

The Development of 5G Vertical Applications in Taiwan

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Institute for Information Industry



Digital Transformation Enabler - III



Advancing Digital Trust

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As the Digital Transformation Enabler, our objective is to promote information communication technology innovation and applications in Taiwan, and to assist in the development of the digital economy.





Taiwan Private 5G Policy



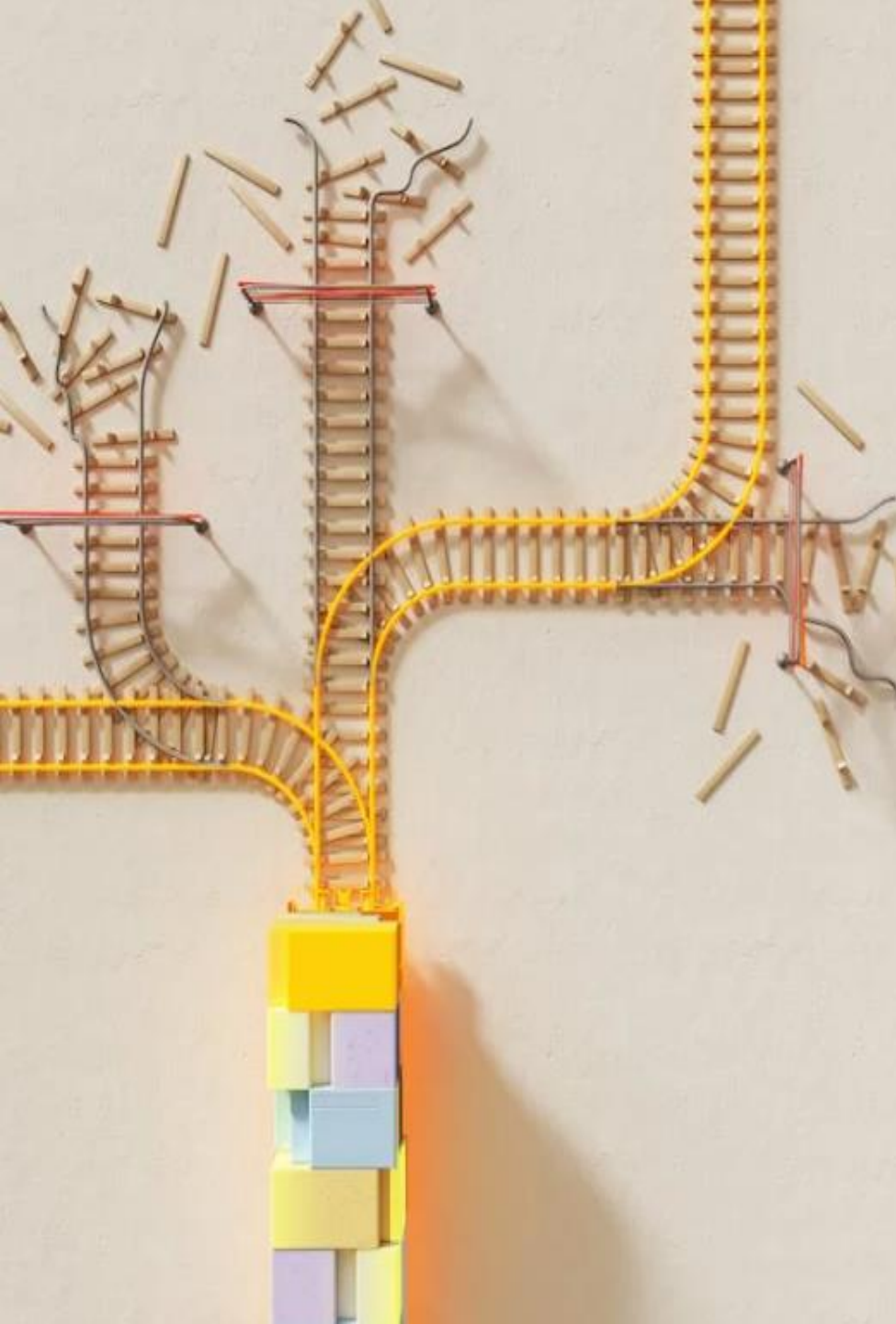
Taiwan Private 5G Strategies and Actions



Trends in Vertical Applications



Conclusion



01

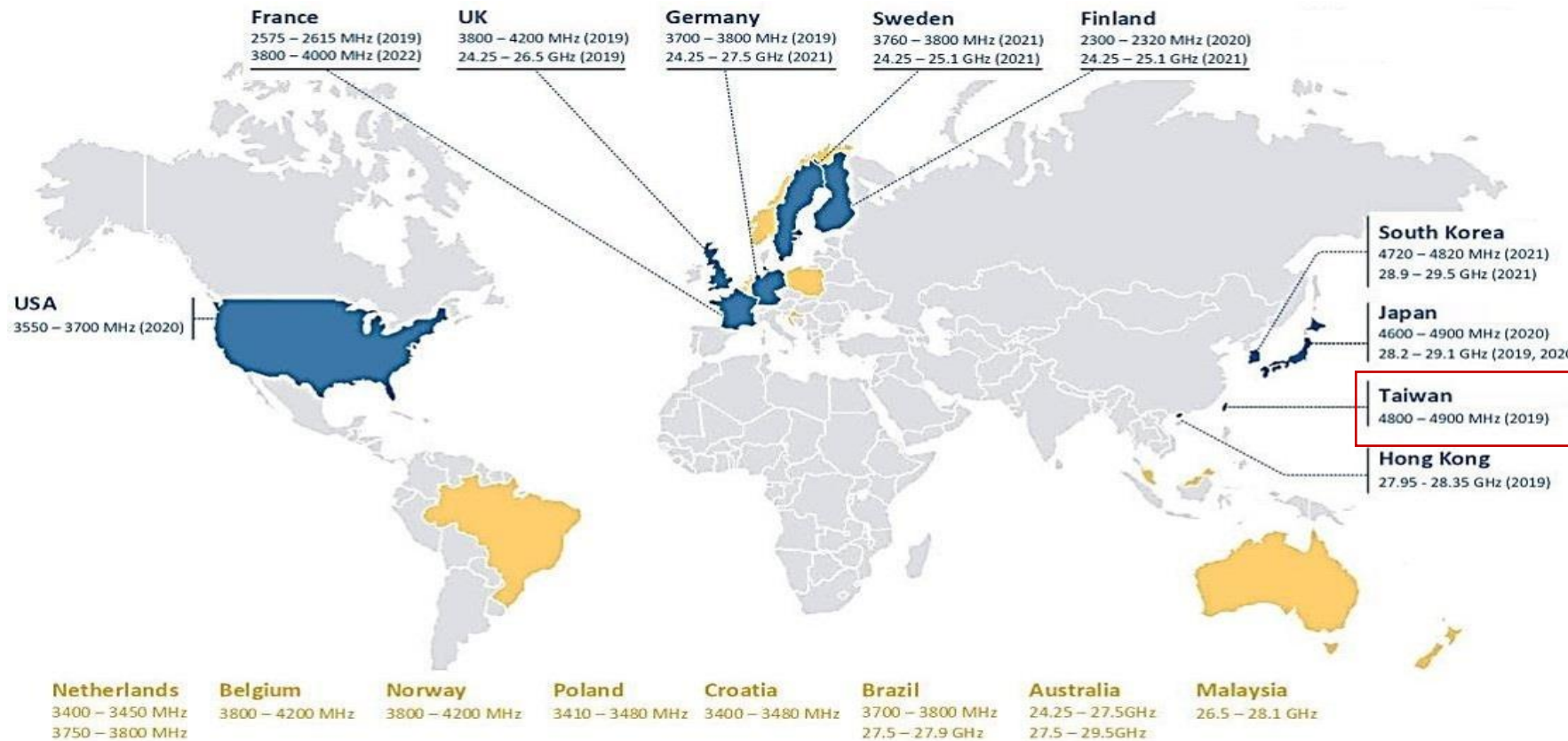
Taiwan Private 5G Policies



Taiwan Private 5G Commercialization



- Japan and Germany lead private 5G network commercialization, followed by USA, UK and France
- Taiwan Private 5G network enters commercial from June 2023



As of 2024.Q1

- Applications: **114**
- Deployment admissions: **79**
- Licenses: **6**
- License-free(short-term): **12**



Taiwan Private 5G Policies



Flexible

- ✓ integration with other core /access network
- ✓ preferred frequency usage rate
- ✓ acquirement of equipment

Open

- ✓ interconnection of same purpose networks
- ✓ cloud connections need special review
- ✓ interference evaluation and resolution

Simple

- ✓ application counseling & assistance
- ✓ simplified base station and network verification
- ✓ accelerates experimental network migration to commercial use
- ✓ no verification required for experimental and short-term applications

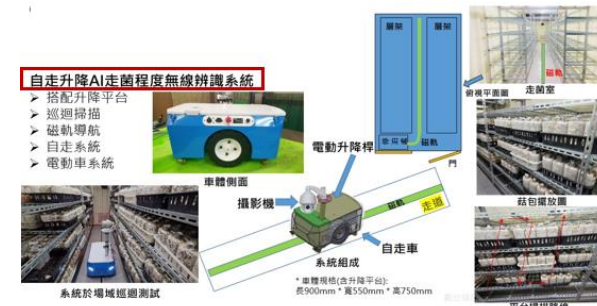
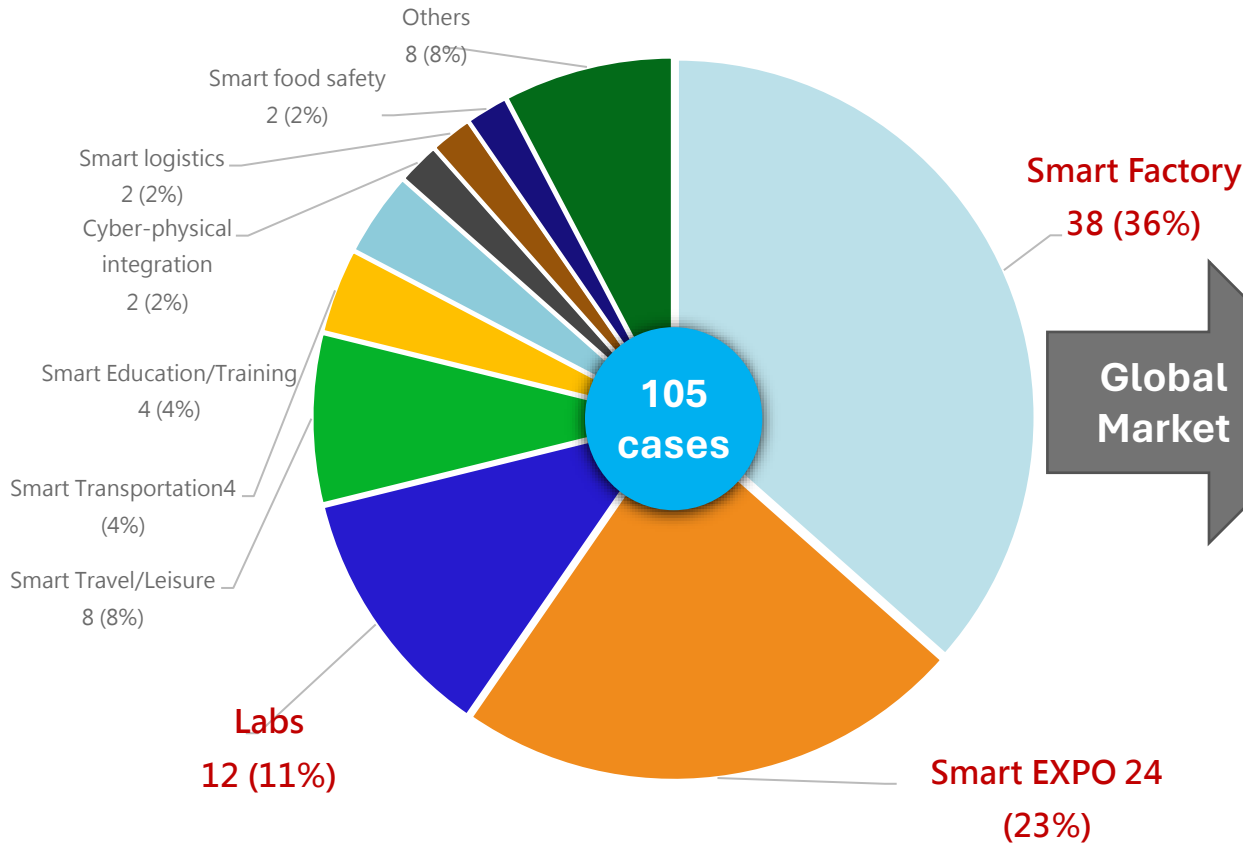


Private 5G Needed in Various Vertical Domains



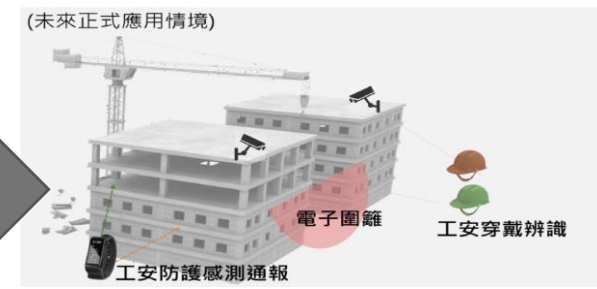
Private 5G Top 3 Vertical Domains 2023: Smart Factory (36%), Smart EXPO (23%), Labs (11%)

Vertical Domains



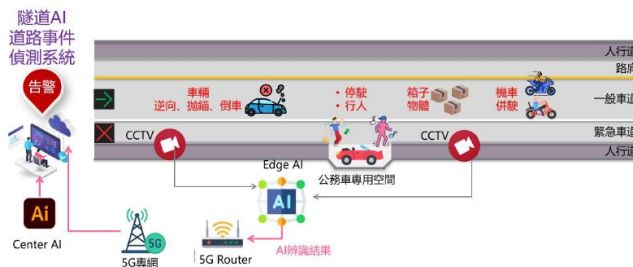
Support traditional industries

5G for wireless monitoring of mushroom growth combined with data analysis and environment control to improve efficiency and tackle lack of labor



Boost advantage industries

industrial safety applications using 5G for e-fence and personal protection equipment checking



Promote public welfare

5G+AI improves traffic accidents detection, notification, and first response to reduce impact and damage



Challenges of Private 5G Applications and Services in Taiwan

High initial costs



SMEs comprise 98% of Taiwan enterprises. Limited budget and lack of professional staff are main hurdles of introducing Private 5G. Organization and operation flow changes impact resulted by DX is also worried.

Connectivity of equipment needs enhancement



For example, in smart factory domain, more than 50% of equipment does not have 5G connectivity which lowers the willingness of introducing Private 5G.

Added value of data not well evaluated



Importance and potential of big data are widely known. However, enterprises have not evaluated the value of data collection, process and utilization. In turn, Private 5G benefits are not appreciated.

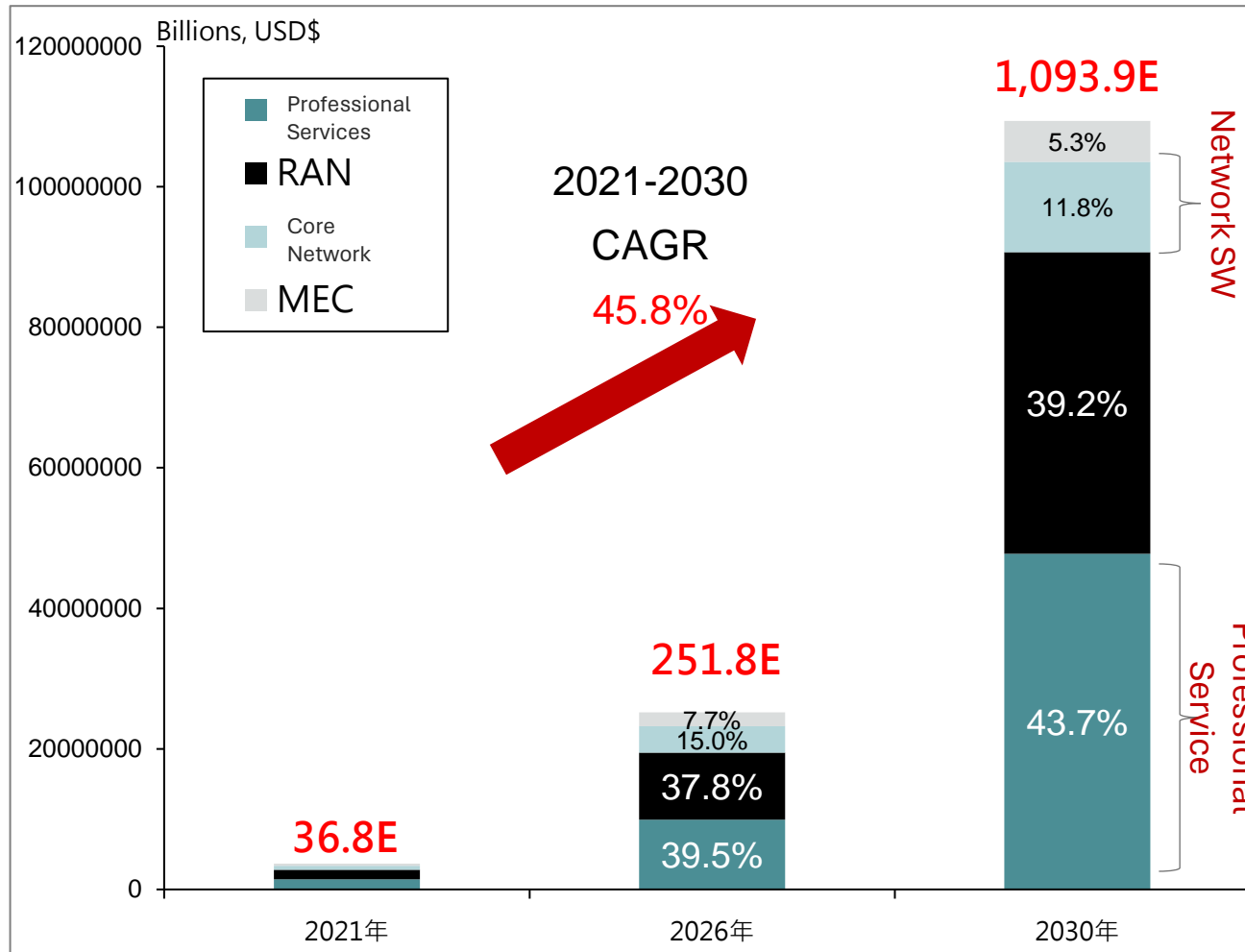
Vertical industries need software and IT services



Some vertical industries are in lack of automation, software and IT capability. It is hard for them to evaluate the cost and benefit of using Private 5G. Let alone maintaining and operating a Private 5G on their own.



Software and IT Services are Key



1. **Software and IT services** will be the core of mobile broadband private network :

- By 2030, global private 5G core network and related IT services market will surpass USD\$**60.7B with 45.8% CAGR** from 2021 to 2030.

2. **Every industry has its Private 5G needs:**

- Since June 2023, the applications of Private 5G in Taiwan have reached 114 cases as of Q1 2024.
- Telecom, IT service and cable TV companies are transformed to 5G SI to support vertical industries introducing and expanding various 5G applications.



02

Taiwan Private 5G Strategies and Actions



Taiwan Private 5G Strategies



Digital Innovation

Cross-ministries collaborations to forge commercial Private 5G solutions. Incentives are provided to speed-up forming of eco-systems, SW/HW integration and expansion of Private 5G services.



Strong Digital Base

Dedicated office providing one-stop service for Private 5G network application and deployment



DX of Industries

Co-work with industrial associations to promote investment in deploying common Private 5G applications of their industry to enable digital transformation of industries.



Dedicated Office for Private 5G One-Stop Services



Private 5G Promotion

Industry consultation
On-site visiting
Potential field on-site counseling
Demand & supply matching

Information Platform

Private 5G industry dynamics and activities
Application announcement and related information
Application documents



Application counseling

Private 5G application counseling and assistance
Private 5G setting evaluation
interference evaluation and resolution support

Verification and review

Private 5G setting application reception
Review and spectrum usage approval
Network verification and license admission
On-site field cybersecurity review



Promote Industrial DX via Co-creation



- Co-drafting Private 5G applications blueprint with industrial associations to inspire more applications and services imagination
- Accelerates industrial DX with Private 5G via diversified benchmark use cases

Traditional industry



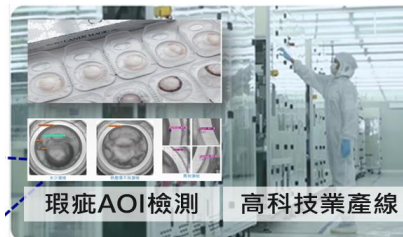
High-end manufacturing



Business services



Production and manufacturing: sheet metal, machinery, meat products, textiles...etc.
Agriculture, forestry, fishery and animal husbandry: greenhouses, farms, fish farms, pastures, etc.



Key industries: semiconductor, electronics, optics, displays, robotics, and more.



People's livelihood services: retail, tourism, exhibitions, TV stations, medical care, education...etc.



Cross-ministries collaboration enables digital innovations with 5G



5G Cyber-physical remote performance



兩廳院、中正紀念堂

MOC & MODA

5G immersive interactive exhibition



高展館、南港展覽館

MOEA & MODA

Portable easy deployment Private 5G



5G行動車出任務

Local governments & MODA

Private 5G+AI

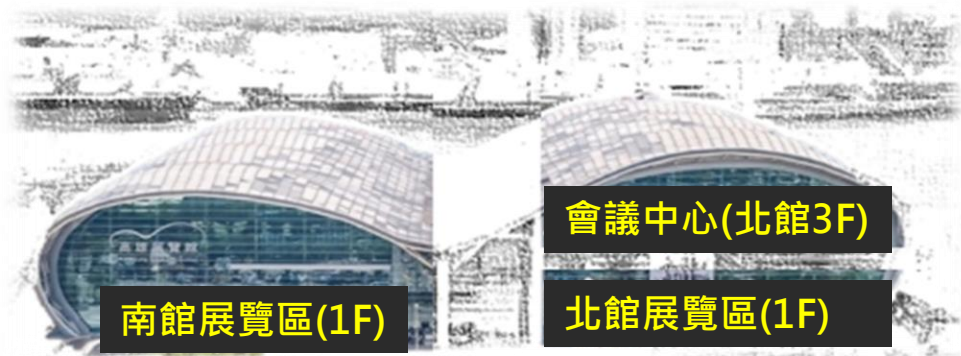


5G+AI+元宵燈藝

MOTC & MODA



National Exhibition Halls as example – Hall as a Platform



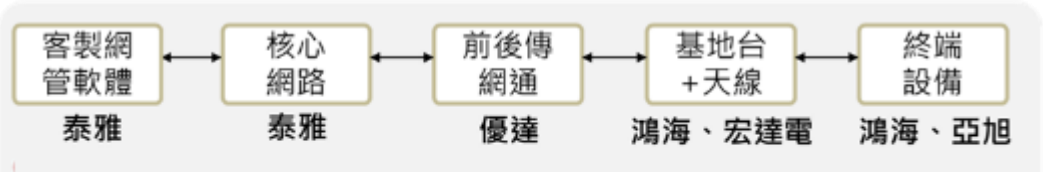
Total Max Data Rate

UL: 5,000 Mbps

DL: 8,600 Mbps

5G BS : 47 small cells

Area: 2.3ha (full coverage of all halls)



整合商組隊 > 擴散亞灣、美、日等大型場域



Interaction with virtual scenery simply by scanning QR code.

mo 數位發展部 Ministry of Digital Affairs | di 數位發展部 數位產業署 Administration for Digital Industries | 財團法人資訊工業策進會 Institute for Information Industry



Combing real-time open data such as weather and traffic information. Artworks and virtual Mazu island sceneries can be blended and shown to global tourists.



03

Trends in Vertical Applications

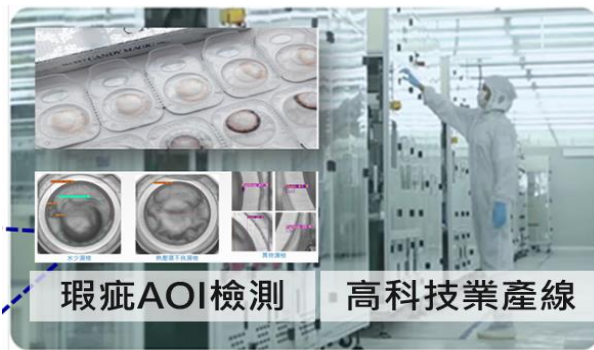


Expanding 5G application services across various industries



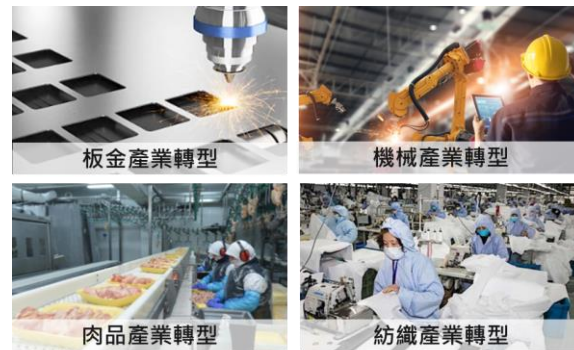
- In-depth cooperation in 5G specialized services across various industries and domains and software solutions will strengthen the commercialization of private 5G application services. In addition to empowering the transformation of Taiwan's key vertical industries, we will also actively leverage Taiwan's experience to provide 5G application service solutions to partners worldwide.

Boost advantage industries



Key foreign exchange earning industries: semiconductor, electronics, optics, displays, robotics, and more.

Support traditional industries



Production and manufacturing: sheet metal, machinery, meat products, textiles...etc.
Agriculture, forestry, fishery and animal husbandry: greenhouses, farms, fish farms, pastures, etc.

Promote public welfare



People's livelihood services: retail, tourism, exhibitions, TV stations, medical care, education...etc.

Vertical industry field



application solutions

5G

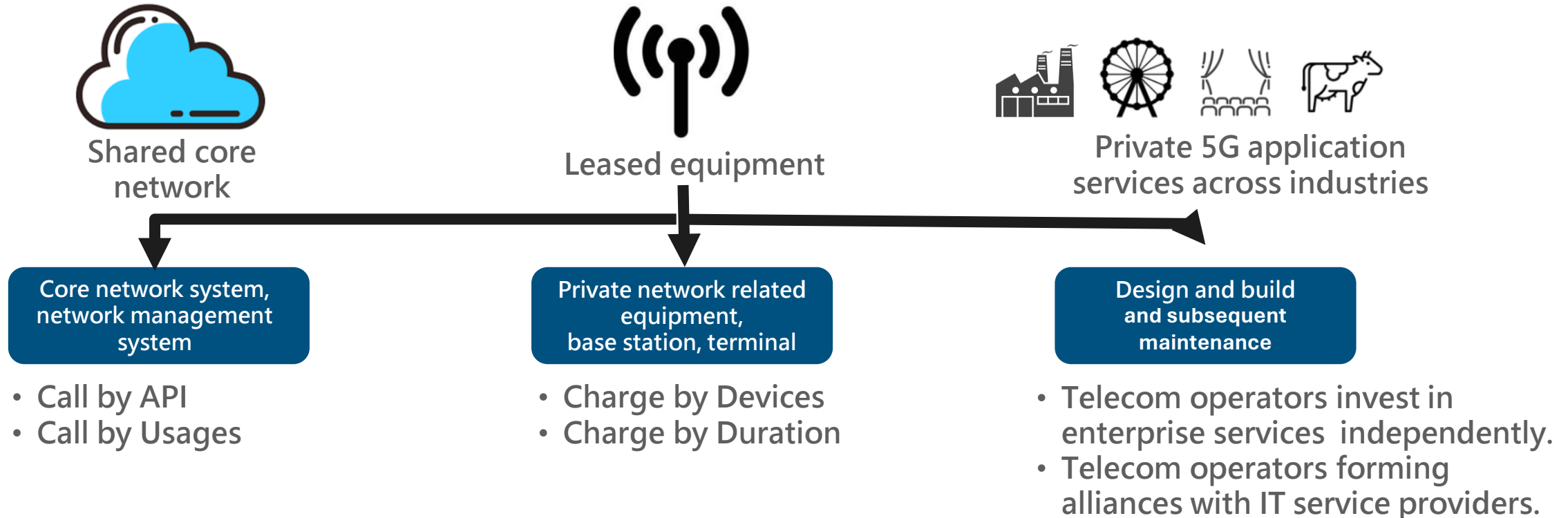


5G digital application plus software and hardware integration goes global



Dedicated network leasing services reduce the barriers to adopting Private 5G network

- Through innovative private 5G software systems such as shared core networks and multi-domain network management systems, the development of network leasing service models reduces the barriers to adopting private 5G network. This enables tangible benefits for digital transformation across various industries.





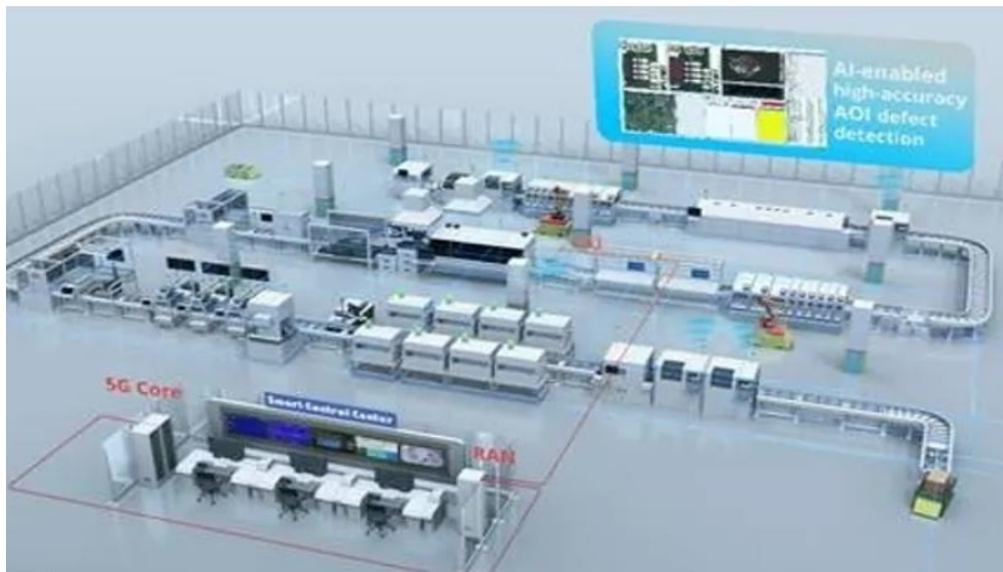
Transformation of high-end manufacturing industry



High-end manufacturing industries (such as AI PC manufacturers, etc.) enhance production efficiency and reduce labor costs by establishing smart factories. At the same time, they integrate 5G smart factory applications (such as digital twins, intelligent inspections, etc.) to create **new business models** and seek opportunities for **overseas factory exports**.

Application service

Digital twin system



Combining IoT and equipment health management solutions to predict equipment failures and production issues in advance, thereby enhancing production efficiency and quality

Application service

Smart production line inspection system



Applying AI and AR technologies for production line inspection and remote troubleshooting, enabling rapid response and resolution of anomalies.



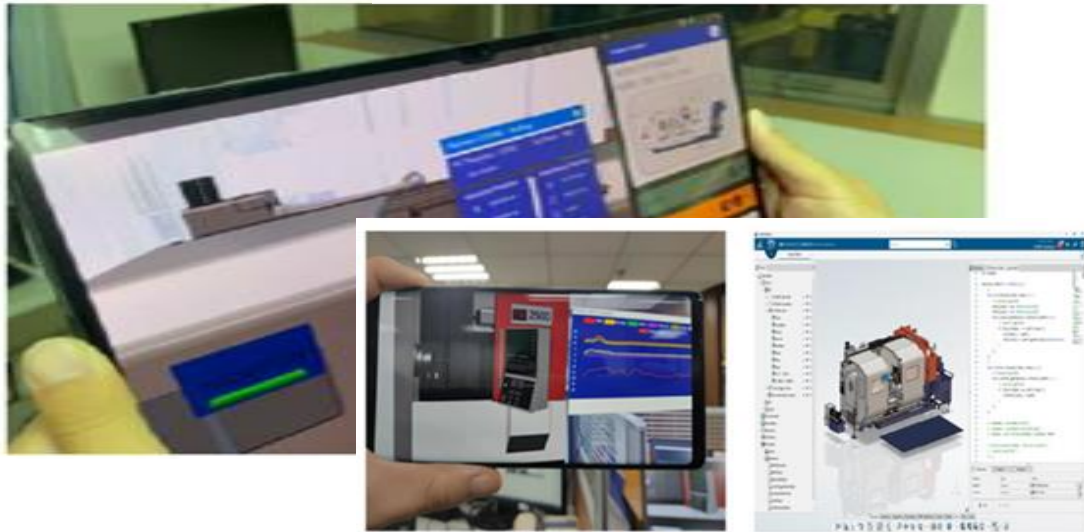
Transformation of traditional manufacturing industry



Traditional manufacturing industries (such as food processing and metalworking) enhance productivity by establishing intelligence, effectively monitoring production capacity, and reducing task handover and communication time. This also lowers environmental and occupational safety risks.

Application service

3D Digital Situation Room Platform



By customizing 3D digital operation manuals and confirming product production details and key points with customers, inspection personnel can use mobile devices to locate and display AR machines, allowing them to observe simulated machining actions.

Application service

Mobile Inspection System



Intuitive AI image recognition enables rapid identification of instrument data, electronic meter reading, and detection of changes in equipment appearance to determine abnormalities.



Transformation of business services industry



Business service industries (such as exhibitions, cultural events, hospitality, and retail) utilize private 5G networks to support high-quality immersive applications, enhancing customer service to strengthen consumer loyalty. Additionally, through digital integration with physical spaces, they can create new business models for the future experience economy.

Application service

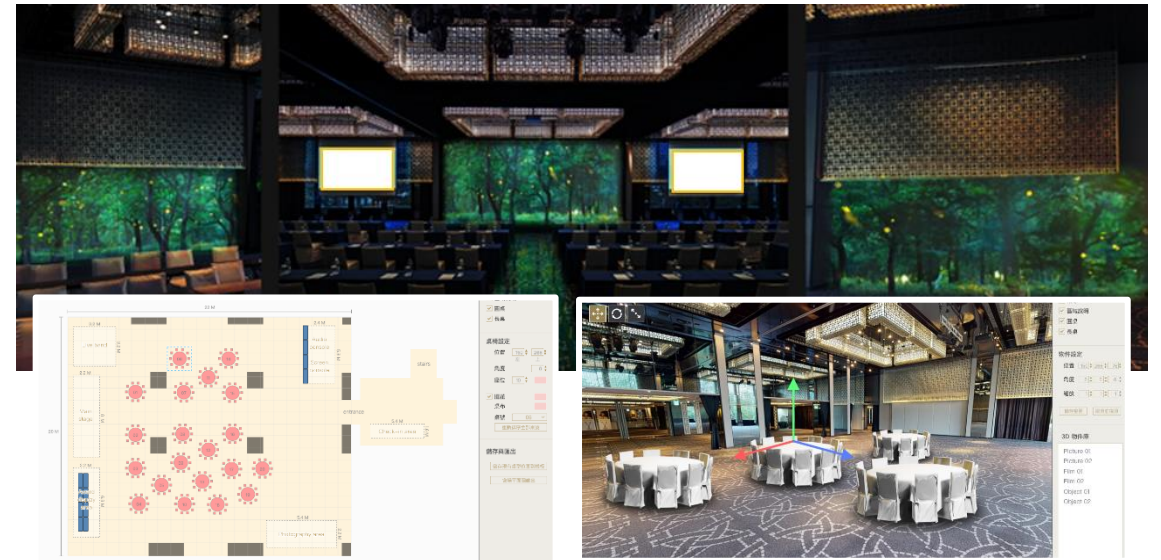
Virtual-Reality Coexistence Exhibition Solution



Creating a new experience for exhibitions and performances that ensures audiences get their money's worth. Remote performers utilize real-time Chroma key rendering. Meanwhile, on-site spectators can switch between first-person and third-person perspectives using AR, fostering interactive immersion within integrated virtual and physical settings.

Application service

Immersive Experience Banquet Solution



Upgrading service models through innovative experiences, revitalizing venue services and adaptations, enhancing communication efficiency, increasing customer attraction, accelerating transactions, and reducing waste from decorations.



Local cultural revitalization and transformation



In response to the challenges and opportunities of the digital economy era, introducing private 5G and digital technology into cultural festivals not only enhances Taiwan's festival culture and tourism industry marketing capabilities, but also leveraging the power of digital software applications, collaboratively develops new business models and creates experiential marketing opportunities.

Application service

5G Digital Festival Experience Solution



The solution integrates traditional craftsmanship with 5G mobile production and broadcasting systems, utilizing 5G transmission technology, and integrating the classical aesthetics of traditional lighting art against the backdrop of famous landmarks, employing digital generative art techniques to provide the public with a new experience of digital light festivals that promote cultural inclusivity.

Application service

5G Immersive Festival Live Streaming Solution



The solution integrates folk and religious cultures with innovative 5G applications to revitalize local festival's cultural assets, attracting more young generations to participate in local folk culture.



Integrating with local culture to accelerate the popularization of private 5G networks

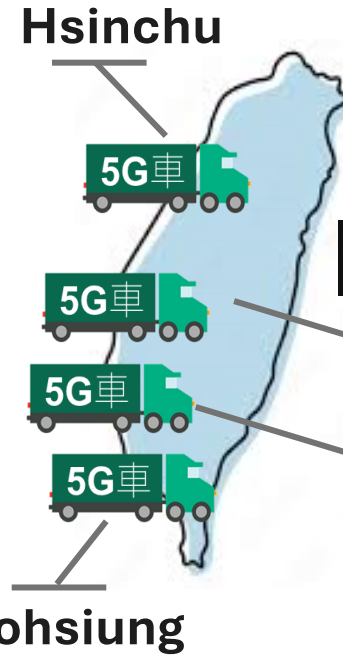


Deploying portable and easy-to-deploy private 5G networks integrated with local culture and festivals, bringing applications into daily life.

5G Mobile Production and Broadcasting System



Hsinchu/
5G Tung Blossom
Festival



Chiayi/5G Tea

Chiayi

Tainan



Tainan/2024
Taiwan Lantern



Kaohsiung/5G
Comic Festival



04

Conclusion



Private 5G is cross domain, service and SW/HW



Local cross-domain collaboration

Field demands drive 5G innovation

Accelerate field DX

Expand ICT innovative application business

Utilize Private 5G SW Technology

Accelerate AIoT services upgrade

SW+HW Integration

Develop Private 5G applications and services

- Effectively integrate local applications and services with various kind of technologies, e.g. AR/VR.
- Lead local ICT applications and services venture companies to join operation and develop new eco-systems.
- Expand, diffuse and continuously optimize developed innovative solutions with sustainable business plan.
- Keep on improving Private 5G solutions and vertical domain applications to accelerate commercialization.
- Focusing on local advantageous industries to promote utilization of 5G to accelerate introduction or production of effective smart services.
- 5G and on-top applications help enable digital upgrade of local industries and establishment of Taiwan 5G AIoT eco-system.
- Catch domain demands and introduce 5G, AI, display, etc.
- Create Private 5G service systems for various industries to drive the integration of contents, systems and services with software and hardware.



Accelerated Growth of Private 5G with the help of Integrated Services



Open
Network

Closed → Open

Under same deployment plan, a 5G network costs 3.5~8 times more than a 4G network
Service update depends on equipment vendors

Related industries:
Communications
equipment, components,
servers

Industrial
Applications

Public → Private

USA, Germany, Japan and Taiwan have released private network dedicated spectrum
Industrial organizations such as 5GAA and XGMF are devoted to promote development and usage

Related industries:
Private network system, SI,
software applications

Software
Value Add

Hardware → Software

Linux Foundation supports various projects, such as Openchain, OpenSSF, to help build complete eco-system
The emerging AI RAN Alliance is exploring AI for RAN, AI and RAN, AI on RAN 5G+AI software eco-system

Related industries:
AI, software solutions, SI



Thank you