

# Enabling Digital Economy with Industrial Best Practice



5G Industry Department

# 5G will Bring a Trillion Dollars Market

## 5G Development Is Booming

74 countries

189 telcos

98 telcos

investing 5G SA

1200+ 5G devices

Source : GSA, 2021.12

The coming 3~5 years is a critical period for 5G development

## 5G will bring over \$13.2 trillion sales

Unit: Billion



Source: HIS, Deloitte, ZTE, by 2035

The ToB market is an important source of 5G revenue

5G empowers thousands of industries, meeting their differentiated requirements.



# 5G Development of Mainstream Operators

	2018	2019	2020	2021	2022	2023
		NSA/SA(eMBB)	SA			
		NSA/SA(eMBB)	SA			
		NSA/SA(eMBB)	SA			
 			NSA		SA	
		NSA(FWA/eMBB)	SA			
		NSA(FWA/eMBB)	SA			
		NSA(FWA/eMBB)	SA			
		NSA(eMBB)	NSA	SA(Industry)		SA
		NSA/SA(eMBB)	SA			
		NSA(eMBB)		SA(Industry)		SA
		NSA(eMBB)				
		NSA(FWA/eMBB)				

**China:**  
SA is the target; NSA is for competition

**Japan & Korea:**  
NSA is for brand & competition; SA is for technology leading

**Europe:** SA  
Different Policy: part is due to government; part is due to competition  
**USA:**  
Most is high frequency; NSA is preferred.

NSA eMBB is mainly deployed in 2019, SA eMBB is mainly deployed in 2020.

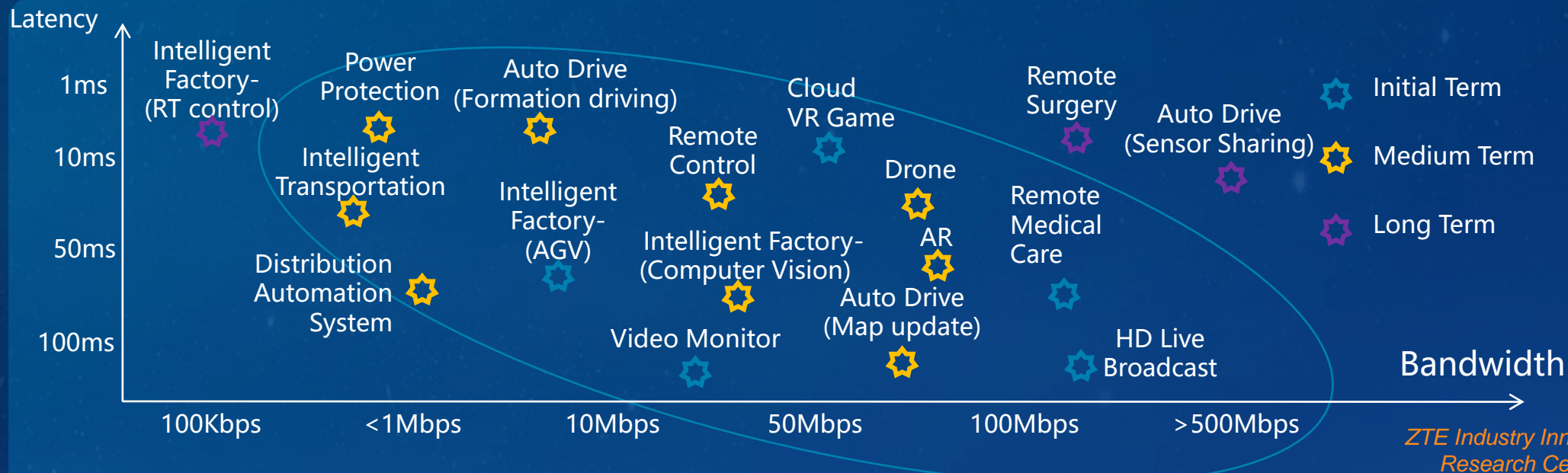
# 5G services are mature step by step

Early 2020

2020-2025

2025 - Future

	Monitor	HD Video	Cloud VR Game	AGV	AR	Remote Medical Care	Drone	Intelligent Transportation	Limited Auto Drive	Smart Grid	Remote Surgery	Intelligent Factory-RT control	L4/L5 Auto Drive
Mandatory	█	█	█	█	█	█	█	█	█	█	█	█	█
Frequent	█	█	█	█	█	█	█	█	█	█	█	█	█
Mature	█	█	█	█	█	█	█	█	█	█	█	█	█



eMBB is mainstream in 5G initial phrase

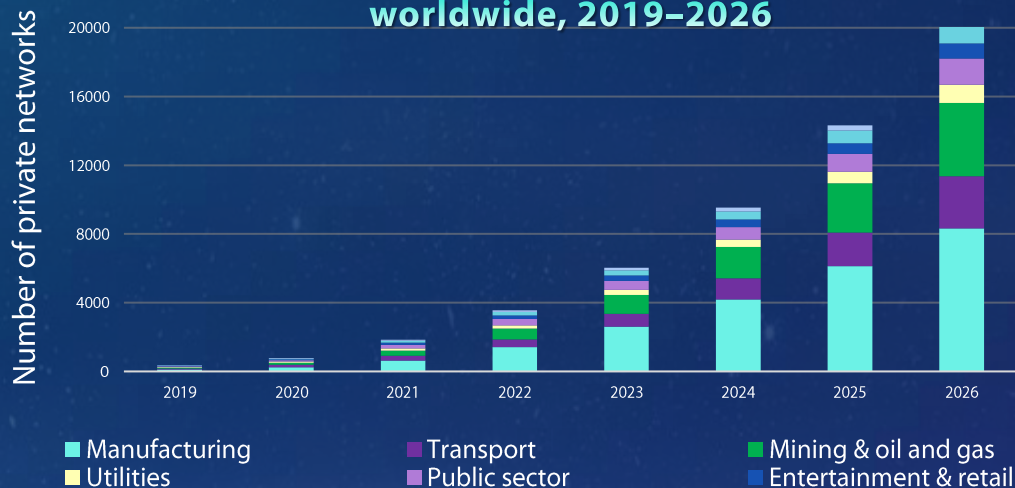
Industry Innovation must be consider end-to-end



**Number of private LTE/5G networks, worldwide, 2019–2026**



**Number of private LTE/5G networks by sector, worldwide, 2019–2026**



## Germany

- ◆ 100M private industrial frequency band is mainly applied in industry, agriculture and forestry fields, accelerating 5G ToB applications.

## America

- ◆ AT&T, T-Mobile and Verizon invest on 5G private network together with large-scale enterprises in vehicle, medical care, logistics and machine-building fields, Verizon launches the first 5G private commercial solution - On Site 5G, Q2, 2021

## China

- ◆ China Mobile issues 5G private network technology system 2.0, which focuses on 18 industries such as factory and mine, and builds over 1,500 5G private network commercial projects.

## Japan and South Korea

- ◆ Network construction first, XR drives 5G industry applications, LG U+ develops 5G-based automatic driving technology of unmanned special vehicle.
- ◆ Japan issues the 5G private frequency license to build a industry private network, and NTT DOCOMO focuses on remote control/remote medical care/remote automatic vehicle monitoring etc.

Global 5G has entered the all-round accelerated development stage, the 5G industry chain has been rapidly developed, and 5G innovative applications have strongly stimulated industrial digitization development.

## New services, new models, and new opportunities



Enabling 5G and implementing the digital transformation of all Industries



13.2 trillion USD

Technology-Driven Integration

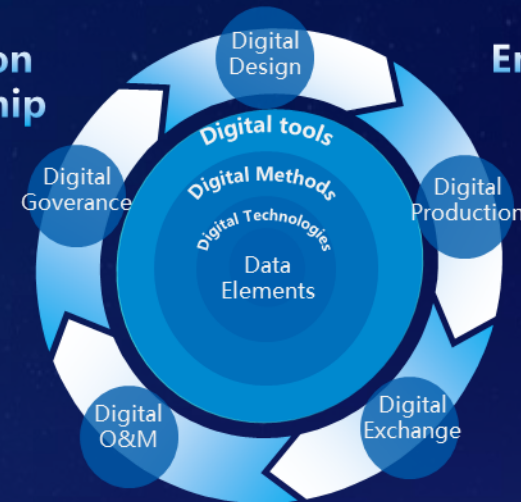


Service Breakthrough and Innovation

## Industrial Digital Transformation

Production Relationship

Entire Production Process



Productivity Digitalization (with whole value chain)

\* Data source: IHS 2019



# 5G Industrial Private Network + DigitalNebula is Empowering Industrial Digital Transformation

ZTE

## Empowering the Industry



Steel, Metallurgy, Electronic, Cement, Cement, Cement, Power, Urban Rail, Port, Railway, Port, Large-Scale Government Enterprise, Finance, New Media, Cultural Tour, Education, and Medical Commercial Operator...

Consultation on Digital Top-Level Design

## DigitalNebula Atomic Modules

Full-stack technology  
(Enabler)

Integration service  
(Inone)

Development Platform  
(Studio)

Transaction ecosystem  
(Market)



ZTE DigitalNebula

## Industrial Private Network

Deterministic Precision Network

Cloud on Demand  
Follow the cloud

Distributed Precision Cloud



ZTE



## All platform capabilities

### Enabler-Full-Stack Technology

- Video Cloud
- Cloud XR
- 3D Rendering
- GoldenDB
- Big Data
- Data Engine
- AI
- ...

### Access of thousands of industrial terminals

- High-spectral Camera
- 4D Millimeter Wave Radar
- Video Synthesis Gateway
- Voiceprint Monitoring Device
- 3D camera
- Industrial Natural Navigation AGV
- Robot
- ...

Multiple technical capabilities  
Fully empower customers and partners

## Multiple partners



500 and partners  
Enhancing technical and field capabilities



# 5G+ Enables Smart Transportation with Connectivity + Computing as Key

## Smart Urban Rail Transit

Train-ground wireless -> smart rail transit

## Smart Road

Vehicle-smart -> vehicle coordination

## Smart Port

Remote control -> intelligent coordination

Subway video backhaul

High-speed railway  
super-LOS vision

Smart road intersection

5G Port Remote Control

Smart transportation  
station Service

High-speed railway  
data offload

Vehicle-road coordination

5G Port Visualization

Rail Transport  
Video Cloud

TECS Cloud  
Platform

Transportation  
Machine vision

V2X Cloud Control  
platform

Port IoT platform



5G TAU



5G antenna

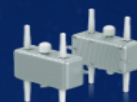
Train-ground wireless network



V2X module



5G OBU



5G RSU

C-V2X network

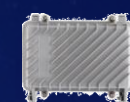


Drive test device



Video gateway

Transportation Edge Computing



5G outdoor Ind. CPE



EBridge (5G VPN)

Remote control

Internet of Vehicles in Changsha: The World's First  
Public-Network 5G Slicing for V2X services



World's First 5G Metropolitan  
Transport Demonstration in Guangzhou



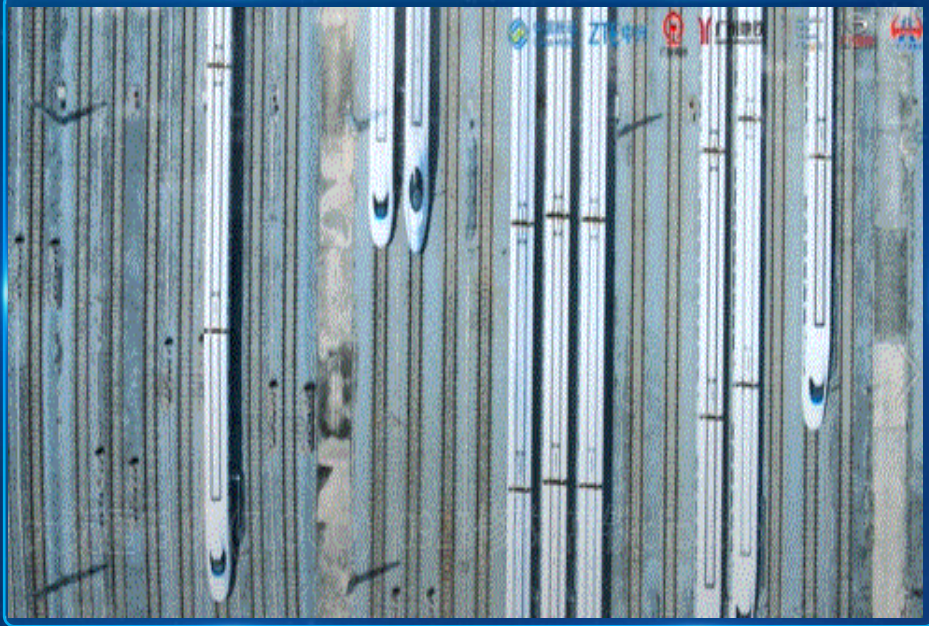
Tianjin Port: The World's First Commercial-Use of  
5G Quay Crane Remote Control





## First in the world

### 5G Smart HSR Application



**Guangzhou South HSR Hub**

- 5G equipment inspection 2 minutes instead of man-made inspection 2 hours
- Super LoS Over-the-horizon early warning in km
- 5G automatic dump, efficiency improved by over 10 times

### First in the world 5G hard slice apps for smart Metro



**Guangzhou Tower MTR Station**

- Full-scenario intelligent management
- Save more than 10% station hall manpower

### Global Leadership 5G Intelligent Network-Based Driving



**Guangzhou Automotive R&D Institute**

- Improve auto driving safety rate 30%
- Global traffic efficiency optimization 20% or above

### First in China 5G+ dispatching bus line



**Guangzhou BRT 27**

- Bus shift scheduling time is shortened from one week to one day
- Improve public transportation efficiency by 10%

### First in China 5G Road vehicle preventive inspection



**Guangzhou Nansha Bridge**

- Improve the road bridge risk identification rate above 65%



## 5G Power Private Network

Providing "last mile" for power supply security

## 5G dedicated mine network

One network with one platform

## Energy Edge Cloud

Mine terminal control room + power multi-station integration

### Visualization of Mining Plane

### Remote Control of the Tunneling plane

### Robots Preventive Monitoring

### Conveyor Belt Monitoring



Full series of mine explosion-proof products



Power CPE



- Intelligent PM and HD video backhaul



- First case in the country 5G+ remote tunneling control
- Visualization of the fully mechanized mining plane & preventive maintenance



- 5G differential protection pilot, the first end-to-end power slicing verification



- China's largest 5G smart grid demonstration area
- Commissioning of BTS R16 by CPE





## Smart Mine Operation Site



↓ The operation cost is reduced by 40% ~ 50% for mining plane operation



↓ The number of people is reduced by 10% to 20%.



↑ The comprehensive productivity improvement in mining areas 10%

### "Seven Countries, Eight Systems"

- Multi-mode, multi-frequency, and multi-service access
- Mine-dedicated i5GC
- Isolation of hard slicing
- Underground end-to-end mine safety certification, over 10 partners

### One platform integrating the chimney systems

- Precision cloud network ICT suite
- Cloud-based comprehensive production management and service system platforms



5G Tunneling preventive maintenance



5G visualization of mining plane



5G remote control of tunneling sites



5G underground auxiliary transportation



5G environment monitoring



# 5G+ Transforms Traditional Manufacturing into Digital Factories

Machines replace human work

Mobile instead of Fixed

Systems convergent in cloud

Flexible logistics

## Industry AI Vision Solutions

## Industrial IoT Platform

## 5G IMES Platform

## Industrial Natural Navigation AGV

Quality Inspection

Cloud-Warehouse

Cloud PLC

Digital Twin

Data Analytics



Convergent Positioning



IIoT



AGV



Machine Vision



XR



Remote Control



Changzhou Precision Research



Ansteel Group



Sunho, Yunnan



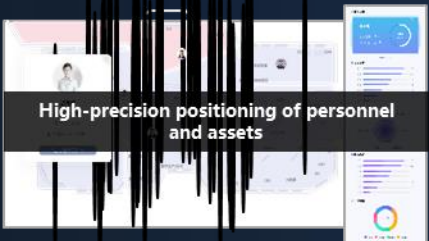
Binjiang



Sany Group

# Industrial Digital Transformation of Sunho Aluminum Factory

One Stop Solution with Panoramic Management System from physical world to digital world



## Industrial Internet Platform



## Intelligent Analysis of Industrial Data



## Industrial visual analysis platform



## Digital workshop multi-dimensional management

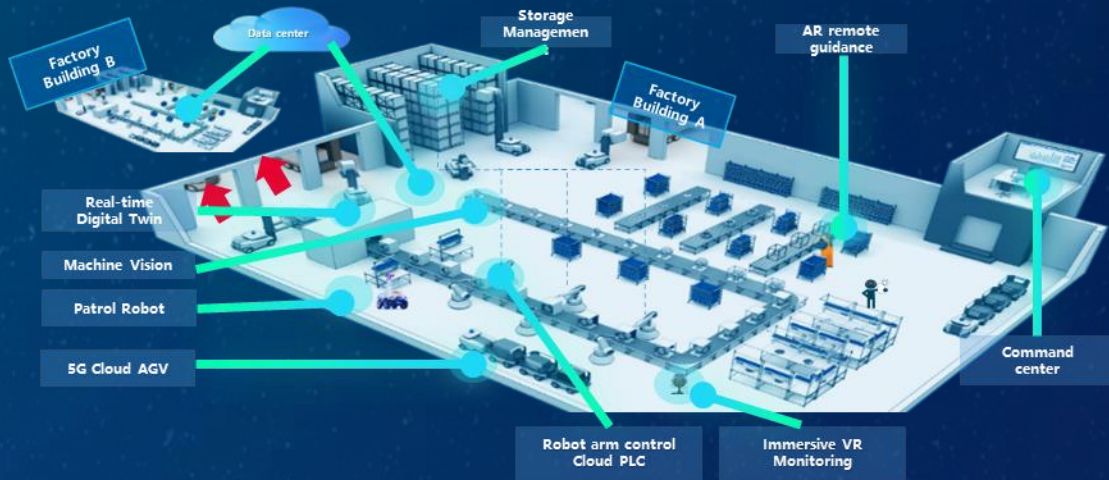


Building Fully-connected factory for digital transformation of manufacturing industry

Integrated management of personnel, vehicles, materials, materials, and products



# All-round Digital Transformation of Manufacturing Industry for 5G Fully-connected Digital Factory in Binjiang



## 1 industrial private network



## 2 distributed cloud platforms



## 3 innovative models



5G Robotic SMT



AR Remote Guidance



5G Digital Twin



5G Natural Navigation AGV



5G+MEC Machine Vision Inspection



Park Digital Management

## Build our own model → Promotion & Replication

Over **60** industrial innovative applications in **16** categories! **30bn RMB** output in 8 months! **Industrial Internet Open Lab** open to our **key partners** Jointly with **Operatos** and **Eco-partners** to promote **Virtual private network + "Internet +" industrial application supermarket**

# 5G Smart ANSTEEL

## 5G+MEC based Machine Vision Quality Control Solution

Partners : ANSTEEL stripe steel factory in Liaoning



Rank **No.7** in Iron and Steel industry worldwide

Cost-effective **NPN** with shared NR and control plane

MEC hosted quality control without IPCs and cables

5G module **embedded** in cameras



Non-Public Networks for Industry Scenarios

Defect repositories of **13** stripe steel lines **sharing**

Accuracy improved from 70% to **95%**

Fast online inspection **10 meters/s**





# Tianjin Port, the Main Business Has Begun to be Commercialized

### 5G Intelligent Unmanned truck

Normal operation

110000 hours

Accumulated mileage

>200000 km

Work cycle

>70000

Safe transportation

150000 TEU



### 5G Crane Remote Control

Operation latency

<20ms

Working height

50m

Working time

>500h

Efficiency improvement

20%



### 5G Real-time Identification of Goods

Stable operation

500 h<sup>+</sup>

Scale deployment

4 shore bridge

UL thp

> 70 M

Save manpower

75%



### 5G Smart Lock & Unlock Station

Recognition time

6s → 3s

Recognition rate

> 95%

Mainstream locks

> 20 types

Efficiency improvement

10%




The operating efficiency of a single bridge reaches 31Move/hour, the overall operating efficiency is increased by nearly 20%, the energy consumption of a single box is reduced by 20%, and the labor is reduced by more than 60%



# 5G is a Totally New Ecosystem for Digitalization






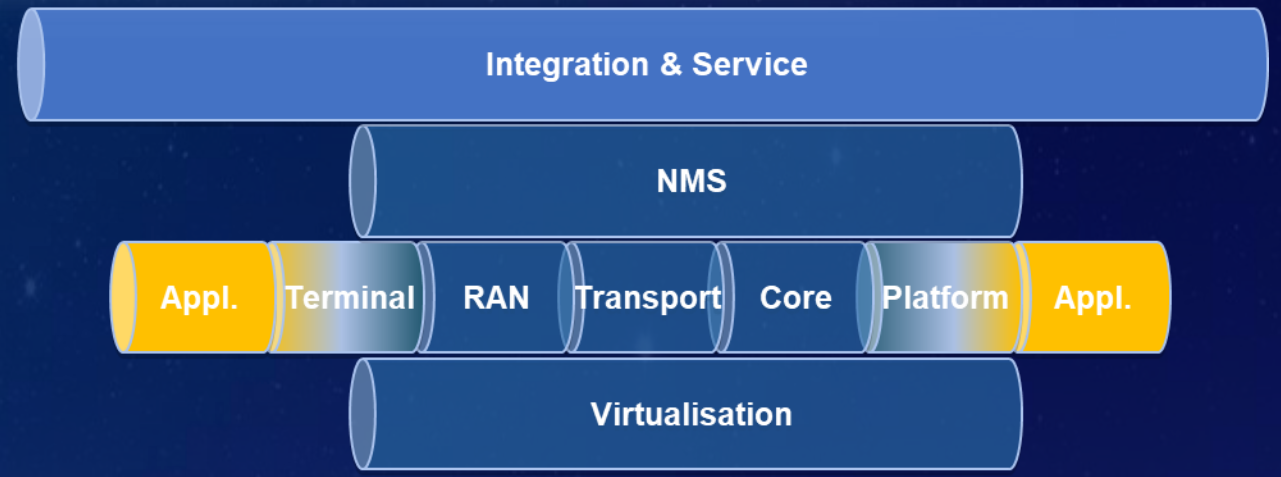
**Digital Products & Services**  
(Apps, digital tools.....)



**Cloud Platform**  
(cloud, hybrid cloud, PaaS, ...)



**Digital Infrastructure**  
( 5G, FBB, Data Center, ...)



3rd partners
  ZTE
  Integrator



# 5G Industry Use Cases Replication and Development: From 1 to N

Steel	Manufacturing	Mine	Port	Grid	Urban Rail	AR/VR	Medical	Education
<ul style="list-style-type: none"> <li>• 5G+PLC remote control</li> <li>• Online detection &amp; diagnosis</li> <li>• ...</li> </ul>	<ul style="list-style-type: none"> <li>• 5G natural navigation AGV</li> <li>• 5G+Cloud PLC</li> <li>• Digital twin</li> <li>• ...</li> </ul>	<ul style="list-style-type: none"> <li>• 5G+10G fiber ring network&amp;precise cloud integrated networking</li> <li>• Explosion-proof certification</li> <li>• ...</li> </ul>	<ul style="list-style-type: none"> <li>• 5G quay crane remote control</li> <li>• 5G truck autopilot</li> <li>• 5G smart tally</li> <li>• ...</li> </ul>	<ul style="list-style-type: none"> <li>• Microsecond high-precision timing</li> <li>• Millisecond differential protection</li> <li>• ...</li> </ul>	<ul style="list-style-type: none"> <li>• 5G massive vehicle-ground data transmission</li> <li>• 5G Super LoS early warning</li> <li>• ...</li> </ul>	<ul style="list-style-type: none"> <li>• VR virtual training</li> <li>• XR virtual training</li> <li>• ...</li> </ul>	<ul style="list-style-type: none"> <li>• 5G remote real-time consultation</li> <li>• ...</li> </ul>	<ul style="list-style-type: none"> <li>• 5G+4K interactive classroom</li> <li>• ...</li> </ul>
Zhanjiang Steel	Nanjing Binjiang	Shaanxi Huangling	Tianjin Port	Guangzhou High-speed Railway	Xinhua News	Colombia Hospital	New Oriental	
Anshan Steel	Gree	Fujiawa Coal	Yantian Port	Southern Grid	Fuzhou Subway	Shanxi Jinci	<ul style="list-style-type: none"> <li>• 5G drone seeding</li> <li>• 5G smart beekeeping</li> <li>• ...</li> </ul>	<ul style="list-style-type: none"> <li>• 5G HD live video</li> <li>• ...</li> </ul>
Anshan Steel	Gree	Fujiawa Coal	Yantian Port	Southern Grid	Fuzhou Subway	Shanxi Jinci	Drei Austria	Cherry Blossom Viewing in Wuhan
Liuzhou Steel	SANY	Shaanxi Dahaize	Antwerp Port	State Grid	Hangzhou Subway	Orange Spain		

**Type 1: Scale Replication**  
 Strong demand    Rich scenarios    Mature solutions  
 Clear commercial models

**Type 2: Commercial Deployment**  
 Unclear business models (reliability vs cost)

**Type 3: Scene Exploration**  
 Fragmental scenarios, difficult industrial integration

**Openness, Cooperation, Win-Win  
5G to Change the World**

**Thank You!**