TELECOM INFRA PROJECT

NaaS Gateway Technical Requirements

Network as a Service (NaaS)
Solution Group

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1. Introduction

1.1 Goal

A group of TIP participants seeks the continued development of the innovative Network-as-a-Service (NaaS) business model designed to enable the expansion of mobile coverage into rural / peri-urban areas and the addition of network capacity into urban areas through a third-party neutral host known as a NaaSCo. The NaaSCo strategy is to invest in shared network infrastructure enabling MNOs to utilize this shared infrastructure to provide greater network coverage and capacity for their customers. For the purposes of this document, NaaS is defined as an open access network where a neutral host (NaaSCo) operates a shared Radio Access Network (RAN) that is connected to multiple Mobile Network Operator (MNO) core networks.

One of the key functions that enables the success of NaaSCos is the ability to securely integrate the NaaS RAN to multiple MNO core networks in a scalable manner that also allows the NaaSCo proper control of and visibility into the RAN elements. This document defines the technical requirements for a NaaS Gateway that addresses the following concepts:

- Aggregation of RAN elements to provide a single integration point to MNO core networks
- Integration to MNO core networks through standard interfaces
- Support multi-MNO core network integration
- Support multi-vendor RAN equipment
- Support for 2G, 3G, 4G and 5G technologies
- Support standard MORAN and MOCN RAN sharing technologies
- Fully featured Network Management System (NMS) with northbound interfaces for integration with other systems
- Ability to measure site level traffic and aggregate traffic to each integrated core network
- Support for standard network performance KPI

1.2 Background

NaaSCos own and operate a RAN that can be shared with multiple operators through wholesale agreements. In rural areas, this model enables the expansion of mobile connectivity to remote locations that are typically not deemed economically viable using traditional models due to lack of infrastructure, low population density, and high deployment and operational costs. In urban areas, this model enables network densification in locations where capital investment from a single MNO is not economically viable. In both rural and urban areas, the NaaS model shifts the CAPEX cost from the MNO to the NaaSCo, reduces overall cost through sharing of assets, and accelerates deployment of new services.

It is critical that NaaSCos can securely integrate their RAN to multiple MNO core networks in a scalable manner that also allows the NaaSCo proper control of and visibility into the RAN network elements. Directly connecting NaaSCo RAN elements to MNO core networks is possible, but this architecture does not scale well in a multi-tenant environment and requires the MNO to either participate in RAN element management or provide the NaaSCo with access to MNO systems that manage the RAN elements. The NaaS Gateway (NaaSGW) solves this issue by aggregating and abstracting the RAN elements and providing a secure, clean demarcation point between the NaaSCo RAN and multiple MNO core networks while also providing the NaaSCo with proper control of and visibility into their RAN network elements.

1.3 Scope

This document defines the technical requirements for a NaaSGW and is divided into the following technical requirements categories:

1. Main Functions
2. Interfaces
3. Hardware Specifications
4. Security

Each requirement is specified as Required (**R**) or Optional (**O**).

2. Technical Requirements

2.1 Main Functions

Requirement Name	Requirement Class	Description
NaaSGW01	R	Aggregation of RAN elements providing a single integration point to MNO's core networks
NaaSGW02	R	Support multiple Radio Access Technologies (2G, 3G, 4G, 5G) operating in standard frequency bands
NaaSGW03	R	Support MORAN and MOCN RAN Sharing methods
NaaSGW04	R	Measure site level traffic and aggregate traffic to each integrated core network
NaaSGW05	O	Measure site level unique users
NaaSGW06	O	Support both trusted and untrusted Wi-Fi APs
NaaSGW07	R	Connect with equipment from different network suppliers
NaaSGW08	R	Provide network element control and configuration of eNBs
NaaSGW09	R	Provide full visibility to the operational status of eNBs
NaaSGW10	O	Support standard network performance KPIs

2.2 Interfaces

Requirement Name	Requirement Class	Description
NaaSGW11	R	Can be interfaced to MNO's core networks through standard interfaces S1-AP, S1-U, S2a, S2b, S6a/S8 lu-PS, lu-CS
NaaSGW12	R	Support Fully featured Network Management System (NMS) with northbound interfaces for integration with other systems (i.e., OSS)
NaaSGW13	R	Standard 3GPP interfaces to existing MNO components (i.e.S8 inbound roaming)
NaaSGW14	O	PLMN based routing between local subscriber DB and MNO/MVNO HSS

2.3 Hardware Specification

Requirement Name	Requirement Class	Description
NaaSGW15	O	Supports deployment on any AMD64 Architecture which can support a Debian or Ubuntu 20.04 Linux installation
NaaSGW16	R	Based on highly available, resilient, and independently scalable architecture

2.4 Security

Requirement Name	Requirement Class	Description
NaaSGW17	R	Encryption and integrity protection for data message, supporting multiple mainstream encryption and integrity algorithms
NaaSGW18	R	IPSec Server function to establish site-to-site IPSec tunnel with the eNB side
NaaSGW19	R	IPSec Client function to establish site-to-site IPSec tunnel with the EPC side
NaaSGW20	R	Two-way authentication, support PSK, certification, and EAP-AKA authentication mode
NaaSGW21	R	IPsec tunneling termination towards RAN and towards core network to improve network security
NaaSGW22	R	Tunnel model: calculate AH or ESP header using the whole IP packet
NaaSGW23	R	Transmission mode: calculate AH or ESP header using data of the transport layer
NaaSGW24	R	Support access control list (ACL) function, data resource authentication and anti-replacement
NaaSGW25	R	Routing and forwarding uplink and downlink data correctly
NaaSGW26	R	Support Network Address Translation (NAT) through function
NaaSGW27	R	Realize eNBs access to the security gateway through VPN technology
NaaSGW28	R	DSCP/ToS inheritance of inner and outer layer

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