# 5G Slicing Association (5GSA)

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# 5G Network Slicing Enables Different Services on the Same Infrastructure

## Situation:
Diversity of use cases call for flexibility

SENSOR NETWORKS

AUTONOMOUS DRIVING

E-HEALTH SERVICES

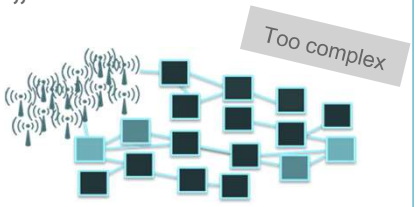
PERVASIVE VIDEO

5G Networks need to support flexible levels of:

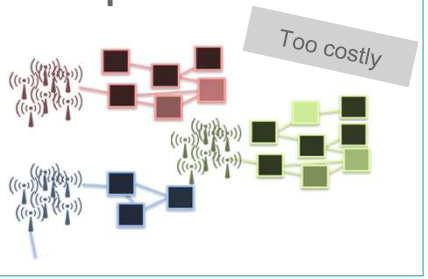
Mobility, Latency, Bandwidth, Coverage, Functionality , …

## Complication:
Limitation of classic solutions

**„All in One“ Network**

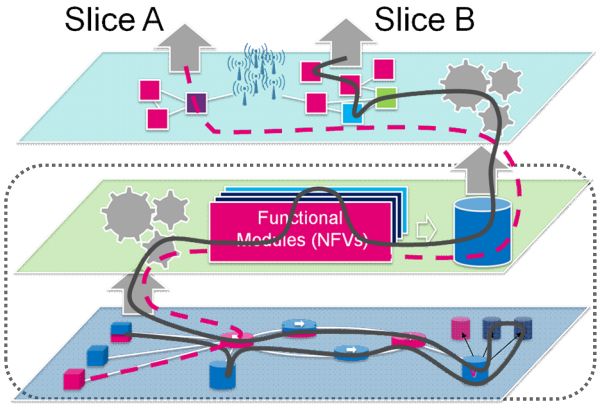



**Multiple Networks**




## Solution:
Multiple logical network build on one physical infrastructure

Strong capabilities for tailored solutions, guaranteed resources and fast provisioning




Business Application Layer

Infrastructure Control Layer

Physical Layer

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# About 5G Slicing Association (5GSA)

**Vision**

**Become a world leading organization to empower digital transformation of various industries.**

**Objective**

Team up with industry partners to leverage network slicing to boost the development and commercialization of 5G B2B applications, and resolve key challenges during the implementation.

Working Groups:

Network slicing to provide value to industry and society

**WG: Ecosystem & Awareness**

- *White paper*
- *Promotions*
- *Webinars and workshops*
- *SDO networking*
- *GIO*
- *Liaisons*
- *Website*

**WG: Requirements for standards**

- *Vertical requirements*
- *Operators requirements*
- *Vendors requirements*
- *Input to standard bodies.*
- *Contribution to Slicing SDO coordination*

**WG: Technology Innovation**

- *New Technologies impact*
- *Deterministic network slicing*
- *AI and ML*
- *Edge Cloud and MEC*
- *Autonomous Networks and Autonomous Digital Infrastructure*

**WG: Business Innovation**

- *PoCs, Trials and pre-commercial launches*
- *Commercial pilot project landing*
- *Network Slicing business opportunities with Verticals*

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# 5GSA organization

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- General assembly
- Council
  - Committee of Experts
  - Secretariat
  - Industry Ecosystem and Awarness WG
  - Requirements for Standards WG
  - Techology Innovation WG
  - Business Innovation WG

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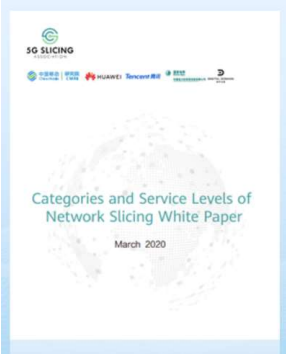
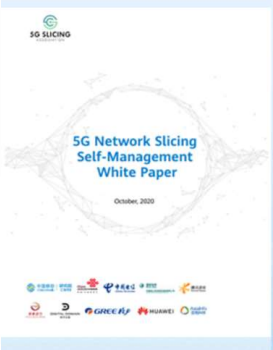
# Some relevant White Papers

**5G Network Slicing for Cross Industry Digitization: position paper**

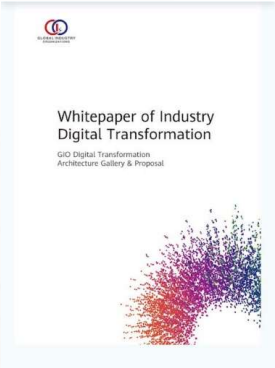
**"5G Network Slicing Business Opportunities for Multimedia"**




**Categories and Service Levels of Network Slicing**

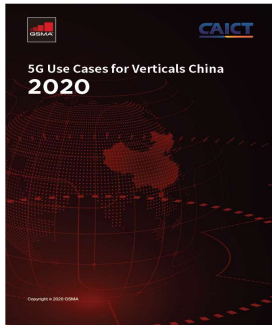



**5G Network Slicing Self Management**

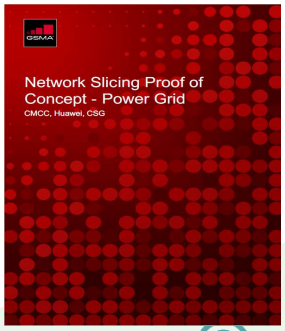



**White paper of Industry Digital Transformation, Architecture gallery and proposal**
**https://www.gio.zone**

**https://www.gsma.com/futurenetworks/resources/powered-by-sa-smart-grid-5g-network-slicing/**




**https://www.gsma.com/greater-china/resources/5g-use-cases-for-verticals-china-2020-3/**




**https://www.gsma.com/futurenetworks/resources/network-slicing-proof-of-concept-power-grid/**

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# 5G slicing for Power Grids

4G: SD Video

5G: 4K UHD Video

**4K UHD Video Based Security Monitoring**

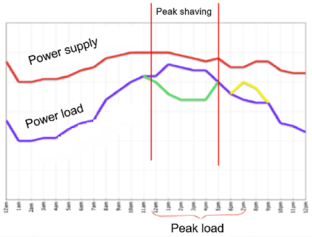
Before:

- SD video is used only to roughly detect risks. In most cases, on-site manual review is still required.

After:

- Zoom in or out to view onsite details and check the distance between the machinery and power wires.
- Onsite manual review is no longer needed in 80% of scenarios.

Before: Passive Reaction




Now: Proactive Detection

**Power Distribution Network Situational Awareness**

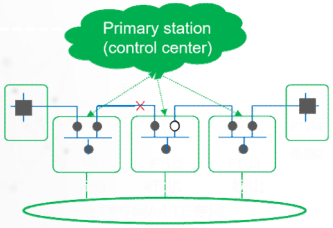
Before:

- Peaks in electricity use are leveled out in response to insufficient power supply.

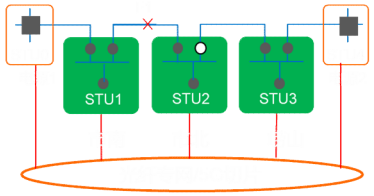
After:

- Power loads are transferred in advance based on prediction results. This prevents device faults and power failures caused by excessive loads.

Before: Centralized Power Distribution




Now: Distributed Power distribution




**Intelligent, Automated Power Distribution**

Before:

- The primary station centrally provides telemetry, remote communication, and remote control.
- A power outage is restricted to within minutes.

After

- DTUs locally determine how to distribute power.
- A power outage is further shortened to just seconds or milliseconds, or even avoided.

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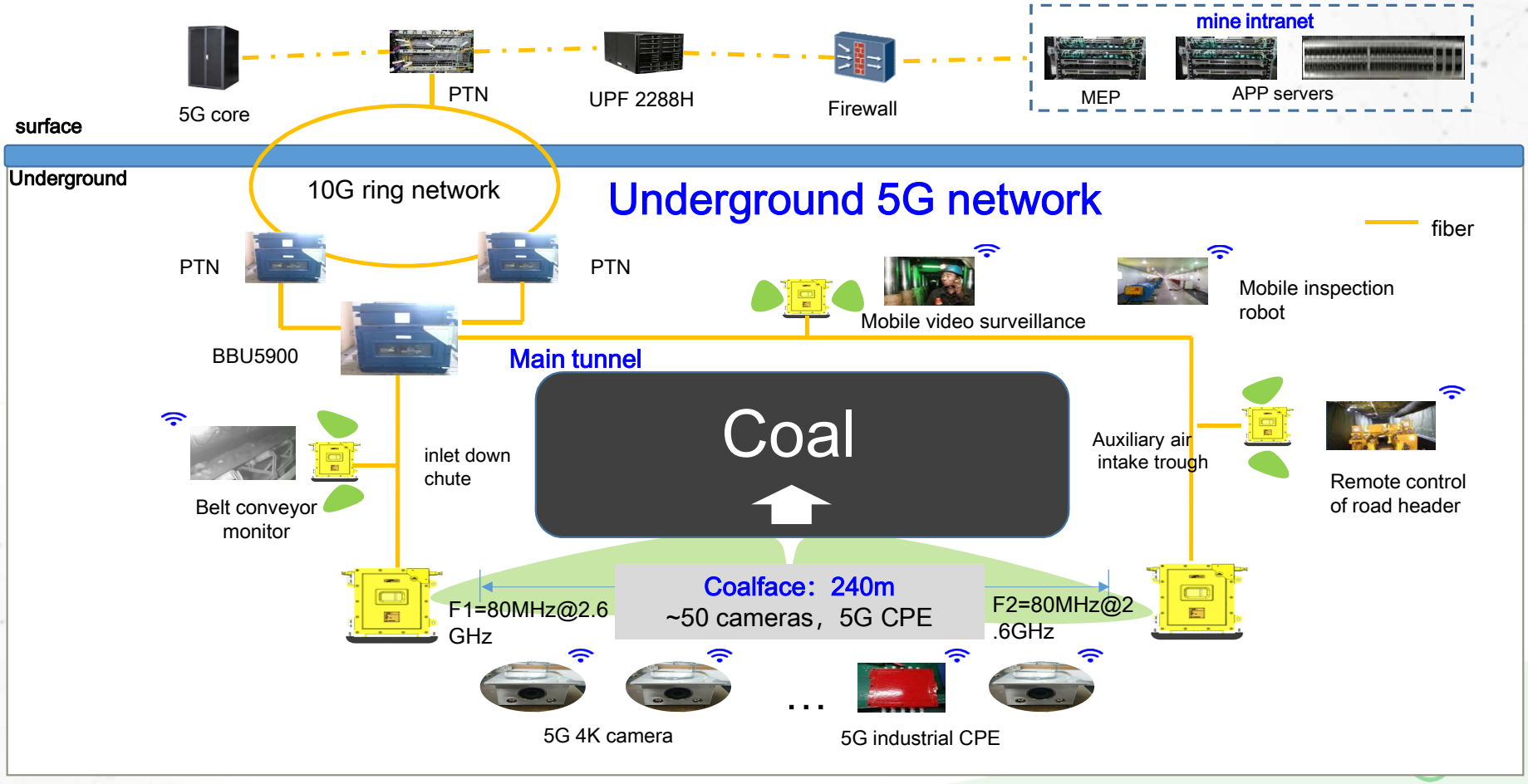
# 5G Smart Mining - Network Architecture

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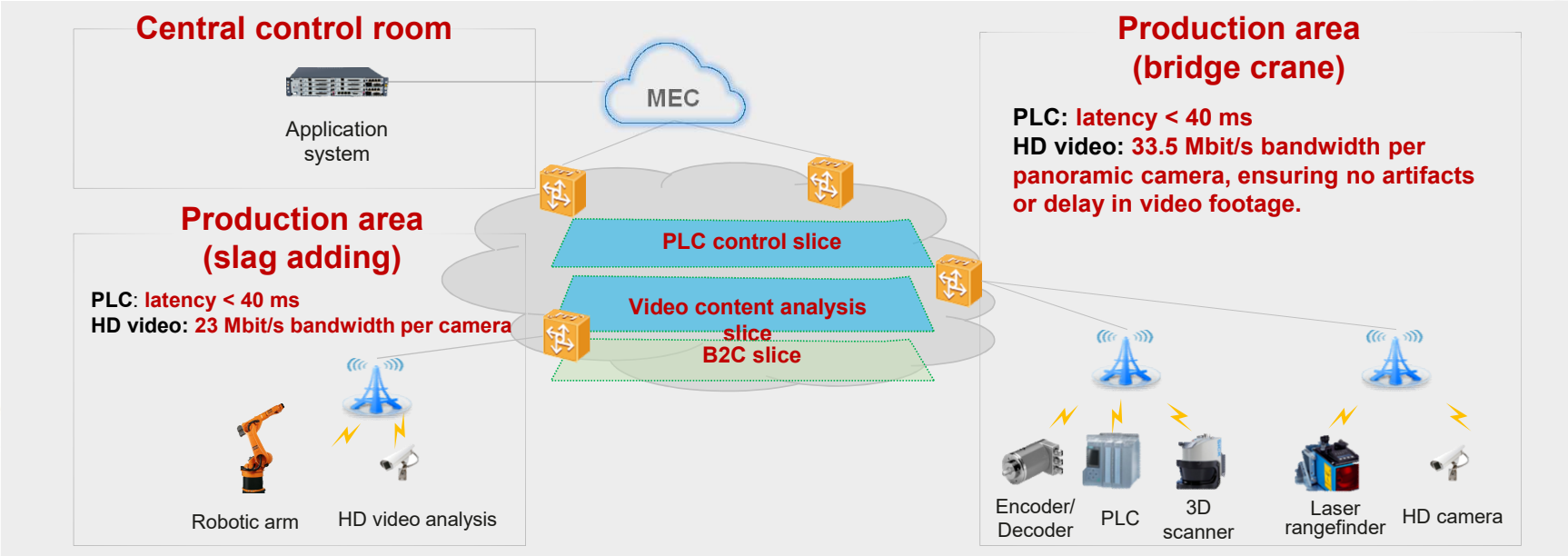
# 5G slicing for steel manufacturing




## The solution

**A high-quality local private network based on slicing was constructed:**

- The 5G base station hardware and spectrums are shared by all services (including production, non-production, and public services). Resources are isolated through network slicing, with FlexE flexibly applied.
- Both production and non-production services in the campus share the campus UPFs, while public services are processed by the public UPFs.

## The requirements

- **High uplink bandwidth**: More than 300 cameras require a total uplink bandwidth of more than 2 Gbit/s.
- **Low latency**: Remote control and real-time monitoring of bridge cranes and marking robots require a latency of no more than 30 ms.
- **High reliability**: The network must stay highly reliable to ensure **no production faults or inadequate product quality are caused by network jitters or failures.**

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# 5G slicing for XR Applications

## Cloud XR Service Types

**Weak-interaction cloud VR services**

Panoramic video (B2C)

Giant-screen cinema (B2C)

FOV video (B2C)

**Strong-interaction cloud VR services**

Gaming (B2C)

Social activity (B2C)

Education (B2C)

**Cloud AR services**

Healthcare (B2B)

Communications (B2B)

Industry (B2B)

## Key Capability Requirements of Three Types of Services

- Connection bandwidth acceleration and GPU acceleration
- Connection-based precise distribution
- Enhanced computing: adaptive and split encoding

- Deterministic low-latency connection with the network latency less than 20 ms and the uplink bandwidth of 50 Mbit/s
- Enhanced computing: rendering, stitching, encoding, and decoding

- Deterministic low-latency connection with the network latency less than 20 ms
- Enhanced computing: rendering and SLAM

Source: *Innovation Research Report of China Mobile 5G Joint Innovation Center*, jointly compiled by China Mobile, Huawei, and Cyber Cloud

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# 5G slicing for Cloud Gaming

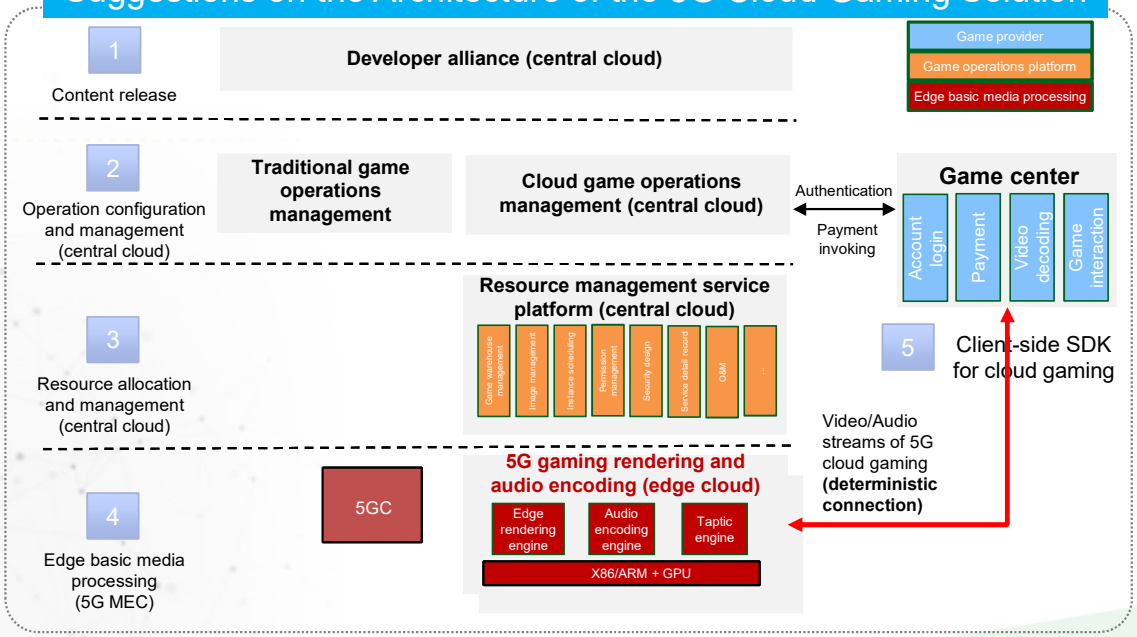
## Cloud Gaming Becoming a New Trend

Cloud disk gaming

Trial promotion

Live streaming and interaction

## Suggestions on the Architecture of the 5G Cloud Gaming Solution




## Pain Points of the Cloud Gaming Industry

- The network transmission latency exceeds 50 ms, which cannot meet the requirement that the E2E latency is less than 100 ms.
- Media compute nodes (such as the cloud gaming rendering node) are deployed at a high position on the mobile network, resulting in high-cost and long-delay video stream transmission.
- Mobile users (terminal capabilities, locations, mobility, and consumption habits) cannot be perceived, resulting in a gap in achieving precise routing.

## Requirements for 5G

**Deterministic connection capabilities, meeting the high bandwidth and low latency requirements of HD cloud gaming:**

- 720p/60 fps@25 Mbit/s
- 1080p/60 fps@50 Mbit/s
- Network latency < 20 ms, jitter rate < 5%

**Enhanced computing capability, meeting requirements of cloud gaming for various user experiences and optimizing computing and transmission costs for closed-loop commercial use:**

- CPU X86/ARM
- Cost-effective GPU acceleration card
- HD and low-bit-rate/Image compression technology

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## 5GSA Reasons to apply as 3GPP MRP

- 3GPP is the leading Partnership Project for 5G Standardization,  Network slicing is a key issue for business valorization of 5G, its industrial deployment moves slow
- 5GSA believes to satisfy all the obligations as outlined in Art. 7 of the 3GPP working procedures, having the potential to bring consensus on market requirements and excluding the goal/capability to define standards (3GPP standards are the reference)
- 5GSA is promoting slicing across organizations and enabling experience sharing between markets and industries
- POC, Trials and pre-commercial deployments with Vertical Business partners are the core of 5GSA expertise and practice
- Requirements extracted with Business Partners on real use cases can support the 3GPP standardization
- 5GSA is a global and open organization, know-how sharing and open collaboration is a mantra for us
- Several 5GSA members are active in 3GPP and major SDOs, the opportunity of approaching Verticals to 3GPP being an extra value

**As a 3GPP MRP, 5GSA can better support the evolution of 3GPP standards and facilitate the 5G B2X deployment worldwide**

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