

Project Pitch - 5G Framed Route - Adding management of sub-networks on WebGUI

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1 Target

This project is designed for network engineers, telecommunication companies, and anyone involved in the design and implementation of 5G networks. It will be particularly useful for companies looking to optimize their 5G networks for faster and more efficient data transmission.

2 Introduction

Framed routing is a new functionality of Open5GS an opensource 5G Core implementation. It doesn't been validated or tested yet. Management/provision operations are still incomplete on the core. Monitoring such networks can be a challenge and we aim to do that by setting up an emulated environment using Virtual Machines.

3 Overview

When a cellular mobile is connected in a mobile network (PLMN - basically a cellular network) it is normally assigned with a single IP. In some scenarios it is essential that this UE's (User equipment's) work as acces points and share their connectivity with others but this implicates the use of a NAT that basically imposes UE's to be seen with a single IP address, assigned by the 5G core to the UE, for a common user it is enough but for advanced uses, our case, it constitute multiple disadvantages like limits the reachability and the bi directional connectivity.

More advanced scenarios require 5G to behave as a router, this means, allow the connection of multiple computer networks and the communication between them, serving one or more LAN segments, i.e. forwarding traffic from connected devices bypassing NAT, we can do that with 5G by adding the Framed Route functionality.

3.1 The problems we are solving

The main benefit of framed routing is that it simplifies data processing and forwarding for network devices and this functionality can be natively added to 5G. Framed Route enables the deployment of extra IP networks behind a UE, allowing access to a number of IPv4 addresses or IPv6 prefixes through the established 5G PDU Session from external networks like the Internet (s).

Features:

1. The 5G network will use the framed routing system, which enables data to be transmitted in frames rather than packets. This will speed up data transfer times by reducing latency and improving network performance.
2. By By minimizing the amount of data that needs to be transmitted across the network, the framed routing protocol will improve network performance. As a result, data transfer rates will increase and network congestion will decrease.

3. Increase network reliability by offering improved mechanisms for packet loss recovery and error correction. This will ensure that data is transmitted accurately and reliably across the network.
4. It will be able to handle increased traffic and data transmission volumes, ensuring that the network remains stable and efficient.

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5 The objective and the plan to get there

The main goal of the project is to validate and test the Framed Route feature in Open5GS and add the management functionality of subnets in the WebGUI API.

The solution must enable the assignment and the management of IPv4/v6 prefixes for each UE through the WebGUI and this change has to be reflected in the user database (MongoDB) and so on to the 5G Core network functions in charge of the PDU session establishment procedure (SMF, UDM and UPF), in the case of UPF it must also be able to receive the framed route TLVs from the SMF (through the PFCP protocol).

Packets directed to any address associated with the specified prefixes and received at the UPF N6 interface will be routed to the appropriate UE through the corresponding GTP tunnel, without involving any NAT operations.

The development project will employ the UERANSIM simulator to replicate the RAN and UE's and Open5gs to replicate the core and the UPF.

6 Brief Biography of the developers

Gonalo Tavares de Bastos and Leonardo Gonalves Cordeiro, we are both Electrical and computer engineering students at Universidade de Coimbra, and this project was chosen by us within the scope of the curricular unit Project 2.

7 Contacts

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