

Overview of 5GMF Current Activities

Prof. Hiroyuki Morikawa University of Tokyo Chairman of Strategy & Planning Committee in 5GMF

The 3rd Global 5G Event Hilton Tokyo Odaiba, Japan, 24 May 2017



Welcome to the Global 5G Event

5GMF (The Fifth Generation Mobile Communications Promotion Forum)

Established :

5GIMIF

- 30 September 2014 (taking over ARIB 2020 and Beyond Ad Hoc.) Innovative R&D through Industry-Academia-Government cooperation.
- **Objectives** : International Standardization and Collaboration. Collaboration with 5G Field Trials.
- Members :
- 122 (Special: 3, Individual: 15, Ordinary: 104 as of 24 April 2017)



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Activities of 5GMF

Activities

- > Over 50 committee meetings are regularly held every year.
- Publishes technical reports & white papers : http://5gmf.jp/en/whitepaper/
- \succ Takes part in the 5G related meetings and exhibitions.
- Collaborate on 5G Field Trial this year.

International Collaboration

- **MoU**: 5G-PPP (EU), 5G Forum (Korea), 5G Forum (Indonesia), MTSFB (Malaysia), IMT-2020 PG (China), WWRF*
- Multi-lateral MoU in Lisbon (Oct. 2015) (5GMF/5G Forum/5G Americas/IMT-2020 PG/5G-IA)





- Global 5G Event: 1st.Beijing, 2nd.Roma, 3rd.Tokyo \geq
- CEATEC Japan (2014/2015/2016) \geq
- Workshop on 5G in Turkey (Jan. 2017) \geq
- WWRF #38 in Taiwan (Mar. 2017)





The 2nd Global 5G Event in Rome



Photo with presenters and other participants Workshop on Next Generation Communications System 5G in Ankara, Turkey

SGIMIF Activities of Service & Application Committee

Usage Scene WG (USG WG)

- Study of a image of near future society and products/services that is reported from various companies.
- Collect and analysis of related materials.
- Service and Application Committee will report their achievements.
- Application Platform WG (APPLF)
- Describe a usage scene by considering not only 5G but also the valuable technologies that will be used in the applications platform in the future.

Meeting List

#1	26 Feb. 2015	Joint meeting		
#2	26 Mar. 2015	USG APPLF		
#3	28 Apr. 2015	USG APPLF		
#4	26 May. 2015	USG APPLF		
#5	31 Jul. 2015	USG APPLF		
#6	26 Jan. 2016	APPLF		
#0	27 Jan. 2016	USG		
#7	28 Jul. 2016	USG		
#8	29 Sep. 2016	USG		
#9	28 Oct. 2016	USG		
#10	16 Nov. 2016	USG APPLF		
#11	30 Jan. 2017	Joint meeting		





Outcome of activities

	Usage Scene WG Usg	Application Platform WG APPLE
#2	Automated Driving as a usage scene	Near-field high speed data transportation service using mm-wave transfer-Jet
#3	5G and VR applications (demo)	Introduction of JASPER interface WG
#4	Future image of financial system	Softwarization, Computerized network and its future
#5	Solutioneering for next 100 years (M2M/IoT)	Update of Maps using increment-P
#6	Mobile communication in the railway business and future	The future and evolution of IT infrastructure by Intel
#7	Latest trend of Connected Car and expectation for 5G	OpenStack/OpenShift Container Platform and mobile edge computing
#8	Security services evolving with the latest technology (Expectation for 5G)	
#9	Next Generation communication using VR with 5G	
#10	Expectation for 5G towards 2020 Tokyo Olympic / Paralympic Games.	

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User Trend in Japan

Trend of Japanese market

- Market of application software has increased as a result of spreading mobile terminals.
- Market expansion of IoT and AI (Artificial Intelligence) has been predicted.

Internet utilization rate (by Age)





User Trend in Japan

- **Trend of mobile users in Japan** (Results of unique research for wide range generations over 2 years)
- Senior mobile users will increase in 2017 in addition to active young generation.
- > Especially, SNS user of schoolgirl is remarkable.
- Impression to the next generation services such as autonomous driving and AI (Artificial Intelligence) has been changing to positive.

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SNS utilization rate (Students vs Seniors)







5G Field Trial

■ 5G-TPG Report ver.1.0

- > Published in March 2017 (Japanese version only)
- This Report addresses the progress of studies carried out by 5G Trial Promotion Group (5G-TPG) in 5GMF.
- This report presents 5G Trial concepts, contents and more than 40 plans of "5G Utilization Projects" addressed in 5G Field Trial.

■ 5G Field Trial

- MIC has started 5G Field Trials in Tokyo and rural areas in Japan this month.
- 5GMF has also started to collaborate with 5G Field Trial.

MIC : Ministry of Internal Affairs and Communications

Report of 5G System Trial Concept & Plan 5G Utilization Project Planning part

Introduction
5G Utilization Projects
Entertainment
Security and Disaster Defense to realize Safe and Secure
Logistics, Agriculture, Office and Factory
Remote Control and Surveillance of Robot and Drone, etc.
Remote Control and Surveillance of Connected Car and Vehicles, and Automated Driving
High Data-Rate and Reliable Communications for High-Speed Moving Vehicles

http://5gmf.jp/wp/wp-content/uploads/2017/03/5g-tpg_report_ver_1_0_public.pdf





Use Cases of 5G Trial

2.1 Entertainment

Get Info from a Photo of an Athlete

2.2 Security and Disaster Defense to realize Safe and Secure

Changing How We Enjoy Sport Image: Changing How H

Real Time Broadcastin

- > Realistic sensation virtual experience
- Ultra high definition, multi angle, 3D Videos, wearable terminal and VR
- > Enhanced mobile broadband (eMBB)

5G EVENT



- Safe and secure Society,
 Occurrence orediction of disaster and crime
- > Ggather from a lot of security camera and sensors
- > Massive machine type communications (mMTC)

Use Cases of 5G Trial

2.3 Logistics, Agriculture, Office and Factory

2.5 Connected Car and Vehicles,

and Automated Driving



CHANGING HOW WE SHOP (THE IOT SUPERMARKET) Information
CHANGING AUTOMOBILE NAVIGATION AND ENDING ACCIDENTS 2



> Massive Connectivity (IoT)

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- Heterogeneous Network, Anywhere same communication environment
- > Massive machine type communications (mMTC)

- ➢ Real time, Reliable communications
- Remote Control, Operation, Surveillance, Support automated driving
- > Ultra reliable and low latency communication (URLLC)

Action Plan of 5GMF towards 2020

5GIMIF

Accelerate practical implementations of 5G towards 2020.





Thank you for your kind attention.

What is Crossover Collaboration

5GIMIF

- > Crossover collaboration means a barrier-less cooperation between various industries.
- > 5G Mobile Communication enables lowering of barriers through its enhanced capabilities.





Two Key Concepts of 5G

1. Satisfaction of End-to-End Quality

5G shall provide satisfactory "End-to-End Quality" required by any kind of application <u>anytime</u>, anywhere and any use scenes.

This conceptualization of "<u>Satisfaction of End-to-End Quality</u>" is very <u>different</u> <u>from previous generations</u> of mobile communication systems, for which best effort delivery was seen as sufficient.

2. Extreme Flexibility

5G networks will be required to provide "Extreme Flexibility" in order to produce this level of End-to-End Quality for the many services 5G systems will be expected to support.





Key Technology

1.Advanced Heterogeneous Network

In addition to 5G Radio Access Technologies (5G RAT), 5G will continue to use already existing 2G, 3G, LTE, WLAN to create an integrated system that can provide support for a variety of services with flexibility.

2.Network Softwarization and Slicing

Network softwarization and slicing will allow network devices and components to support a variety of services in a extremely flexible manner.





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5GIMIF

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GIMIF



communications

obal 5g event

Recommendation ITU-R M.2083-0 (09/2015)

Evolution of IMT

Usage scenarios of IMT for 2020 and beyond

Enhanced mobile broadband (eMBB) Massive Machine Type Communication (mMTC) Ultra reliable and low latency communication (URLLC)

Enhanced mobile broadband



Ultra-reliable and low latency communications

Enhancement of key capabilities from IMT-Advanced to IMT-2020





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Requirements for User Scenes





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Agreements related to Technical Performance Requirements (Evaluation Methods) for IMT-2020 Radio Interface (s)

Test environment	Indoor Hotspot	Dense Urban	Rural	Urban Macro	Urban Macro	
Usage scenario	eMBB (Enhanced mobile broadband)			(Massive machine type communications)	URLLC (Ultra-reliable and low-latency communications)	Evaluation Method
Peak data rate	Downlink 20 Gbit/s, Uplink 10 Gbit/s			_	_	Analytical
Peak spectral efficiency	Downl	Downlink 30 bit/s/Hz, Uplink 15 bit/s/Hz		_		Analytical
User experienced data rate	1 K	Downlink 100 Mbit/s Uplink 50 Mbit/s	-	_	_	Analytical, Simulation
5 th percentile user spectral efficiency	Downlink 0.3 bit/s/Hz Uplink 0.21 bit/s/Hz	Downlink 0.225 bit/s/Hz Uplink 0.15 bit/s/Hz	Downlink 0.12 bit/s/Hz Uplink 0.045 bit/s/Hz	_	_	Simulation
Average spectral efficiency	Downlink 9 bit/s/Hz/TRxP Uplink 6.75 bit/s/Hz/TRxP	Downlink 7.8 bit/s/Hz/TRxP Uplink 5.4 bit/s/Hz/TRxP	Downlink 3.3 bit/s/Hz/TRxP Uplink 1.6 bit/s/Hz/TRxP	_	_	Simulation
Area traffic capacity	Downlink 10 Mbit/s/m ²	_	_	—	_	Analytical
Latency (U-Plane)	4 ms			—	1 ms	Analytical
Latency (C-Plane)	20 ms			—	20 ms	Analytical
Connection density	_	_	-	10 ⁶ devices/km ²	_	Simulation
Energy efficiency	Efficient data transmission in loaded case (average spectral efficiency) Low energy consumption (higher sleep ratio and longer sleep duration)			_	_	Inspection
Reliability	Success probability of transmitting a layer 2/3 packet 1-10 ⁻⁵ (L2 PDU of 32byte)			Simulation		
Mobility	1.5 bit/s/Hz (10km/h)	1.12 bit/s/Hz (30km/h)	0.8 bit/s/Hz (120km/h) 0.45 bit/s/Hz (500km/h)	_	_	Simulation
Mobility interruption time	1obility interruption time 0 ms -		0 ms	Analytical		
Bandwidth	The requirement for bandwidth is at least 100 MHz. The RIT/SRIT shall support bandwidths up to 1 GHz for operation in higher frequency bands (e.g. above 6 GHz).					Inspection

45G

Reference to Draft New Report ITU-R M.[IMT-2020.TECH PERF REQ] (5D/TEMP/300R1) and Preliminary Draft New Report ITU-R M.[IMT-2020.EVAL] (5D/TEMP/297)



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p://5amf in/wp/wp-content/uploads/2017/03/5a-tpg report ver 1.0 public pdf			

