IETF-122 I2ICF Side Meeting

Interface to In-Network Computing Functions (I2ICF): Framework

(draft-jeong-opsawg-i2icf-framework)

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Motivation of this Draft

- draft-jeong-opsawg-i2icf-framework
  - The draft defines a **framework** for managing and configuring for Interface to In-Network Computing Functions (I2ICF) which are essential for various network environments (NFV and SDN).
    - **In-Network Computing Functions (ICF):** Network Functions (NFs) and Application Functions (AFs).

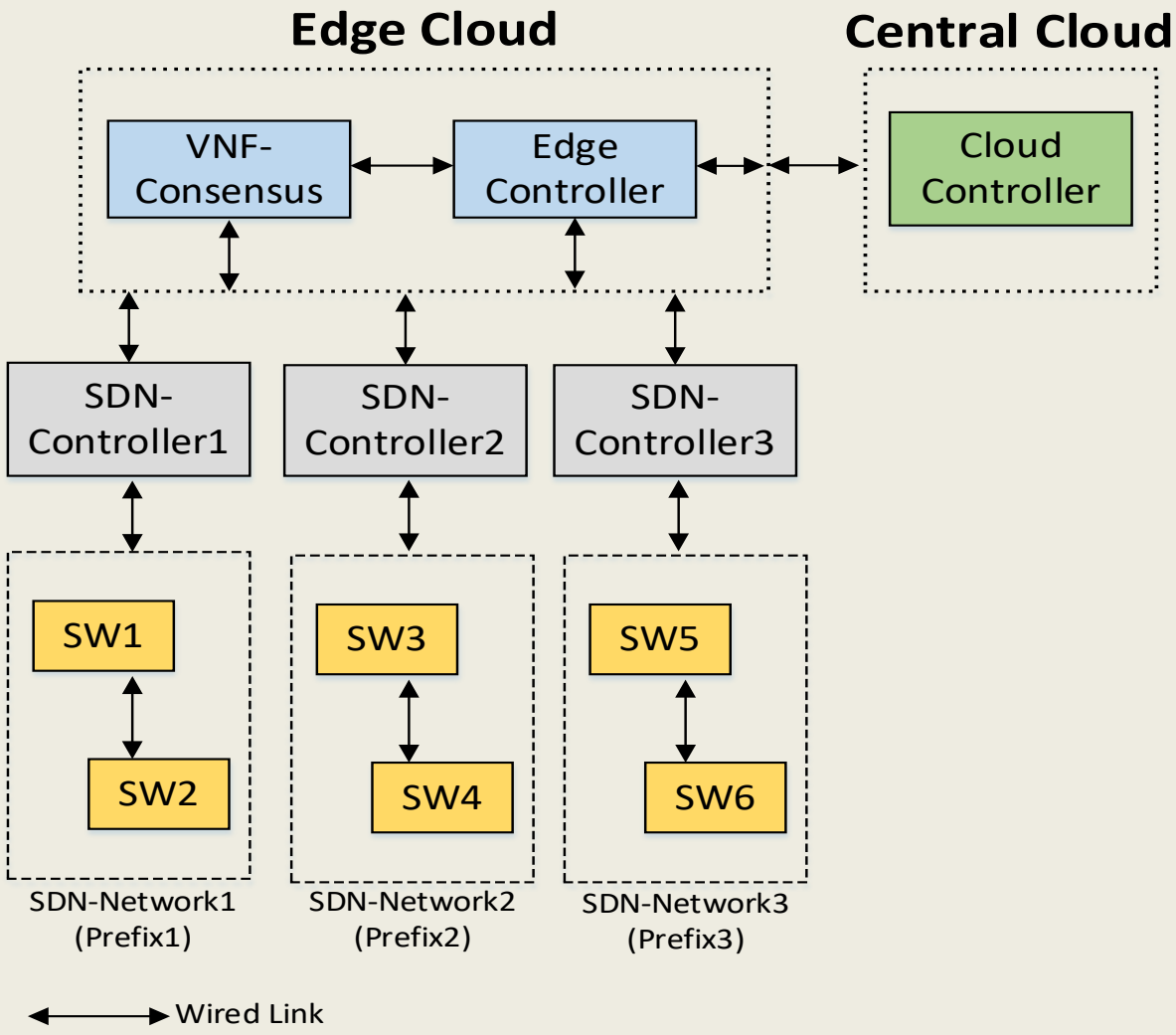
- **Main Contents of this Draft**
  - In-Network Computing Functions (ICFs)
  - Framework Components
  - Interfaces in the I2ICF Framework

I2ICF Framework for ICF Management:

(e.g., P4 Switch, VNF-Consensus, Failure Detector, and Reliable Broadcast)

- This framework shows a **VNF-Consensus Architecture in an Edge Cloud** for I2ICF framework to synchonize the SDN Controllers for flow table information in the same Edge Cloud.

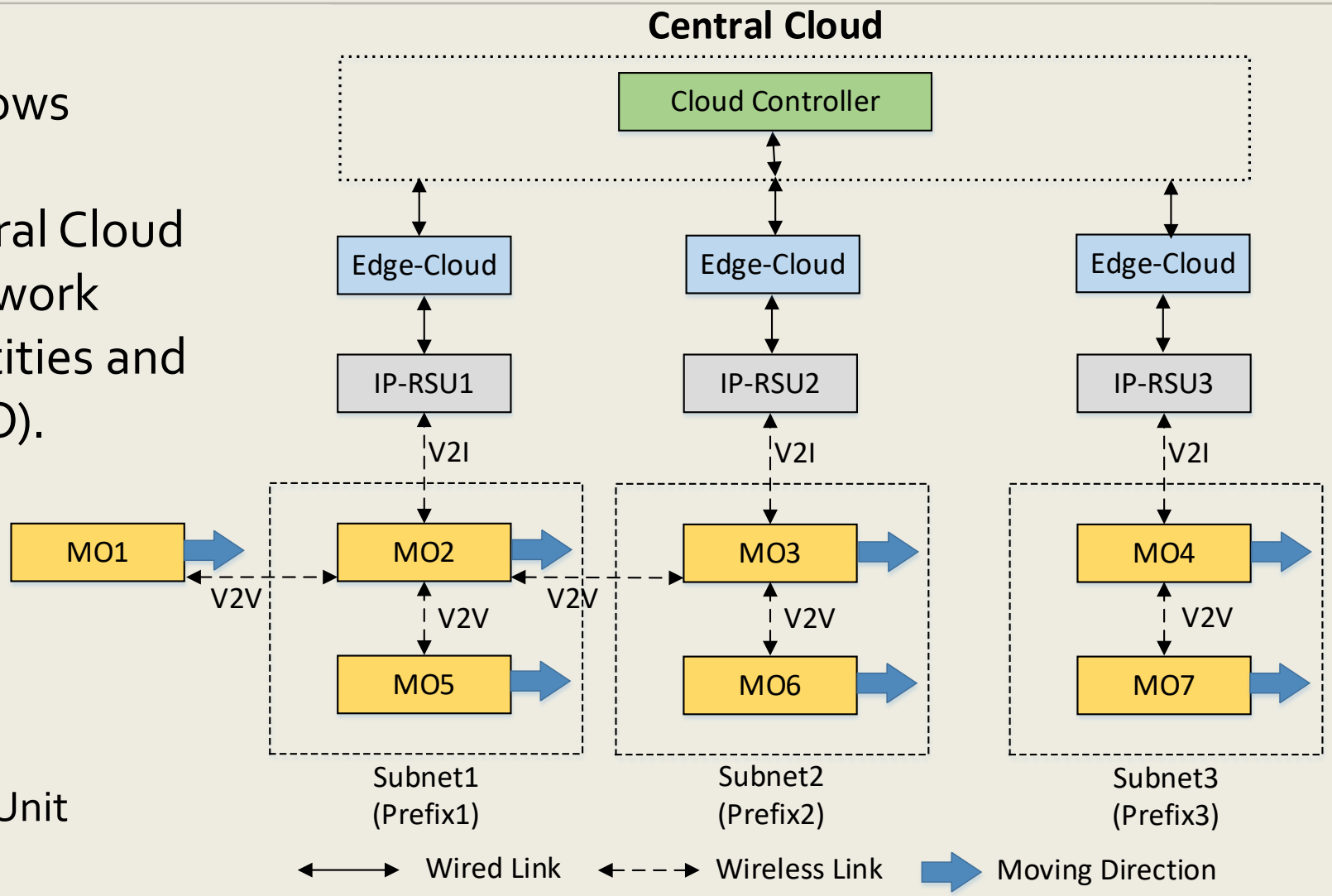
VNF: Virtual Network Function
SW: Switch



VNF-Consensus Architecture in Edge Cloud for I2ICF Framework

I2ICF Framework for ICF Management (e.g., Mobile Objects (MOs) like On-Device AI Devices)

- This framework shows Wireless and Wired Networks in a Central Cloud for the I2ICF framework having network entities and Mobile Objects (MO).



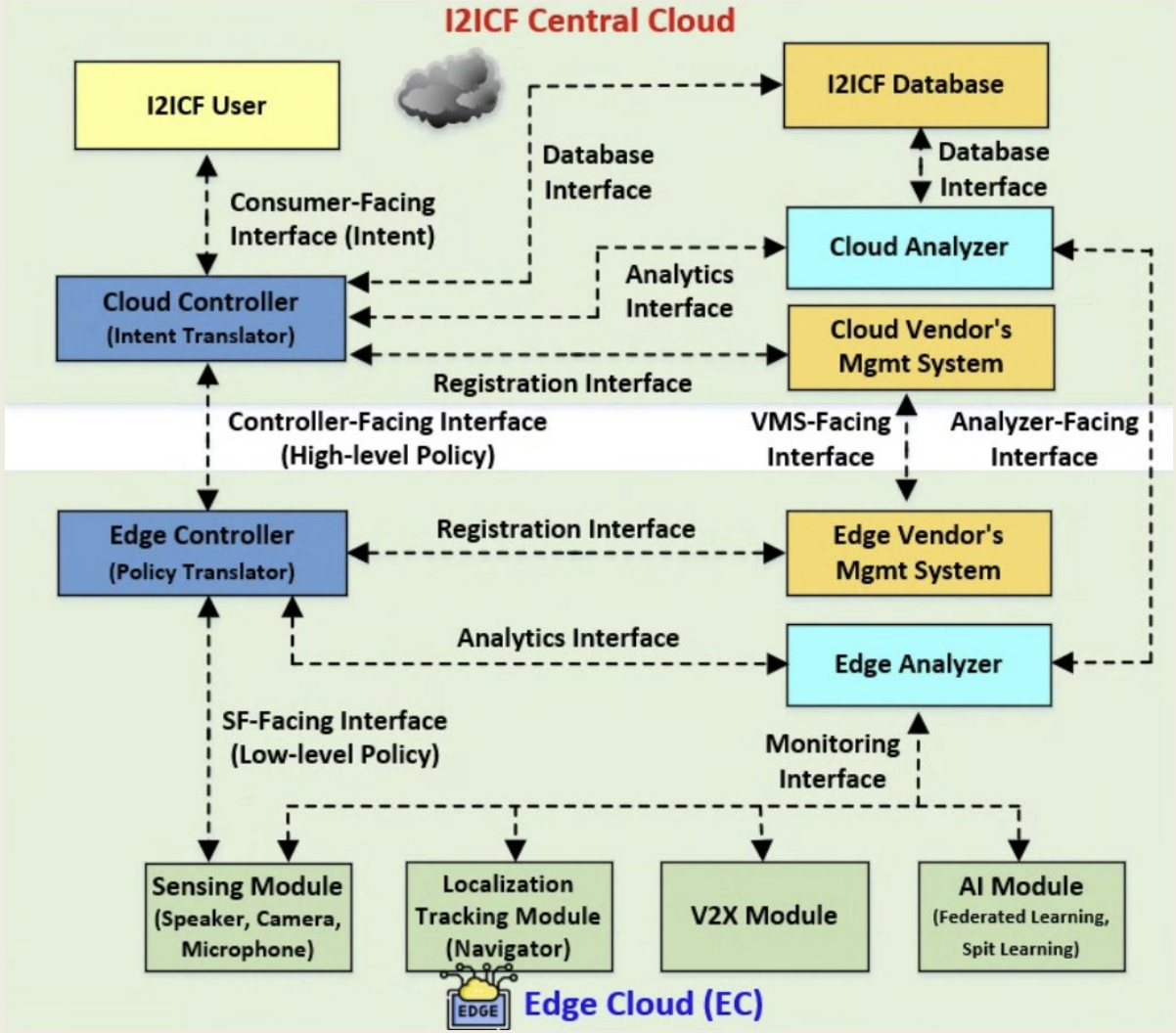
IP-RSU: IP Road-Side Unit
MO: Mobile Object

Wireless and Wired Networks in Central Cloud for I2ICF Framework

I2ICF Framework for ICF Management
(ICFs in Edge Cloud)

- For the automatic network configuration of Edge Cloud, an **Intent-Based Management** is required between Central Cloud and Edge Clouds.
  - **Registration of ICFs**
  - **Service Enforcement**
  - **Service Monitoring**

- This framework shows an **I2ICF framework for an Edge Cloud**. The framework consists of Central Cloud and Edge Clouds.

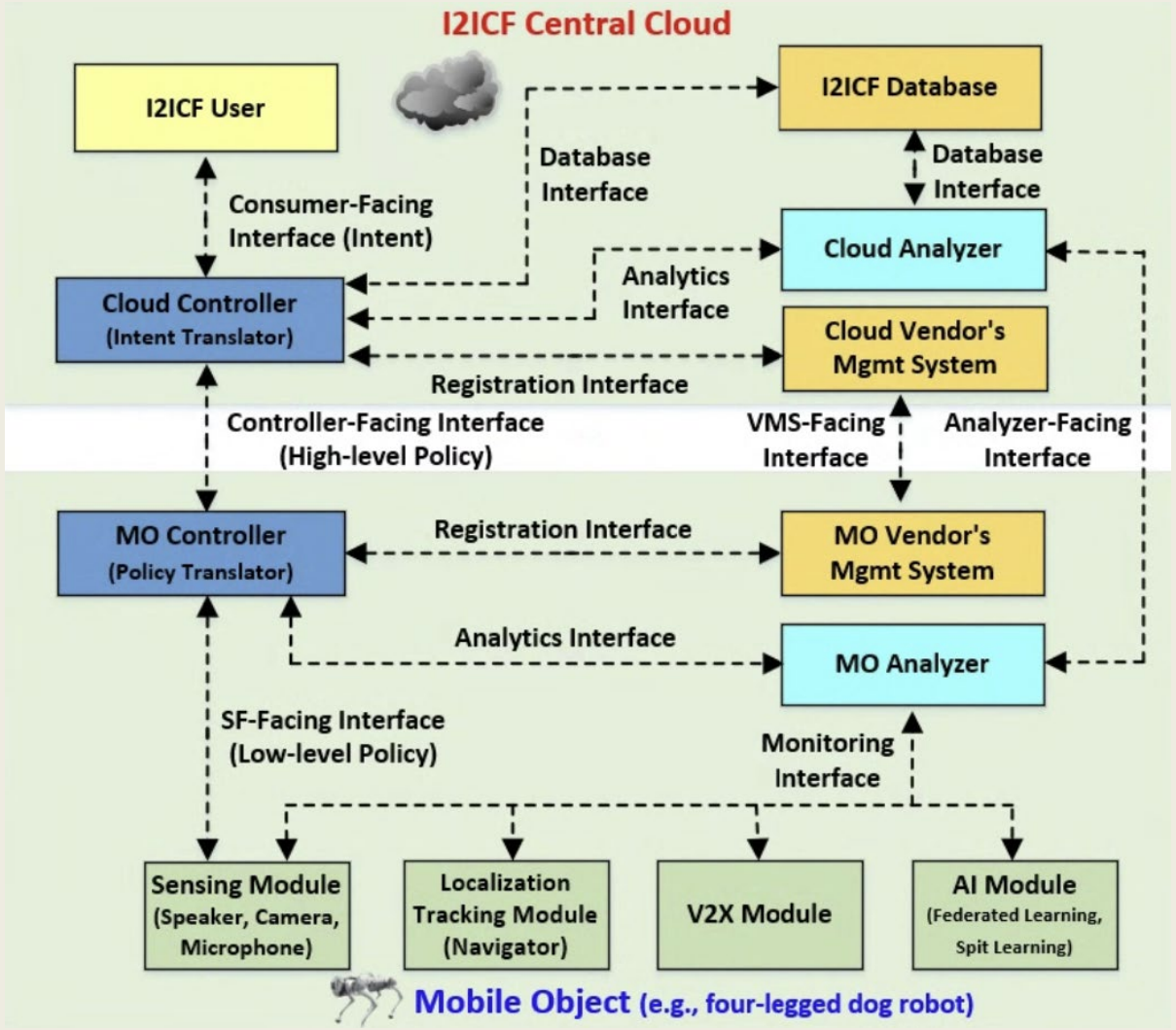


I2ICF Framework for Edge Cloud

I2ICF Framework for ICF Management
(ICFs in Mobile Object)

- For the automatic network configuration of MOs, an **Intent-Based Management** is required between the Central Cloud and MOs.

- This framework shows an **I2ICF framework as an IBS for an MO**. The framework consists of Central Cloud and an MOs.



I2ICF Framework for Mobile Object

I2ICF Framework for ICF Management

- A Central Cloud (CC) consists of the components below:
  - **I2ICF User**

    The software that is used by I2ICF administrators to deliver network intents to MO controllers and Edge controllers.
  - **Cloud Controller**

    The main component that is responsible for the management and control of other system components of the central cloud, including security.

I2ICF Framework for ICF Management

- A Central Cloud (CC) consists of the components below:
  - **I2ICF Database**

    The database that manages the information of MOs and ECs, including network and security configuration and status of MOs and ECs.
  - **Cloud Analyzer**

    The component that gathers and evaluates monitoring data from MO Analyzers and Edge Analyzers to ensure the functionality and performance of SFs.

I2ICF Framework for ICF Management

- An IBS in an MO (or EC) is composed of components below:
  - **MO Controller (or Edge Controller)**

    The component that controls and manages other components of the MO or EC framework.
  - **Vendor's Management System**

    The component that provides an image of a virtualized SF for MO/EC to the MO/EC framework.

I2ICF Framework for ICF Management

- An IBS in an MO (or EC) is composed of components below:
  - **MO Analyzer (or Edge Analyzer)**

    The component that collects monitoring data from SFs of MOs/ECs and analyzes the collected data to monitor the activity and performance of SFs.
  - **Service Function (SF)**

    The component that can be either a virtual network function (VNF), cloud native network function (CNF), or physical network function (PNF) of a specific service.

Interfaces in the I2ICF

- **The interfaces in the I2ICF are composed as below:**
  - **Consumer-Facing Interface**

    The interface between I2ICF User Internet and the Cloud Controller.
  - **Controller-Facing Interface**

    The interface between the Cloud Controller and the MO Controller (or Edge Controller) for the transmission of high-level policies corresponding to translated intents.
  - **Service Function (SF)-Facing Interface**

    The interface between the MO/EC Controller and SF for the transmission of translated lower-level policies.

Interfaces in the I2ICF

- **The interfaces in the I2ICF are composed as below:**
  - **Registration Interface**

    The interface used to transfer information about SF capabilities and access control for the registration of the SF with either the Cloud Controller or MO/EC Controller.
  - **Monitoring Interface**

    The interface between the SF and the MO/EC Analyzer used to collect the SF monitoring data and is employed to identify security, system, and network issues related to the SF.
  - **Analytics Interface**

    The interface for the transmission of policy reconfigurations or feedback produced as a result of analyzing the SF monitoring data.

Interfaces in the I2ICF

- **The interfaces in the I2ICF are composed as below:**
  - **Analyzer-Facing Interface**

    The interface between the MO/EC Analyzer and the Cloud Analyzer for the exchange of security, network, and system-related analysis of SFs.
  - **VMS-Facing Interface**

    The interface between the MO/EC VMS used to exchange SF feature information, such as SF container images.
  - **Database Interface**

    The interface for exchanging data of an I2ICF Database. This is an interface between the I2ICF Database and the Cloud Controller, or between the I2ICF Database and the Cloud Analyzer.

Summary

- This document proposes an I2ICF framework as an Intent-Based System (IBS) for both MOs and ECs.
- Through this IBS, the SFs (i.e., NFs and AFs) in the MOs and ECs can be better configured and managed.
- Base on the proposed framework, both virtualized NFs and AFs can be efficiently orchestrated for agile resource re-configurations and flexible updates.

Next Steps

- This draft will be enhanced to accommodate use cases for I2ICF as follows:
  - A Use Case of Data Center Networking
  - A Use Case of Cooperative Intelligent Transportation Systems (C-ITS)
  - A Use Case of I2ICF for Edge Cloud
  - A Use Case of I2ICF for Mobile Objects (e.g., Robots and SDVs)
- I2ICF Group will prepare a WG-Forming BoF in the IETF 123 in Madrid.
- I2ICF Group will prepare IETF-123 Hackathon Project to clarify the I2ICF Framework and Interfaces.