

Empowering Smart Healthcare Journey with Digital Transformation

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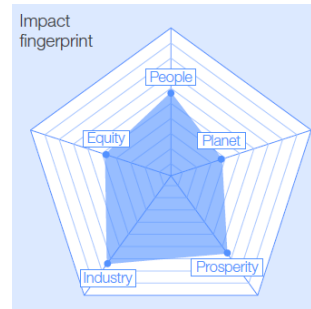
Content

- **Walking Through Digital Transformation Trends**
- Digital Transformation and Innovations of Smart Healthcare
- Next-Generation Smart Hospital Architecture
- Looking Toward Future: 5.5G and Intelligent World 2030

World Economic Forum: Top 10 Emerging Technologies of 2023

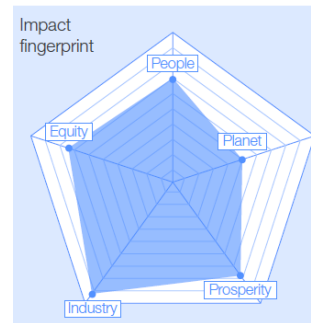


05 Metaverse for mental health
Shared virtual spaces to improve mental health.



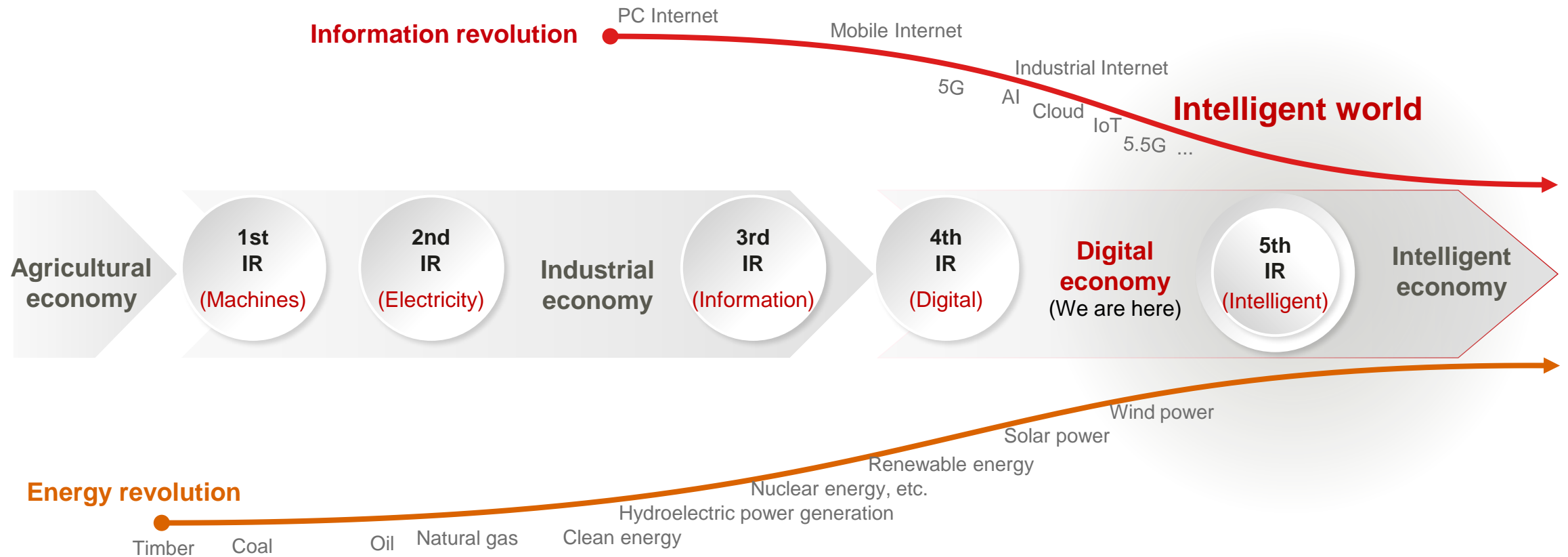
- Digital environment using VR/AR/XR and Metaverse for mental health treatment
- The metaverse may be used to provide a shared virtual space for people to connect and access therapy.
- Gaming platform to increase patient treatment and help destigmatize mental health issues

10 AI-facilitated healthcare
New technologies to improve the efficiency of healthcare systems.

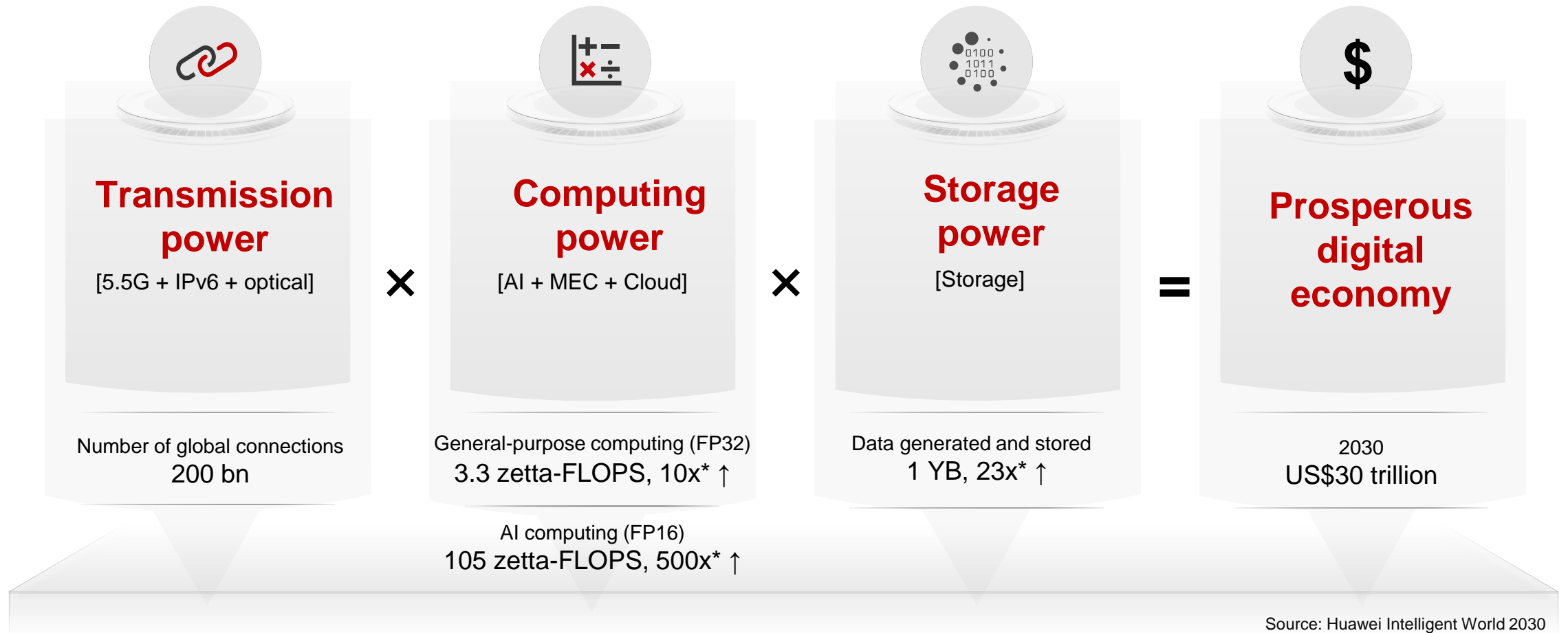


- One of the most effective ways emerging AI systems may impact healthcare is through the treatment of data and analytics.
- Intelligent tools to assist in the identification monitoring and treatment of new or ongoing medical conditions
- Improve diagnosis capability an outreach

Decarbonization and Digital and Intelligent Transformation: Pathways to the Intelligent World



Transmission, Computing, and Storage Power: The cornerstone of Digital Economy



Source: Huawei Intelligent World 2030

* Time range from 2020 to 2030.

5G: From Communication Service to Diverse Services

B2C

B2X

Consumer Connection

Calling Changed

Internet Access Changed

Industry Connection

Life Changed

Society Changed

1G



Analog Voice

2G



Digital Voice and SMS

3G



Mobile Internet

4G



Mobile Broadband

5G



eMBB

Speed
20X (20Gbps)

uRLLC

Latency
1/20 (1ms)

mMTC

Connection
10X (1m/km2)

Call

MBB

Healthcare: Making Health Computable, Bettering Quality of Life

Identifying potential health problems

From treatment to prevention



Building knowledge graphs for **efficient, real-time** health management

Value of ICT: Personal health data modeling

Internet, IoT, AI, wearables, and portable monitoring devices



Making the prediction of disease spread more accurate with AI

Value of ICT: Scientific modeling and intelligent analysis

Natural language processing and machine learning

Precision medicine

From "one-size-fits-all" to "bespoke"



More accurate drug trials to design better treatment plans

Value of ICT: Personalized treatment plans

An AI-powered pharmaceutical platform that optimizes medication dosages



Achieving **safe & precise** identification of cancer cells with AI

Value of ICT: Adaptive radiation therapy

AI-powered target area location and image registration

Home-hospital

From hospital consultations to home diagnosis



Cloud-based diagnosis services **connecting patients with top experts online**

Value of ICT: Online medical image analysis and AI-assisted diagnosis

Device data collection + 5G + cloud computing



Portable devices that lower the threshold for professional medical examinations

Value of ICT: Mobile medical examinations

Smaller and chip-based components, handheld ultrasound scanners

Proactive Prevention, Precision Medicine, and Telemedicine: Analysis and AI Modeling Need Stronger Computing Power

Huawei's predictions for 2030



AI computing power (FP16):
105 ZFLOPS, a **500x**
increase over 2020



Global general computing power
(FP32): **3.3 ZFLOPS**, a **10x**
increase over 2020

Computer performance		
Name	Unit	Value
kiloFLOPS	kFLOPS	10 ³
megaFLOPS	MFLOPS	10 ⁶
gigaFLOPS	GFLOPS	10 ⁹
teraFLOPS	TFLOPS	10 ¹²
petaFLOPS	PFLOPS	10 ¹⁵
exaFLOPS	EFLOPS	10 ¹⁸
zettaFLOPS	ZFLOPS	10 ²¹
yottaFLOPS	YFLOPS	10 ²⁴
ronnaFLOPS	RFLOPS	10 ²⁷
quettaFLOPS	QFLOPS	10 ³⁰

1. Using computing technologies to identify potential health problems, shifting the focus from treatment to prevention



Directions for exploration



3. Home-spital: Using cloud-edge-device synergies to bring healthcare services into patients' homes



2. Precision medicine and treatment plans



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12 Scenarios in Three Categories for Smart Healthcare Upgrade

Dashboard

- Overview
- Performance appraisal
- Security
- Operations
- Assets
- Emergencies

Smart hospital

- Smart ward round
- Remote IV monitoring
- Real-time sign collection
- Infant security
- Remote patient visit

1. Smart ward

- Remote expert support
- Remote training

2. Remote surgical guidance

- AI-assisted diagnosis
- Cloud medical images

3. AI-assisted diagnosis and treatment

- Information sharing
- Treatment upon onboarding ambulances
- Remote treatment guide

4. Remote first aid

- IR temperature measurement
- Information inquiry robots
- Disinfection robots

5. Smart clinic

- Special target recognition
- Vehicle recognition & management
- Incident monitoring
- Situation awareness
- One-click alarming

6. Smart security

- Lifecycle management
- Asset visualization

7. Asset management

...

- Smart healthcare
- Smart service
- Smart management

- Remote consultation
- Information sharing
- Cross-region collaboration

9. Remote consultation

Medical consortium

- Remote surgery demo
- Remote interaction and discussion

10. Remote training

- Full monitoring
- Video surveillance
- Facial recognition
- Big data analysis
- AI-based review

11. Insurance monitoring

Healthcare Authorities

- Unified platform
- Unified big data foundation
- Epidemiological investigation
- Resource dispatching
- Chronic disease management

12. Smart disease control and prevention

HUAWEI CLOUD Digital Healthcare Solution Overview

Digital Healthcare Solution

SaaS

AI-assisted Medical Imaging Cloud



- Chest Cancer
- Bone fractures
- Lung nodules
- Retina diseases
- Hemorrhagic Stroke Risk Assessment
- Brain Tumour
- PACS Cloud

Telemedicine



- Online physician video consultations
- Digital prescriptions
- Medical certificates
- Personal health advisory
- E-Referral
- Tele pharmacy
- Managed care
- MDT

Digital hospital HIS/EMR/LIS/IOC



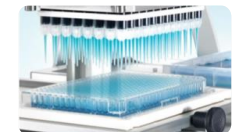
- Clinical Management System
- Hospital Information System
- Claim Exchange Platform
- Inventory Management System
- Queue and Appointment Booking Apps
- Vaccine Management System
- Mobile clinical
- Internet Hospital

AI & Big Data Healthcare Mgmt



- Comprehensive Infectious Diseases Monitoring Platform
- Closed-Loop Epidemic Response System
- Dynamic Population Management
- Multi-Dimensional Close Contact Tracing
- Personalized Health Management
- Blockchain based Vaccine Passport

Medical Research Computing Platform



- Predictions of Drug Resistance and Selectivity
- Drug Discovery Platform
- Exploration the Entire Chemical Space
- Gene test

HUAWEI CLOUD Vertical Solution & High Level Cloud Service

IaaS/PaaS

➤ Data Backup/DR Solutions

➤ HPC Solution

➤ Video Surveillance Solutions

➤ Big Data/ EI Solution

➤ Security Solutions

➤ Cloud Drive

➤ CDN & OBS

➤ DC / CC/ VPN Solution

HUAWEI CLOUD/HCSO IaaS / PaaS Service

Network Operation Center (NOC)/ Digital Operation Center (DOC)/ Security Operation Center(SOC)

Clinical Difficulties with the Network Connection and Real-time Imaging

Clinical Diagnosis and Treatment



Clinician

Case discussion



Teaching rounds



Doctor-patient Communication



Teleconsultation



Clinical Difficulties

2D images is limited and difficult to make focus and synchronization between multi doctors in MDT consultation

There are a long way to grow up for young doctor by study of 2D and B&W images

For patients and their families, they can not fully understand the disease, treatment plan and risk

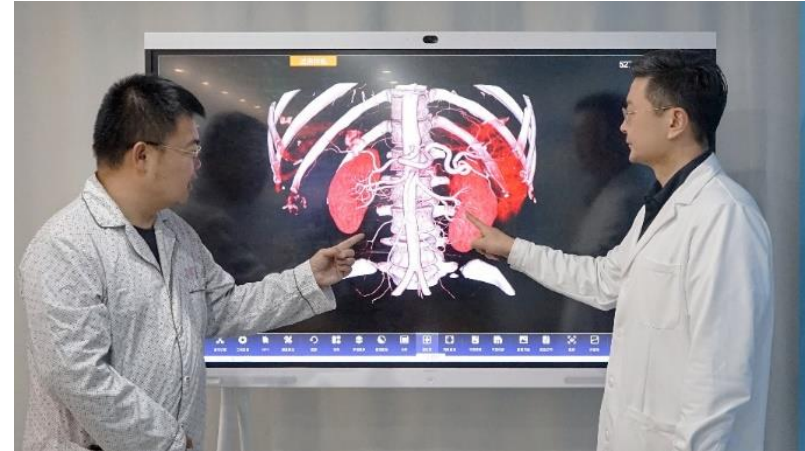
Hospital remote consultation center needs large investment and complex management, utilization rate is low

Intelligent Imaging Application Scenario

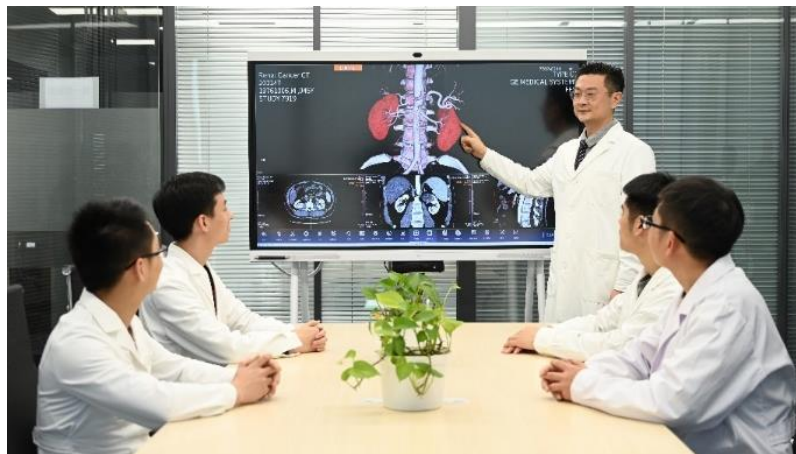
Case discussion



Doctor-patient communication



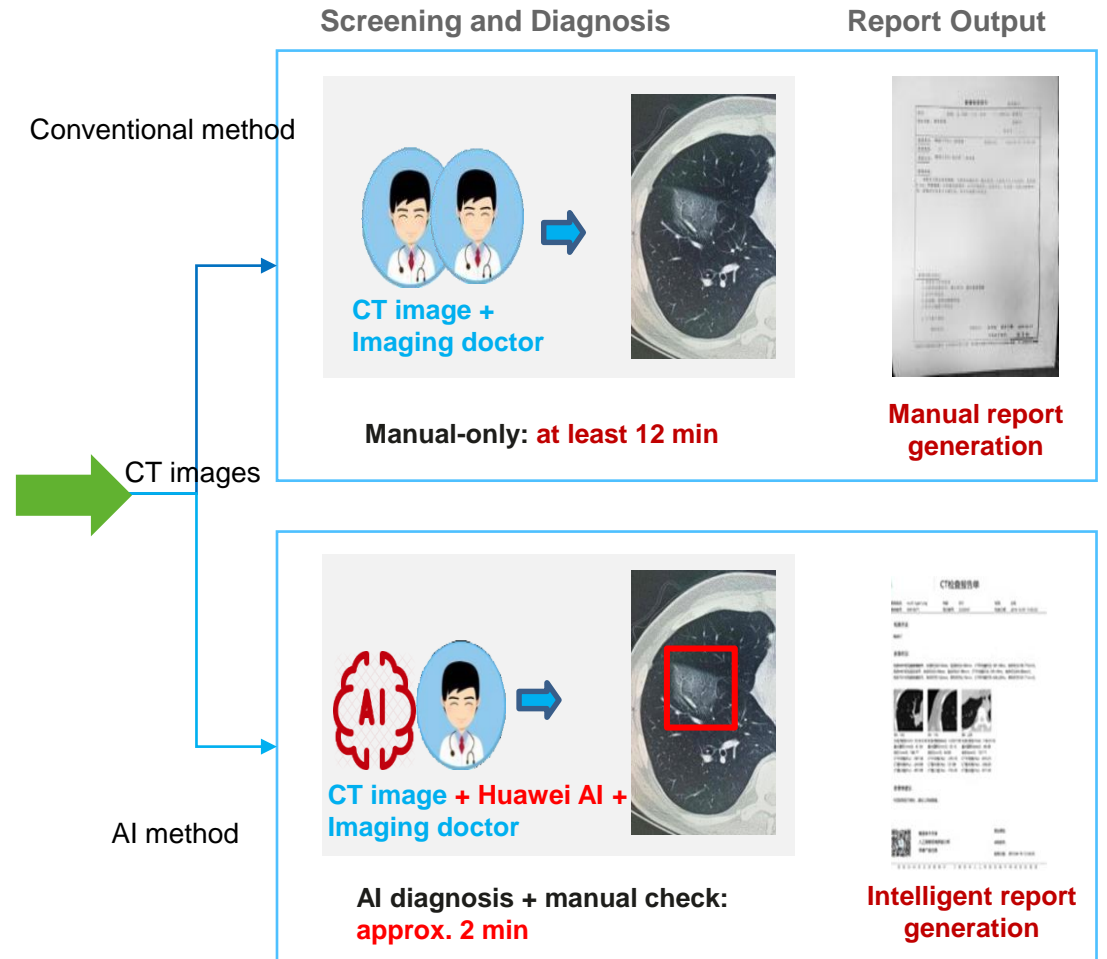
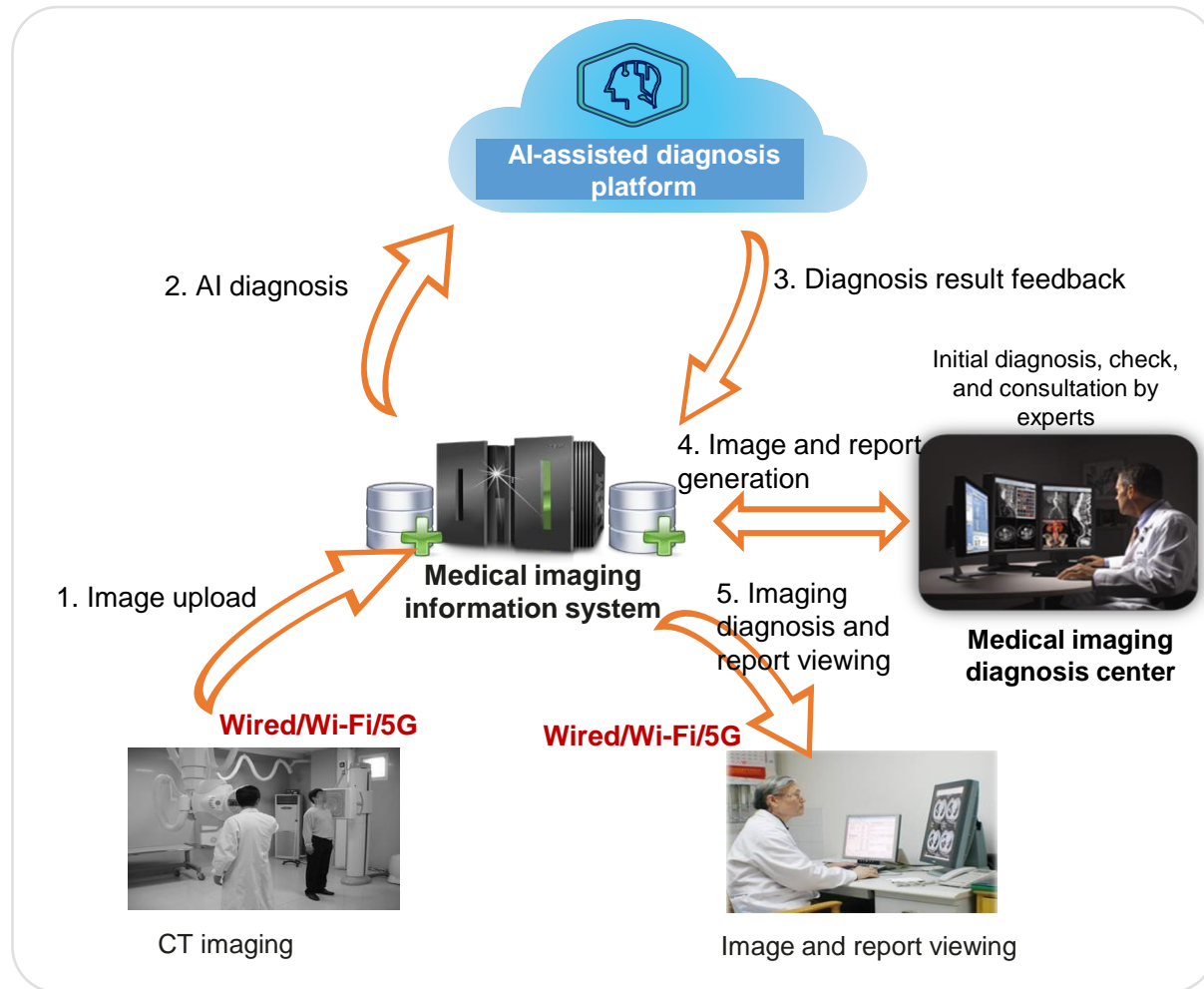
Teaching rounds



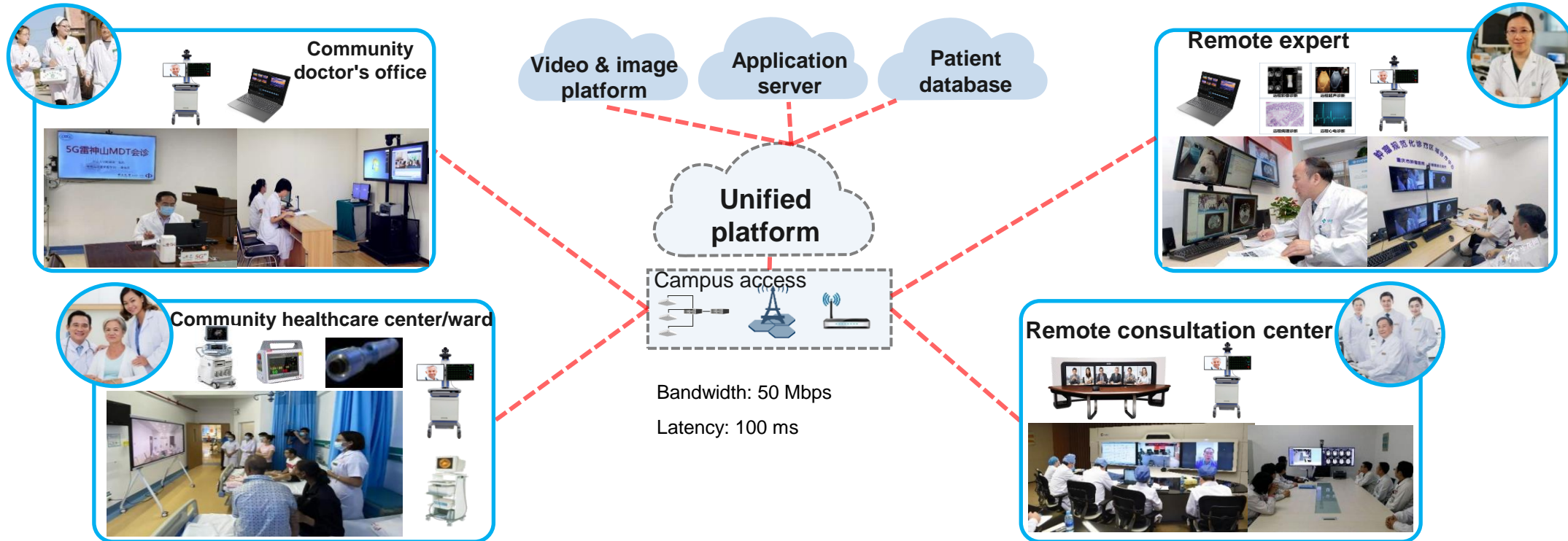
Teleconsultation



AI-assisted Diagnosis and Treatment: Efficient Diagnosis of Potential COVID-19 Carriers



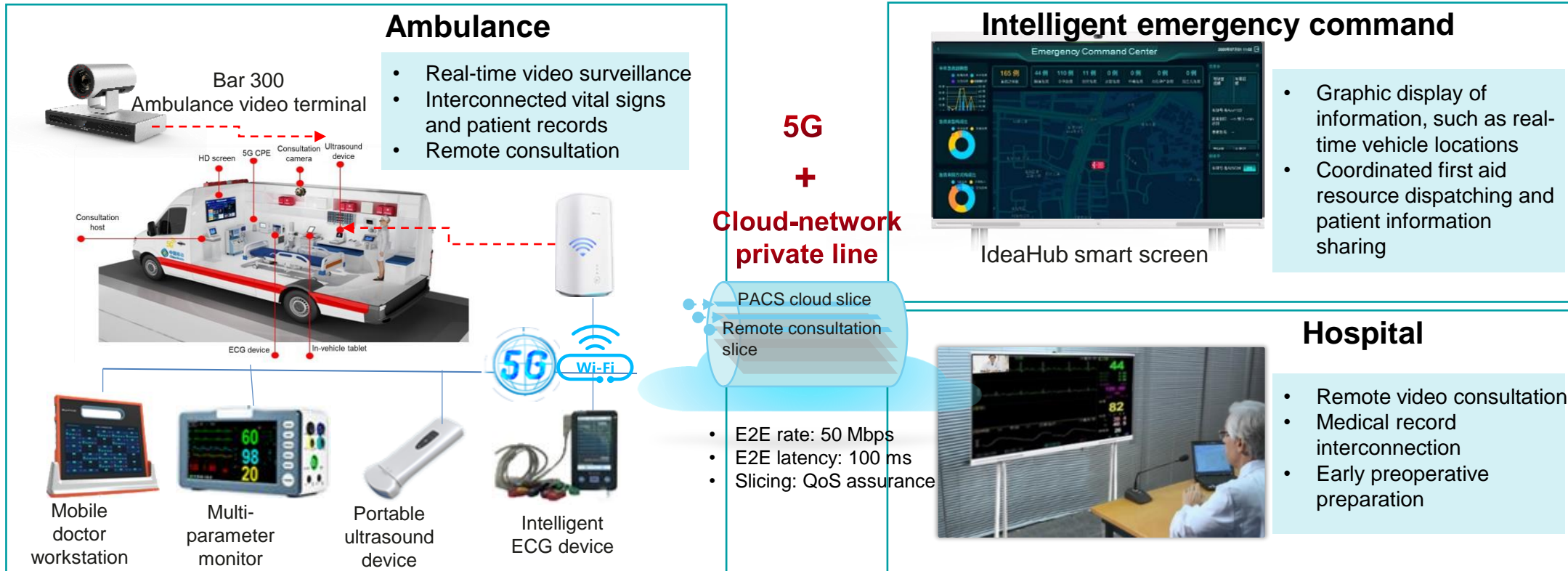
Remote Consultation: Real-Time Data Collection, Sharing, and Collaboration on Unified Platform



- Improved collaborative healthcare in community hospitals and **less travel for patients**
- **Online** consultation between patients and experts
- **Multi-party** consultation
- **Real-time sharing** of medical images and patients' data
- HD (4K) cameras connect to examination devices for real-time data collection and sharing, **improving the accuracy of remote diagnosis and treatment.**

Smart Ambulance: 5G + Cloud-Network Private Lines for Seamless Emergency Center-Ambulance-Hospital Communication

Synchronization of HD medical data and in-vehicle images, enabling "in-ambulance hospitalization"

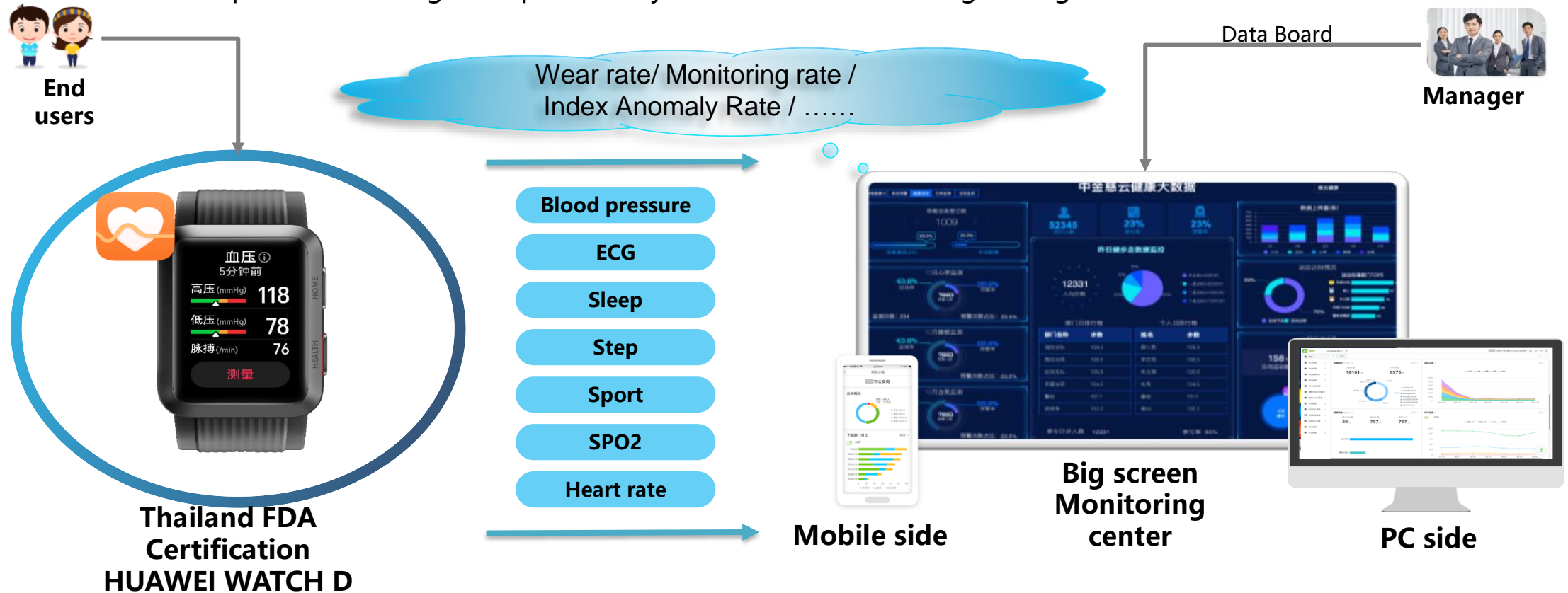


5G + cloud-network private lines with high bandwidth and low latency offer a new approach to first aid by ensuring mobile data transmission and video communication, enabling ambulance upgrades, and allowing rapid data interconnectivity.

Wearable Device + Data board Solution:

Achieve Digital Dynamic Health Monitoring

Users wear Huawei wearable devices to monitor health indicators in real time and synchronize the data to the health platform. Managers implement dynamic health monitoring through multi-terminal dashboards.

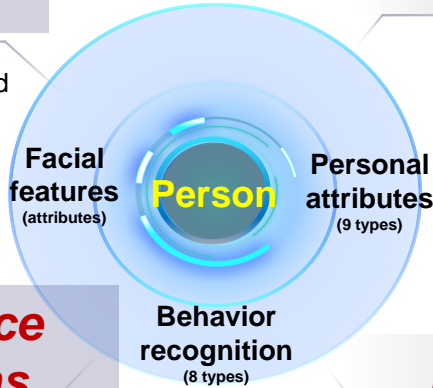


AI CCTV systems:

Feature Extraction, Precise Recognition, and Innovative Practice

Blacklist-based face alert

Real-time alerts based on tens of millions of records



Face search by image

Storage of tens of billions of face data records, meeting 1-year storage requirements of small- and medium-sized sites

Practical face applications

Frequency statistics (SDK)
Distributed face clustering within minutes among millions of data records
(ISVs develop practical applications based on platform capabilities.)

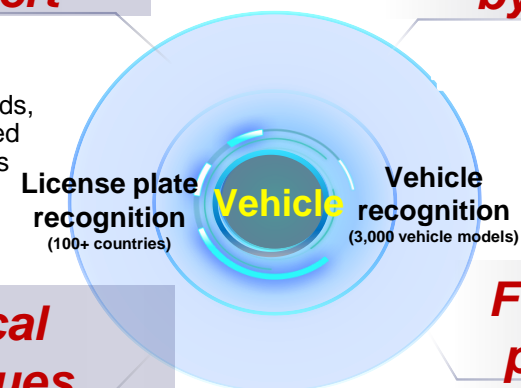


Face tagging

Real-time tagging based on a static library with millions of records

Blacklist-based vehicle alert

> 95% alert accuracy for 300,000 records, results returned within seconds



Vehicle search by image

Storage of tens of billions of vehicle data records, meeting 1-year storage requirements of small- and medium-sized sites

Practical techniques

Detect vehicles entering a city for the first time, late night excursions, use of cloned license plates, etc. (provided by ISVs)

Fuzzy license plate search

Perform fuzzy search through tens of billions of license plate images within seconds, meeting the 1-year image search requirements of cities

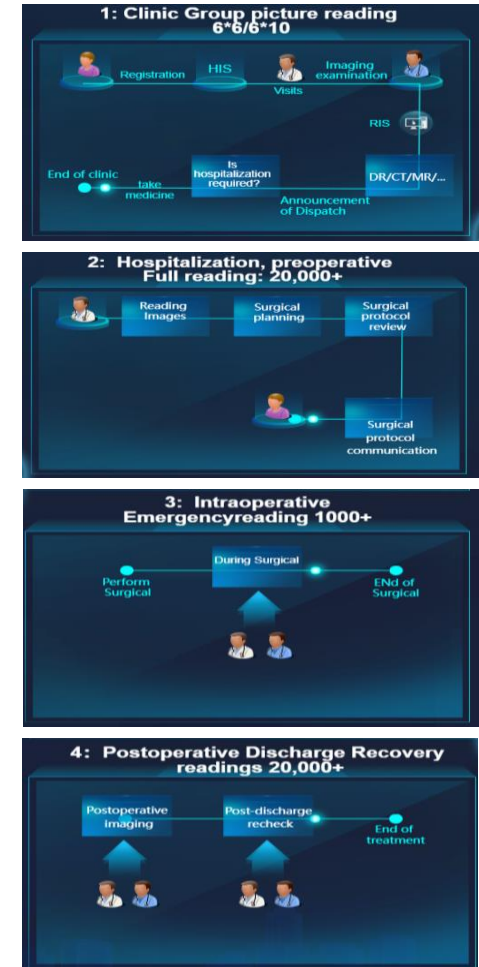


Huawei iDeahub:

Perfect experience for telemedicine and reading terminal



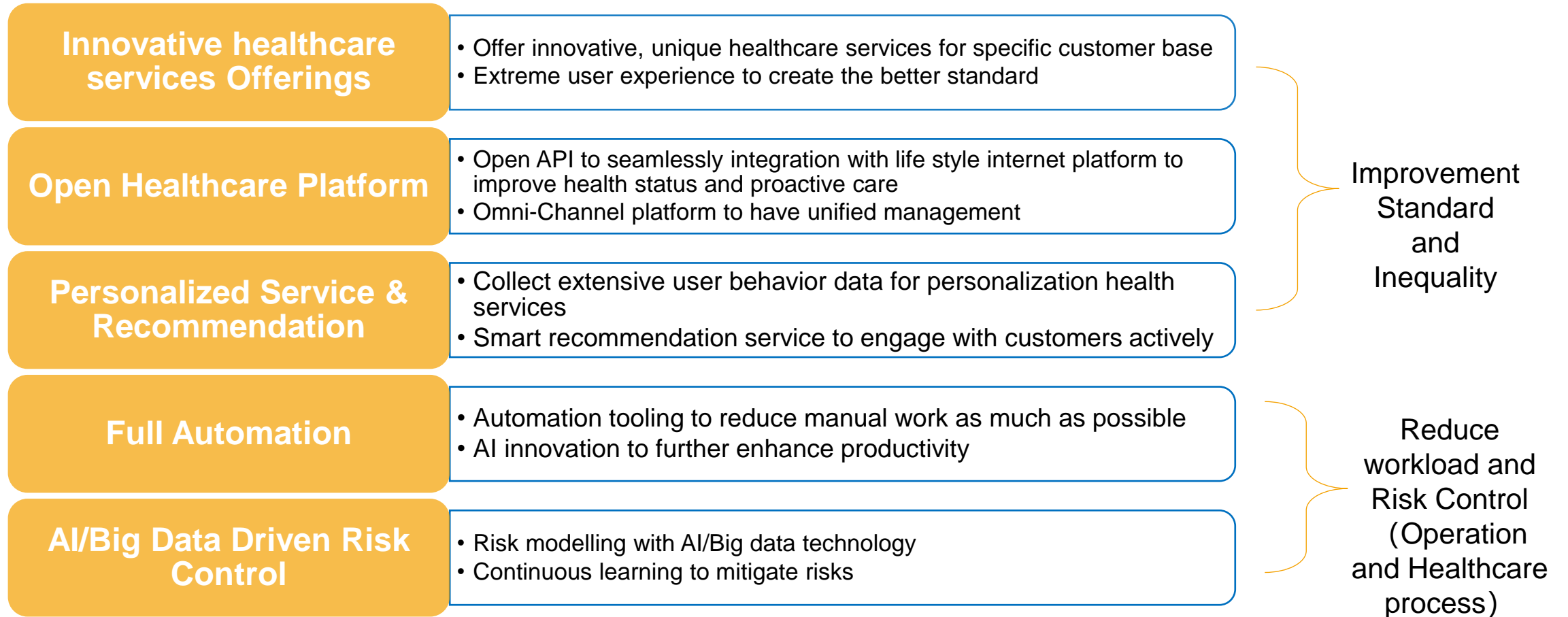
Diagnosis & Treatment Process



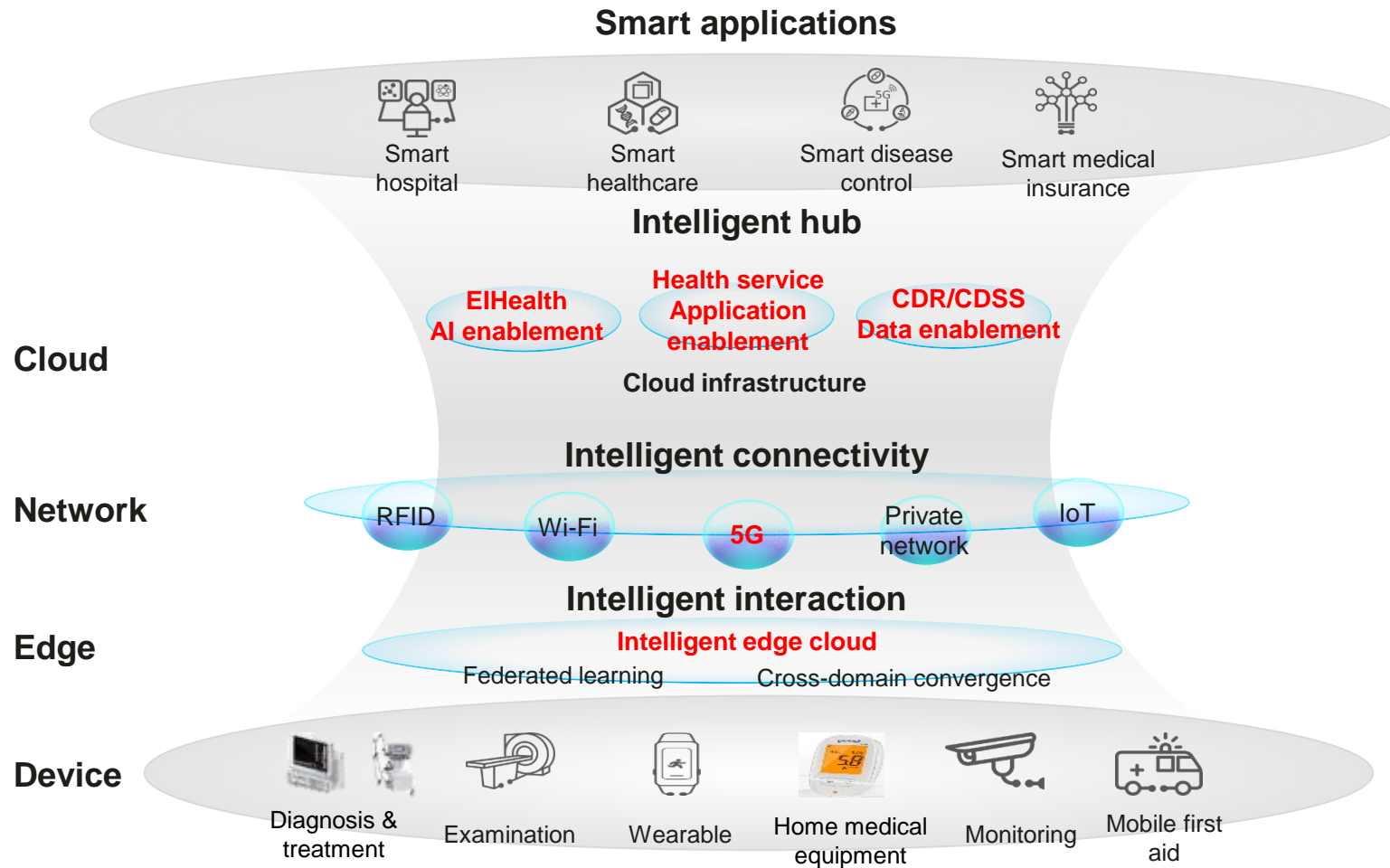
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Build Solutions to Address Key Success Factors of Next Generation Hospital



Intelligent Healthcare with Cloud-Network-Edge-Device Synergy for Improved Quality and Efficiency



Application enablement

- Technology integration and data convergence
- Digital assets accumulation and more innovative applications

All-domain collaboration

- Cloud-network-edge-device synergy
- Intelligent decision-making and efficient execution

Continuous evolution

- Service-driven, stable architecture
- Periodic iteration and smooth evolution

Openness & sharing

- Open architecture and capabilities
- Co-construction and sharing, unleashing the potential of ecosystems

Overview of Intelligent Scenario Construction in Hospitals



All-element collaboration All-scenario intelligence

Smart O&M

Increasing staff efficiency ↑

Scientific assessment

Improving mgt. efficiency ↑

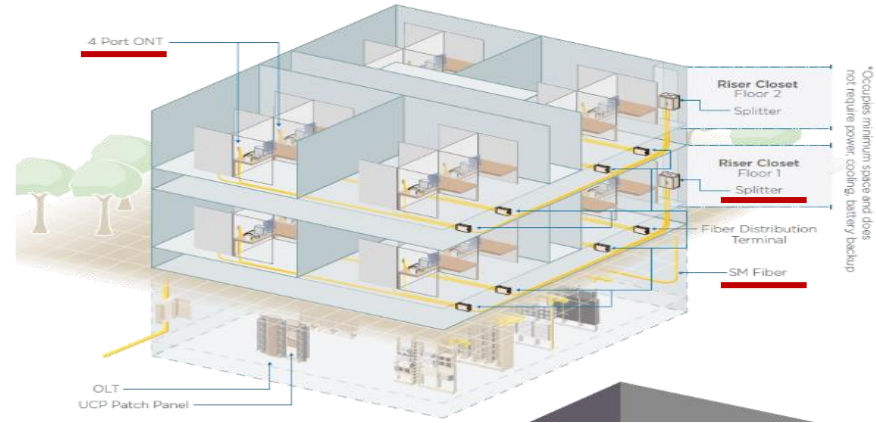
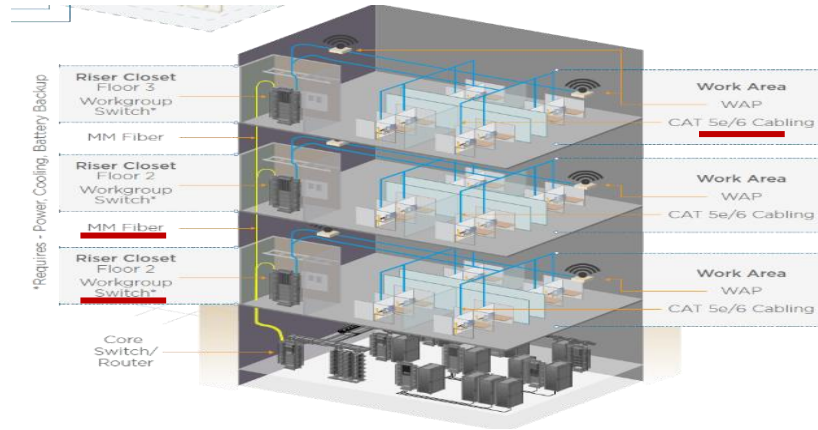
Accurate data matching

Reducing energy consumption ↓

Operation data support

Better Asset protection ↑

FTTH: Fiber-to-the-Healthcare Services



Horizontal copper wire leads to high cost, difficult to upgrade
Scenarios

Powered by POL: All optical connectivity, P2MP and Single-Mode fiber bidirectional



Smart Ward
 Connecting with the IoMT at patient room



Smart Nurse Station
 Connecting with mobility services and security



Medical Imaging Reading Room
 Connecting with real-time PACS



Smart Doctor's Office
 Connecting with online HIS and high-speed PACS



Smart Clinic Hall
 Connecting with registration service, payment and Queue system



Operation Room
 Connecting with camera for real-time consultant and teaching platform

5G Private Network Enhance Reliable Connectivity

Solutions

To unleash the full potential of 5G Huawei together with telecom operators employs mobile networks that provide enterprises with dedicated access to private resources. Those so-called 5G Mobile Private Networks (MPN) ensure not only high performance but also the highest level of security needed for the digital transformation of enterprises.

Benefits

- **Low latency:** supporting cutting-edged healthcare application
- **High Security:** Separate network from public usage to guarantee the privacy of data
- **Virtualized:** Network slicing enables individual network requirement for each application.

Scenarios



Outside Hospital

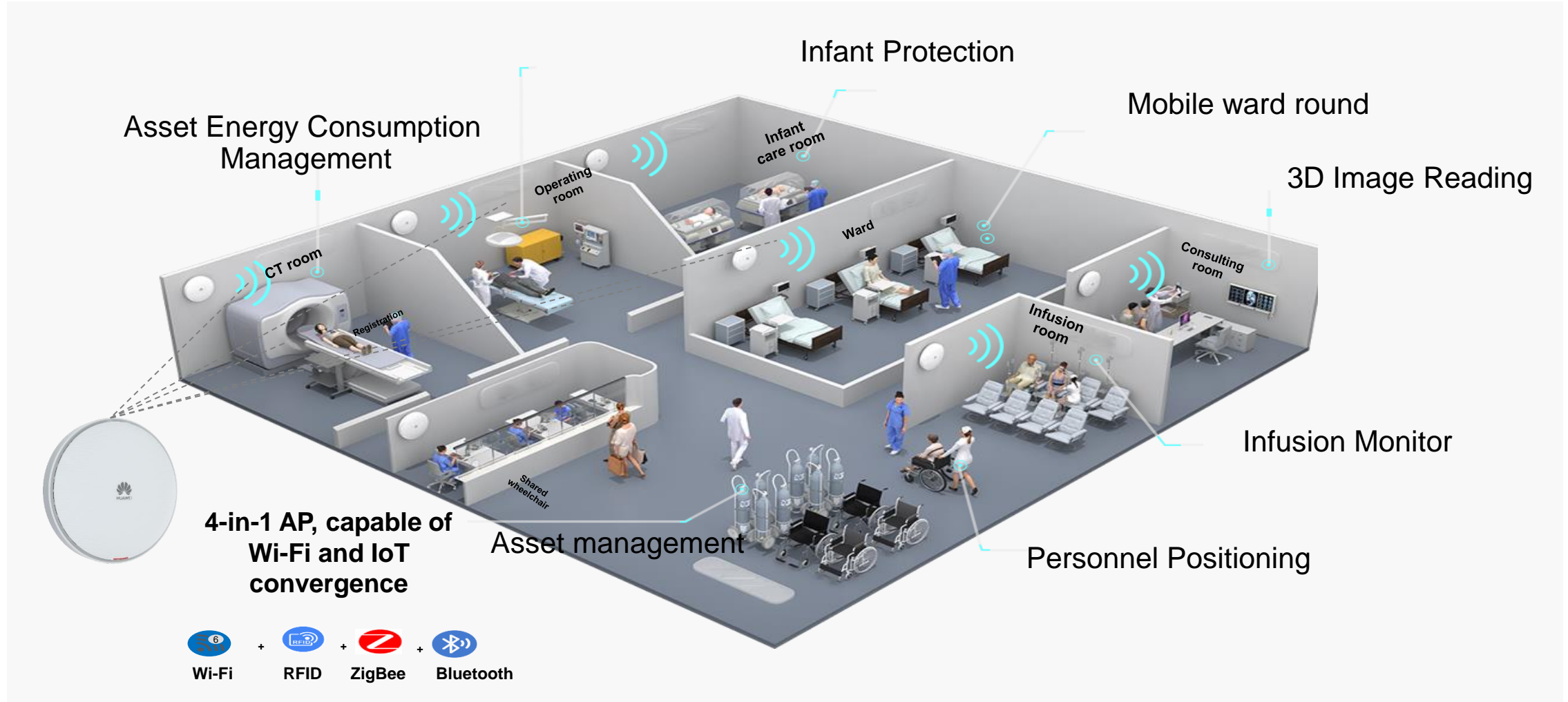


Inter-Hospital



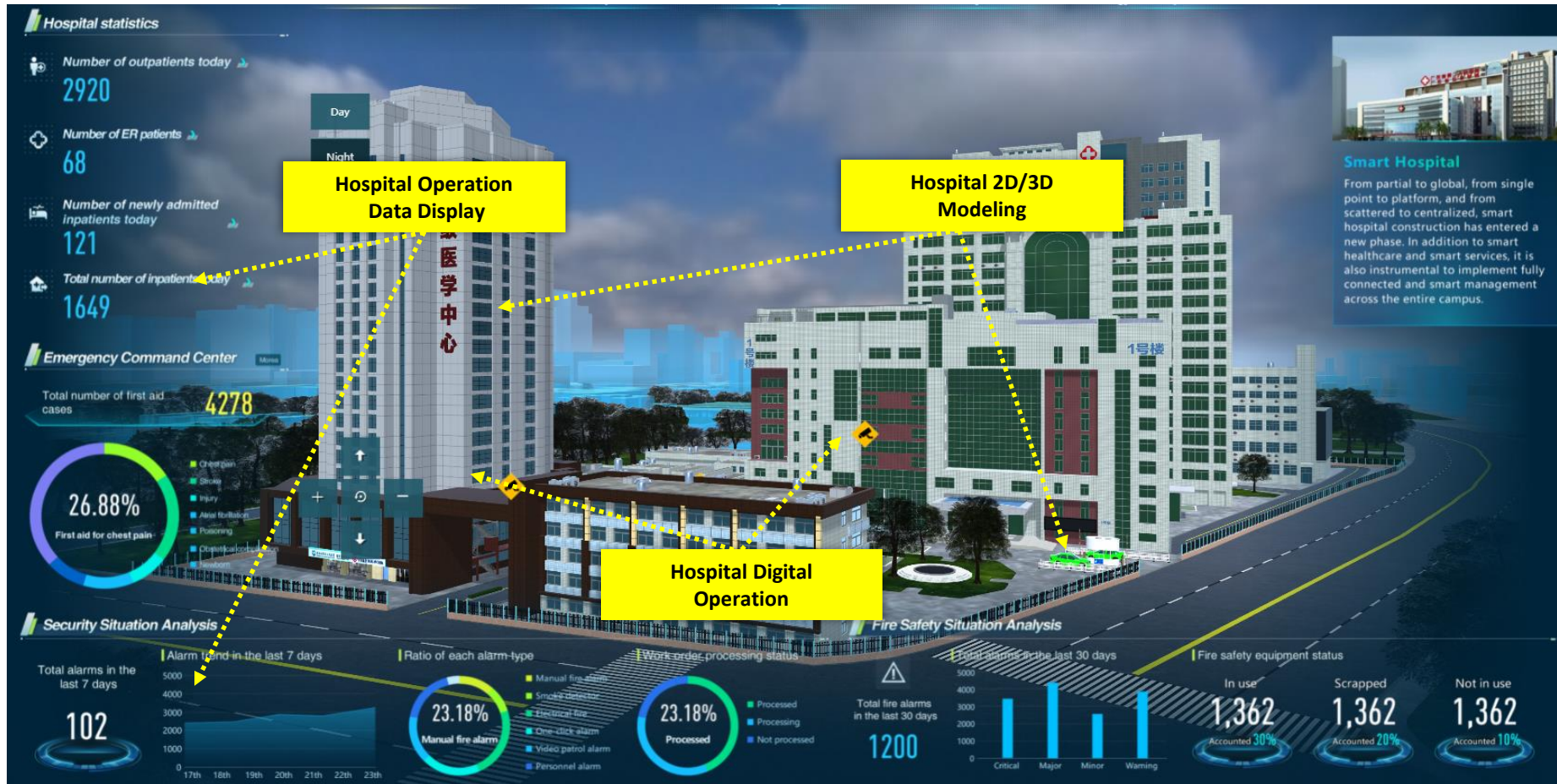
Intra-Hospital

Huawei Smart IoT Hospital Solution Overview



Hospital Operation Center:

Enabling Virtualization & Digitization of Hospital Operations



1. Situational Awareness

- Reference function: real-time alarm and events, system running status, service statistics, customized reports...
- Design input: data or statistics to be viewed, data display of each service subsystem in hospital

2. 2D/3D Modeling

- Reference function: overall view, floor view, device layout...
- Design input: Building layout, building and floor area, floor plan and drawings...

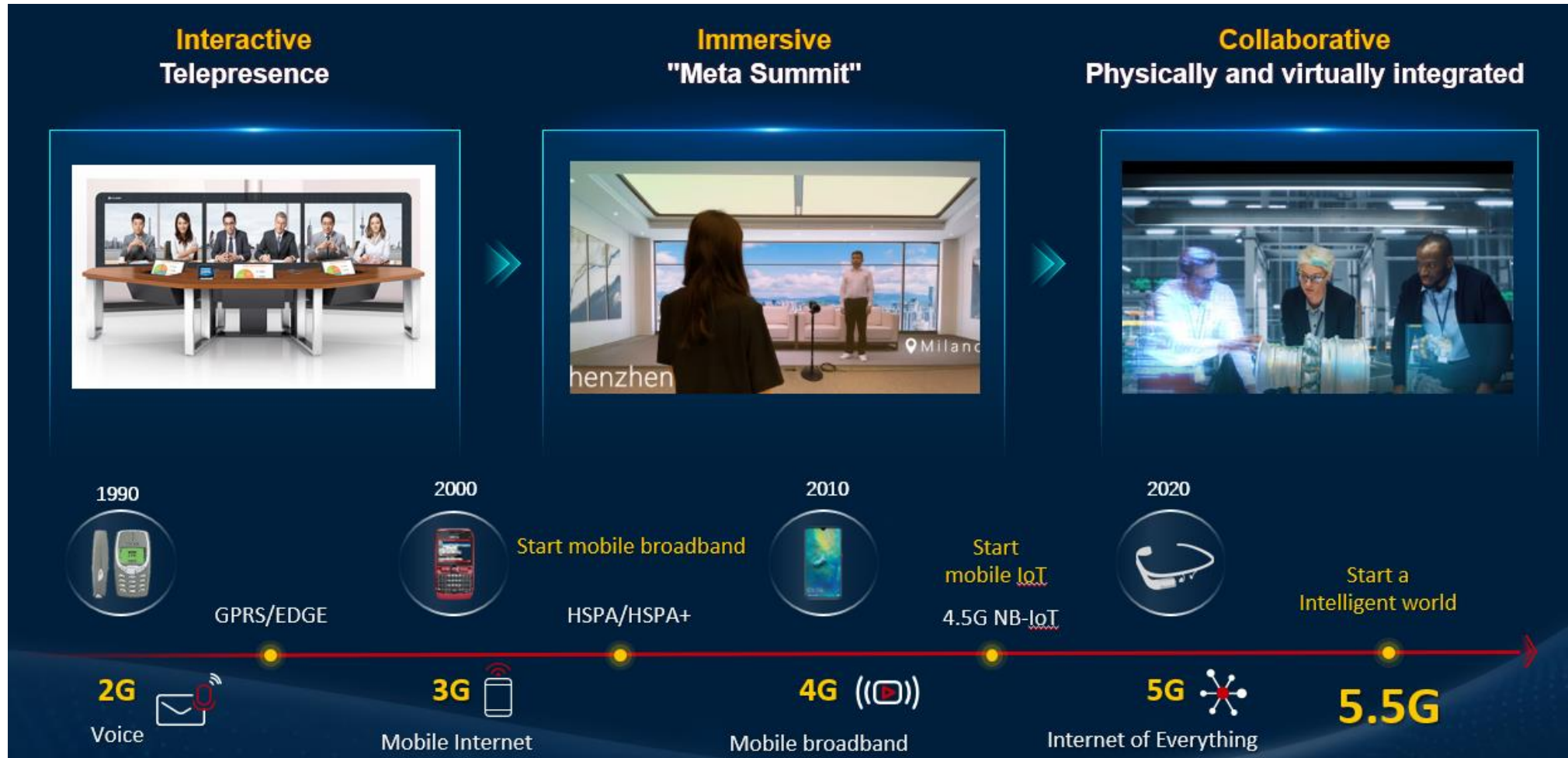
3. Digital Operations

- Reference function: device management, remote control...
- Design input: function area marking, device layout marking, Service linkage...

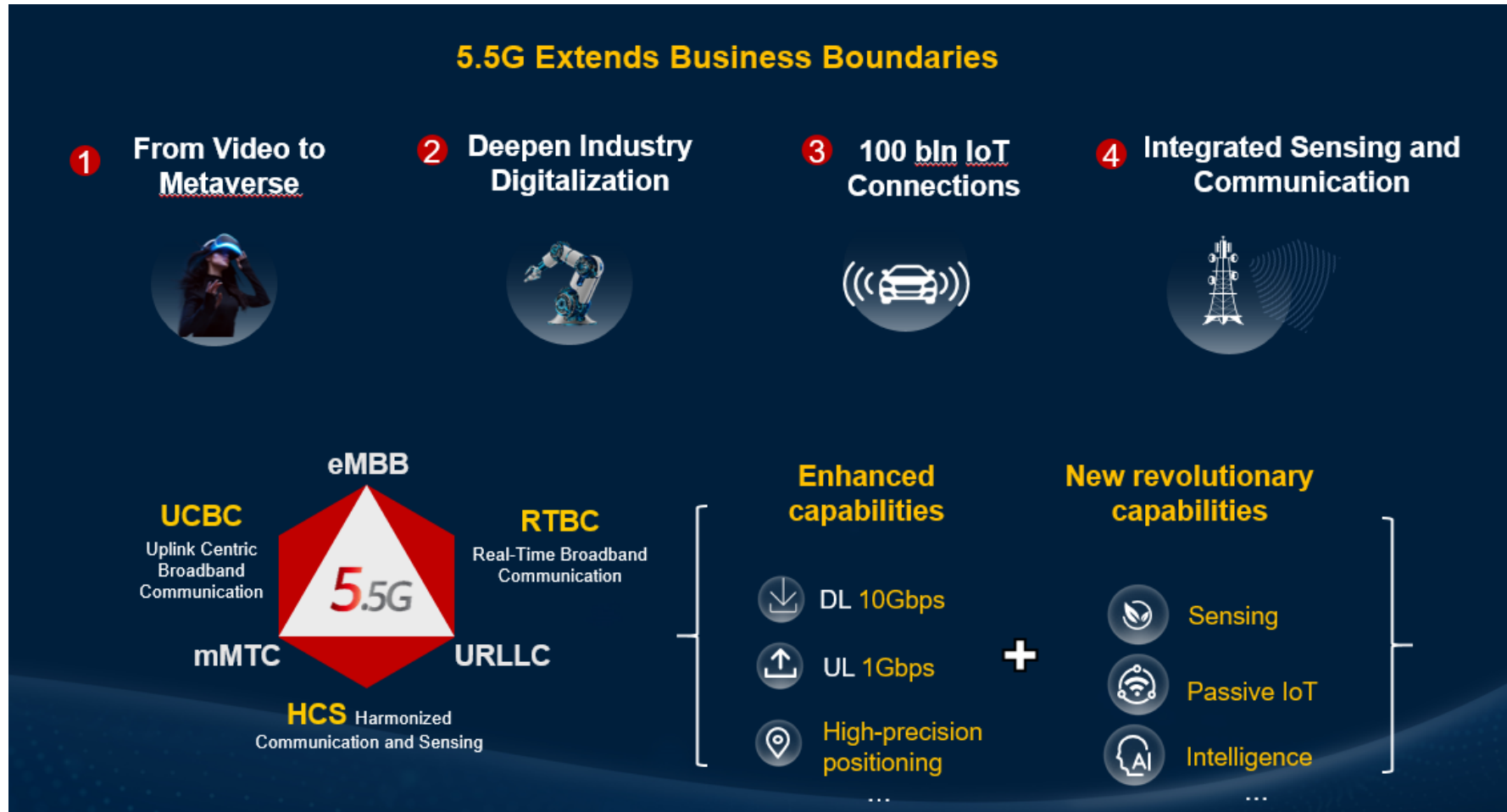
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We Never Stop Pursuing Better Experiences



5.5G Enhanced Capability Largely Extend 5G Business Boundaries



Moving Towards Intelligent World 2030



Thank you!

- **Together for a healthier world**

