

Article Overview

The UPF connects to the core switch via N3/N6 interfaces for user-plane traffic, with session control managed over N4 using PFCP.

UPF Overview

The User Plane Function (UPF) is the 5G core network element responsible for packet routing, forwarding, QoS enforcement, and traffic steering between the NG-RAN (gNB) and external data networks (DN) such as the Internet or enterprise services . It acts as the data-plane anchor, while the SMF controls session parameters over the N4 interface . UPFs can be deployed centrally, regionally, or at the edge depending on latency and traffic requirements .

Key Interfaces for Core Switch Interconnection

- o N3 Interface: Connects the UPF to the gNB (RAN) using GTP-U tunnels. This interface handles uplink and downlink user traffic from the radio network .
- o N6 Interface: Connects the UPF to the Data Network or core switch. This is the primary interface for forwarding user-plane traffic to external services .
- o N4 Interface: Connects the UPF to the Session Management Function (SMF) for session setup, modification, and deletion using PFCP messages. This interface does not carry user traffic but configures the UPF for proper forwarding .
- o N9 Interface: Optional interface for UPF-to-UPF interconnection, useful for traffic steering or multi-UPF deployments .

Steps to Interconnect UPF with the Core Switch

- o Physical/Virtual Connectivity: Ensure the UPF has a network path to the core switch, either via physical Ethernet ports or virtual interfaces in a cloud-native deployment .
- o Configure N6 Routes: Assign the N6 interface IP and configure routing so that all traffic destined for the data network passes through the core switch. This may involve static routes or dynamic routing protocols depending on the network design .
- o GTP-U Tunnel Setup: For uplink/downlink traffic, configure GTP-U tunnels on the N3 interface. The SMF programs the UPF with uplink TEIDs and QoS parameters via PFCP over N4 .
- o QoS and Traffic Steering: Apply QoS policies and traffic steering rules on the UPF to ensure proper prioritization and forwarding. This includes uplink/downlink rate enforcement, reflective QoS marking, and optional DPI-based traffic handling .
- o Testing and Validation: Verify connectivity by sending test traffic from the RAN through the UPF to the core switch and onward to the data network. Monitor for packet loss, latency, and correct QoS enforcement .

Deployment Considerations

Interconnecting UPF with the core switch

- o Cloud-Native UPF: If using containerized UPF (e.g., BESS-UPF), ensure Kubernetes networking allows N6 connectivity to the core switch and sufficient CPU resources for high-throughput traffic .
- o Latency-Sensitive Applications: Place UPFs closer to the edge to reduce latency for real-time services.
- o Redundancy: Consider multiple UPFs with N9 interconnections for load balancing and failover. By following these steps, the UPF can be effectively interconnected with the core switch, ensuring efficient user-plane traffic forwarding, QoS enforcement, and seamless integration with the 5G core network .

In this article, we will discuss about few important UPF command syntax that is used here to write an UPF for a given power intent.

Product overview User Plane Function (UPF) is one of the 5G core (5GC) Network Functions (NF). UPF is responsible

Learn the 5G UPF including user-plane packet forwarding, N3/N6 interfaces, PFCP control via SMF, QoS enforcement, and its role in

UPF Architecture The User Plane Function (UPF) is a fundamental component of a 3GPP 5G core infrastructure

This project implements a 4G/5G User Plane Function (UPF) compliant with 3GPP TS23.501. It follows the 3GPP Control and User

5G-UPF Overview Product Description The User Plane Function (UPF) is one of the network functions (NFs) of the 5G

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The GPRS tunneling protocol for the user plane (GTP-U) supports multiplexing of the traffic from different PDU sessions by tunneling

This blog will break down how UPF handles the initiation of both downlink and uplink data transfer, using the diagram

`map_power_switch -domain <domain_name> -lib_cell <lib_cell_name> <switch_name>`
Even when not switching, CMOS cells

3 Power Switch Definition ? Why? Used for power gating to control power to a domain. ? Example: Switch

Interconnecting UPF with the core switch

SW_CORE controls

UPF in SOC:1. Set the level of implementation constraints.

Detailed comparison of all 15+ 5G Core network functions with focus on AMF, SMF, and UPF roles, interfaces, scaling

The 5G Core uses a service-based control architecture around AMF, SMF, UDM, AUSF, PCF, NRF, and NSSF, with the UPF

Concise cheat sheet on UPF (Unified Power Format) covering power domains, switches, networks, level shifters, and more. VLSI

It is interconnected with the Data Network (DN) in the 5G architecture. As a primary network function (NF) of the 5G

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