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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 6G 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-task, 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. Compared to the traditional API interface integration model, the AI Agent is capable of achieving more flexible and loosely coupled collaboration methods through abilities such as semantic perception, strategy-driven execution, and autonomous decision-making. The essence of this change is an upgrade from "system integration" to an "Intranet of 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 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.

Network Requirements:

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

* Unified Agent Discovery and Invocation: Agents must rely on standard protocols to locate and invoke the capabilities of other Agents within the enterprise network (e.g., printing or storage services).

* 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 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.

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.

* 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.

* Mobility Management: the robots and AGVs are constently moving, it is critical to maintain the session for the moving nodes.

3. Home Broadband Network Scenarios

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

Agent Collaboration:

* Home Security: For instance, a smart camera may stream footage to a NAS Agent for storage of anomalous events, while simultaneously alerting to the user’s Mobile Agent.

* 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 and home requirements: the fully isolated Self-contained Private Deployment and the resource-optimized Economical Integrated Implementation.

4.1. Self-contained Private 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 cloud).

* 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.

4.2. Economical Integrated Implementation

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).

5. Security Considerations

TBD

6. IANA Considerations

This document has no IANA actions.

7. Acknowledgements

TBD

8. Normative References

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[RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <https://www.rfc-editor.org/info/rfc8174>.

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