

**Emerging Technologies:
From Smartphones to IoT to Big Data**

Smart Device & Mobile Emerging Technologies

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Yonsei University**

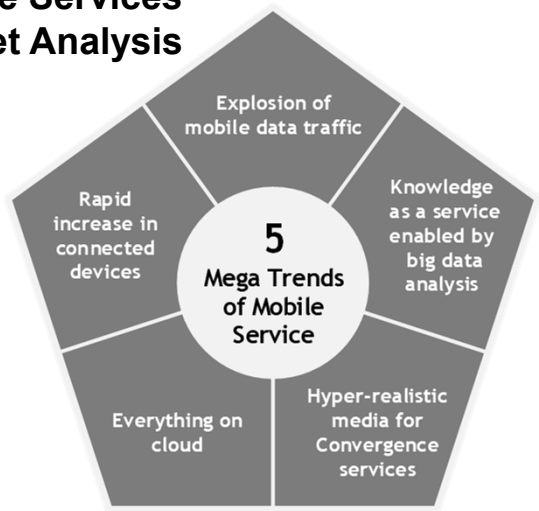
Smart Device & Mobile Emerging Technologies

❖ Modules

- 1. Mobile Business Rankings & Analysis**
- 2. Smart Devices**
 - Smartphones, Smart Watches, Components
- 3. Mobile Communications**
- 4. 4G & 5G Mobile Technologies**
- 5. Smartphone OSs**
 - Android, iOS
- 6. Smartphone & Mobile Network Project**

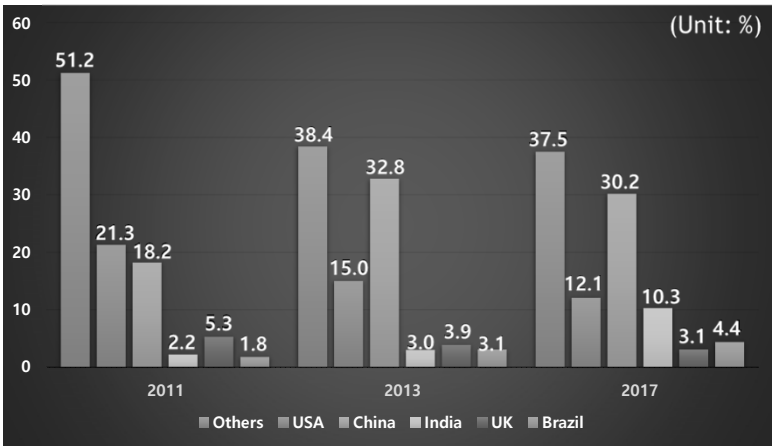
Mobile Business Rankings & Analysis

Mobile Services Market Analysis



Mobile Business Rankings & Analysis

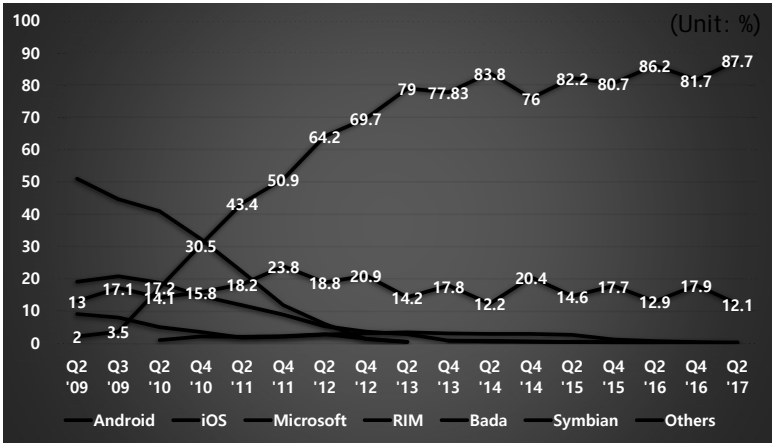
❖ Global Smartphone Market Share by Country



[Ref] Statista, Global smartphone market share in 2011, 2013, and 2017, by country, 2018

Mobile Business Rankings & Analysis

❖ Global Mobile OS Market Share



[Ref] Statista, Global mobile OS market share in sales to end users from 1st quarter 2009 to 2nd quarter 2017, 2018.

Smart Devices

❖ Smartphones & Smart Watches

- Galaxy Note8

- Gear S3

- iPhone X

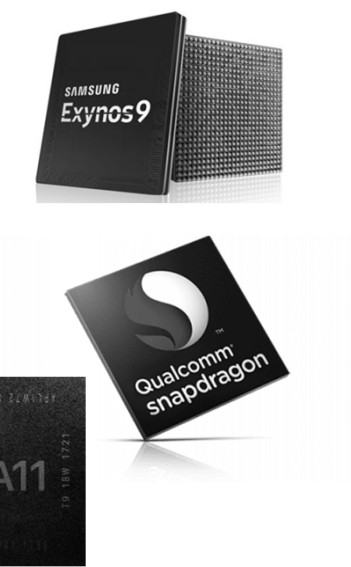
- Apple Watch Series 3

IP67 IP68
Dust Tight
Waterproof
Under 1m
Beyond 1m



Smartphone SoC Processors

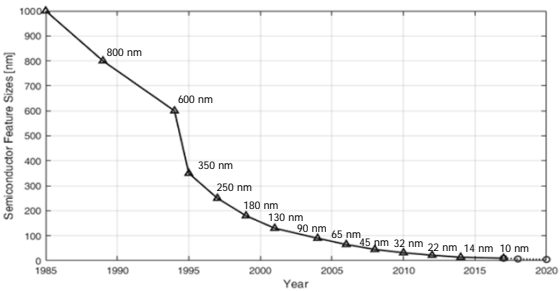
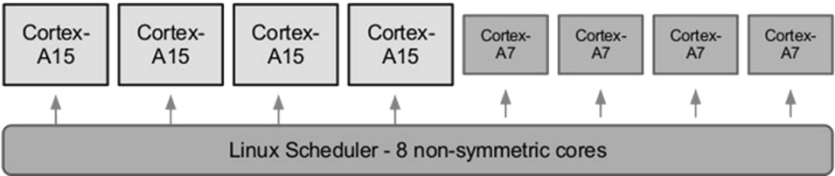
- ❖ Samsung Exynos Octa 8895
- ❖ Qualcomm MSM8998 Snapdragon 835
- ❖ Apple A11 Bionic



Smartphone Semiconductor Technology

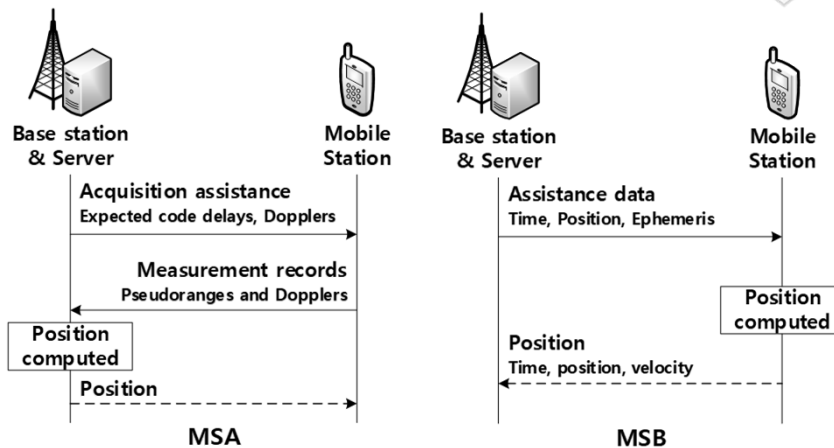
- ❖ Semiconductor Size Evolution
- ❖ big.LITTLE

ARM



Smart Device GPS

- ❖ GPS (Global Positioning System)
- ❖ A-GPS (Assisted-GPS)




Wireless Charging Technologies



Type	Inductive	Resonant
Frequency	Power transmission (Charging) 100~250 kHz (WPC) 232~278 kHz, 205~300 kHz (PMA)	6.78 MHz ± 15 kHz (A4WP)
	Power control (Communication) In-band (Packet)	Out-band (BLE 2.4 GHz)
Standardization		WPC, AirFuel (PMA) AirFuel (A4WP)
Characteristics	Compliant with Qi & PMA	Compliant with Rezenze Multi device charging Free positioning

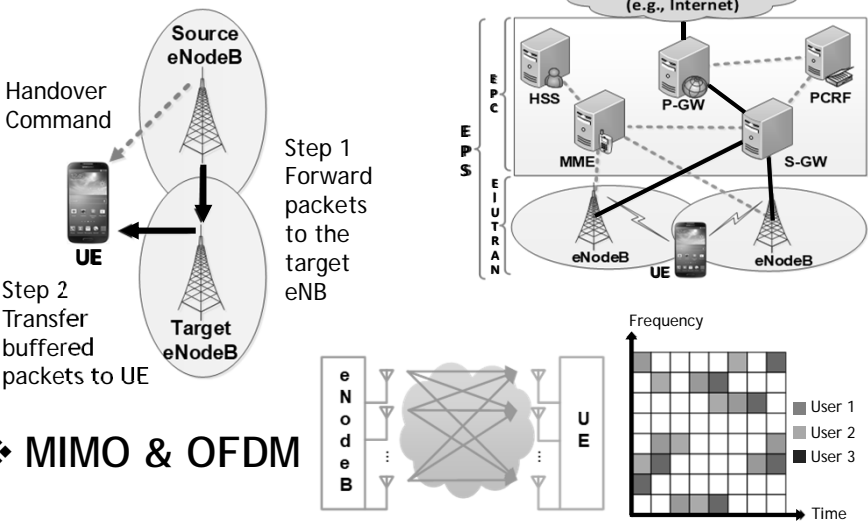
Mobile Communications 1G~5G

- 1G: AMPS
 - 2G: GSM, IS-95, cdmaOne
 - 3G: UMTS, WCDMA, CDMA2000, CDMA2000 1xEV-DO, HSDPA, EV-DO Rev. A, HSPA+, EV-DO Rev. B
 - 4G: LTE, LTE-A
 - 5G
- 

SIM (Subscriber Identity Module)

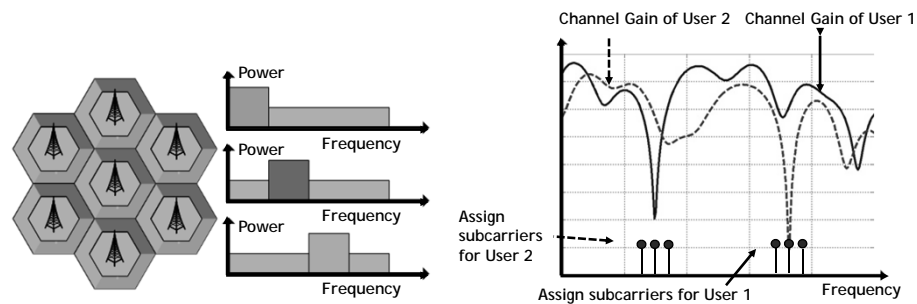
4G LTE

❖ Packet Forwarding & HO



4G LTE-A (LTE-Advanced)

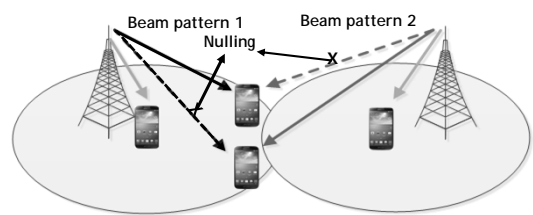
- ❖ ICIC (Inter-Cell Interference Coordination) & FFR (Fractional Frequency Reuse)



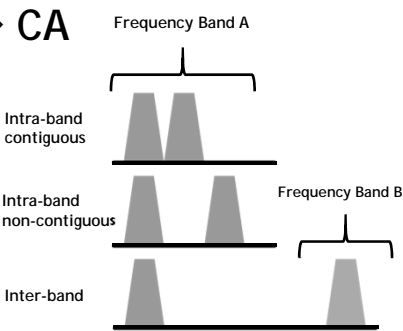
- ❖ DSA (Dynamic Subcarrier Assignment)

4G LTE-A (LTE-Advanced)

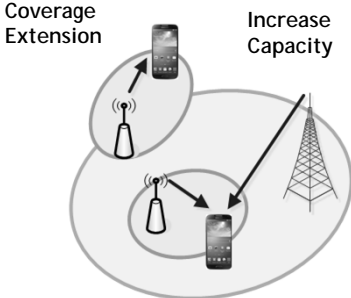
- ❖ CoMP

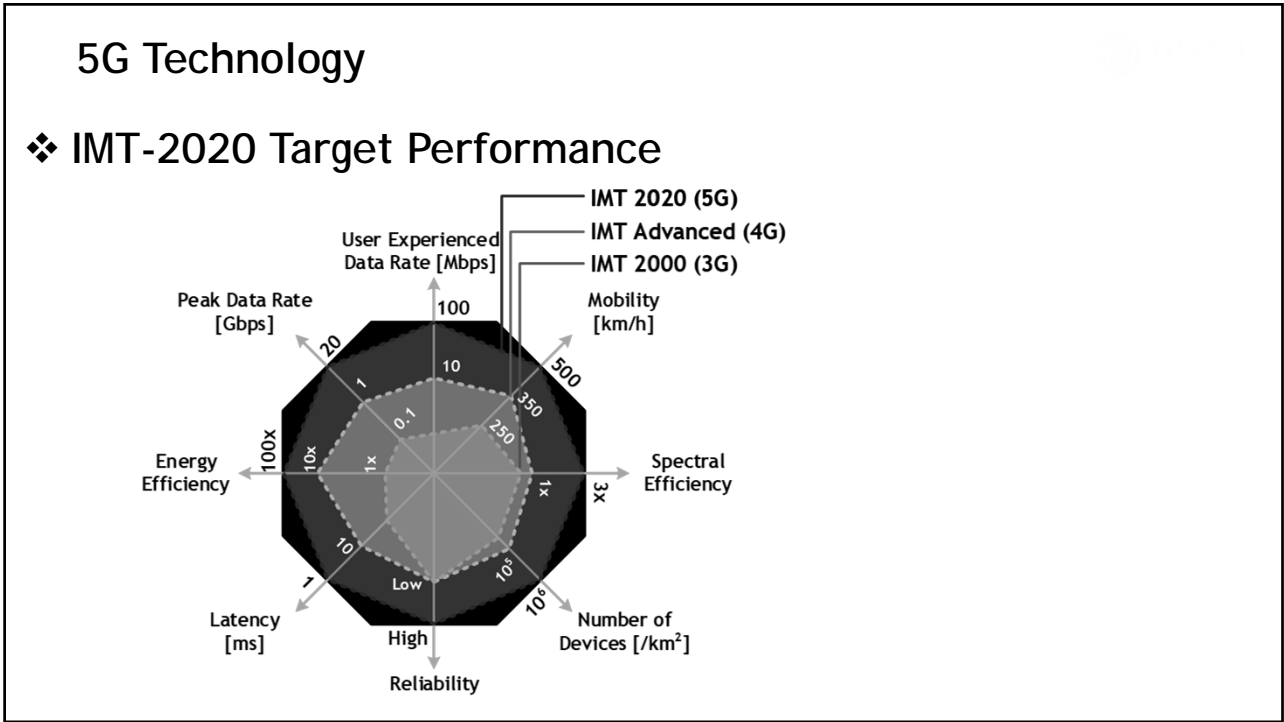
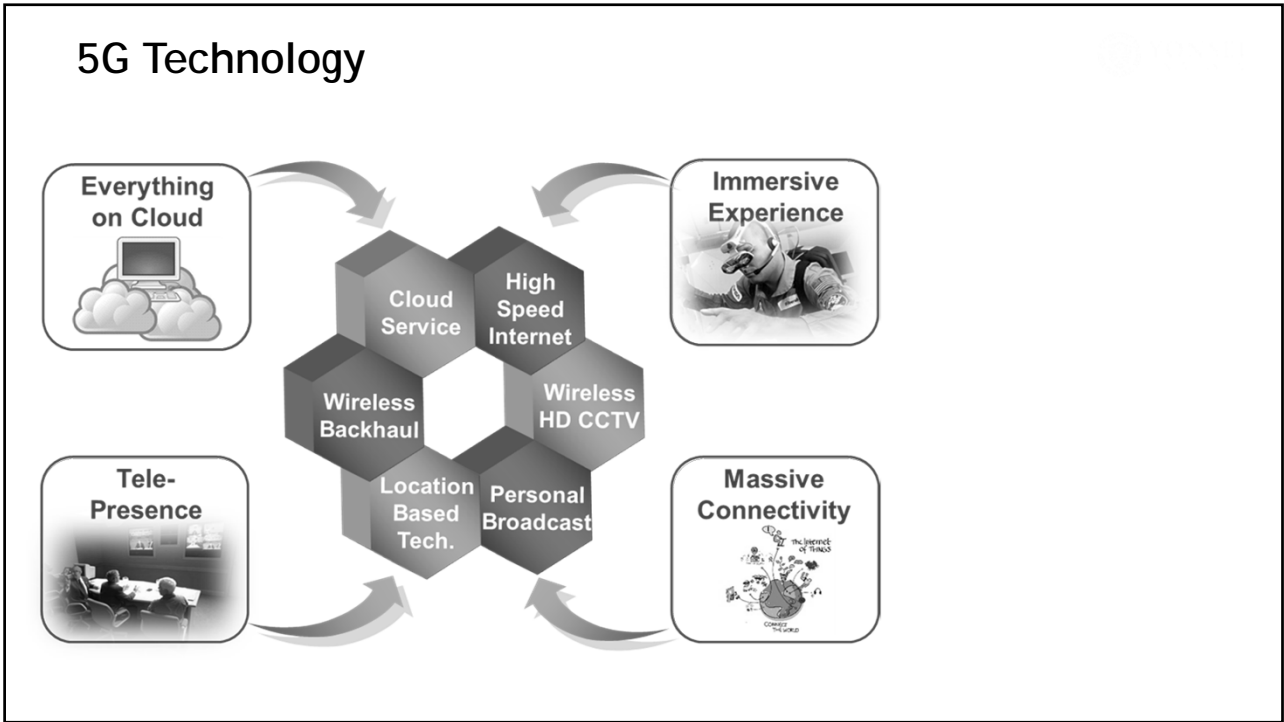


- ❖ CA



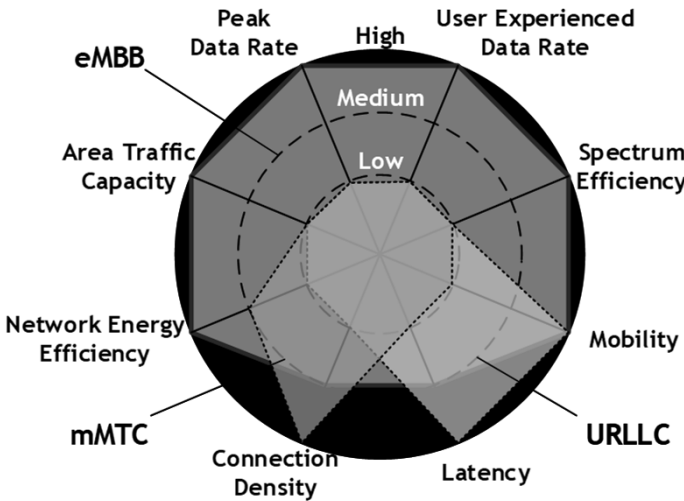
- ❖ HetNet & SON





5G Technology

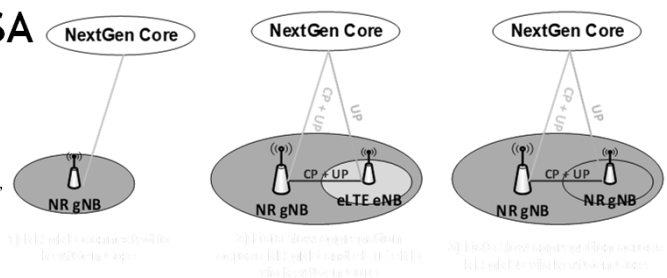
❖ 3GPP 5G-NR Usage Scenarios



5G Deployment Scenarios

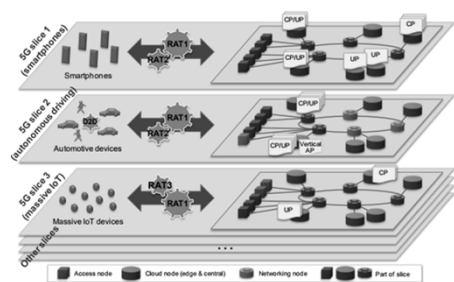
❖ SA & NSA

[Ref] 3GPP TR 38.804
“Study on New Radio
Access technology;
Radio Interface
Aspects (Release 14),”
v14.0.0 Mar. 2017



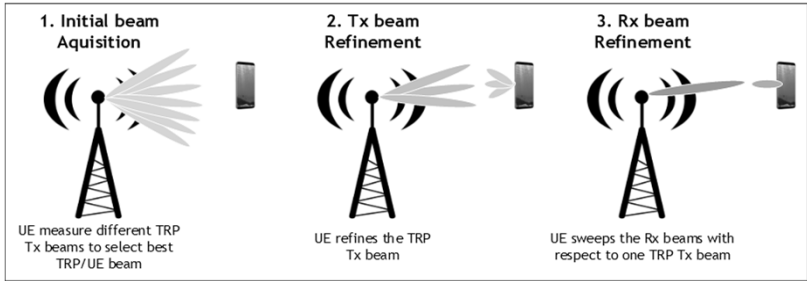
❖ Network Slicing

[Ref] NGMN 5G White Paper, 2015

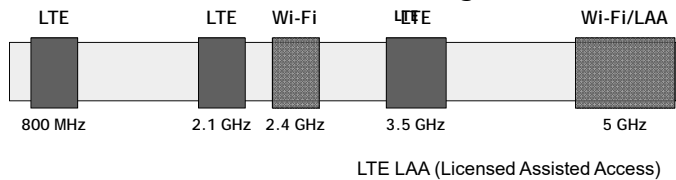


5G Wave Technology

❖ mmWave System



❖ Multi-RAT Internetworking

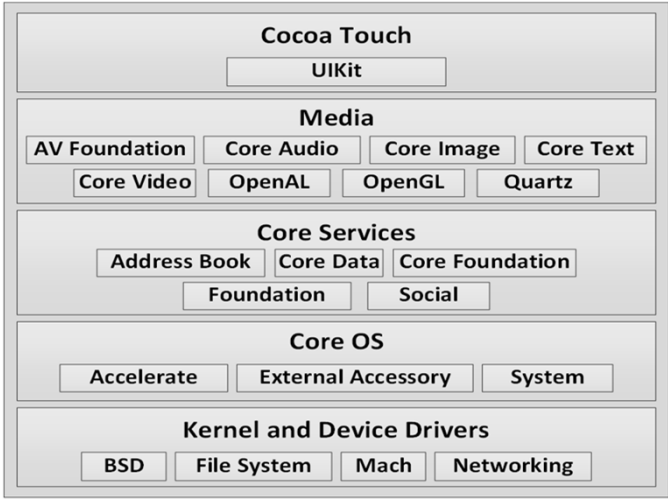


iOS Evolution



iOS Architecture

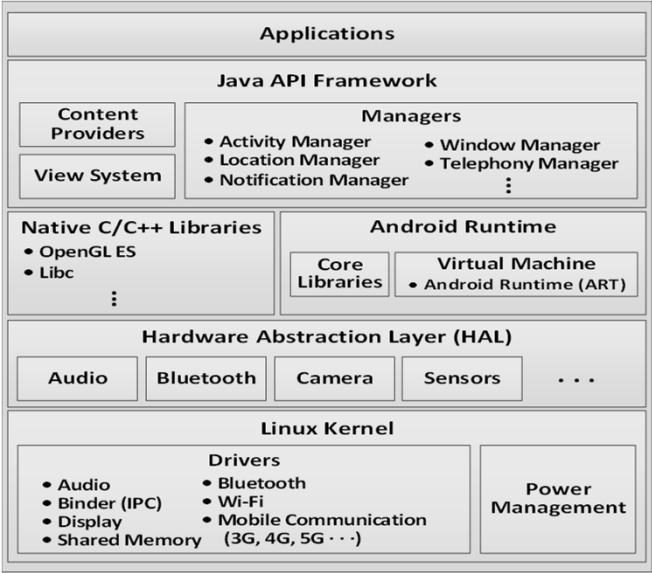
❖ Overview of iOS (SDK) Architecture




Android Evolution



Android Architecture



Smartphone Project



AIDA64

Android Google Play Store, Apple App Store

AIDA64 / System	
Device Model	Samsung Galaxy S7 (Korea)
Device Codename	hero
Device Type	Phone
Manufacturer	samsung
Model	SM-G930K
Brand	samsung
Board	universal8890
Device	heroltekt
Hardware	samsungexynos8890
Platform	exynos
Product	heroltekt
Serial	ce11160b1a12943704
Installed RAM	4 GB LPDDR4
Total Memory	3533 MB
Available Memory	1084 MB
Internal Storage	24.96 GB
Total Space	
Internal Storage	1879 MB
Free Space	
External Storage	29.02 GB
Total Space	
External Storage	5172 MB
Free Space	
Device features:	

Device Model	
Samsung Galaxy S7 (Korea)	
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Total Space	
External Storage	5172 MB
Free Space	

Android phone

Mobile Network Project



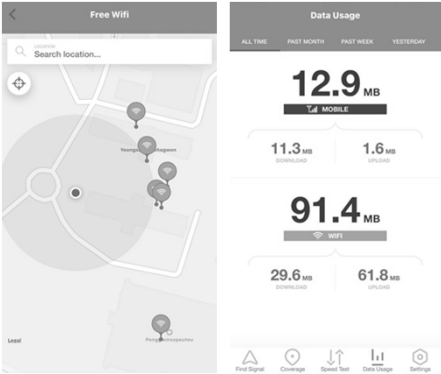
Network Cell Info Lite
Available at Google Play Store



OpenSignal
Speed Test & Maps
Available in the Apple App Store



FieldTester
Available in the Apple App Store



Mobile Network Project



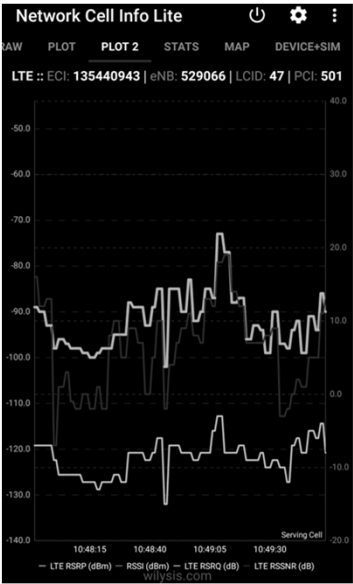
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Mobile Network Project



Network Cell Info Lite


Available at Google Play Store



OpenSignal

Speed Test & Maps

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FieldTester

Available in the Apple App Store

Three

Continuous testing ☒

Phone Signal

0 %

-113.0 dBm

Refresh

Latency

49.8 ms

Refresh

Data Network:

INACTIVE

WiFi status:

ACTIVE

Network SSID:

D-Link

Network BSSID:

1c:bd:b9:8a:99:8f

Latitude

51.498146

Longitude

-0.220768

Mobile Network Project

❖ iOS Field Test Mode

*3001#12345##

Add Number

1234567890*

ABCDEF GHIJKL MNOPQRSTUVWXYZ

Phone

Favourites

Recents

Contacts

Keypad

VoiceMail

< Back

Serving Cell Measurements

Measured RSSI

64.00 dBm

Qrxlevmin

-134 dBm

P_Max

85 dBm

Max UE Tx Power

-29 dBm

Version

5

S Non Intra Search

30 dBm

Physical Cell ID

0

Average RSRP

-138.25 dBm

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