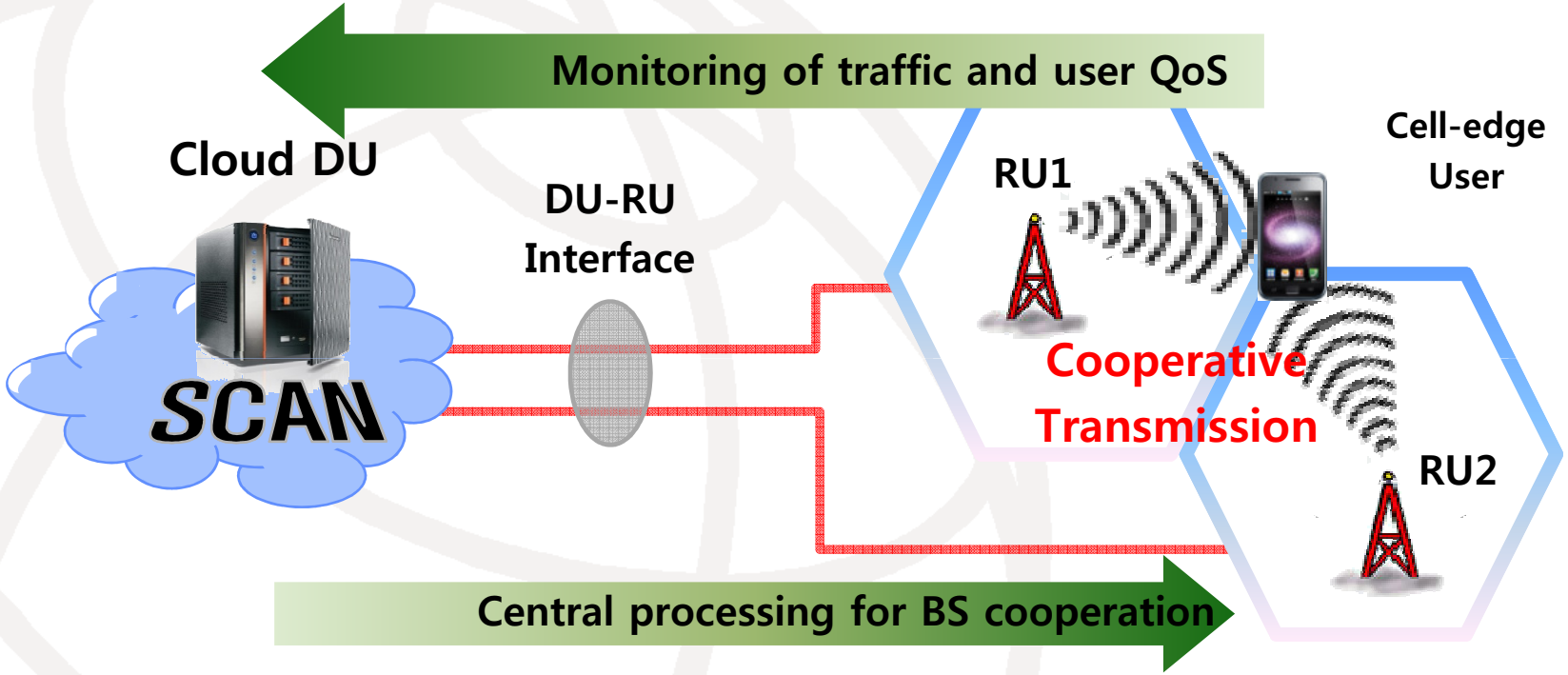
✓ **Flexible Network Architecture**

- Efficient resource management via virtualization
- Flexible network configuration using open platform

IV. SKT's RAN Evolution : SCAN

Smart Network Technology

✓ Evolution to Smart Network: Cloud-based BS cooperation, SDR, Self-optimization



✓ **Cloud-based BS Cooperation : Network Capacity Enhancement**

- Cooperative Radio Resource Management
- Multi-cell Transmission based on Multi-antenna Scheme
- Load Balancing and traffic optimization

✓ **SDR (Software Defined Radio) to support multi-technology**

Thank You