

IBN-based E2E Service Orchestration on Top of KOREN

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Abstract—The increasing number of services impacted in the rise of complexity for E2E service orchestration. The newer network requirements of bandwidth achievement and QoS requirements have forced the researcher towards innovative design of underlying networks. This work proposes an IBN-based E2E service orchestration which will automate the process of service provisioning and its dynamic management. The proposed system will ensure the service assurance while keeping the requested context of the service. In addition, the IBN platform will enable orchestration of service for UAV (Unmanned Aerial Vehicles) over several underlying platforms. It also considers the orchestration of service over multiple domains and utilizes FlexRAN and OSM (OpsourceMANO) as RAN and Core orchestrators. In addition, it is based on KOREN Transport infrastructure to interconnect multiple domains.

Keywords—IBN, OSM, 5G, MicroStack and ML

I. INTRODUCTION

The biggest challenge of 5G is to provide specialized services that are way more beyond the capabilities of 4G network. It is very challenging to provision non-conventional services while they have very unique set of requirements. Drones or UAVs also enables variety of services each having unique requirements [1]. The services lying under the umbrella of UAV are as follows:

- leading with emergency services requiring low latency, high availability and assured service provisioning.
- after that logistic which requires high availability, reduction of cost and conformance of delivery.
- thirdly the drone leasing at tourist spots and sports sector, similarly media and livestreaming services each have their own subset of precise requirements.

Newer technology provides many unique solutions to provide such services however each solution has focused on a single domain and combining such solution is very complex in regard to security, availability and pricing. Hence, this work is focused on using IBN (Intent-based Networking) as central platform for managing operation across different domains allowing each user to subscribe different many services without even wondering about who the service provider is and how the service will be provided [2]. At the same time, it assures the security, QoS (quality of service) agreements and insures provisioning of services through proper channel [3]. Using this

IBN system the vendors agree to provide services with specified SLA requirements using digital contracts and similarly clients only pay for the services that are being provided. In addition, it can easily manage the agreements between multiple parties and handle services across multiple domains.

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The rest of the paper is organized as follows: Section II explains the system overview and section III concludes the paper.

II. SYSTEM OVERVIEW

A. System Working

From top IBN system enables the control of vastly distributed KOREN testbed while accepting high-level user requirements. After that there are three network domains that are handled using IBN system [12]. Firstly, the access network configuration are generated to handle service requirements at RAN (Radio Access Network). ML resource management is imposed for optimized resource allocation. Secondly, the transport network of KOREN is controlled using Restful JSON API's of SDN controllers at KOREN. RouteNet approach is used to handle the traffic and routing of the transport network. Thirdly, core networks orchestrator configuration for instantiation of slices. The OSM-Nine orchestrator allows to deploy light weight EPC using micro stack distribution of OpenStack developed by Linux Foundation. In addition, ML driven resource assurance is applied to handle scaling of VNF (Virtual Network Functions) to proactively optimize the cloud resources.

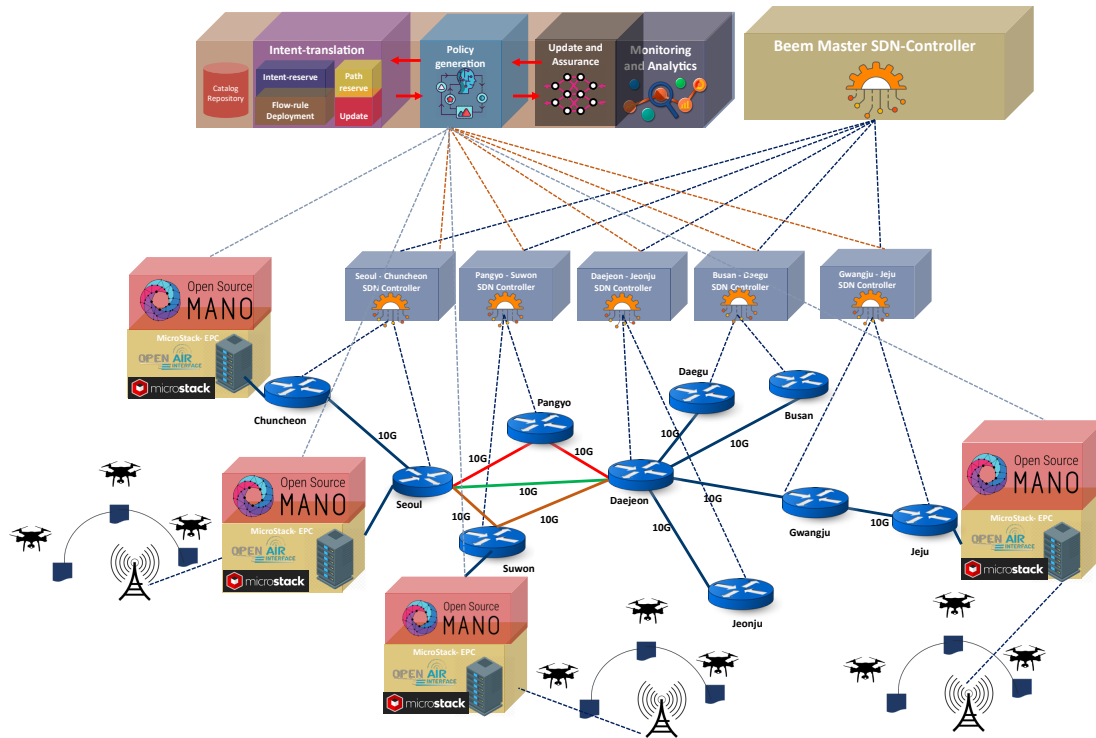


Fig. 1. Test-bed using KOREN and Access Network for drones connectivity using IBN

B. Testbed

The test-bed contains IBN system and 5G network integrated with KOREN network. At each KOREN node there is an EPC and core network deployed. The IBN system consists of web-based frontend and python based backend. Similarly, KOREN network consists of multiple layered SDN controller to manage Transport Network and it can be referred from [5]. KOREN provides highspeed connection between 10 Nodes and we have deployed OSM based EPC and Access network at each node as shown in Figure 1. The EPC used is OpenAir Interface components and access network includes Flex RAN based setup for the current network. For monitoring system, we have used Grafana configured with OSM and KOREN. The Grafana collects the information of VNFs and the KOREN links. IBN system also imposes multiple machines learning based models for the assurance of services dynamically and allocation of optimized resources.

III. CONCLUSION

This work is focused on orchestration of services across multiple domains in a 5G fashion. It proposes an automated way for IBN-based closed loop lifecycle management of service. It starts with allowing user to request services in high-level fashion and translates the requirements to all the domains using a trickle-down dispersed service provisioning. It proposes multiple machine learning models to optimize end-to-end service and assure the availability of service with the requested throughout the life of service. The novelty of the IBN-Based approach is that it abstracts the details of underlying domains and vendor

specific infrastructures. In addition it serves as a single solution for highly distributed future network.

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