Содержание

Handover ePDG

Handover allows a subscriber device (UE) to automatically switch traffic between Wi-Fi and LTE networks without interrupting an active session. The feature is used to ensure the continuity of services, primarily voice and multimedia (for example, VoWiFi and VoLTE), when changing the connection conditions.

Switching can occur in two directions:

- **Wi-Fi → LTE** – when Wi-Fi connection quality deteriorates or signal loss occurs.
- **LTE → Wi-Fi** – if you detect an available Wi-Fi network and have a Wi-Fi preference policy.

When the handover works correctly, the user does not notice the switch: the active IP session is saved, and the service continues to work without interruption.

The solution architecture complies with the 3GPP specifications for integrating **3GPP and non-3GPP accesses**.

Main specifications:

- **3GPP TS 23.402** Architecture enhancements for non-3GPP access
- **3GPP TS 24.302** - Access to the EPC via non-3GPP access networks
- **3GPP TS 33.402** Security aspects of non-3GPP access
- **3GPP TS 29.273** - Evolved Packet Data Gateway (ePDG) interfaces

Handover process participants

The switching process involves elements of the LTE radio network, Wi-Fi infrastructure and the core of the mobile network.

Main systems:

- **UE (User Equipment)** - Subscriber device.
- **Wi-Fi Access Point** The Wi-Fi access point through which the device connects to the network.
- **eNodeB (eNB)** An LTE base station providing radio access.
- **MME (Mobility Management Entity)** - A subscriber mobility management node in LTE.
- **SGW (Serving Gateway)** A gateway for routing user traffic within a mobile network.
- **PGW (Packet Data Network Gateway)** A gateway to external networks (e.g. the Internet).
- **PCRF (Policy and Charging Rules Function)** - Control of traffic policies and QoS parameters.
- **HSS (Home Subscriber Server)** is a subscriber database.
- **AAA Server (3GPP AAA)** A non-3GPP authentication server.
- **ePDG (Evolved Packet Data Gateway)** A gateway that securely connects a subscriber to a mobile kernel via untrusted Wi-Fi networks.

Network elements communicate with each other through standard 3GPP interfaces.

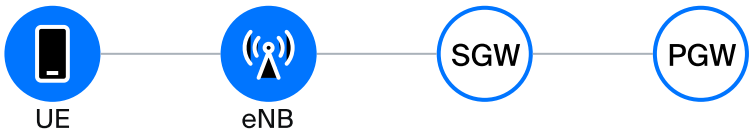
The main interfaces used in handover between Wi-Fi and LTE are shown in the table below.

Interface	Connected elements	Purpose	Specification
SWu	UE - ePDG	Installation of a secure IPsec tunnel when accessed via Wi-Fi	3GPP TS 24.302
SWm	ePDG - AAA	Subscriber authentication via Diameter	3GPP TS 29.273
S2b	ePDG - PGW	Transfer of user traffic between Wi-Fi access and EPC	3GPP TS 29.273
S6b	ePDG - HSS	Receiving subscriber data for authentication	3GPP TS 29.273
S11	MME - SGW	Managing LTE bearer sessions	3GPP TS 29.274
S1-U	eNodeB - SGW	User traffic transmission in LTE	3GPP TS 36.414
Gx	PGW - PCRF	Transfer of QoS policies and tariff rules	3GPP TS 29.212

Handover types

Handover Wi-Fi - LTE

This Case is used when a subscriber is connected to Wi-Fi, but the connection quality deteriorates.

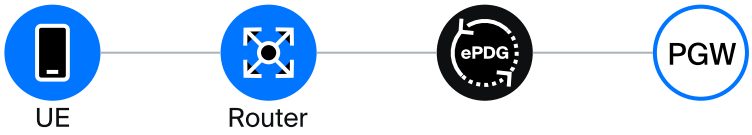


Main stages:

1. **Initiation of handover**
   The decision to switch is usually made by **UE**, analyzing:
   - wi-fi signal
   - linkage
   - internal policies of the device. The device then starts searching for an available LTE network.
2. **LTE connection**
   UE establishes a radio connection to **eNodeB** and initiates a standard LTE connection procedure.
3. **Authentication and registration**
   MME performs the following procedures:
   - Subscriber authentication via **HSS**
   - registration of the device in the network.
4. **Installation of user session**
   A data transmission session is created through:
   - **SGW**
   - **PGW**
     Traffic and QoS parameters are defined by **PCRF** policies.
5. **Transfer of user traffic**
   Once an LTE session is established, user traffic begins to be transmitted via LTE.
6. **Completion of the Wi-Fi session**
   After a successful switch, the IPsec Wi-Fi tunnel is closed and Wi-Fi connections are freed up.

Handover LTE - Wi-Fi

This Case is used to offload the mobile network or improve the quality of the connection when there is an available Wi-Fi network.



Main stages:

1. **Wi-Fi detection**
   UE detects the available Wi-Fi network and, depending on the operator's policy, initiates the connection.
2. **Secure tunnel installation**
   UE establishes **IPsec tunnel** to **ePDG** using **IKEv2** protocol.
   Specification: 3GPP TS 24.302
3. **Authentication**
   ePDG interacts with the **AAA server** that authenticates the subscriber.
   Usually used mechanism **EAP-AKA**, allowing the use of SIM-card data.
   Specification: 3GPP TS 33.402
4. **Creating a user session**
   After successful authentication, ePDG establishes a connection to **PGW**, through which a user session is created.
5. **Traffic transport**
   User traffic is transmitted through Wi-Fi.
6. **Release of LTE resources**
   After switching, the LTE session is closed and the radio resources of the network are released.