FG-AINN Workshop “Building an AI-native Future of Industry”

From Autonomous Networks to AI-Native Networks: China Unicom's Practice

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China Unicom
September 2026

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ITU-T Focus Group on Autonomous Networks (FG-AN)

- **Period:** December 2020 to January 2024
- **Objective**: providing **an open platform to perform pre-standards activities** related to autonomous networks

Management team

Chairman: Leon Wong

Vice-Chairmen: Xu Dan, Cao Xi , Salih Ergut, Gyu Myoung, Vishnu Ram OV

WG1
Use Cases and Requirements Analysis

Chair: Yongsheng Liu

WG2
Architecture and Core Technical Enablers

Chair: Xiaojia Song

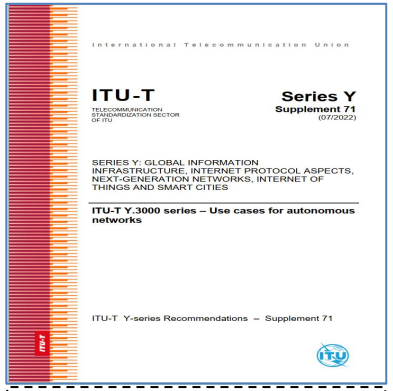
Paul Harvey

WG3
Proof of Concepts

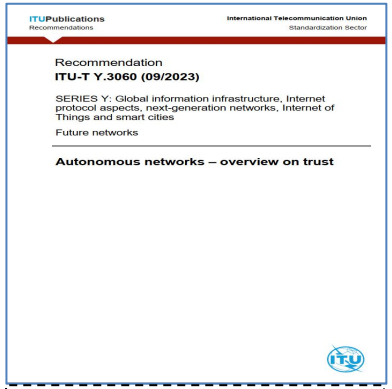
Chair: Alfons Mittermaier

Liya Yuan

Deliverables Transposed into ITU-T Y-series Recommendations

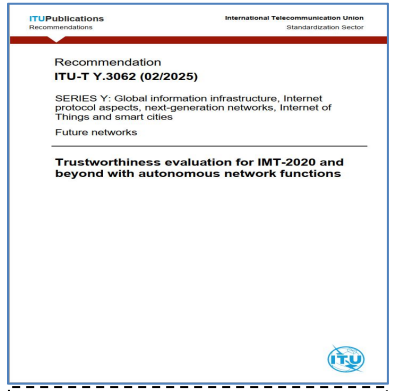


Supplement 71
Use cases

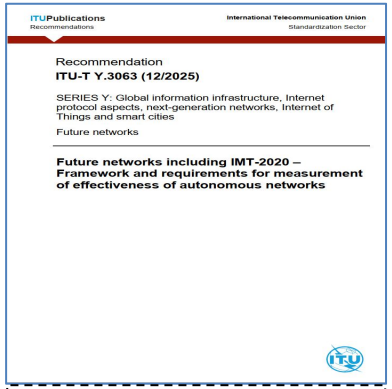


Y.3060
Overview on trust

Y.3061
Architecture framework



Y.3062
Trustworthiness

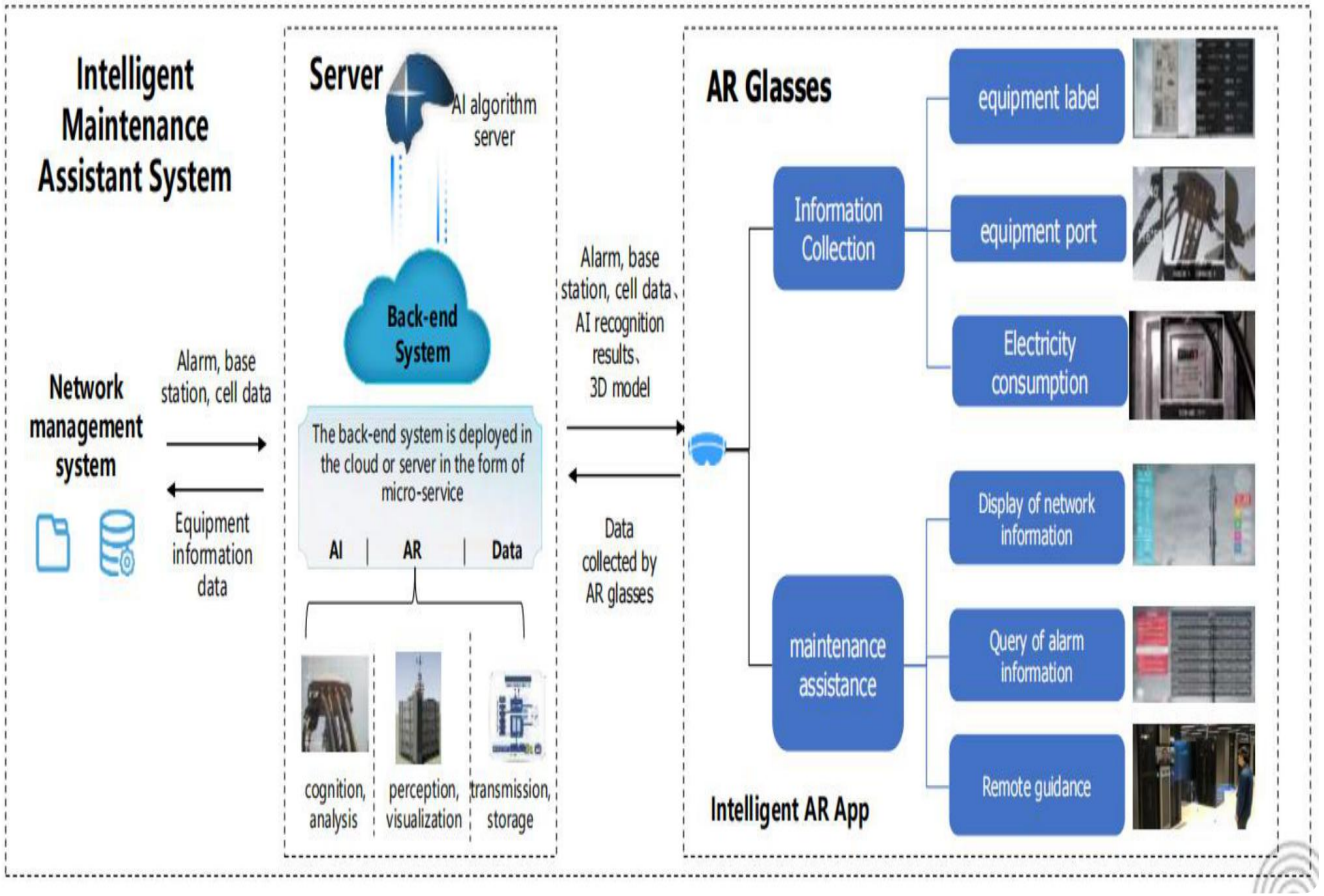


Y.3063
Effectiveness

Y.3064
Knowledge management

FG-AN-usecase-029: Intelligent Maintenance Assistant System

A comprehensive intelligent service system for **network operation and maintenance scenarios**, combining **AI + AR** to provide intelligent assistance for workers.



Three-Step Workflow

1. AR glasses and other external sensors collect data about the device and environment
2. The collected data are applied with AI algorithms to create a visualization against the real device and environment to assist network workers
3. The visualization is displayed on AR glasses to assist worker for network maintenance and optimization

Critical Requirements

AN-UC029-REQ-001 — collect network operations and maintenance environment data using automated techniques such as AR glasses

AN-UC029-REQ-002 — analyse operations and maintenance environment data using cloud and AI techniques

AN-UC029-REQ-003 — provide intelligent assistance rendered using techniques such as AR

AN-UC029-REQ-XXX -……

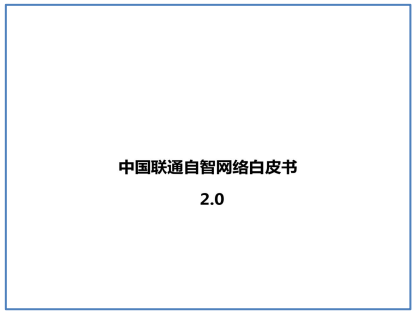
AN White Paper towards L4 with AI Agents

Six editions of the white paper trace a clear evolution—from introducing the concept of autonomy to the development of **L4 with Agentic AI**

V1.0 · Jun 2020

Concept

The vision and the L0–L5 autonomy concept of the autonomous driving networks



V2.0 · Dec 2021

Framework

Target framework, grading standard, evaluation system and operations practice

V3.0 · Nov 2022

Architecture

Target architecture fixed: three features (digital, intelligent, agile), three layers (business, service, network), three closed loops

2024 · July 2024

AI large model

Generative AI and network large language models enter the framework

2025 · July 2025

L4 with AI Agent

L4 objectives and L4 technical architecture with focusing on AI agnet

2026 · July 2026

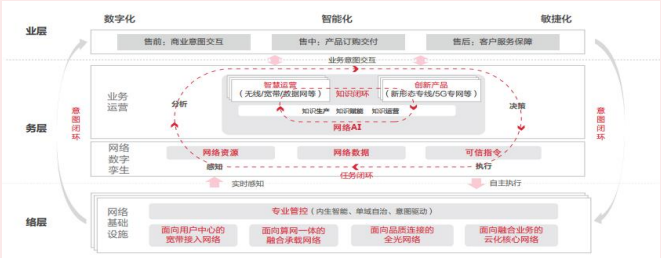
Multi-agent

Multi-agent collaborative architecture and 2030 evolution roadmap

What changed across the six editions

2020–2022

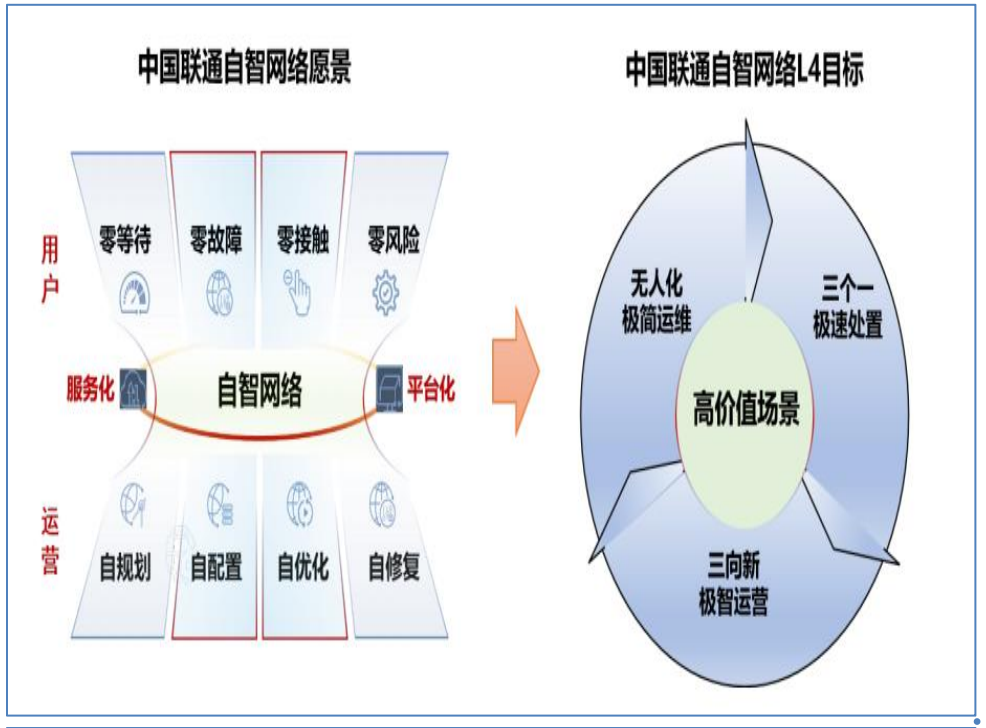
Target architecture established — three features, three layers, three closed loops



2024–2026

Generative AI and AI agents are used to achieve L4 objectives

Vision, Objectives and 2030 Roadmap



Vision: "Four Zeros" for Users, "Four Selfs" for Operations

Customer-Centric (Four Zeros)
- Zero wait for service activation
- Zero faults in experience
- Zero touch service process
- Zero risk in security

Operation-Driven (Four Selfs)
- Self-Planning of network goals
- Self-configuration & deployment
- Self-healing of faults
- Self-optimization of quality

Objectives: advancing to L4 autonomy

Unmanned operation
Unmanned operations for the network operation center with AI agents

Predictive loop
Proactive "perceive-predict-decide-execute" closed-loop resolution

Value-Driven operation
Shift from labor-intensive to swarm intelligence for value realization

2030 Evolution Roadmap

2025-2027
Single-Scenario Autonomy

Scale 30+ high-value scenarios with AI agents as the core

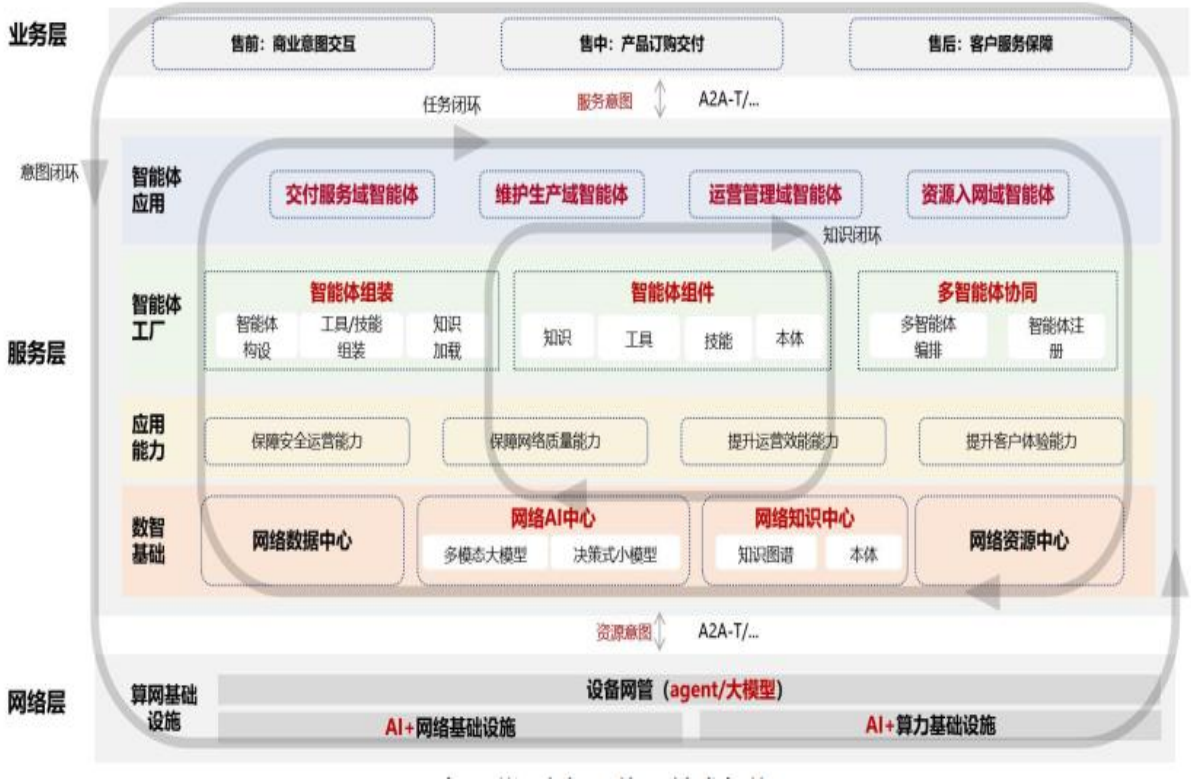
2028-2030
Collaboration autonomy

Cross-domain synergy and efficient multi-agent collaboration

L4 Technical Architecture

To achieve L4 objectives, China Unicom builds a new **agent-centric L4 technical architecture** for autonomous networks. Three paradigm shifts are enabled:

- **Interaction**: "Human + Platform" → "Human-Machine (Copilot/Agent) Collaboration"
- **Application**: "Application + Tool" → "Multi-Agent Collaboration"
- **Development**: "Traditional Development Mode" → "Agent Development Ecosystem"



Four types of agents, Delivery domain agent, maintenance domain agent, operation domain agent, resource domain agent

Agent factory, agent assembly workshop, agent component workshop, and agent collaborative governance

Application capabilities, security operation, quality assurance, operational efficiency improvement, customer experience enhancement capabilities

Digital foundations, network data center, network resource center, network AI center, network knowledge center

Innovative Use Cases

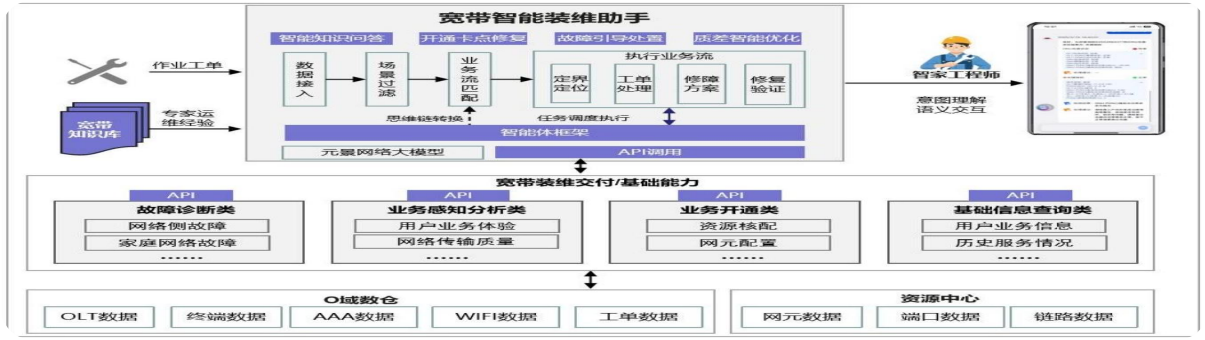
Operational Efficiency

Inspection

7x24h automated execution via "human-defined strategies, digital employee execution, and manual takeover for exceptions"

Broadband

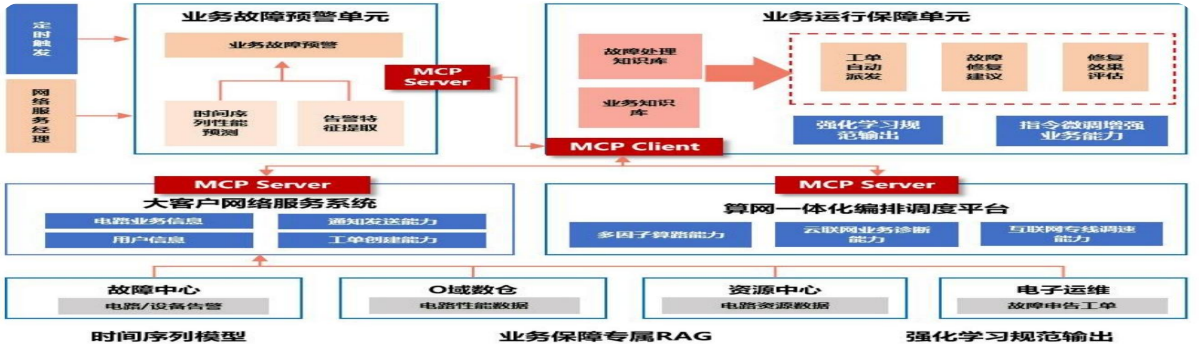
AI Assistant with large model+small model, Retrieval-Augmented Generation (RAG) and Chain-of-Thought (CoT) reasoning



Service Reliability

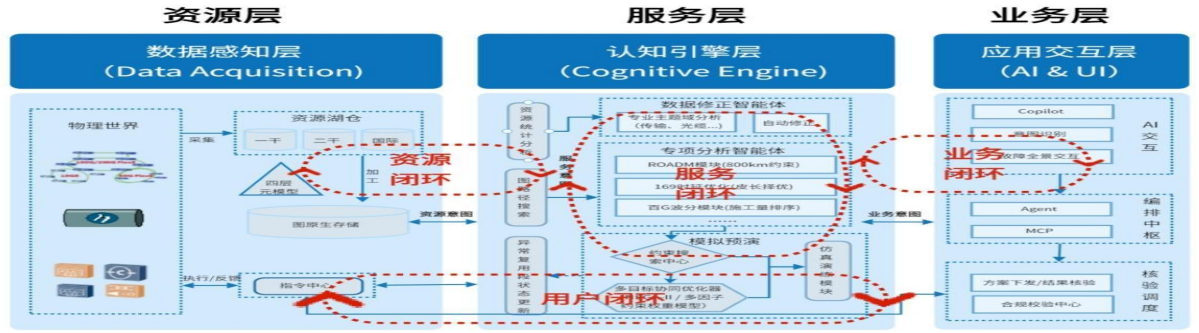
VIP Line

Dedicated-line service assurance agent covers the workflow including fault identification, pre-processing, troubleshooting



Network resource

A national centralized network resource center with digitial twin technology realizes cross-domain collaborative practice at L4 level



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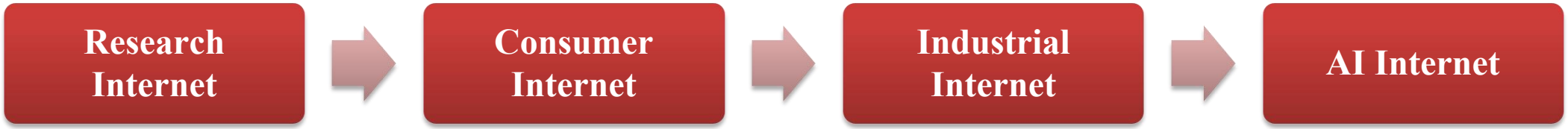
Internet Development of Four Stages

Judged by the objects the Internet serves, its development falls into four main stages — **research, consumer, industrial and AI Internet**. The fourth stage is still emerging and has not yet become a settled consensus.



	Research Internet	Consumer Internet	Industrial Internet	AI Internet
Year	**1969**	**1990**	**2010**	**2022 ~**
Landmark	ARPA establishes **ARPANET**, connecting four computers; from 1986 universities and government-funded research institutes join NSFNET.	The **World Wide Web** is born; IETF reaches consensus on Internet design principles.	Since 2010, countries deploy **IoT** and the industrial Internet, integrating Internet technology with manufacturing, transport and other real-economy sectors.	OpenAI opens **ChatGPT** (GPT-3.5) to the public; companies race to build AI agents
Characteristics	Mainly used in military and academic research	Mainly used for public consumption and services	Deep integration of the Internet with the real economy	Full integration with AI, with autonomous evolution

Definition and Vision of Internet 2030

Internet 2030 White Paper

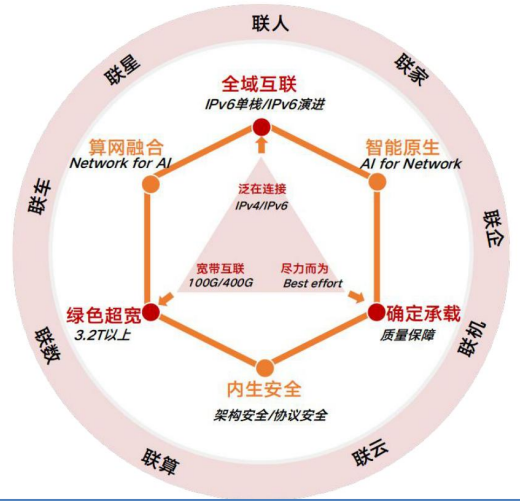
Why Internet 2030?

- The Internet is **the core infrastructure of the intelligent era**, with AI, 5G-A/6G, advanced computing, big data, IoT, blockchain and quantum information converging fast
- As a vast legacy infrastructure, its technology and industry evolution faces **multi-dimensional challenges** that need consensus and exploration in practice
- 2024 marks 55 years of the global Internet— **a turning point** to define the next generation

Definition

Internet 2030 is defined as **a new type of digital infrastructure**—built through **iterative evolution** and comprising both the public Internet and dedicated bearer networks — based on IPv6 evolution at the network layer, **TCP/UDP optimization** and new protocol introduction at the transport layer, **Ethernet enhancement** at the link layer, **photonic-electronic upgrade** at the physical layer, and **enhanced intelligence at the management** and control layer

Netowrk Scenarios and Technical Characteristics of Internet 2030



Nine connection scenarios

Now ~ 2027
People · Home · Enterprise · Cloud
Deep integration of the four

2027 ~ 2030
Machine · Computing · Data · Vehicle
Reaching things, computing power and data

2030 ~
Satellite and beyond
Space-air-ground-sea, all domains

Six Technical Characteristics

Enhanced — three capability evolutions

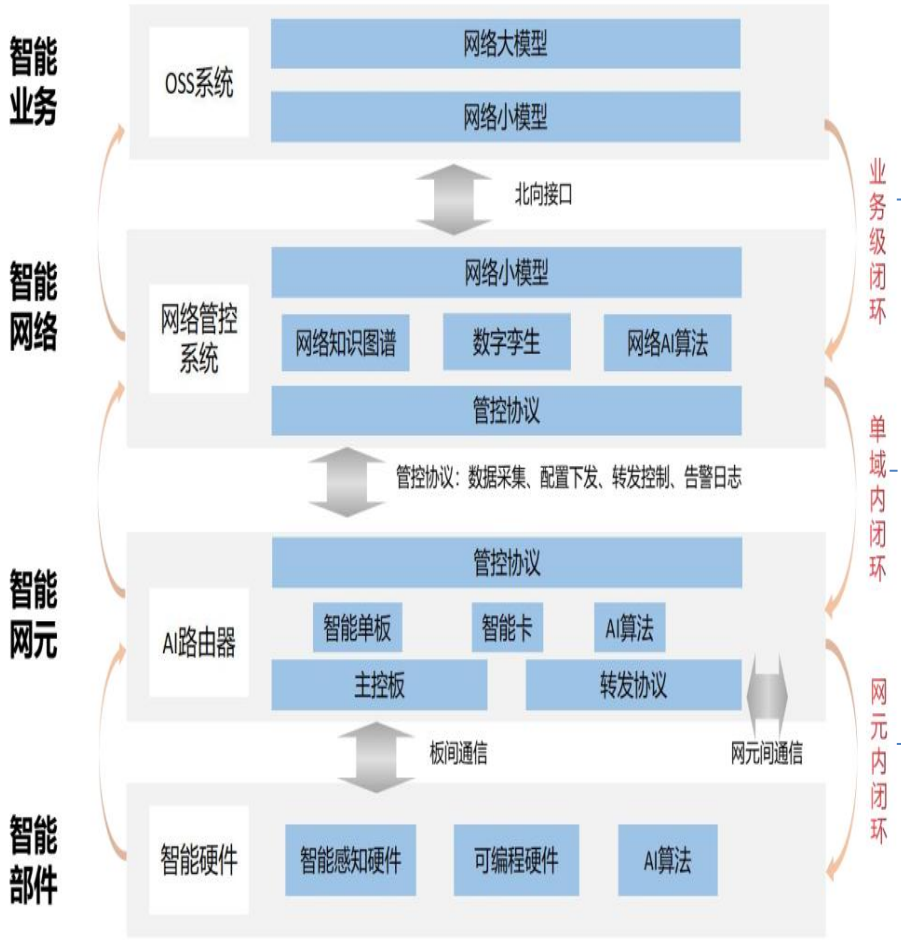
Ubiquitous Connectivity	IPv6 evolution technologies as the base of innovation
Green Ultra-Broadband	Photonic-electronic convergence; ports to 3.2T and 6.4T
Deterministic Bearing	Deterministic bandwidth, latency, jitter, loss and reliability

Newly added — three new characteristics

Computing-Network Convergence	Network + computing + data — Network for AI
AI-Native	Network + AI — AI for Network
Intrinsic Security	Network + security — security and trust built in by design

AI-native Attribute of Internet 2030

AI technology is fully embedded in the Network. From the service layer down to the component layer, each layer builds its own intelligent capability and closes its own loop.



Intelligent service

Nework large and small models work together, taking the service as the unit, to achieve **cross-domain** autonomous collaboration

Service-level loop

Intelligent Network

Network knowledge graph, network AI algorithms and digital twin plan build, maintain and optimize services, topology and systems in **one domain**

Domain-level loop

Intelligent Element

Intelligent hardware and AI enhance how components work, giving them self-sensing and self-adjusting capability and improving the efficiency of the **data plane**

Element-level loop

Intelligent Component

Intelligent hardware, algorithms, architecture and protocols analyse and optimize service, traffic, security, monitoring and energy inside **one element**

中国联通
China unicom

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Overview of AI-Native Network Practice

AI-native is a key characteristic of Internet 2030. China Unicom puts it into practice in **three layers** and on one set of **foundational standards**.

Intelligent service: Internet of Agents

The network serves agents — a new architecture and a network-side protocol framework for human-agent, agent-agent and agent-computing interconnection.

Internet of Agent white paper (August 2025)

Intelligent network: Network Agents

Agents operate the network: an agent-native communication network that understands intent, predicts demand and optimises itself

Communication Network Agent white paper (July 2025)

Intelligent element: AI-Native Router

Intelligence inside the device — sensing, forwarding and control built into the router, with a newly added intelligent plane

AI-native Router white paper (July 2024)

Foundational Standards

Computing power resource measurement model and parameters for LLM inference

ITU-T SG11 · Q.MP-LLM-FN

Functional requirements of computing power modelling in the CPN

ITU-T SG13 · Y.CPN-rcpm


INTERNATIONAL TELECOMMUNICATION UNION
TELECOMMUNICATION STANDARDIZATION SECTOR
STUDY PERIOD 2025-2028

SG11-TD1293/GEN
STUDY GROUP 11
Original: English

Question(s): 13/11 — Geneva, 14-22 July 2026

TD

Source: Editors

Title: Output –draft Recommendation ITU-T Q.MP-LLM-FN "Computing power resource measurement model and parameters for large language model inference in future networks" (Geneva, 14-22 July 2026)

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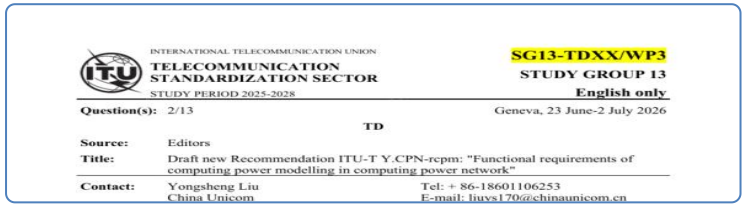
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STUDY PERIOD 2025-2028

SG13-TDXX/WP3
STUDY GROUP 13
English only

Question(s): 2/13 — Geneva, 23 June-2 July 2026

TD

Source: Editors

Title: Draft new Recommendation ITU-T Y.CPN-rcpm: "Functional requirements of computing power modelling in computing power network"

Contact: Yongsheng Liu, China Unicom — Tel: + 86-18601106253, E-mail: liuys170@chinaunicom.cn

Intelligent Service (1/2) : Internet of Agents

A New Paradigm

- Traditional Internet connects **information** — static data and fixed-function devices
- The Internet of Agents connects autonomous **agents**; the network becomes an intelligent collaboration network

Four Evolution Paths

- Network infrastructure → intelligent service infrastructure
- Content network → agent network
- Single access → ubiquitous access
- Connection-oriented → task-oriented XaaS

Nine Key Technologies

Identity	Identity management	Registration and discovery	Routing and addressing
Transport	New transport	Multimodal interaction	Task orchestration
Service	Agent service	Security mechanisms	Capability exposure

Four-Layer Architecture

- application enabling layer
- Coordination layer
- Interconnection layer
- Resource layer

Intelligent Service (2/2) : Model-Agent-Protocol (CubeMAP)

Why a New Protocol?

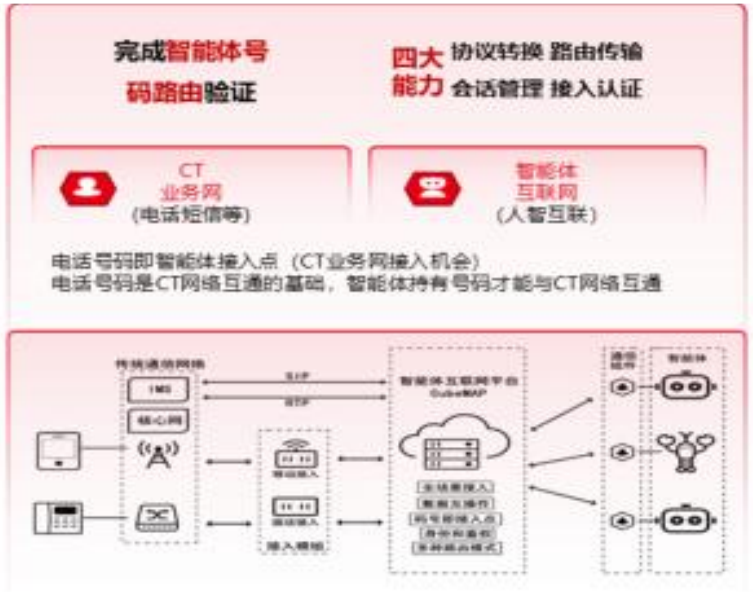
Existing agent protocols — ANP, A2A and others — mainly solve task expression and identity authentication between agents. They sit at the **application layer** and assume the network is an **IP-reachable pipe**.

CubeMAP

It focuses on the **network-side protocol**. It provides network services for interconnection between human, agent and computing elements, and lets the network play its **scheduling, coordination and enhancement** role in agent interconnection.

Three interconnection scenarios on the CubeMAP

Human-agent interconnection



Agent-agent interconnection

- 平台具备多协议（A2A、ANP、MCP）智能体**注册发现**能力，实现能力集中纳管与精准匹配；通过**协议适配转换**与**动态组网**技术，打通跨域任务调度与资源协同调用，为智能体数字员工提供全局协同入口

Agent-Computing interconnection

- 构建了用户侧至多数据中心的全链路闭环调度体系，实现智能路由、动态负载均衡与故障无感切换，确保大模型服务高可用、低时延、极致体验，为算力网络智能化调度奠定坚实基础

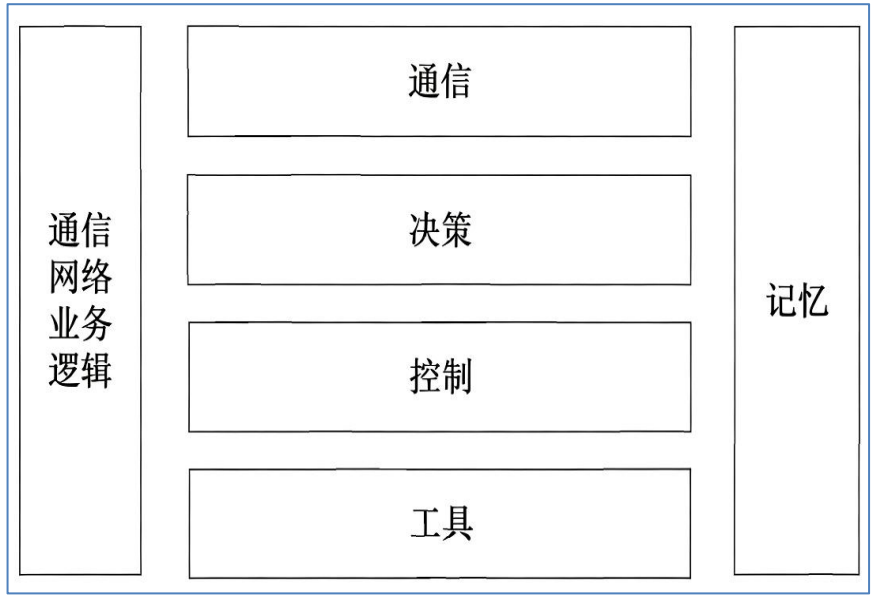
Intelligent Network : Network Agents

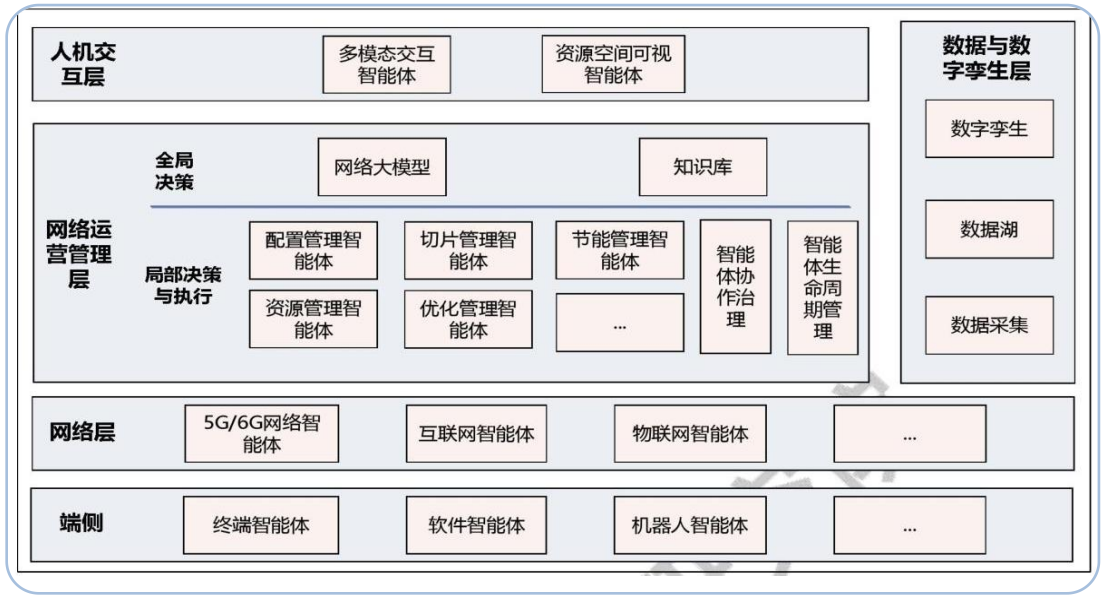
What Is a Network Agent?

An intelligent autonomous entity that completes a closed-loop process of "Intention → Perception → Analysis → Decision → Planning → Execution → Optimization", enabling self-evolving network operations

Composition

Six modules: communication, memory, decision, control, tools and service logic





Layered Architecture

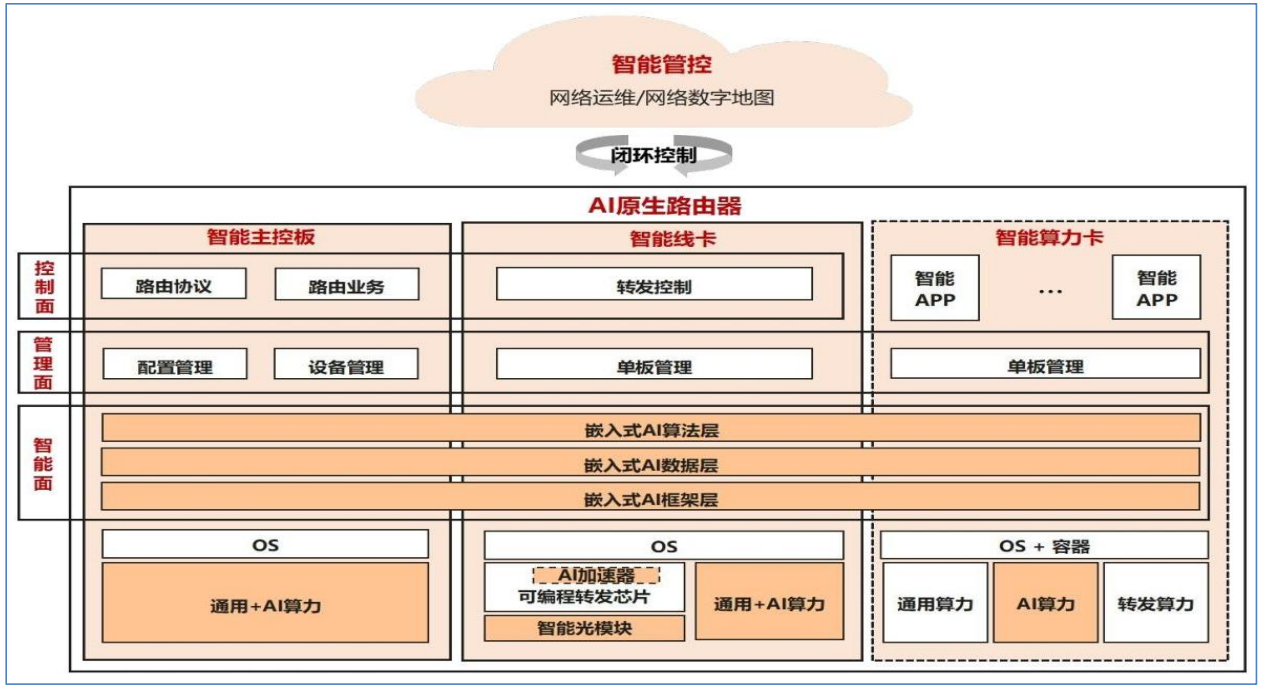
A 5-layer integrated system empowering end-to-end intelligence:

- Human-machine interaction layer
- Network operation & management layer
- Data & digital twin layer
- Network layer
- device-side layer

Intelligent Element: AI-Native Router

Core Definition

An innovative network device embedding **AI/ML into its fundamental architecture**. It transcends traditional routing by enabling real-time monitoring, auto-configuration, and dynamic path optimization for ultra-stable, high-speed connectivity.



Key Capabilities

Intelligent Perception
Real-time traffic monitoring & anomaly detection

Intelligent Forwarding
Proactive QoS & bandwidth scheduling.

Intelligent Control
Auto fault diagnosis & self-healing

Application Scenarios

AI for Reliability

Microsecond-level link switching and rapid congestion relief ensure zero downtime for critical services

AI for O&M

Smart fiber fault location and silent failure identification enable automated, proactive troubleshooting

AI for Security

AI-DDoS "Flash Defense" and hardware-trusted root provide global threat monitoring and instant response

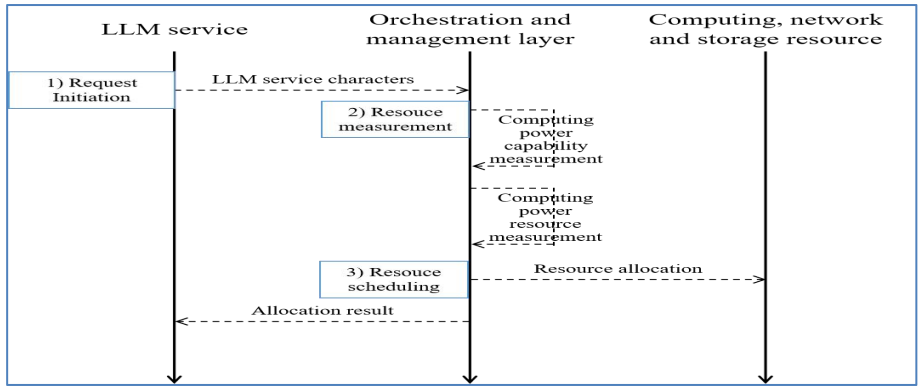
AI for Energy Saving

Learns traffic patterns to dynamically adjust power consumption, achieving "on-demand energy supply"

Foundation Standards: Computing Power Measurement

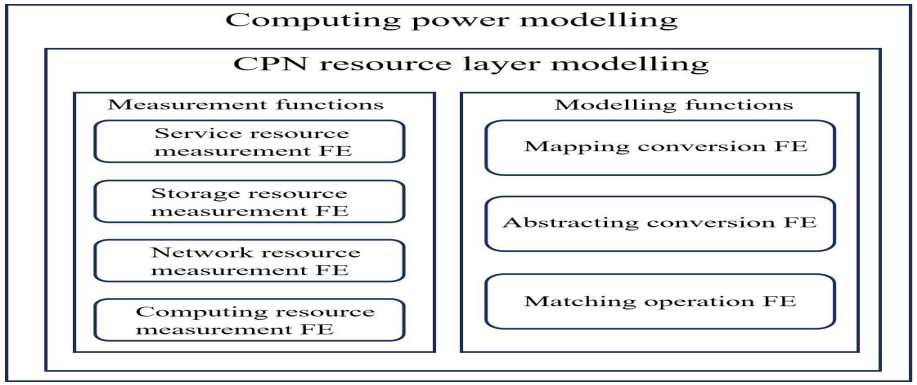
ITU-T SG11 · Q.MP-LLM-FN

It specifies the methods, model and key parameters for **computing power resource measurement of LLM inference** in future networks, thereby providing a basis for resource estimation, allocation, and optimization



ITU-T SG13 · Y.CPN-rcpm

It defines **four measurement functions** and **three modelling functions**, including physical-to-virtual mapping and cross-architecture equivalence mapping for heterogeneous resources



Foundational for the AI-native network

Both are computing power modelling standards and span intelligent service layer to intelligent component layer in the AI-native network architecture.

Evaluating AI performance

Measurement parameters describe how well LLM inference actually performs — service-level metrics such as first-token latency and throughput

Sizing the hardware AI runs on

The model translates an AI inference into concrete hardware demand — accelerators, memory, storage and network bandwidth.

Thank you!