

**IETF-118 NMRG**

# **Intent-Based Network Management Automation in 5G Networks** **(draft-jeong-nmrg-ibn-network-management-automation-03)**

**November 10, 2023**  
**Prague**



**Jaehoon (Paul) Jeong**  
**Department of Computer Science and Engineering, SKKU**  
**Email: [pauljeong@skku.edu](mailto:pauljeong@skku.edu)**

# Problem Statement (Research Questions)

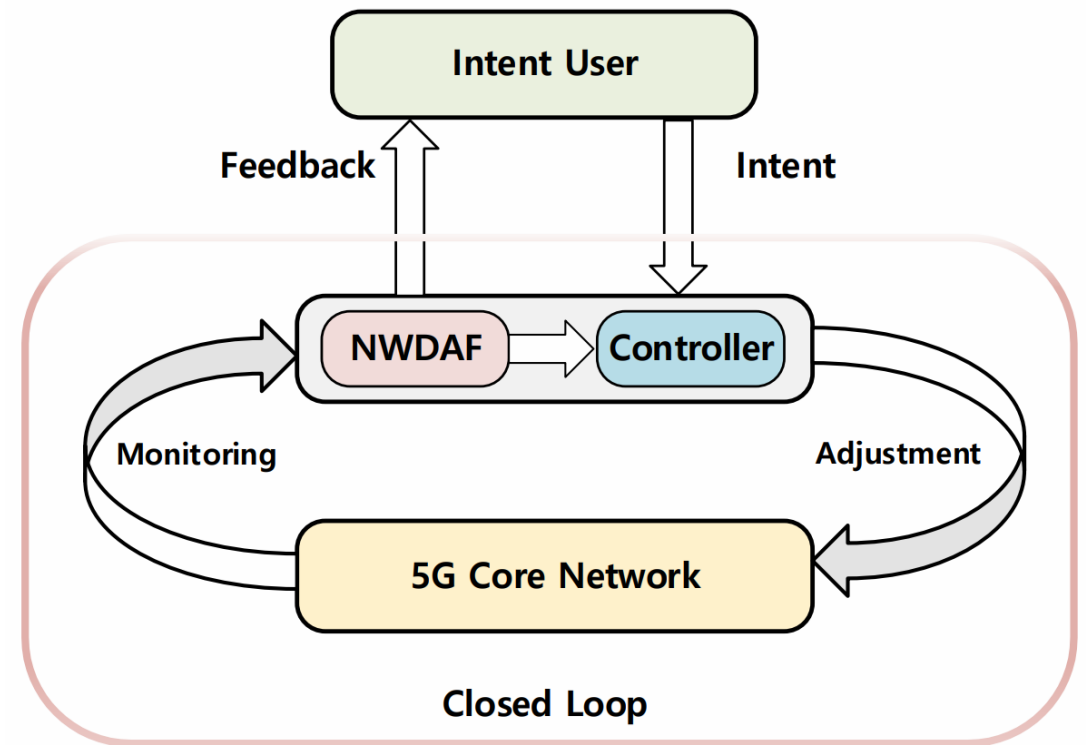
- The goal of this draft [1] is to make a use case of IBN for 5G network management.
  - The common part of the definitions of Intent from IETF NMRG and 3GPP [2-6] is used for IBN.
- The following work items will be investigated:
  - A framework for 5G intent-based network management,
  - A data model mapper between an intent data model and a policy data model,
  - An intent translator from an intent to a policy,
  - A closed-loop control for intent assurance, and
  - A network audit system for secure intent provisioning.

# Suggestion for NMRG Use Cases

- NMRG can work for guidelines for an intent translator and closed-loop control mechanism for demands from other SDOs (3GPP, ETSI, ITU-T) such as
  - 5G core network management (e.g., network slicing, SRv6 routing, and fault recovery),
  - Internet of Things (IoT) device management, and
  - V2X vehicular network management (for terrestrial vehicles, Urban Air Mobility (UAM), and drones).
- NMRG can use the Security Policy Translator (SPT) of I2NSF WG as a reference:
  - <https://datatracker.ietf.org/doc/html/draft-yang-i2nsf-security-policy-translation-15>

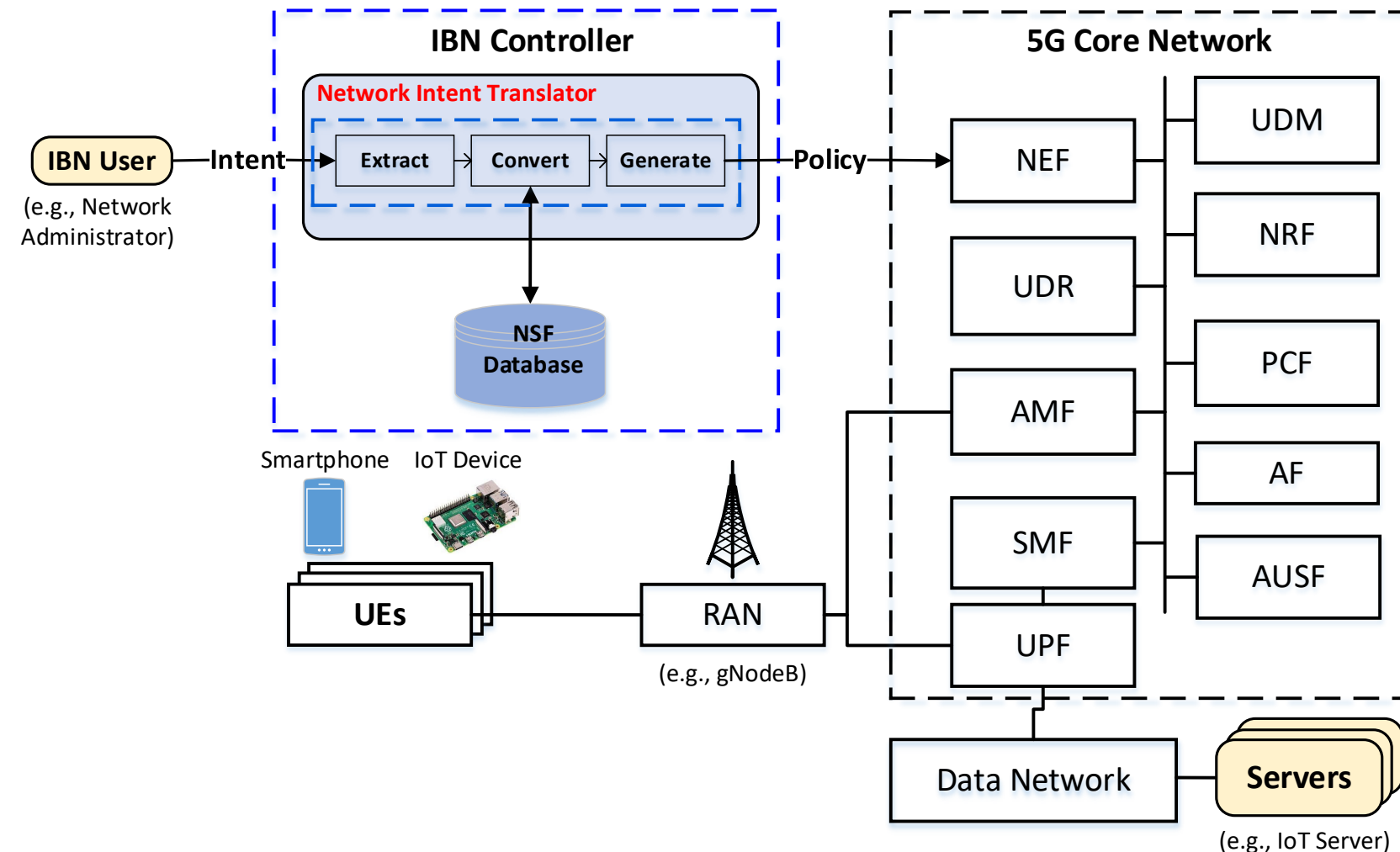
# Intent Driven Management Service [3-6]

- Intent [2] can be used for management and control of closed-loop automation.
- Intent User provides an intent to the Controller, which will be translated to configure the 5G Networks.
- Then the NWDAF can monitor and collect data from the 5G Networks to analyze the performance.
- Feedback will be given to adjust the 5G Networks to ensure the performance is up to the intent of the user.



Intent-based closed loop system  
for 5G core networks

# Intent-Based Network Management Automation (1/7)



## • Intent Translation

1. **Extract:** Verify an intent [1,2] given by IBN User and extract data.
2. **Convert:** Transform the extracted intent data to the corresponding policy data and select the proper Network Functions to apply the policy.
3. **Generate:** Producing a policy in a JSON format to be delivered to the selected Network Function (e.g., NEF).

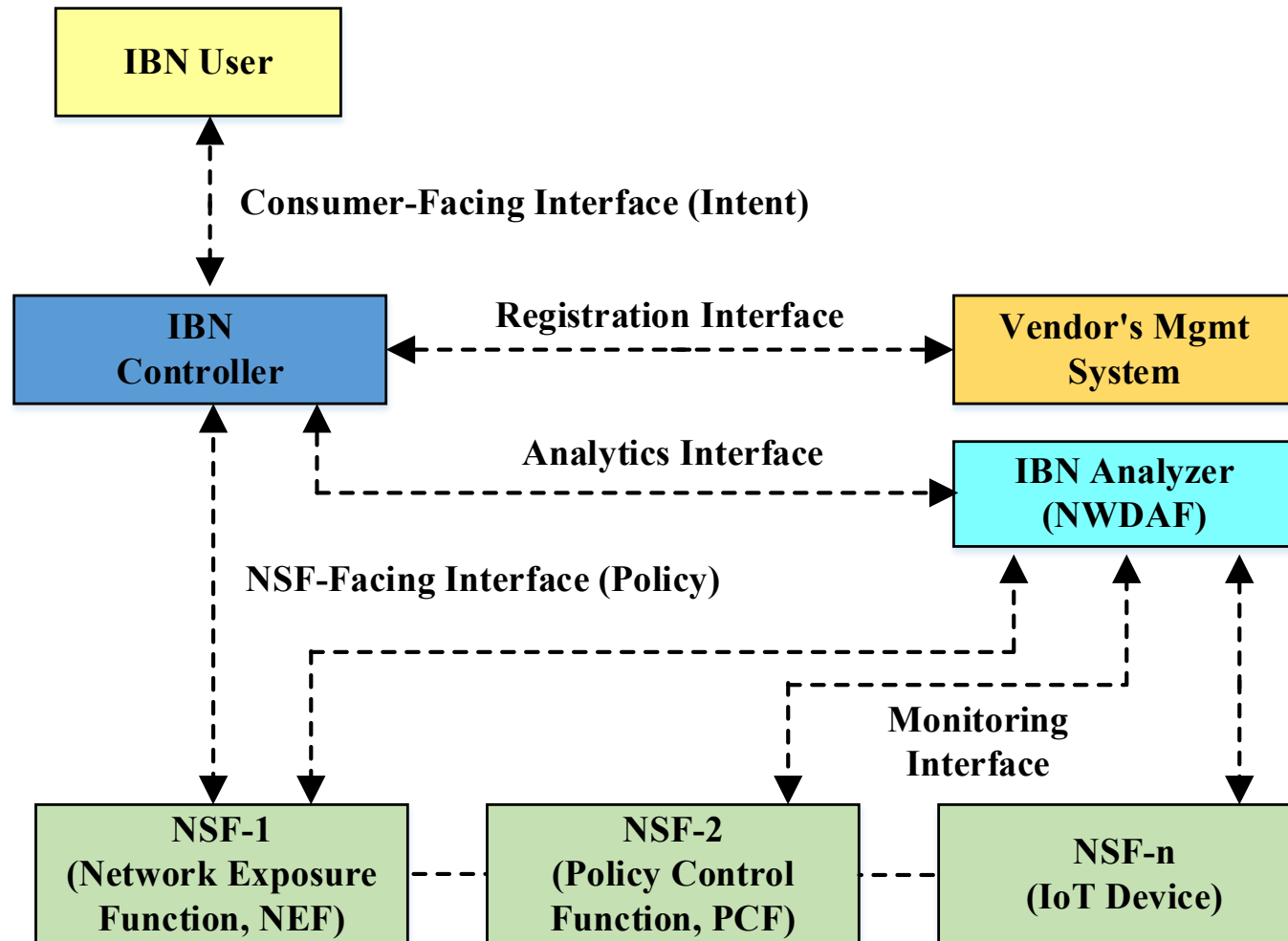
# Intent-Based Network Management Automation (2/7)

- SKKU, SSU, and ETRI are working for an Intent-Based Network Management Automation for 5G Networks.
  - Intent-Based Network Management Automation in 5G Networks [1]
    - <https://datatracker.ietf.org/doc/html/draft-jeong-nmrg-ibn-network-management-automation-03>
  - They have an experience of having developed a Security Policy Translator (SPT) in the I2NSF WG:
    - <https://datatracker.ietf.org/doc/html/draft-yang-i2nsf-security-policy-translation-15>
    - [Open Source] <https://github.com/jaehoonpaul/i2nsf-framework>
- The above draft [1] specifies the following:
  - The Framework of Intent-Based Network Management in 5G networks.
  - A Network Intent Translator (NIT) (with data model mapper) from an intent to a policy.
  - A Network Audit System for remote attestation of network functions
  - A Use Case of IoT device data aggregation in 5G networks



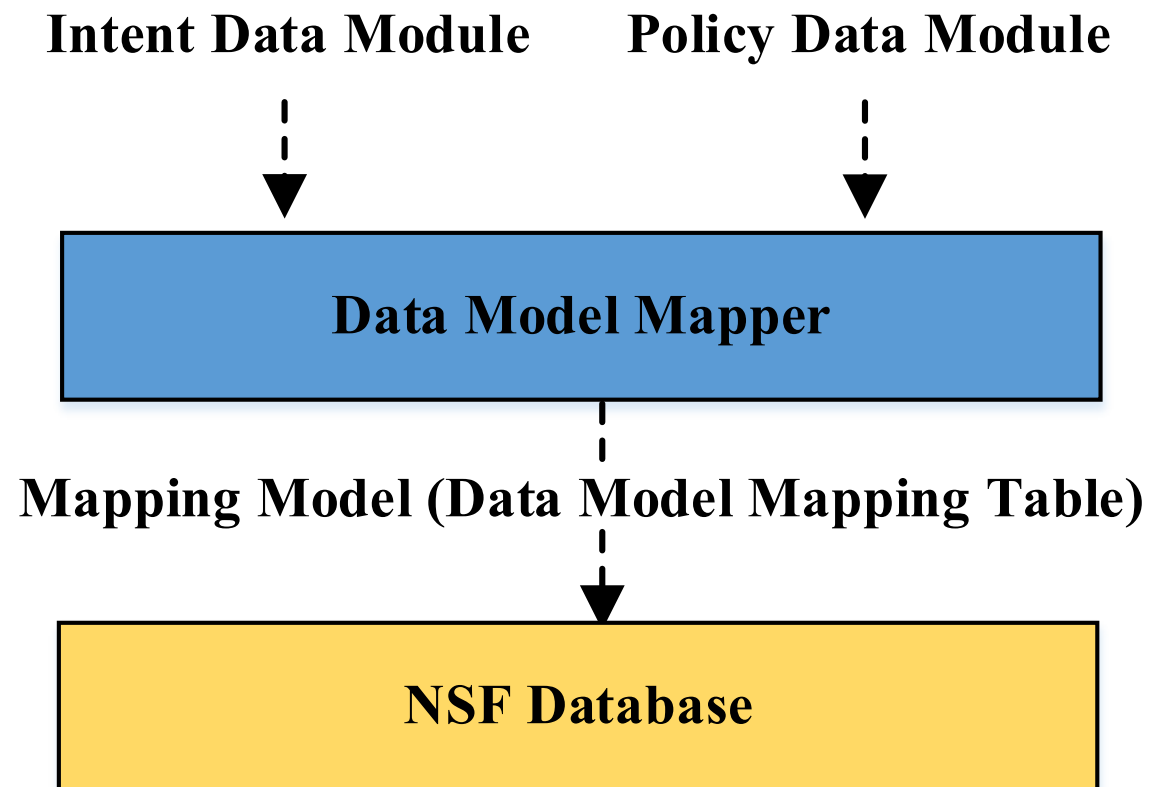
# Intent-Based Network Management Automation (3/7)

- 5G Intent-Based Network Management Framework



# Intent-Based Network Management Automation (4/7)

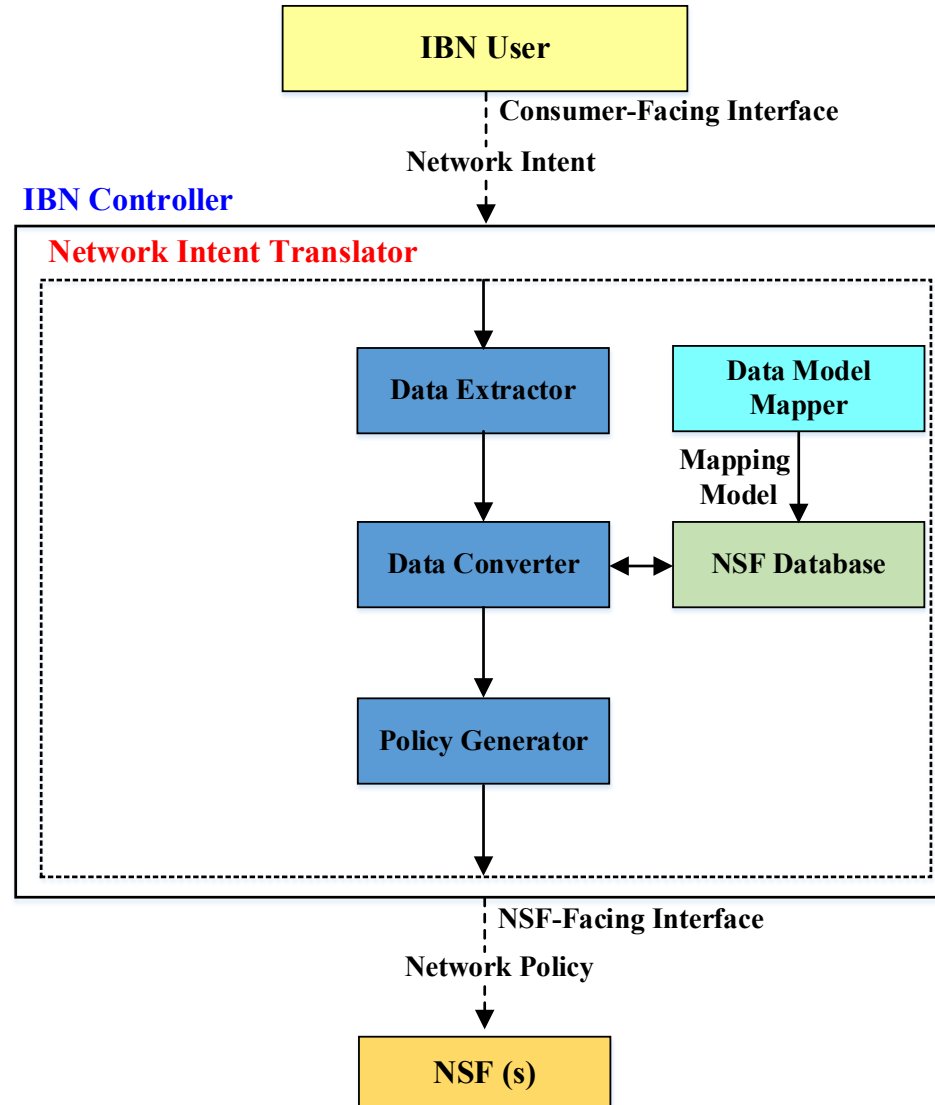
- Automatic Mapping of Intent and Policy Data Models





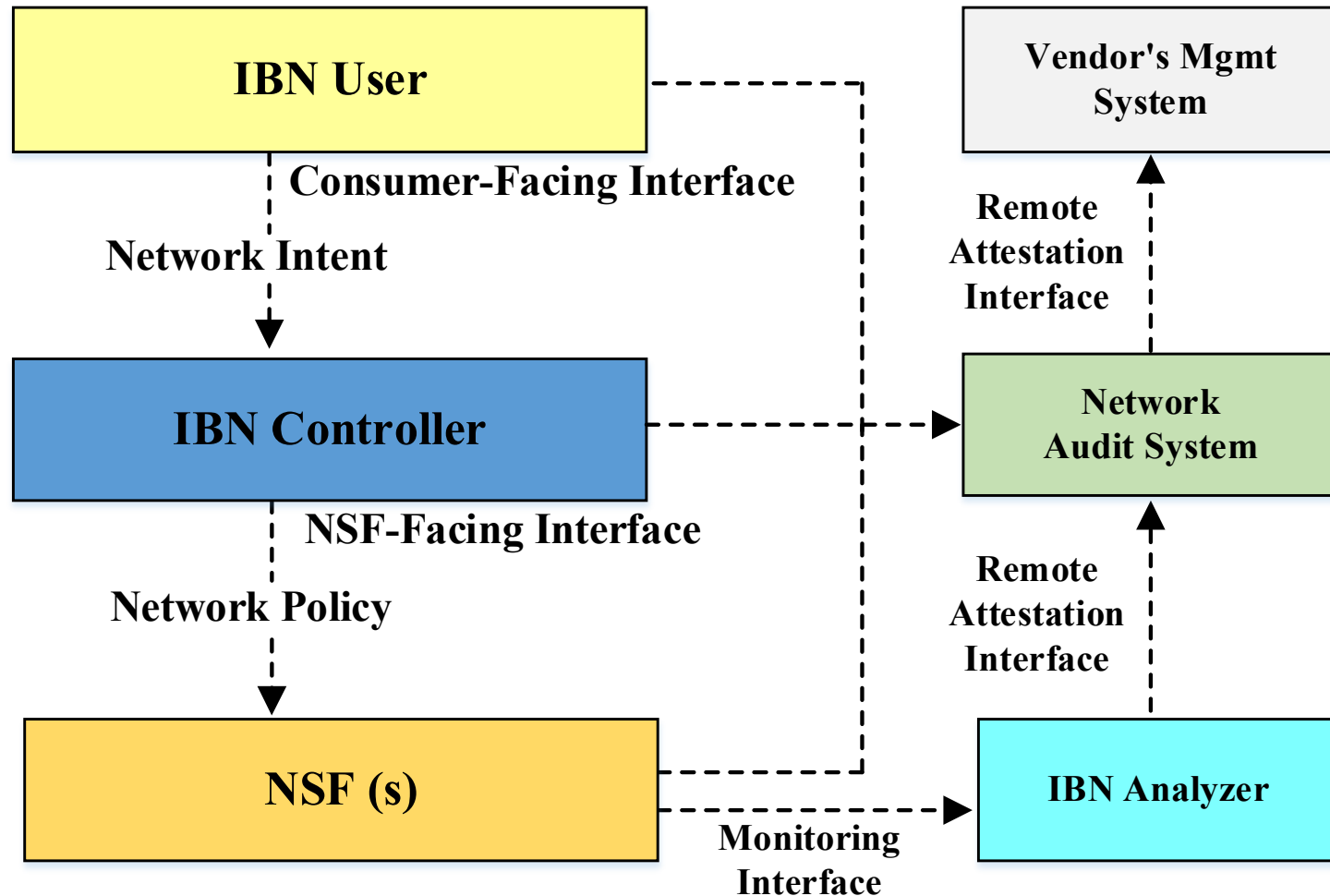
# Intent-Based Network Management Automation (5/7)

- Network Intent Translator (NIT)
  - Translates Network Intent into Network Policy.



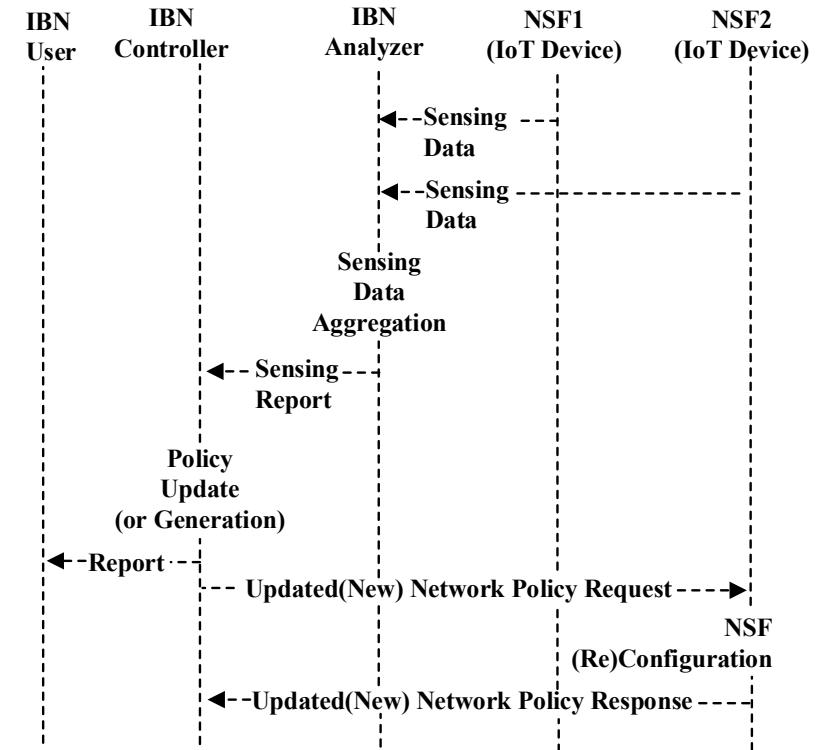
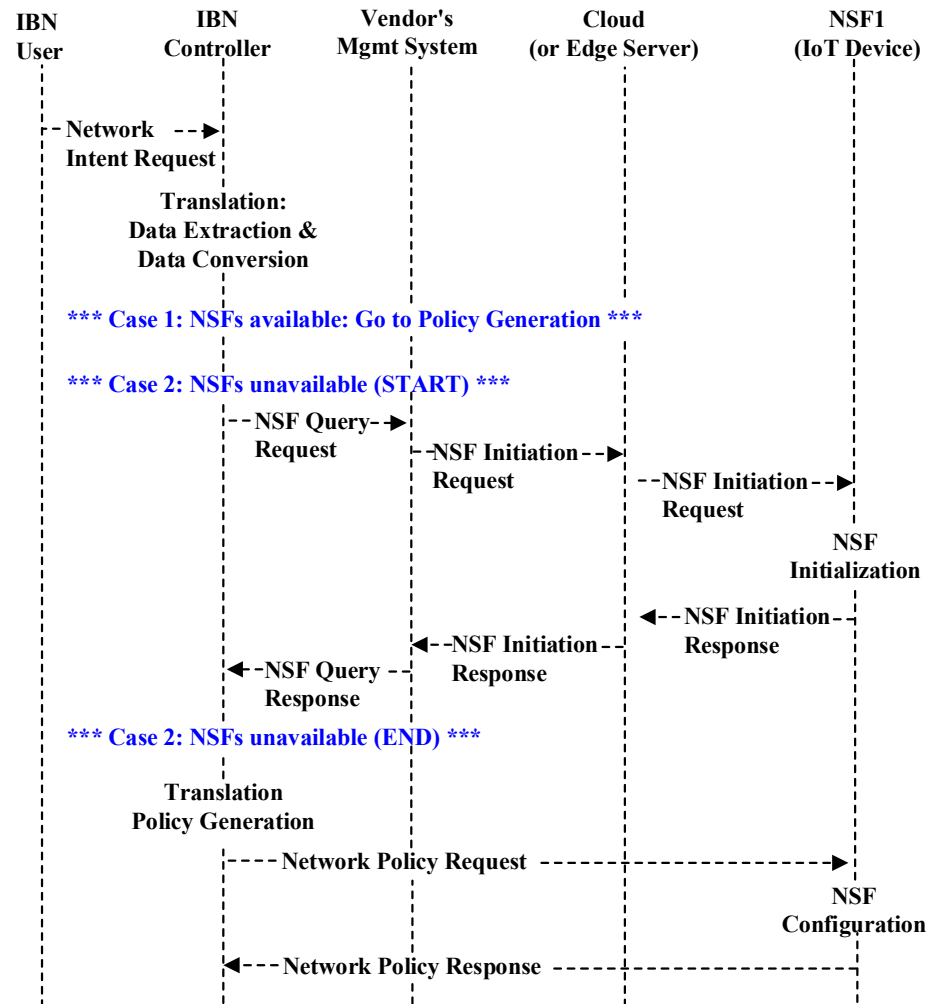
# Intent-Based Network Management Automation (6/7)

- Network Audit System for Activity Auditing



# Intent-Based Network Management Automation (7/7)

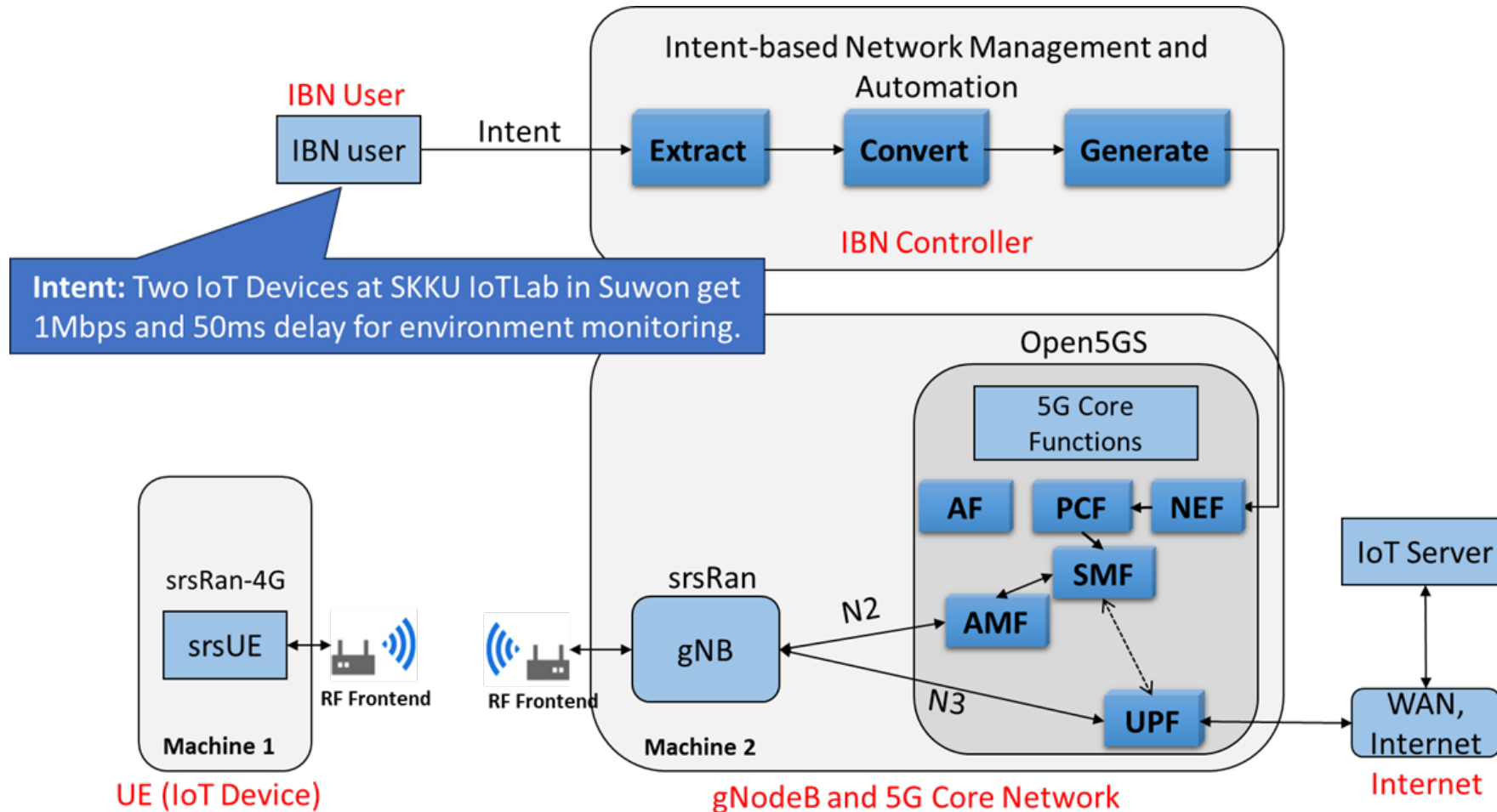
- IoT Device Data Aggregation Policy Enforcement and Reporting



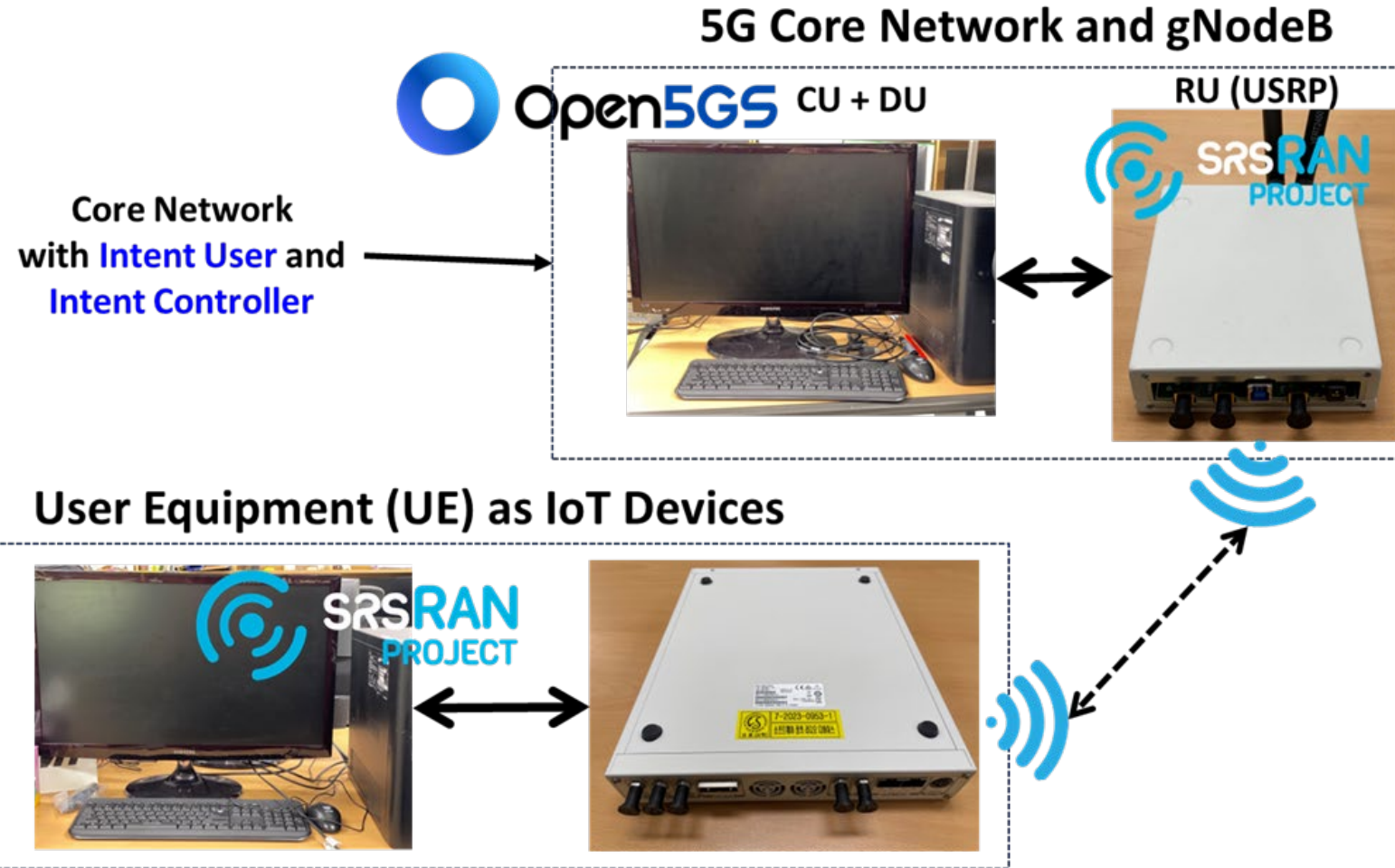
# Intent Types

- Intent Types
  - **Network Intent**: e.g., throughput and E2E delay
  - **Application Intent**: e.g., configuration for applications
- Examples of Intents
  - **Network Intent**: Two IoT devices at SKKU IoTLab in Suwon get 1Mbps and 50ms delay for environmental monitoring.
  - **Application Intent**: SKKU IoTLab's IoT devices measure light & temperature, and report them to an IoT server every 5 min.

# SKKU 5G Testbed (1/2)



# SKKU 5G Testbed (2/2)



[IETF-118 NMRG Hackathon Project] <https://github.com/IETF-Hackathon/ietf118-project-presentations/blob/main/IETF118-Intent-Based-Network-Management-Automation-Hackathon-Project.pdf>



# Next Steps

- Is this draft valuable to work on it in NMRG?
- If so, may this draft be adopted as an RG item now?  
Or is it needed to develop this draft more?
- In this IETF-118 NMRG hackathon project, we showed the feasibility of 5G Testbed.
  - We will work on 5G Testbed to support Intent-Based Network Management Automation at IETF 119.
- We welcome your comments and feedback 😊

# References

1. J. Jeong, Y. Ahn, Y. Kim, and J. Park, “Intent-Based Network Management Automation in 5G Networks”, draft-jeong-nmrg-ibn-network-management-03, November 2023.  
<https://datatracker.ietf.org/doc/draft-jeong-nmrg-ibn-network-management-automation/>
2. A. Clemm, L. Ciavaglia, L. Z. Granville, and J. Tantsura, “Intent-Based Networking - Concepts and Definitions”, RFC 9315. <https://doi.org/10.17487/RFC9315>
3. 3GPP. (2023). Management and orchestration; Intent driven management services for mobile networks (Technical Specification (TS) 28.312). 3rd Generation Partnership Project (3GPP).  
<http://www.3gpp.org/DynaReport/28312.htm>
4. 3GPP. (2020). Telecommunication management; Study on scenarios for Intent driven management services for mobile networks (Technical Report (TR) 28.812). 3rd Generation Partnership Project (3GPP). <http://www.3gpp.org/DynaReport/28812.htm>
5. 3GPP. (2023). Management and orchestration; Concepts, use cases and requirements (Technical Specification (TS) 28.530). 3rd Generation Partnership Project (3GPP).  
<http://www.3gpp.org/DynaReport/28530.htm>
6. 3GPP. (2023). Management and orchestration; Provisioning (Technical Specification (TS) 28.531). 3rd Generation Partnership Project (3GPP).  
<http://www.3gpp.org/DynaReport/28531.htm>