



ITU WTIS
ONLINE2020
1 - 3 December 2020

A collection of 3D-rendered icons representing various 5G network devices and services, including a laptop, a smartphone with a map, a tablet with a person in a yellow suit, a cloud with a Wi-Fi symbol, a small black device with a yellow antenna, and a smartphone with a data dashboard. Dotted lines connect these devices, suggesting a network or data flow.

Country experience on measuring the deployment of 5G networks

December 2, 2020

Lee, Yeong Ro, Vice President (lyr@nia.or.kr)



- 01 | **Background and Procedure of Evaluation**
- 02 | **Summary of 'Quality Evaluation Result'**
- 03 | **Outcome of Evaluation and Future Plan**

Background of Quality Evaluation

Urban

Population ↑
Investment ↑
Good Quality



Rural

Population ↓
Investment ↓
Poor Quality



Significant quality gap in telecom service between urban and rural areas

Problem 1.
Equal Price but Different Quality
(depending on geo-environment and population density)

Problem 2.
Insufficient Quality Information to the Users

Problem 3.
Lack of Coverage Information

**Annual Evaluation of QoS
and Open it to the Public**

Procedure of Quality Evaluation



Step1. Selection of Target Services

Wired

100 Mbps
1 Gbps
10 Gbps

Wireless

Wi-Fi
3G, 4G(LTE)
5G

Not to measure the best **technical** Capacity

But to measure the quality that **user experience** using real end user devices (Smartphone, PC)

Step2. Establishment of Measurement Scheme

Organising Working Group
that is independent on Stake Holders
to secure relevance of whole process



To determine measuring terminal
(End user devices : Smartphone, PC)



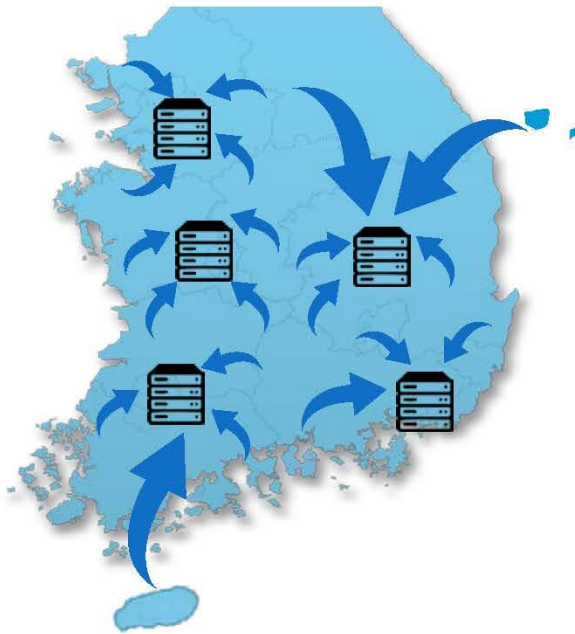
To determine method and metrics
(Throughput, Delay time, etc...)



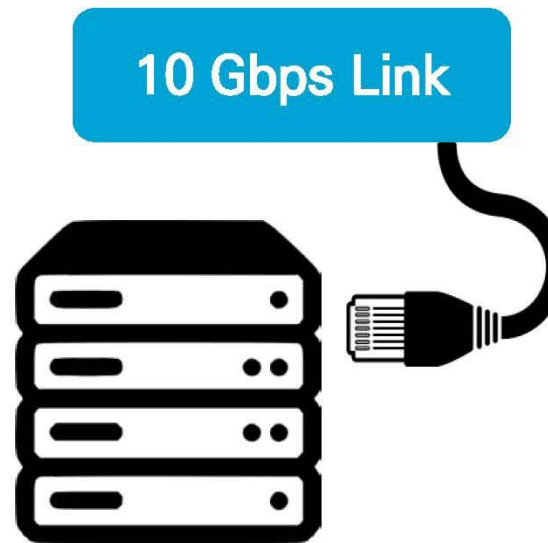
To set-up final Evaluation Plan



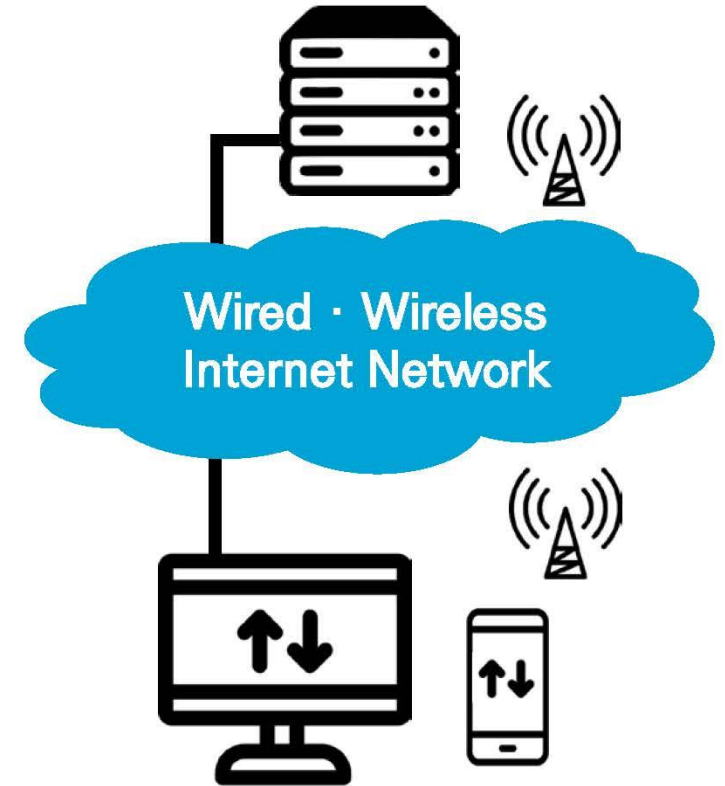
■ Measurement Method



Install Measurement Servers
at the IDC of each providers



10 Gbps or higher links
to each measurement server



Real End user device
used to collect data

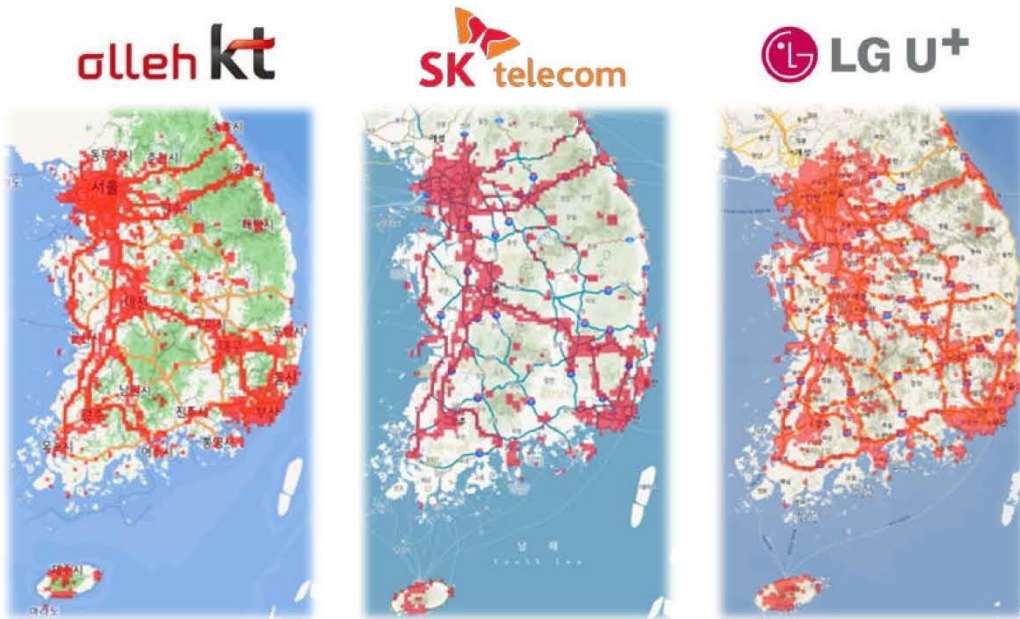


■ Measurement Metrics

Category	Metrics	
Wireless	Throughput(Mbps)	Transmission and reception speed between terminal device–measurement server
	Connection success rate(%)	The rate of successful calls by attempting to connect to the measurement server
	Transmission success rate(%)	The rate of calls connected to the measurement server and transmitted at a certain speed
	Round trip latency(ms)	Time to transmit a signal to the measurement server and to receive a response signal
	Packet loss rate(%)	The rate of data that was not received during data transmission and reception
	Web–page loading time(sec)	Time until all screens of web page are displayed on the terminal device
Wired	Throughput_Intra(Mbps)	Transmission and reception speed between terminal device–measurement server
	Throughput_Inter(Mbps)	Transmission and reception speed between terminal device–web portal provider server
	Web–page loading time(sec)	Time until all screens of web page are displayed on the terminal device
Only for “5G”	5G to 4G Re–direction Rate(%)	The rate of network reconnection to 4G network while using 5G network

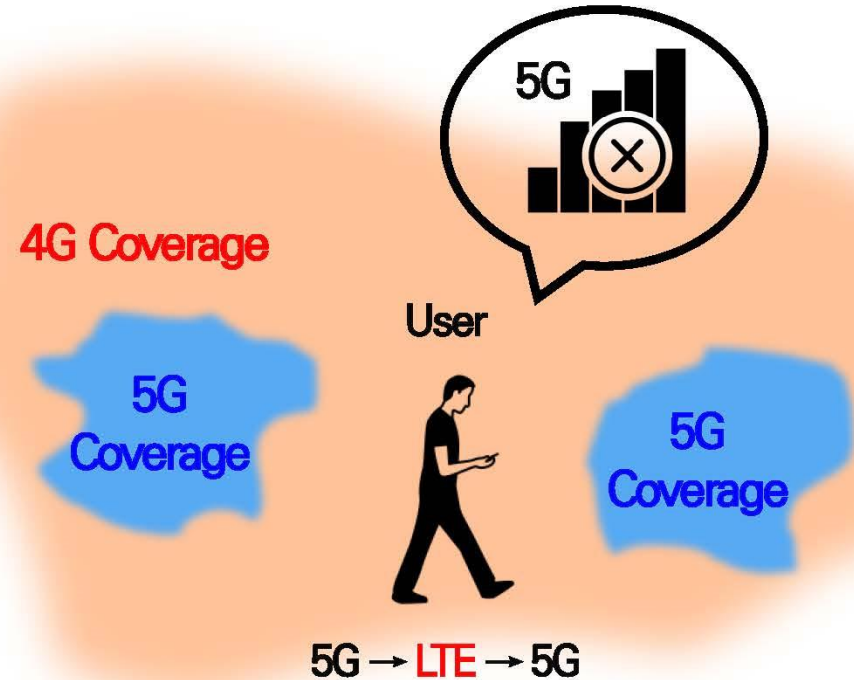


■ New Metrics for 5G Service Evaluation : 5G to 4G Re-direction Rate



※ 5G service coverage map by providers (July 2020)

Low Coverage Rate,
5G Island



Frequent 5G Connection Off,
and Reconnection to 4G station



Step3. To perform field tour and measurement

① By population density such as metropolitan, mid - to small cities, and rural areas.



② By region type such as transportation facility, underground shops, markets, and hospitals.



③ By sport and leisure area such as island, sea roads, coastal roads, and trails.



④ By public transportation such as high-speed railroad, city subways, and highways.





Step4. Collection of Data and Validation

① Pre-review meetings with third party experts



② Check devices and measurement software errors



③ Remove error data under the abnormal conditions



④ Validate whole process and Reporting



Wireless and Wired Internet Quality in 2019



Quality of Wireless Internet Services

※ 2018 results in parentheses ()

	Download Speed	Upload Speed	Connection Success rate	Transmission Success rate	Round Trip Latency	Packet Loss rate	Web-page Loading time
4G	158.53 Mbps (150.68 Mbps)	42.83 Mbps (43.93 Mbps)	99.98% (99.97%)	99.18% (99.43%)	36.34 ms (40.73 ms)	0.85% (0.73%)	1.01 sec (1.29 sec)
3G	5.50 Mbps (6.08 Mbps)	1.73 Mbps (1.89 Mbps)	99.55% (99.30%)	98.43% (98.96%)	98.66 ms (88.65 ms)	1.21% (1.38%)	1.91 sec (2.48 sec)
WiFi	333.51 Mbps (305.88 Mbps)	288.02 Mbps (290.25 Mbps)	99.93% (99.98%)	99.57% (99.61%)	23.41 ms (20.77 ms)	0.76% (0.38%)	0.93 sec (1.11 sec)

Quality of Wired Internet Services

※ 2018 results in parentheses ()

	Download Speed (Intra)	Upload Speed (Intra)	Download Speed (Inter, Bulk e-mail)	Upload Speed (Inter, Bulk e-mail)	Web-page Loading time
100Mbps	99.27 Mbps (99.39 Mbps)	98.85 Mbps (98.36 Mbps)	92.25 Mbps (91.95 Mbps)	87.86 Mbps (56.57 Mbps)	0.80 sec (1.07 sec)
1Gbps	951.67 Mbps (913.83 Mbps)	949.19 Mbps (907.10 Mbps)	350.71 Mbps (359.53 Mbps)	294.80 Mbps (238.75 Mbps)	0.77 sec (1.07 sec)

5G Quality : First half of 2020



5G and 4G Subscribers in Korea

(Million)

	2019.4 (5G Commercialize)	2019.6	2019.9	2019.12	2020.3	2020.6	2020.9
5G	0.27 M	1.34 M	3.47 M	4.67 M	5.88 M	7.37 M	9.25 M
4G	56.34 M	56.02 M	55.38 M	55.69 M	55.28 M	54.96 M	54.33 M

5G Coverage and Service Availability : 7 Major Global Cities in Korea

Public Facilities(In-building) 5G Availability			Transportation Infrastructure 5G Availability			
Indoor Base Station	Outdoor Base Station	Avg.	Subways	High Speed Rail	Highways	Avg.
78.27%	49.63%	67.93%	76.33%	75.45%	78.21%	76.56%

Quality of 5G Wireless Internet Services : 7 Major Global Cities in Korea

Download Speed	Upload Speed	5G to 4G Re-direction rate	Connection Success rate	Transmission Success rate	Packet Loss rate	Web-page Loading time
656.56 Mbps	64.16 Mbps	6.19 %	99.95 %	99.57 %	0.57%	1.01 sec

Outcomes



Target services by years

- 1999 2G Voice, PSTN
- + 2001 High-Speed Internet
- 2006 WCDMA, WiBro
- + 2010 Wi-Fi
- + 2012 4G(LTE)
- 2013 VoLTE (LTE Voice)
- 2014 Vulnerable regions
- + 2015 1Gbps Internet
- 2016 Coverage Inspection
- + 2019 10Gbps Internet
- + 2020 5G

Download Speed Improvement (National Avg)

(Mbps)

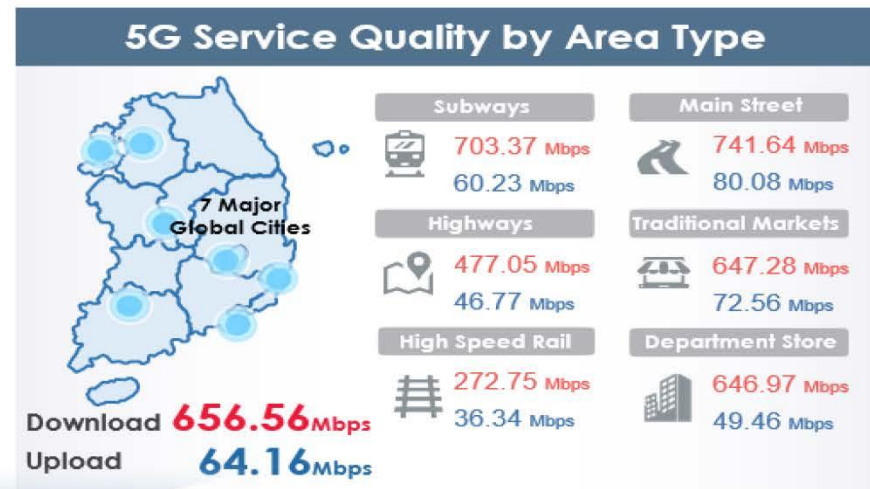
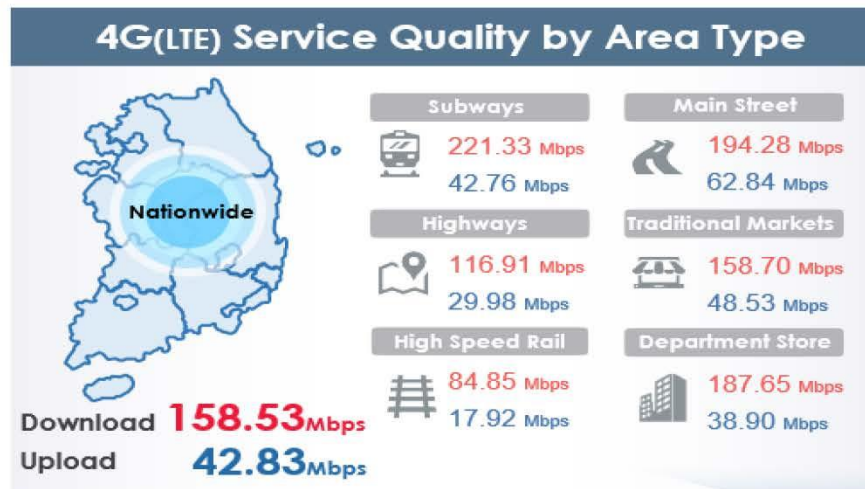
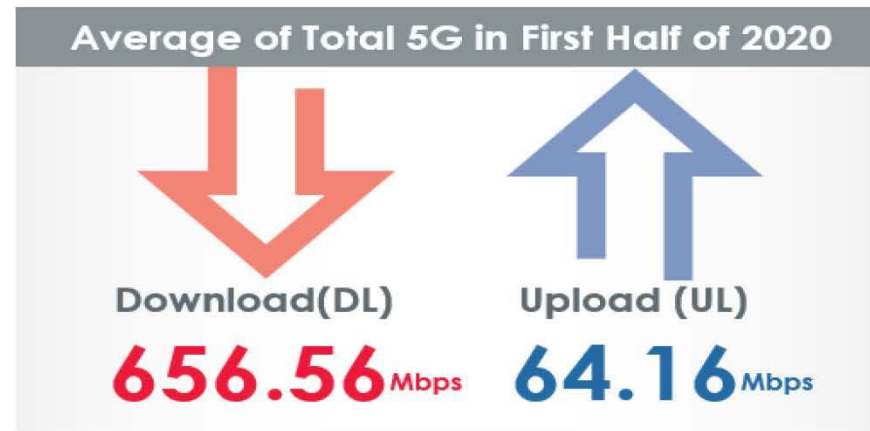
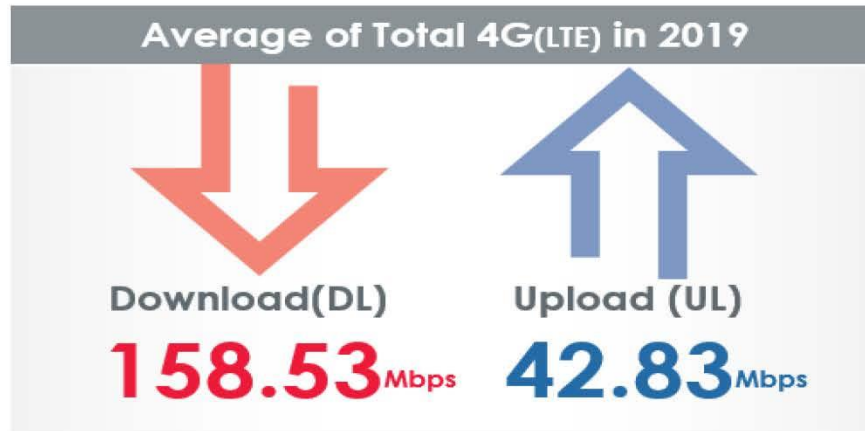
Division	2017	2018	2019	CAGR
4G	133.4	150.7	158.5	9%
Wi-Fi	264.9	305.9	333.5	12.2%
1G (Wired)	873.8	913.8	951.7	4.4%
100M (Wired)	99.1	99.4	99.3	0.1%

Download speed of 4G in rural area

(Mbps)

Division	2017	2018	2019	CAGR
4G in rural area	99.6	126.1	128.5	13.6%

Outcomes and Future Plan



Open quality information to the public
in various types by provider, service and region



Thank You



ITUWTIS
ONLINE2020
1 - 3 December 2020

NIA NATIONAL INFORMATION
SOCIETY AGENCY

