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Cross-device Communication Framework for AI Agents in Network Devices
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Abstract

With the development of large language models (LLM), AI Agent software continues to emerge. AI agents deployed on different network devices need to collaborate to accomplish some complex tasks, such as network measurement and network troubleshooting. This collaboration requires cross-device communication between AI agents.

This document proposes a cross-device communication framework for AI agents in network devices, and analyzes the requirements for the communication protocol.

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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Table of Contents

1. Introduction

With the development of large language models (LLM), AI Agent software continues to emerge. They have played a significant role in enhancing work and production efficiency. Deploying AI Agents on network devices will be the next beneficial attempt.

AI agents deployed on different network devices need to collaborate to accomplish more complex tasks, especially those that span multiple devices and involve network-level operations. For example, this can help us perform better in areas such as network measurement[I-D.zeng-mcp-network-measurement] and network troubleshooting[I-D.zeng-mcp-troubleshooting].

This collaboration requires communication between AI agents, so this document proposes a cross-device communication framework for AI agents in network devices, and analyzes the requirements for the communication protocol.

In this framework, the agents that communicate with each other are peers, capable of using synchronous and asynchronous communication methods, and support both structured and unstructured messages.

2. 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 RFC 2119 [RFC2119] RFC 8174 [RFC8174] when, and only when, they appear in all capitals, as shown here.

3. Terminology

A2A: Agent2Agent Protocol

MCP: Model Context Protocol

4. Framework and Key Components

The figure below shows the communication framework, including three network devices A~C, with some AI agents deployed on each device.

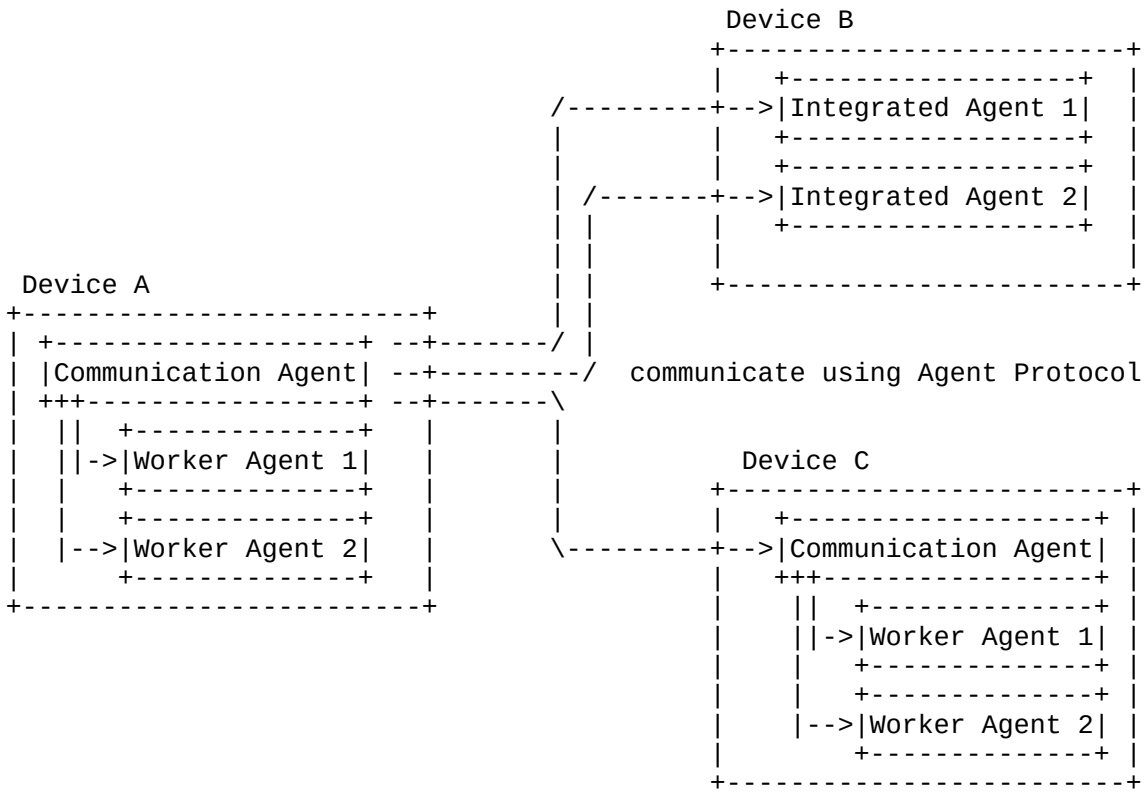

Figure 1: Cross-device Communication Framework for AI Agents in Network Devices

Agents on network devices are categorized into three types: Communication Agent, Worker Agent, and Integrated Agent.

* Communication Agent: Responsible for the intelligent agent communication of this network device with external systems. It aggregates the capabilities of all local Worker Agents to generate the overall capability of the network device for external representation. It receives cross-device access requests from Worker Agents and uses the Agent protocol to communicate with Communication Agents on other devices. It also manages asynchronous or long-term tasks.

* Worker Agent: It performs specific functions for a particular set of tasks locally, such as network measurement and troubleshooting. It does not handle AI agent communication across devices. Worker Agents on different devices do not communicate with each other. Within a device, Worker Agents can communicate with each other or with the Communication Agent using either the Agent protocol or custom methods. This document does not impose any restrictions on the communication methods.

* Integrated Agent: Possesses both the functions of Worker Agent and Communication Agent. It has the capability to perform specific tasks and communicate with other agents.

The Communication Agents on each device have a peer relationship with each other. Based on the invocation relationship during a single communication, they can be further categorized into two roles: Client Agent and Server Agent.

* Client Agent: Constructs task requirements into request messages and sends them to the Server Agent via the Agent Protocol. It waits for the Server Agent to return a response message. The task result is obtained by parsing the response message, or recording the task ID in the response message returned by the Server Agent and retrieving the task result from the Server Agent by the task ID later.

* Server Agent: In terms of capability discovery, it constructs the capabilities of AI agents in the device into capability negotiation messages and sends them to the Client Agent via the Agent Protocol. For processing task requests, it receives request messages from the Client Agent through the Agent Protocol. For short-term tasks, after completing the task, it constructs the task result into a response message. For long-term tasks, it generates a task ID and constructs the task ID into a response message. The response message is then sent to the Client Agent via the Agent Protocol. When a long-term task is completed, the task result is cached, and the Server Agent waits for the Client Agent to retrieve the task result using the task ID.

The cross-device communication protocol between AI agents in network devices is referred as Agent Protocol.

* Agent Protocol: The communication protocol between agents on two devices, which includes functions such as capability discovery and negotiation, task assignment and result collection, authentication, and secure communication. For example, emerging protocols like A2A or MCP, or mature protocols like NETCONF/YANG, can be used.

5. Requirements

5.1. Requirements for AI Agent in Network Devices

TBD

5.2. Requirements for Agent Protocol

The communication protocol between AI agents in network devices is referred as Agent Protocol. There are some requirements for it.

[REQ 2-1a] Agent Protocol MUST support synchronous request/response interaction.

[REQ 2-1b] Agent Protocol SHOULD support streaming interaction for better experience in some man-machine interaction scenarios.

[REQ 2-1c] Agent Protocol MUST support to response task id immediately and acquire the result by task id later.

[REQ 2-1d] Agent Protocol SHOULD support bidirectional interaction for the scenarios where Server Agent asks for more information from Client Agent.

[REQ 2-1e] Agent Protocol MUST support to exchange structured messages, such as message in JSON or Protobuf format.

[REQ 2-1f] Agent Protocol SHOULD support to exchange unstructured messages, such as natural language.

[REQ 2-1g] TBD

5.3. Requirements for Security schema

TBD

6. Illustration

6.1. Using A2A as the communication protocol

TBD

6.2. Using MCP as the communication protocol

TBD

7. IANA Considerations

TBD

8. Security Considerations

TBD

9. References

9.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <https://www.rfc-editor.org/info/rfc2119>.

[RFC8126] Cotton, M., Leiba, B., and T. Narten, "Guidelines for Writing an IANA Considerations Section in RFCs", BCP 26, RFC 8126, DOI 10.17487/RFC8126, June 2017, <https://www.rfc-editor.org/info/rfc8126>.

[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>.

9.2. Informative References

[I-D.zeng-mcp-network-measurement] Zeng, G. and J. Mao, "MCP-based Network Measurement Framework: Using Model Context Protocol for Intelligent Network Measurement", Work in Progress, Internet-Draft, draft-zeng-mcp-network-measurement-00, 20 October 2025, <https://datatracker.ietf.org/doc/html/draft-zeng-mcp-network-measurement-00>.

[I-D.zeng-mcp-troubleshooting]
Zeng, G. and J. Mao, "Using the Model Context Protocol (MCP) for Intent-Based Network Troubleshooting Automation", Work in Progress, Internet-Draft, draft-zeng-mcp-troubleshooting-00, 20 October 2025, <https://datatracker.ietf.org/doc/html/draft-zeng-mcp-troubleshooting-00>.

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