



IETF-123 NMRG



An Intent Translation Framework for IoT Networks ([draft-gu-nmrg-intent-translator-01](#))

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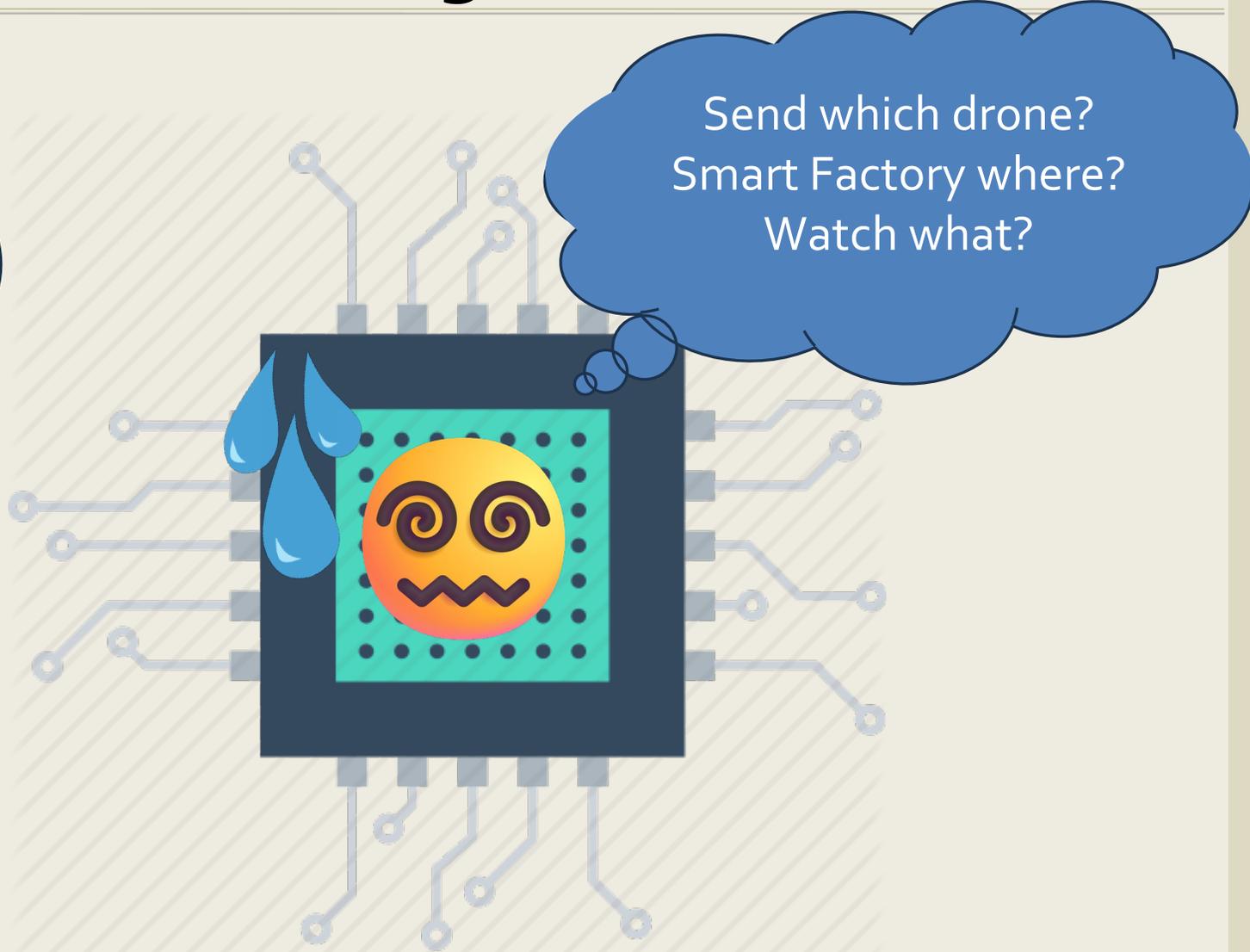
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Why do we need an Intent Translation Framework for Network Management?



Send a drone over to Smart Factory and start surveillance



Send which drone?
Smart Factory where?
Watch what?



Goal of this Draft



- ❑ **An Intent Translation Framework for IoT Networks**
 - ❑ This draft defines a **Framework** for Translating high-level intents based on natural language into validated structured policies (such as YAML) that can be executed by network orchestrators.
 - ❑ **What can it solve?**
 - Eliminates manual policy translation bottlenecks
 - Enables autonomous and scalable policy enforcement
 - Bridges gap between natural language intent and machine-executable policy
- ❑ **Key Components:**
 - ❑ **Intent Processing:** Extracts structured intent representations from user inputs.
 - ❑ **Semantic Alignment:** Matches intent with domain-specific knowledge (e.g., KG reasoning).
 - ❑ **Confidence Assessment:** Identifies low-confidence mappings for human-in-the-loop or fallback strategies.
 - ❑ **Policy Generation:** Produces YAML policies aligned with 3GPP TS 28.312 procedures.



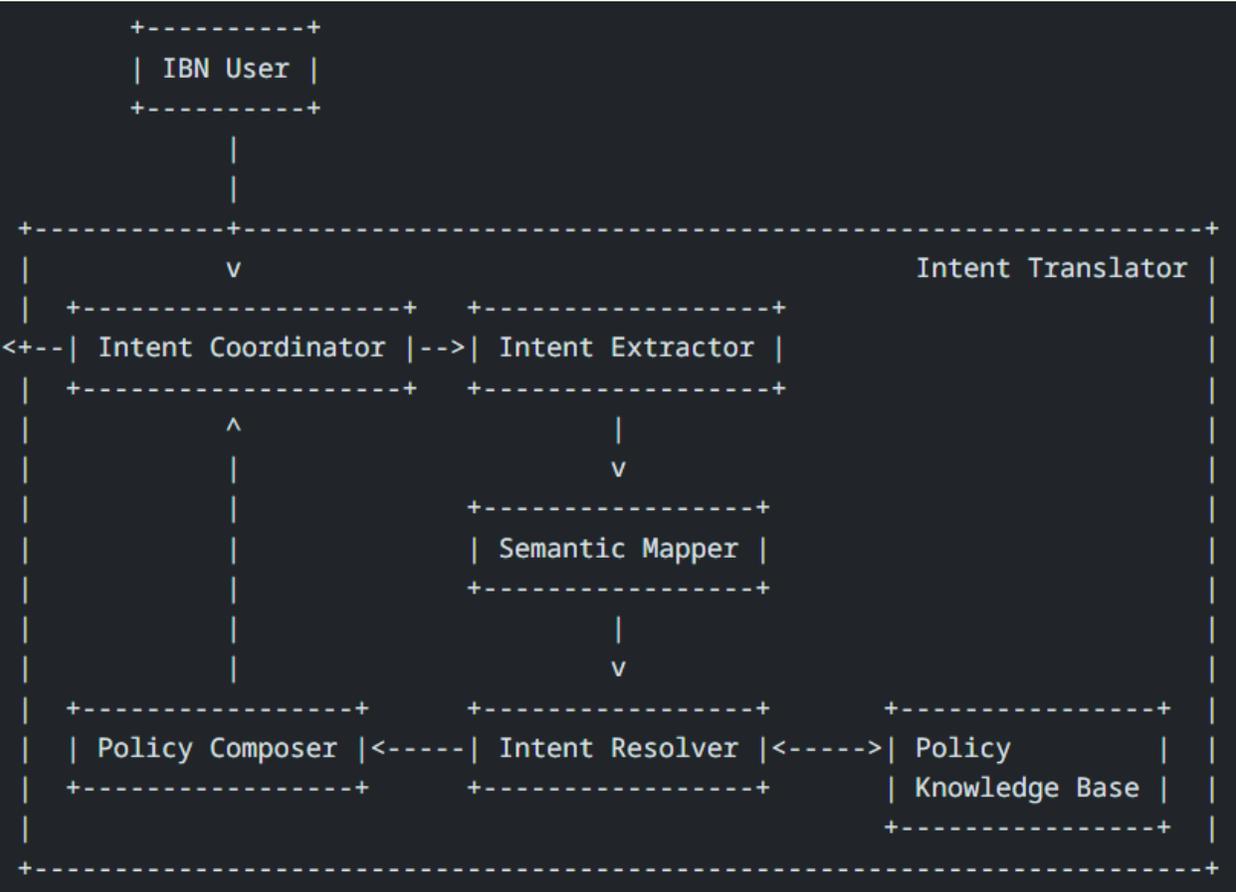
Scope for the Draft



- 1. Intent Translation Framework** for intent based network management for IoT Network
 - ▣ This framework extracts an intent from natural language commands and converts it into a policy.
- 2. Semantic Mapper** of vectorizing structured intent
 - ▣ It maps an extracted intent into an embedded vector.
- 3. Intent Resolver** for reasoning intent with domain knowledge
 - ▣ It matches an embedded intent vector with a domain knowledge graph in Knowledge Base.



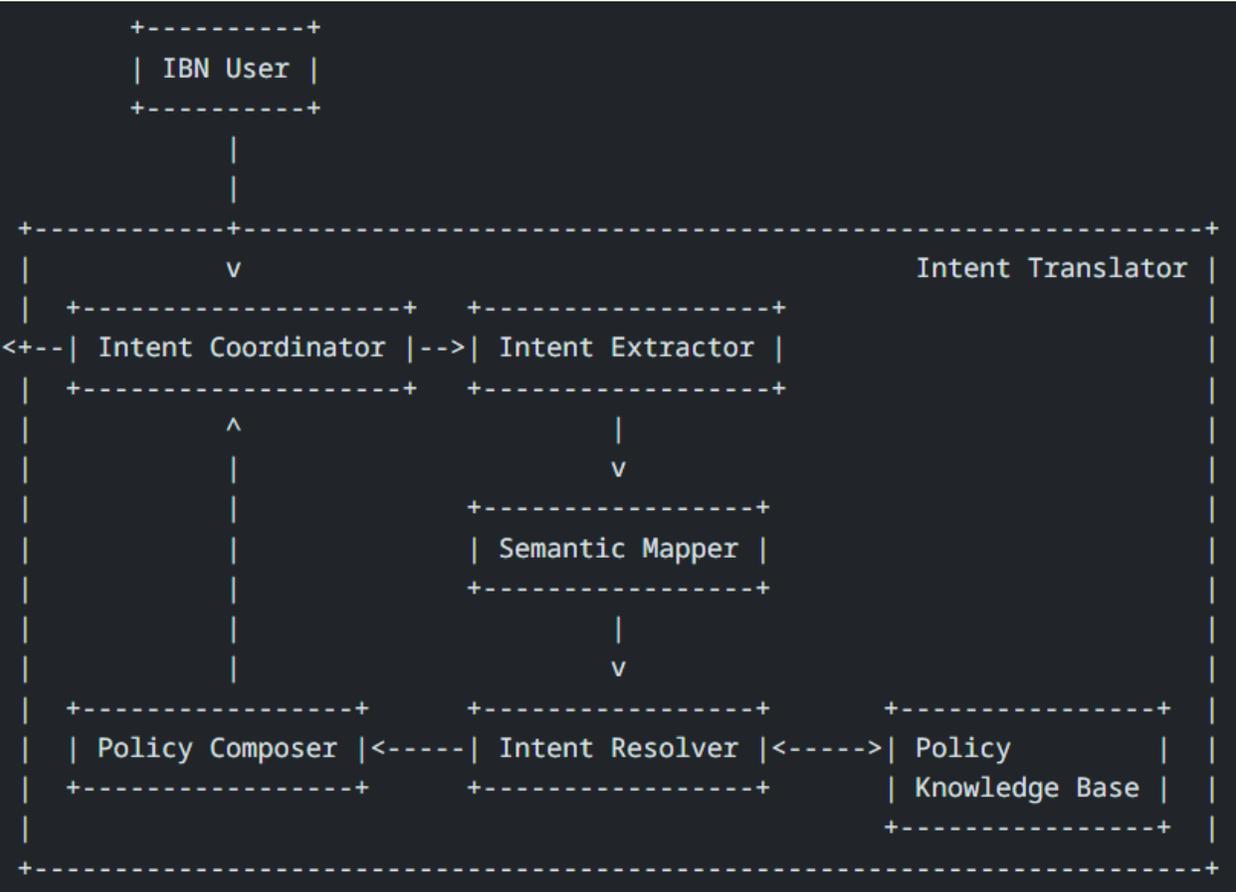
Step 1: Intent Translator Framework



- **Intent Translator**
 - It converts a natural language intent into a structured, network policy for enforcement in intent-based management systems.



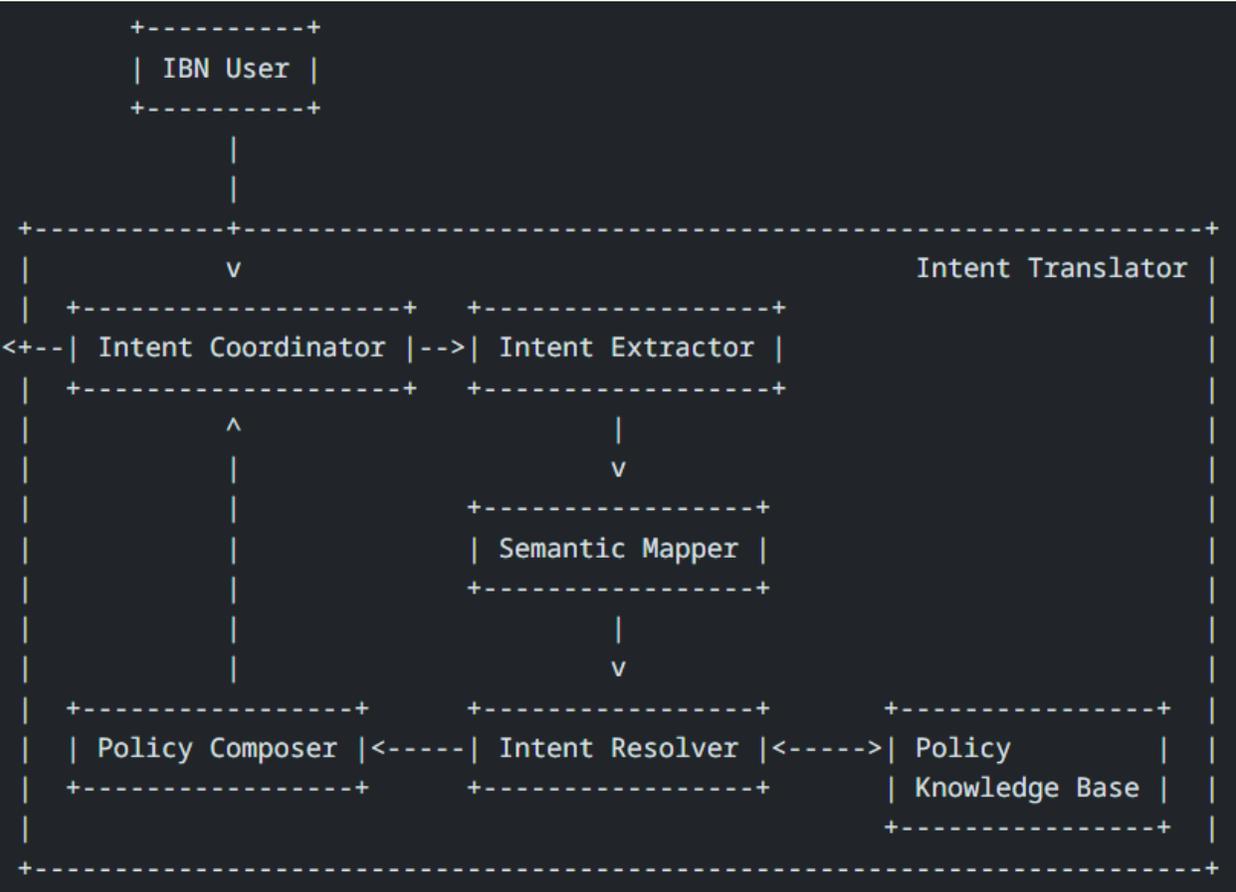
Step 1: Intent Translator Framework



- **Intent Coordinator**
 - It receives an intent submitted by an IBN user and forwards the natural language intent to the Intent Extractor.
 - It also delivers a network policy to downstream systems for enforcement, such as a network orchestration engine.



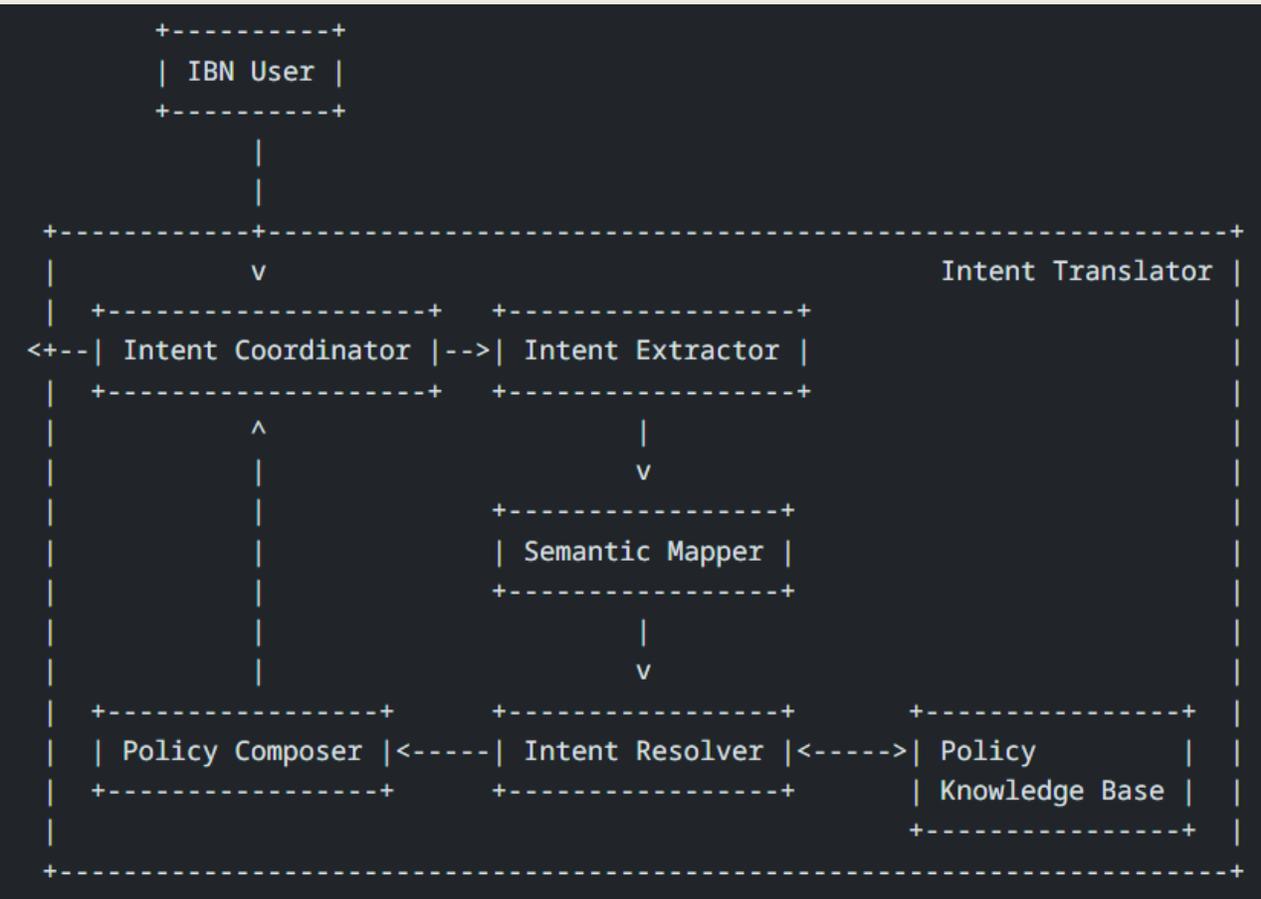
Step 1: Intent Translator Framework



- **Intent Extractor**
 - It extracts structured elements from a natural language intent based on a few-shot based large language model (LLM).
 - It parses the incoming natural language statement to key elements (e.g., action, source, and destination).



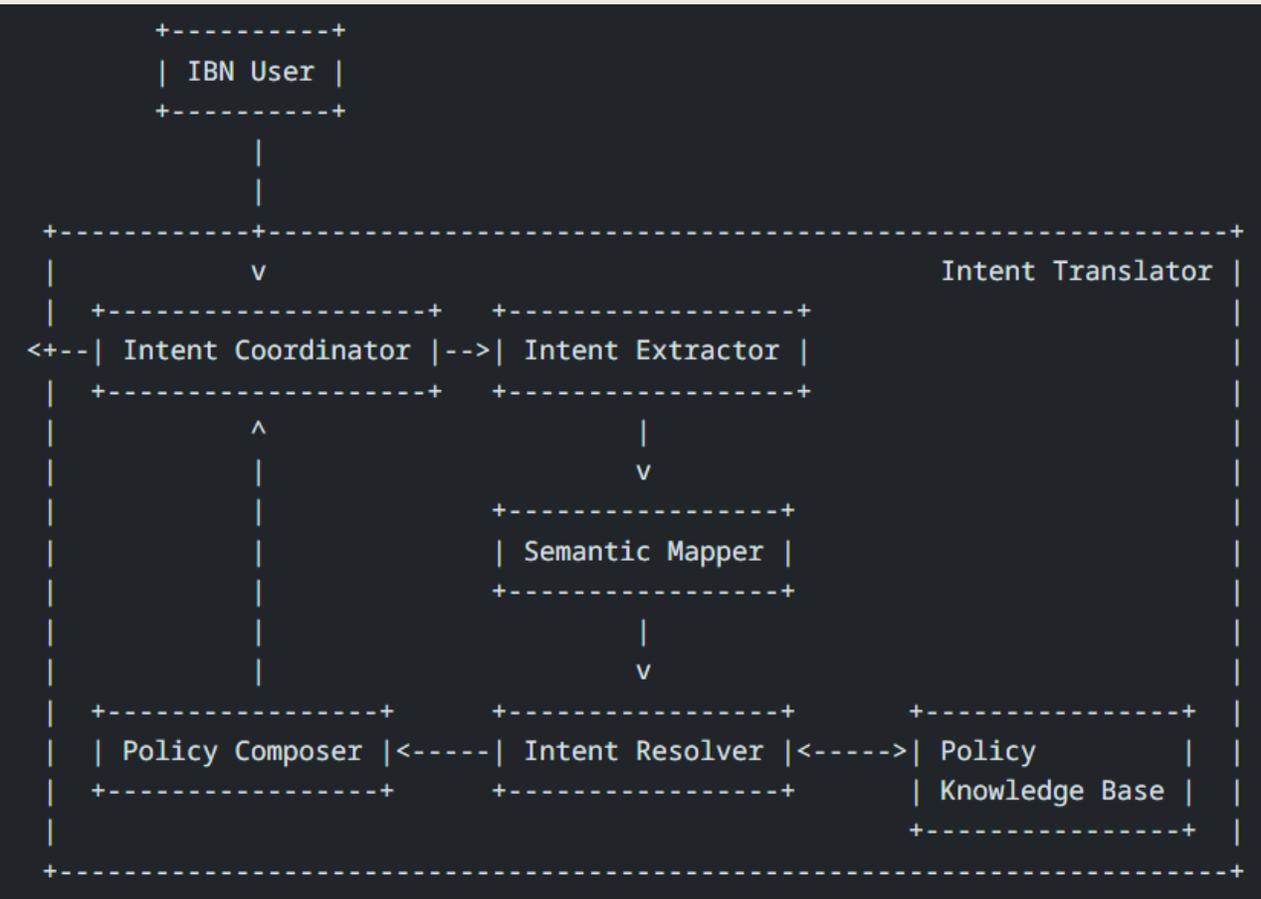
Step 1: Intent Translator Framework



- **Semantic Mapper**
 - It projects the structured intent into semantic space using pretrained embedding space.
- **Intent Resolver**
 - It compares the embedded intent vector against the domain knowledge stored in the Policy Knowledge Base.



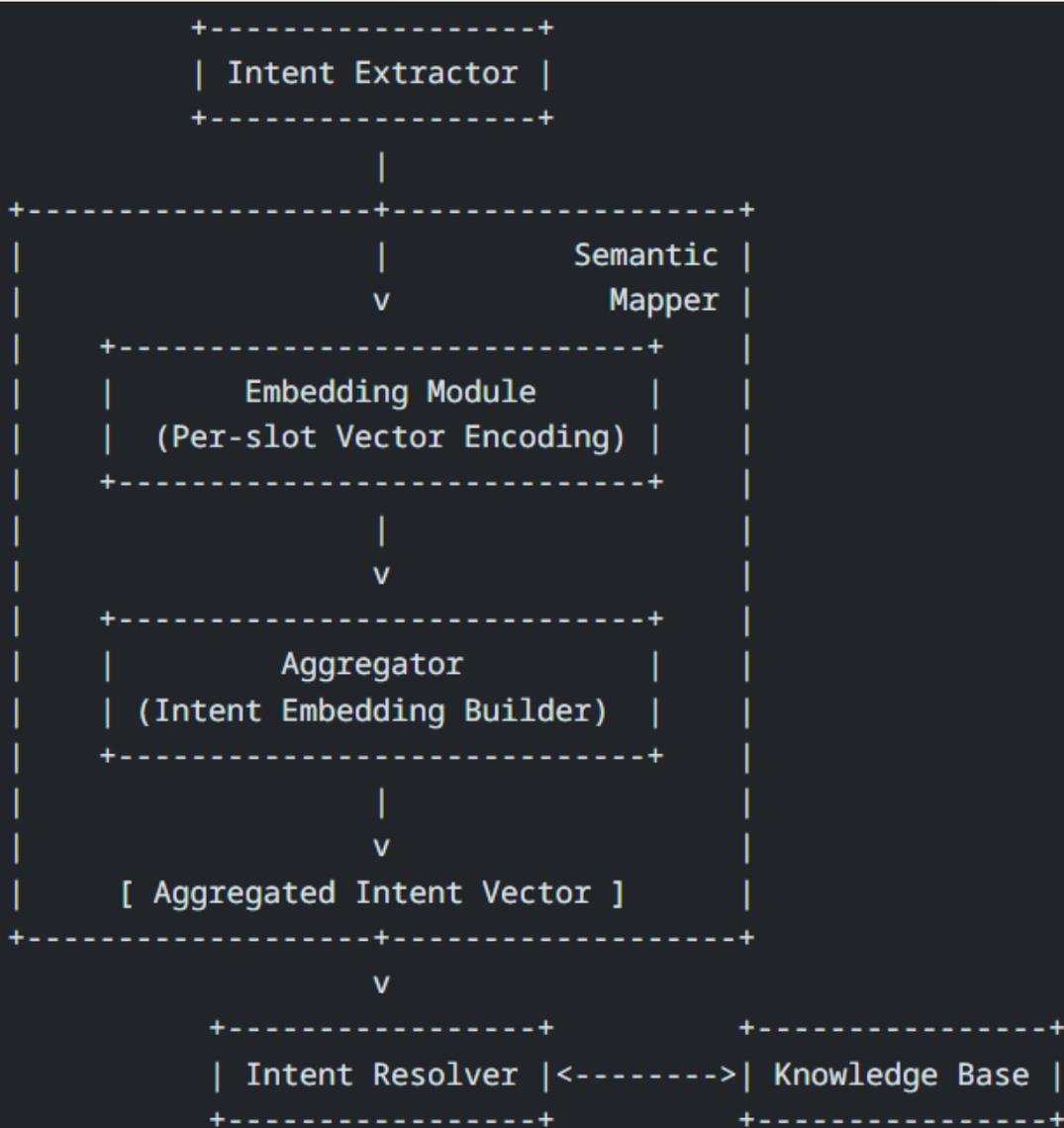
Step 1: Intent Translator Framework



- **Policy Knowledge Base**
 - It stores the domain knowledge as a knowledge graph to support semantic mapping and approximate inference between intents and policies.
- **Policy Composer**
 - It generates a policy document in YAML format based on the extracted intent structure and selected knowledge graph items.



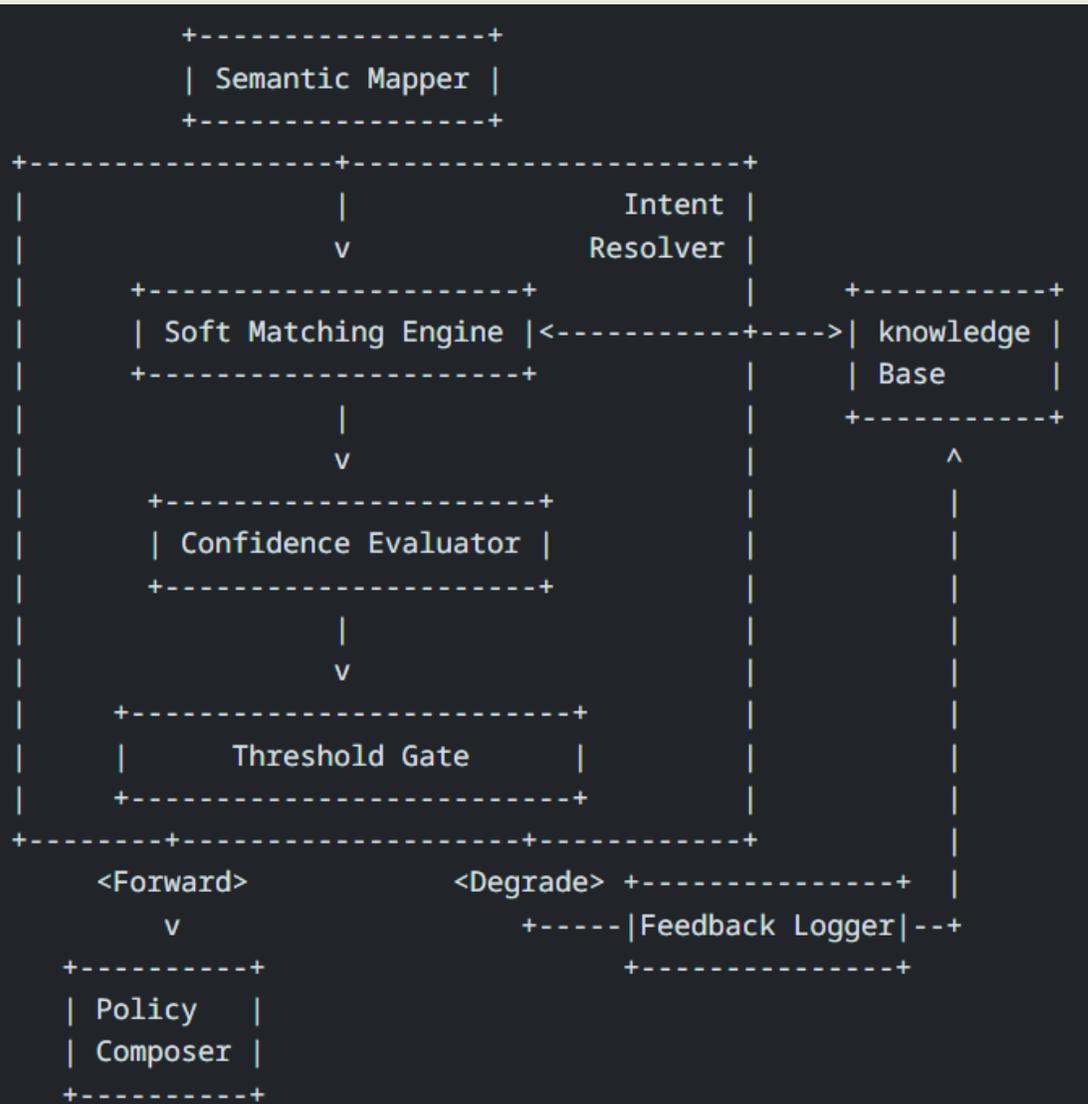
Step 2: Semantic Mapper Module



- **Semantic Mapper**
 - It embeds extracted intents from Intent Extractor into semantic space aligned with the domain knowledge graph and transforms them into vectors.
 - It deliver the aggregated intent representation vector to Intent Resolver for reasoning.



Step 3: Intent Resolver Module



■ Intent Resolver

- It semantically matches intent embeddings and Knowledge Base and evaluates the similarity for feedback to Knowledge Base.



Summary



- ❑ This document proposes a practical and scalable architecture for intent translation in next-generation management systems.
- ❑ Through this, the natural language intent can be reliably mapped to structured policy outputs for automatic network service configuration.
- ❑ Based on the proposed framework, it enables knowledge-grounded automation in complex service domains such as IoT network and intelligent edge infrastructures (e.g., Robotic AI agents).



Next Steps



- ❑ This draft will be enhanced to accommodate problems as follows:
 - ❑ Deployment Considerations: the actual operational policy and pre-embedding verification
 - ❑ Degradation and Human Oversight Considerations: high-trust environments and human verification procedures through review and documentation.
 - ❑ Security Considerations: secure channels and include verification and policy conflict detection functions for malicious input.
- ❑ We will prepare IETF-124 Hackathon Project to clarify (i) Intent Translator and (ii) Use Case for Robotic AI Agents.