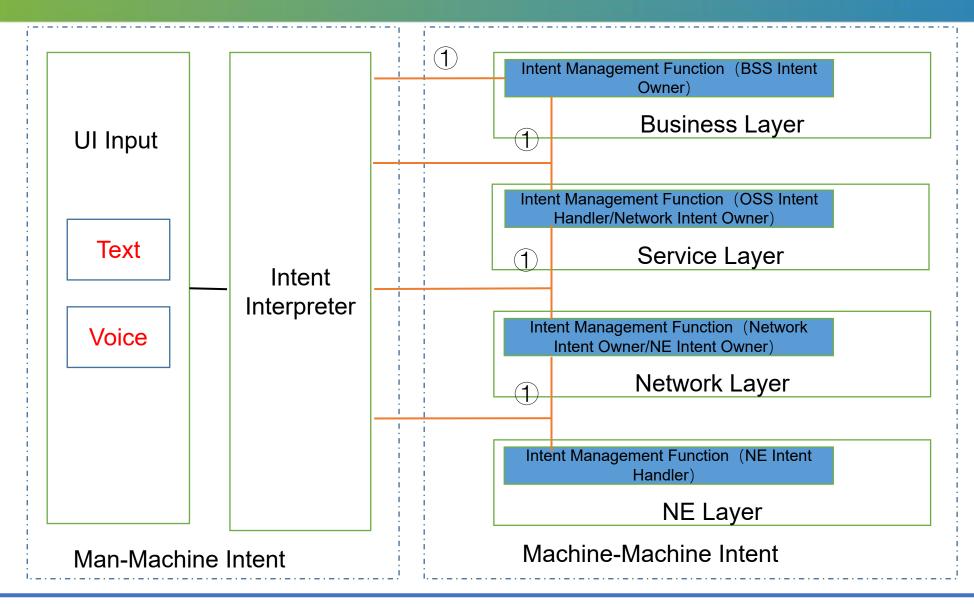# Use Cases Proposal for Nephio

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Autonomous network intent management framework

Nephio can play a significant role in the intent processing within the Network Layer and NE Layer.

The intent standard projects led by our team

Lead projects:

● ETSI NFV-IFA 050 Intent Management Service Interface and Information Model Specification
https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=64383

● ETSI ENI 013 Intent Policy Model Gap Analysis
https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=62019

● ONAP R11/R12 General Intent Model and General Intent Interface Requirements
https://wiki.onap.org/pages/viewpage.action?pageId=138872665

Participated projects:

● 3GPP SA5 Intent driven management services for mobile networks
https://www.3gpp.org/ftp/Specs/archive/28_series/28.312

● TM Forum IG1253 Intent in Autonomous Networks
https://projects.tmforum.org/wiki/display/ANP/IG1253+Intent+in+Autonomous+Networks+v1.2.0

Intent for Core Network Element Delivery

Intent Information: This intent includes the following information: NE type, target metrics (such as connection count, user count, etc.), location information (deployment location/service area information, etc.), configuration information (interface information, IP, network, etc.), and resource information (virtual resource information, etc.).

Intent Owner: The Core Network Management System in the Operations Support System (OSS).

Intent Handler: The vendor's core network management functionality. (Maybe use Nephio)

Implementation: Nephio determines whether to create new core network elements or perform modifications (scaling) on existing ones. It generates relevant operations for the core network element (deployment or scaling) and issues configuration information specific to that core network element. Nephio also conducts monitoring and health checks to ensure intent fulfillment, with support for recovery plans in case of non-compliance. And nephio reports whether the delivery intent for core network elements has been achieved and provides intent handling results to the Core Network Professional Management System.

Intent for Core Network Assurance

Intent Information: This intent containing core network assurance expectations, such as improving energy efficiency KPIs in the core network subnet by m%

Intent Owner: The Core Network Management System in the Operations Support System (OSS).

Intent Handler: The vendor's core network management functionality. (Maybe use Nephio)

Implementation: Based on the expectations of improving core network energy efficiency,Nephio monitors metrics related to energy efficiency, such as vCPU utilization and critical network KPI metrics. It can adjust energy usage while ensuring network KPI requirements are met. And Nephio can report whether the core network's energy efficiency improvement expectations have been achieved.

Using AI to Identify Unfulfilled Intent

Nephio can utilize AI for intelligent diagnosis and analysis. By processing intent reports and monitoring data, along with historical records, it intelligently identifies instances where intents are not fulfilled and provides corrective solutions.

- When an AI model detects potential issues or unfulfilled intents, it notifies the Intent Owner through an Intent Report.

- Using AI technology to formulate a response plan for quickly resolving issues or taking measures to ensure that the intent is restored to satisfied state.

- As the network and demands evolve, continuously optimizing the AI model and response strategies to enhance Nephio's reliability and performance.

Using AI to Resolve Intent Conflicts

AI can provide intelligent, automated, and efficient solutions in handling intent conflicts. It helps Nephio reduce the issues caused by intent conflicts and ensures that the intents of different users or systems are appropriately addressed.

- AI can effectively detect conflicts between different intents. This may involve multiple intents accessing the same resources or performing the same tasks, or their requirements conflicting with each other.

- AI can analyze the root causes of intent conflicts. It can take into consideration the relationships between intents, constraints, and other contextual information to better understand conflicts.

- AI can formulate decisions to resolve intent conflicts. This may involve determining which intent should take precedence based on priorities, resource availability, and other factors or coordinating the execution of different intents.

- AI can automatically adjust the execution of intents to resolve conflicts. This may include rescheduling the execution time of tasks, reallocating resources, or modifying the way tasks are executed.

Intent Model from other system

Attribute	Content	Description
intentId	String	The identifier of this intent.
intentName	String	It describes the name of the intent.
	IntentExpectation	Multiple expectation lists contained in one intent.
intentContexts	Context	It describes the list of IntentContext(s) which represents the constraints and conditions that should apply for the entire intent.
intentFulfilmentinfo	FulfilmentInfo	It describes status of fulfilment of an intent and the related reasons for that status.

Nephio CRD

```
apiVersion: nf.nephio.org/v1alpha1
kind: FiveGCoreTopology
metadata:
  name: fivegcoretopology-sample
spec:
  upfs:
    - name: "agg-layer"
      selector:
        matchLabels:
          nephio.org/region: us-central1
          nephio.org/site-type: edge
      namespace: "upf"
      upf:
        upfClassName: "free5gc-upf"
        capacity:
          uplinkThroughput: "1G"
          downlinkThroughput: "10G"
        n3:
          - networkInstance: "sample-vpc"
            networkName: "sample-n3-net"
        n4:
          - networkInstance: "sample-vpc"
            networkName: "sample-n4-net"
        n6:
          - dnn: "internet"
            uePool:
              networkInstance: "sample-vpc"
              networkName: "ue-net"
              prefixSize: "16"
```

- Convert other intent model to the format of Nephio CRDs.
- Operation information of Nephio intent is parsed and added to other intent model.