

# Activities on IoT and 5G by KDDI

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**1. KDDI business domain**

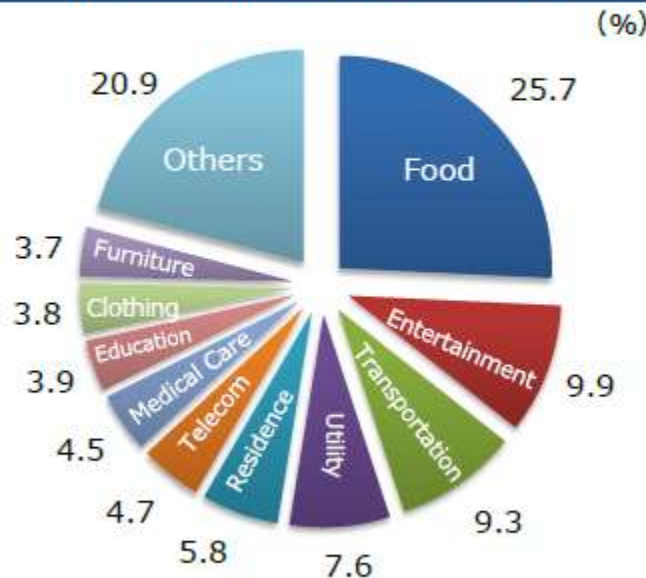
**2. IoT Business by KDDI**

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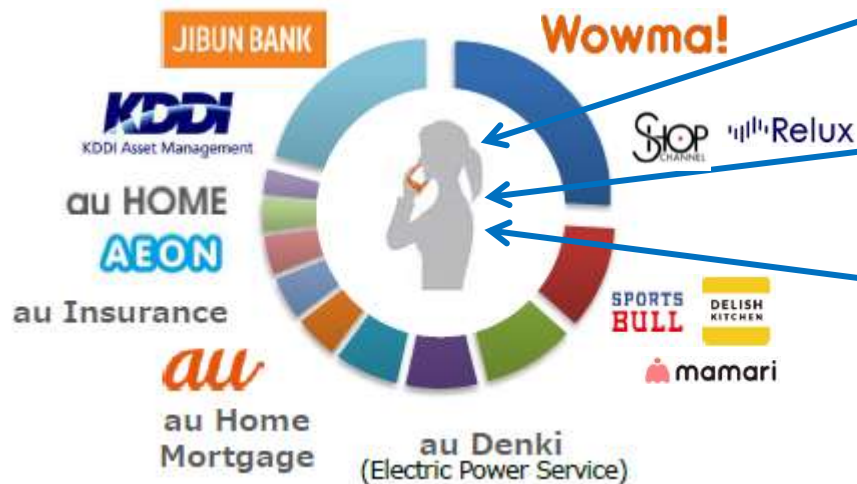
## Expanding the business domain to every aspect of customers' daily life

Household Consumption Expenditure Composition Ratio (Household with two or more people)\* (%)



\*Created by KDDI based on "Family Income and Expenditure Survey Report (Household Receipts and Disbursements) -Preliminary Average for 2017" issued by Ministry of Internal Affairs and Communications)

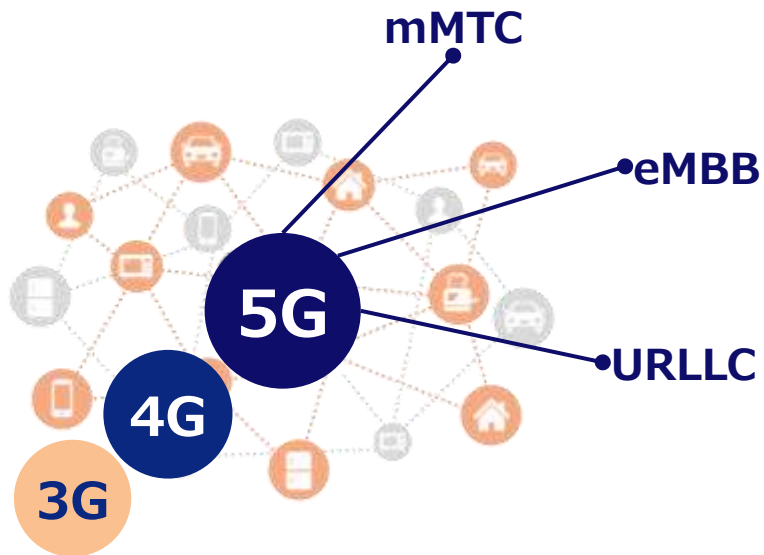
## Need to strengthen our Core Business



- ✓ High Quality Network
- ✓ New Technology
- ✓ Low Cost Operation

- ✓ Technology Alignment
- ✓ Open Innovation

KDDI utilizes promising technologies such as 5G, IoT, Big data analysis and AI



IoT

Big Data

AI...



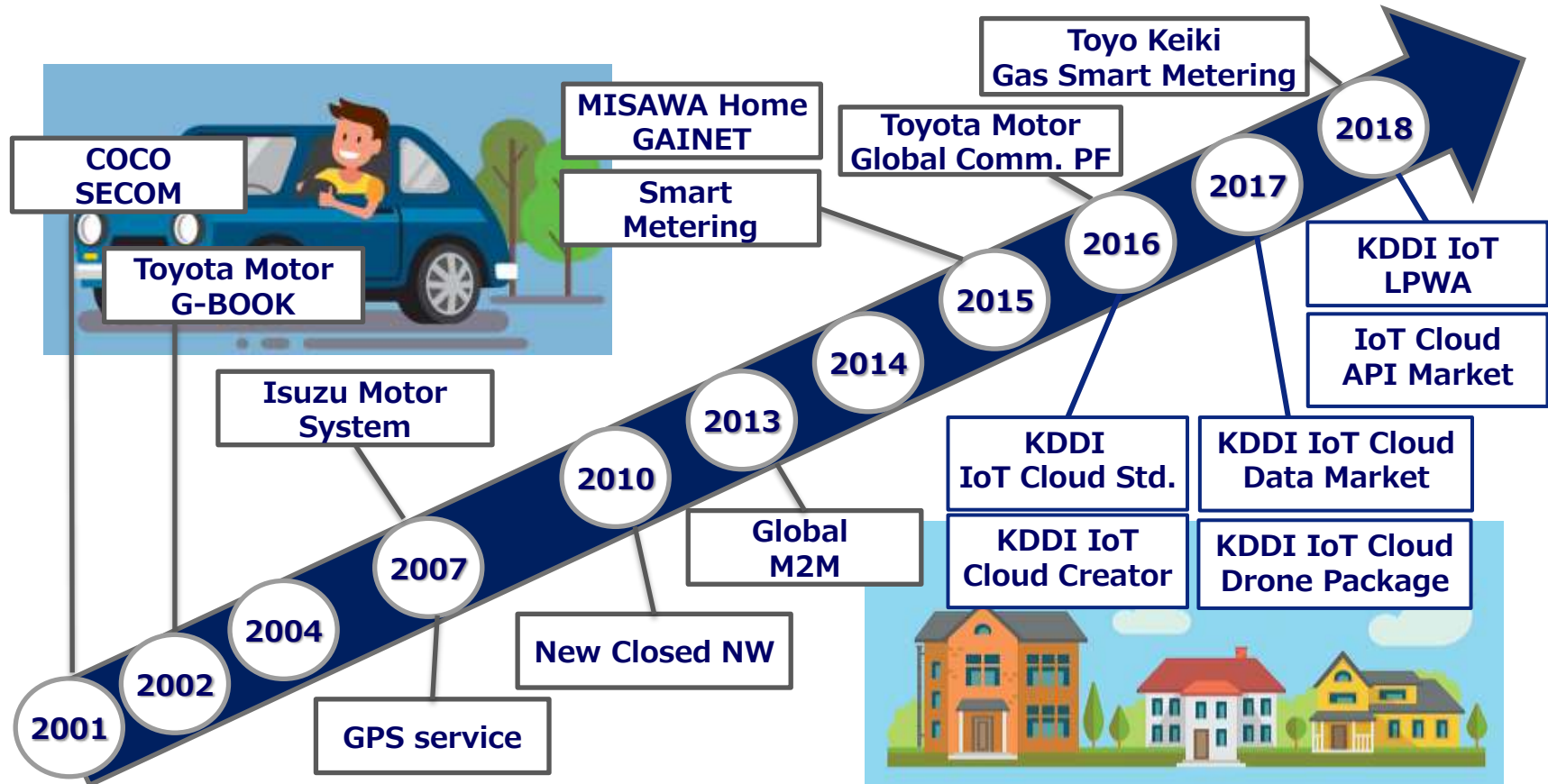
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- KDDI started LPWA using LTE-M from Jan. 2018
- LTE-M is based on LTE, which
  - ✓ has nation-wide coverage area
  - ✓ does not need new nodes and facilities in KDDI network

## LPWA?

Lower power consumption of terminals and wider service coverage



Supports prompt service launch, customization, cost reduction, and efficiency improvement for customers



More than 2,000 types of sensors, including location, temp., humidity, flow, human sensors, etc.



Customization of human interface and daily reports.



Real time monitoring of surveillance cameras

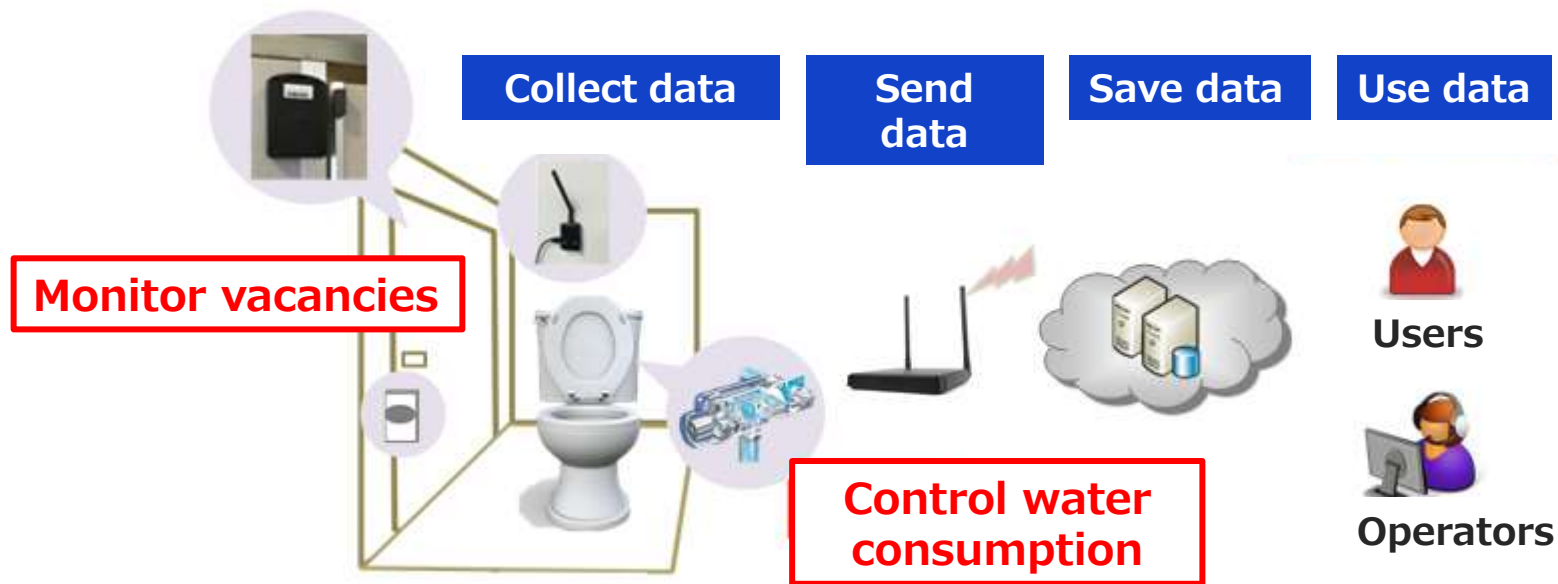


Location and map functions using GPS sensors.



In English and Japanese. Support of other languages planned.

- ✓ Vacancies of restrooms are checked by smartphones
- ✓ Water consumption is saved up to 50% by adjusting amount of water





In combination of short range local radio network "Wi-SUN" and 3G/LTE network.

3G/LTE Network

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# Explore 5G possibility in collaboration with partners *au* 5G

## Mobility



Car (>190km/h)



Train(100km/h)

## Low Latency



ICT  
Construction



Tele existence

## Safer and securer



Security  
System



Smart Station

*au* 5G

## Better Society



Smart School

\*Part of the projects are carried out as 5G trails supported by MIC.

## High Definition Video, VR/AR

Live video from  
drone



Stadium  
Entertainment



Free  
Navigation



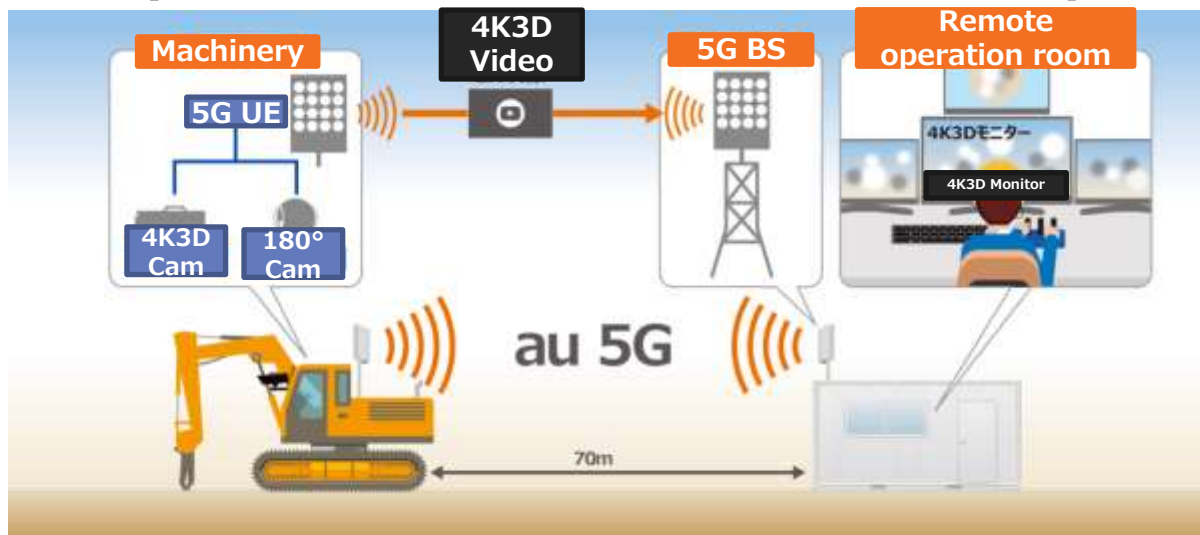
VR Travel



# Remote control of construction machinery



Japan's first 5G demonstration using 4K3D monitoring for application to remote construction by KDDI, NEC and OBAYASHI Corp.



**Outcome: -35% of time for remote control**

The project was carried out as part of 5G field trials supported by MIC, Japan.

# Entertainment in a Stadium

# “Free navigation video” to 5G tablets

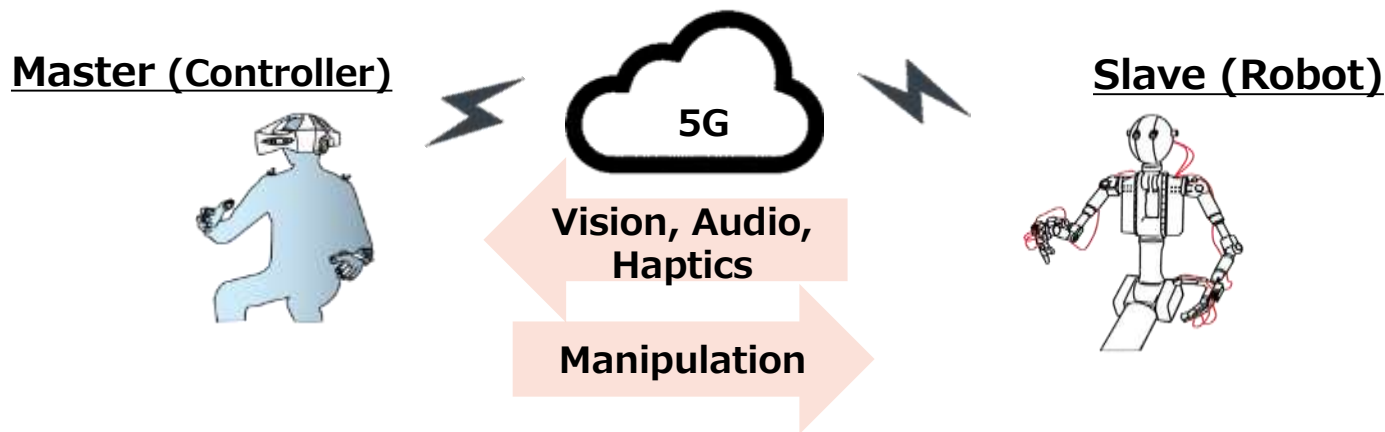
- ✓ At a professional baseball game on June 26, 2018.
- ✓ First success globally.
- ✓ Create video from any angle a viewer wants using sixteen 4k video materials.



Okinawa Cellular Stadium

# Telexitence

Telexistence is a robot enabling synchronized remote control  
You can feel temperature, pressure, feelings through your hand



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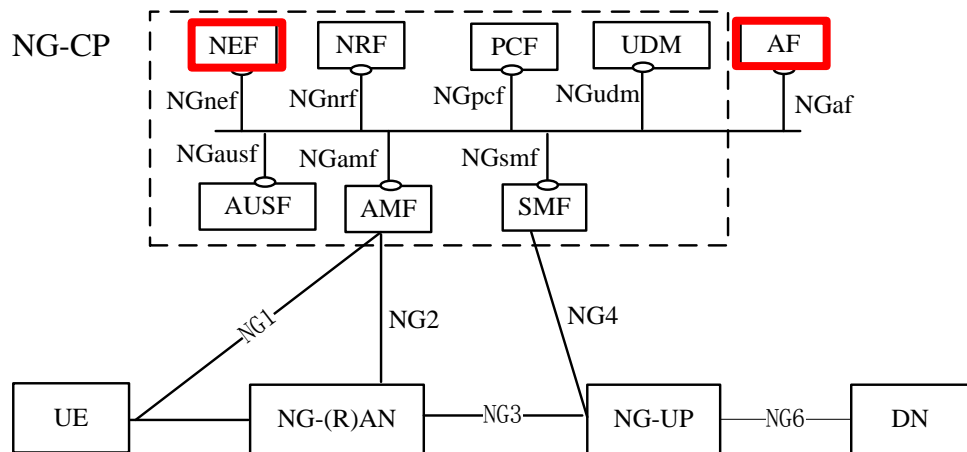
4. Concerns on security in 5G

# What's new in 5G (compared to 4G)?

Viewpoints	4G	5G	Major change in 5G NW
Main target	People	People and <b><u>things</u></b>	(a) Massive simultaneous connections
NW capability	MBB, IoT	eMBB, mIoT, <b><u>uRLLC</u></b>	(b) Higher frequency, Local breakout (including CUPS)
Configurability	Operator	Operator + Enterprise customer (or 3 <sup>rd</sup> party)	(c) Exposure func. and API for 3 <sup>rd</sup> party

Realized by low cost!

Major change in 5G NW	What's needed in 5G NW?
(a) Massive simultaneous connections	NFV, Massive capacity at NW nodes
(b) Higher frequency, Local breakout (including CUPS)	More BS, More GW, MEC, New architecture in RAN (CU-DU splitting)
(c) Exposure func. and API for 3 <sup>rd</sup> party	NEF and AF in 5GC





## Summary of “changes” in 5G

### □ NW

- Virtualization including NFV not only in mobile core but also IP networks and RAN
- Software portion will increase
- New NW nodes such as MEC and CU-DU in RAN will appear
- More RAN nodes will be deployed
- More nodes will be located closer to customers
- Exposure functions enabling NW slicing open a new application interface with customers (or 3<sup>rd</sup>-party)

### □ Terminals and devices

- Massive IoT will bring variety of IoT devices



**Needs robust and light security SW and systems**

Designing The Future

**KDDI**

あたらしい自由。

*au*