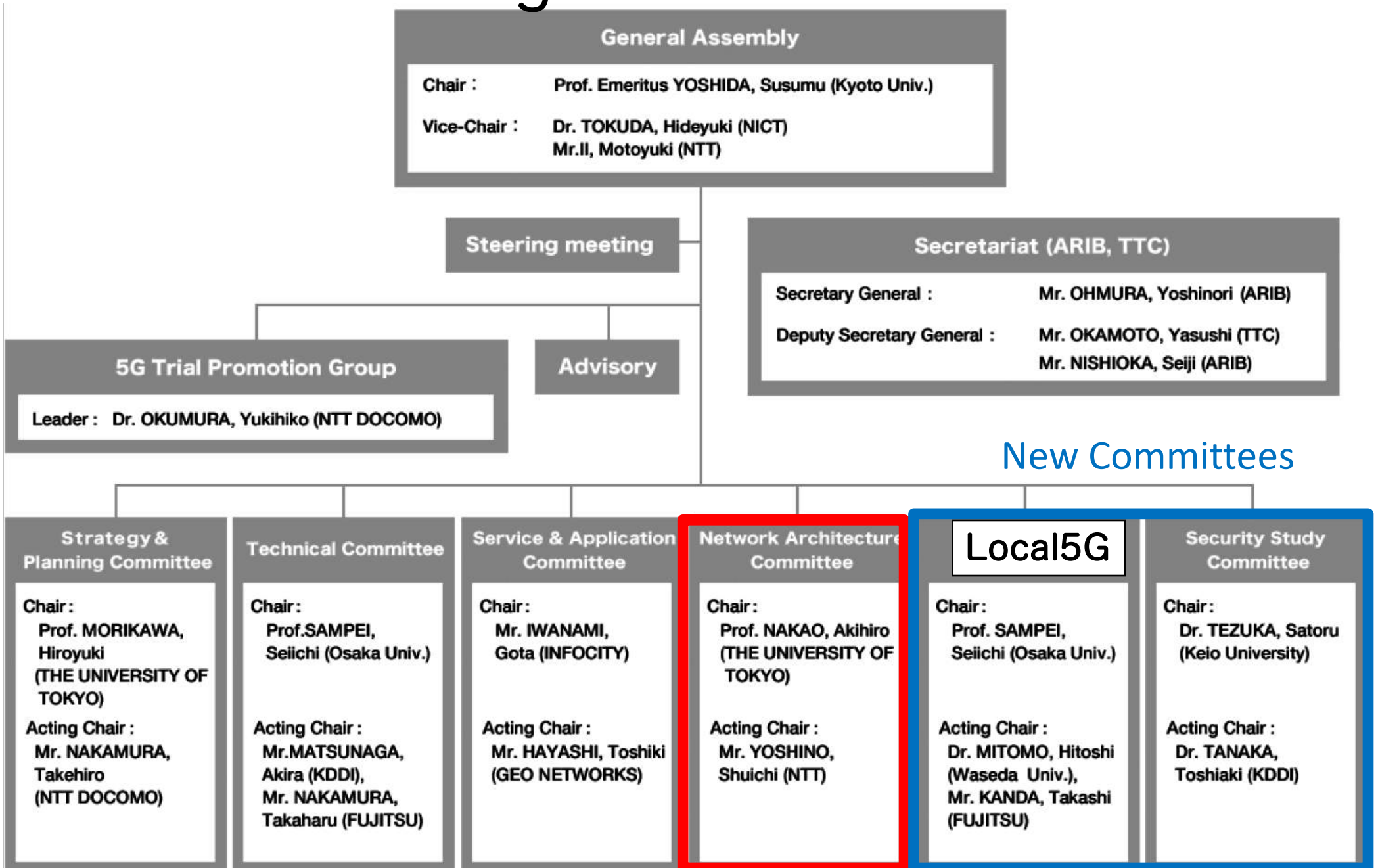
Democratizing 5G for Enabling Innovations from Everyone

2019/11/7

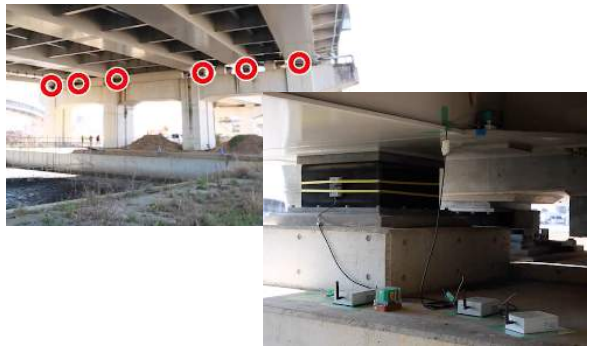
Aki Nakao
The University of Tokyo

5GMF Organizational Structure

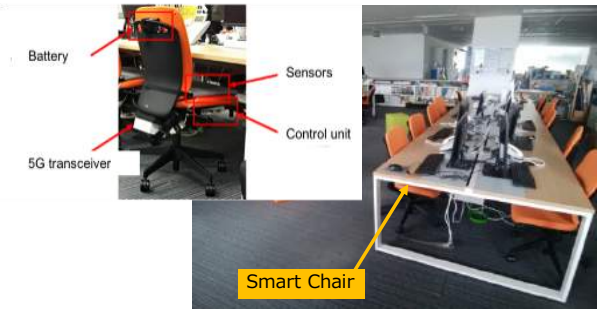


Overview of MIC 5G Field Trials in 2017-2019

massive Machine Type Communications (mMTC)



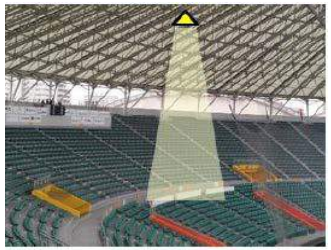
(bridge inspection)



(healthy workplace)

enhanced Mobile BroadBand (eMBB)

(multi-transmission of 8K video)



(sports)

(transmission to car/train@over 60mph)

Ultra-Reliable Low Latency Communications (URLLC)

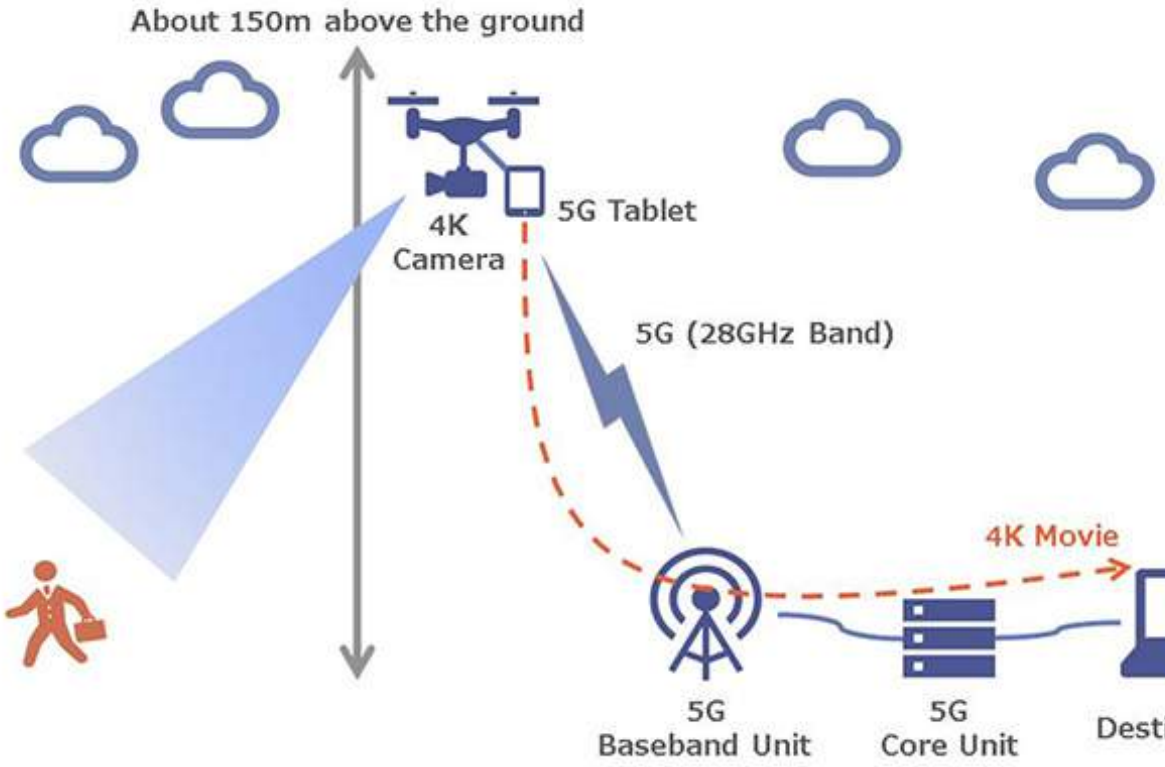
(remote machinery control)

(telemedicine)

(truck platooning)

July 12, 2018

国内初、「5G」ドローンを用いた4K映像のリアルタイム伝送に成功



2020年サービス開始を目標に開発が進められている第５世代モバイル通信では、新しいサービスの提供が始まります。その一つとして、28GHz帯を使用した、現在の携帯の約100倍の速度の高速通信サービスが実現されます。高速通信サービスでは4Kの高精細映像通信が可能になります。

2018年6月8日、中尾研究室では、KDDI株式会社と共同で東京大学柏IIキャンパスにて4Kビデオカメラ搭載のドローンによるリアルタイム映像伝送実験をサムソン電子の５G実験システムを使用し高細精度の4Kビデオ映像を伝送することができました。実験では、ビデオカメラの映像をドローンから送信するため５Gのモバイル端末を使用し、送信された映像信号は柏IIキャンパスに設置した５G無線実験基地局で受信しました。5Gの実サービスに近い形態でドローンからの４K映像リアルタイム配信は国内初となります。

THE UNIVERSITY OF TOKYO

“Cycling Shimanami 2018”

Press Release!

Released 2018/10

Tomorrow, Together
KDDI

東京大学
THE UNIVERSITY OF TOKYO

5G drones capture realtime video of about 8000 cyclists


WAVE ONE
ATM net
START


KIRIN

Democratization of 5G

Democratization by Oxford Dictionary:

“The action of making something accessible to everyone.”

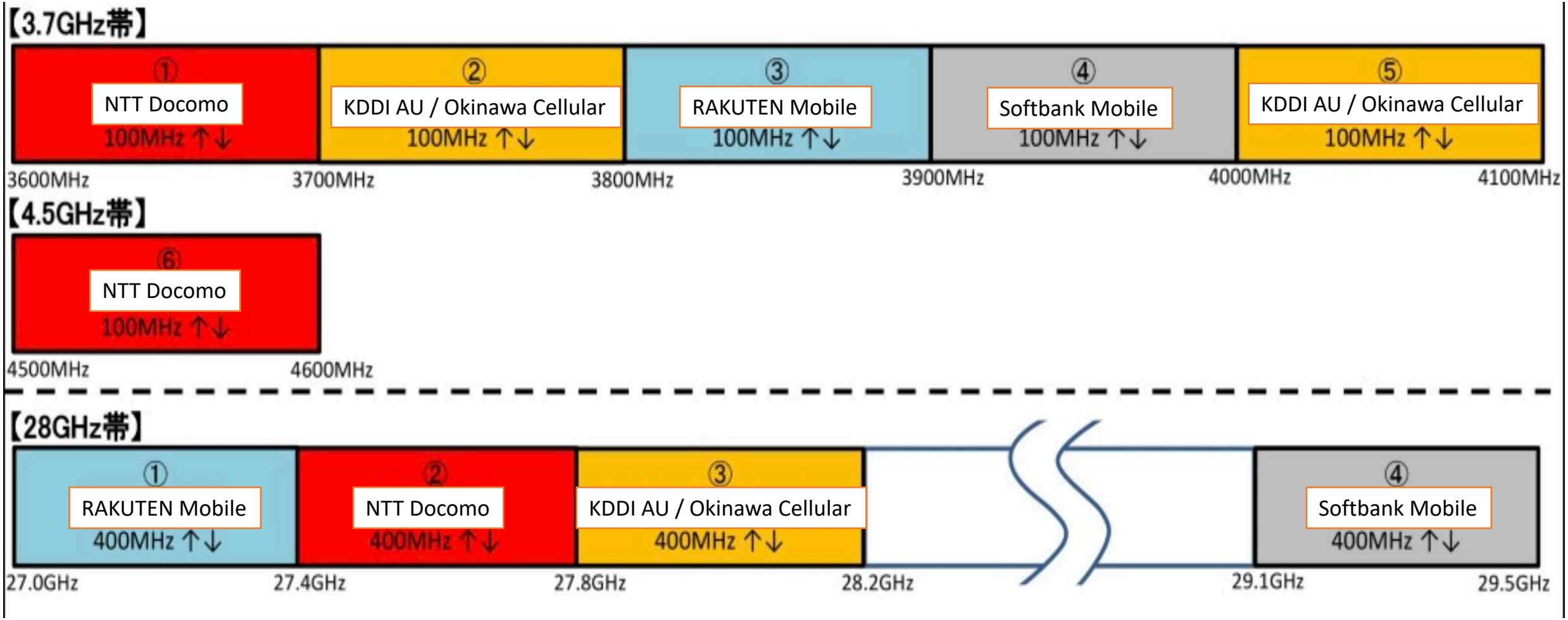
=> Make 5G available to evenone not just operators

Key Components

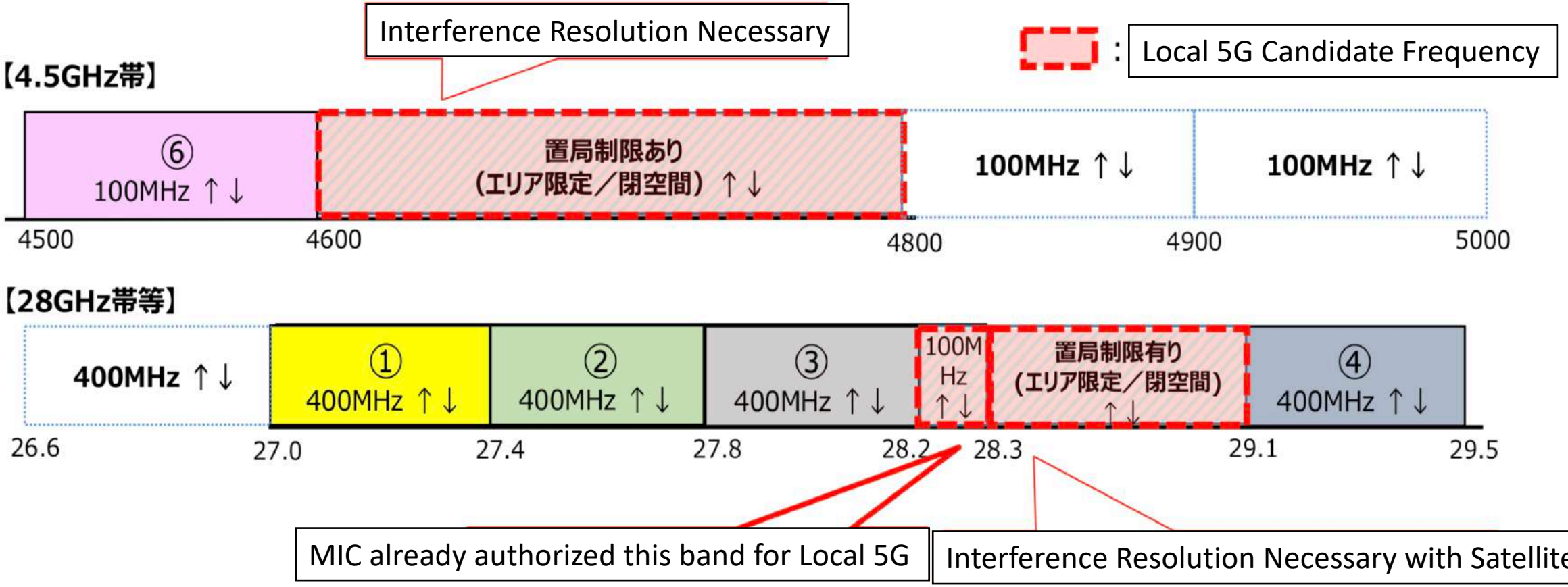
- Unlicensed / Private Licensed Bands
- Softwarization
- Region as Testbed

5G Frequency Band Allocation

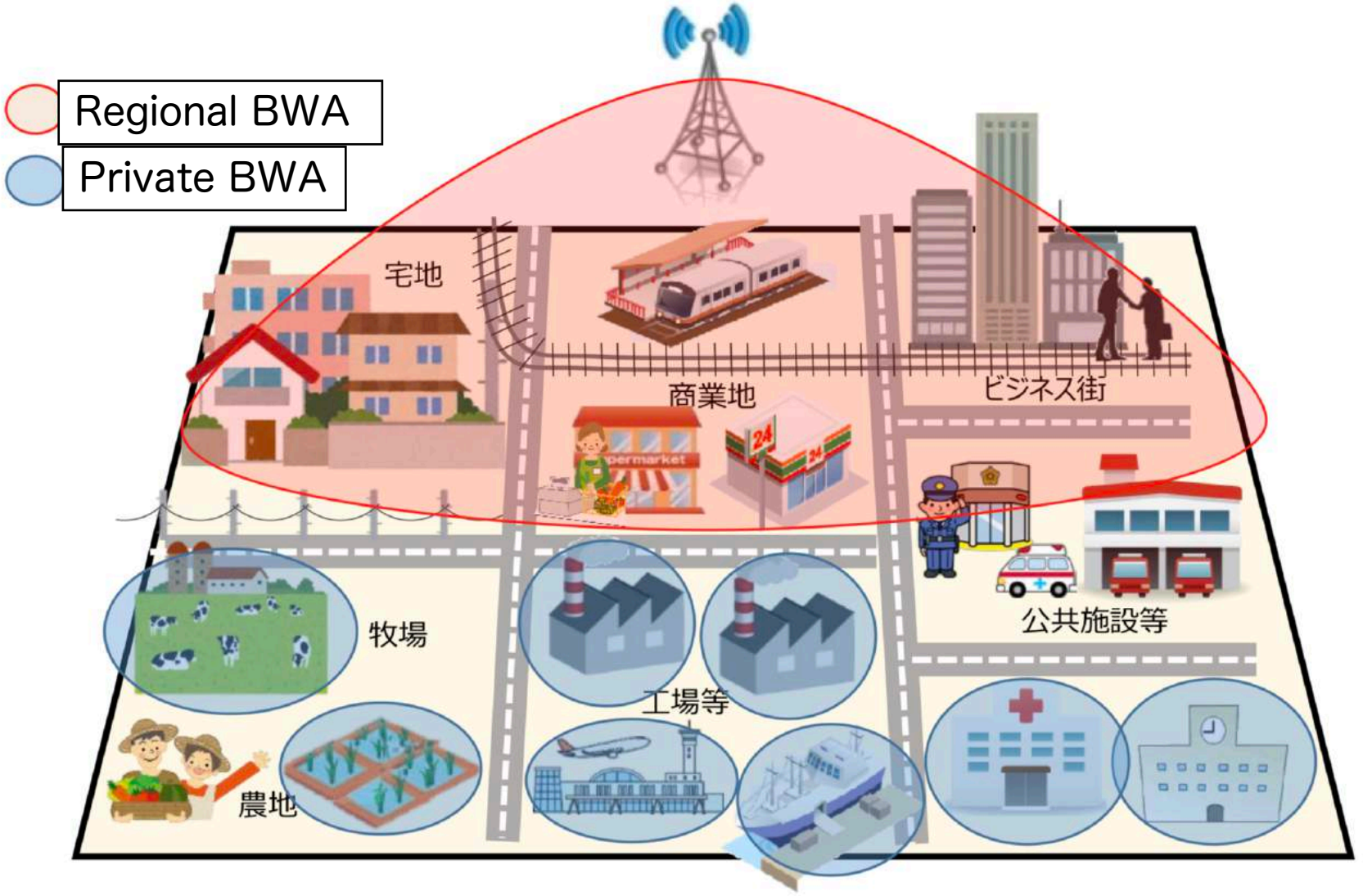
Japan has 4 MNOs now (NTT Docomo, KDDI AU, Softbank and RAKUTEN)



Local 5G (Private 5G) in Japan

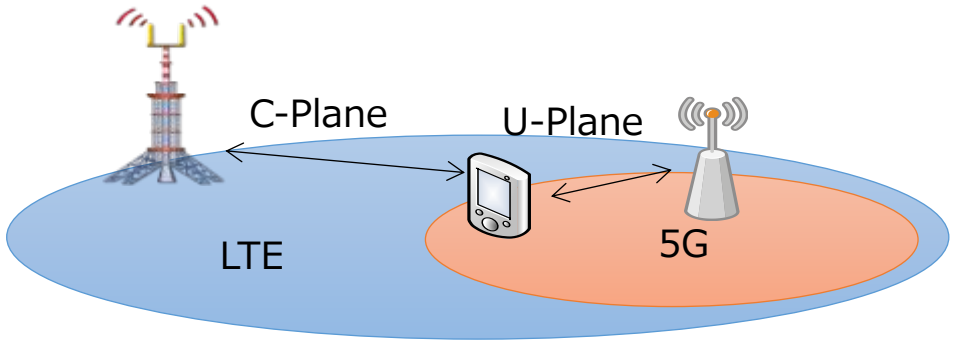


Regional BWA and Private BWA



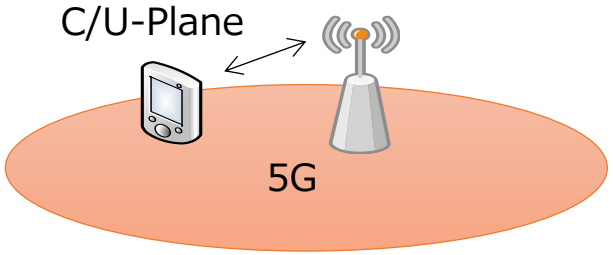
Local 5G Planning towards 2020 (5G NSA → SA)

NSA (Non Stand Alone)



NSA(Non-Standalone)

SA (Stand Alone)



SA(Standalone)

Realistic Plan at the beginning of 2020

28GHz Local 5G
2.5GHz Private BWA/Local BWA
Dual Operation

Realistic Plan in 2020

- 28GHz Local 5G
- 4.5GHz Local 5G

Either of Both

Released 2019/10/18

NTTEAST

東京大学
THE UNIVERSITY OF TOKYO

“Local 5G Open Lab”

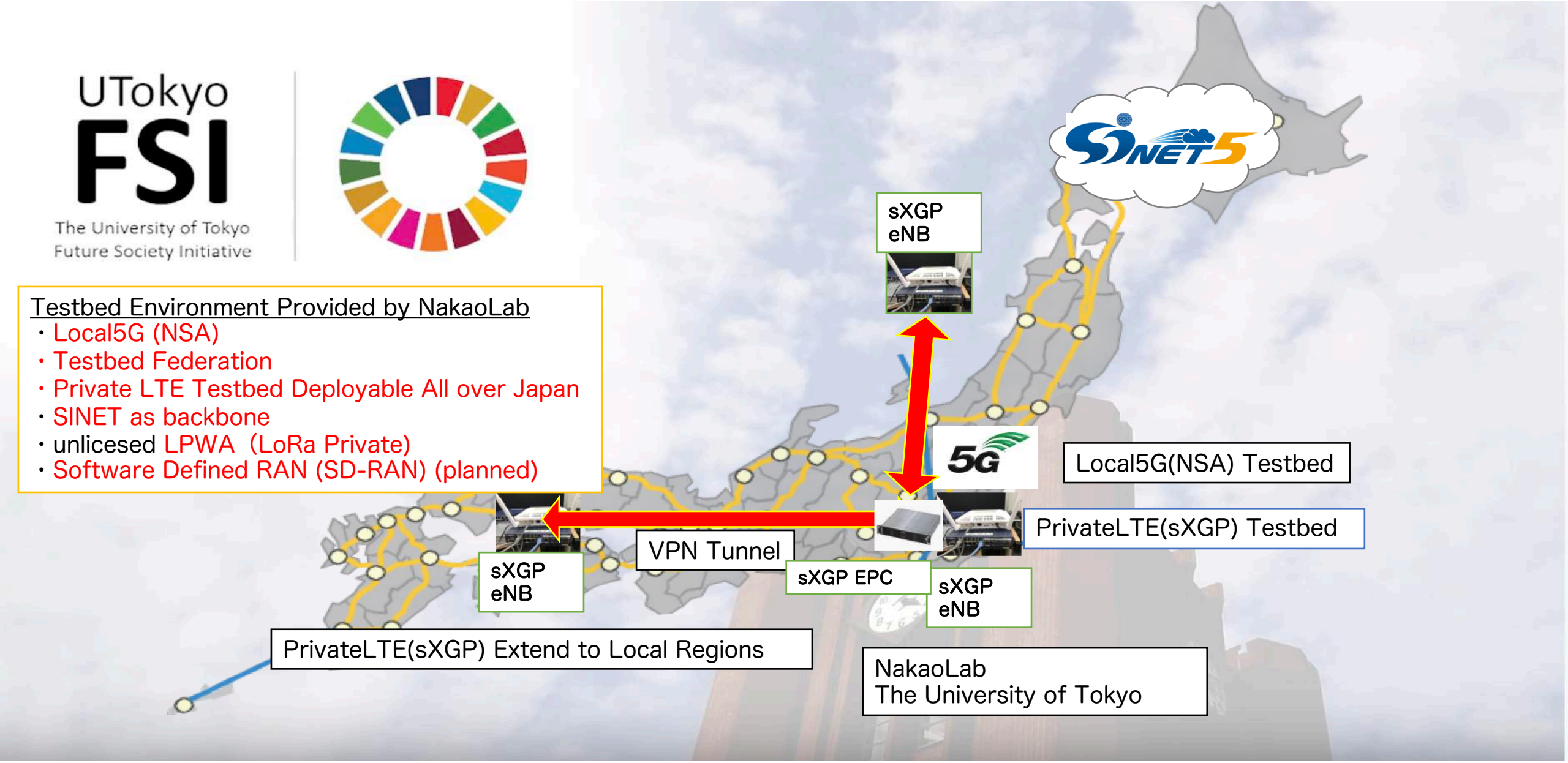
Japan’s First Collaborative Testbed for Private/Local 5G

Co-creating Viable Usecases with Vertical Partners

NakaoLab's Initiative for Local 5G

UTokyo FSI
The University of Tokyo
Future Society Initiative

Testbed Environment Provided by NakaoLab
- Local5G (NSA)
- Testbed Federation
- Private LTE Testbed Deployable All over Japan
- SINET as backbone
- unlicesed LPWA (LoRa Private)
- Software Defined RAN (SD-RAN) (planned)



https://www.youtube.com/watch?v=z6itIL3Gvy0 https://www.u-tokyo.ac.jp/adm/fsi/ja/sdgs_region.html

What “5G Democratization” means to Researchers

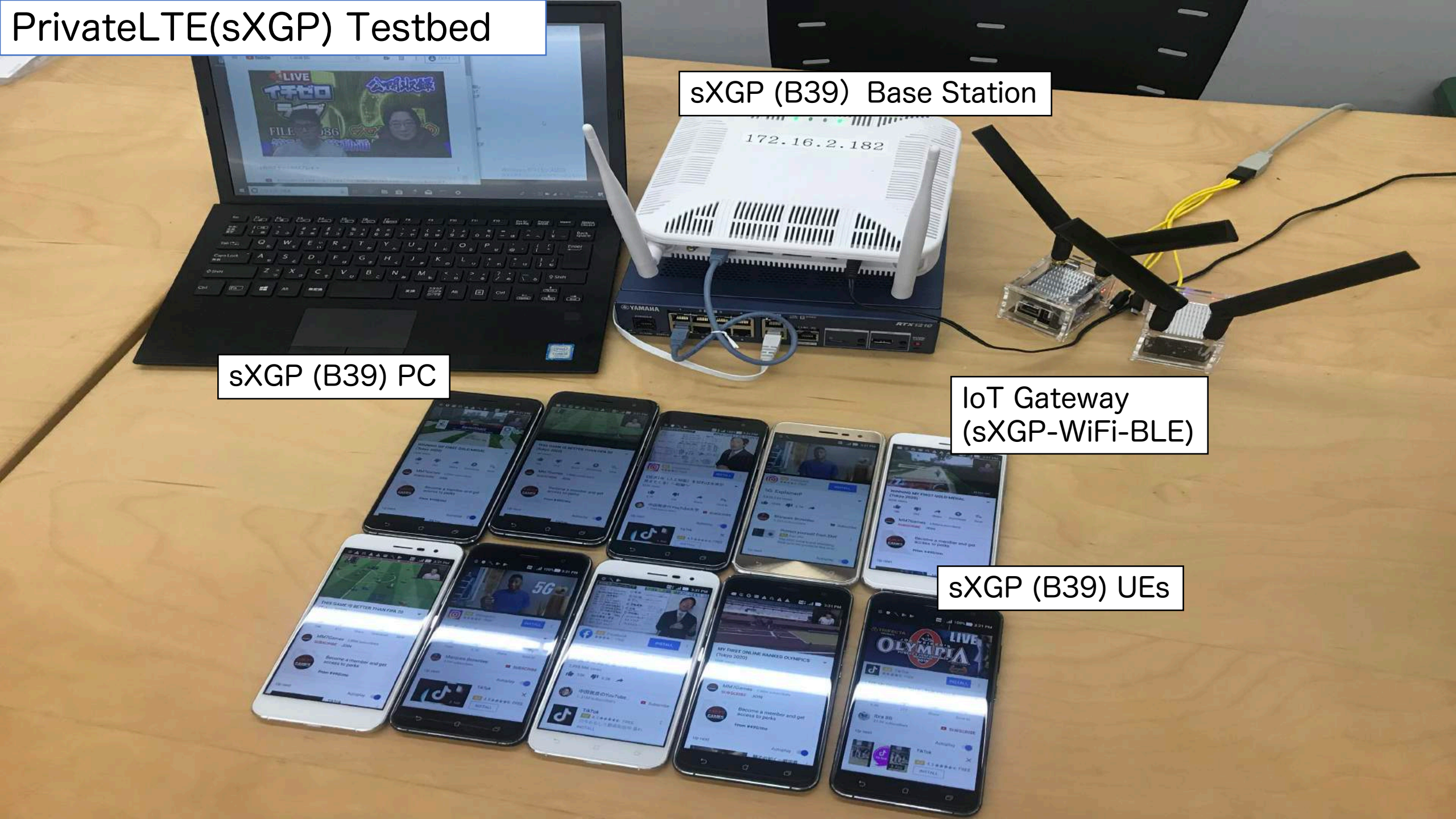
NakaoLab’s Research Area

- 「Network Slicing」
- 「Network Softwarization」
- 「Edge Computing」
- 「Autonomous Management using AI/ML」
- 「Local regions empowered by IoT・AI」

Democratized 5G serves as “Testbed”
for developing/deploysing and experimenting with the latest research results

- High-Risk-High-Reward type of network technologies can find their paths to real deployment
- Highly customizable network operations for reginal users
- Find real use cases for URLLC (and eMBB and mMTC)

PrivateLTE(sXGP) Testbed

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YAMAHA
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Press Release!

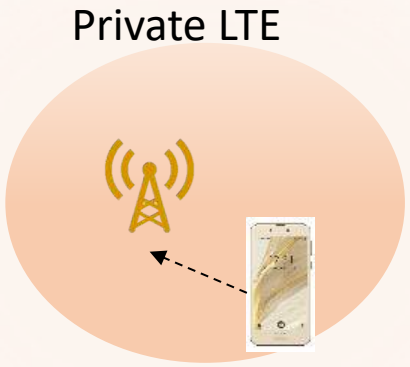
東京大学 THE UNIVERSITY OF TOKYO

IIJ Internet Initiative Japan

Released 2019/6/5

Private LTE/ Public LTE Roaming

Prior Art



Pros

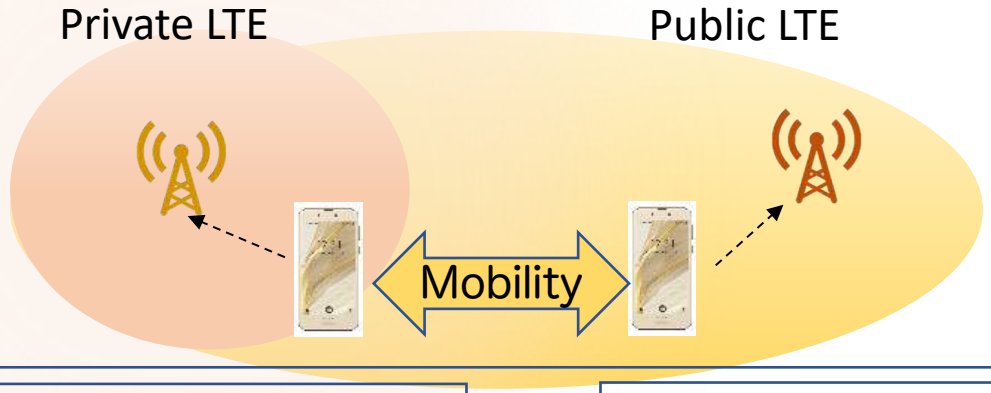
Low Cost
Reliability
Ultra Low Latency

Cons

Regional

Unavailabie outside private coverage

Our proposed Solution



Pros

Low Cost
Reliability
Ultra Low Latency

Cons

Regional

Pros

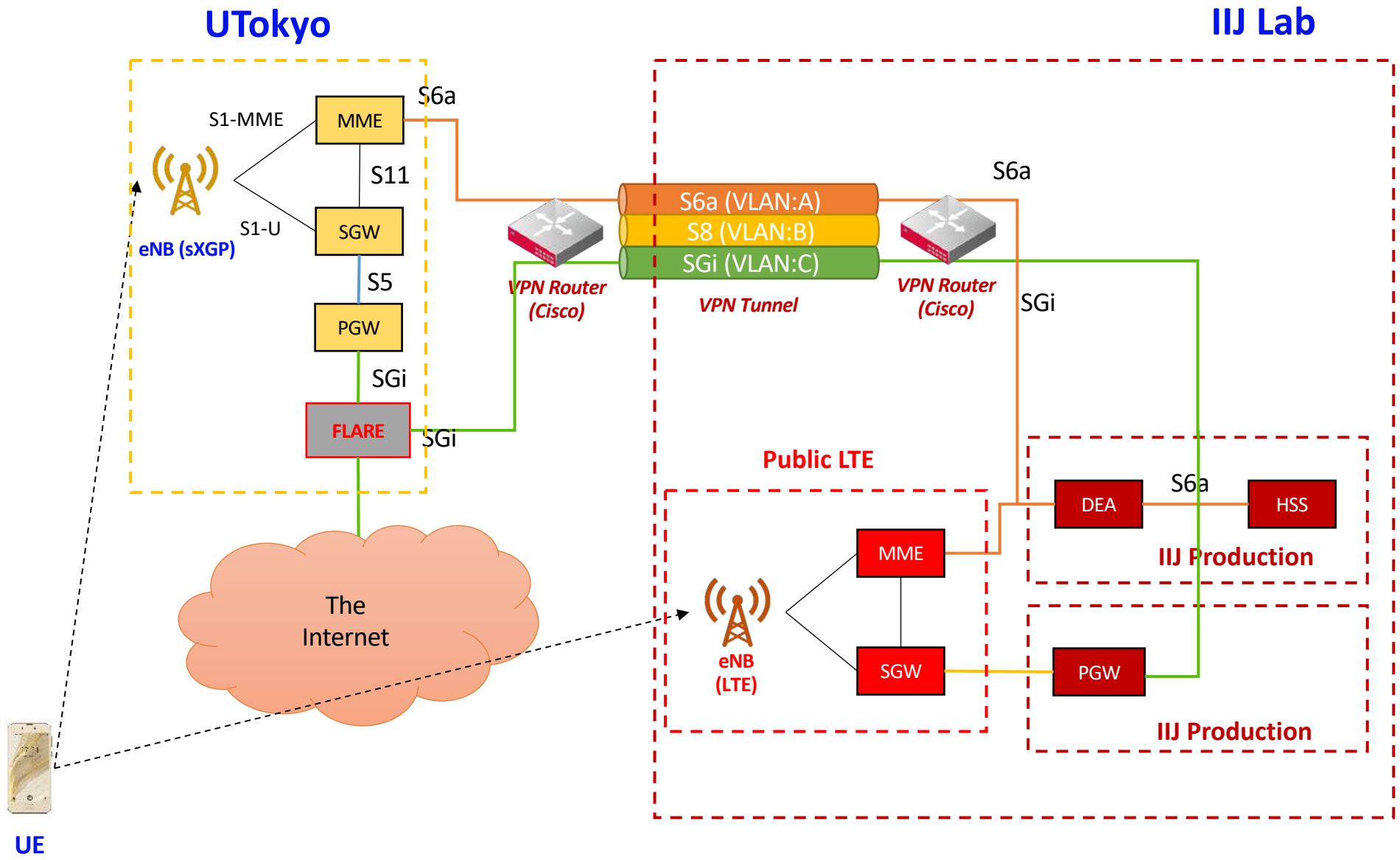
Wide Area
Reliability

Cons

High Cost

Connect to Public if outside private coverage
Costeffective usage of public and private connectivity

Private LTE/ Public LTE Roarming Field Experiment (UTokyo and IIJ)



- UE connects to Private LTE with higher priority (Low cost, URLLC, High Reliability)
- UE switches to Public LTE once outside the private coverage (Wide Area)

Network Softwarizaion around 5G

OPEN AIR INTERFACE

OpenAirInterface

5G software alliance for democratising wireless innovation

Founding Member

EURECOM

Strategic Members

orange

NOKIA Bell Labs

TCL 创意感动生活 The Creative Life

technicolor

FUJITSU

SAMSUNG

CISCO

University of Kent

INDRAPRASTHA INSTITUTE of INFORMATION TECHNOLOGY DELHI

UNIVERSITY of WASHINGTON

iMinds

THE UNIVERSITY OF UTAH

b com

北京郵電大學

instituto de telecomunicações

THE UNIVERSITY of EDINBURGH

Universidad Carlos III de Madrid

University of Essex

TNO innovation for life

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

UniversidadeVigo

RUTGERS WINLAB | Wireless Information Network Laboratory

RUB

UPMC SORBONNE UNIVERSITÉS

POLITECHNIKA POZNAŃSKA

Technische Universität München

Amirkabir

technische universität dortmund

Inria

財團法人資訊工業策進會 INSTITUTE FOR INFORMATION INDUSTRY

CTU

NTNU

RICE

ETRI

台科大 TAIWAN TECH

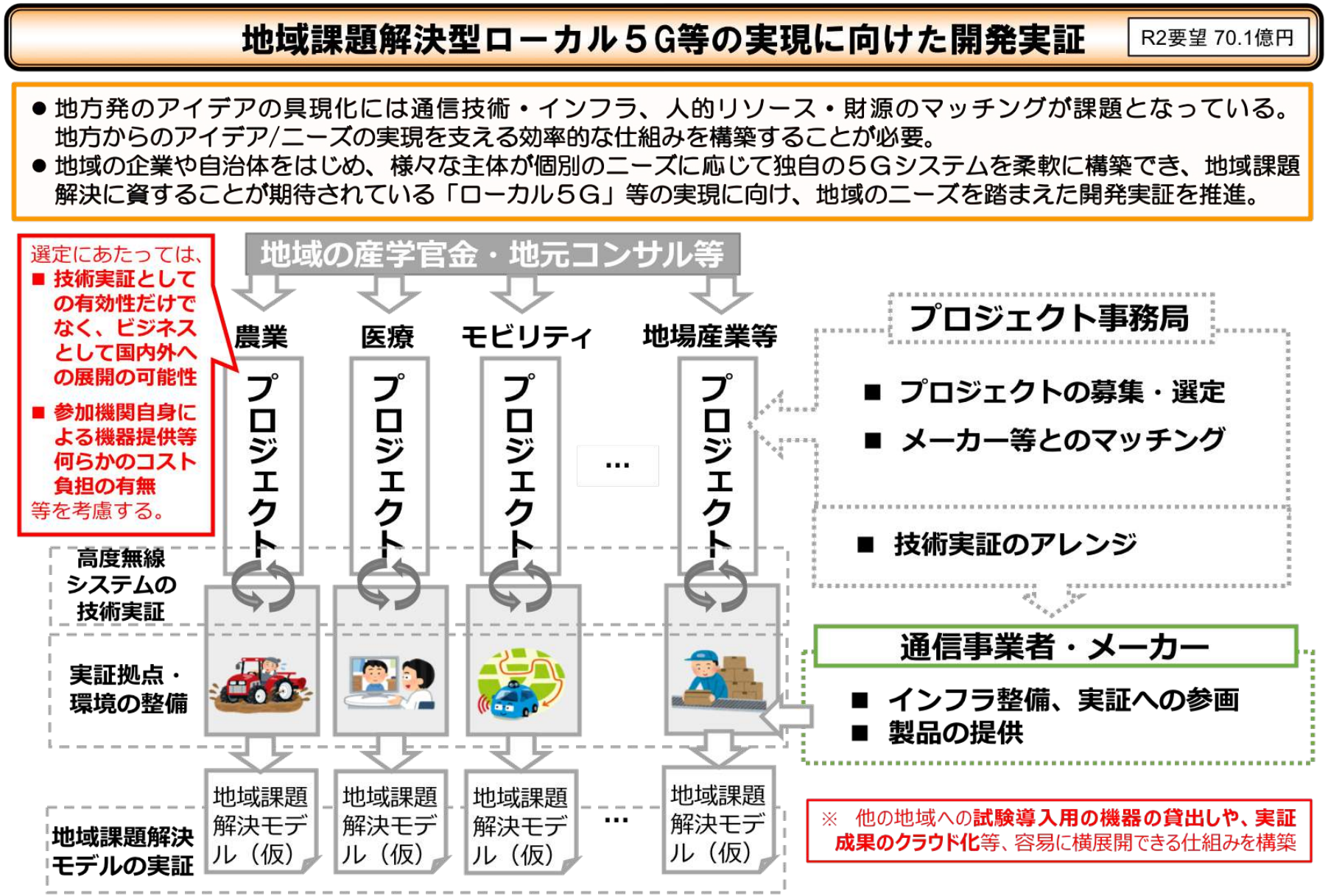
UNIVERSIDAD NACIONAL DE COLOMBIA

上海无线通信研究中心

SAST STELLENBOSCH ACADEMY OF SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

Japanese PAWR for Local 5G (Private 5G)

FY 2020 / 7 B JPY (64 M USD)



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