



Using Design Thinking to create Human-Centred Solutions for Complex Systems and Networks

THE FUTURE OF 5G NOW

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CORPORATE PROFILE

NEC Corporation

Establishment

Established

1899

(122 year old)



Global Network

Consolidated subsidiaries

301

Across over

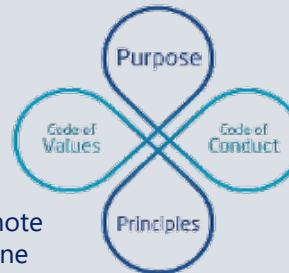
50 countries



NEC Way

Purpose

\Orchestrating a brighter world **NEC**



NEC creates the social values of safety, security, fairness and efficiency to promote a more sustainable world where everyone has the chance to reach their full potential

Employees

Over

115,000



R&D Budget

As at Mar 2021

¥115B

(3.8% of revenue)



Revenue

As at Mar 2021

¥2,994B

(US\$27B)[^]

Technological Capabilities

Global

Leaderships

- Biometric
- Artificial Intelligence (A.I.)
- Network



[^]Based on US\$1 = ¥110



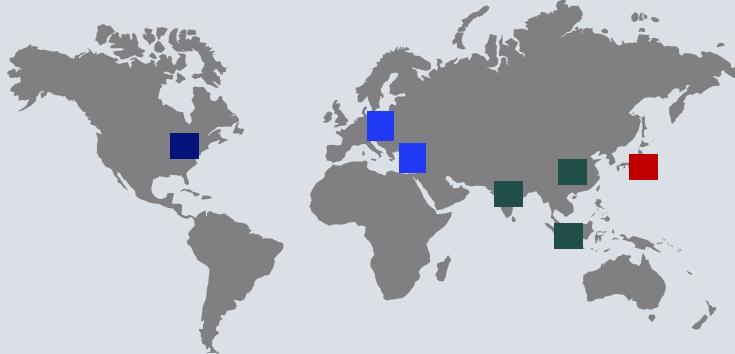
NEC LABORATORIES WORLDWIDE

NEC Corporation

Global Laboratories

Locations

10



- **JAPAN (4): Central Research Laboratories (Japan)**
Takes the Central role in NEC R&D, focusing on AI (recognition, analysis), Security, ICT platform, & other cutting-edge technologies, Such as Quantum computing.
- **AMERICA:** Development of cutting-edge core technologies
- **EUROPE:** R&D thru EU projects & standardization activities
- **ISRAEL:** Promote marketing-type research
- **CHINA:** Development of core technologies in AI & Network
- **INDIA:** Core technologies to address challenges of emerging countries
- **SINGAPORE:** Co-creation of innovative solutions with customers and partners, mainly for developed countries.

Biometric Leadership

World

No. 1*

(Backed with over 50 years of R&D in Biometrics)



NEC biometric authentication

 Bio-IDiom

* According to tests performed by the U.S. National Institute of Standards and Technology

A.I. Leadership

A.I. Researchers & Data Scientists over

1,800

(Across the world in 10 laboratories)



 NEC the WISE

Network Leadership

Support data flow for

100 mil

People



NEC Smart Connectivity

TECHNOLOGICAL HIGHLIGHTS

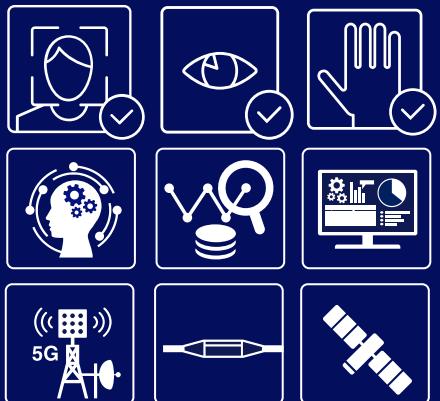
NEC Corporation

ICT Technologies

From

Sea floor to Outer space

Providing extensive value to customers in a wide range of fields, all across the world



The image is a collage of three scenes. The top half shows a satellite in space against a dark background with Earth's horizon visible. The bottom left shows a submarine cable being laid on the ocean floor by a ship, with several workers in hard hats on the deck. The bottom right shows a large yellow cylindrical structure, possibly a storage tank or part of a ship, with several workers around it.

Satellite Solutions

Hayabusa2 returns to Earth after a journey of over 5 billion km

NEC Wins 2021 Leading Lights Award for 'Best New 5G Core Product' and 'Best New Open RAN Product'

Submarine Cable Solutions

World Longest submarine cable system.
Spanning 15,000 km across pacific ocean linking Singapore to San Francisco, USA



Singapore

Good design thinking 'critical' in transforming Singapore again: PM Lee



By Vimita Mohandas

Advertisement

Ad

DESIGN THINKING

"STAY HUNGRY, STAY FOOLISH..." - S. JOBS

Design Thinking - Introduction (PPT) (Fully Editable PowerPoint Presentation) Service Design

flevy Flevy.com Best Practices [VISIT SITE](#)

“Good design thinking was a key reason for Singapore’s successful journey from third world to first, and it will be critical to transform Singapore again, and stay an outstanding city in the world”

Prime Minister Lee Hsien Loong

5 Apr 2018

NEC's early headstart with Design Thinking with IDEO

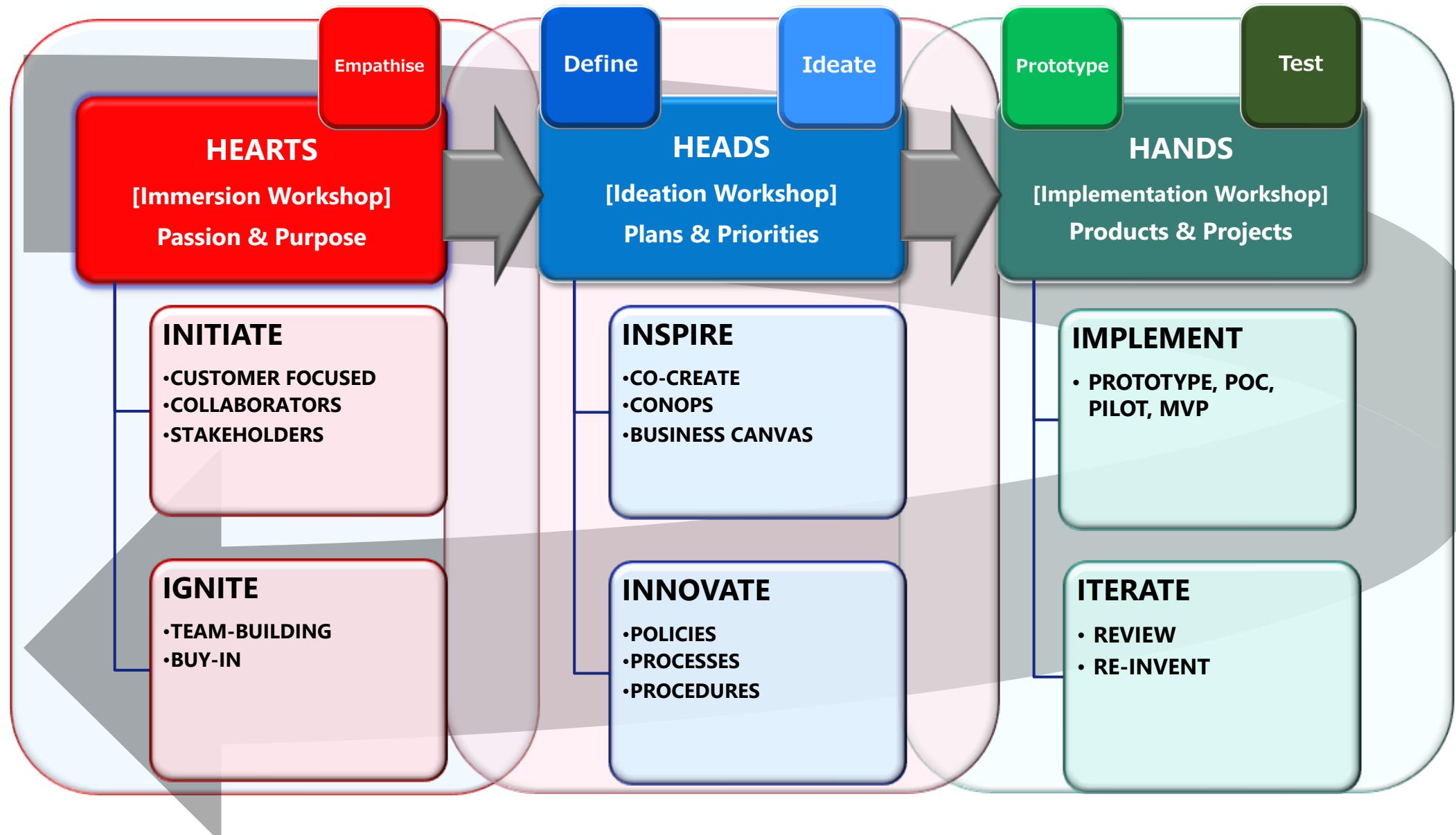
- In the 1990s, NEC and IDEO collaborated on the "Greenhouse Project" and the "Engineering Design Project" for 5 years.
- "NEC Design Thinking" was influenced by these activities.
- Approaching design thinking from a human perspective has encouraged innovations and evolved DX.
- Design thinking helps people generate ideas in a collaborative way that takes full advantage of everyone's perspectives, breaking mental barriers and changing mindsets.



Tim Brown

Executive Chair at IDEO, the global design consultancy. He has written numerous books and articles including "Change by Design" (Harper Business) and "Design for Action" (Harvard Business Review).

NEC Human-Centred Design Thinking Framework



Training Modules

Module (A) Intro Level – Via Two Zoom sessions

Session 1 (1 Hour)

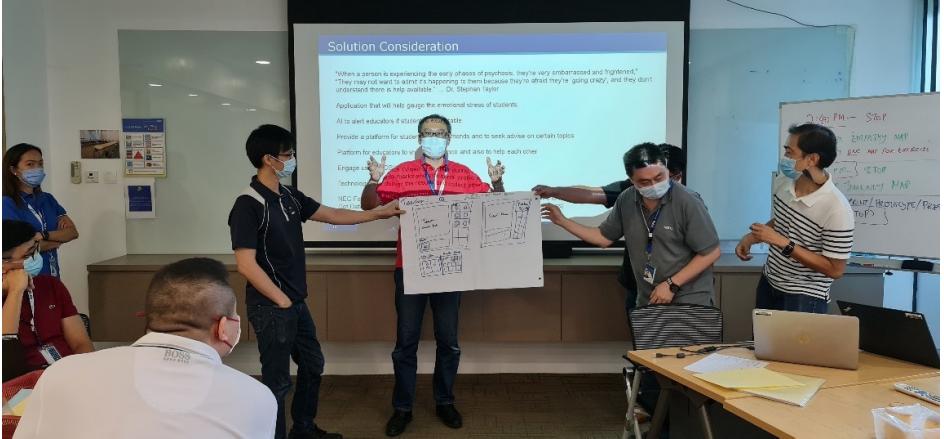
1. Introduction to Design Thinking
2. Why is Design Thinking relevant?
3. Use-Case examples of DT in Public Sector
4. What is the NEC DT for Public Sector?
5. Design Thinking vs SDLC, Lean Startup, Agile

Session 2 (1 Hour)

1. Deep dive on each module of NEC DT for Public Sector
2. What are the key tools for each module?
3. Usage of the tools
4. Review and Quiz

Module (B) Facilitator Level – Half-day onsite training workshop

1. Group-based Exercises
2. Actual usage of DT process with use-case for each target client
3. Presentation by teams



Design Thinking with Social Value Design for Social Value Creation





Two points of view in thinking about design.

What kind of people are the users of this product?



User Experience

NEC provides attractive and easy-to-use products and services by emphasizing the processes by which they are used by many people in many different environments, and thinking about how we can improve the value of the user's experience.

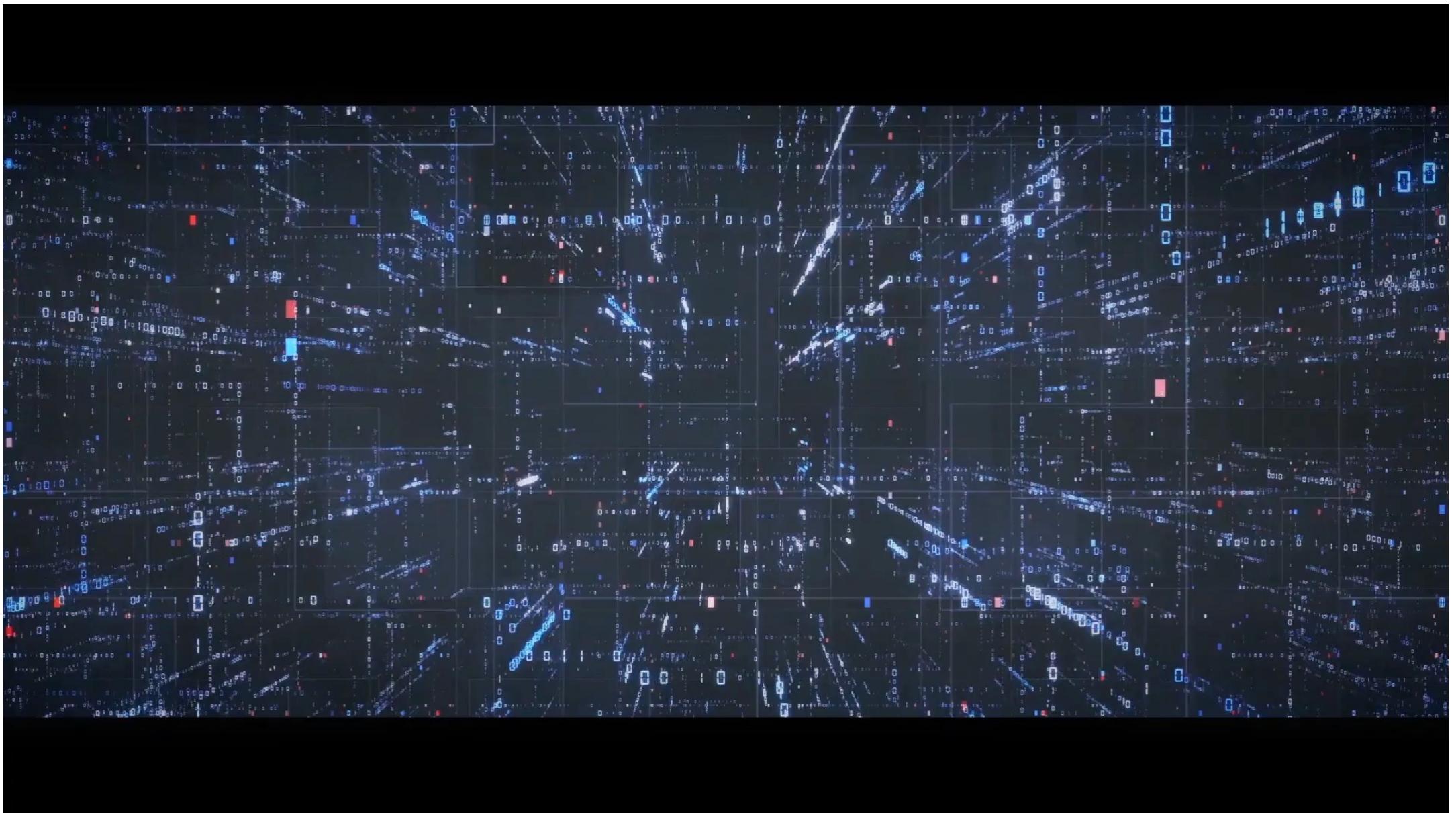
What is the role of design in society?



Social Experience

NEC provides products and services not only from the individual point of view, but also from the point of view of creating the best solutions for the different types of people who make up society. We do this by thinking about exactly what would make an ideal society.

Social Value Innovation Journey 5G - Now



SOCIAL VALUE CREATION WITH 5G

NEC has accomplished and ongoing 5G PoCs in Japan with various vertical partners to drive Industrial DX



eMBB High-definition image Transmission, etc.

Safety Dedicated & Closed NW

URLLC Remote control, etc.

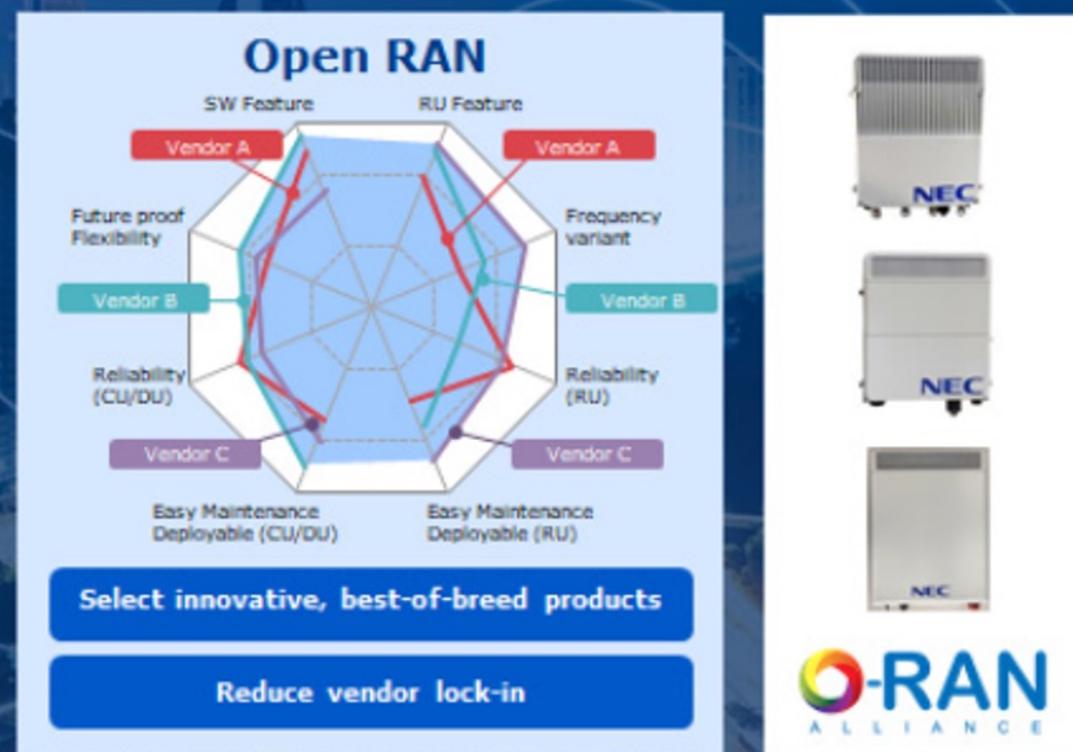
Stability Wireless NW with Less radio interference

mMTC Massive sensor Installation, etc.

Flexibility Flexible network resource allocation

■ NEC's Radio Unit is

- Easy to Deploy: Light-weight and low powerconsumption
- Easy to Integrate: ORAN compliant interface which allows operators to select best-of-breed product



New Revolution by 5G

Society 5.0

Revolution

Industry 3.0

1993

Permitted Commercial Use
of the Internet

Deregulation

Infrastructure

Wired
Internet

1990-

Industry 4.0
AI Ubiquitous

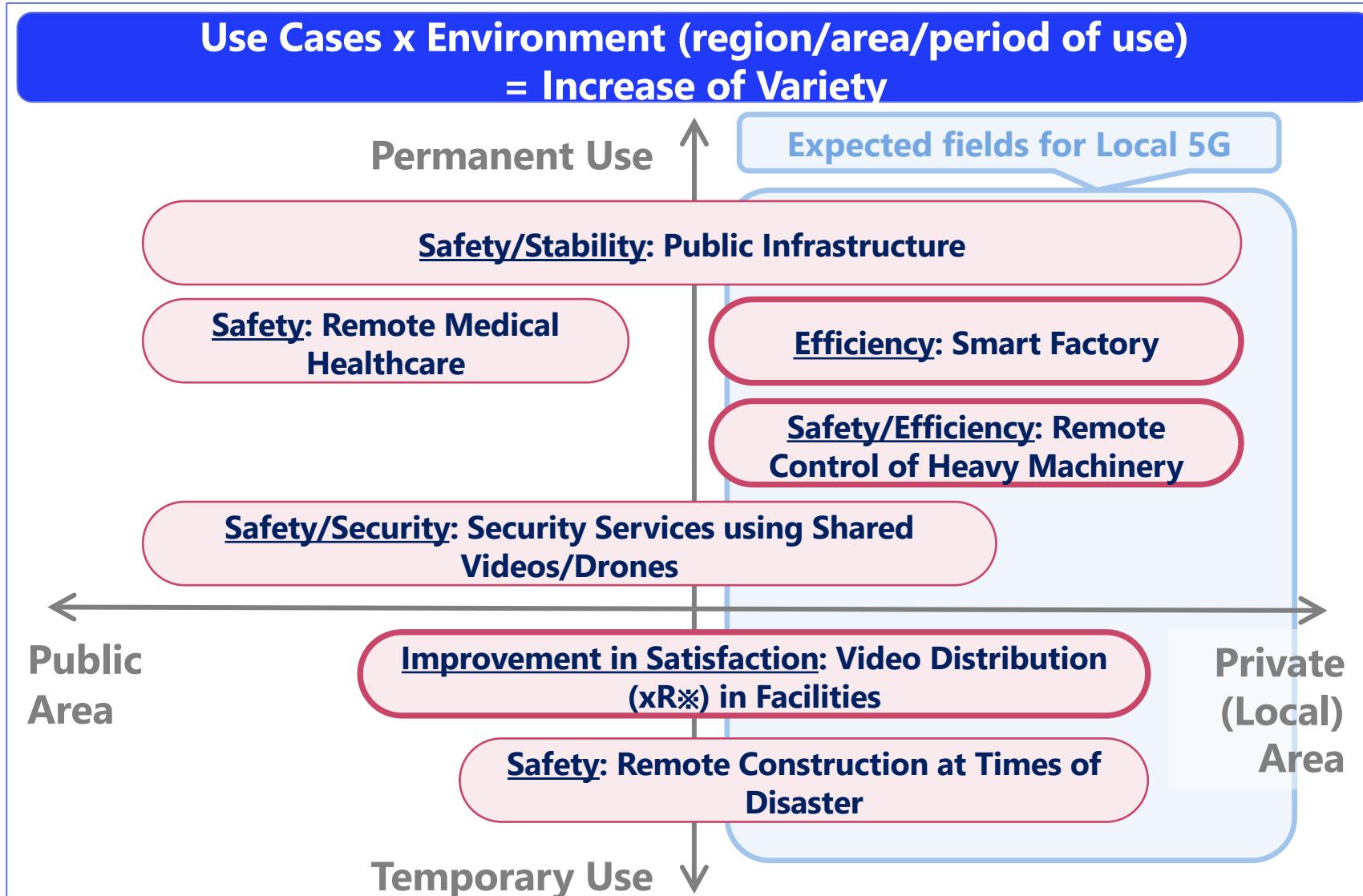
Towards new era of "Things"
and "Events" with AI/IoT

2019~

Allocates radio spectrum for
Local 5G Industrial Use

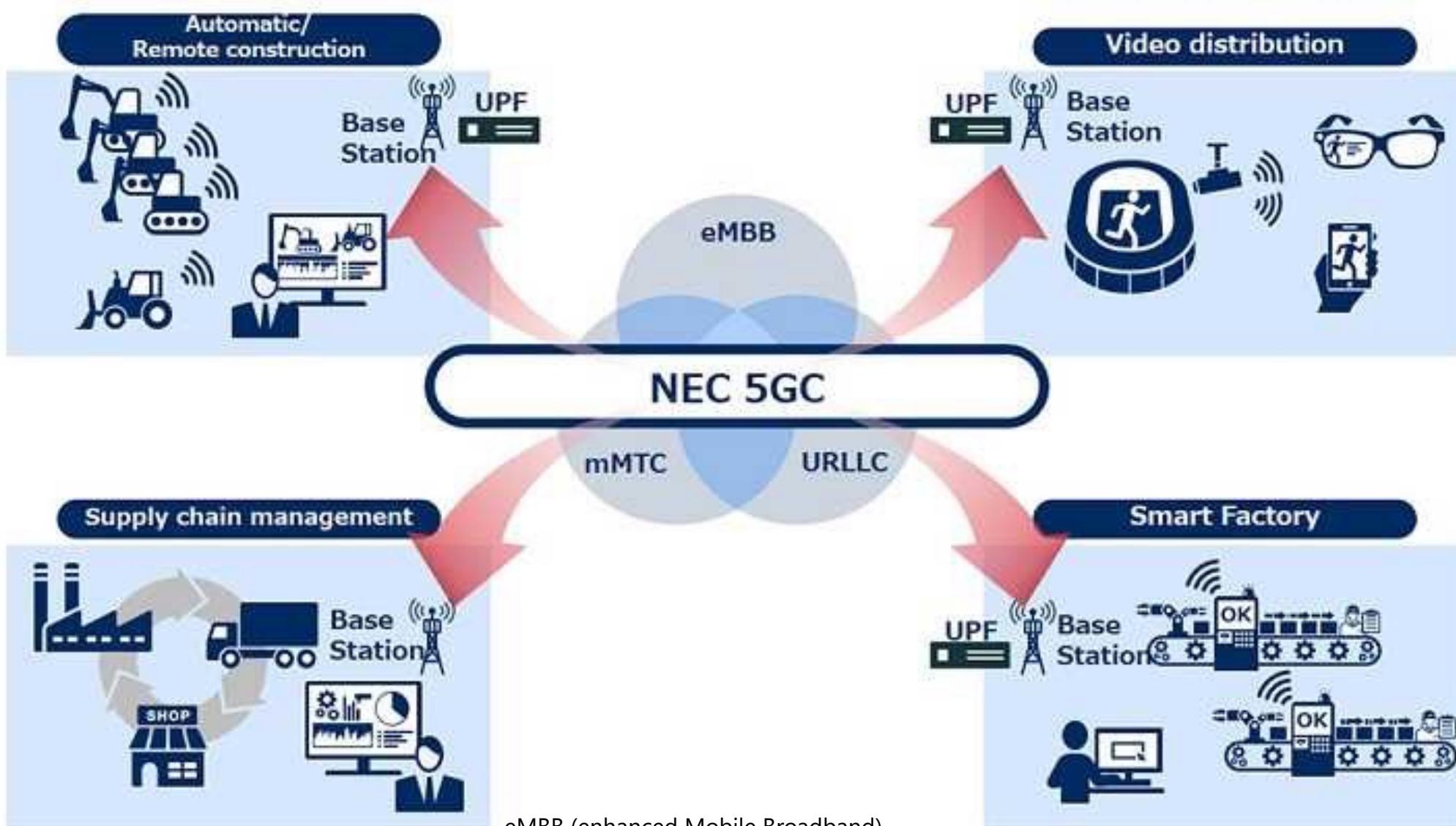
5G
2020-

Fields where self-operated 5G (Local 5G) are expected



(Source) Translation of page 5 of the document (http://www.soumu.go.jp/main_content/000589529.pdf) distributed at the work party of investigating Local 5G in Information and Communication Technology Subcommittee of Information and Communications Council, December 12th 2018

NEC STANDALONE 5G USE-CASE EXAMPLES



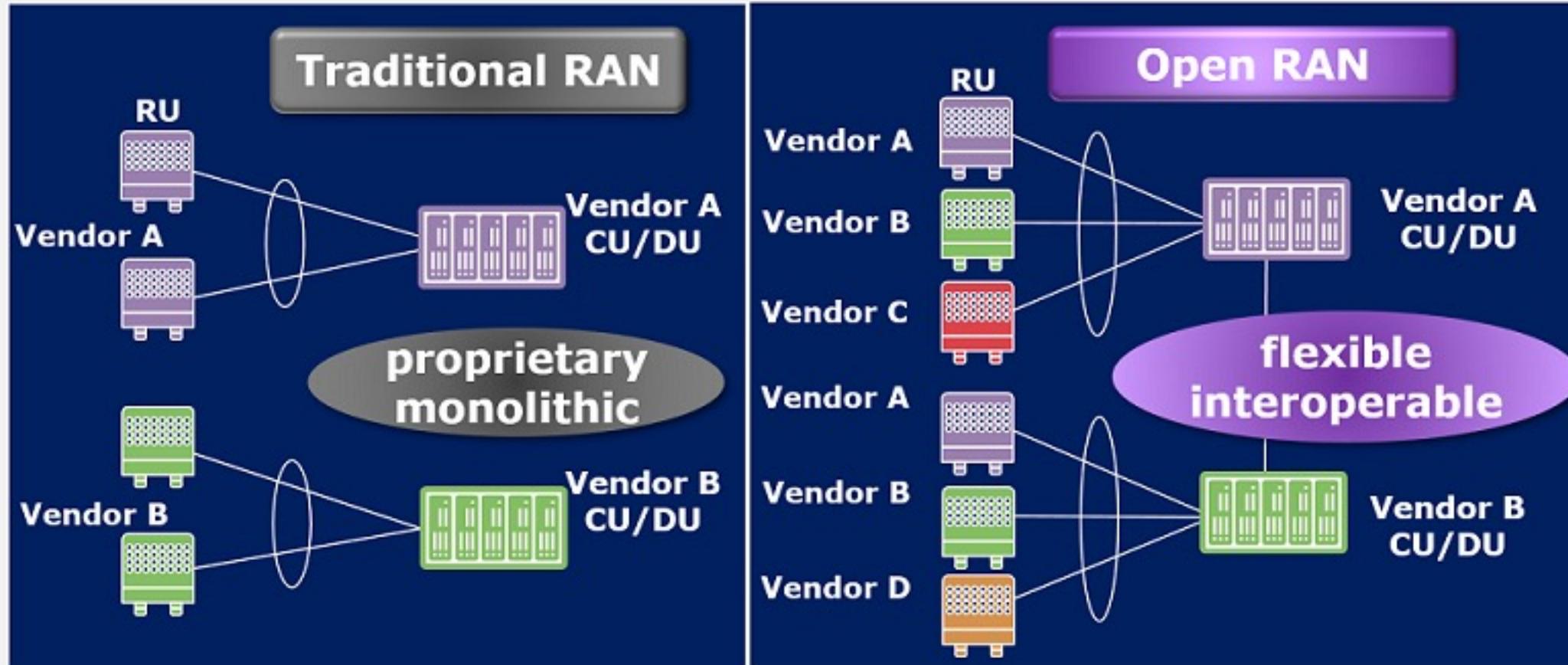
eMBB (enhanced Mobile Broadband)

URLLC (Ultra Reliable Low Latency Communications)

mMTC (massive Machine Type Communications)

5GC – 5G Core

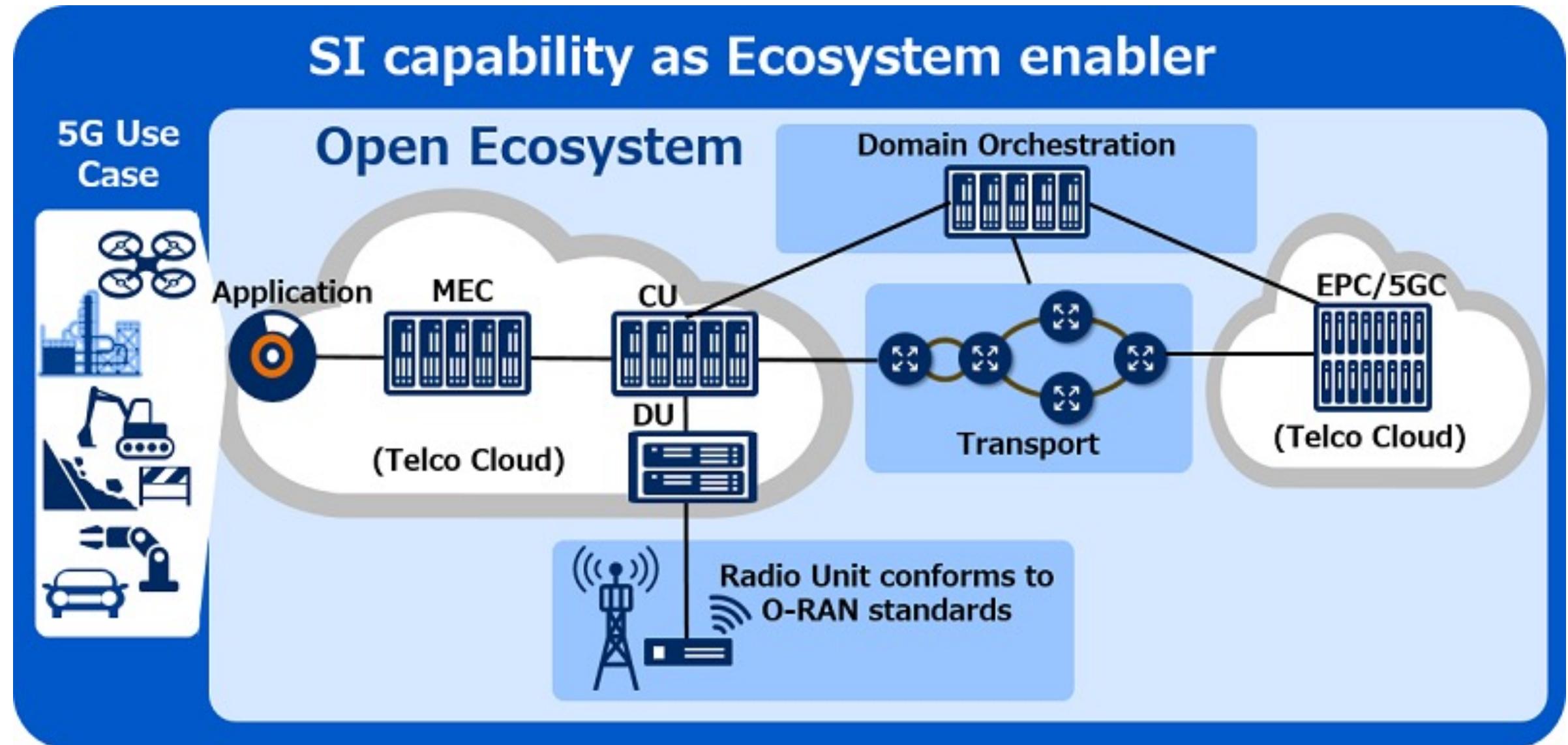
OPEN RADIO ACCESS NETWORK (RAN) – WHAT IS IT?



In traditional RAN, the interfaces between RU, CU and DU are vendor proprietary and non-interoperable with other vendors.

Open RAN interface is standardized and interoperable among different vendors.

NEC SI capability as Ecosystem Enabler



5G for Public Safety and Security

- In Japan mobile operator **NTT Docomo** has partnered with **ALSOKE**, a leading provider of physical security services and **NEC** to demonstrate the potential of 5G.
- The three companies held a trial where 5G was used to capture high-resolution images on CCTV cameras, drones, gates and portable devices for security guards.
- NEC then combined these images with their crowd recognition, facial recognition and AI services in order to provide real time security monitoring to provide an advanced security solution.



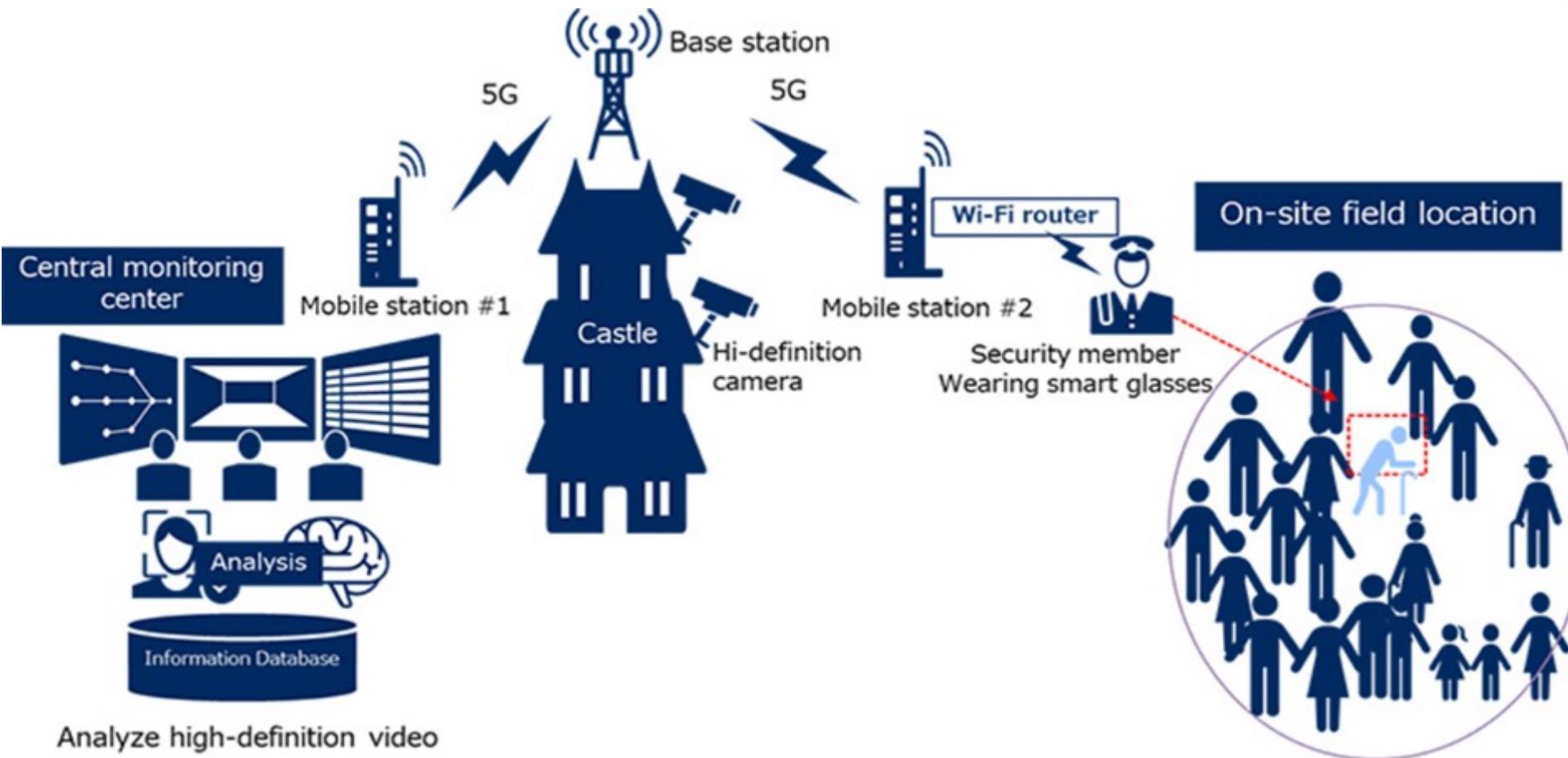
NEC



docomo 5G

5G for Public Safety and Security

Trial I: NEC contributes to monitoring test utilizing 5G conducted by NTT DOCOMO and ALSOK (Mar 2019)

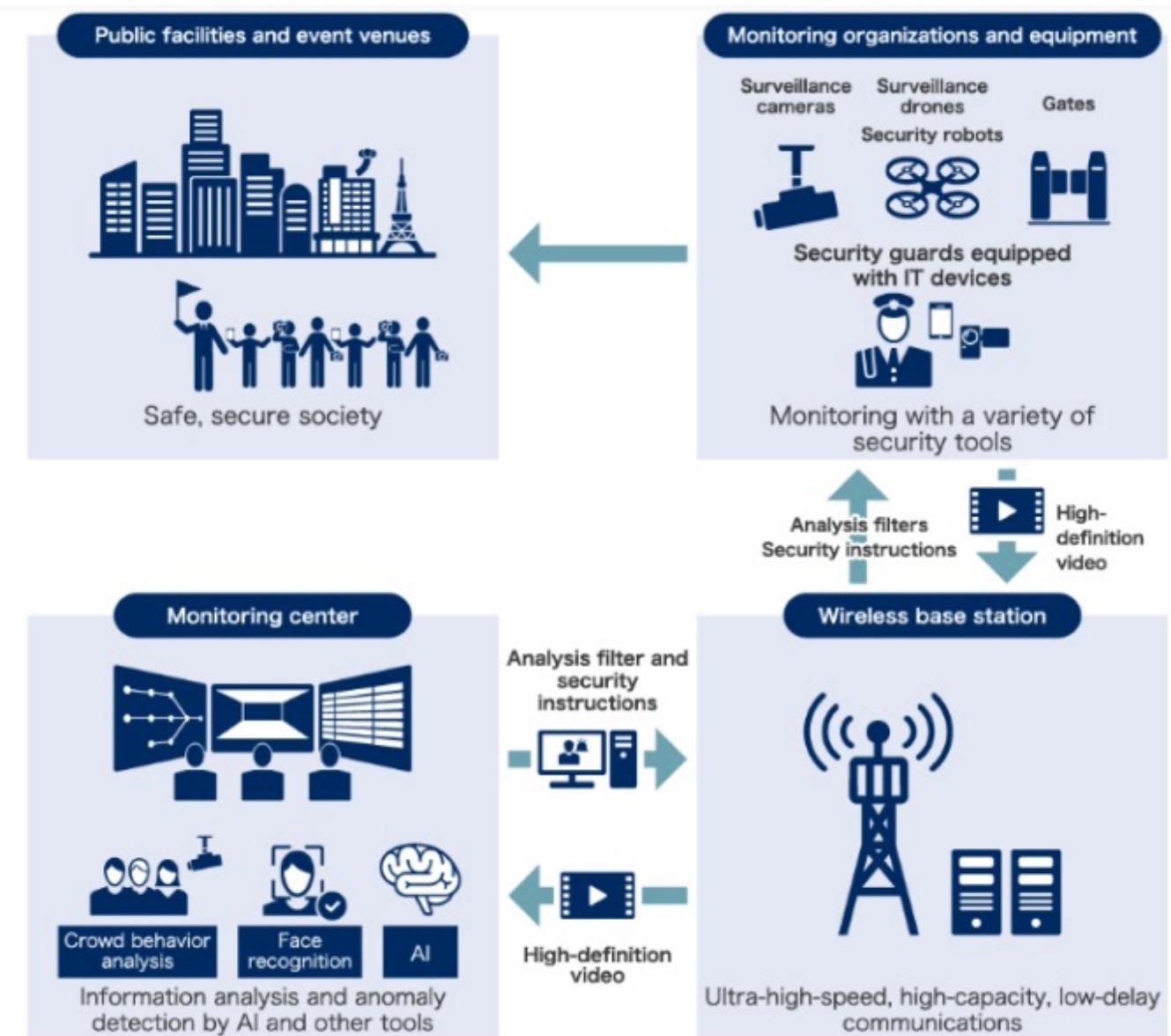


Advanced security services

This trial will verify the implementation of security for preventing crimes and accidents in combination with featuring image analysis and AI-based security, as well as the advantages of 5G.

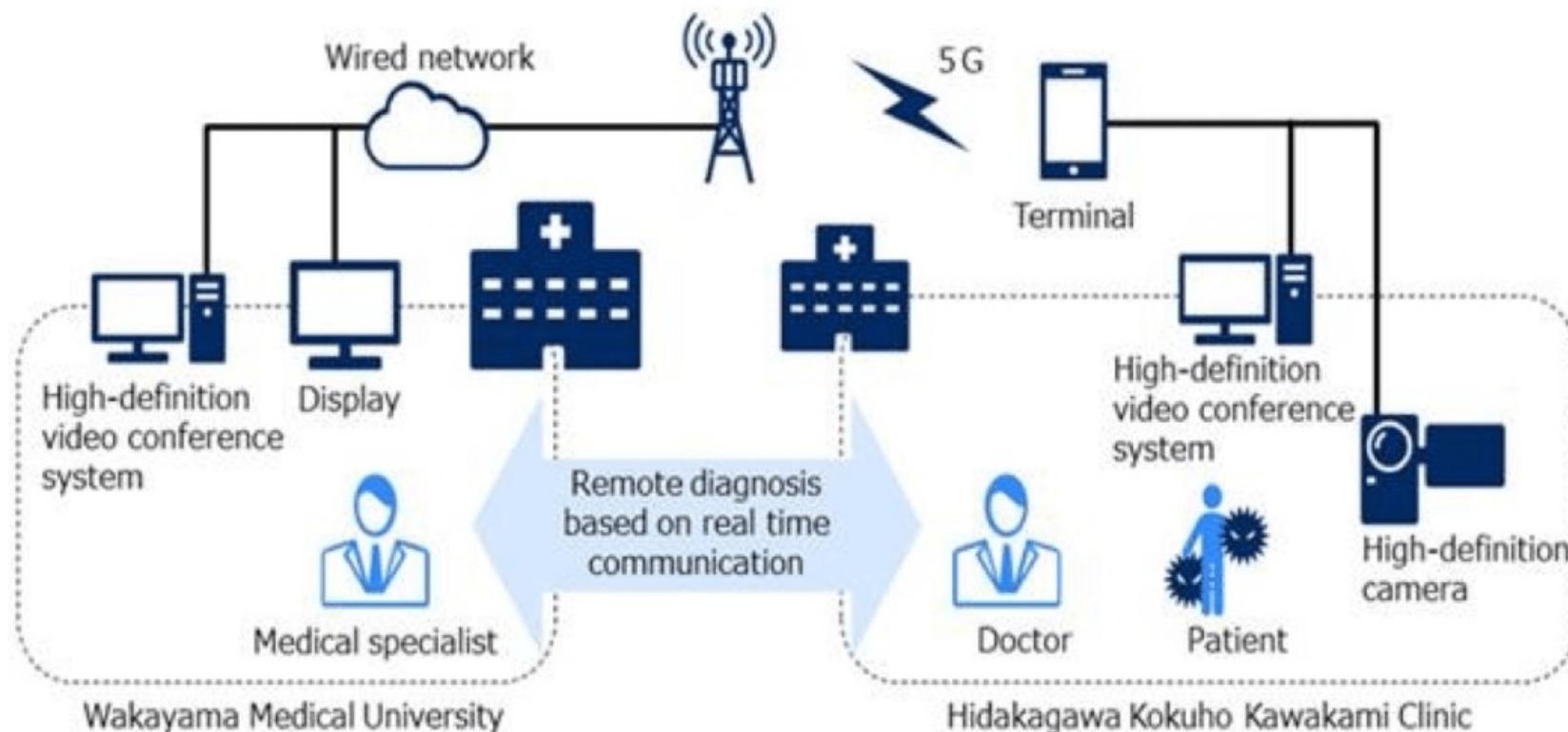


NEC HP : Trial to achieve advanced security services leveraging 5G
<https://www.nec.com/en/global/about/vision/case/20.html>

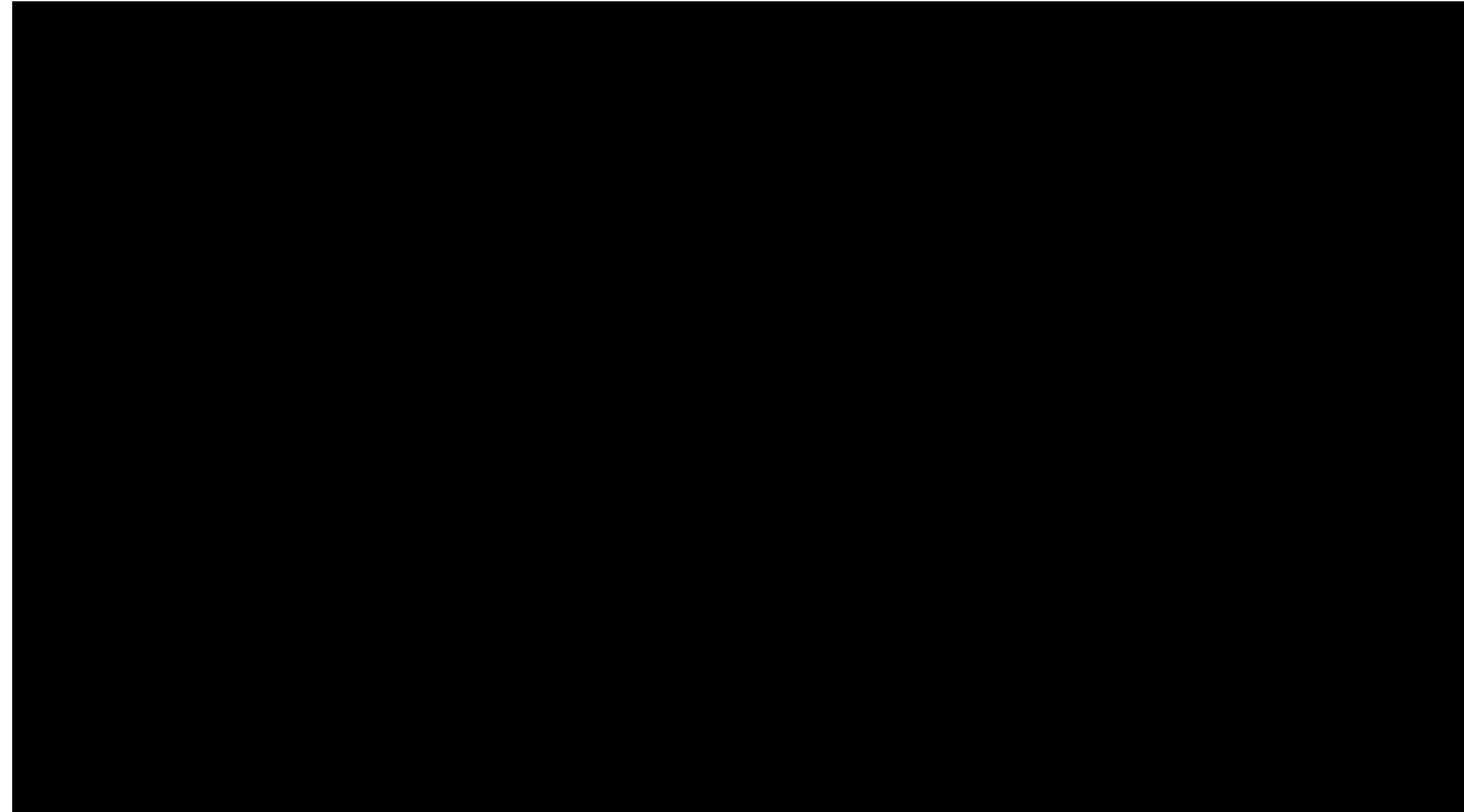


5G MEDICAL USE-CASE

System architecture of the field trial conducted by NEC and NTT DOCOMO in Japan for remote medical examinations.

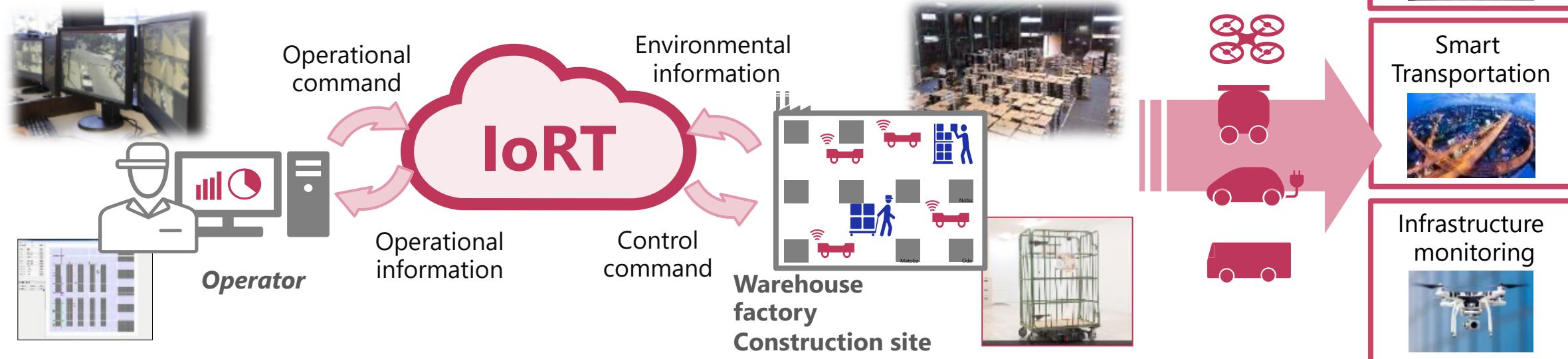


Smart Manufacturing with 5G – 2030 vision



Cloud robotic control solution

Remote robotic control for multiple robots of multi-vendors can realize better productivity under the collaboration between human operators/workers/robots



Dynamic route generation/control

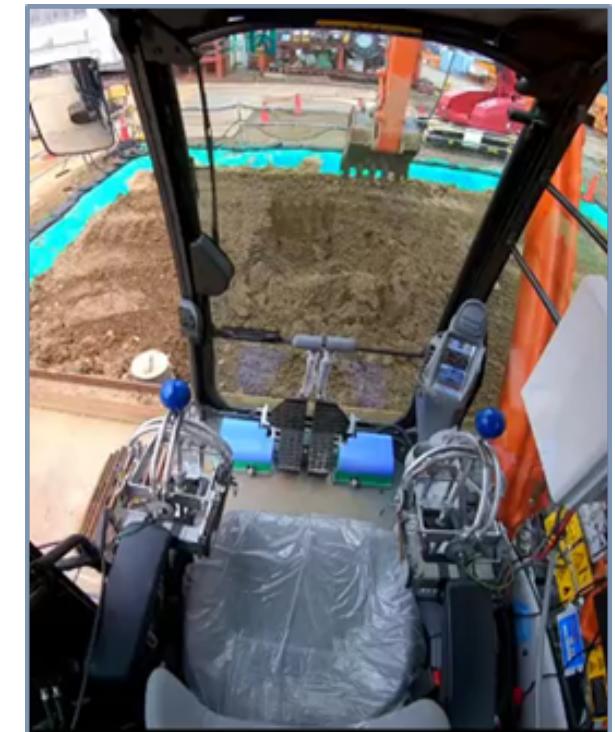
Adaptive to an ever-changing situation
collaborative work between human workers and other robots

Situational understanding from bird' view

Integrated analysis with sensors equipped in a facility
No blind spot

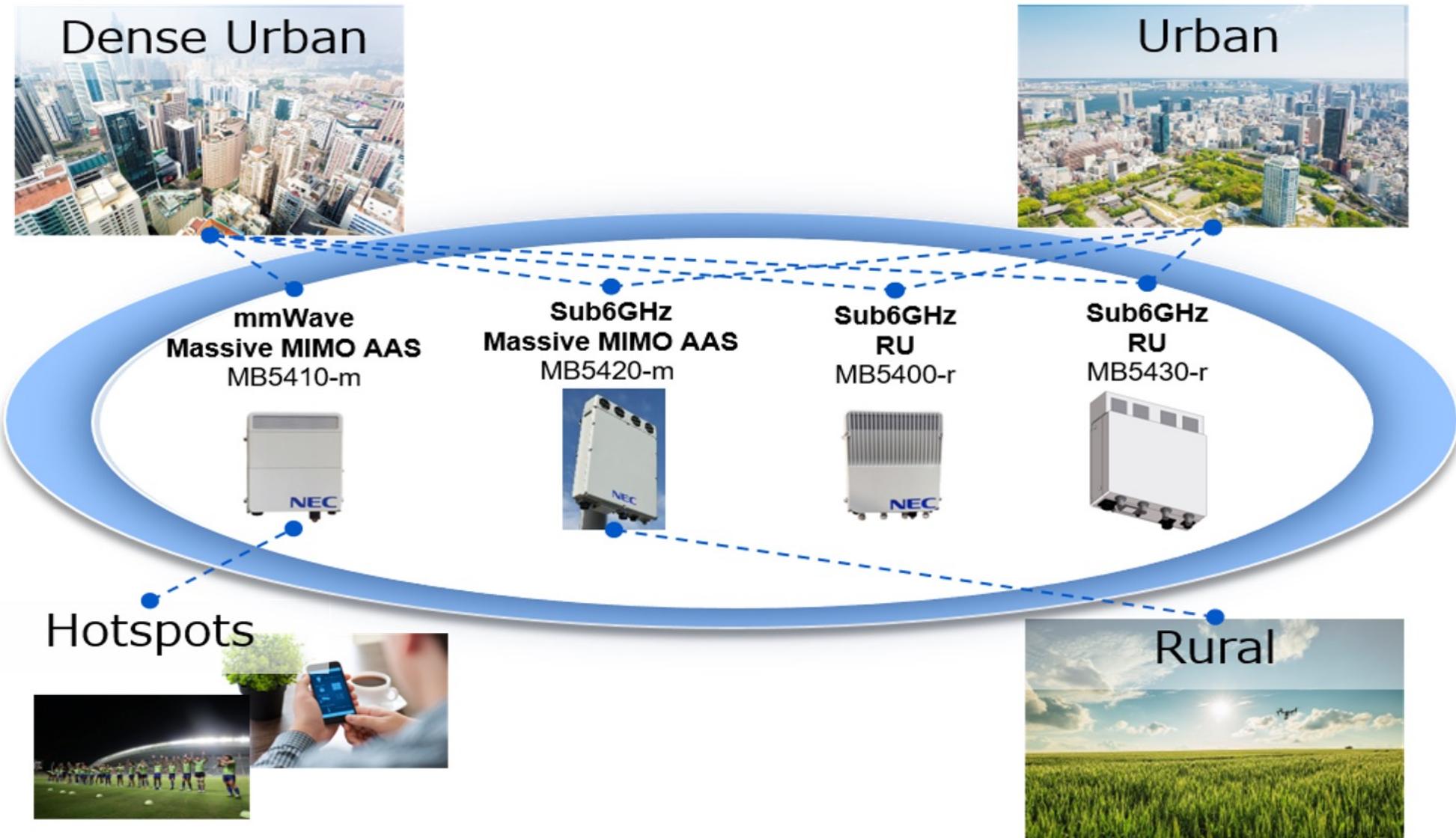
Remote Autonomous Operation of Construction Machinery/Mining machine

- **Full automation** of construction work by robotizing construction machinery
- **High efficiency**...the same level as general operators (loading on 10t truck within 4-5 min.)
- **Safety**...no accidents resulting in injury or death by multiple fail safe using sensor NW (1/3 of the accidents corresponds to construction)



- Challenges of controlling construction machinery
 - ① **Dynamics variation** (posture, operation, type)
 - ② **Response delay** (mass, hydraulic delay, play, ...)
- **Adaptive Prediction Control**...solves both the dynamics variation and response delay

NEC 5G Outdoor systems



NEC 5G Vertical Business Platform for Communication Service Providers (CSP)

The diagram illustrates the NEC 5G Vertical Business Platform for Communication Service Providers (CSP), organized into four main sections:

- Digital Service for Business Users:** Features a circular icon representing the "Netcracker Business Cloud".
- Ecosystem Partnership to build up Best-of-Breed Solutions:** Features the Netcracker logo and the text "An NEC Company".
- Hybrid Cloud Ecosystem:** Shows two clouds: "Private/ Public Cloud" and "Telecom Cloud (NFVI & Edge Cloud)".
- 5G Ready Network Ecosystem:** A detailed network diagram showing connections between various components: Public Cloud, Private Cloud, Enterprise Office, Home, SME Office, CSP Local Office, RAN Site, MEC, DU/RRH, Front-haul, Metro/ Aggr Access NW, CSP Central Office Data Center, and Core NW.

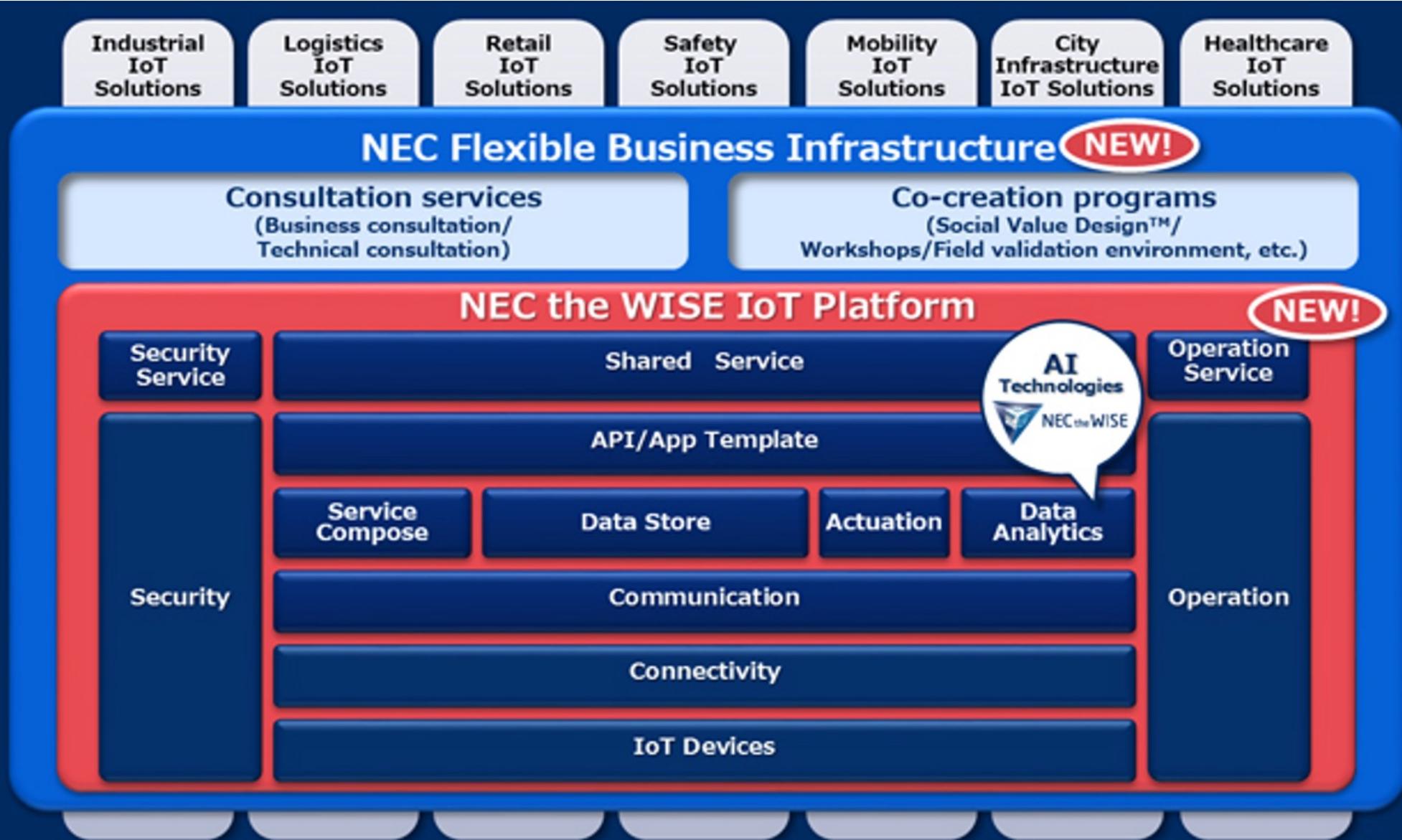
Partnership logos displayed across the platform include:

- NEC**
- Netcracker** (An NEC Company)
- JUNIPER NETWORKS**
- DELL EMC**
- redhat.**
- infinera®**
- ADVA™ Optical Networking**
- A10**

Vertical columns on the right side highlight specific solutions:

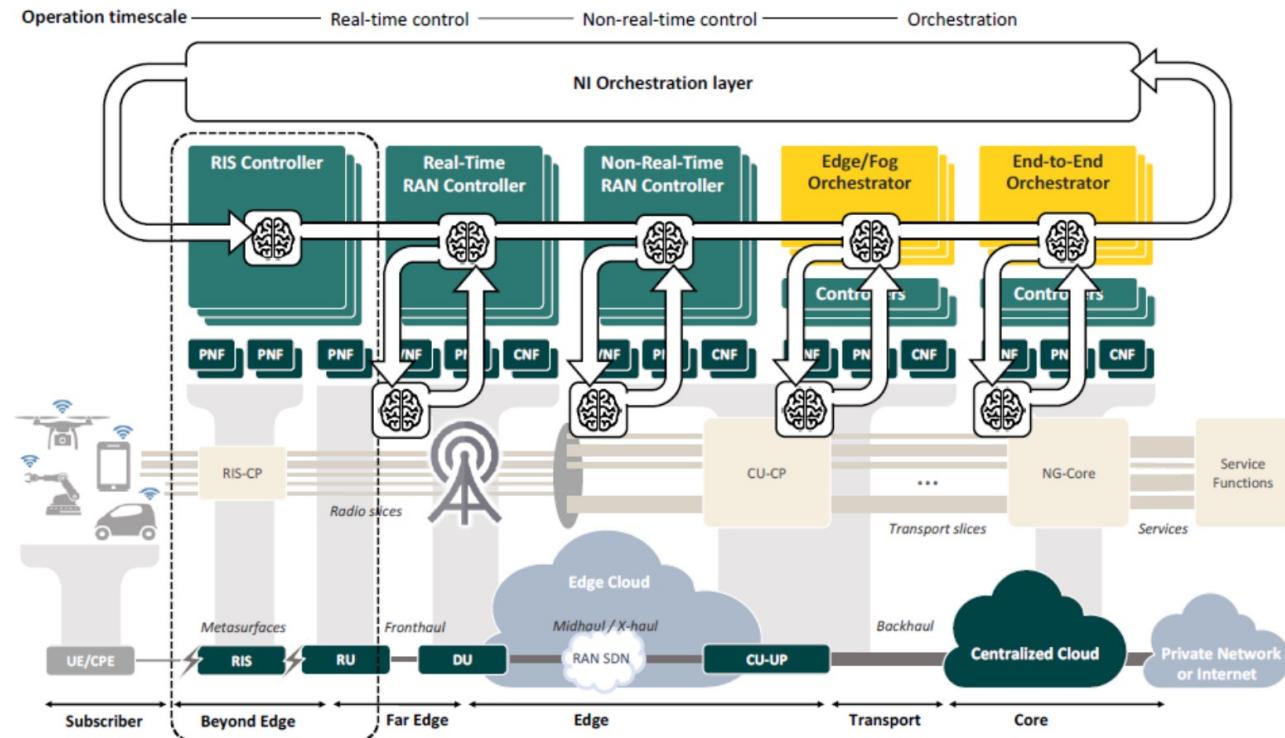
- NEC Full Stack Security Solutions:** Includes "Security as a NW Service" and "Telecom Cloud Security".
- 5G Ready NW Security**

NEC the WISE - AI Platform for Intelligence of IOT & 5G



Building Beyond 5G systems with NEC technology for next-generation mobile services

Heidelberg, Germany, March 30, 2021 – NEC Laboratories Europe is the newly appointed Technical Manager for the Horizon 2020 Project DAEMON: aDAptive and sElf-Learning MOBILE Networks, coordinated by IMDEA Networks Institute. The DAEMON consortium will design and implement a native *network intelligence (NI)* framework for Beyond 5G (B5G) that automates best practice decision-making for cellular networks. NEC Laboratories Europe will play a pivotal role in ensuring the project's success by leading the design, development and implementation of this technology framework.



5G and the Smart City - Early use cases are now emerging



NIKKEI Asia

News by Location ▾ Business ▾ Markets Tech ▾ Politics ▾ Economy ▾ Features ▾ Opinion ▾ Life & Arts ▾ A

TELECOMMUNICATION

NEC and Spain's Telefonica to test Open RAN wireless

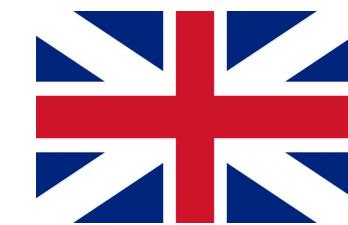
Partners aim to build 800 5G stations across four markets by 2022



Piloto 5G Catalunya – Barcelona, Spain

The Spanish city of Barcelona is often lauded as one of the leading Smart Cities in Europe and is also the host of the annual Global Mobile World Congress and hence it should come as no surprise that the city has one of the most aggressive roadmaps in the world for the incorporation of 5G connectivity into its Smart City planning. The local government under the guidance of the Secretary of State for Information Society and Digital Agenda (SESIAD) has developed a 'Piloto 5G Catalunya' program which has secured funding for 5G projects within the city in areas such as education, industry, commerce, tourism, transport, and safety and emergency management. The program will formally begin in September of 2021 and continue until December of 2022. Some of the specific services that the program will develop include 5G for broadcasting, distance learning, smart manufacturing, connectivity for tourism and connected vehicles.

5G and the Smart City - Early use cases are now emerging



Private 5G Network for Smart City Services – Liverpool, United Kingdom

The city of Liverpool in the United Kingdom has taken an innovative approach to incorporating 5G into its Smart City services, as it has built a private 5G network for use primarily for health and social care services. The network seeks to reduce “digital poverty” and offers free connectivity for social care, healthcare, and education in selected areas of the city. Services such as these are now more important than ever as given the lockdowns resulting from COVID-19, many citizens are only able to access healthcare and education remotely.

NEC participates in the UK Government-led 5G Open RAN trial program with the NeutrORAN testbed



Image courtesy of NEC

| NEC, AWS expand collaboration to include 5G, digital government



By **Juan Pedro Tomás** September 8, 2021

[5G](#) [Americas](#) [APAC](#) [BSS OSS](#) [Business](#) [Carriers](#)
[EMEA](#) [Network Infrastructure](#)

NEC Corporation has expanded its collaboration with Amazon Web Services (AWS) in areas that include global 5G and digital government, in support of accelerating digital transformation for customers.

As part of the new agreement, NEC aims to develop an end-to-end 5G offering and to provide it globally by combining NEC's cloud-native open 5G mobile core, OSS/BSS solutions, local 5G use cases, and AWS cloud and edge solutions.

Join NEC and Transform the World in the Disruption



NEC

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