The Autonomic Deployment Mechanism of Service Intent in Autonomic Networks

draft-du-anima-service-intent-auto-deployment

ANIMA@IETF 125@ShenZhen

Beijing University of Post and Telecommunications

Jialu Du,Ye Tian, Xiangyang Gong, Sheng Jiang

Overview

Objective

Automate the deployment and management of service intents in autonomic networks, translating high-level business objectives (e.g., “low-latency compression of video stream X”) into coordinated allocation of network, compute, and storage resources. 。

Mechanism

Intent Parsing： Translate high-level service intents into resource reservation requirements.
Determination of Service Responders： Orchestrate responders participating in negotiation based on intent constraints and resource status.
Negotiation and Dynamic Maintenance： The initiator and responders negotiate specific resource reservation values based on the service intent information carried via GRASP.

Referring to two relevant new drafts

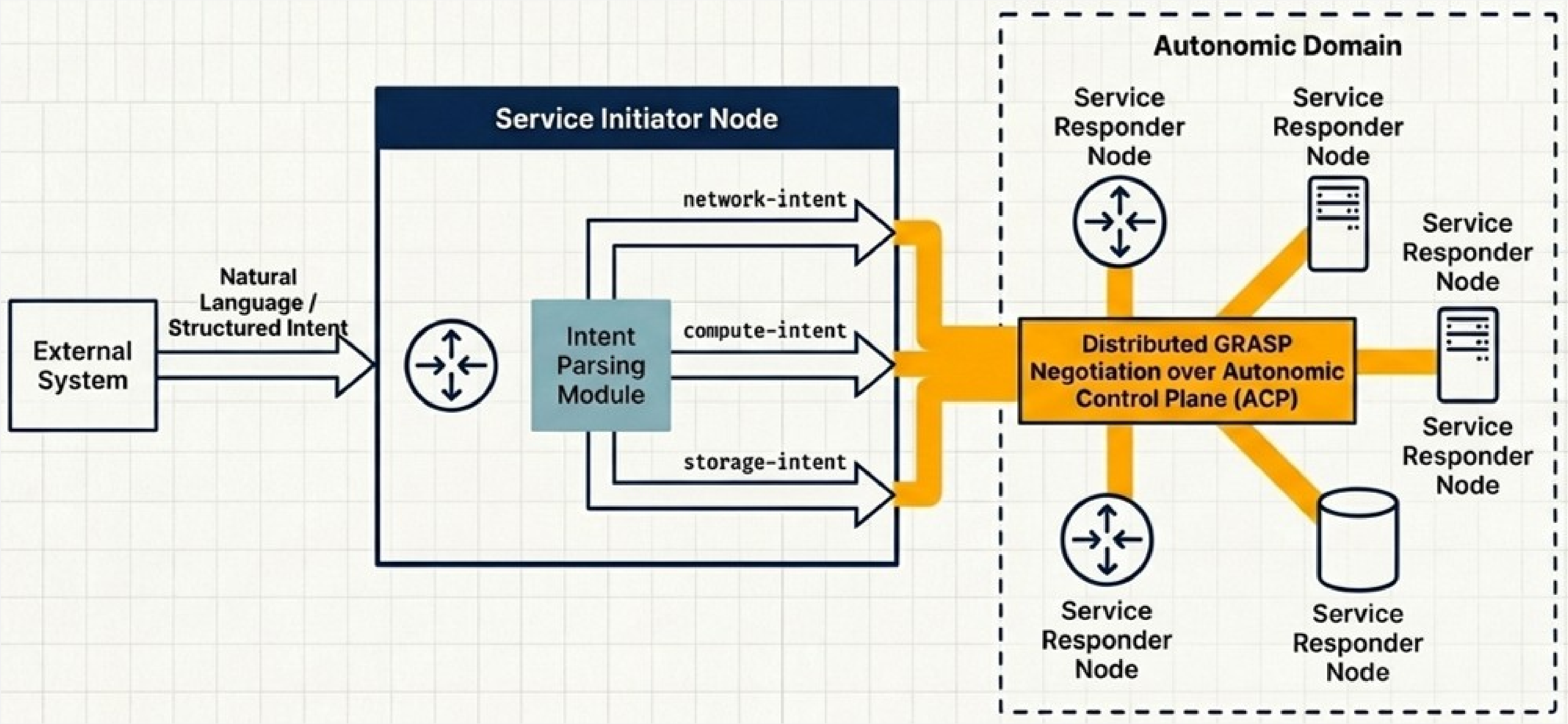
draft-ietf-anima-network-service-auto-deployment， framework define resource management ASA
draft-zhu-anima-service-intent, Definition of Service Intent in Autonomic Networks

Moving Beyond Value-Based Resource Allocation

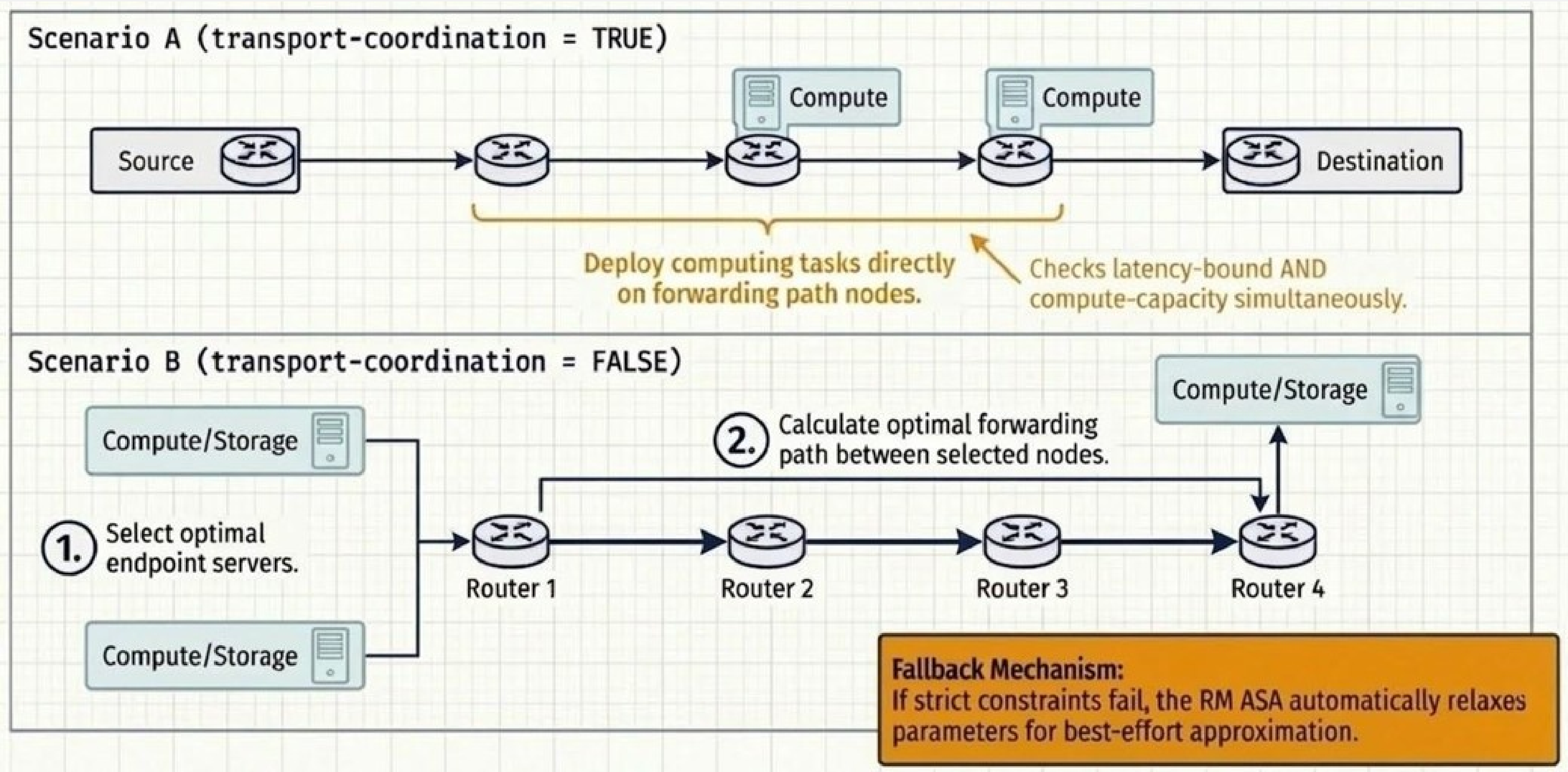
	Traditional Configuration	Value-Based GRASP (Previous Drafts)	Semantic Intent (This Draft)
Approach	Manual CLI / Static Policies	`draft-ietf-anima-network-service-auto-deployment`	Intent-Aware RM ASA Negotiation
Paradigm	How to do it.	Reserve 10Mbps on Node A.	Guarantee end-to-end latency for AI video compression.
Limitation / **Advantage**	**Limitation:** High overhead, static, fails in dynamic states.	**Limitation:** Lacks semantic understanding. Cannot jointly optimize interdependent compute and network paths.	**Advantage:** Translates abstract Service Level Objectives (SLOs) into joint optimization of heterogeneous resources (Network + Compute + Storage).

Requires Semantic Understanding →

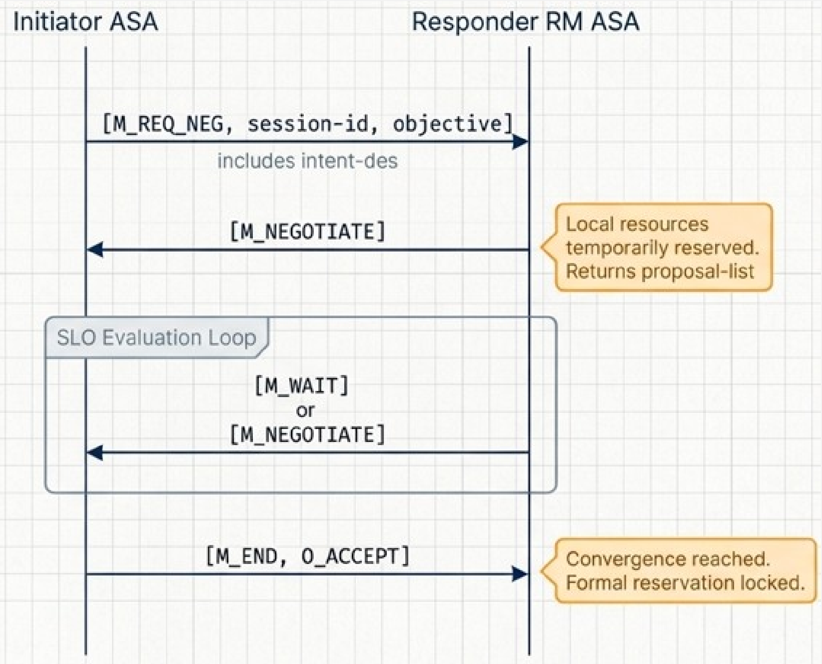
Intent-based Service Deplovment via RM ASAs



Multi-Dimensional Service Responder Selection



Hop-by-Hop GRASP Negotiation State Machine




```
Extended Resource Manager Objective:
objective-value = [
   [ service-type, service-id, … ],
   [ intent-des, proposal-list ]
]

proposal-list = [* proposal]
proposal = {
   proposal-id: uint,
   guaranteed-resources: {
      bandwidth: uint,
      compute-capacity: uint
   },
   expected-contributions: {
      added-latency: uint,
      added-jitter: uint
   }
}
```

Synthesizing the Global End-to-End Solution

Negotiation happens locally, but intent is assured globally. Individual node constraints are mathematically combined to verify total service intent compliance before reservation

Collect Proposals

Aggregate proposal-list data from Forwarding, Compute, and Storage responders.

Compatibility Check

Ensure seamless handoffs (A committed bandwidth is equal to B required).

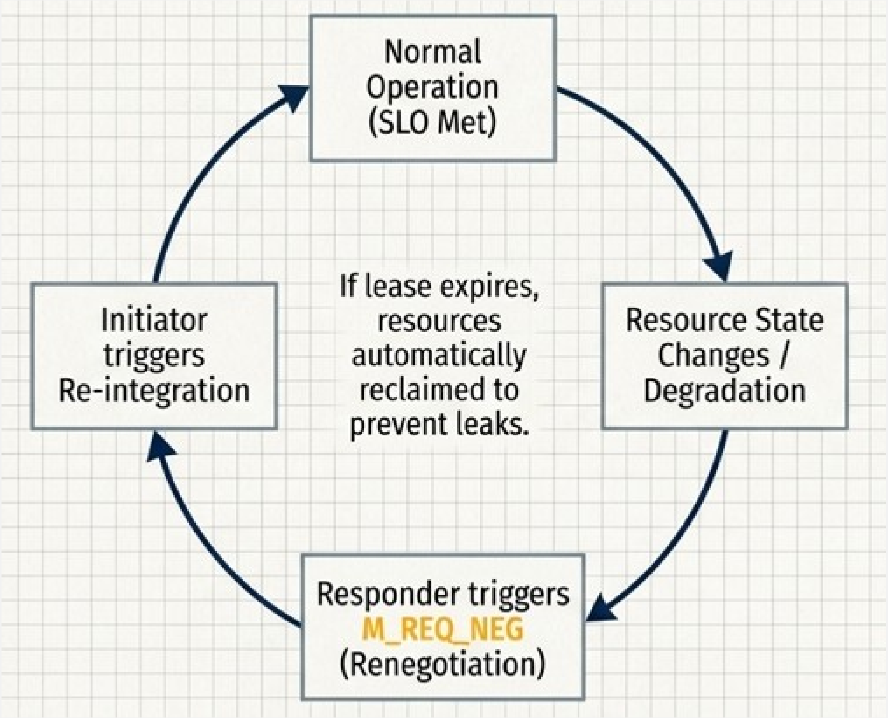
Global Confirmation

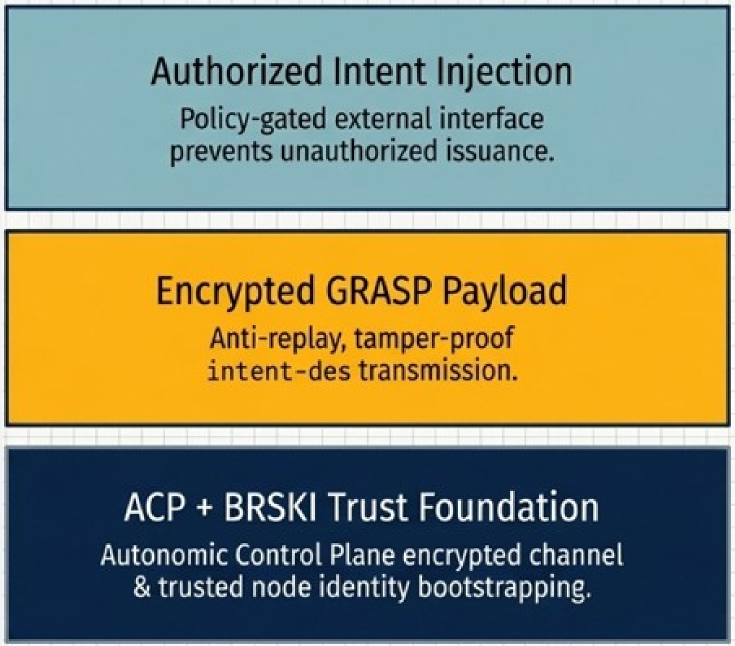
Flood the message to all selected nodes to finalize and lock temp reservations.

Standardized Feedback

Return allocated resource details (path metrics,expected performance) to the external upper-iayer system.

Dynamic Lifecycle





Feedback AND Next Step

Suggestion1

The negotiation process should consider integrating more of the existing mechanisms from RFC 8990.

Suggestion 2

When releasing resources, consider using GRASP's dry-run capability to validate solution feasibility in advance.

Future work 1

Revise the description of the negotiation process and consider adopting the dry-run mechanism to optimize resource reservation and failure handling.

Future work 2

Use standard tools to verify and correct the CDDL format. Complete the whole framework together with other draft including the implementation and demonstration

Thanks and comments!

draft-du-anima-service-intent-auto-deployment

ANIMA@IETF 125@ShenZhen

Beijing University of Post and Telecommunications

Jialu Du,Ye Tian, Xiangyang Gong, Sheng Jiang