LFNETWORKING
Developer & Testing Forum

Intent-driven Operating for Cloud-network Convergence Services based on ONAP

Dong Wang (China Telecom)
Henry Yu (Huawei)
Lei Shi (AsiaInfo)

Outline

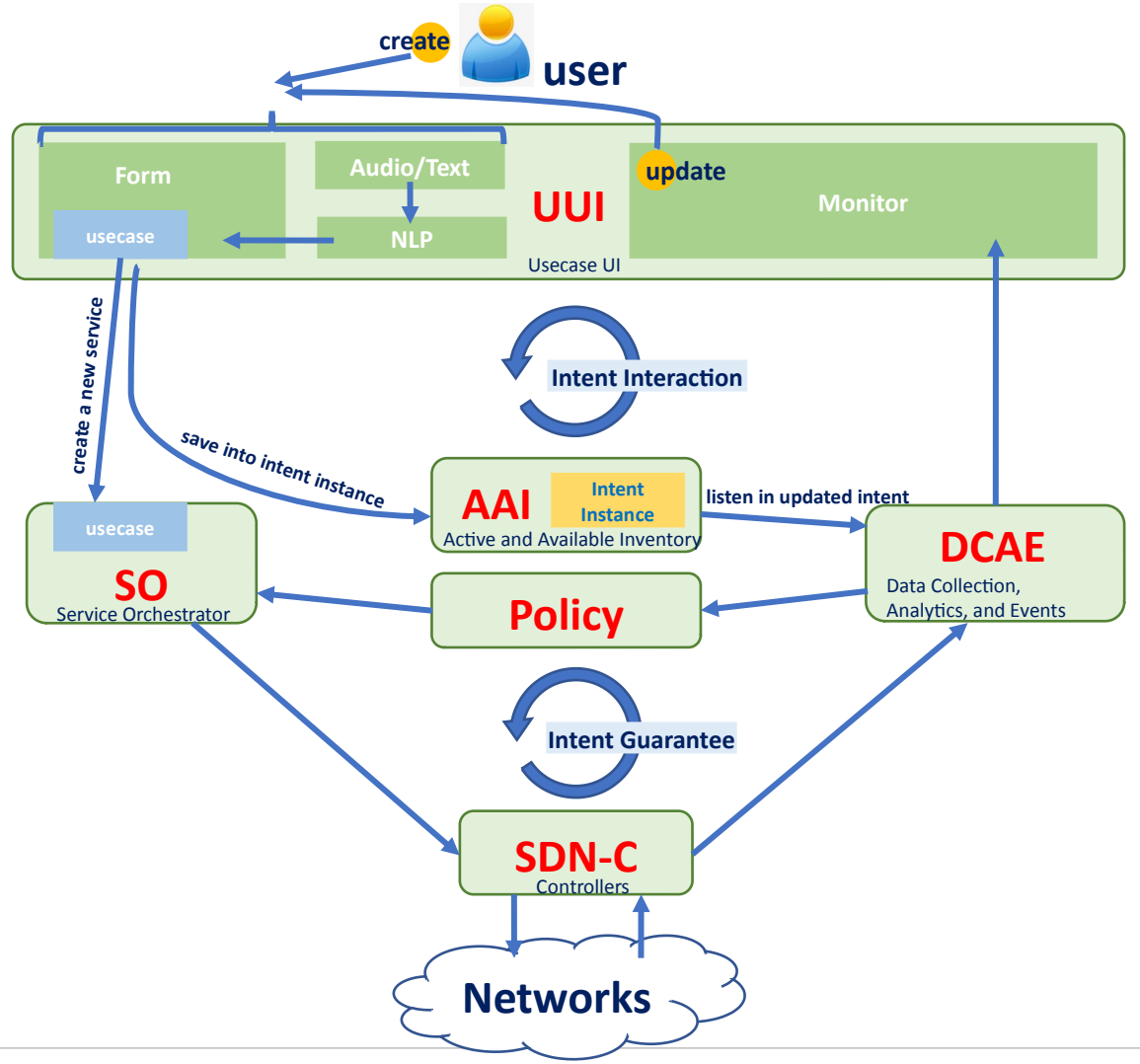
LFN NETWORKING
LFN Developer & Testing Forum

1. Intent-driven Closed-loop Autonomous Networks
2. Implementation of IBN from R8 (Honolulu) to R11 (Kohn)
3. REQ of R12 Intent-driven Operating for Cloud-network Convergence

Intent-driven Closed-loop Autonomous Networks based on ONAP Projects

LFN Developer & Testing Forum

- A self-driving network that uses decoupling network control logic and closed-loop orchestration techniques to automate application intents.
- An intelligent network, which can automatically convert, verify, deploy, configure, and optimize itself to achieve target network state according to the intent of the operators, and can automatically solve abnormal events to ensure the network reliability.



Architecture of Intent-driven Closed-loop Autonomous Networks

Collaborations among Academics, SDOs and ONAP

LFN Developer & Testing Forum

Academics

IEEE

- A Survey on Intent-Driven Networks
- A Brief Survey and Implementation on Refinement for Intent-Driven Networking

Academic exchanges

Open-source

ONAP
OPEN NETWORK AUTOMATION PLATFORM

Align with Multi-SDO

SDOs

IETF

IETF/IRTF:

- Intent-Based Networking - Concepts and Definitions
- Intent Classification

ETSI

ETSI ZSM/ENI:

- ZSM 011 Intent-driven autonomous networks; Generic aspects
- ENI 008 InTent Aware Network Autonomicity (ITANA)

tmforum

TMF:

- IG1234 Intent Oriented Customer Engagement (IoCE) Guide
- IG1253 Intent in Autonomous Networks

3GPP

3GPP SA5:

- TS 28.312 Intent driven management services for mobile networks
- TR 28.812 Study on scenarios for Intent driven management services for mobile networks

ITU

ITU-T:

- Scenarios and Requirements of Intent-Based Network for network evolution
- functional architecture of NGN evolution by adoption of Intent-Based Network

CCSA

CCSA:

- 2015B58 Network Intelligent Capability Enhancement for SDN/NFV: Study of Key Technologies of Intent Network

Autonomous Networks Multi-SDO Initiative

Who we are

SDO	Group/Project	SDO	Role
3GPP	SA5	IETF	WG on AN
CCSA	TC7	ITU-T	FG-AN
ETSI	ENI, F5G, MEC, NFV, PDL, TC INT/AFI, ZSM	Linux Foundation*	ONAP
GSMA	Future Networks	NGMN	Automation
IEEE	Future Networks	TM Forum	AN Project

*Open Source Community

Outputs and Vision

LF NETWORKING
LFN Developer & Testing Forum

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
- ✓ **REQ-1214/ONAPARC-744** Maintenance and Enhancement of Intent-driven Closed-loop Autonomous Networks in R11
- ➢ **REQ-1411/ONAPARC-766 Intent-driven Operating for Cloud-network Convergence Services**

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

- ✓ **TMF Catalyst 2023**: Intent-driven closed-loop autonomous services towards next-generation networks
- ✓ **ETSI ZSM PoC #3**: Automation of Intent-based cloud leased line service
- ✓ **ITU-T**: Scenarios and Requirements of Intent-Based Network for network evolution

ONE SUMMIT

https://sched.co/1BKrX

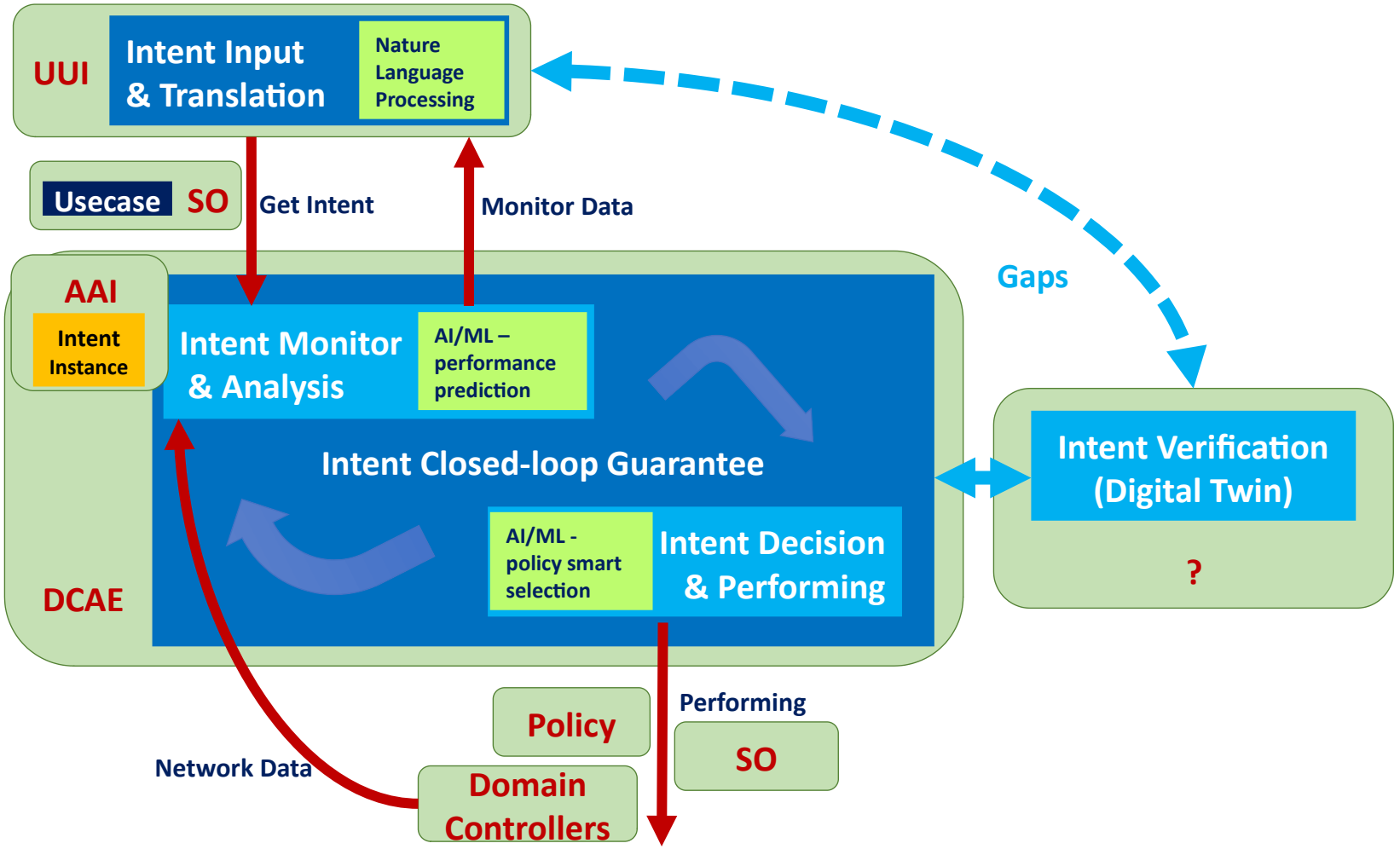
Panel Discussion: Evolution of Closed-loop Autonomous Networks by Open Source Use Cases - Dong Wang, China Telecom; Henry Yu, Huawei Technologies; Kevin Tang, ST; Ahila Pandaram, Wipro Limited & Chugang Yang, Xidian...

ISSAQUAH

- Focus on the evolution of future networks, and study new technologies, services and applications; based on the R&D of ONAP, provide a reference for the deployment of operators, verify new technologies with academics and promote the development of standardizations.
- For intent-driven closed-loop autonomous networks, verify the key technologies of intelligent networks based on the scenes of fixed networks, mobile networks and cloud-network convergence by CCVPN and E2E Slicing use cases.

Enable AI/ML for Intent-driven Autonomous Networks in ONAP

LF NETWORKING
LFN Developer & Testing Forum



AI/ML Abilities for Intent-driven Autonomous Networks in ONAP

Key Features

AI/ML Algorithms

- ☐ Nature Language Processing
- ☐ STT (Speech to Text)
- ■ Prediction
- ■ Decision-making

AI/ML Frameworks

- ➢ TenserFlow
- ➢ PyTorch

AI/ML Platform

- ✓ Acumos AI

Acumos AI

https://www.acumos.org/

Outline

1. Intent-driven Closed-loop Autonomous Networks
2. Implementation of IBN from R8 (Honolulu) to R11 (Kohn)
3. REQ of R12 Intent-driven Operating for Cloud-network Convergence

2.1 Intent Translation by NLP Algorithms

LFN Developer & Testing Forum

UUI

Target: translate from human inputs to network parameters based on NLP in UUI, choose a suitable usecase and then run the usecase in ONAP.

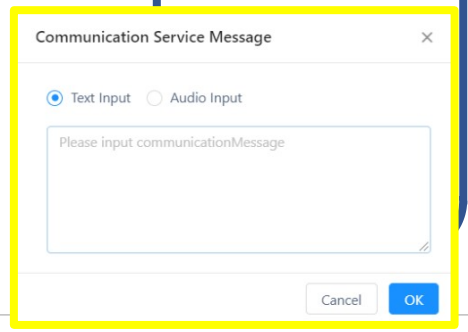
Input

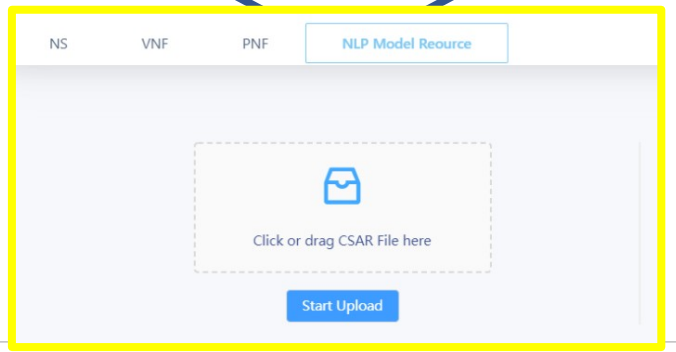
Text

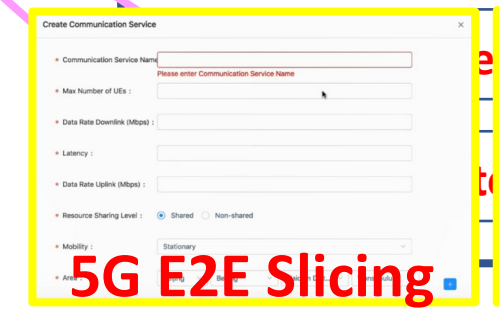
Voice

Nature Language Processing

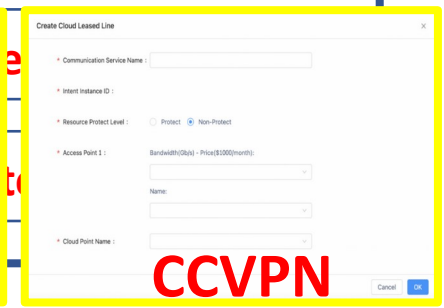
- Parameter1: network service (5G / Fixed network)
- Parameter2: scenario
- Parameter3: throughput
- Parameter4: latency
- ...







5G E2E Slicing



CCVPN

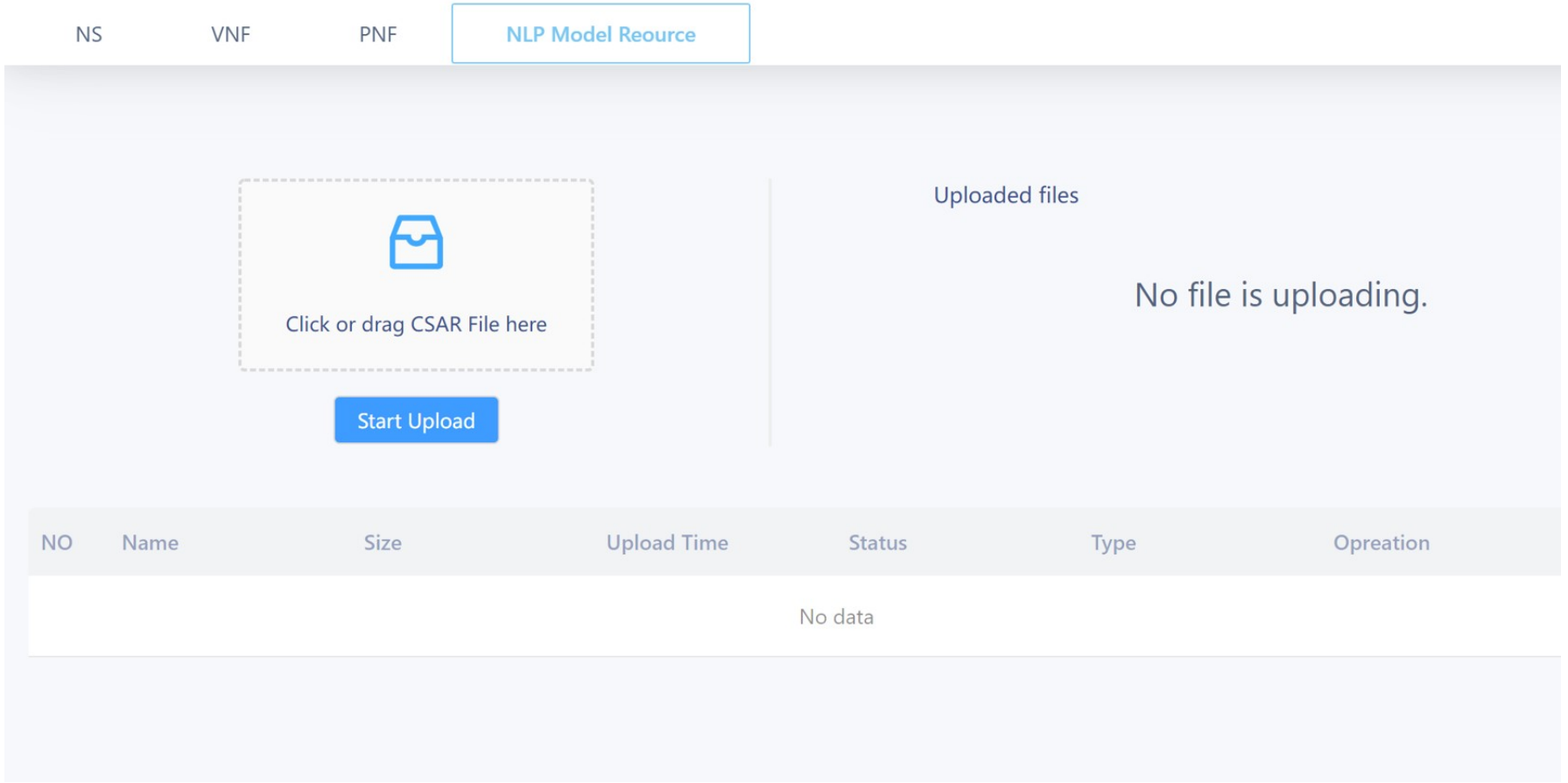
2.1 NLP Model Management

LFN Developer & Testing Forum

Key Features

NLP Model Management

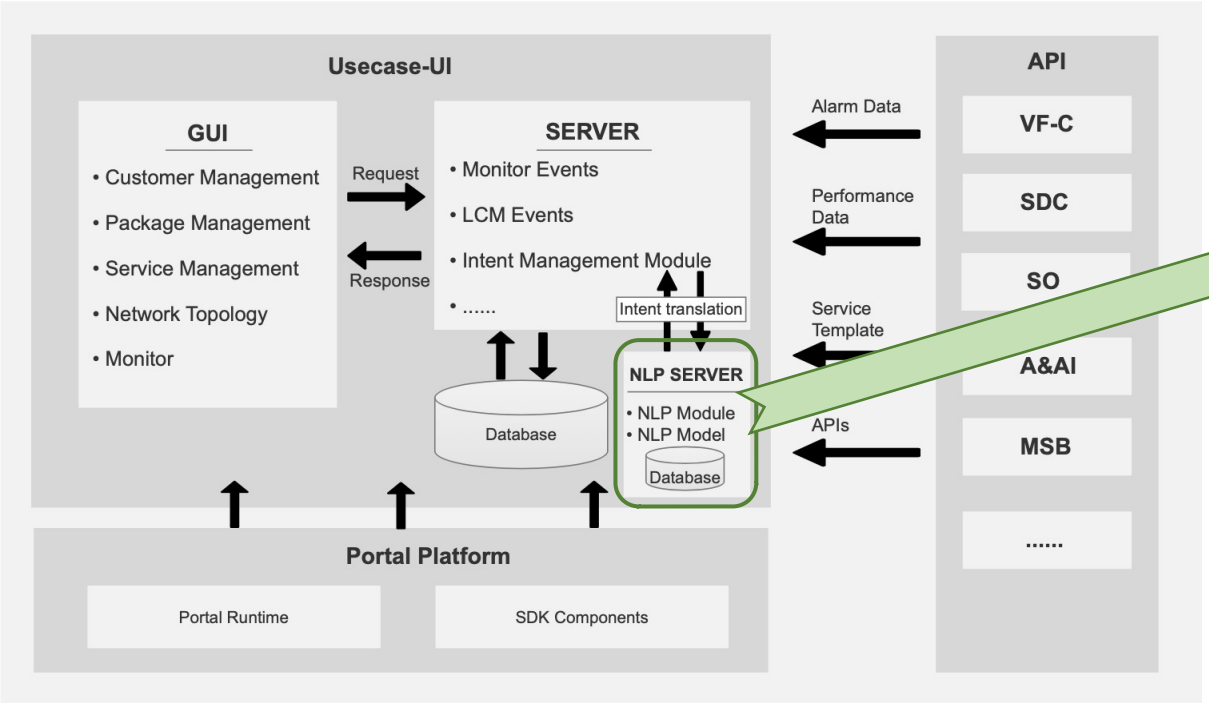
- ☐ Upload model
- ☐ Delete model
- ☐ Active/Inactive model
- ■ Select model for different usecases in same AI framework and microservice



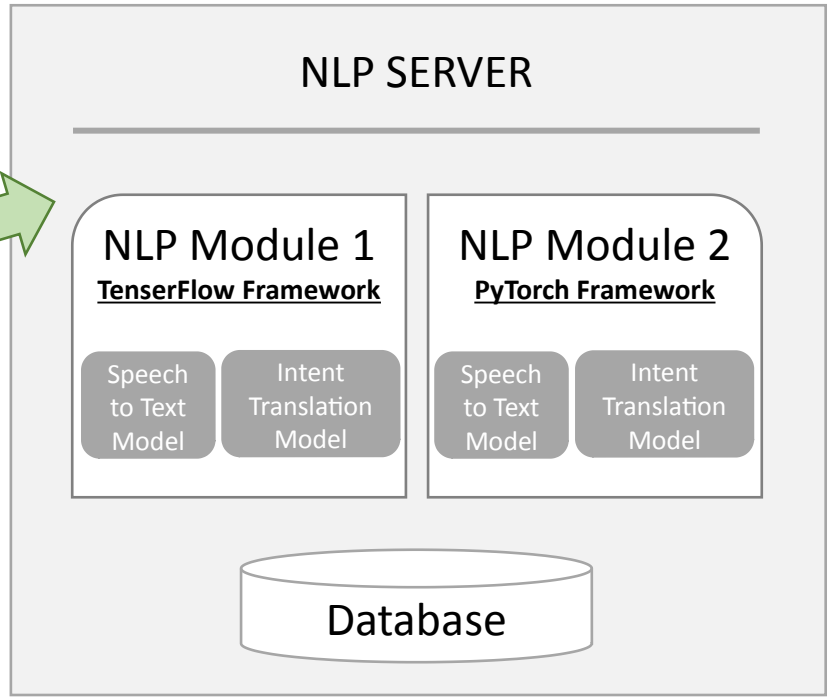
Screenshot of NLP Model Management

2.1 Enhancement of NLP platform and model in UUI

- **Support both TenserFlow and PyTorch frameworks to support more models**



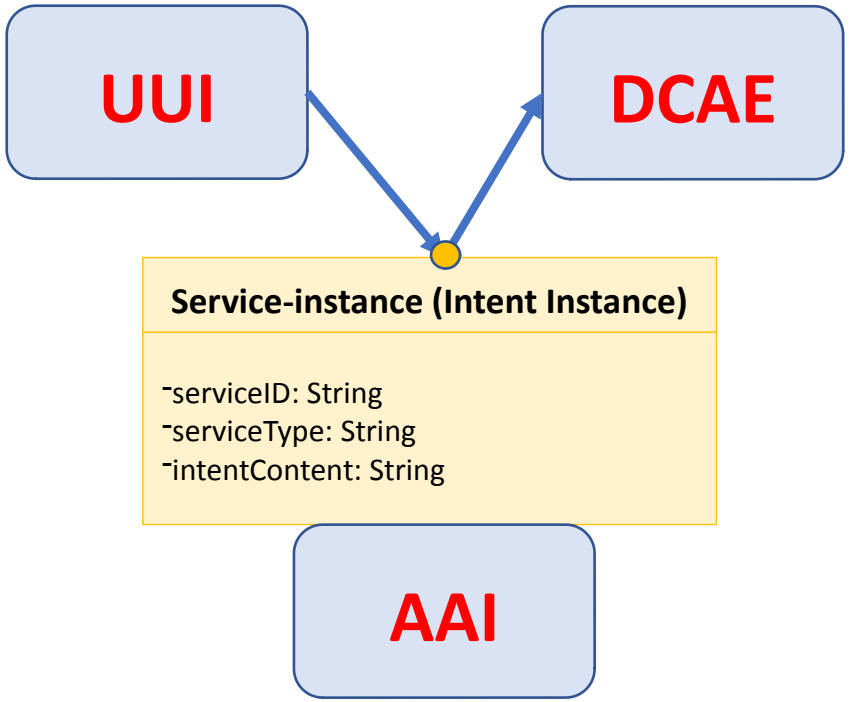
Components of UUI since Honolulu Release



Enhancement of NLP microservice in UUI

2.2 Intent Instance in AAI

Functions: Intent Instance is created to save the users' **real-time intent** (network parameters) and connected service ID (CCVPN service ID / E2E Slicing CSI ID) in AAI.



Intent Instance Applied in AAI:

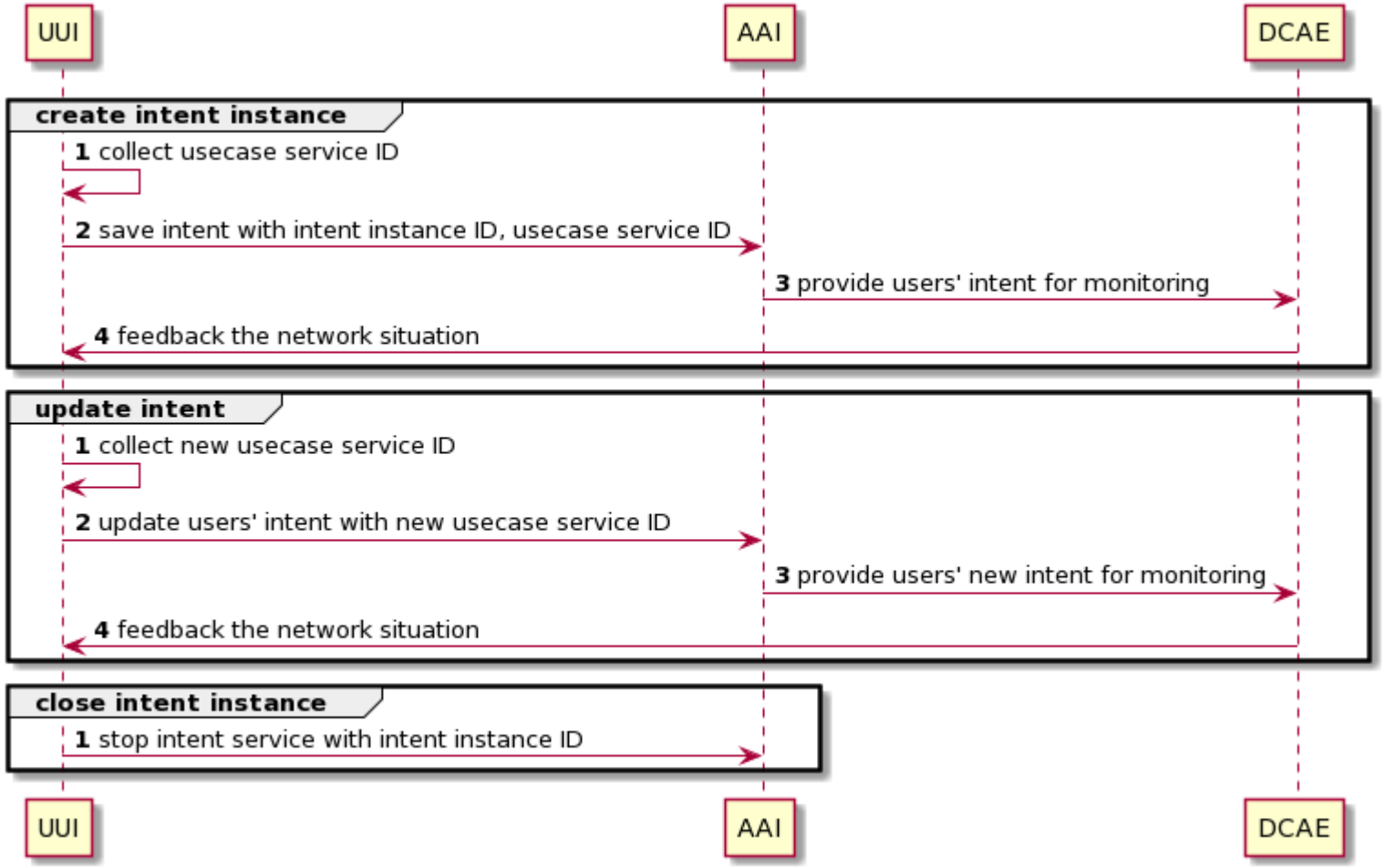
1. Intent Instance is created to save the users' real-time intent in Active and Available Inventory. The other records related to the intents are not real-time, which are saved in the independent database in UUI, and will be saved in CPS in further releases.

2. The target of Intent-based Networking is to develop to support multiple usecase services, so it is not a sub-node of any usecase in AAI. And IBN provides network services without perception for users. Multiple usecase services could be switched by IBN for a same user.

3. DCAE keeps listening to the updated intent from AAI for monitoring.

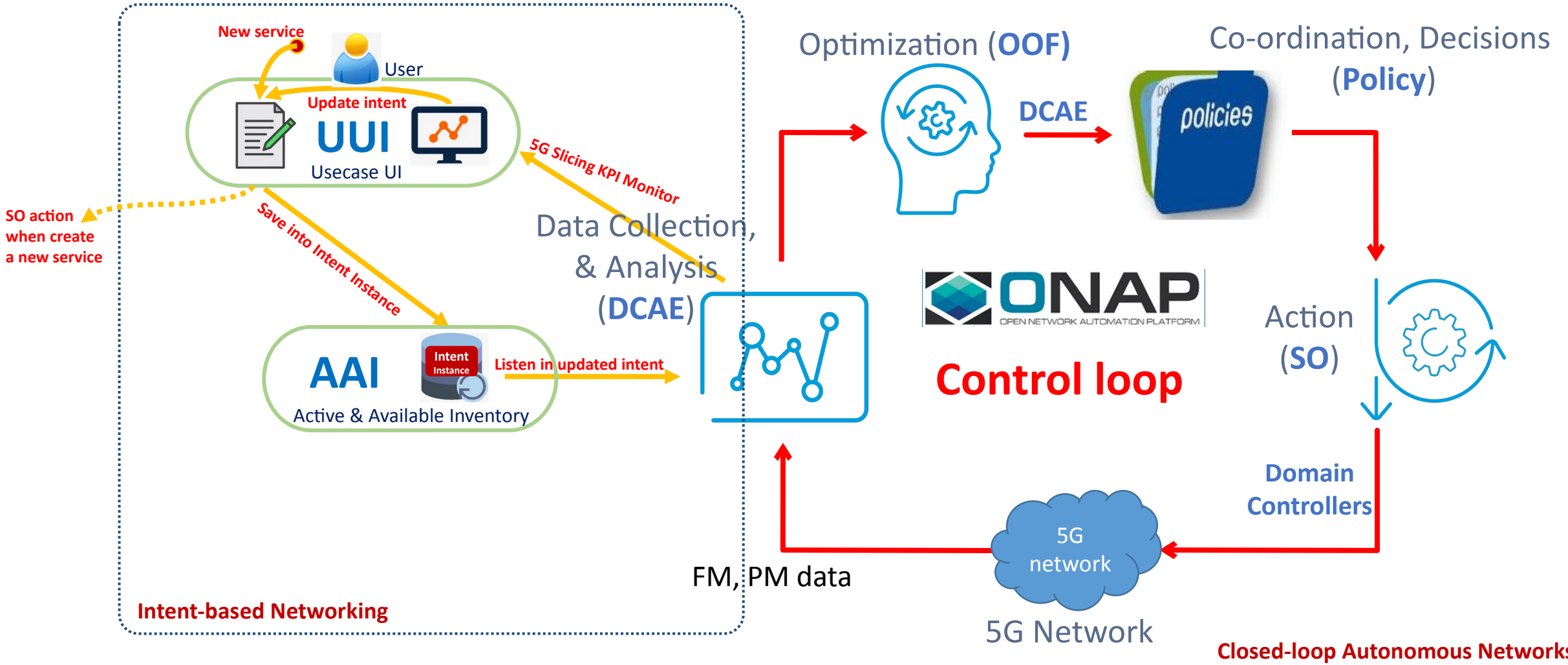
serviceType: 'CCVPN', 'E2ESlicing'

2.2 Workflow of Intent Management

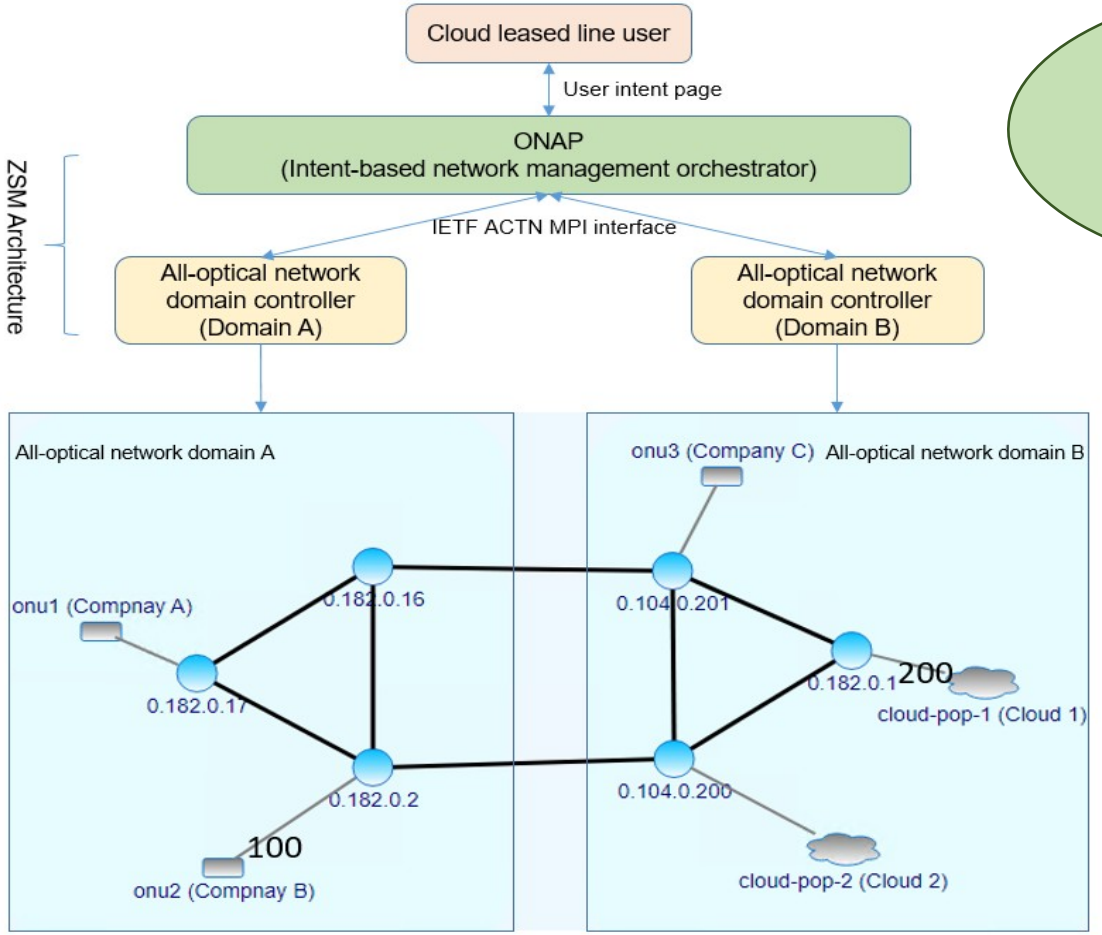


*1. A usecase service ID includes the service instance ID of CCVPN or CSI ID of E2E Slicing, which is collected in UUI after creating a new service.

2.3 Intent-driving E2E Slicing Usecase

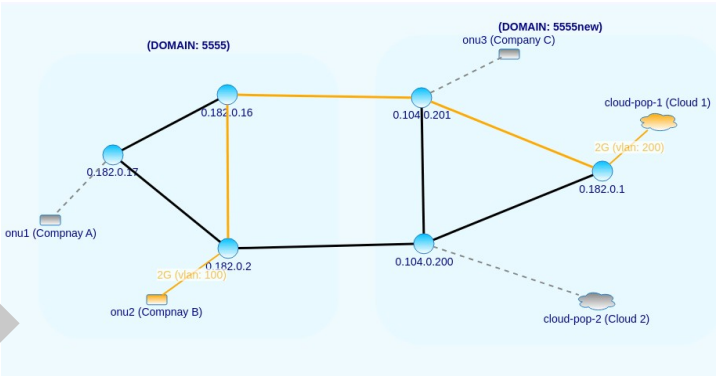


2.4 CCVPN: Automation of Intent-based cloud leased line service

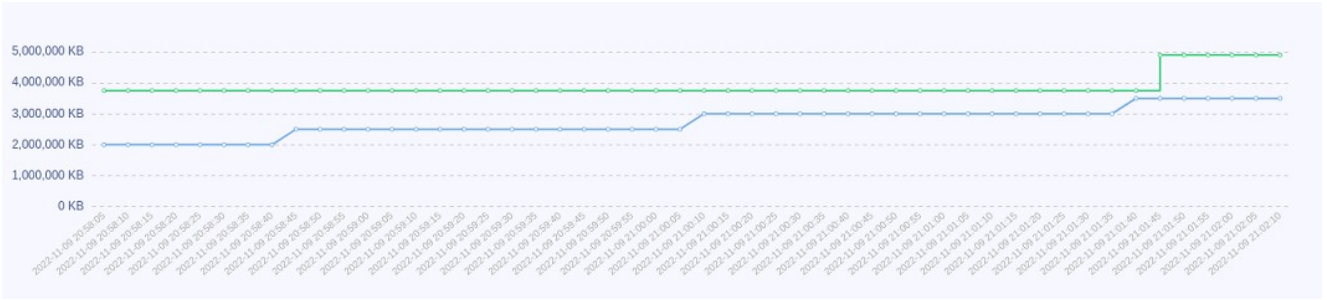


I need a connection from company B to Cloud one, with a bandwidth of 2Gbps

Translate and create



Bandwidth monitoring and guarantee

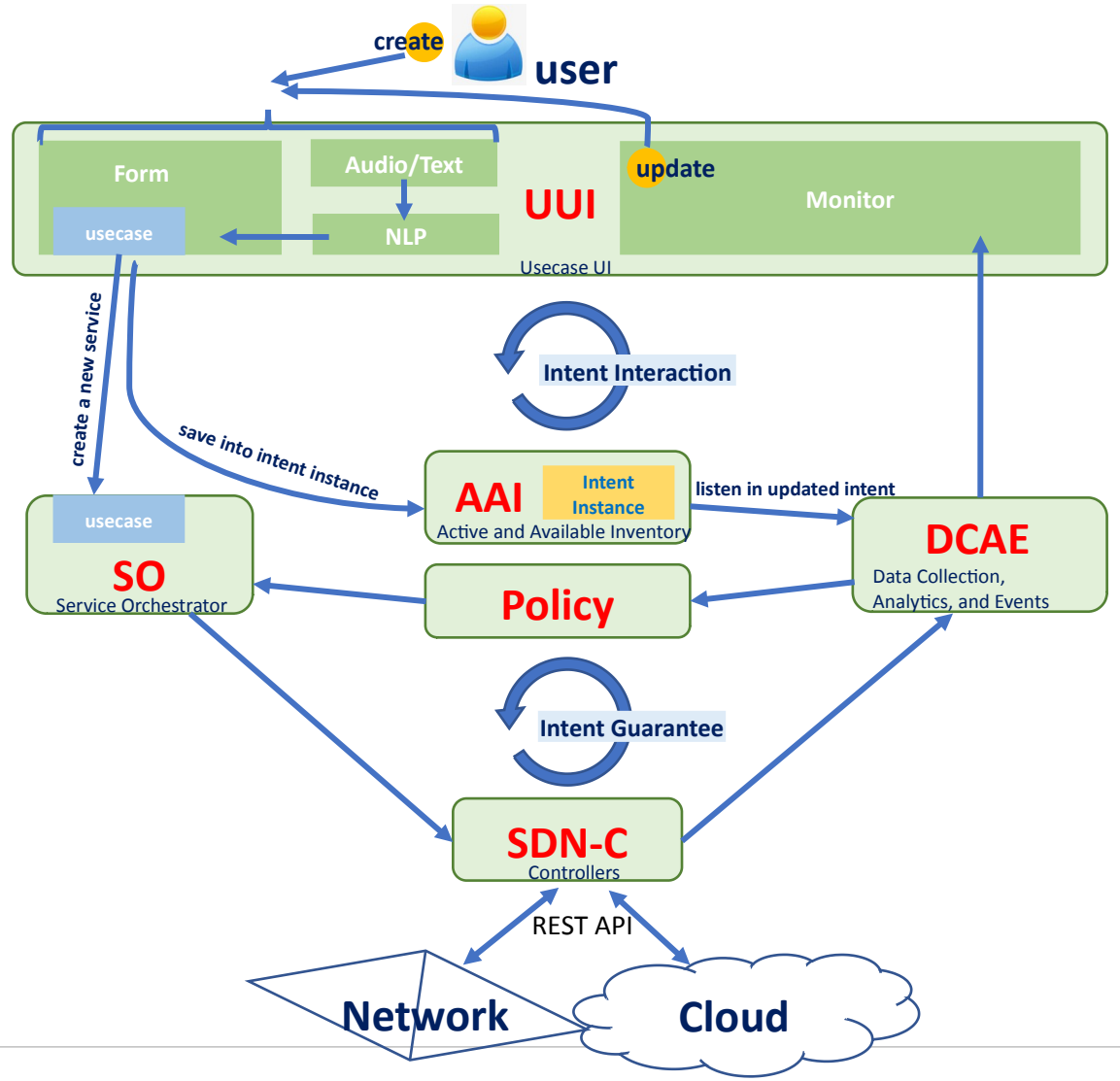


Outline

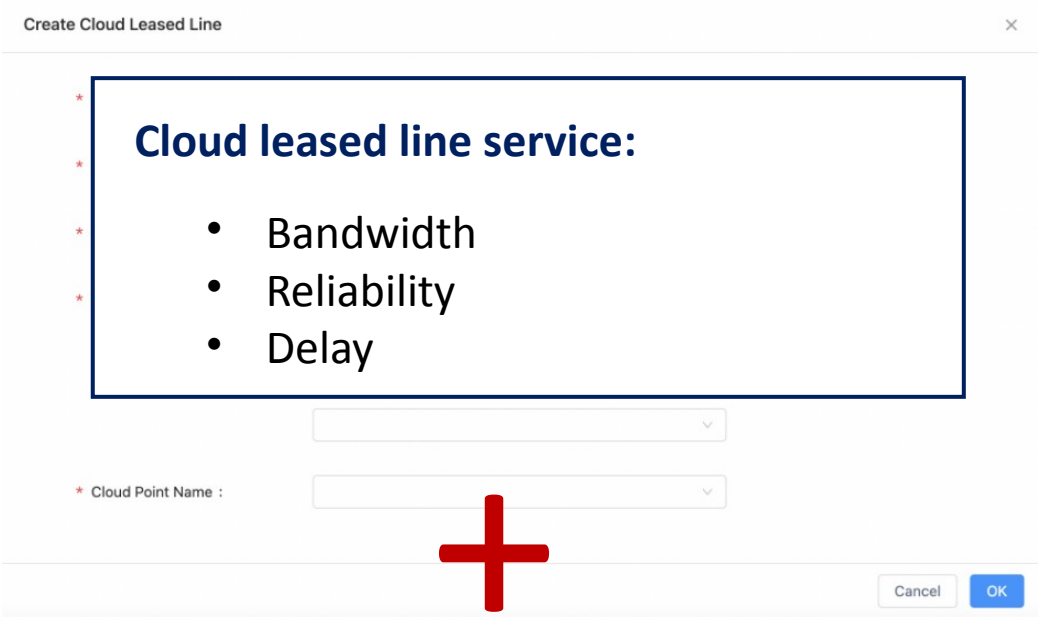
LFN NETWORKING
LFN Developer & Testing Forum

1. Intent-driven Closed-loop Autonomous Networks
2. Implementation of IBN from R8 (Honolulu) to R11 (Kohn)
3. REQ of R12 Intent-driven Operating for Cloud-network Convergence

3. Cloud-network Convergence by extending CCVPN usecase



Cloud-network Convergence Services by ONAP



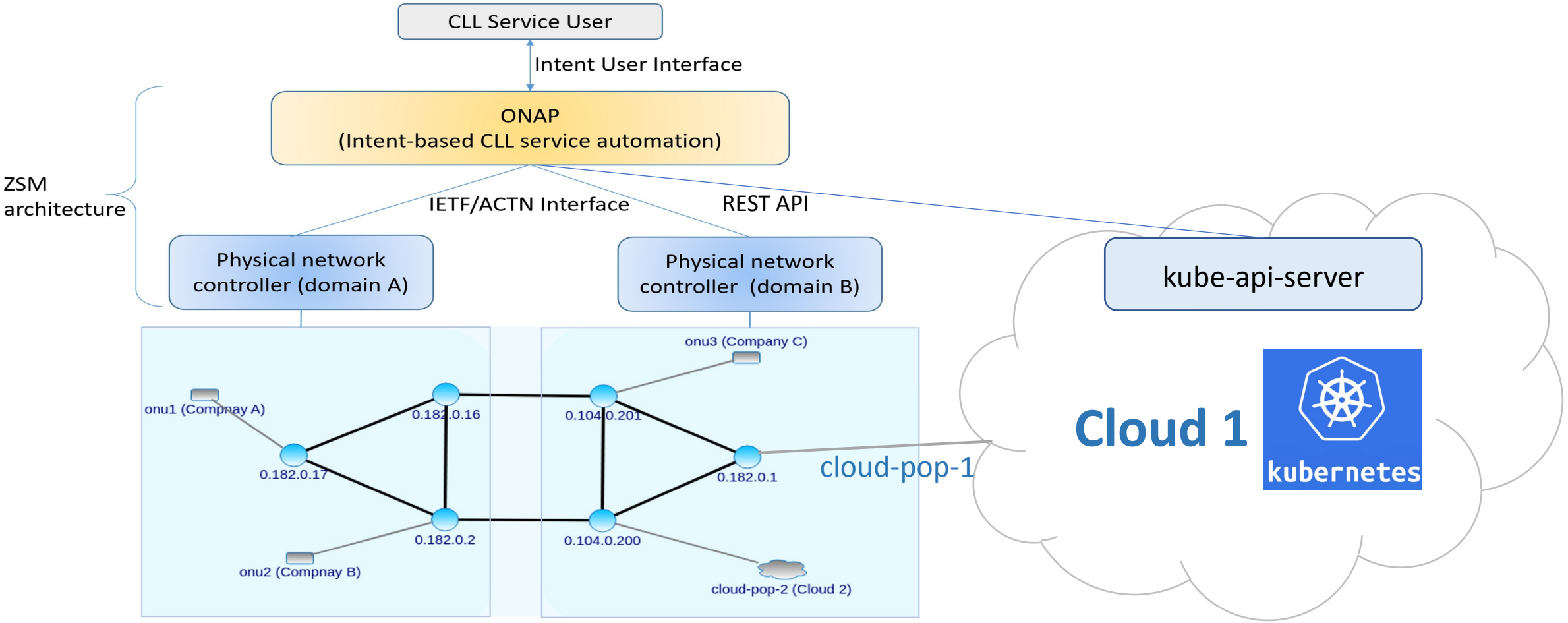
Cloud leased line service:

- Bandwidth
- Reliability
- Delay

Cloud service:

- CPU
- GPU
- Memory
- Hard-drive

3. Cloud-network Convergence by extending CCVPN usecase



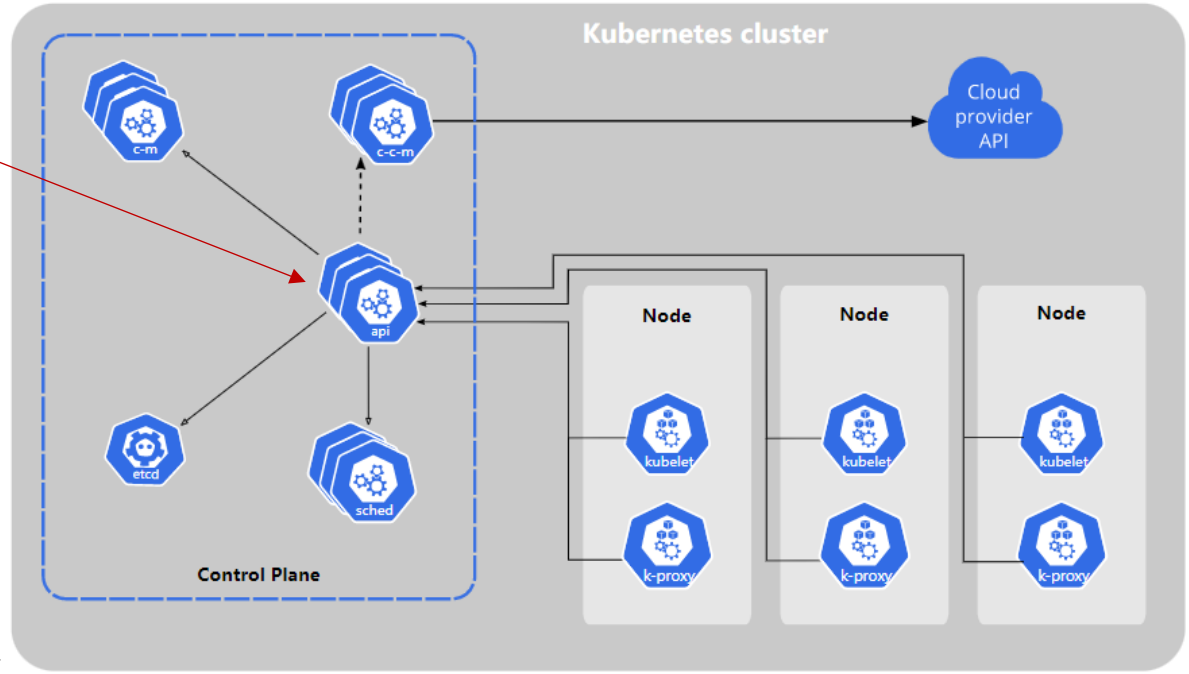
ETSI ZSM PoC #3: Automation of Intent-based cloud leased line service

3. Functions of SDN-C/Kubernetes API

ONAP
OPEN NETWORK AUTOMATION PLATFORM

SDN-C

REST API



Functions:

a. Deployment, access & authentication

b. Pods creation & lifetime management

c. Network access configuration

https://kubernetes.io/docs/concepts/overview/kubernetes-api/

LF NETWORKING
Developer & Testing Forum

Thanks!

Dong Wang (China Telecom)
Email: wangd5@chinatelecom.cn

https://lfnetworking.org