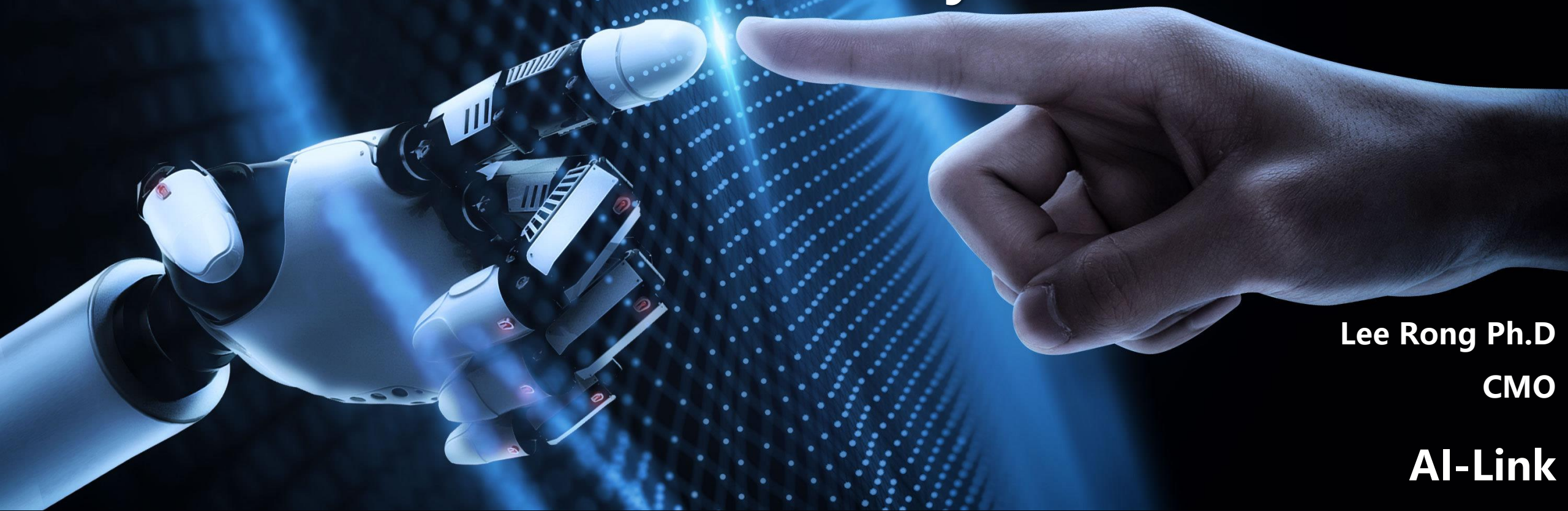
The application of 5G+Edge towards Industry 4.0



Lee Rong Ph.D

CMO

AI-Link

Today wireless connections still account a small percentage among industrial connectivities

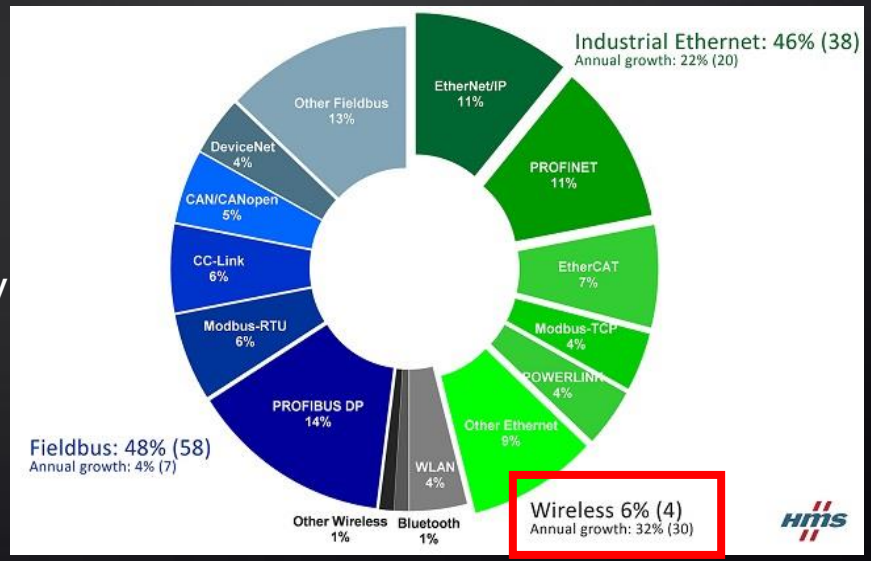
- Industry 4.0 “3 pillars”: network as the basis, platform as the core, and safety needs to be ensured

  Today the majority of connectivity are by wired technologies such as Fieldbus and Industrial Ethernet

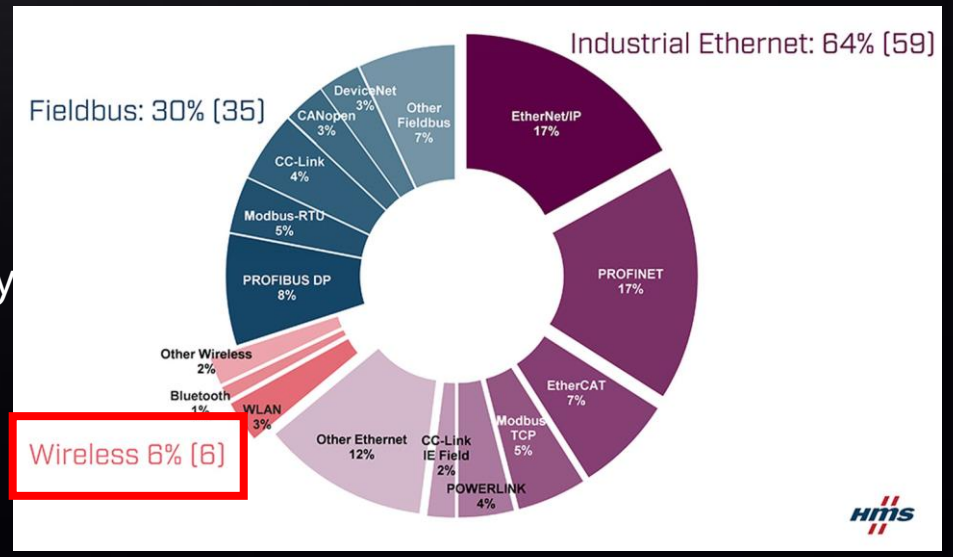
- Nowadays wireless connectivity only still accounts as a small percentage:
  - Limited by the ability of WiFi, LoRa and BT etc.,
  - Flexible production and Industry 4.0 are yet to take off

- However industrial wireless technologies are gaining tractions

2017 survey



2020 survey



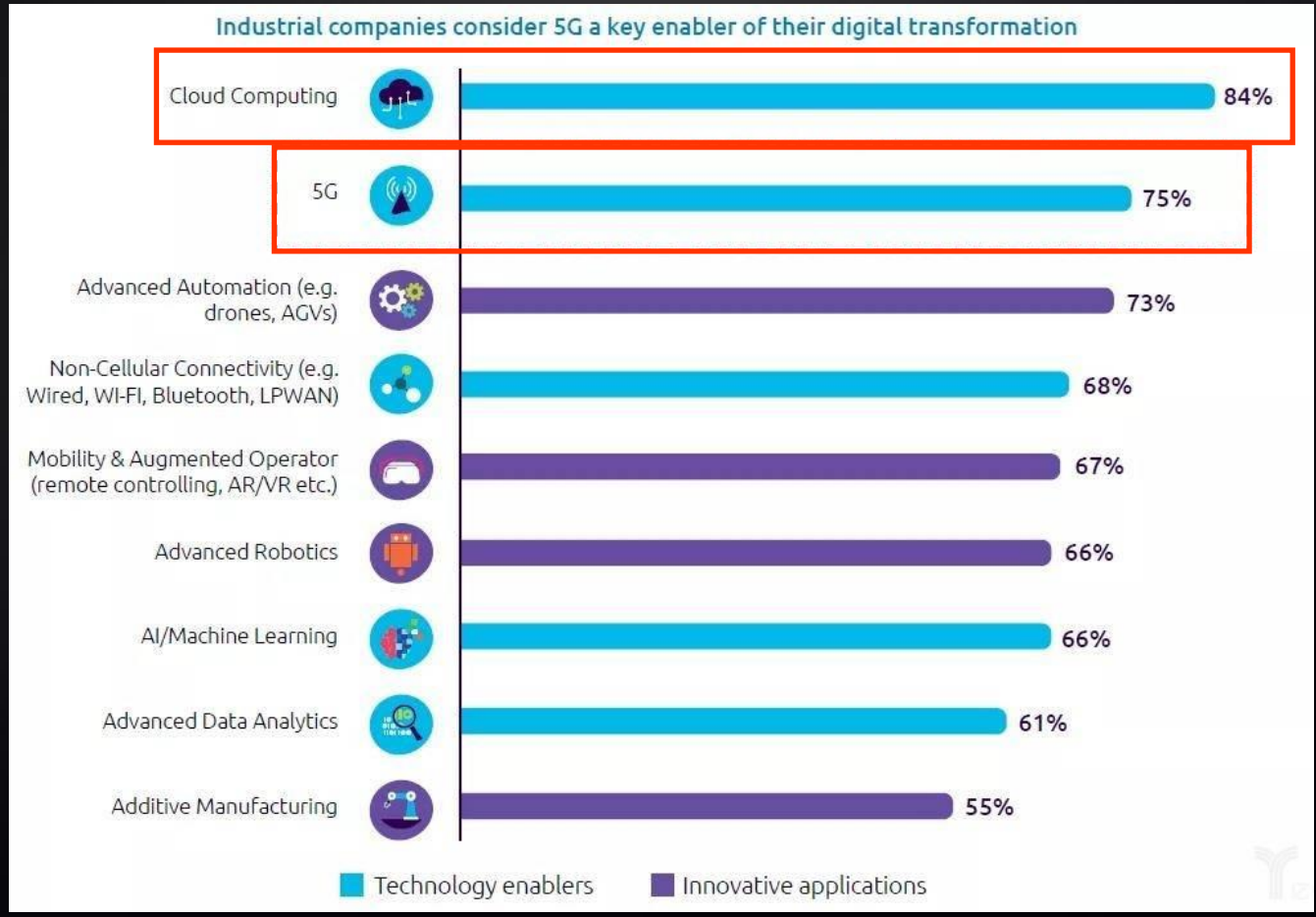
HMS IIoT connectivity annual survey

The importance of 5G+Edge Computing for Industry 4.0

- Cap Gemini published “5G in industrial operations” based on survey from 800+ industrial companies globally;

- Cloud Computing (include Edge Computing) and 5G were ranked #1 and #2 on the list, making them the most sought after future technologies towards Industry 4.0!

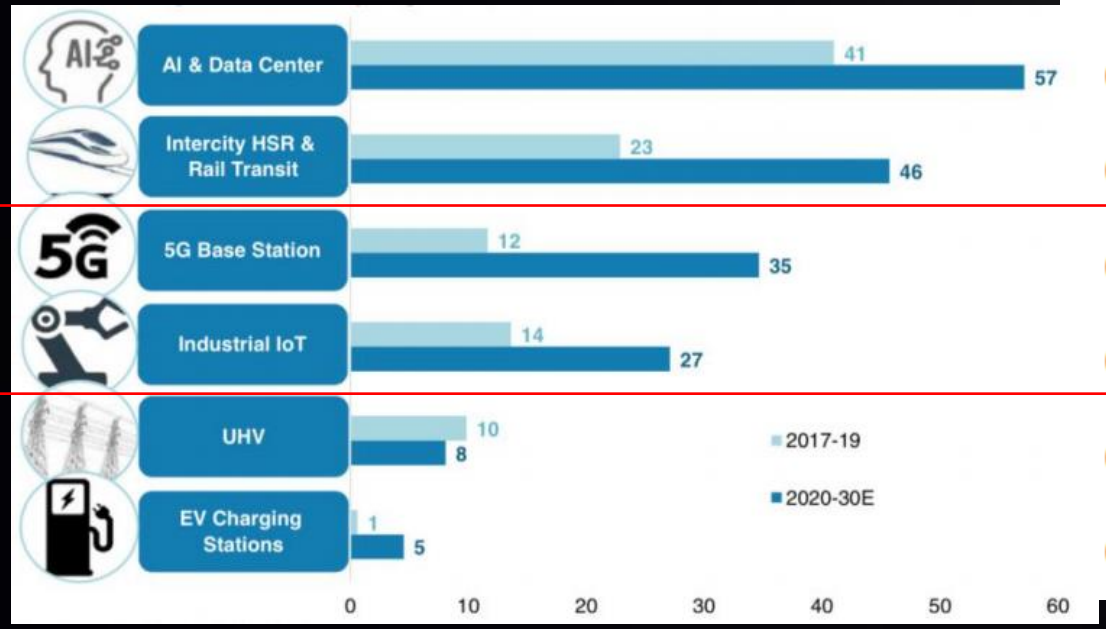
Consulting company Frost&Sullivan also has predicted that by 2022, around 90% of the industrial companies will adopt Edge Computing



China new infra. construction to accelerate the merging of 5G and Industry 4.0

"80% of the 5G use cases are related to Industry 4.0"

Morgan Stanley's estimate on the amount of investments related to the China's new infrastructure construction per category



(a) 数据中心和 AI：570 亿美金

(b) 高铁：460 亿美金

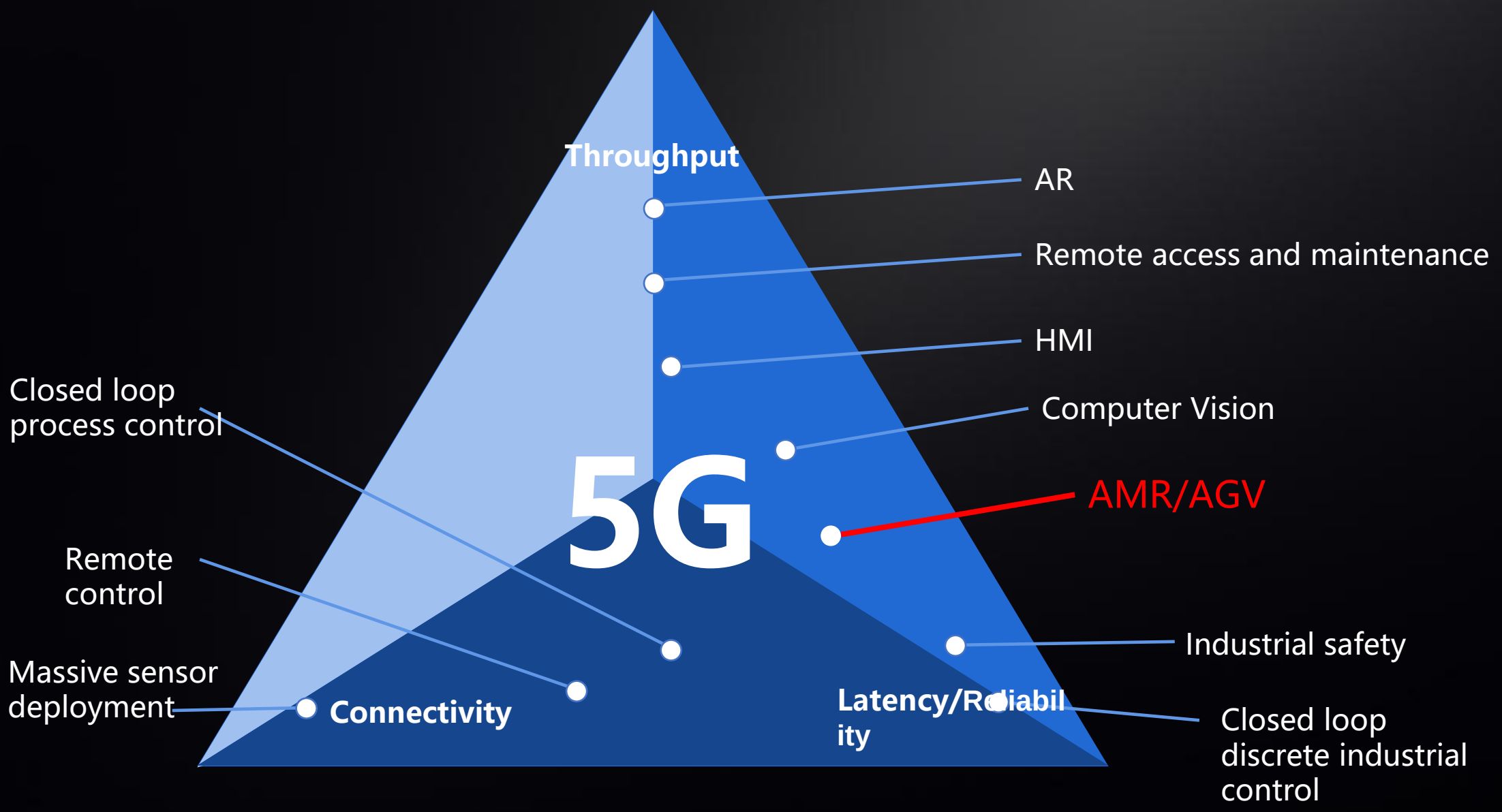
(c) 5G: 35 Billion USD

(d) Industry 4.0: 27 Billion USD

(e) UHV 特高压：80 亿美金

(f) 电动汽车充电站：50 亿美金

5G related industrial use cases



Release the full potential of future industrial mobile robots (AMR/AGV) with 5G+Edge

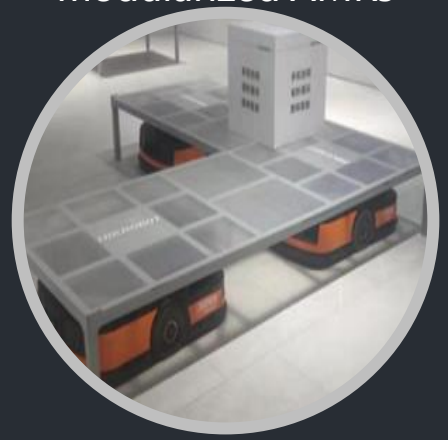
Ultra dense AMR deployment

- 2000+ AMRs within an area of 2000m^2 x 3 floors with a deployment density of 0.33 AMRs/m^2;
- requires 30-60 WiFi APs for the coverage with handover, congestion and reliability issues;
- A local 5G deployment with only 3 pRRUs can cover the same area with no issues as experienced by WiFi and more scalable;
- +Edge Cloud deployment with coherent PaaS level functionality on multiple AMRs coordination pushes the joint innovation.

Mobile robots with advanced functionality

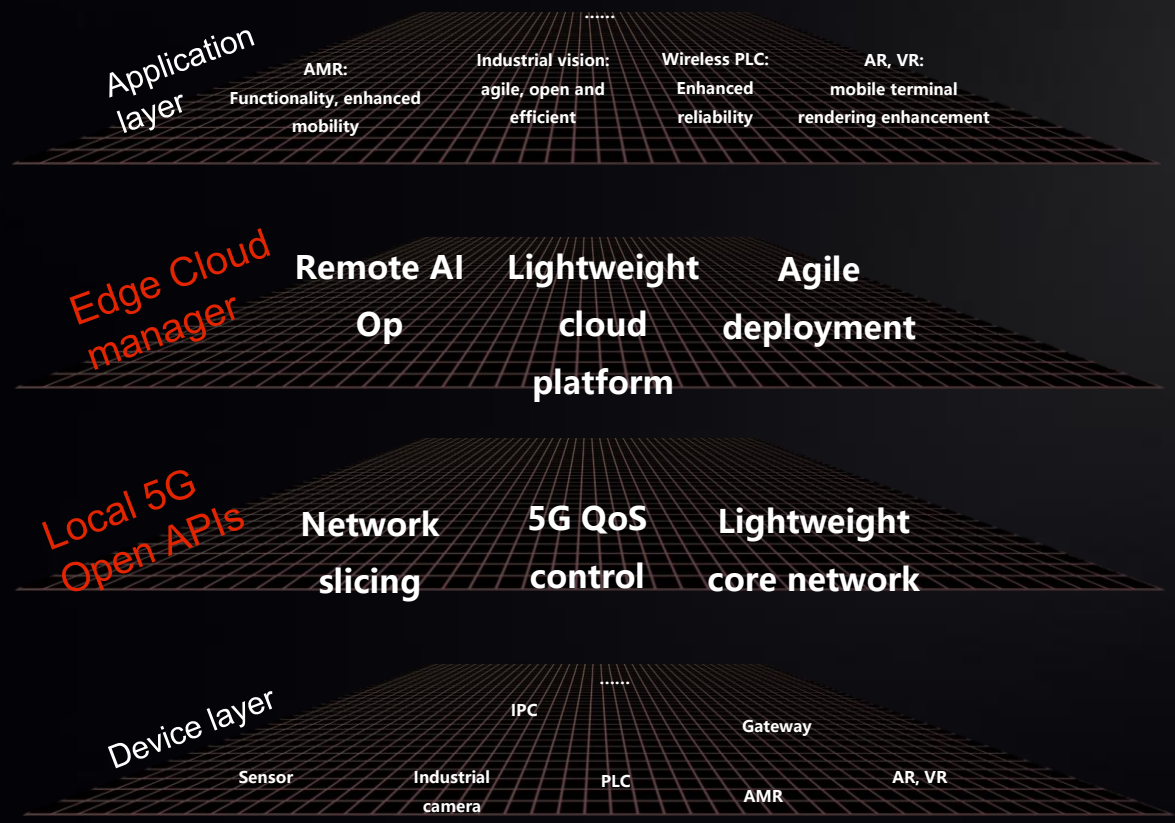
- A futuristic AMR utilizes 6 or more 1080p or 4K cameras supporting robotic arm positioning, object identification, automatic inspection and VSLAM each with its own QoS;
- Local 5G with right QoS support at Edge Cloud level can provide a much more reliable and QoS oriented approach than WiFi for such use case.

Extreme coordination among modularized AMRs



- Multi AMRs cooperatively transport large items at high speed requires real-time centralized interactions among AMRs;
- this requires the total e2e network delay to be at a consistent sub 10 ms level to achieve optimal effect;
- Local 5G optimized by Edge Cloud components can deliver such performance with future version pushing towards 1ms level.

AI-LINK Local 5G+Edge Platform: Create a factory-level solution streamlining devices, networks, edge cloud and applications



Local 5G+Edge 2.0 to be released in 2021 Apr!

APP Empowerment

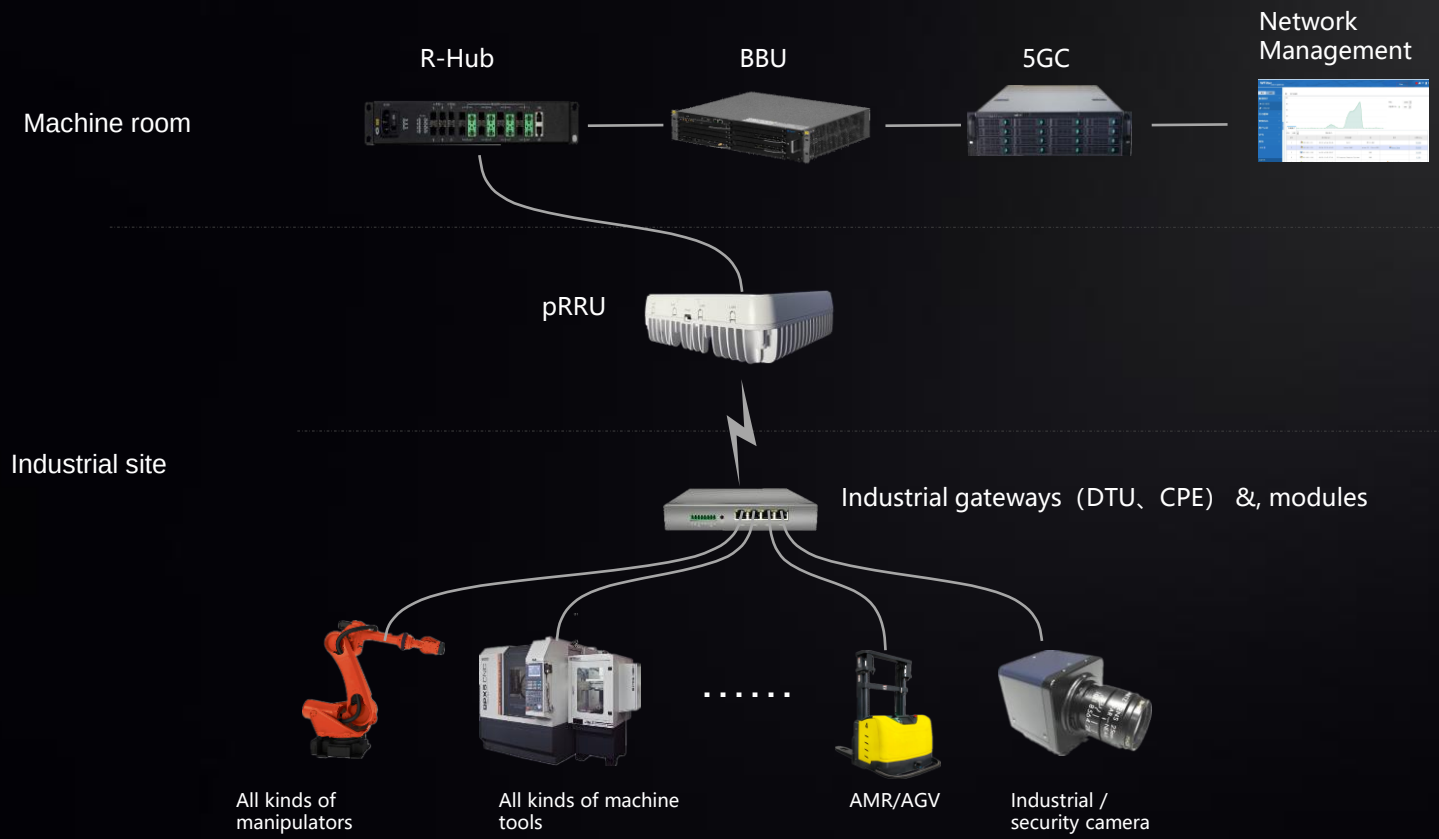
Low-cost & AI Op

Full Access to 5G

High Interoperability

AI-LINK Local 5G e2e solution: low cost and customizable specifically tailored for industrial deployment

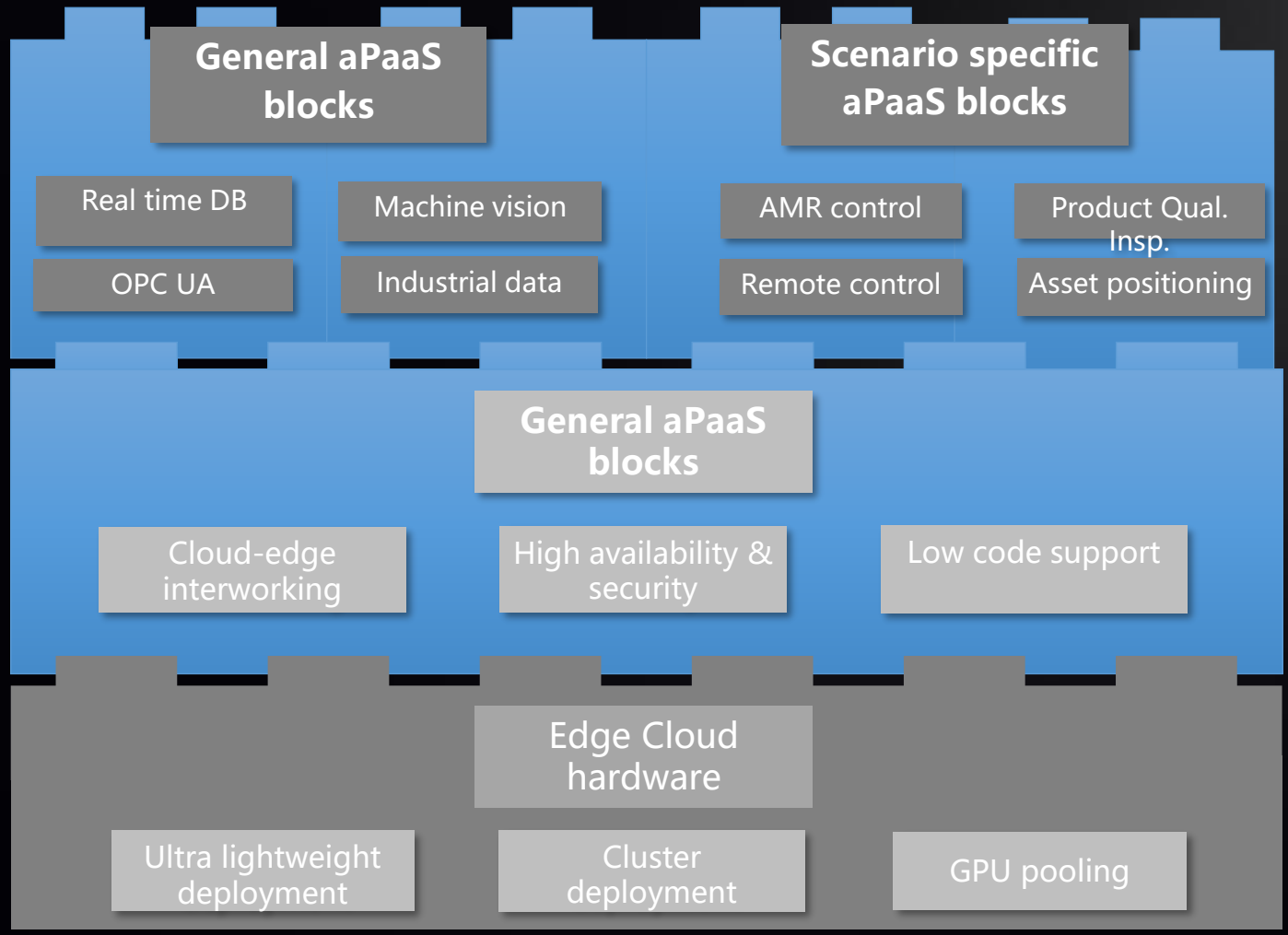
AI-LINK Local 5G network topology

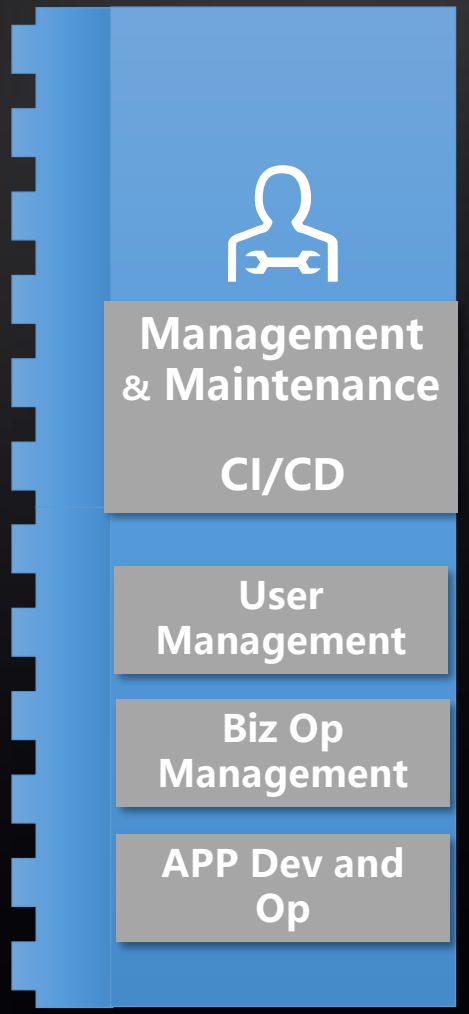


AI-LINK Local 5G capability

- Flexible customization: support on-demand customization, short delivering cycle time.
- Full band coverage: support 700MHz ~ 4.9ghz wide band coverage.
- Local and/or remote network management capability
- Southbound interoperability supporting multi-vendors
- API exposure through northbound edge to release 5G potentials to industrial APPs
- High data security

Edge Cloud PaaS platform: the first industrial edge approach dedicated to 5G+Edge for Industry 4.0!





- Low code support
- Safe and reliable for industrial deployment
- Full openness to release capabilities
- Auto management and maintenance

Enabling the world's largest building materials enterprise with 5G+Edge based production lines!

Technical bottlenecks

- The transfer of finished products from production area to storage area depends on manual forklifts, which has low transfer efficiency and high labor cost;
- Moving materials in the production lines need real-time positioning, and traditional solutions are costly and unreliable;
- The mobile unpowered kiln car has poor automatic correlation with the power drag system and needs manual operation;
- If the derailment of the mould car is not found in time, it is easy to cause secondary accidents;
- ...

Enhanced by 5G+Edge

- Using 5G+Edge based solution to implement the next level AMR, the auto-forklifts can quickly roam in the factory with high accuracy and reliability.
- Improve the moving material perception through 5G+Edge based industrial vision;
- Auto-detect the relative position of kiln car and drag car through 5G+Edge based industrial vision to realize auto-drag on demand.
- Innovative sensing technology based on 5G+Edge based vision to identify the derailment of the mould car.
- ...

Outcomes

Digitalization level of factory ↑ 20%	Circulation efficiency of kiln car production line ↑ 25%
Production scheduling efficiency ↑ 80%	Factory cabling cost ↓ 15%
Labor cost ↓ 40%	Production risk ↓ 25%

AI-LINK is expanding both its domestic and global businesses covering more than ten industries today

Global business penetration

- Energy
- Agriculture Machinery
- Automation
- Automobile Manufacturing
- Hospital
- Banking

Domestic business penetration

- Building Material
- Energy & Utility
- 3C
- Automobile Manufacturing

AI-Link

Looking forward to walk down the 5G+Edge path with you ！