

RRC Complete System Architecture - All Components and Data Flows (rrc100.c Implementation)

RRC Core Implementation (rrc100.c)

c)

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PHY Integration

- update_phy_metrics_for_node()
- is_link_quality_good()
- PHY_LinkMetrics monitoring

Quality Thresholds:
RSSI: -90dBm, SNR: 10dB, PER: 50%

Neighbor Tracker

- init_neighbor_tracking()
- parse_hello_packet_capabilities()
- update_neighbor_capabilities()
- cleanup_stale_neighbors()
- assign_tdma_slots()

Hello Packet Format:
Byte[0]: 0x01 (HELLO)
Byte[3]: TX/RX flags

Uplink Processor

- rrc_process_uplink_frame()
- forward_olsr_packet_to_l3()
- deliver_data_packet_to_l7()
- convert_frame_to_app_packet()
- rrc_deliver_to_application_layer()

Bidirectional Flow Support

OLSR NC Queue

- rrc_olsr_nc_queue
- init_olsr_nc_queue()
- enqueue_olsr_nc_packet()
- rrc_tdma_dequeue_nc_packet()

NC Slot Management

Application Feedback

- notify_application_of_failure()
- generate_slot_assignment_failure_message()
- notify_successful_delivery()

Failure Messages:
"SLOT_ASSIGN_FAIL"
"No route available"
"DELIVERY_SUCCESS"

Packet Processor

- rrc_process_application_packet()
- process_custom_packet()
- map_data_type_to_priority()
- create_frame_from_rrc()
- enqueue_to_appropriate_queue()

Priority Mapping:
PTT → -1, Voice → 0, Video → 1
File → 2, SMS → 3, Relay → 4

FSM State Manager

- RRC_SystemState current_rrc_state
- RRC_ConnectionContext connection_pool[8]
- rrc_fsm_stats statistics

- rrc_handle_power_on()
- rrc_handle_data_request()
- rrc_handle_route_change()
- rrc_periodic_system_management()

States: NULL → IDLE → SETUP → CONNECTED → RECONFIG → RELEASE

Static Memory Pools

- ApplicationMessage message_pool[16]
- PHY_LinkMetrics phy_metrics[32]
- NodeCapability neighbor_capabilities[32]
- TDMA_SlotInfo tdma_slot_table[8]
- RRC_ConnectionContext connection_pool[8]

Total Memory: 6.25KB static
No malloc/free: Embedded-friendly

Application Layer (L7)

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CustomApplicationPacket

- uint8_t src_id, dest_id
- RRC_DataType data_type
- TransmissionType transmission_type
- uint8_t data[16], size_t data_size
- uint32_t sequence_number
- bool urgent

Example Input:
src_id: 1, dest_id: 2
data_type: RRC_DATA_TYPE_SMS
data: "Hello World"
urgent: false

queue

c Integration

Priority Queues

- analog_voice_queue (PTT)
- data_from_l3_queue[0-3] (Priorities)
- rx_queue (Relay)
- olsr_hello_queue (NC)

- enqueue(queue*, frame)
- dequeue(queue*)
- is_empty(), is_full()

Frame Structure

- uint8_t source_add, dest_add
- uint8_t next_hop_add
- bool rx_or_l3
- int priority, TTL
- DATATYPE data_type
- char payload[16]
- int payload_length_bytes

Example Data Flow Scenario:
1. App sends SMS "Test" from Node 1 to Node 2
2. RRC triggers FSM: IDLE → CONNECTION_SETUP
3. OLSR returns next_hop = 3
4. TDMA confirms slot available for priority 3
5. FSM transitions: CONNECTION_SETUP → CONNECTED
6. Frame created and enqueued to data_from_l3_queue[3]
7. Success notification sent to application

Memory Usage Breakdown:
• ApplicationMessage pool: 16 × 48B = 768B
• PHY metrics: 32 × 32B = 1024B
• Neighbor capabilities: 32 × 24B = 768B
• Connection pool: 8 × 64B = 512B
• TDMA slot table: 8 × 16B = 128B
• Statistics & queues: ~3KB
Total: 6.25KB static allocation

External Team APIs

«ext»

PHY Team API

- phy_get_link_metrics(node, rssi*, snr*, per*)
- phy_is_link_active(node)
- phy_get_packet_count(node)

Metrics Examples:
RSSI: -85dBm, SNR: 15dB, PER: 10%

TDMA Team API

- tdma_check_slot_available(node, priority)
- tdma_request_nc_slot(payload, len, slot*)

Return Values:
true: Slot available, false: Busy

OLSR Team API

- olsr_get_next_hop(dest_node)
- olsr_trigger_route_discovery(dest_node)

Return Values:
0: No route, >0: Next hop ID