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# APAC IoT INNOVATION SUMMIT

Kuala Lumpur 24-26 Sept 2019



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# Session 6: IoT in the 5G Era

Kuala Lumpur 24-26 Sept 2019



**Takehiro Nakamura**

SVP & GM of 5G  
Laboratories  
NTT DOCOMO

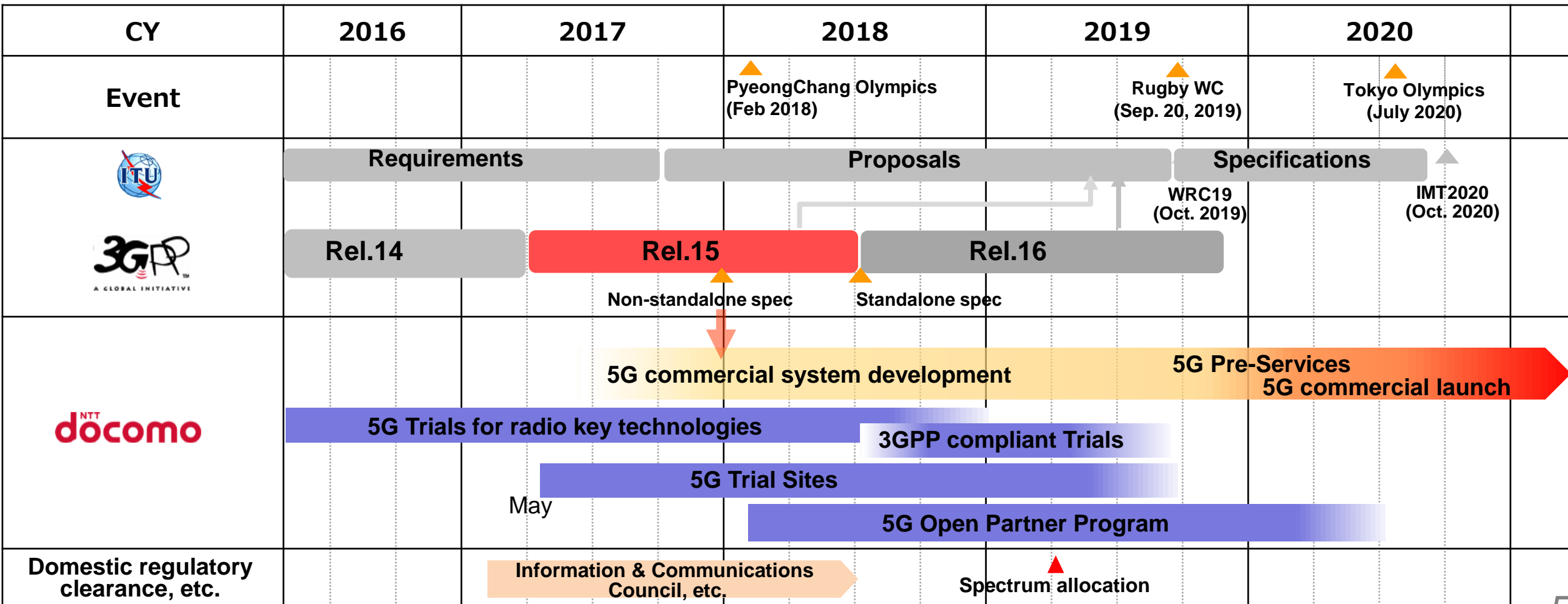
**Session 6:**  
**Deployment of 5G Services in Japan**

# 5G Deployment and Use Cases

Takehiro Nakamura  
NTT DOCOMO, Inc.

# Time schedule for 5G Commercial Launch by 2020

- 5G commercial services will be launched at 2020 Spring based on Non-Standalone of 3GPP specifications
- 5G Pre-Services have been launched on Sep. 20, 2019 taking the opportunity of RWC 2019



## 5G pre-commercial service was launched taking the opportunity of Rugby World Cup 2019™

For consumers



Rugby World Cup 2019™



Roll out 5G coverage in various locations across Japan

For enterprises



Regional vitalization  
Solution of social issues



## Deliver new game viewing style at 8 stadiums & live viewing venues across Japan



Multi-angle viewing



High-presence live viewing



HERE COMES

>>5G

JAPAN 2020



To start Sept. 20

# 5G Pre-Commercial Service

生活の可能性が、ひらかれる。

Music



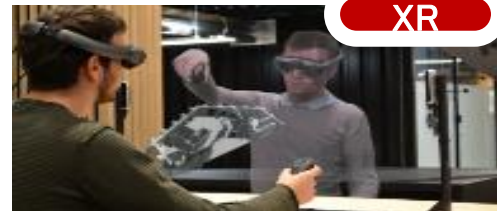
Sports



Game



XR



Travel

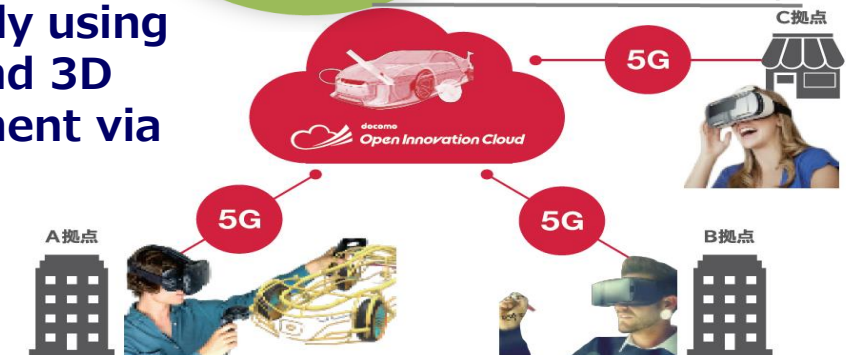


ビジネスの可能性が、ひらかれる。

Co-creation with partners  
from a wide range of industries



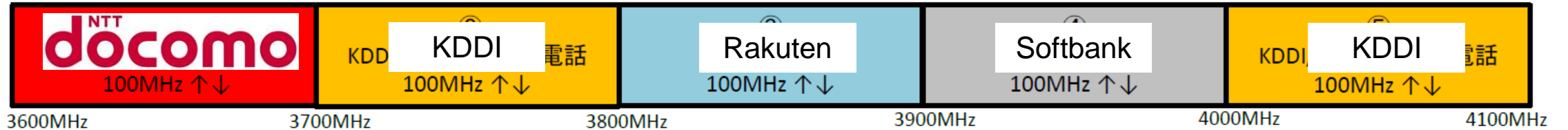
Co-work remotely using  
VR goggles and 3D  
Drawing Equipment via  
5G





# 5G Spectrum Allocation Results

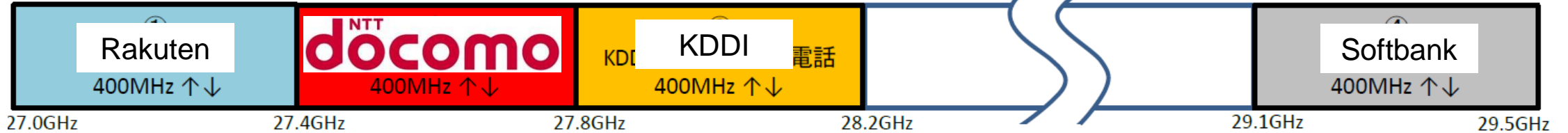
## [3.7 GHz Band]



## [4.5 GHz Band]

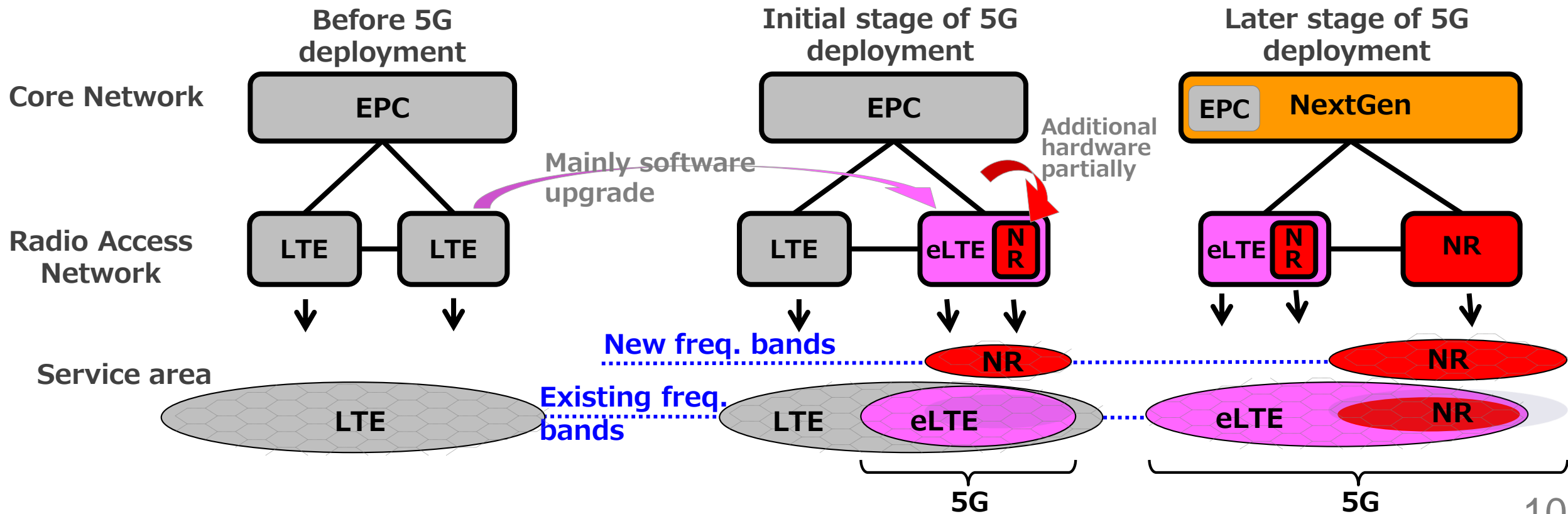


## 28 GHz Band]



# 5G Migration Scenario

- **Initial Stage of 5G deployment:**  
5G services will be provided by tight interwork between eLTE with existing frequency bands and 5G New Radio(NR) with new frequency bands, i.e. Non Stand Alone(NSA) and Option 3x
- **Later stage of 5G deployment:**  
NextGen CN will be deployed to provide services flexibly by architecture suit for slicing. NR will be deployed for the existing and additional new frequency bands. Support stand-alone NR.



## Expand activities for creating new use cases



Demo Experiments  
for promote activities

FY2017

Expand Partners

Num. of partners  
exceed **3,000**

New co-created services in  
various industries

Education

Construction

Finance

media

Transportation

Manufacture

Services

Entertainment

FY2020  
Commercial  
Deployment





# Participation from a wide variety of industries



## Initiatives in creating new businesses with a wide variety of business partners utilizing 5G

### 5G information sharing

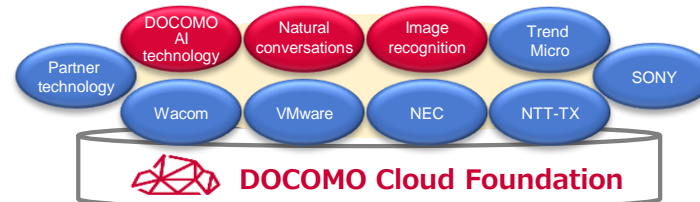


Domestic and overseas 5G information, 5G lecture materials and videos, 5G verification testing reports

### 5G verification environment



DOCOMO's 5G Open Lab™  
Yotsuya, Osaka, Okinawa, Guam



DOCOMO Open Innovation Cloud™

### Communication (matching)



2018

- 5G workshop
- Theme based workshops (AR/VR)
- Theme based workshops (production reform and creation)
- DOCOMO OpenHouse2018 Partner only event

2019

- 5G Business Camp

Convened at 6 locations across Japan in Mar. - Jun. 2019. Efforts underway to convert the 33 exhibitions and other solutions into commercial business.

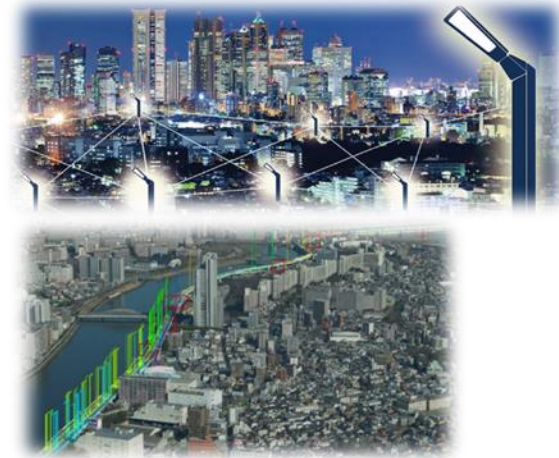
Image transmission



Remote medicine



Remote monitoring



DOCOMO 5G Open Partner Program

## 5G BUSINESS CAMP



xR



Robotics



Authentication/AI



## Create solutions that lead to various types of value and solve social problems

Local creation

Medical and nursing care

Protection against disasters and crime

Insufficient labor

Primary industries



製作・著作：凸版印刷株式会社



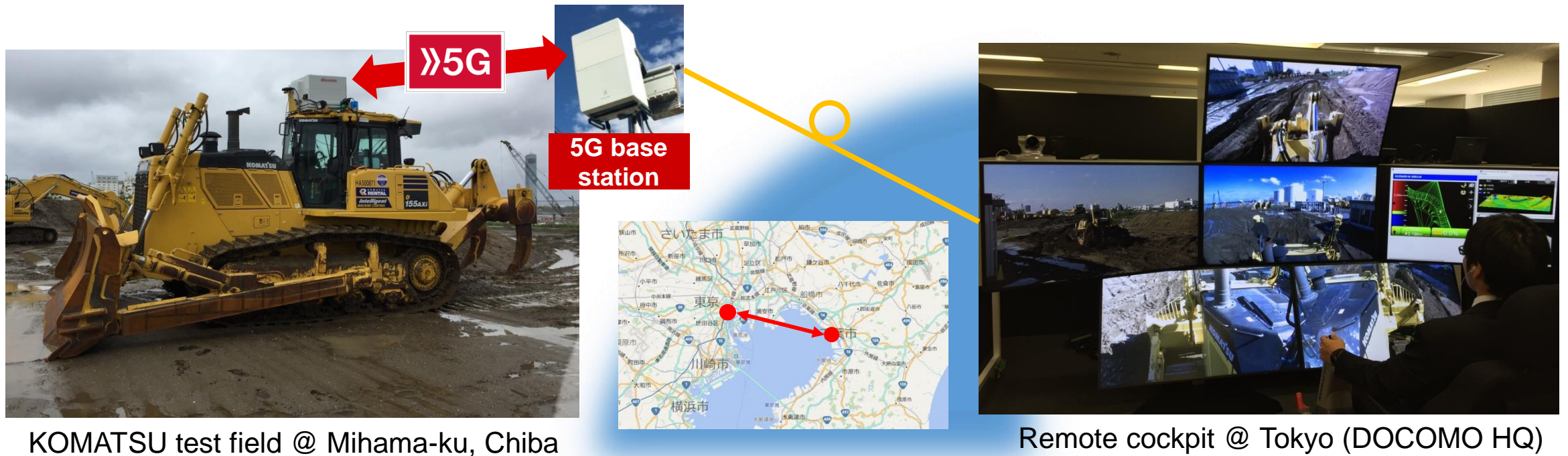
Over 150 trials



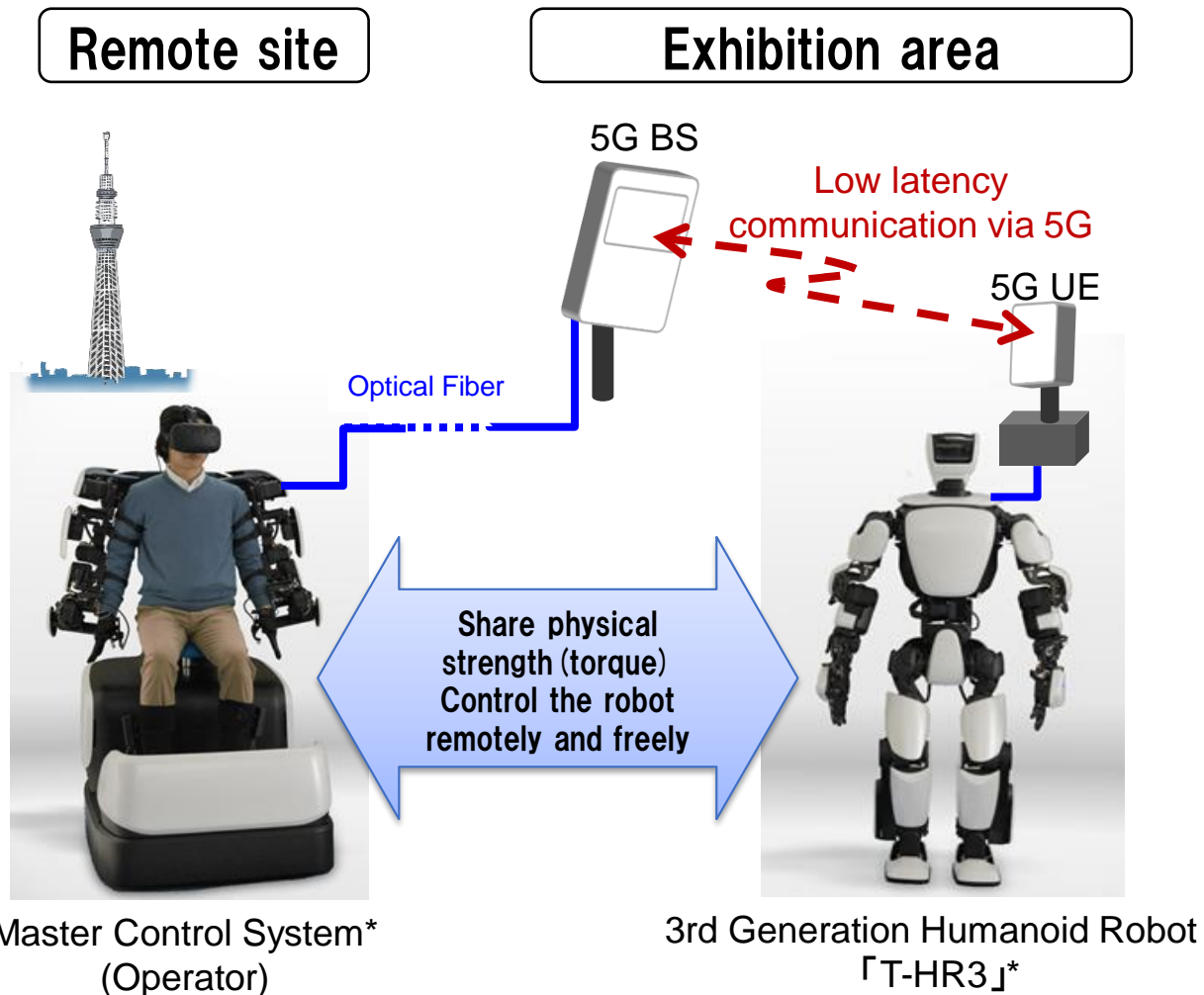
# Remote operation system for construction machines



To realize a remote operating system for construction/mining machines leveraging the high-speed and low-latency characteristics of the 5G radio technology



## T-HR3 × 5G



- Remote control of humanoid robot utilizing low latency capability of 5G
- Physical strength (torque) and haptic perception can be shared between the operator and the robot (T-HR3)
- Operator can control the robot remotely and freely with the sense of avatar
- Use cases
  - Support household cares, care for old people and child, etc, remotely
  - Support constriction works and medical diagnostic by the robot
  - Extreme work at, e.g. disaster area, space

\* T-HR3 and the control system was developed by Toyota



# Telemedicine Services Exploiting 5G



Remote doctor's interview and diagnosis trials based on 4K high resolution video transmission over 5G to realize telemedicine services between the advanced medical hospital and the local medical clinic

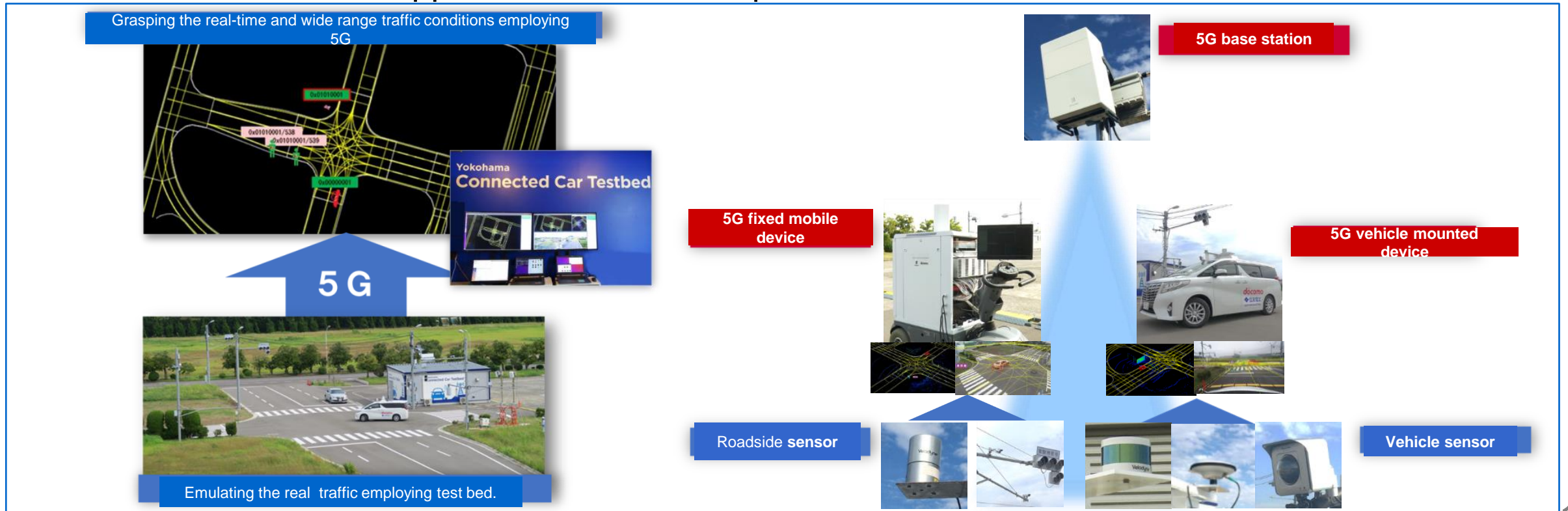


# Demonstration targeting use of road traffic condition data employing 5G

## Real-time data collection and analysis of road traffic conditions

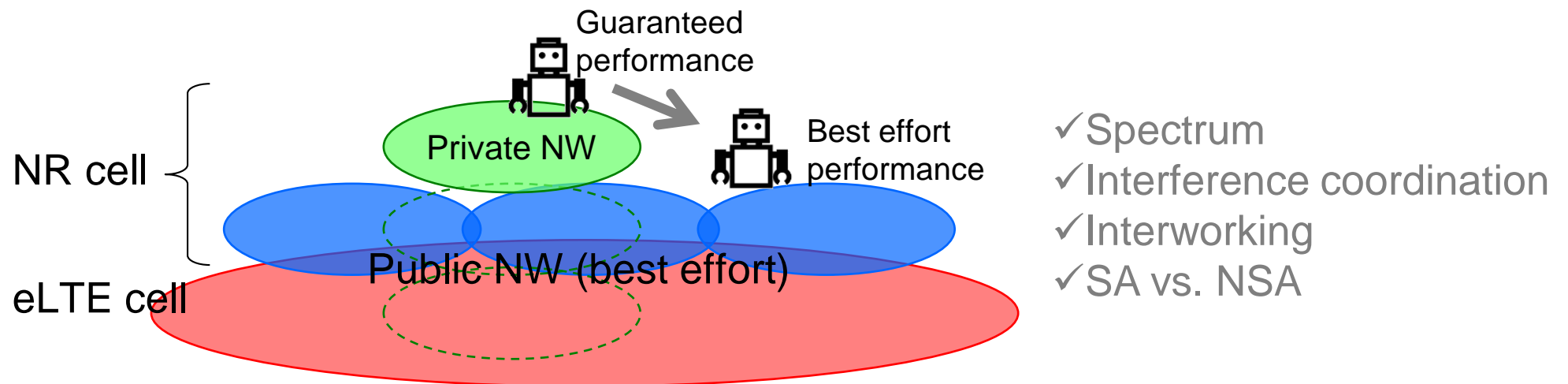


- Real-time data collection and analysis of road traffic conditions employing 5G
- Huge-amount of data from sensors embedded in the traffic infrastructures such as vehicles, roads and buildings transferred via 5G
- Grasping real-time and wide-range traffic conditions and providing advanced support for vehicles and pedestrians



- High demand of industry network to provide specific and high performances, e.g. ;
    - Relatively high minimum data rate (sometimes for many devices, sometimes uplink heavy)
    - High reliability to keep service quality
    - Low end-to-end latency
    - Easy temporary network deployment for events, construction sites, etc.
- ➔ Private 5G network is a promising solution to address such requirements

- A technical issue – public/industry overlay deployment





## 報道発表資料

いいね! ツイート

(お知らせ) ファナック、日立、ドコモ、5Gを活用した製造現場の高度化  
に向け共同検討を開始

-工場・プラント内における5Gの有用性を検証-

<2019年9月2日>

[https://www.nttdocomo.co.jp/info/news\\_release/2019/09/02\\_01.html](https://www.nttdocomo.co.jp/info/news_release/2019/09/02_01.html)

## Press Releases

September 2, 2019

### DOCOMO Joins 5G Alliance for Connected Industries and Automation

— Aims to build industrial 5G networks supporting factory automation —

Print Like Tweet

TOKYO, JAPAN, September 2, 2019 --- NTT DOCOMO, INC. announced today that it has joined the 5G Alliance for Connected Industries and Automation (5G-ACIA) with the aim of further advancing the use of 5G technology in the manufacturing sector.

[https://www.nttdocomo.co.jp/english/info/media\\_center/pr/2019/0902\\_00.html](https://www.nttdocomo.co.jp/english/info/media_center/pr/2019/0902_00.html)

## 報道発表資料

いいね! ツイート

## Press Releases

September 10, 2019

### DOCOMO to Commence 5G Trials at Manufacturing Sites in Partnership with OMRON and Nokia

Print Like Tweet

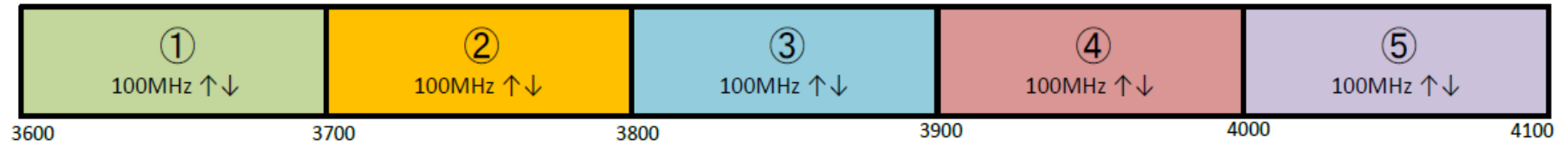
TOKYO, JAPAN, September 10, 2019 --- NTT DOCOMO, INC. announced today that it has agreed with OMRON Corporation and Nokia Solutions and Networks Oy to collaborate in trials of 5G mobile communication technology inside factories, with the aim of significantly enhancing future manufacturing productivity.

There is increasing demand for wireless communications inside manufacturing plants driven by the need for stable connectivity between IoT devices, including those embedded in machine controls. As machine background noise and the movement of people in manufacturing sites have the potential to interfere with wireless communications, thorough verification of the reliability and stability of any 5G technology deployed in such environments is required.

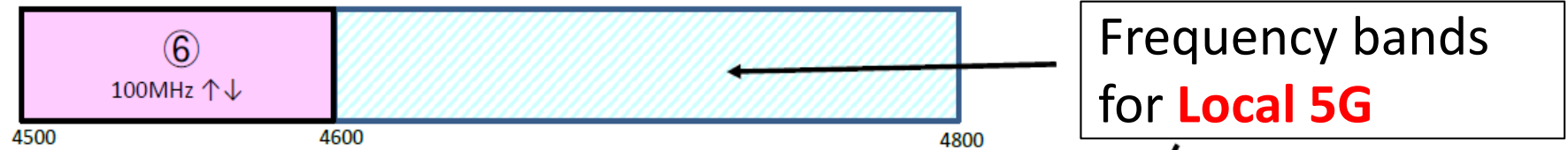
[https://www.nttdocomo.co.jp/english/info/media\\_center/pr/2019/0910\\_00.html](https://www.nttdocomo.co.jp/english/info/media_center/pr/2019/0910_00.html)

# 5G Spectrum Allocation in Japan

3.7 GHz:  
100 MHz x 5 blocks

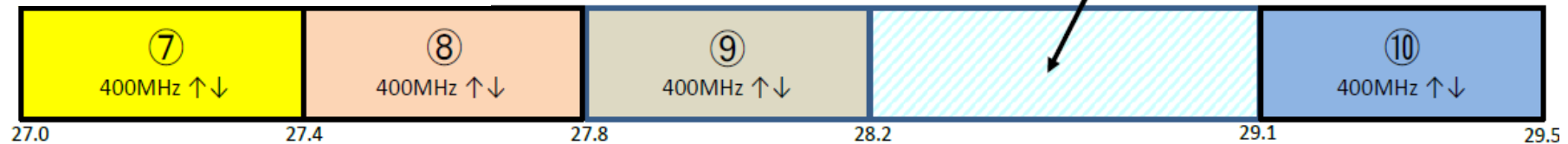


4.5 GHz:  
100 MHz x 1 block



Frequency bands  
for **Local 5G**

28 GHz:  
400 MHz x 4 blocks



Source: [http://www.soumu.go.jp/menu\\_news/s-news/01kiban14\\_02000358.html](http://www.soumu.go.jp/menu_news/s-news/01kiban14_02000358.html)

## ■ Coverage

- Myth: 5G will be available everywhere
- Real: 5G will be deployed in limited area and expanded for several years. 4G network will be enhanced continuously and combined use of 4G and 5G is essential.
- Future(My wish): (almost) 5G Everywhere

## ■ Performance

- Myth: 10 Gbps of data rate and 1 ms of latency everywhere
- Real:
  - Several Gbps of peak data rate due to limitation of terminal performance. Typical data rate will be less than that depending on radio conditions, e.g. propagation loss, blockage, spectrum BW.
  - Latency will be several ms to several tens ms depending on NW configuration and distance between BS and server.
- Future(My wish): Peak data rate > over 10Gbps, 1Gbps (almost) everywhere

## ■ Use cases

- Myth: 5G will be available for any use cases
- Real: Need to develop nice application and business model beforehand
- Future(My wish): cope with any use cases for eMBB, URLLC and mMTC



Thank you for your attention!

