YESDR

Your Extensible Software Defined Radio

**YesDR Technical Specification**

**YesDR TS 00.004**

Version 1.0.0
Release 1

# Procedures and Call Flows

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## Contents

## 1 Scope

This Technical Specification defines the normative procedures and call flows for the YesDR Release-1 system.

This document specifies message sequencing, functional interactions, and procedural behavior between YesDR entities during key operations, including registration, authentication, session management, and spectrum-driven reconfiguration.

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## 2 References

- YesDR TS 00.001 – Overall System Description
- YesDR TS 02.xxx – YesDR Network Function Specifications
- YesDR TS 03.xxx – YesDR Protocol Specifications
- 3GPP TS 23.502 – Procedures for the 5G System

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## 3 General Procedural Principles

- All procedures SHALL follow a request–response model.
- Procedures MAY be aborted upon error detection.
- State transitions SHALL be atomic per UE context.
- Messages SHALL be delivered reliably unless explicitly stated.

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## 4 UE Registration Procedure

### 4.1 Purpose

The UE Registration procedure establishes a secure signaling context between YUE and the YesDR Core Network.

### 4.2 Procedure Description

1. YUE sends `RegistrationRequest` to YBS
2. YBS forwards NAS payload to YAMF
3. YAMF requests authentication vectors from YAUSF
4. YAUSF retrieves subscription data from YUDM
5. YAMF sends `AuthenticationRequest` to YUE
6. YUE responds with `AuthenticationResponse`
7. YAMF performs RES* verification
8. YAMF initiates Security Mode Control

9. YAMF sends `RegistrationAccept` to YUE

Upon successful completion, the UE SHALL be in `REGISTERED` state.
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## 5 Authentication Procedure

### 5.1 Purpose

This procedure authenticates the UE and establishes a shared security context.

### 5.2 Procedure Description

1. YAMF sends authentication request to YAUSF
2. YAUSF returns RAND, AUTN, and HXRES*
3. YUE validates AUTN and computes RES*
4. YUE sends RES* to YAMF
5. YAMF validates RES* via YAUSF

Authentication SHALL fail if RES* does not match XRES*.
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## 6 Security Mode Control Procedure

### 6.1 Purpose

This procedure establishes NAS integrity and ciphering protection.

### 6.2 Procedure Description

1. YAMF selects security algorithms
2. YAMF sends `SecurityModeCommand`
3. YUE responds with `SecurityModeComplete`

After completion, all NAS messages SHALL be protected.
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## 7 PDU Session Establishment Procedure

### 7.1 Purpose

This procedure establishes user-plane connectivity between YUE and the Data Network.

### 7.2 Procedure Description

1. YUE sends `PDUSessionEstablishmentRequest`
2. YAMF forwards request to YSMF
3. YSMF allocates IP address
4. YSMF establishes PFCP session with YUPF
5. YSMF returns session parameters
6. YBS configures GTP-U tunnels
7. YUE receives `PDUSessionAccept`

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## 8 User Plane Data Transfer

### 8.1 Description

After PDU session establishment:

- Uplink packets SHALL be encapsulated using GTP-U
- Downlink packets SHALL be forwarded using TEID mapping
- Policy enforcement SHALL occur at YUPF

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## 9 Spectrum Monitoring and Reporting Procedure

### 9.1 Purpose

This procedure enables continuous spectrum awareness.

### 9.2 Procedure Description

1. YSM performs spectrum scanning
2. YSM computes occupancy metrics
3. YSM sends `SpectrumReport` to YCRF
4. YCRF stores and analyzes data

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## 10 AI-Assisted Radio Reconfiguration

### 10.1 Purpose

This procedure enables adaptive radio configuration based on spectrum intelligence.

### 10.2 Procedure Description

1. YRMF queries YCRF for spectrum intelligence
2. YRMF computes new radio parameters
3. YRMF sends reconfiguration command to YBS
4. YBS applies updated radio parameters

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## 11 Error Handling Procedures

- Procedures MAY be retried upon transient failures
- Authentication failures SHALL result in UE rejection
- Session failures SHALL trigger resource cleanup

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## 12 Relationship to 3GPP Procedures

YesDR procedures are conceptually aligned with 3GPP TS 23.502 but are simplified to:

- Reduce signaling complexity
- Enable SDR-based experimentation
- Support AI-driven decision making

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