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ONAP R11- general intent model and general intent interface

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01 Motivation and SDO Background

02 Achievements of China Mobile in intent research

03 Relationship with existing work of ONAP

04 Requirements for general intent model and interface

05 Project roadmap

Introduction to intent

Definition of intent

- Intent is the formal specification of all expectations including requirements, goals, and constraints given to a technical system. (TMF IG1253)
- Intent expresses the expectations that need to be realized without paying attention to how to realize them.
- Intent decouple the expectations of the system from the specific implementation details, leaving room to allow the producer to explore alternative options and find optimal solutions.
- Intent reduces the degree of manual participation in the network and improves the automation level and operation efficiency.
- Intent simplify the network operation process, reduce the network operation cost and improve the external business growth of operators.

Current situation of Intent Research

- The research on intent is still in the preliminary stage, and operators and manufacturers have not reached an agreement on intent management.
- Lack of consensus on intent interface and intent expression model.
- Lack of definition of intent information model and intent data model.

China Mobile

- Objective : Build an L4 level autonomous network by 2025.
- Action : Reserch on the key technologies, reference implementation and industry standards of intent network management to ensure that the operation of intent network meets the overall expectations of operators.

Motivation for introducing general intent model

The formal expression of intents can be achieved by well-defined information models which completely define the semantics and vocabulary that is required for the operation of each autonomous system that uses intents.

TMF IG1253

Intent modeling defines the expressiveness of intent. It introduces vocabulary and semantics needed to express and encode the knowledge about requirements, goals and constraints an intent object shall carry. Standardized intent models define common semantics in order to enable two parties to agree on the meaning of intent and remove ambiguities and divergent interpretation.



3GPP 28.312

An intent is typically understandable by humans, and also needs to be interpreted by the machine without any ambiguity.

ZSM 011

The sender and receiver of intents need to agree in their interpretation; therefore, there should be no ambiguity in their meaning.

Motivation for introducing general intent interface

The intent handling interface is the means of communication between two intent management functions. One of them is in the intent handler role and the other in the intent owner role. This interface and its procedures are closely related to the phases and tasks within intent lifecycle management.

TMF IG1253

All domain specific information would be encapsulated within the intent and subject to the modeling of intent. This domain independence immediately means that an implementation of the intent handling interface can be reused for every intent management function irrespective of its intent handling scope.



3GPP 28.312

An Intent driven MnS includes several management capabilities to support intent lifecycle management.

ZSM 011

In general, the needed capabilities for intent object instances life cycle management and intent reporting can be offered by the intent interface operations together with intent models that extend the intent interface capabilities and deliver additional information.

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Achievements of China Mobile in Intent Research

1

ETSI ENI 013

- Investigate the current situation of SDO intent Research (including general intent model and intent interface).
- Provide a list of recommendations for common solutions.

3

CCSA

- Research and discuss intent management architecture and related reference points, intent expression model, intent lifecycle management, etc
- Five projects have been approved in CCSA TC7/SP1.

5

3GPP

- Participate in and promote the discussion on relevant standards such as intent definition, intent classification, intent model, intent interface, etc.

2

ETSI ENI 015

- Enhance the processing of intent policy.
- Research intent decomposition technology and provide proposed solutions.

4

ETSI NFV IFA050

- Specify the intent management service interface in nfv-mano, including interface requirements and operations.
- The specified general intent model can be used for developing NFV intent model, and the intent model specific to nfv-mano domain is specified.

6

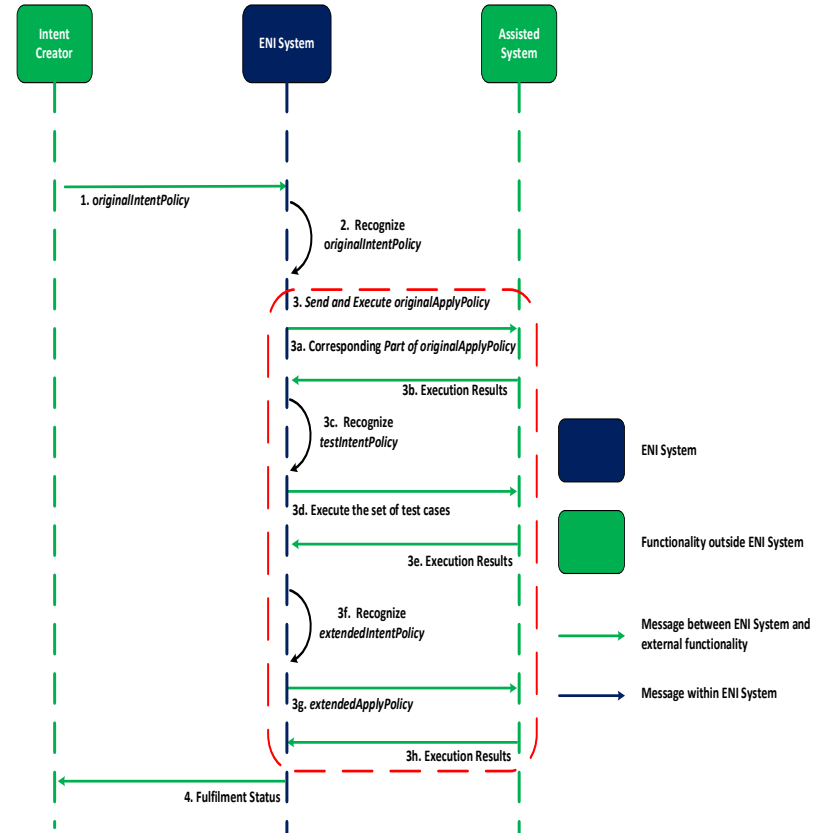
TMF

- Continuously participate in working discussions on general intent model and intent interface.
- Deeply participate in the discussion of autonomous network and intent framework.

Intent decomposition

ETSI ENI 015

- Considering the complexity of user's goals, the intent decomposition can be introduced to enhance the general procedures of intent policy processing. The processed intent is able to be decomposed by three components, which are about execution, testing and extension.
- Ensure the realization of the intent creator's goals (the goals of intent are able to be tested and assured automatically. If the testing results are not able to meet the goals, the corresponding extended procedure will be triggered automatically).
- In the right figure, an intent decomposition method is described. An "originalIntentPolicy" is able to be recognized as "originalApplyPolicy", "testIntentPolicy" and "extendedIntentPolicy".
- In the different intents involved in decomposition, the general intent model and general intent interface are adopted to make all intents use the same expression and interaction mode.



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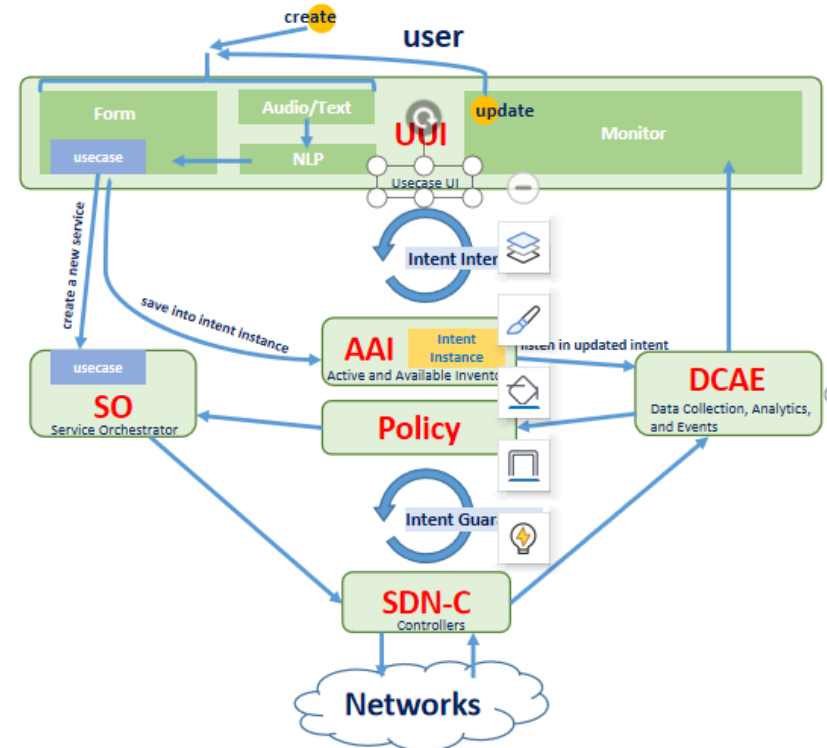
Existing intent work of ONAP

Key Functions and Developments of Intent-based Networking in ONAP:

- ✓ **REQ-453/ONAPARC-641** Smart Operator Intent Translation in UUI based on IBN - R8 5G Slicing Support
- ✓ **REQ-861/ONAPARC-701** Smart Intent Guarantee based on IBN - R9 Intent Instance
- ✓ **REQ-1074/ONAPARC-729** Smart Intent Guarantee based on Closed-loop in R10
- ✓ **REQ-1075/ONAPARC-730** Network Services without Perception for Users based on IBN
- Maintenance and Enhancement of Intent-driven Closed-loop Autonomous Networks in R11

Collaborations and Outputs with SDOs (ETSI ZSM / ITU-T):






- ✓ **ETSI ZSM PoC 003:** Automation of Intent-based cloud leased line service
- ✓ **ITU-T:** Scenarios and Requirements of Intent-Based Network for network evolution; functional architecture of NGN evolution by adoption of Intent-Based Network; signalling architecture of Intent-Based Network for network evolution



Architecture of Intent-driven Closed-loop Autonomous Networks

Relationship with existing work of ONAP

The existing intent work of ONAP introduce the concept of intent into ONAP through in-depth research and pioneering work. The solution in our requirement is a supplement and enhancement to the existing solutions of ONAP.

-  **Introducing intent decomposition technology**
to enable the handling capabilities for complex intent.
-  **Introducing general intent model**
to improve interoperability between components/systems via standardised intent description.
-  **Introducing general intent interface**
for all the related interactions involved in the life cycle management of intent.
-  **Enhancing intent mapping capability**
from expectation to actions via AI model or Apex policy etc.
-  **Enhancing intent use case**
to include cloud leased line, which illustrates the enhanced end-to-end intent handling process.

01

Enhancing the flexibility of intent processing

- The concept of intent decomposition is introduced, so complex intents can be flexibly decomposed into lower level intents.
- Intents can be reused in composite intents to enhance the reusability of intent implementation technologies.
- Via INTENT ANALYSIS SERVER (later explained in detail), ONAP components can easily support intent related functions.

02

Enhancing the generality of intent processing

- Model federation mechanism is introduced (later explained in detail) to enable domain extension.
- Through the use of INTENT ANALYSIS SERVER, the system supports the interaction with other third-party intent systems.
- Except the existing man-machine intent interface, machine-machine intent interface is supported.

03

Enhancing standardization

- Based on the existing standards of TMF(TM F IG1253/TMF 921A), ETSI ENI 015 etc.
- The schemes and use cases implemented by this requirement can also contribute to the intent related standards.

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REQ-1267 General intent model and general intent interface

For complex intent, such as the intent of cloud leased line, it is necessary to decompose the complex intent into sub intents of different dimensions, and implement the user's original intent through the execution of sub intents. So we need to deal with machine-machine intent, and for different intents or sub intents in the system, it is necessary to provide general intent model and general intent interface to ensure that all intents(especially machine-machine intents) operate according to the same expression and process.

Key Contacts - Lingli Deng(CMCC), Keguang He (CMCC), Chuanyu Chen (Huawei), Dong Wang (China Telecom), Henry Yu(Huawei)

Executive Summary - This requirement provides general intent model and general intent interface in ONAP to make all intents(especially machine-machine intents) in the system operate in the same way. At the same time, for complex intents, the technology of intent decomposition and orchestration is provided, and the above ideas and schemes are fully implemented in ONAP through a use case based on cloud leased line.

Business Impact - Complex intents can be decomposed into simple intents, and the modeling and interaction of intents can be ensured to be handled in a unified way.

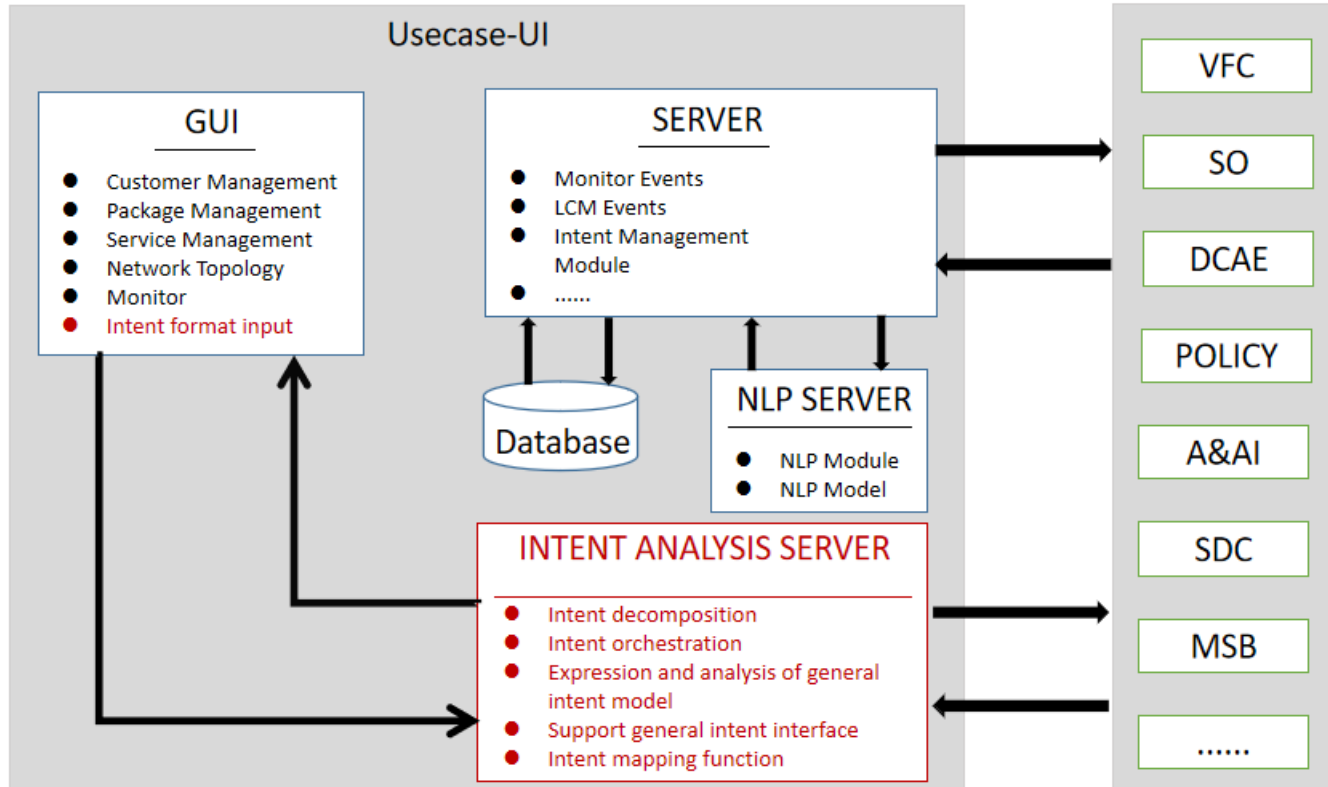
Business Markets - This REQ provides a novel solution to intent modeling and interaction:

1. It provides model federation mechanism to make the intent modeling execute according to the unified specification, and can reuse the existing domain related models which enables extension to different application scenarios.
2. It provides the unified intent interface, which makes the intent interaction in the running state more interoperable and manageable.

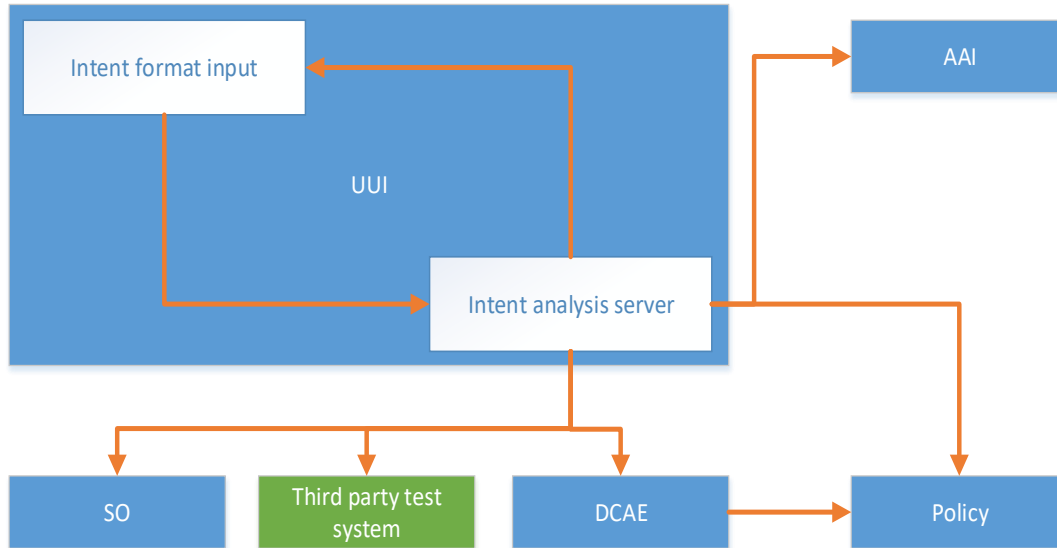
Funding/Financial Impacts - By formulating general intent modeling methods and interactive interfaces, standardize the intent operation process, improve user friendliness, improve the customer experience and increase the business value.

Organization Mgmt, Sales Strategies - *There is no additional organizational management or sales strategies for this requirement outside of a service providers "normal" ONAP deployment and its attendant organizational resources from a service provider.*

Add intent analysis micro service in UUI



Interaction with existing ONAP components



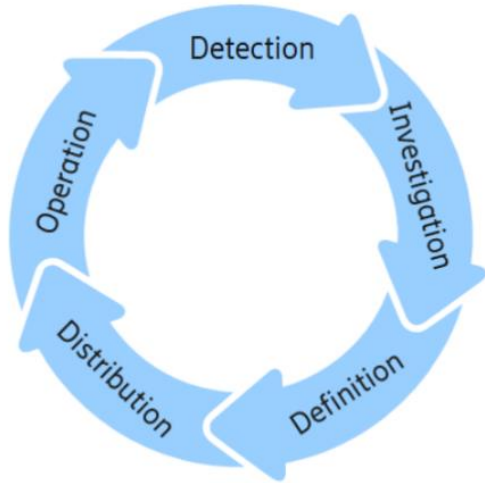
The following intents can be supported :

- Intent related to deployment and modification based on SO.
- Intent related to verification based on third party test system.
- Intent related to assurance based on DCAE.

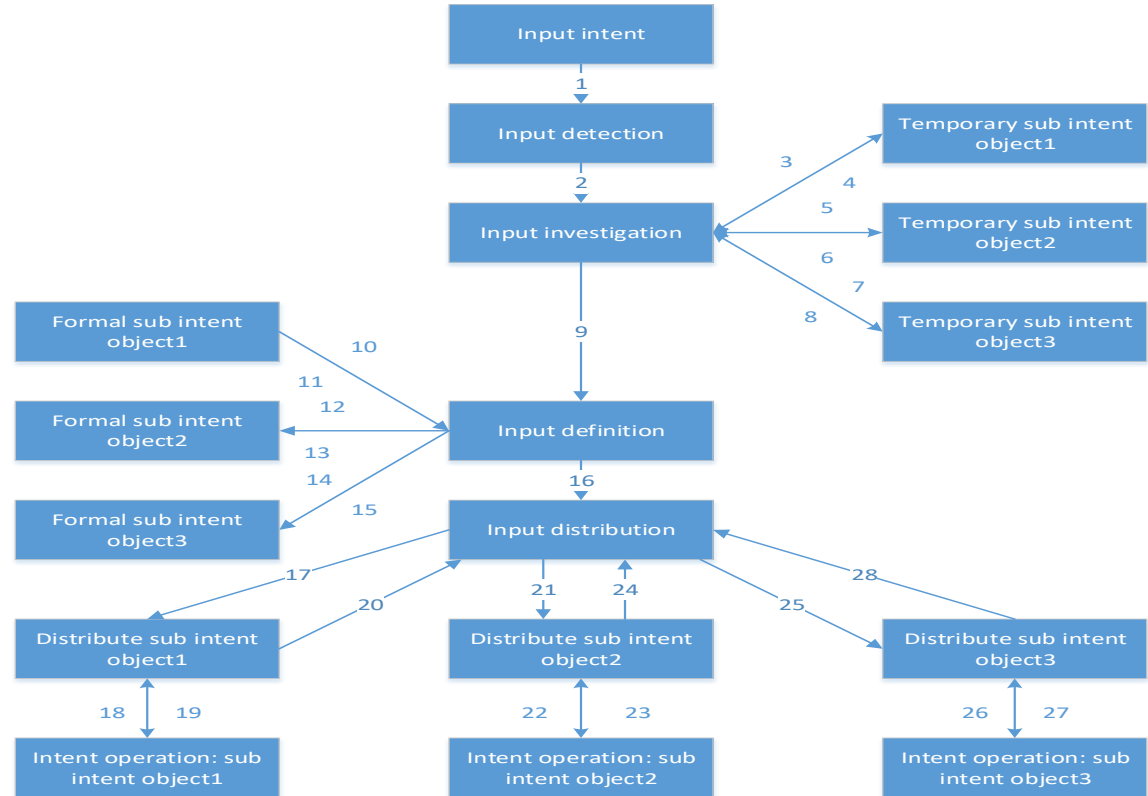
Use the following components to support our requirements :

- Use AAI to save intent related information.
- Intent analysis server uses policy to support intent decomposition and decision making.
- DCAE uses policy to perform intent related assurance operations.

Intent processing flow



TMF Intent lifecycle phases



General intent model

Intent model

- └─ Intent expectation list
 - | └─ expectation1
 - || └─ expectation target
 - || └─ state list of expectation target
 - || └─ state1
 - || └─ condition1
 - | └─ expectation2
 - || └─ expectation target
 - || └─ state list of expectation target
 - || └─ state1
 - || └─ condition1

Base on the model federation mechanism defined in TMF IG1253

Intent common model

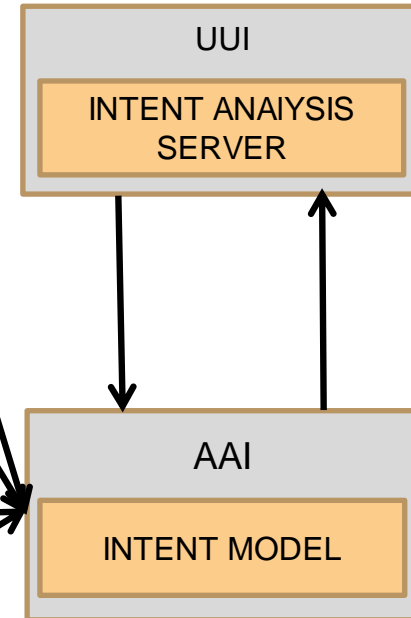
The domain independent general expression ability is defined.

Intent extension model

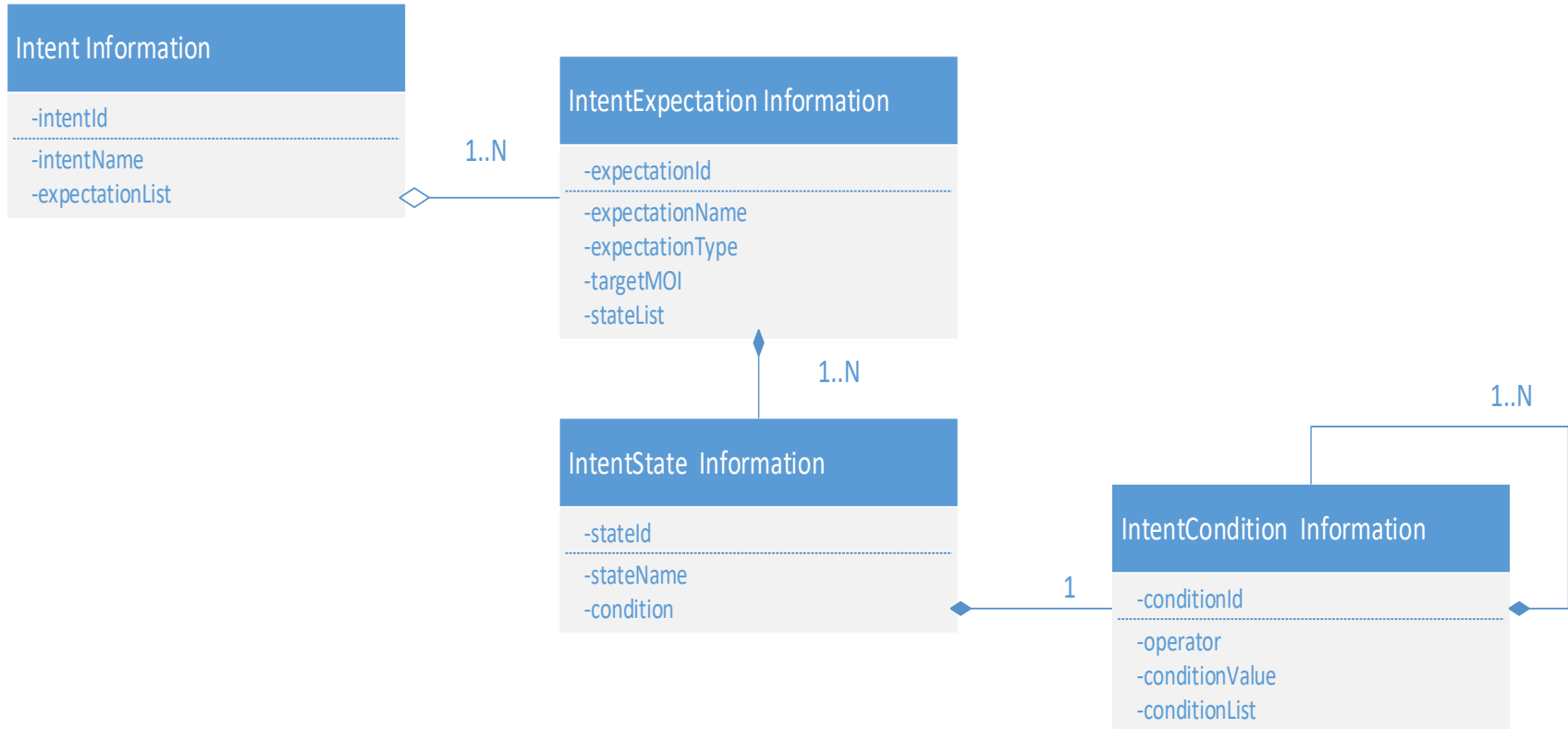
A model is based on the intent common model and connects the new modeling components with the intent common model.

Domain information model

A model is independent of the intent common model and the intent extension model. This information model of the existing domain created by the intent independent operation can be directly used in the intent expression.



UML diagram of general intent model



General intent interface

Based on the interface defined in TMF 921A

Mandatory interface

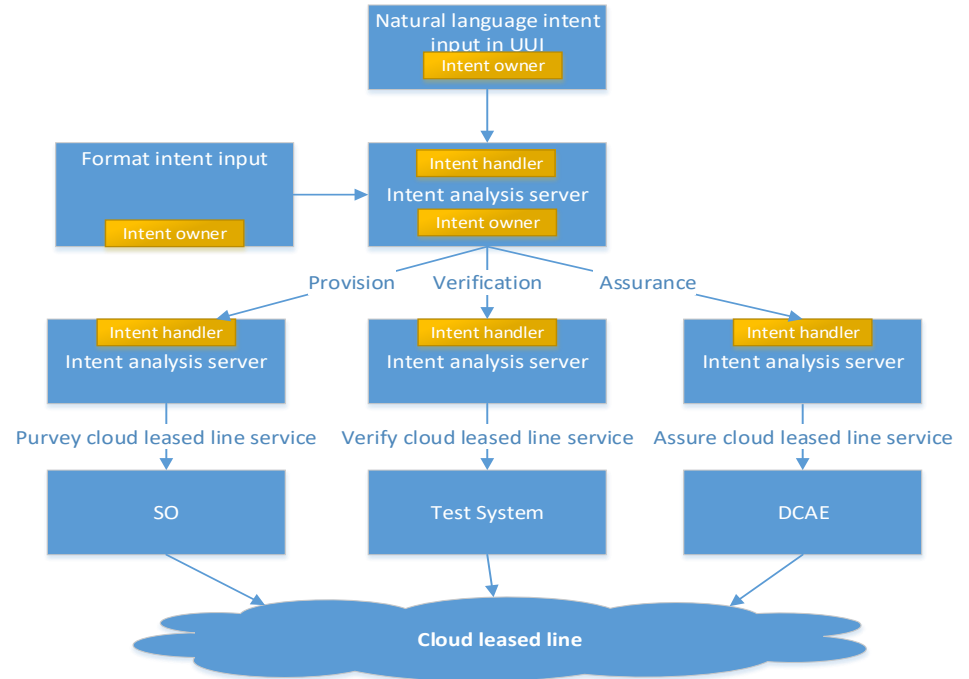
- Create interface: Used by the intent owner to create the intent and send it to the intent handler.
- Update interface: Used by intent owner to update the existing intent.
- Delete interface: Used by the intent owner to delete the existing intent.
- Query interface: Used by intent owner to query the existing intent implementation.

Optional interface

- Report interface: Used to convey the intent report. Once necessary, the intent handler will report the intent processing status and success to the intent owner, and it will be started by the intent handler.
- Probe interface: We can explore whether the intent handler can implement the specific intent, and verify the effect and possible impact of the intent in advance. We can use simulation and other technologies.

Use case description

Operators provide intent based cloud leased line services, and provide corresponding assurance measures based on user needs. An enterprise user orders a cloud leased line with a bandwidth of 1G from the operator. In order to meet this intent, the intent handler will configure the cloud leased line with a bandwidth of 1G and enable the exclusive assurance measures. At the same time, provides some high level service quality assurance technology. For example, When the bandwidth utilization rate exceeds 80%, the bandwidth will be expanded by 60% to ensure the user experience. At the same time, when the traffic returns to normal (the utilization rate is 30%), the service bandwidth will be restored to 1g. Whenever the expansion / reduction operation is executed, the intent handler will notify the intent owner through the intent report.



Intent model description

```
---expectation1: DeliveryExpectation
---| --- targetMOI: NULL
---| ---| ---state1: Cloud leased line service type
---| ---| ---| ---condition1: The type of cloud leased line service that an operator has used for a
certain service (such as game service, such as video service)
---| ---| ---state2: Whether to provide high-level service quality assurance
---| ---| ---| ---condition1: Yes
---expectation2: PropertyExpectation
---| --- targetMOI: NULL
---| ---| ---state1: Bandwidth
---| ---| ---| ---condition1: =1G
---| ---| ---state1: Latency
---| ---| ---| ---condition1: >5ms
---| ---| ---| ---condition2: <10ms
```

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MVP Tasks

- Support general intent model.
- Support general intent interface.
- Support format intent input.
- Support intent decomposition.
- Support intent related use case to demonstrate our requirements.

Potential extensions

- Support intent orchestration.
- Support intent report interface and probe interface.
- Support the test system to verify the intent.

Long term evolution plan of the project

Including the introduction of more intent common models, intent extension models and domain information models. And for the general intent interface, the report interface and probe interface can be enhanced to make the interface more general.

Continue to enrich intent scenarios and complete more intent use cases.

01

02

The interaction between ONAP and third-party systems (intent or non intent) can be deeply studied and implemented to make the intent function of ONAP more general.

03

The background of the slide is a close-up, shallow depth-of-field photograph of golden wheat stalks. The wheat is in sharp focus in the foreground, with the background softly blurred, creating a warm, sunlit atmosphere.

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Thanks!
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