Use Cases and Practices for Intent-Based Networking

IETF 120
draft-kdj-nmrg-ibn-usecases-01

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Background of the Document (1/2)

• The positioning of this document
  • Refine methodologies to build IBN systems
  • Make a summary of the practical learnings from different use cases (i.e., difficulties, challenges, research directions, etc.)
  • Merge IBN use cases drafts (i.e., expired and active drafts)

• Why merging?
  • There are many relevant documents still active in NMRG and also in other groups.
  • Some of them may have similar parts, like sharing similar architectures and using similar methods for implementation.
  • The goal is to better organize these use cases and condense the research value of IBN and other relevant topics, like Intent-driven networking, autonomous networking, AI and network management, etc.
Background of the Document (2/2)

• Some progress after IETF119 and the interim meeting on IBN use cases.
  • Authors and contributors of the relevant drafts agreed on merging IBN use cases documents to be a single document.
    • Maybe it has not covered all relevant drafts, but it covered most of them.
  
• Most of the comments received from the interim meeting have been addressed:
  • Methodologies have been refined.
  • We set up a new section for learnings and takeaways.
  • The maturity of use cases will be polished in the next version.
The Structure of the Document

1. Introduction
2. Methodologies for Building IBN Systems
   2.1. System Awareness and Data Collection
   2.2. Construction of IBN Systems
3. IBN Use Cases
   3.1. IBN for Routing and Path Selection
       3.1.1. IBN for Service Function Chaining
       3.1.2. IBN for SRv6 Networks
   3.2. IBN for SLA Guarantee
       3.2.1. Clustered Alternate-Marking Methodology
   3.3. IBN for Cloud-Based Security Service Management
   3.4. IBN for IoT Device Management
   3.5. IBN for Software-Defined Vehicle Management
   3.6. IBN for Interconnection
   3.7. IBN for IETF Network Slices
4. Practice Learnings
   4.1. Difficulties and Challenges
   4.2. Future Research Directions
5. Other Considerations
6. Security Considerations
7. IANA Considerations
8. References
   8.1. Normative References
   8.2. Informative References

• Introduction
  • Briefly explaining the positioning of the document and its relationship with RFC 9315 and RFC 9316

• Methodologies for Building IBN Systems
  • Summarization of the methods for building IBN core components

• IBN Use Cases
  • Merging IBN use cases in and out of NMRG

• Practice Learnings
  • Summarization of the achievements, difficulties and challenges, and future research directions for building IBN systems
Methodologies for Building IBN Systems

• System Awareness and Data Collection
  • Methods and Tools
  • Metrics (e.g., traffic-related ones and network-related ones)
  • Granularity (e.g., traffic type, time, and spatial aspect)

• Construction of IBN Systems
  • Intent Translation (e.g., template-based ones and NLP-based ones)
  • Policy Generation and Mapping (e.g., ruled-based provisioning and inference-based generation)
  • Intent Deployment
  • Intent Verification
  • Evaluation
  • Optimization
IBN Use Cases (1/2)

• Which documents were merged?
  • draft-chen-nmrg-ibn-management-01
  • draft-yang-nmrg-network-measurement-intent-07
  • draft-park-nmrg-ibn-network-management-srv6-02
  • draft-jeong-nmrg-ibn-network-management-automation-04
  • draft-jeong-i2nsf-security-management-automation-07
  • draft-jeong-opsawg-intent-based-sdv-framework-02
  • draft-contreras-nmrg-interconnection-intents-05
  • draft-contreras-nmrg-transport-slice-intent-07
  • others to be merged...
• Should Section 3 (IBN Use Cases) replace all other use cases drafts?
  • This may be controversial now, so we want to hear opinions from the NMRG.
  • Some of the use cases drafts may be merged to this draft in the case where they have only overall architecture and ideas rather than detailed operations and management.
  • Others may be further developed as independent drafts with detailed operations and management for real implementation and deployment.

• About the Structure of Section 3
  • Currently, it is just piled up with different use cases and not well organized.
  • It will be improved in next steps.
Practice Learnings

• Difficulties and Challenges in Building IBN Systems
  • How to achieve stability in dynamic network environments?
  • How to achieve collaborative management across multiple domains?
  • How to achieve resource constrained IBN deployment?

• Future Research Directions
  • A Generic Intent Model for Full Life-Cycle Assurance
  • Autonomous End-to-End Network Policy Generation
  • Intent Implementation with Large Language Models (LLMs)
Next Steps

• Polishing the Document
  • The authors will polish up Section 3 (IBN Use Cases) to make each use case be well-organized to have the same tone and style with a similar depth of description in terms of both description and maturity.

• Enhancement of the Document
  • The authors will enhance other sections according to comments from the NMRG.

• Adoption Call
  • May I ask for Adoption Call to speed up its development with the NMRG?
Appendix: SDV Use Case
(SDV: Software-Defined Vehicle)
Figure 6: The Life Cycle of Intent-Based System (IBS) for Software-Defined Vehicle (SDV) Management
Figure 7: Intent-Based Management Framework for Software-Defined Vehicles

- **SDV User**
  - Make an intent and send it to Cloud Controller.

- **Cloud Controller**
  - Translate the intent into a high-level policy and send it to SDV Controller.

- **SDV Controller**
  - Translate the high-level policy into a low-level policy and send it to Service Functions (SFs).

- **Service Functions**
  - Perform the requested services.
Hackathon Project for Software-Defined Vehicles

ietf120-hackathon-interface-to-in-network-functions-i2inf/

- **SDV User**
  - Make an intent (e.g., SDV monitoring) and send it to Cloud Controller.

- **Service Function (e.g., Powertrain ECU)**
  - Perform the requested service (e.g., SDV monitoring data delivery)
  - Deliver Monitoring Data to Cloud Analyzer