AI BASED NETWORK MANAGEMENT AGENT (NMA): CONCEPTS & ARCHITECTURE

NMOP, IETF 124

draft-zhao-nmop-network-management-agent/

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GOAL AND SCOPE OF THE DRAFT

Background

- Concept of AI agent widely accepted in the industry (e.g. TMF Autonomous Networks)

Scope

- This draft establishes a **standardized architecture** for **AI Agents in Network Management (Network Management Agents - NMAs)**.

Goals

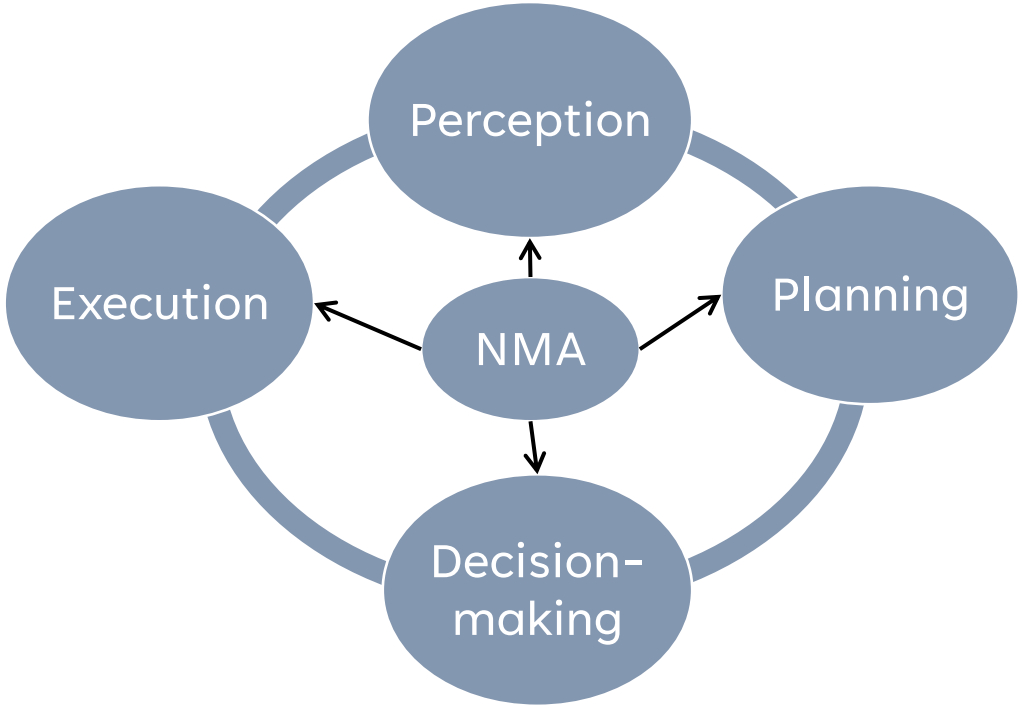
- Define the foundational framework of the NMA.
- Clarify the relationship between the NMA and existing network controllers.
- Specify functional requirements for NMAs across various network scenarios, including their required interfaces.

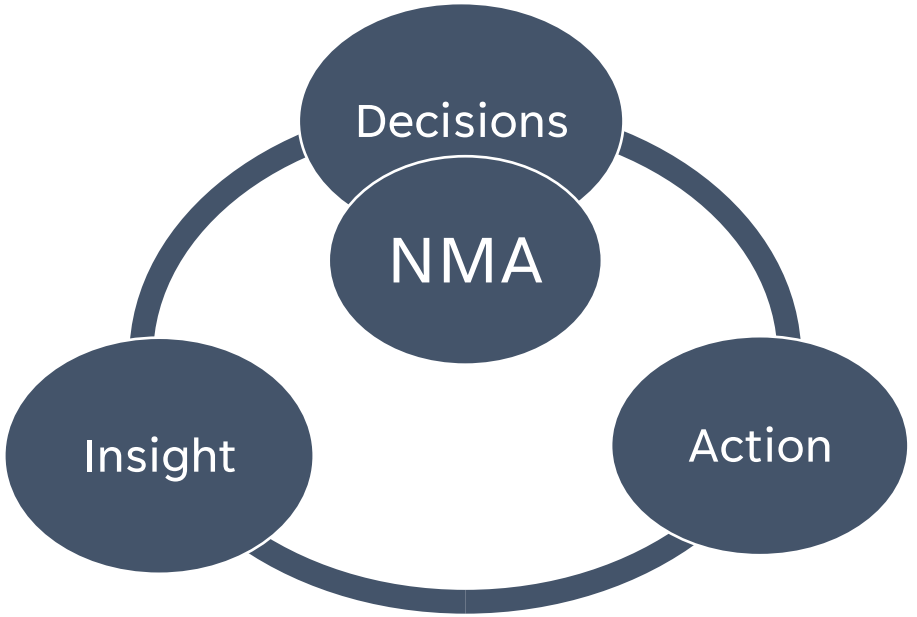
Not Goals

- Specific agent implementation details are out of scope.

NMA DEFINITION

- NMA = AI Agents for network management = A network management entity built on ML/AI and equipped with the processing capabilities to create autonomous closed-loop.
- It interacts with other components of the NM tools to: carry out network perception, do task intent interpretation, task planning, decision-making and task execution operations based on user task intentions or preset goals, so as to achieve closed-loop operations

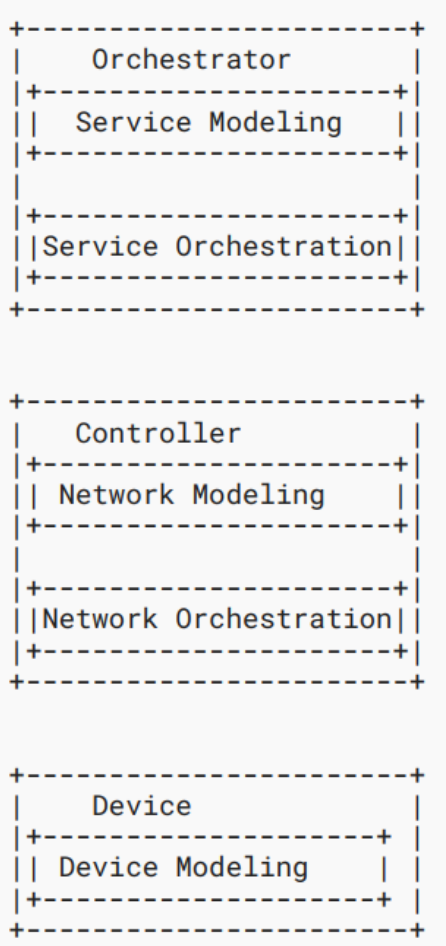




RELATIONSHIP WITH RFC8969

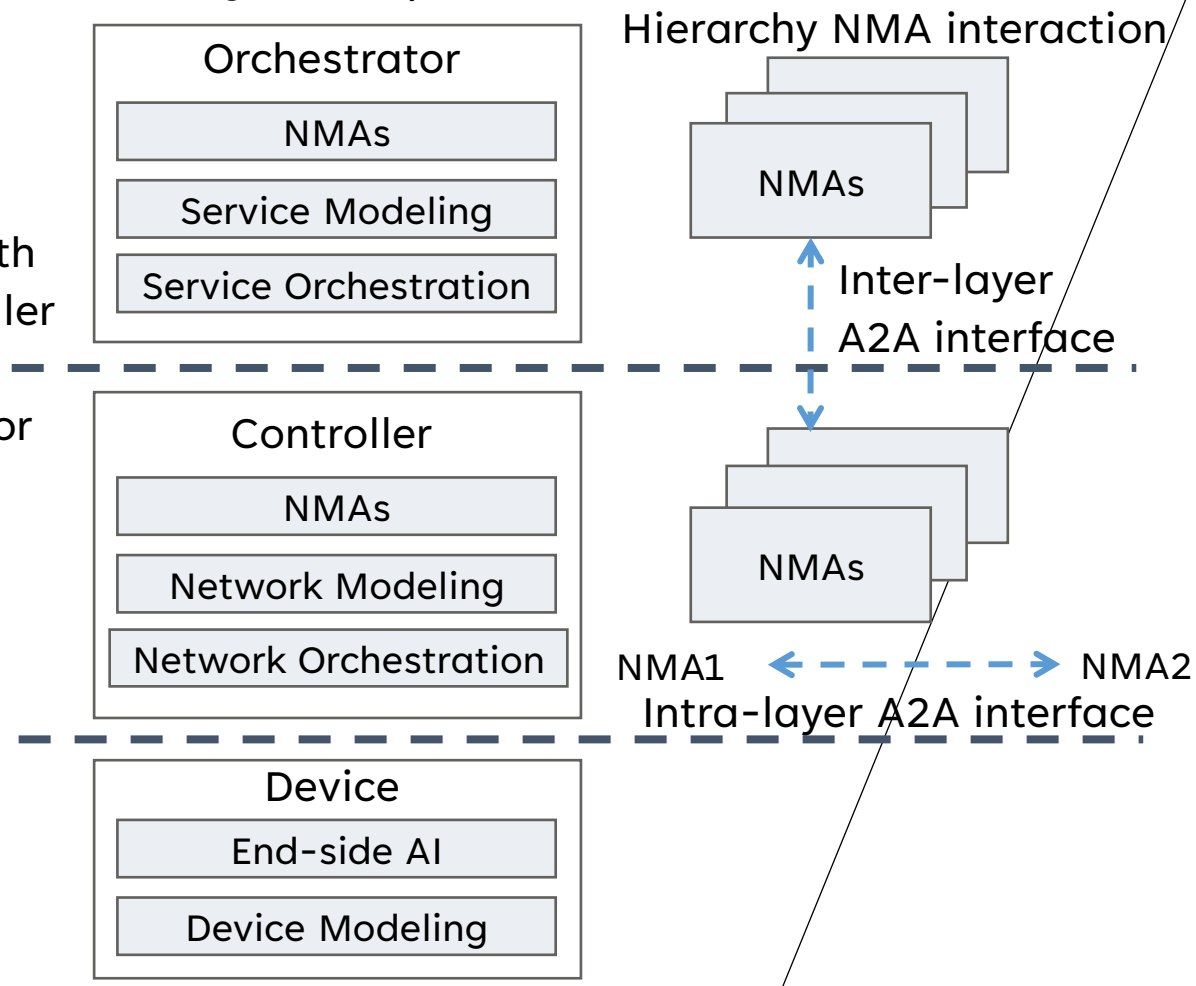
RFC 8969 A Framework for Automating Service and Network Management with YANG

Relation: this draft enhances RFC 8969 with AI/ML “intelligent” capabilities



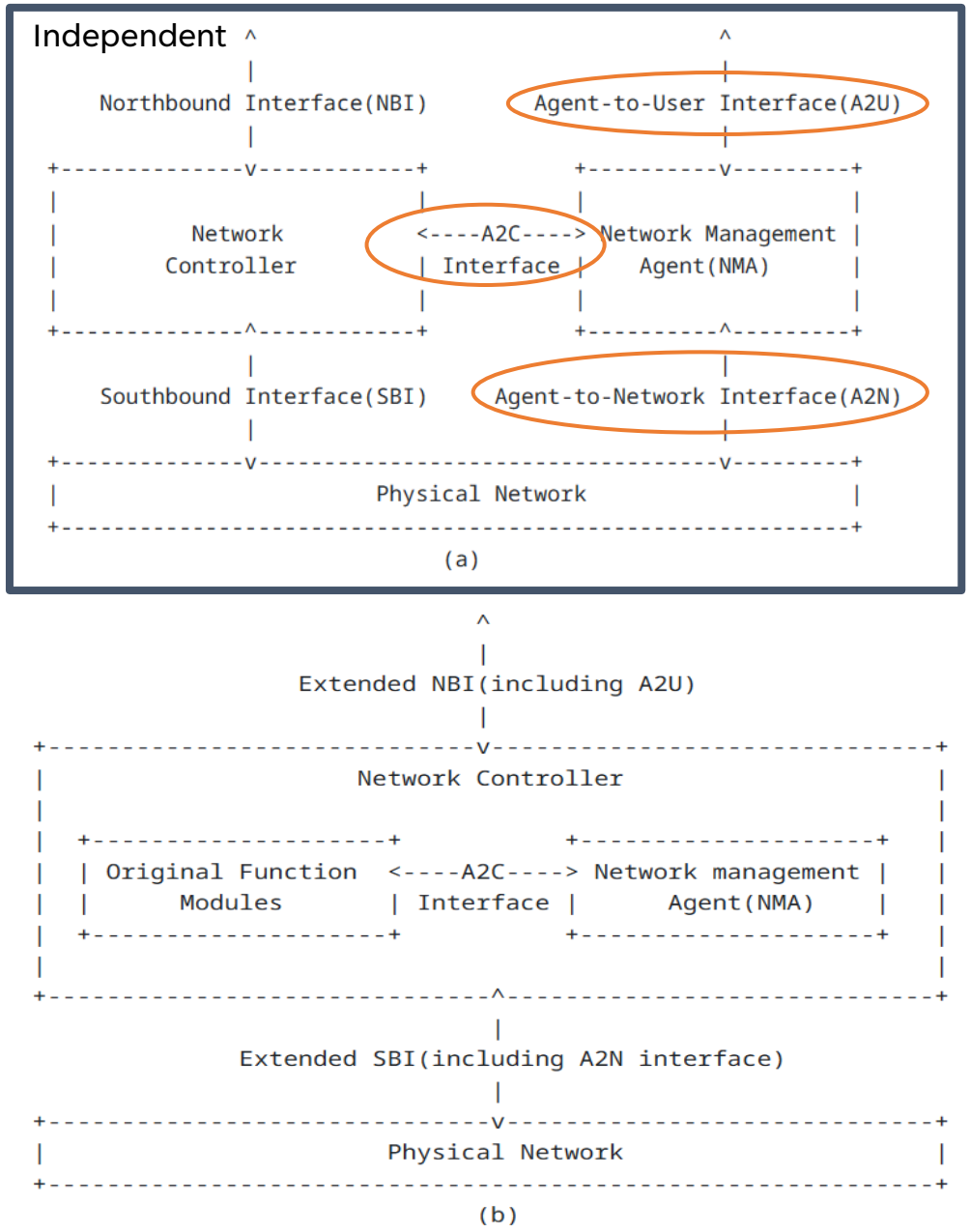
Layering and Representation withing a network operator

NMA can exist at both the Controller and Orchestrator levels.



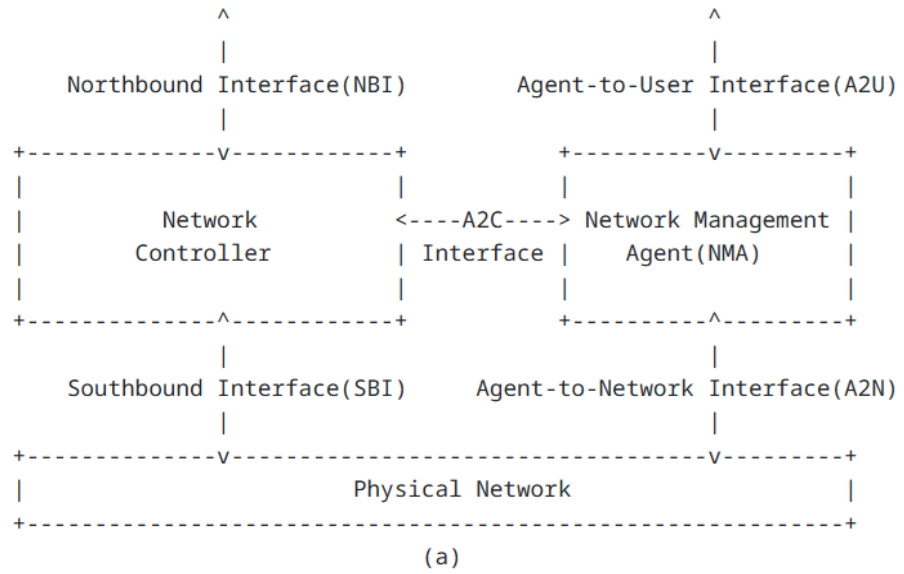
Enhanced intelligent network management and control framework based on NMA

NMA INTERFACES – IMPACTS OF DEPLOYMENT MODELS

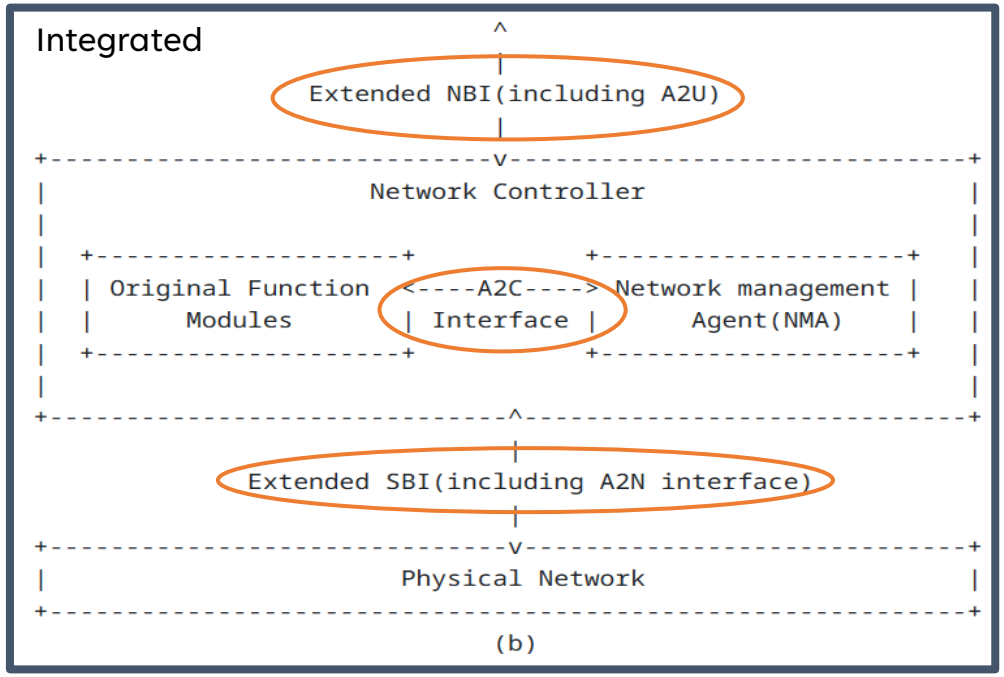


- **Agent-to-User interface (A2U):**
  - The interface between the **NMA and the user**, where the user can be a human or another system.
  - Used to receive **call requests** from users and return **task processing results**.
  - Should support both **structured and natural language** modes.
  - The **Agent-to-Agent (A2A) interface** between NMAs is included in the scope of this interface.
- **Agent-to-Controller interface (A2C):**
  - In the **independent** mode, this interface is an east-west interface between the controller and NMA;
  - In the **integrated** mode, this interface is an internal interface of the controller and is not within the scope of this document.
- **Agent-to-Network interface (A2N):**
  - The interface between the **NMA and network**.
  - In the independent mode, this interface is a new SBI between the Agent and the network;
  - In the integrated mode, this interface can be extended based on the original SBI.

NMA INTERFACES – IMPACTS OF DEPLOYMENT MODELS



(a)



(b)

When NMAs are deployed in the controller, the related interface standardization work includes:

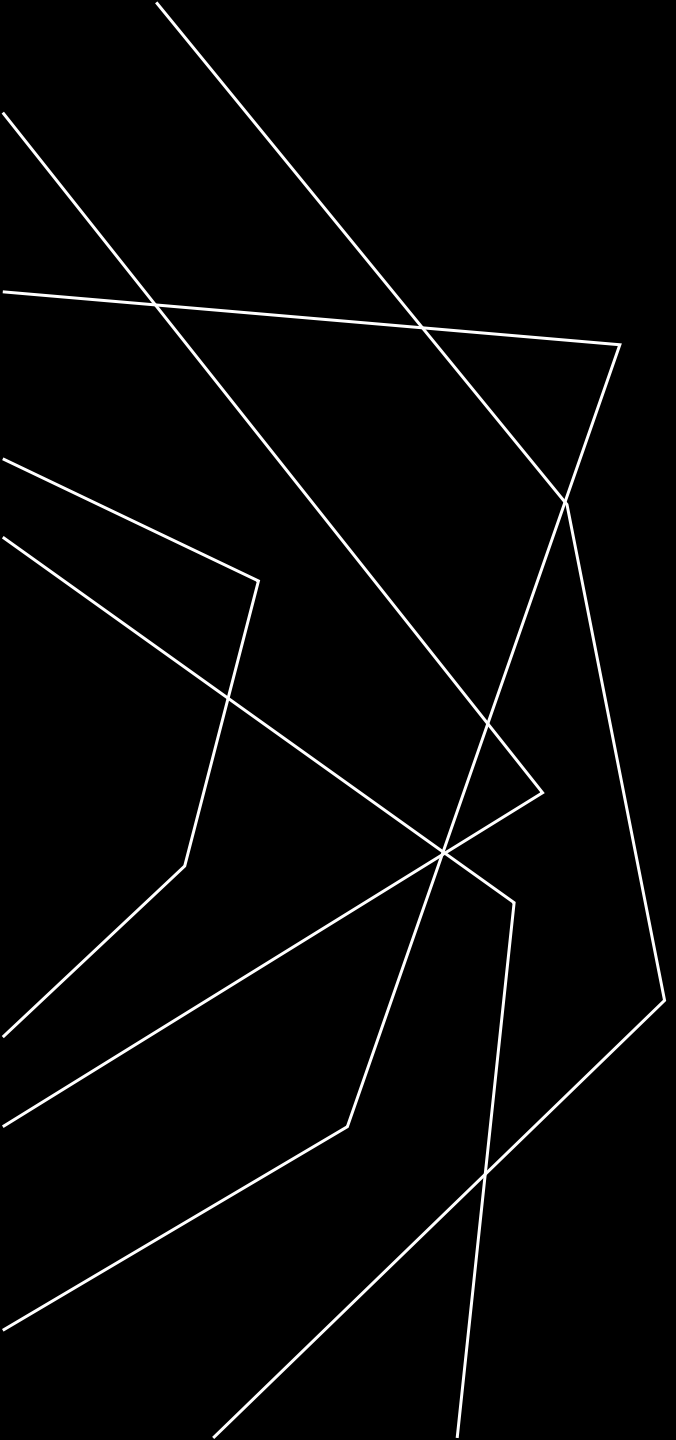
- **Extended NBI of the controller**:
  - Key interface for collaboration between upper- and lower-layer systems, needs to realize functions such as capability discovery and invocation between upper and lower layer NMAs.
  - There's a **strong demand for its standardization and extension** to satisfy the communication needs between NMAs.
  - Communication between NMAs in the upper-layer orchestrator and those in the lower-layer controller: **a single communication channel physically but multiple A2A communication logically**.
- **Extended SBI of the controller**:
  - Theoretically, NMAs will not directly configure or operate devices; instead, they will call the functional modules of the controller for device-related configuration.
  - The need for standard extension of this interface is minimal, and it is not within the scope of this draft.

OPEN ISSUES

- **Interface standardization requirements:**
  - **Is extending the controller's NBI to support NMA capability invocation and interaction the right way forward?**
  - **Based on which interface protocol?**
    - ✓ **NETCONF/YANG:** Maybe not good choice, not suitable for conversational interaction.
    - ✓ **HTTP/JSON:** Suitable protocol. Needs to be defined from scratch.
    - ✓ **MCP, A2A, etc. :** Existing interfaces in the industry, have relatively complete definitions. We can extend based on them. But are they suitable for **Network Management Agents?**
- **Are the identified requirements collecting all the industry needs?**

NEXT STEPS

- Improve the content of the draft, especially on the interfaces
- Collect comments and contributions from NMOP
- Pre-requirement for all AI/Agentic work in NMOP. Far from being complete, but ready start working on it as a WG?



THANK YOU