YesDR Technical Specification

YesDR TS 02.008

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Release 1

YesDR Cognitive Radio Function (YCRF)

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Contents

1 Scope

This Technical Specification defines the YesDR Cognitive Radio Function (YCRF).

YCRF provides centralized cognitive intelligence for spectrum sensing, data aggregation, AI-assisted analysis, and decision support within the YesDR architecture.

YCRF interacts with the YesDR Radio Management Function (YRMF), YesDR Spectrum Monitor (YSM), and other YesDR control-plane entities.

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2 References

2.1 Normative References

- YesDR TS 01.001: YesDR Overall Architecture
- YesDR TS 02.001: YesDR Core Network Functions
- YesDR TS 02.007: YesDR Radio Management Function (YRMF)

2.2 Informative References

- 3GPP TR 38.843: AI/ML for NR Air Interface
- IEEE 1900 Cognitive Radio Standards

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3 Definitions, Symbols, and Abbreviations

Abbreviation	Description
YCRF	YesDR Cognitive Radio Function
YRMF	YesDR Radio Management Function
YSM	YesDR Spectrum Monitor
YNRF	YesDR Network Repository Function
AI	Artificial Intelligence
ML	Machine Learning
FFT	Fast Fourier Transform

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4 Functional Overview

YCRF provides cognitive intelligence capabilities including:

- Spectrum sensing data aggregation
- Storage of spectrum measurements
- AI-assisted spectrum analysis
- Decision support for radio resource allocation

YCRF SHALL expose service-based interfaces over HTTP.

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5 YCRF Architecture

YCRF consists of the following logical components:

- NRF registration and heartbeat client
- Spectrum data ingestion service
- Persistent spectrum database (PostgreSQL)
- AI/ML analysis interface
- Logging and telemetry module

YCRF SHALL register with YNRF and maintain liveness using periodic heartbeat messages :contentReference[oaicite:1]index=1.

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6 Spectrum Data Storage

YCRF SHALL store spectrum sensing and measurement data received from YSM or other entities.

6.1 Stored Data Model

Field	Description
Timestamp	UTC timestamp of measurement
Payload	Raw or processed spectrum data (JSON)
Source Node	Identifier of reporting entity

Spectrum data SHALL be stored in a relational database.

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7 Service-Based Interfaces

7.1 Spectrum Data Ingestion Service

7.1.1 Store Spectrum Data

HTTP Method: POST
URI: /store

Input Parameters:

- Spectrum measurement payload (JSON)

Output:

- Storage confirmation

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7.2 Spectrum Data Access Service

7.2.1 Retrieve Spectrum Database URI

HTTP Method: GET
URI: /spectrum-data

Output Parameters:

- Database connection URI

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8 AI-Assisted Cognitive Processing

YCRF MAY integrate AI/ML models for:

- Spectrum occupancy prediction
- Interference detection
- Signal classification
- Channel quality estimation

AI outputs SHALL be made available to YRMF to support radio resource allocation decisions.

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9 Logging and Telemetry

YCRF SHALL support:

- Local file-based logging
- UDP-based centralized logging
- Timestamped event records

Logs SHALL include registration, heartbeat, data ingestion, and error events :contentReference[oaicite:2]index=2.

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10 Error Handling

YCRF SHALL return appropriate error responses for:

- Database connection failures
- Invalid data payloads
- Internal processing errors

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11 Security Considerations

YCRF SHALL:

- Protect stored spectrum data
- Use secure transport for control interfaces
- Validate incoming requests

Access to spectrum intelligence SHALL be restricted to authorized YesDR functions.

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12 Relationship to Cognitive Radio Standards

YCRF aligns with cognitive radio principles while:

- Supporting centralized spectrum intelligence
- Enabling AI-driven decision support
- Allowing SDR-based experimentation

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