Your Extensible Software-Defined Radio

YesDR Technical Specification

YesDR TS 00.001

Version 1.0.0
Release 1

Overall System Description

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1 Scope

This Technical Specification provides the overall system description for the YesDR (Your Extensible Software Digital Radio) standard.

YesDR defines a modular, extensible, and software-centric framework for the design, implementation, teaching, and experimentation of end-to-end cellular wireless systems using Software Defined Radios (SDRs).

This document serves as the primary entry point to the YesDR specification set and defines the architectural principles, functional entities, deployment models, and relationships between YesDR components.

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2 References

2.1 Normative References

- YesDR TS 02.xxx: YesDR Network Function Specifications

- YesDR TS 03.xxx: YesDR Control and Management Protocols

2.2 Informative References

- 3GPP TS 23.501: System Architecture for the 5G System

- 3GPP TS 23.502: Procedures for the 5G System

- 3GPP TR 38.843: AI/ML for NR Air Interface

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3 Definitions, Symbols, and Abbreviations

3.1 Definitions

- **YesDR**: A modular cellular wireless standard enabling end-to-end protocol experimentation using SDRs.

- **Network Function (NF)**: A logical functional entity providing a specific capability within the YesDR architecture.

3.2 Abbreviations

YUE	YesDR User Equipment
YBS	YesDR Base Station
YAMF	YesDR Access Management Function
YSMF	YesDR Session Management Function
YUPF	YesDR User Plane Function
YUDM	YesDR Unified Data Management
YAUSF	YesDR Authentication Server Function
YPCF	YesDR Policy Control Function
YNRF	YesDR Network Repository Function
YSM	YesDR Spectrum Monitor
YCRF	YesDR Cognitive Radio Function

YRMF	YesDR Radio Management Function

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4 Design Principles

YesDR is designed according to the following principles:

- **End-to-End Visibility**: Full control and observability from PHY to Core Network.

- **Modularity**: Each network function is independently deployable and replaceable.

- **Extensibility**: New protocols, AI models, and procedures can be integrated without redesign.

- **SDR-Centric**: Radio functions are implemented using SDRs and software-based PHY processing.

- **AI-Native**: Native support for AI-driven spectrum sensing, optimization, and automation.

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5 Overall Architecture

The YesDR architecture consists of:

- User Equipment (YUE)

- Radio Access Network (YBS)

- Core Network Functions (YCore)

- User Plane (YUPF)

- Cognitive and Spectrum Intelligence Functions

The architecture supports service-based interfaces and protocol-based control interfaces.
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6 Functional Entities

6.1 User Equipment (YUE)

Implements full NAS, security, and user-plane protocol stacks and interfaces with the radio access network using SDRs.

6.2 Base Station (YBS)

Provides radio access, access-stratum security, NAS forwarding, and user-plane tunnel mapping.

6.3   Core Network Functions

The YesDR Core Network includes:

- YAMF – Access and mobility management

- YSMF – Session and IP management

- YUPF – User-plane forwarding

- YUDM – Subscription and identity storage

- YAUSF – Authentication and key agreement

- YPCF – Policy and traffic control

- YNRF – NF registration and discovery

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7   Cognitive and AI Functions

YesDR integrates AI-driven intelligence through:

- YSM – Distributed spectrum sensing

- YCRF – Centralized spectrum intelligence and AI inference

- YRMF – AI-assisted radio resource management

These functions enable dynamic spectrum access, traffic prediction, signal classification, and autonomous network optimization.

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8   Interfaces and Protocols

YesDR defines the following protocols:

- YACP – Access control and NAS signaling

- YSMP – Spectrum management and reporting

- PFCP-like control for user-plane management

- GTP-U-like tunneling for user-plane traffic

Interfaces MAY be service-based or protocol-based depending on deployment requirements.

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9   Deployment Models

YesDR supports multiple deployment models:

- Single-node all-in-one deployment

- Distributed core and RAN deployment

- SDR-based laboratory testbeds

- National-scale research testbeds

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10   Relationship to 3GPP Systems

YesDR is conceptually aligned with 3GPP 5G System architecture but intentionally simplifies procedures and interfaces to support experimentation and innovation.

YesDR MAY interoperate with selected 3GPP components such as Open5GS and ORAN platforms.
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11   Release and Evolution

YesDR follows a release-based evolution model.

Release 1 focuses on:

- End-to-end connectivity

- SDR-based PHY

- AI-assisted spectrum and resource management

Future releases MAY extend mobility, multi-RAT, and large-scale deployment features.
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