



2024 创新预见 Better Together
6G未来 Better Future
全球6G技术大会
GLOBAL 6G CONFERENCE

6G and Manufacturing Industries

China Unicom - Dr. Jian FAN



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5G at midway towards 6G

- 5G commercial launch: June 2019
- >50% use-cases in manufacturing industries
- 10 typical use-cases: collaborative R&D, remote control, coordinated equipment operation, flexible manufacturing, assisted assembling, CV based QC, equipment fault diagnosis, smart logistics, unmanned inspection, production supervision
- Private network + edge computing represent the most of requirements

Some references

Case 1: BMW in Shenyang

- 1) Multi-campus 5G private network with A/B redundant base-stations
- 2) Uplink data speed rate reaching 1.13Gbps with 200MHz frequency spectrum
- 3) Key use cases: connection, control, positioning , sensing, i.e. 5G EMS, -40% network cost, ECS software downloading, car field test data transmission, etc
- 4) Network planning: 3000+ of connected devices, data traffic(daily average 10 TB) from 2020-2025
- 5) High accuracy positioning: 1-3m@90% by UTDOA algorithm
- 6) Dedicated vendor agnostic system for network monitoring and SLA supervision

Some references

Case 2: Sinopec in Nanking

- 1) Joined development with Sinopec of chemical explosion-proof small cell base stations, installed in the sensitive zones
- 2) Gases detection by the portable laser equipment (100m) carried by the robots and fixed bird's eye IR camera on the top of pole(a radius of 3km)
- 3) Beidou+5G+Bluetooth positioning services, 2 ground enhancement stations deployed

Some references

Case 3: Schneider Electric China

- 1) 20 factories 5G PN with a unique operator and a unified NOC, full dedicated network with non shared RAN and dedicated core network
- 2) Uses cases for industrial control, Reconfigurable production lines, virtual HMI, smart AGV scheduling

Evolution towards 6G

- Higher network performance required: 10X more than 5G.
- Millimeter waves introduction: will further reduce latency to 1ms@99.9999 %. New use-cases for wireless industrial control like motion control, not possible for 5G.
- Multi function network: communications + sensing with use-cases as slope monitoring in mining industries or drones detection for grid protection, etc
- Other new use-cases: industry4.0 CPS, digital twin, metaverse, GenAI

Risks and challenges for 6G

- **Divergent standards:** The US has formed the Next G alliance, with Qualcomm, Apple, Samsung, Nokia, Ericsson, AT&T, and others; The flagship 6G research project "Hexa-X" of the European Union also brings together 25 European and American companies and research institutions. The exclusion of Chinese industry from these alliances will inevitably lead to different understandings of demand and solutions.

Risks and challenges for 6G

- **Frequency band selection:** The centimeter waves may become the main frequency band of 6G. This is maybe a compromise between performance, coverage range and power consumption. But the millimeter waves are still interesting for some high value use-cases in industries.
- **Cost and energy consumption:** Reducing costs and power consumption is an important direction for future innovation.



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