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Agents Networking Scenarios in Enterprise and Broadband Networks
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Abstract

This document describes agents networking scenarios in enterprise and home broadband networks. These scenarios differ from mobile networks and Internet scenarios. Since the agentic service is still at the emerging stage, especially in enterprise and home broadband networks, the scenarios are mostly based on reasonable assumptions.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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1. Introduction

With the rapid development of artificial intelligence, single-agent systems have gradually revealed their limitations in handling complex, multi-tasking, and cross-domain scenarios. Agent networking, as a core paradigm for breaking through individual capabilities and achieving collective intelligence, has become a key trend in the future development of agents.

This document describes agents networking scenarios in enterprise and home broadband networks.

1.1. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

2. Enterprise Scenarios

The AI Agent is progressively becoming the key technological unit supporting both internal enterprise process automation and cross-enterprise ecosystem collaboration. The AI agent communication in enterprise scenarios include the following three types: - Via Internal Network: AI agents within the enterprise are interconnected to perform tasks via the enterprise internal network. - Via Interconnected Network: AI agents deployed across multiple branch of enterprise, which collaborate through private line. - Via Internet Network: AI agent within enterprise access Internet to collaborate with the external AI agents.

2.1. Smart Office

In the smart office scenario, AI Agents enhance daily productivity and collaboration.

Agent Collaboration:

* Personal Assistant Coordination: A user’s personal AI Agent (residing on a mobile device or PC) coordinates with other specialized Agents, such as the Meeting Room Agent, IT Service Agent etc.. This collaboration facilitates automated task execution, including scheduling meetings, reserving room resources, preparing necessary documents, and initiating video conference sessions.

* Team Task Alignment: Multiple project-related Agents, representing different team members or functions, engage in real-time data sharing, automatic summarization of meeting minutes, dynamic task prioritization, and collaborative document editing.

* Remote Work: In remote work scenarios, efficient telecommuting is achieved through the collaboration between terminal AI agents (such as mobile phones and laptops) and office equipment AI agents (including cloud desktops, printers, video conferencing terminals, and file-sharing servers). The participating roles are employees who operate terminal AI agents, terminal AI agents responsible for sending and receiving instructions, and office equipment AI agents that execute tasks.

Networking and Communication Requirements:

* Low Latency and High Reliability: Crucial for seamless video conferencing and real-time collaborative applications.

* Data Privacy and Security: By deploying gateways or other technologies to intercept private data, the security of enterprise data is ensured. Technologies such as encryption are used to enhance the safety of data during network transmission.

* Secure Authentication and Authorization: To ensure Agent actions are strictly compliant with the authorized scope granted by the human user or project manager.

2.2. Agentic Digitalization

This scenario focuses on automating and optimizing business processes using autonomous Agents.

Agent Collaboration:

* Business Workflow Automation: A Process Management Agent collaborates with various Business System Agents (e.g., CRM Agent, ERP Agent). It autonomously translates high-level business intents (e.g., "maximize customer retention") into executable plans, decomposes the overall task, and executes complex workflows across disparate business systems by invoking their respective Agents.

* Data-Driven Decision Making: Data Collection Agents aggregate information from various sources, feeding it to Data Analysis Agents. The resulting insights guide Decision Agents, which autonomously take prescribed actions, such as dynamically adjusting cloud resource allocations.

Networking and Communication Requirements:

* Heterogeneous Interoperability: Agent communication protocols must be designed to bridge communication gaps between legacy IT system APIs and modern AI Agent platforms.

* High Concurrency and Scalability: The network infrastructure must be capable of supporting numerous Agents engaged in frequent, complex, and high-volume interactions across the enterprise.

2.3. Industrial Automation

This scenario applies Agents to the operational domain, demanding strict performance guarantees.

Agent Collaboration:

* High Efficient Producing: On the production floor, Sensors, Robots, Controllers agent collaborate to continuously monitor environmental variables and production status. This tight collaboration allows for dynamic optimization of manufacturing processes, maximizing efficiency and minimizing downtime.

* High Quality Producing: Remote Diagnostics Agents collaborate with local Equipment Agents to transmit high-definition video feeds and machine logs. This enables sophisticated remote fault diagnosis and highly accurate predictive maintenance operations.

* Intelligent Warehousing:Intelligent warehousing refers to automating and intelligently managing warehouse operations. In this scenario, the AI agents collaborate to predict, plan, schedule, and optimize warehouse operations, thereby enhancing efficiency and safety.

Networking and Communication Requirements:

* Ultra-Low Latency and Jitter: Critical control loops require communication that adheres to industrial-grade standards, specifically Ultra-Reliable Low-Latency Communication.

* Deterministic Networking (DetNet): The underlying network may need to incorporate DetNet technologies to guarantee bounded and predictable latency for communications among critical control Agents.

* Data Privacy and Security: Achieve the isolation of production data and operational data to ensure that critical data does not leave the domain.

* OT/IT Convergence: A key requirement is defining how Agents can securely and reliably communicate with gateway functions connecting the Operational Technology (OT) domain to the Information Technology (IT) domain.

3. Home Broadband Network Scenarios

The home network scenario is characterized by user experience optimization and device collaboration.

Agent Collaboration:

* Home Security: When remotely printing documents for children while away from home, users can activate the home printer via their smartphone. During routine monitoring by the home camera, abnormal pet activity will trigger alerts pushed to the user’s smartphone.

* User Experience Guarantee: The Home Gateway (e.g., on the home router/ONT, or on the BNG) collaborates with Terminal Agents (e.g., on gaming consoles, smart TVs) to classify traffic. This allows the Gateway to dynamically prioritize and allocate bandwidth to latency/bandwidth-sensitive applications (like online gaming or 4K streaming), ensuring a consistently high Quality of Experience (QoE).

Networking and Communication Requirements:

* Lightweight and Efficient Protocols: Given the variety of resource-constrained consumer devices, the Agent communication protocol must be designed to be lightweight and computationally efficient.

* Mobility Management: The network architecture must provide mechanisms to maintain session persistence and support seamless handover for Agents when a user transitions between the home Wi-Fi network and a mobile cellular network.

4. Operational Considerations

There are two primary operational paradigms in varying enterprise requirements: - Enterprises build their own local networks and also lease operator private lines. - Operators provide both managed network services and private lines for Enterprises.

Home broadband services may not involve operational considerations.

5. Deployment Considerations

5.1. Limited domain Deployment

This model emphasizes security, performance, and control, typically favored by large enterprises, industrial environments (Smart Manufacturing), or highly security-conscious users.

* Isolated Infrastructure: All core AI Agent components, including the Large Language Model (LLM) inference engines, Agent orchestrators, Agent naming/discovery services, etc., are deployed entirely within the private network domain (e.g., enterprise LAN or private network).

* Data Sovereignty: No Agent communication data, task context, or locally sensitive information leaves the private network. This is essential for scenarios involving proprietary data or compliance with strict regulatory requirements.

* On-Premises Compute Resources: Requires substantial dedicated compute and storage resources (e.g., GPUs for inference) within the private domain, which must be connected via high-speed interfaces.

* Controlled Network Egress: Strict policies are applied to prevent Agents from accessing unauthorized external services, minimizing the external attack surface. The network needs mechanisms for precise monitoring of all egress traffic initiated by Agents.

5.2. Public domain Deployment

This model prioritizes cost-efficiency, and leverages existing cloud and public infrastructure, often seen in home networks (Home Broadband) and smaller Smart Office setups.

* Hybrid Architecture: The core intelligence (e.g., the LLM) and central coordination services (e.g., Agent discovery) are typically hosted in a public or operator cloud environment. Local Agents (e.g., device Agents, edge Agents on the home gateway) handle sensing, local actuation, and interface with the cloud-based central Agent.

* Tool/API Delegation: Cloud-based Agents often delegate local tasks by invoking APIs exposed by local Agents, or by sending compressed instructions to the edge device.

* Cost Optimization: This model reduces the need for comprehensive system that combined by various components, but rather, some integrated model of providing the service (e.g. through an Agent Gateway).

6. Security Considerations

TBD

7. IANA Considerations

This document has no IANA actions.

8. Normative References

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