ULAK

# ULAK RAN PRODUCTS


# TBB4510 SINGLE RAN (4G + 5G) | BASEBAND UNIT

## Product Specification

| | |
|---|---|
| CU/DU Joint Baseband Unit on Cots Server | Single Ran (4G + 5G) |
| LTE FDD / NR FDD / NR TDD Support | O-RAN Fronthaul Split Option 7.2x Compliance |
| Supports 3GPP 4G and 5G Standards | |

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**3.1** Front View
**3.2** Rear View
**3.3** Led Status Indicator

# 01 Overview

ULAK 4G & 5G Baseband Unit (BBU) is a carrier-grade platform built on x86-64 architecture, running on a COTS server with an integrated CU/DU joint architecture, unifies 4G LTE and 5G NR in a single system. It follows open 3GPP and O-RAN standards—using O-RAN Split 7.2x fronthaul based on eCPRI—for true multi-vendor interoperability. With flexible Ethernet interfaces, precise network timing, and scalable compute resources, it enables straightforward deployment and cost-efficient growth across modern RAN networks.

# 02 General Characteristics

| | |
|---|---|
| Supported Technologies | LTE FDD, NR FDD, NR TDD |
| Mixed Mode (NR+LTE) | Yes |
| O-RAN Compliance | Option 7.2x Compliance |
| Radio Interface Ports (eCPRI) | Onboard 12×25 GbE SFP28 ports with eCPRI support |
| Synchronization Sources | GNSS<br>PTP (G.8275.1, G.8275.2, G.8265.1)<br>SyncE (G.8262, G.8264, G.8264.1) |
| # of External Alarms | 4 |
| Form Factor | 2U Rackmount |
| Dimensions (W x H x D) | 436.88 x 88.9 x 298.8mm (17.2" x 3.5" x 11.8") |
| Weight | Net Weight: 7.7 kg (17 lbs) |
| Input power | 2x 600W DC -48V Redundant Power Supplies |
| Ingress protection rating | IP20 |
| Operating temperature | -20°C to +55°C (-4°F to +131°F) |
| Operating Relative Humidity | 8% to 90% (non-condensing) |
| MTBF | MTBF 300000 hours@25°C |
| Holdover Time | Up to 24 hours with GNSS (± 1.5 µs)<br>Up to 8 hours with PTP (± 1.5 µs) |

**Table 2-1 General Specifications**

# 03 Product Overview

## 3.1 Front View

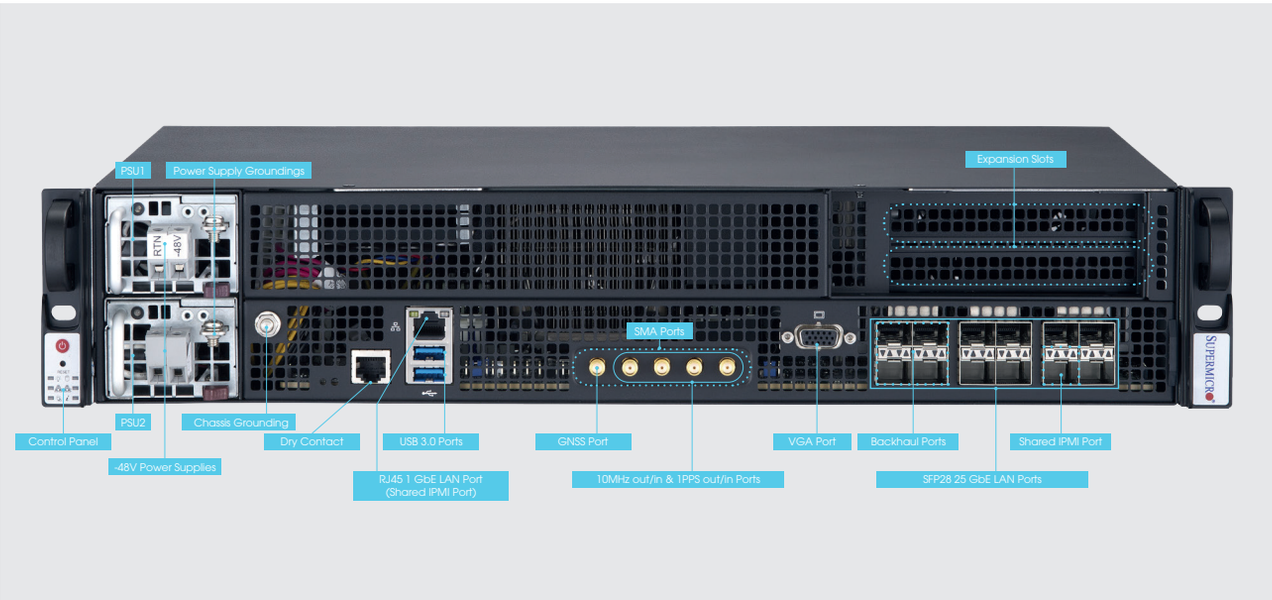
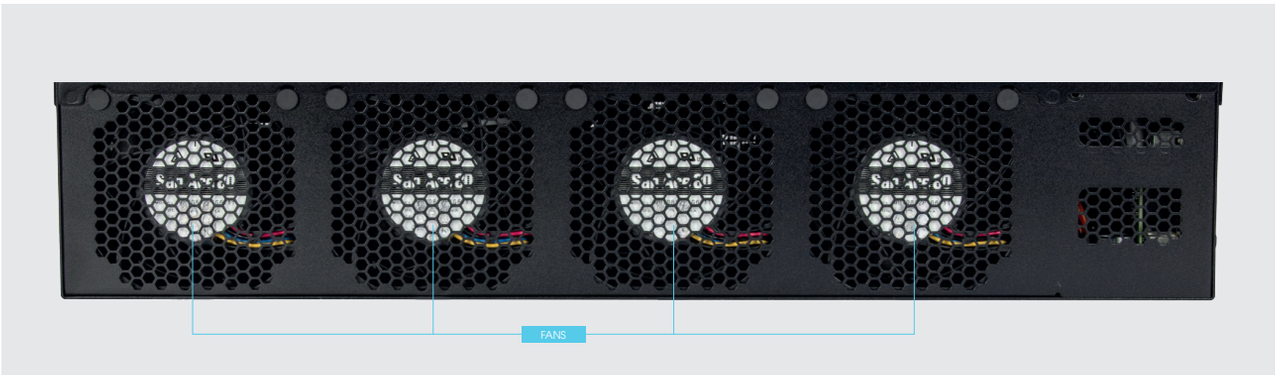



Figure 3-1 Front Panel

| | |
|---|---|
| Control Panel | Front control panel with LEDs and buttons (see Chapter 3.3 for details) |
| Power Supplies | 2 x 600W redundant power supply modules (PSU1 on top, PSU2 below) |
| Dry Contact | 1 x Dry Contact Port (4 External Alarms) |
| LAN Ports | 1 x RJ45 1 GbE LAN port (Fronthaul, Backhaul, IPMI shared Port)<br><br>12 x SFP28 25 GbE LAN ports supporting eCPRI for fronthaul and backhaul connectivity, with IPMI shared port capability |
| USB Ports | 2 x Two USB 3.0 ports |
| SMA Ports | 5 x SMA (GNSS / 10MHz out / 1PPS out / 10MHz in / 1PPS in) ports |
| VGA Port | 1 x video port |
| Expansion Slots | 2 x PCIe Slot for LAN Port expansion with NIC Card (2 x 4 SFP28 25 GbE LAN ports) |

**Table 3-1 Front Panel**

### 3.2 Rear View




| | |
|---|---|
| FANS | 4 (Internal) 8-cm fans |

Table 3-2 Rear Panel

### 3.3 LED Status Indicator

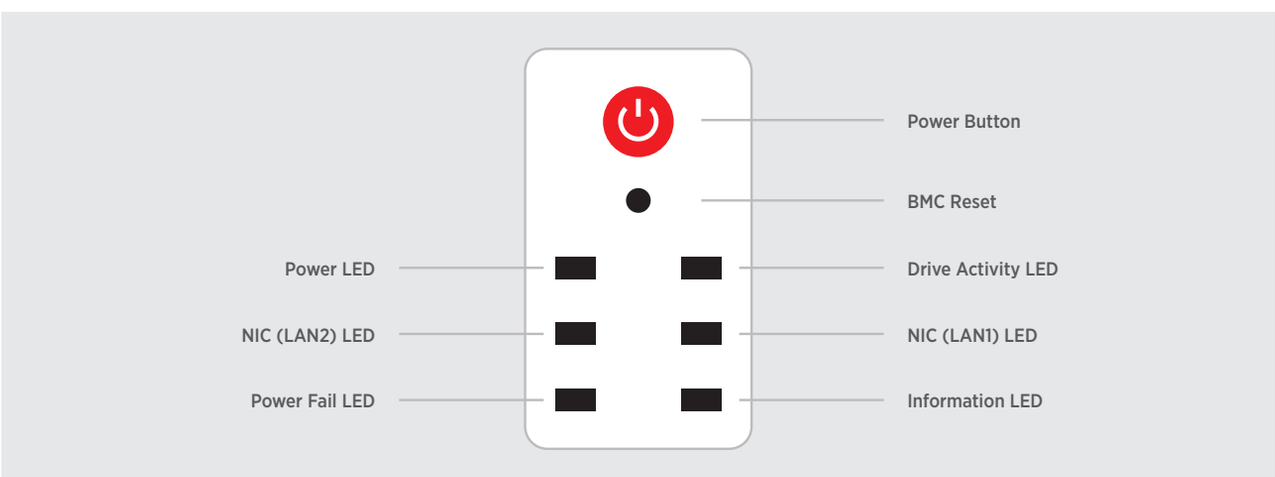



Figure 3-3 Control Panel

| Feature | Description |
|---|---|
| Power Button | The main power switch applies or removes primary power from the power supplies to the server but maintains standby power. |
| BMC Reset | Used to reset the BMC. |
| Power LED | Indicates power is being supplied to the system power supply units. This LED is illuminated when the system is operating normally. |
| Drive Activity LED | Indicates activity on the storage drives when flashing. |
| NIC (LAN1) LED | Indicates network activity on LAN1 when flashing. |
| NIC (LAN2) LED | Indicates network activity on LAN2/3/4/5 when flashing. |
| Power Fail LED | Indicates a power supply module has failed. |
| Information LED | Alerts operator to several states |

Table 3-3 Control Panel


# URB8041 B8B20B28 / N8N20N28

## Product Specification

**4T4R FDD Triple-Band Radio | 80W per Port max, 320W in total | LTE / NR / NB-IoT Support**

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**4.** Product Configuration

**4.1** Logical Port Mapping
**4.2** Carrier Configuration

**5.** Power Consumption

**6.** Certification Compliance

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# 01 Basic Characteristics

| | |
|---|---|
| 3GPP RAT Types | LTE / NR / NB-IoT * |
| 3GPP Bands | B8B20B28 / N8N20N28 |
| 3GPP Band1 | B8 / N8 |
| UL Frequency Range | 880 MHz - 915 MHz |
| DL Frequency Range | 925 MHz - 960 MHz |
| 3GPP Band2 | B20 / N20 |
| UL Frequency Range | 832 MHz - 862MHz |
| DL Frequency Range | 791 MHz - 821 MHz |
| 3GPP Band3 | B28 / N28 |
| UL Frequency Range | 703 MHz - 733 MHz |
| DL Frequency Range | 758 MHz - 788 MHz |
| Duplex | FDD |
| DL/UL Branches | 4T4R |
| Number of Carrier (Excluding NB-IoT) per Band | 2 |
| Number of NB-IoT Carrier per Radio | 2 |
| Output Power (Watt) | 80W per Port max, 320W in total |
| LTE Carrier Bandwidth (MHz) | 5/10/15/20 |
| NR Carrier Bandwidth (MHz) | N8: 5/10/15/20<br>N20: 5/10/15/20<br>N28: 5/10/15/20 |
| Max OBW (MHz) / Max IBW (MHz) | B8/N8: 30 / 30<br>B20/N20: 35 / 35<br>B28/N28: 30 / 30 |

**Table 1-1 Basic Characteristics**

*Hardware-supported but currently not software-enabled, to be supported by future software upgrade

# 02 General Specifications

| | |
|---|---|
| Max. (e)CPRI Data Rate (Gbit/s) | 25 |
| Size (H x W x D) | 415mm x 400mm x 158.5mm |
| Weight | 26.5 Kg 26.32 lt |
| MTBF (hours) @ 25°C Telcordia SR-332 | 300,000 Hours |
| Optical eCPRI 10G Support | Yes |
| Optical eCPRI 25G Support | Yes |
| Operating Temperature | -40°C to +55°C |
| Power Supply | DC -40.5V to -58.5V |
| Antenna Port | 4x 4.3-10 Female |
| RET Port | Yes |
| RET | AISG2.0 with RS485 |
| Number of Optical Ports | 2 |
| Alarm Port | Yes |
| External Alarm | 2 pairs |
| IP Class | IP65 |
| Fronthaul Interface | 7.2 Cat. A |
| ORAN Compatibility | WG4.CUS, ORAN WG4.MP, ORAN WG4.IOT |
| Synchronization Reference Sources | PTP (G.8275.1) and SyncE (G.8262, G.8264, G.8264.1) |
| PIM-C | Yes |
| Conformity | RED 2014/53/EU (CE), TS 36 .141, TS 38.141, TS 37.141 |
| Humidity | 5% RH to 100% RH |
| Salt Mist | 35°C, 5 % NaCl Solution, 10d |
| Lightning Surge | Surge Waveform of 8/20 µs, 20 kA |

**Table 2-1 General Specifications**

# 03 Product Overview

## 3.1 Outlook

Figure 3-1 Front View

Figure 3-1-1 Back View

Figure 3-1-2 Bottom View

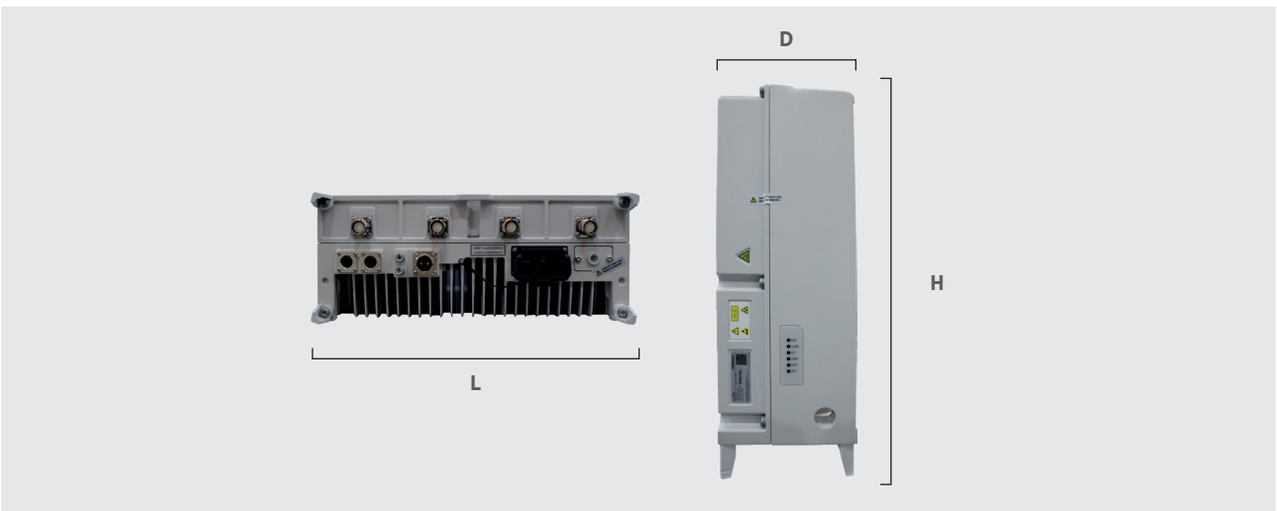



Figure 3-1-3 Product Outlook

| Typical Dimension Value(mm) | | | Typical Weight(kg) |
|---|---|---|---|
| H (mm) | L (mm) | D (mm) | |
| 415 | 400 | 158.5 | 26,5 |

Table 3-1 Product Size and Weight

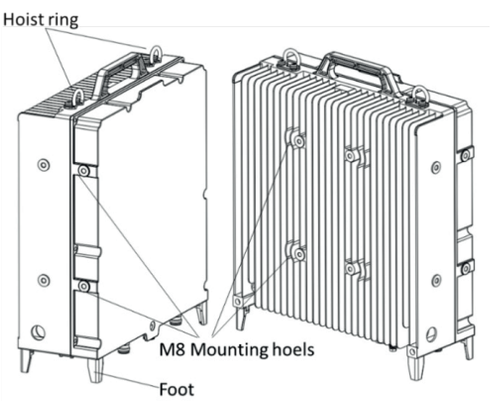



Figure 3-1-2 Product Structure Feature

## 3.2 Front Panel

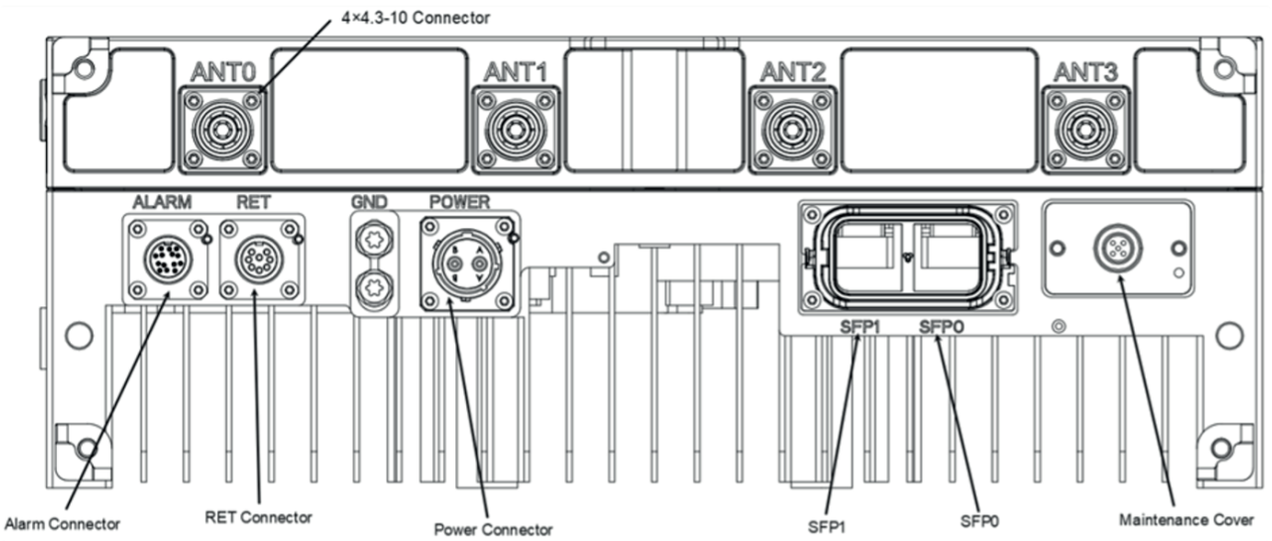



Figure 3-2 Front Panel

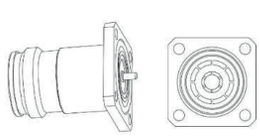
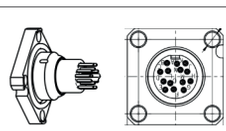
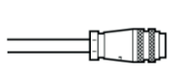
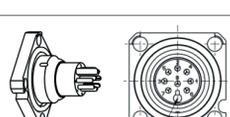
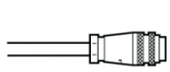
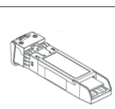
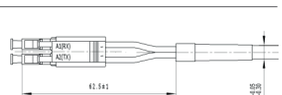
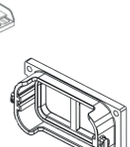
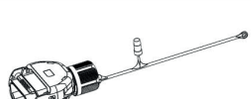
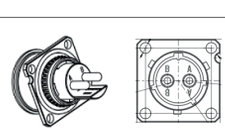
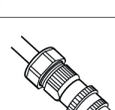
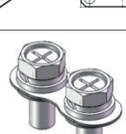
| Name | Description | Connector Types | Connector Illustration | Cable Illustration |
|---|---|---|---|---|
| ANT0 | RF port connected to antenna | 4.3-10 Female |  |  |
| ANT1 | | 4.3-10 Female | | |
| ANT2 | | 4.3-10 Female | | |
| ANT3 | | 4.3-10 Female | | |
| ALARM | External alarm ports which can be connected 2 pairs alarm input | 14 pin Connector |  |  |
| RET | Control signal and DC port connected to RET etc. | 8 pin Connector |  |  |
| SFP0 | Optical port | SFP+ |  |  |
| SFP1 | | SFP+ |  |  |
| POWER | Power supply DC input port | Power Connector |  |  |
| GND | Radio grounding port | M6 Bolt |  |  |

Table 3-2 Front Connector

### 3.3 LED Status Indicator


Figure 3-3 LED Overlay

| LED | Colour | Status |
|---|---|---|
| RUN | Green | Power on |
| | Off | Power off |
| ALARM | Red | Alarms generated |
| | Off | Alarms not generated |
| ACT | Green | Tx Channel enable |
| | Off | Tx Channel disable |
| VSWR | Red | Mismatch Alarm generated |
| | Off | Mismatch Alarm not generated |
| SFP0 | Green | CPRI0 Link up |
| | Red | CPRI0 Link down |
| SFP1 | Green | CPRI1 Link up |
| | Red | CPRI1 Link down |

Table 3-3-1 LED Instruction

# 04 Product Configuration

### 4.1 Logical port mapping

| Physical | Logical | TX | RX |
|---|---|---|---|
| ANT1 | T0/R0 | B8B20B28 / N8N20N28 T0 | B8B20B28 / N8N20N28 R0 |
| ANT2 | T1/R1 | B8B20B28 / N8N20N28 T1 | B8B20B28 / N8N20N28 R1 |
| ANT3 | T2/R2 | B8B20B28 / N8N20N28 T2 | B8B20B28 / N8N20N28 R2 |
| ANT4 | T3/R3 | B8B20B28 / N8N20N28 T3 | B8B20B28 / N8N20N28 R3 |

Table 4-1 Logical Port Mapping

4.2 Carrier Configuration

| Band | RAT | Carrier Bandwidth (MHz) | Max Carrier Number | Max Power |
|---|---|---|---|---|
| B8 / N8 | NR | 5 | 2CC NR/LTE | 80W Per Port |
| | | 10 | | |
| | | 15 | | |
| | | 20 | | |
| | LTE | 5 | | |
| | | 10 | | |
| | | 15 | | |
| | | 20 | | |
| B20 / N20 | NR | 5 | 2CC NR/LTE | |
| | | 10 | | |
| | | 15 | | |
| | | 20 | | |
| | LTE | 5 | | |
| | | 10 | | |
| | | 15 | | |
| | | 20 | | |
| B28 / N28 | NR | 5 | 2CC NR/LTE | |
| | | 10 | | |
| | | 15 | | |
| | | 20 | | |
| | | 30 | | |
| | LTE | 5 | | |
| | | 10 | | |
| | | 15 | | |
| | | 20 | | |

Table 4-2 Product Configuration List

# 05 Power Consumption

| LOAD | MIN | TYPICAL | MAX |
|---|---|---|---|
| 25 degrees with 100% Load | | 1120 W | |
| 25 degrees with 50% Load (busy) | | 700 W | |
| 25 degrees with 30% Load (medium) | | 540 W | |
| 25 degrees with 10% Load (low) | | 385 W | |
| 100% Load within Operating Temperature | | | 1290 W |
| ETSI 202 706 based average | | 555 W | |

**Table 5-1 Consumption for 100% DL Configuration**

# 06 Certification Compliance

This radio is designed in compliance with CE, EMC, and applicable safety standards. Additional certifications required for specific market regions can be provided upon request.

# 07 Regulatory Compliance

| Category | Subcategory | Standard |
|---|---|---|
| RF Performance | 3GPP BS Transmission and Reception | 3GPP TS 38.104 V15.16.0<br>3GPP TS 37.104 V15.16.0<br>3GPP TS 36.104 V15.16.0 |
| | 3GPP Conformance Testing | 3GPP TS 38.141-1 V15.16.0<br>3GPP TS 37.141-1 V15.16.0<br>3GPP TS 36.141-1 V15.16.0 |
| | ETSI BS Transmission and Reception | ETSI TS 138 104 V15.16.0<br>ETSI TS 137 104 V15.16.0<br>ETSI TS 136 104 V15.16.0 |
| | ETSI Conformance Testing | ETSI TS 138 141-1 V15.16.0<br>ETSI TS 137 141-1 V15.16.0<br>ETSI TS 136 141-1 V15.16.0 |
| EMC | / | ETSI EN 301 489-1 V2.2.3:2019 |
| | | ETSI EN 301 489-50 V2.3.1:2021 |
| | | 3GPP TS 37.113 V15.7.0:2019 |
| | | 3GPP TS 38.113 V15.7.0:2019 |
| | | CISPR 32 |
| | | IEC 61000-4-3 |
| | | IEC 61000-4-6 |
| | | IEC 61000-4-4 |
| | | IEC 61000-4-5 |
| Environment | Storage | EN 300 019-2-1 |
| | Climatic and Mechanical Tests | EN 300 019-2-4 |
| | Ingress Protection | JIS C0920 IPX5; JIS C0920 IP6X; IEC 60529 IPX5; IEC 60529 IP6X; |
| | Earthquake | Telcordia GR-63-CORE, Zone4 |
| | Transportation | EN 300 019-2-2; IEC 60721-3-2; JIS Z0200:2003 |
| | Altitude | JIS C 60068-2-13 |
| | Misc. | Telcordia GR-487-CORE |
| Safety | / | IEC 60950-1 |
| | | IEC 60950 -22 |
| | | IEC 60825-1 |
| | | EN 50383/4/5 |
| | | EN 62368-1 |
| AISG | / | AISG 2.0 |
| RoHS | / | Directive 2011/65/EU and Amendment 2015/863/EU |
| ORAN Interface | CUS Plane | ORAN WG4.CUS |
| | M Plane | ORAN.WG4.MP |

**Table 7-1 Applied Requirement Standards**


# URB5040 B1B3 / N1N3

## Product Specification

**4T4R FDD Dual-Band Radio | 60W per Band max, 120W per Port max, 480W in total | LTE / NR / NB-IoT Support**

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**3.** Product Overview

**3.1** Outlook
**3.2** Front Panel
**3.3** Led Status Indicator

**4.** Product Configuration

**4.1** Logical Port Mapping
**4.2** Carrier Configuration

**5.** Power Consumption

**6.** Certification Compliance

**7.** Regulatory Compliance

# 01 Basic Characteristics

| | |
|---|---|
| 3GPP RAT Types | LTE / NR / NB-IoT * |
| 3GPP Bands | B1B3 / N1N3 |
| 3GPP Band1 | B1 / N1 |
| UL Frequency Range | 1920 MHz - 1980 MHz |
| DL Frequency Range | 2110 MHz - 2170 MHz |
| 3GPP Band2 | B3 / N3 |
| UL Frequency Range | 1710 MHz – 1785 MHz |
| DL Frequency Range | 1805 MHz - 1880 MHz |
| Duplex | FDD |
| DL/UL Branches | 4T4R |
| Number of Carrier (Excluding NB-IoT) per Band | 3 |
| Number of NB-IoT Carrier per Radio | 2 |
| Output Power (Watt) | 60W per Band max, 120W per Port max,<br>480W in total |
| LTE Carrier Bandwidth (MHz) | B1: 5*/10/15/20<br>B3: 5/10/15/20 |
| NR Carrier Bandwith (MHz) | N1: 5*/10/15/20<br>N3: 5/10/15/20/30/35* |
| Max OBW (MHz) / Max IBW (MHz) | B1/N1: 60 / 75<br>B3/N3: 60 / 75 |

**Table 1-1 Basic Characteristics**

*Hardware-supported but currently not software-enabled, to be supported by future software upgrade

# 02 General Specifications

| | |
|---|---|
| Max. (e) CPRI Data Rate (Gbit/s) | 25 |
| Size (H x W x D) | 530mm x 400mm x 144.5mm |
| Weight | 29 kg 30.64lt |
| MTBF (hours) @ 25°C Telcordia SR-332 | 300,000 Hours |
| Optical eCPRI 10G Support | Yes |
| Optical eCPRI 25G Support | Yes |
| Operating Temperature | -40°C to +55°C |
| Power Supply | DC -40.5V to -58.5V |
| Antenna Port | 4x 4.3-10 Female |
| RET Port | Yes |
| RET | AISG2.0 with RS485 |
| Number of Optical Ports | 2 |
| Alarm Port | Yes |
| External Alarm | 2 pairs |
| IP Class | IP65 |
| Fronthaul Interface | 7.2 Cat. A |
| ORAN Compatibility | WG4.CUS, ORAN WG4.MP, ORAN WG4.IOT |
| Synchronization Reference Sources | PTP (G.8275.1) and SyncE (G.8262, G.8264, G.8264.1) |
| PIM-C | Yes |
| Conformity | RED 2014/53/EU (CE), TS 36 .141, TS 38.141, TS 37.141 |
| Humidity | 5% RH to 100% RH |
| Salt Mist | 35°C, 5% NaCl Solution, 10d |
| Lightning Surge | Surge Waveform of 8/20 µs, 20 kA |

Table 2-1 General Specifications

# 03 Product Overview

## 3.1 Outlook


Figure 3-1 Front View

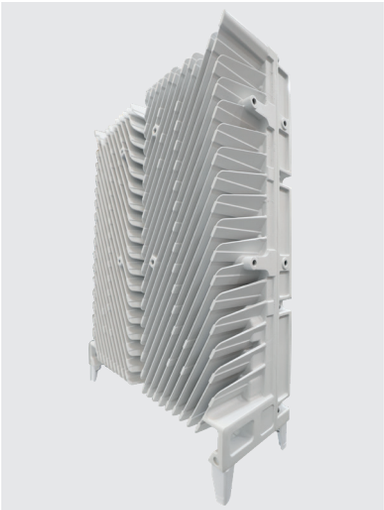


Figure 3-1-1 Back View

Figure 3-1-2 Bottom View

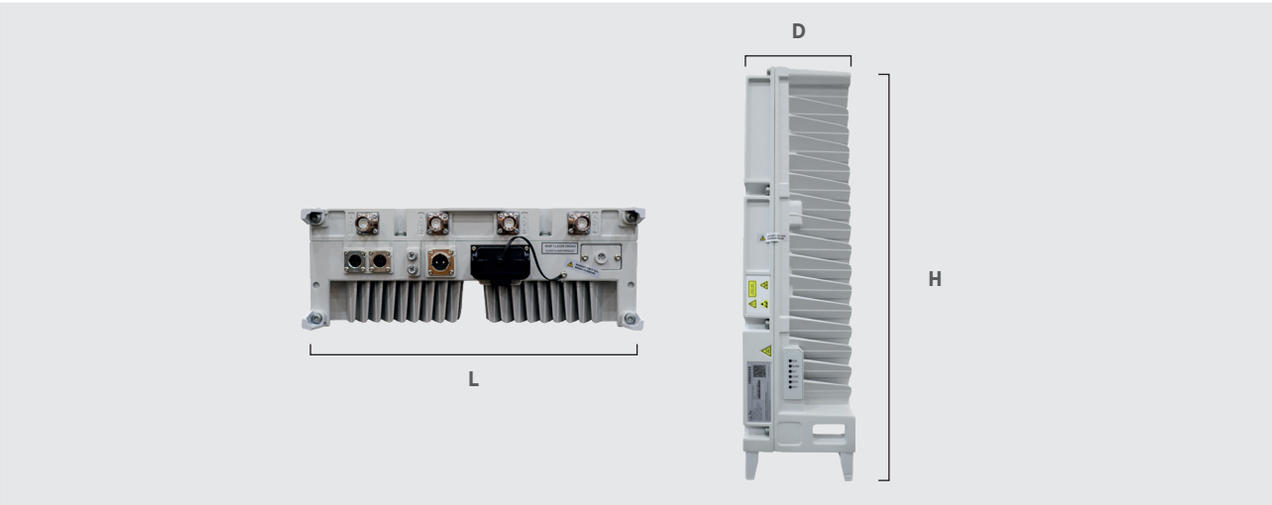



Figure 3-1-3 Product Outlook

| Typical Dimension Value(mm) | | | Typical Weight(kg) |
|---|---|---|---|
| H (mm) | L (mm) | D (mm) | |
| 530 | 400 | 144.5 | 29 |

Table 3-1 Product Size and Weight

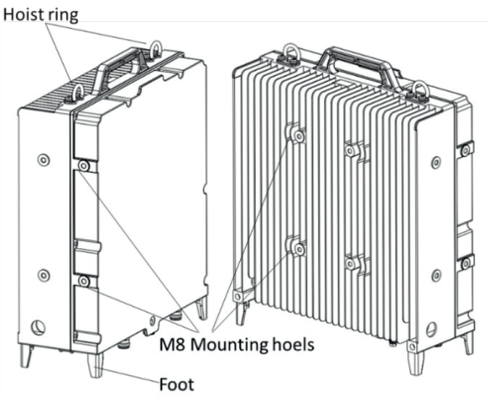



Figure 3-1-4 Product Structure Feature

## 3.2 Front Panel

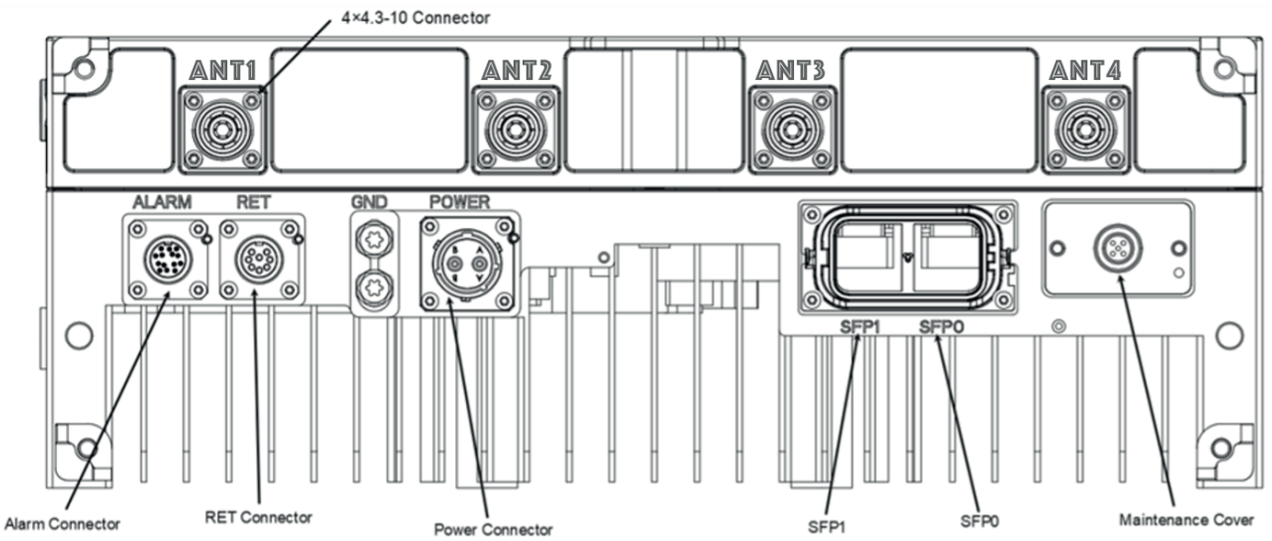



Figure 3-2 Front Panel

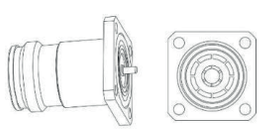
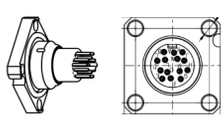
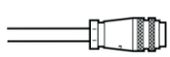
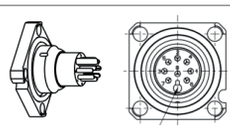
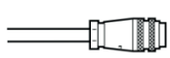
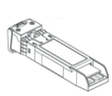
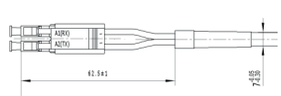
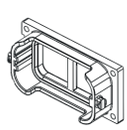
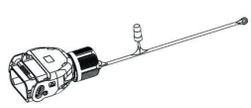
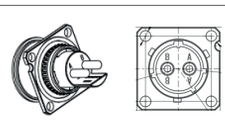
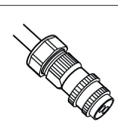
| Name | Description | Connector Types | Connector Illustration | Cable Illustration |
|---|---|---|---|---|
| ANT1 | RF port connected to antenna | 4.3-10 Female |  |  |
| ANT2 | | 4.3-10 Female | | |
| ANT3 | | 4.3-10 Female | | |
| ANT4 | | 4.3-10 Female | | |
| ALARM | External alarm ports which can be connected 2 pairs alarm input | 14pin Connector |  |  |
| RET | Control signal and DC port connected to RET etc. | 8 pin Connector |  |  |
| SFP0 | Optical port | SFP+ |  |  |
| SFP1 | | SFP+ |  |  |
| POWER | Power supply DC input port | Power Connector |  |  |
| GND | Radio grounding port | M6 Bolt |  |  |

Table 3-2 Front Connector

### 3.3 LED Status Indicator


Figure 3-3 LED Overlay

| LED | Colour | Status |
|---|---|---|
| RUN | Green | Power on |
| | Off | Power off |
| ALARM | Red | Alarms generated |
| | Off | Alarms not generated |
| ACT | Green | Tx Channel enable |
| | Off | Tx Channel disable |
| VSWR | Red | Mismatch Alarm generated |
| | Off | Mismatch Alarm not generated |
| SFP0 | Green | CPRI0 Link up |
| | Red | CPRI0 Link down |
| SFP1 | Green | CPRI1 Link up |
| | Red | CPRI1 Link down |

Table 3-3-1 LED Instruction

# 04 Product Configuration

### 4.1 Logical port mapping

| Physical | Logical | TX | RX |
|---|---|---|---|
| ANT1 | T0/R0 | B1B3 / N1N3 T0 | B1B3 / N1N3 R0 |
| ANT2 | T1/R1 | B1B3 / N1N3 T1 | B1B3 / N1N3 R1 |
| ANT3 | T2/R2 | B1B3 / N1N3 T2 | B1B3 / N1N3 R2 |
| ANT4 | T3/R3 | B1B3 / N1N3 T3 | B1B3 / N1N3 R3 |

Table 4-1 Logical Port Mapping

### 4.2 Carrier Configuration

| Band | RAT | Carrier Bandwidth (MHz) | Max Carrier Number | Max Power |
|---|---|---|---|---|
| B1/N1 | LTE | 10 | 3CC NR/LTE | 60W per Port |
| | | 15 | | |
| | | 20 | | |
| | NR | 10 | | |
| | | 15 | | |
| | | 20 | | |
| B3/N3 | LTE | 5 | 3CC NR/LTE | 60W per Port |
| | | 10 | | |
| | | 15 | | |
| | | 20 | | |
| | NR | 5 | | |
| | | 10 | | |
| | | 15 | | |
| | | 20 | | |
| | | 30 | | |

**Table 4-2 Product Configuration List**

Note: 60W per Band max, 120W per Port max, 480W in total

# 05 Power Consumption

| LOAD | MIN | TYPICAL | MAX |
|---|---|---|---|
| 25 degrees with 100% Load | | 1486 W | |
| 25 degrees with 50% Load (busy) | | 914 W | |
| 25 degrees with 30% Load (medium) | | 635 W | |
| 25 degrees with 10% Load (low) | | 311 W | |
| 100% Load within Operating Temperature | | | 1500 W |
| ETSI 24 Hours Average | | 597 W | |

**Table 5-1 Consumption for 100% DL Configuration**

# 06 Certification Compliance

This radio is designed in compliance with CE, EMC, and applicable safety standards. Additional certifications required for specific market regions can be provided upon request.

# 07 Regulatory Compliance

| Category | Subcategory | Standard |
|---|---|---|
| RF Performance | 3GPP BS Transmission and Reception | 3GPP TS 38.104 V15.16.0<br>3GPP TS 37.104 V15.16.0<br>3GPP TS 36.104 V15.16.0 |
| | 3GPP Conformance Testing | 3GPP TS 38.141-1 V15.16.0<br>3GPP TS 37.141-1 V15.16.0<br>3GPP TS 36.141-1 V15.16.0 |
| | ETSI BS Transmission and Reception | ETSI TS 138 104 V15.16.0<br>ETSI TS 137 104 V15.16.0<br>ETSI TS 136 104 V15.16.0 |
| | ETSI Conformance Testing | ETSI TS 138 141-1 V15.16.0<br>ETSI TS 137 141-1 V15.16.0<br>ETSI TS 136 141-1 V15.16.0 |
| EMC | / | ETSI EN 301 489-1 V2.2.3:2019 |
| | | ETSI EN 301 489-50 V2.3.1:2021 |
| | | 3GPP TS 37.113 V15.7.0:2019 |
| | | 3GPP TS 38.113 V15.7.0:2019 |
| | | CISPR 32 |
| | | IEC 61000-4-3 |
| | | IEC 61000-4-6 |
| | | IEC 61000-4-4 |
| | | IEC 61000-4-5 |
| Environment | Storage | EN 300 019-2-1 |
| | Climatic and Mechanical Tests | EN 300 019-2-4 |
| | Ingress Protection | JIS C0920 IPX5; JIS C0920 IP6X; IEC 60529 IPX5; IEC 60529 IP6X; |
| | Earthquake | Telcordia GR-63-CORE, Zone4 |
| | Transportation | EN 300 019-2-2; IEC 60721-3-2; JIS Z0200:2003 |
| | Altitude | JIS C 60068-2-13 |
| | Misc. | Telcordia GR-487-CORE |
| Safety | / | IEC 60950-1 |
| | | IEC 60950 -22 |
| | | IEC 60825-1 |
| | | EN 50383/4/5 |
| | | EN 62368-1 |
| AISG | / | AISG 2.0 |
| RoHS | / | Directive 2011/65/EU and amendment 2015/863/EU |
| ORAN Interface | CUS Plane | ORAN WG4.CUS |
| | M Plane | ORAN.WG4.MP |

**Table 7-1 Applied Requirement Standards**


# URB2040 B7 / N7

## Product Specification

**4T4R FDD Single-Band Radio | 80W per Port max, 320W in Total | LTE / NR / NB-IoT Support**

CONTENT

**1.** Basic Characteristics

**2.** General Specifications

**3.** Product Overview

**3.1** Outlook
**3.2** Front Panel
**3.3** Led Status Indicator

**4.** Product Configuration

**4.1** Logical Port Mapping
**4.2** Carrier Configuration

**5.** Power Consumption

**6.** Certification Compliance

**7.** Regulatory Compliance

ULAK

# 01 Basic Characteristics

| | |
|---|---|
| 3GPP RAT Types | LTE / NR / NB-IoT * |
| 3GPP Bands | B7 / N7 |
| UL Frequency Range | 2500 MHz - 2570 MHz |
| DL Frequency Range | 2620 MHz - 2690 MHz |
| Duplex | FDD |
| DL/UL Branches | 4T4R |
| Number of Carrier (Excluding NB-IoT) per Band | 3 |
| Number of NB-IoT Carrier per Radio | 2 |
| Output Power (Watt) | 80W per Port max, 320W in Total |
| LTE Carrier Bandwidth (MHz) | 5*/10/15*/20 |
| NR Carrier Bandwidth (MHz) | 5*/10/15*/20/25*/30/35*/40 |
| Max OBW (MHz) / Max IBW (MHz) | 70 / 70 |

**Table 1-1 Basic Characteristics**

*Hardware-supported but currently not software-enabled, to be supported by future software upgrade

# 02 General Specifications

| | |
|---|---|
| Max. (e)CPRI Data Rate (Gbit/s) | 25 |
| Size (H x W x D) | 530mm x 400mm x 138.5mm |
| Weight | 28 Kg 29,36 lt |
| MTBF (hours) @ 25°C Telcordia SR-332 | 300,000 Hours |
| Optical eCPRI 10G Support | Yes |
| Optical eCPRI 25G Support | Yes |
| Operating Temperature | -40°C to +55°C |
| Power Supply | DC -40.5V to -58.5V |
| Antenna Port | 4x 4.3-10 Female |
| RET Port | Yes |
| RET | AISG2.0 with RS485 |
| Number of Optical Ports | 2 |
| Alarm Port | Yes |
| External Alarm | 2 pairs |
| IP Class | IP65 |
| Fronthaul Interface | 7.2 Cat. A |
| ORAN Compatibility | WG4.CUS, ORAN WG4.MP, ORAN WG4.IOT |
| Synchronization Reference Sources | PTP (G.8275.1) and SyncE (G.8262, G.8264, G.8264.1) |
| PIM-C | No |
| Conformity | RED 2014/53/EU (CE), TS 36 .141, TS 38.141, TS 37.141 |
| Humidity | 5% RH to 100% RH |
| Salt Mist | 35°C, 5 % NaCl Solution, 10d |
| Lightning Surge | Surge Waveform of 8/20 µs, 20 kA |

**Table 2-1 General Specifications**

# 03 Product Overview

## 3.1 Outlook

Figure 3-1 Front View

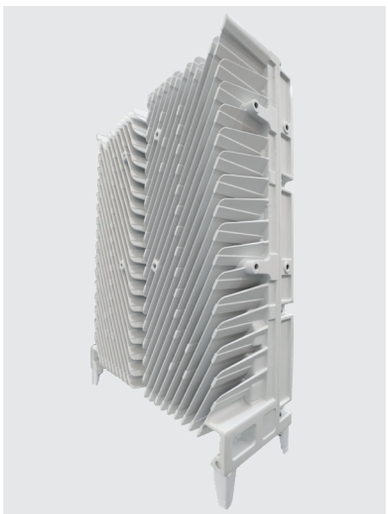


Figure 3-1-1 Back View

Figure 3-1-2 Bottom View

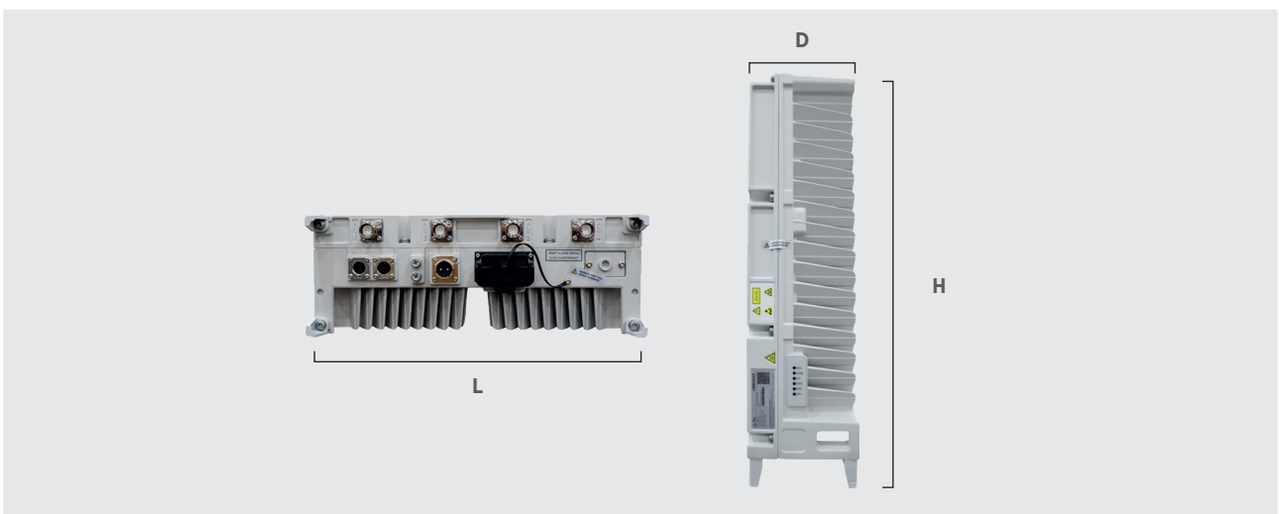



Figure 3-1-3 Product Outlook

| Typical Dimension Value(mm) | | | Typical Weight(kg) |
|---|---|---|---|
| H (mm) | L (mm) | D (mm) | |
| 530 | 400 | 138.5 | 28 |

Table 3-1 Product Size and Weight

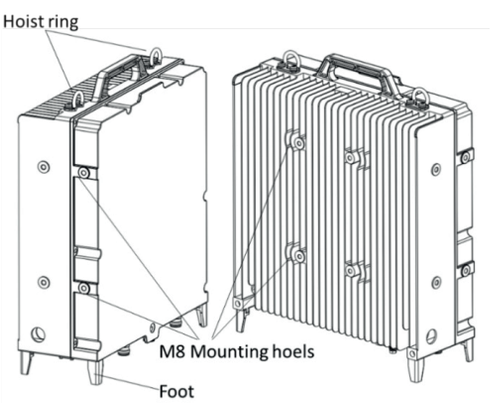



Figure 3-1-4 Product Structure Feature

## 3.2 Front Panel

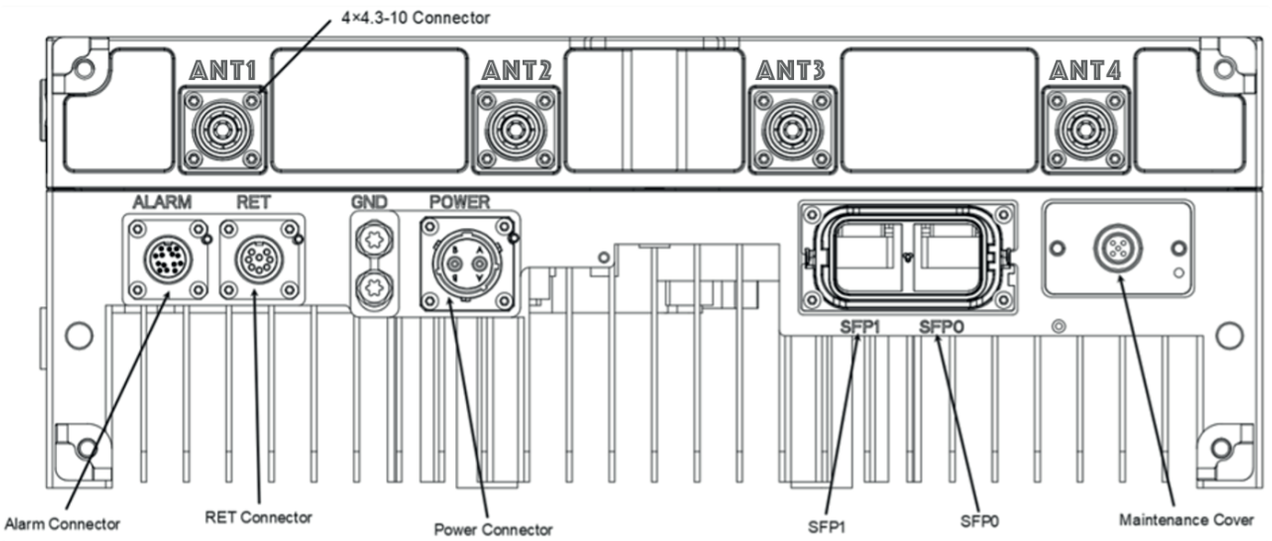



Figure 3-2 Front Panel

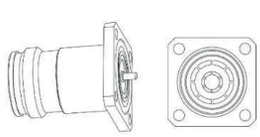
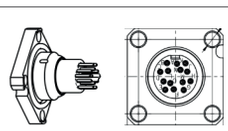
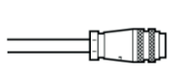
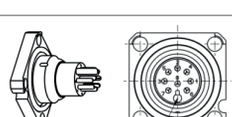
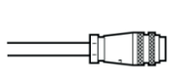
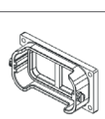
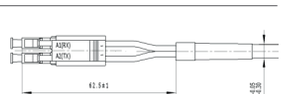
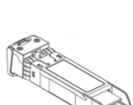
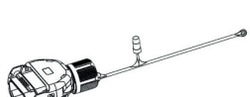
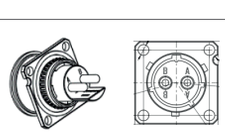
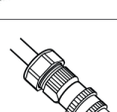
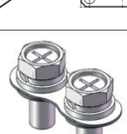
| Name | Description | Connector Types | Connector Illustration | Cable Illustration |
|---|---|---|---|---|
| ANT1 | RF port connected to antenna | 4.3-10 Female |  |  |
| ANT2 | | 4.3-10 Female | | |
| ANT3 | | 4.3-10 Female | | |
| ANT4 | | 4.3-10 Female | | |
| ALARM | External alarm ports which can be connected 2 pairs alarm input | 14pin Connector |  |  |
| RET | Control signal and DC port connected to RET etc. | 8 pin Connector |  |  |
| SFP0 | Optical port | SFP+ |  |  |
| SFP1 | | SFP+ |  |  |
| POWER | Power supply DC input port | Power Connector |  |  |
| GND | Radio grounding port | M6 Bolt |  |  |

Table 3-2 Front Connector

### 3.3 LED Status Indicator


Figure 3-3 LED Overlay

| LED | Colour | Status |
|---|---|---|
| RUN | Green | Power on |
| | Off | Power off |
| ALARM | Red | Alarms generated |
| | Off | Alarms not generated |
| ACT | Green | Tx Channel enable |
| | Off | Tx Channel disable |
| VSWR | Red | Mismatch Alarm generated |
| | Off | Mismatch Alarm not generated |
| SFP0 | Green | CPRI0 Link up |
| | Red | CPRI0 Link down |
| SFP1 | Green | CPRI1 Link up |
| | Red | CPRI1 Link down |

Table 3-3 LED Instruction

# 04 Product Configuration

### 4.1 Logical port mapping

| Physical | Logical | TX | RX |
|---|---|---|---|
| ANT1 | T0/R0 | B7 / N7 T0 | B7 / N7 R0 |
| ANT2 | T1/R1 | B7 / N7 T1 | B7 / N7 R1 |
| ANT3 | T2/R2 | B7 / N7 T2 | B7 / N7 R2 |
| ANT4 | T3/R3 | B7 / N7 T3 | B7 / N7 R3 |

Table 4-1 Logical Port Mapping

4.2 Carrier Configuration

| Band | RAT | Carrier Bandwidth (MHz) | Max Carrier Number | Max Power |
|---|---|---|---|---|
| B7/N7 | NR | 10 | 3CC NR/LTE | 80W Per Port |
| | | 15 | | |
| | | 20 | | |
| | | 25 | | |
| | | 30 | | |
| | | 35 | | |
| | | 40 | | |
| | LTE | 5 | | |
| | | 10 | | |
| | | 15 | | |
| | | 20 | | |

Table 4-2 Product Configuration List

# 05 Power Consumption

| LOAD | MIN | TYPICAL | MAX |
|---|---|---|---|
| 25 degrees with 100% Load | | 945 W | |
| 25 degrees with 50% Load(busy) | | 655 W | |
| 25 degrees with 30% Load(medium) | | 505 W | |
| 25 degrees with 10% Load(low) | | 370 W | |
| 100% Load within Operating Temperature | | | 1150 W |
| ETSI 202 706 based Average | | 522 W | |

Table 5-1 Consumption for 100% DL Configuration

# 06 Certification Compliance

This radio is designed in compliance with CE, EMC, and applicable safety standards. Additional certifications required for specific market regions can be provided upon request.

# 07 Regulatory Compliance

| Category | Subcategory | Standard |
|---|---|---|
| RF Performance | 3GPP BS Transmission and Reception | 3GPP TS 38.104 V15.16.0<br>3GPP TS 37.104 V15.16.0<br>3GPP TS 36.104 V15.16.0 |
| | 3GPP Conformance Testing | 3GPP TS 38.141-1 V15.16.0<br>3GPP TS 37.141-1 V15.16.0<br>3GPP TS 36.141-1 V15.16.0 |
| | ETSI BS Transmission and Reception | ETSI TS 138 104 V15.16.0<br>ETSI TS 137 104 V15.16.0<br>ETSI TS 136 104 V15.16.0 |
| | ETSI Conformance Testing | ETSI TS 138 141-1 V15.16.0<br>ETSI TS 137 141-1 V15.16.0<br>ETSI TS 136 141-1 V15.16.0 |
| EMC | / | ETSI EN 301 489-1 V2.2.3:2019 |
| | | ETSI EN 301 489-50 V2.3.1:2021 |
| | | 3GPP TS 37.113 V15.7.0:2019 |
| | | 3GPP TS 38.113 V15.7.0:2019 |
| | | CISPR 32 |
| | | IEC 61000-4-3 |
| | | IEC 61000-4-6 |
| | | IEC 61000-4-4 |
| | | IEC 61000-4-5 |
| Environment | Storage | EN 300 019-2-1 |
| | Climatic and Mechanical Tests | EN 300 019-2-4 |
| | Ingress Protection | JIS C0920 IPX5; JIS C0920 IP6X; IEC 60529 IPX5; IEC 60529 IP6X; |
| | Earthquake | Telcordia GR-63-CORE, Zone4 |
| | Transportation | EN 300 019-2-2; IEC 60721-3-2; JIS Z0200:2003 |
| | Altitude | JIS C 60068-2-13 |
| | Misc. | Telcordia GR-487-CORE |
| Safety | / | IEC 60950-1 |
| | | IEC 60950 -22 |
| | | IEC 60825-1 |
| | | EN 50383/4/5 |
| | | EN 62368-1 |
| AISG | / | AISG 2.0 |
| RoHS | / | Directive 2011/65/EU and amendment 2015/863/EU |
| ORAN Interface | CUS Plane | ORAN WG4.CUS |
| | M Plane | ORAN.WG4.MP |

Table 7-1 Applied Requirement Standards


# URB1040 N78 (3400 MHz – 3600 MHz)

## Product Specification

**4T4R TDD Single-Band Radio | 40W per port max, 160W in total | NR TDD Support**

CONTENT

**1.** Basic Characteristics

**2.** General Specifications

**3.** Product Overview

**3.1** Outlook
**3.2** Front Panel
**3.3** Led Status Indicator

**4.** Product Configuration

**4.1** Logical Port Mapping
**4.2** Carrier Configuration

**5.** Power Consumption

**6.** Certification Compliance

**7.** Regulatory Compliance

# 01 Basic Characteristics

| | |
|---|---|
| 3GPP RAT Types | NR |
| 3GPP Bands | N78 (3400 MHz – 3600 MHz) |
| DL/UL Frequency Range | 3400 MHz - 3600 MHz |
| Duplex | TDD |
| DL/UL Branches | 4T4R |
| Number of Carrier | 2* |
| Output Power (Watt) | 40W per port max, 160W in total |
| NR Carrier Bandwidth (MHz) | 20*, 40*, 50, 60, 80, 90, 100 |
| Max OBW (MHz) / Max IBW (MHz) | 120* / 120* |

**Table 1-1 Basic Characteristics**

*Hardware-supported but currently not software-enabled, to be supported by future software upgrade

# 02 General Specifications

| | |
|---|---|
| Max. (e) CPRI Data Rate (Gbit/s) | 10 |
| Size (H x W x D) | 320mm x 260mm x 120mm |
| Weight | 10.3 Kg 10 lt |
| MTBF (hours) @ 25°C Telcordia SR-332 | 400,000 Hours |
| Optical eCPRI 10G Support | Yes |
| Optical eCPRI 25G Support | No |
| Operating Temperature | -40°C to +55°C |
| Power Supply | DC -40.5V to -58.5V |
| Antenna Port | 4x 4.3-10 female |
| RET Port | Yes |
| RET | AISG2.0 with RS485 |
| Number of Optical Ports | 2 |
| Alarm Port | Yes |
| External Alarm | 2 pairs |
| IP Class | IP65 |
| Fronthaul Interface | 7.2 Cat. A |
| ORAN Compatibility | WG4.CUS, ORAN WG4.MP, ORAN WG4.IOT |
| Synchronization Reference Sources | PTP (G.8275.1) and SyncE (G.8262, G.8264, G.8264.1) |
| PIM-C | No |
| Conformity | RED 2014/53/EU (CE), TS 38.141 |
| Humidity | 5% RH to 100% RH |
| Salt Mist | 35°C, 5 % NaCl Solution, 10d |
| Lightning Surge | Surge waveform of 8/20 µs, 20 kA |

**Table 2-1 General Specifications**

# 03 Product Overview

## 3.1 Outlook

Figure 3-1 Front View

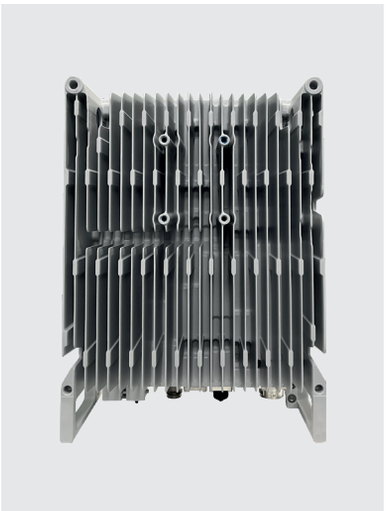


Figure 3-1-1 Back View

Figure 3-1-2 Bottom View

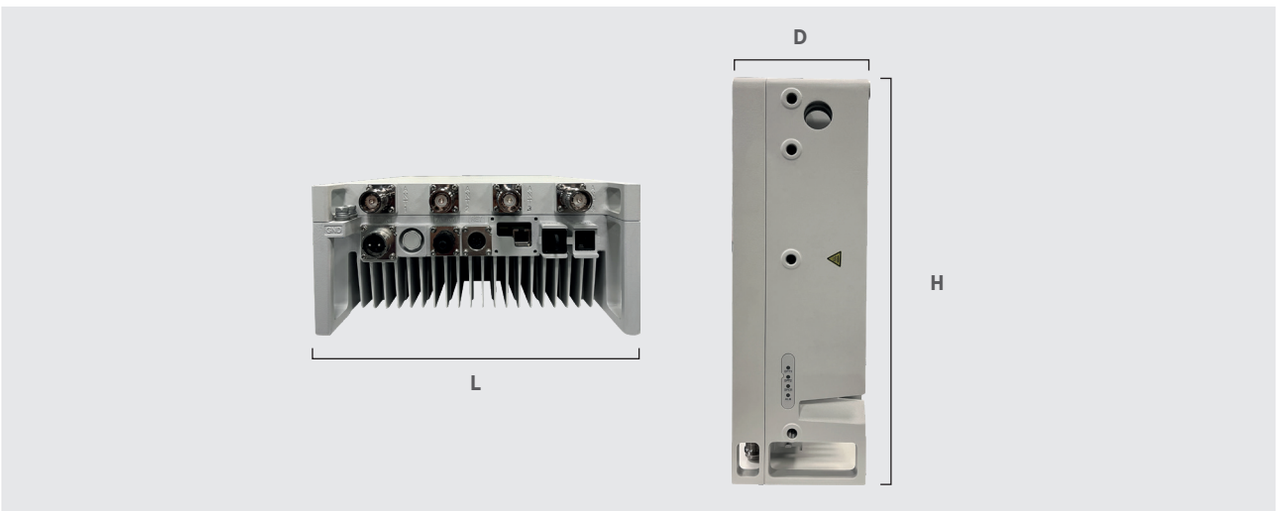



Figure 3-1-3 Product Outlook

| Typical Dimension Value(mm) | | | Typical Weight(kg) |
|---|---|---|---|
| H (mm) | L (mm) | D (mm) | |
| 320 | 260 | 120 | 10,3 |

Table 3-1 Product Size and Weight

## 3.2 Front Panel

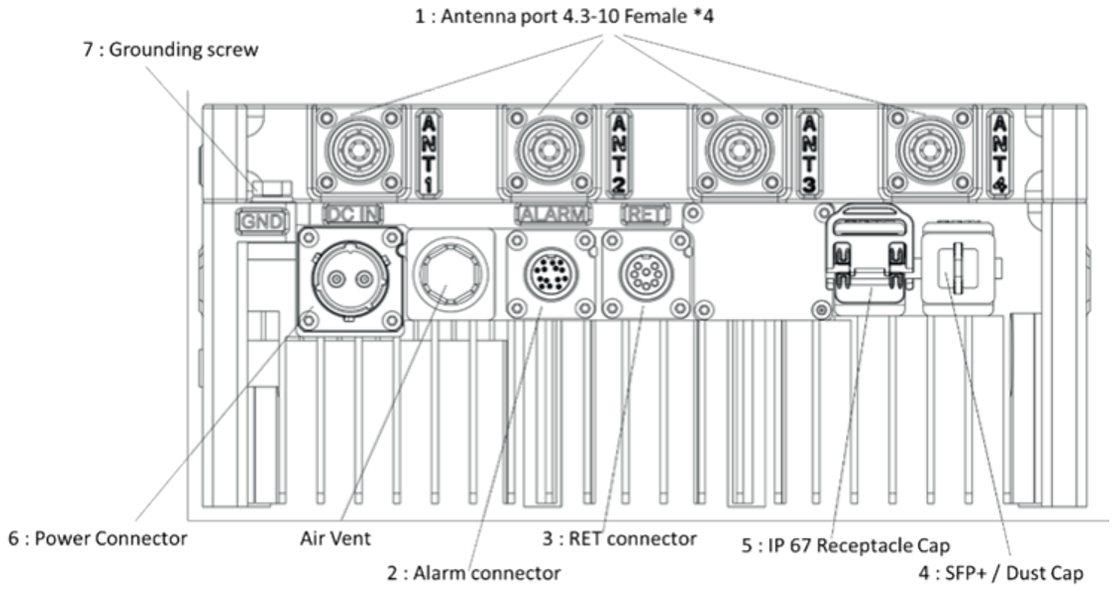



Figure 3-2 Front Panel

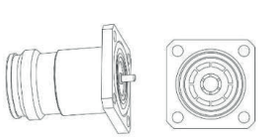
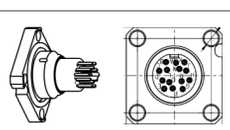
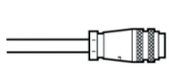
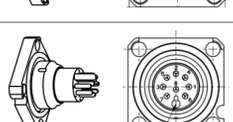
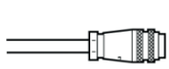
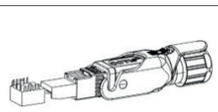
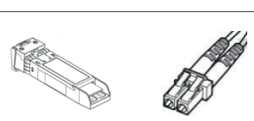
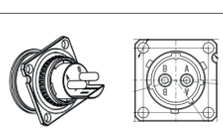
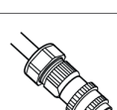
| Name | Connector Types | Connector Illustration | Cable Illustration |
|---|---|---|---|
| ANT1 | 4.3-10 Female |  |  |
| ANT2 | 4.3-10 Female | | |
| ANT3 | 4.3-10 Female | | |
| ANT4 | 4.3-10 Female | | |
| External Alarm | Alarm connector , DIN 14pin |  |  |
| RET | RET connector with AISG compatible, 8 pin |  |  |
| OPT1 | SFP+ |  |  |
| OPT2 | IP 67 Receptacle Cap |  | NA |
| -48V DC power supply | Power Connector |  |  |
| Grounding | Grounding screw, M6 |  |  |

Table 3-2 Front Connector

### 3.3 LED Status Indicator

Four LED indicates the operation status: SFP0/SFP1/OPER/ALM.


Figure 3-3 LED Overlay

| LED | Colour | Status |
|---|---|---|
| OPT1 | Green | CPRI Link up |
| | Off | CPRI Link down |
| OPT2 | Green | CPRI Link up |
| | Off | CPRI Link down |
| OPER | Green | Initialization done |
| | Off | Booting or Power off |
| ALM | RED | Alarm Occurred |
| | Off | No Alarm |

Table 3-3 LED Instruction

# 04 Product Configuration

### 4.1 Logical port mapping

| Physical | Logical | TX | RX |
|---|---|---|---|
| ANT1 | T0/R0 | N78 T0 | N78 R0 |
| ANT2 | T1/R1 | N78 T1 | N78 R1 |
| ANT3 | T2/R2 | N78 T2 | N78 R2 |
| ANT4 | T3/R3 | N78 T3 | N78 R3 |

Table 4-1 Logical Port Mapping

### 4.2 Carrier Configuration

| Band | RAT | Carrier Bandwidth/MHz | Max Carrier Number | Max Power |
|---|---|---|---|---|
| N78 | NR | 20*, 40*, 50, 60, 80, 90, 100 | 2CC* | 40W Per Port |

Table 4-2 Product Configuration List

*Hardware-supported but currently not software-enabled, to be supported by future software upgrade

# 05 Power Consumption

| LOAD | MIN | TYPICAL | MAX |
|---|---|---|---|
| Low Load (RF 10%) @25 degree | | 105 W | |
| Medium Load (RF 30%) @25 degree | | 212 W | |
| Busy Load (RF 50%) @25 degree | | 273 W | |
| RF 100% @25 degree | | 450 W | 500 W |
| ETSI 202 706 based average | | 205.6 W | |

**Table 5-1 Consumption for 100% DL Configuration**

# 06 Certification Compliance

This radio is designed in compliance with CE, EMC, and applicable safety standards. Additional certifications required for specific market regions can be provided upon request.

# 07 Regulatory Compliance

| Category | Subcategory | Standard |
|---|---|---|
| RF Performance | 3GPP BS Transmission and Reception | 3GPP TS 38.104 V15.16.0 |
| | 3GPP Conformance Testing | 3GPP TS 38.141-1 V15.16.0 |
| | ETSI BS Transmission and Reception | ETSI TS 138 104 V15.16.0 |
| | ETSI Conformance Testing | ETSI TS 138 141-1 V15.16.0 |
| EMC | / | ETSI EN 301 489-1 V2.2.3:2019 |
| | | ETSI EN 301 489-50 V2.3.1:2021 |
| | | 3GPP TS 37.113 V15.7.0:2019 |
| | | 3GPP TS 38.113 V15.7.0:2019 |
| | | CISPR 32 |
| | | IEC 61000-4-3 |
| | | IEC 61000-4-6 |
| | | IEC 61000-4-4 |
| | | IEC 61000-4-5 |
| Environment | Storage | EN 300 019-2-1 |
| | Climatic and Mechanical Tests | EN 300 019-2-4 |
| | Ingress Protection | JIS C0920 IPX5; JIS C0920 IP6X; IEC 60529 IPX5; IEC 60529 IP6X; |
| | Earthquake | Telcordia GR-63-CORE, Zone4 |
| | Transportation | EN 300 019-2-2; IEC 60721-3-2; JIS Z0200:2003 |
| | Altitude | JIS C 60068-2-13 |
| | Misc. | Telcordia GR-487-CORE |
| Safety | / | IEC 60950-1 |
| | | IEC 60950 -22 |
| | | IEC 60825-1 |
| | | EN 50383/4/5 |
| AISG | / | AISG 2.0 |
| RoHS | / | Directive 2011/65/EU and amendment 2015/863/EU |
| ORAN Interface | CUS Plane | ORAN WG4.CUS0 v02.00 |
| | M Plane | ORAN.WG4.MP.0 v02.00 |

Table 7-1 Applied Requirement Standards


V 1.0

# URB1140 N78 (3600 MHz – 3800 MHz)

## Product Specification

**4T4R TDD Single-Band Radio | 40W per port max, 160W in total | NR TDD Support**

CONTENT

**1.** Basic Characteristics

**2.** General Specifications

**3.** Product Overview

**3.1** Outlook
**3.2** Front Panel
**3.3** Led Status Indicator

**4.** Product Configuration

**4.1** Logical Port Mapping
**4.2** Carrier Configuration

**5.** Power Consumption

**6.** Certification Compliance

**7.** Regulatory Compliance

ULAK

# 01 Basic Characteristics

| | |
|---|---|
| 3GPP RAT Types | NR |
| 3GPP Bands | N78 (3600 MHz – 3800 MHz) |
| DL/UL Frequency Range | 3600 MHz - 3800 MHz |
| Duplex | TDD |
| DL/UL Branches | 4T4R |
| Number of Carrier | 2* |
| Output Power (Watt) | 40W per port max, 160W in total |
| NR Carrier Bandwidth (MHz) | 20*, 40*, 50, 60, 80, 90, 100 |
| Max OBW (MHz) / Max IBW (MHz) | 120* / 120* |

**Table 1-1 Basic Characteristics**

*Hardware-supported but currently not software-enabled, to be supported by future software upgrade

# 02 General Specifications

| | |
|---|---|
| Max. (e) CPRI Data Rate (Gbit/s) | 10 |
| Size (H x W x D) | 320mm x 260mm x 120mm |
| Weight | 10.3 Kg 10 lt |
| MTBF (hours) @ 25°C Telcordia SR-332 | 400,000 Hours |
| Optical eCPRI 10G Support | Yes |
| Optical eCPRI 25G Support | No |
| Operating Temperature | -40°C to + 55°C |
| Power Supply | DC -40.5V to -58.5V |
| Antenna Port | 4x 4.3-10 female |
| RET Port | Yes |
| RET | AISG2.0 with RS485 |
| Number of Optical Ports | 2 |
| Alarm Port | Yes |
| External Alarm | 2 pairs |
| IP Class | IP65 |
| Fronthaul Interface | 7.2 Cat. A |
| ORAN Compatibility | WG4.CUS, ORAN WG4.MP, ORAN WG4.IOT |
| Synchronization Reference Sources | PTP (G.8275.1) and SyncE (G.8262, G.8264, G.8264.1) |
| PIM-C | No |
| Conformity | RED 2014/53/EU (CE), TS 38.141 |
| Humidity | 5% RH to 100% RH |
| Salt Mist | 35°C, 5 % NaCl Solution, 10d |
| Lightning Surge | Surge Waveform of 8/20 µs, 20 kA |

**Table 2-1 General Specifications**

# 03 Product Overview

## 3.1 Outlook

Figure 3-1 Front View

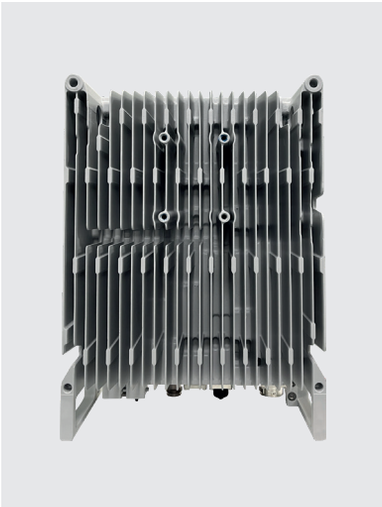


Figure 3-1-1 Back View

Figure 3-1-2 Bottom View

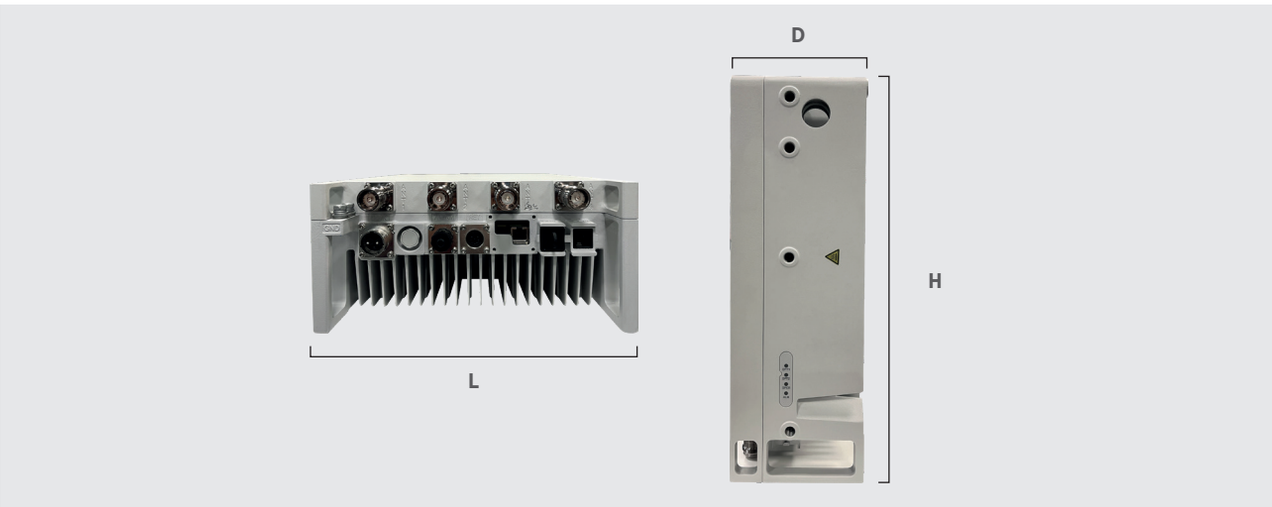



Figure 3-1-3 Product Outlook

| Typical Dimension Value(mm) | | | Typical Weight(kg) |
|---|---|---|---|
| H (mm) | L (mm) | D (mm) | |
| 320 | 260 | 120 | 10,3 |

Table 3-1 Product Size and Weight

## 3.2 Front Panel

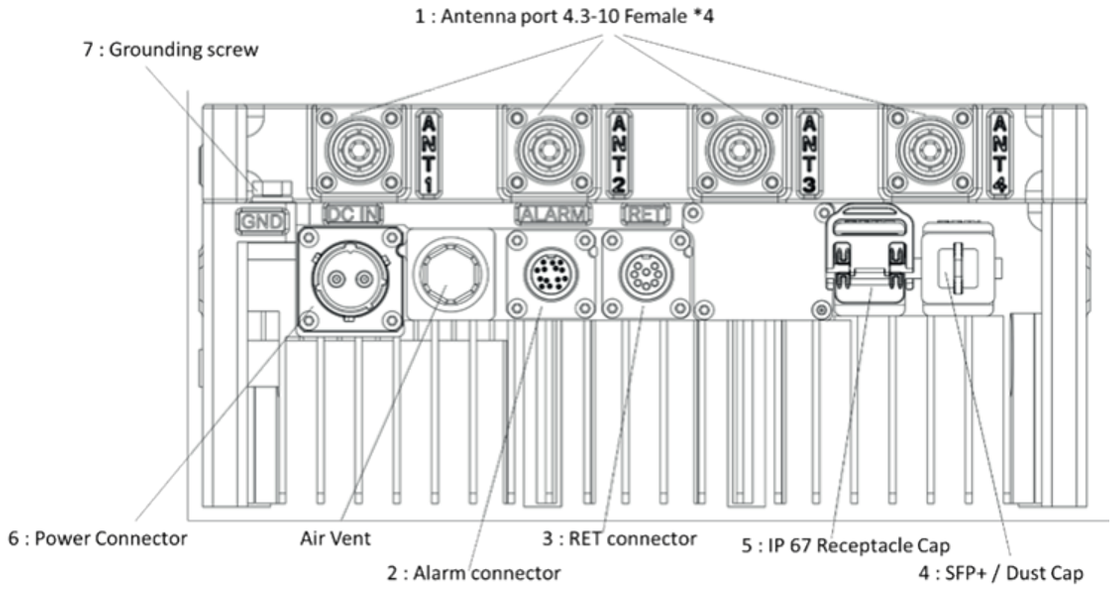



Figure 3-2 Front Panel

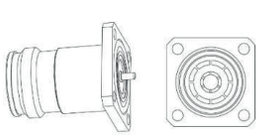
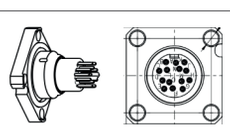
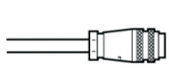
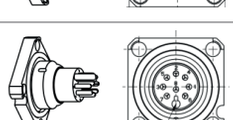
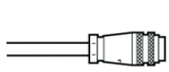
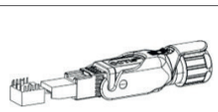
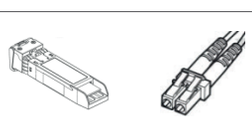
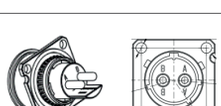
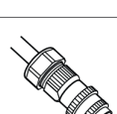
| Name | Connector Types | Connector Illustration | Cable Illustration |
|---|---|---|---|
| ANT1 | 4.3-10 Female |  |  |
| ANT2 | 4.3-10 Female | | |
| ANT3 | 4.3-10 Female | | |
| ANT4 | 4.3-10 Female | | |
| External Alarm | Alarm connector , DIN 14pin |  |  |
| RET | RET connector with AISG compatible, 8 pin |  |  |
| OPT1 | SFP+ |  |  |
| OPT2 | IP 67 Receptacle Cap |  | NA |
| -48V DC power supply | Power Connector |  |  |
| Grounding | Grounding screw, M6 |  |  |

Table 3-2 Front Connector

### 3.3 LED Status Indicator

Four LED indicates the operation status: SFP0/SFP1/OPER/ALM.


Figure 3-3 LED Overlay

| LED | Colour | Status |
|---|---|---|
| ALM | RED | Alarm Occurred |
| | Off | No Alarm |
| OPER | Green | Initialization done |
| | Off | Booting or Power off |
| OPT1 | Green | CPRI Link up |
| | Off | CPRI Link down |
| OPT2 | Green | CPRI Link up |
| | Off | CPRI Link down |

Table 3-3 LED Instruction

# 04 Product Configuration

### 4.1 Logical port mapping

| Physical | Logical | TX | RX |
|---|---|---|---|
| ANT1 | T0/R0 | N78 T0 | N78 R0 |
| ANT2 | T1/R1 | N78 T1 | N78 R1 |
| ANT3 | T2/R2 | N78 T2 | N78 R2 |
| ANT4 | T3/R3 | N78 T3 | N78 R3 |

Table 4-1 Logical Port Mapping

### 4.2 Carrier Configuration

| Band | RAT | Carrier Bandwidth/MHz | Max Carrier Number | Max Power |
|---|---|---|---|---|
| N78 | NR | 20*, 40*, 50, 60, 80, 90, 100 | 2CC* | 40W Per Port |

Table 4-2 Product Configuration List

*Hardware-supported but currently not software-enabled, to be supported by future software upgrade

# 05 Power Consumption

| LOAD | MIN | TYPICAL | MAX |
|---|---|---|---|
| Low Load (RF 10%) @25 degree | | 105 W | |
| Medium Load (RF 30%) @25 degree | | 211 W | |
| Busy Load (RF 50%) @25 degree | | 270 W | |
| RF 100% @25 degree | | 430 W | 500 W |
| ETSI 202 706 based average | | 204.2 W | |

**Table 5-1 Consumption for 100% DL Configuration**

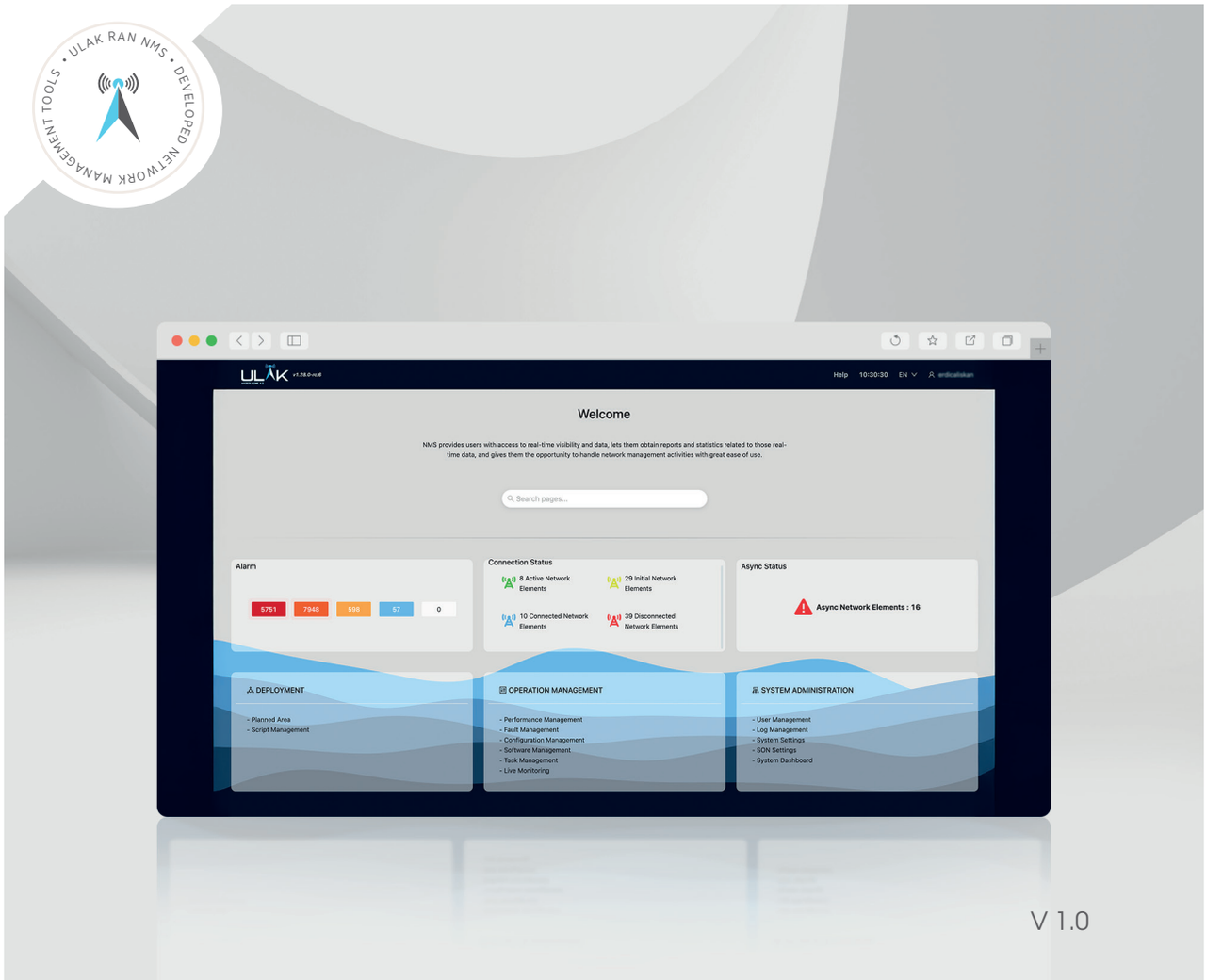
# 06 Certification Compliance

This radio is designed in compliance with CE, EMC, and applicable safety standards. Additional certifications required for specific market regions can be provided upon request.

# 07 Regulatory Compliance

| Category | Subcategory | Standard |
|---|---|---|
| RF Performance | 3GPP BS Transmission and Reception | 3GPP TS 38.104 V15.16.0 |
| | 3GPP Conformance Testing | 3GPP TS 38.141-1 V15.16.0 |
| | ETSI BS Transmission and Reception | ETSI TS 138 104 V15.16.0 |
| | ETSI Conformance Testing | ETSI TS 138 141-1 V15.16.0 |
| EMC | / | ETSI EN 301 489-1 V2.2.3:2019 |
| | | ETSI EN 301 489-50 V2.3.1:2021 |
| | | 3GPP TS 37.113 V15.7.0:2019 |
| | | 3GPP TS 38.113 V15.7.0:2019 |
| | | CISPR 32 |
| | | IEC 61000-4-3 |
| | | IEC 61000-4-6 |
| | | IEC 61000-4-4 |
| | | IEC 61000-4-5 |
| Environment | Storage | EN 300 019-2-1 |
| | Climatic and Mechanical Tests | EN 300 019-2-4 |
| | Ingress Protection | JIS C0920 IPX5; JIS C0920 IP6X; IEC 60529 IPX5; IEC 60529 IP6X; |
| | Earthquake | Telcordia GR-63-CORE, Zone4 |
| | Transportation | EN 300 019-2-2; IEC 60721-3-2; JIS Z0200:2003 |
| | Altitude | JIS C 60068-2-13 |
| | Misc. | Telcordia GR-487-CORE |
| Safety | / | IEC 60950-1 |
| | | IEC 60950 -22 |
| | | IEC 60825-1 |
| | | EN 50383/4/5 |
| AISG | / | AISG 2.0 |
| RoHS | / | Directive 2011/65/EU and amendment 2015/863/EU |
| ORAN Interface | CUS Plane | ORAN WG4.CUS0 v02.00 |
| | M Plane | ORAN.WG4.MP.0 v02.00 |

Table 7-1 Applied Requirement Standards




V 1.0

# ULAK RAN NMS

NMS TOOLS

## DEPLOYMENT

- Planned Area
- Script Management

## OPERATION MANAGEMENT

- Performance Management
- Fault Management
- Configuration Management
- Software Management
- Task Management
- Live Monitoring

## SYSTEM ADMINISTRATION

- User Management
- Log Management
- System Settings
- System Dashboard

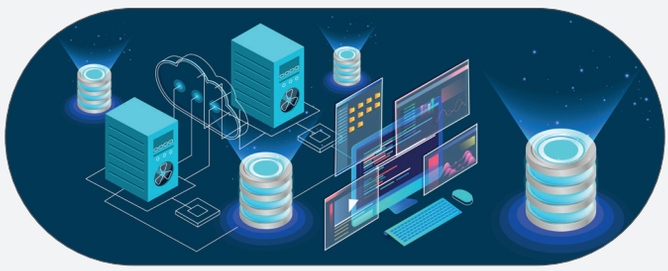
## NMS INTEGRATION

- Temip
- OneNT
- LDAP
- Optima
- Netcool

# Application Architecture

Scalable Microservice Architecture

Elasticsearch & Big Data Analytics



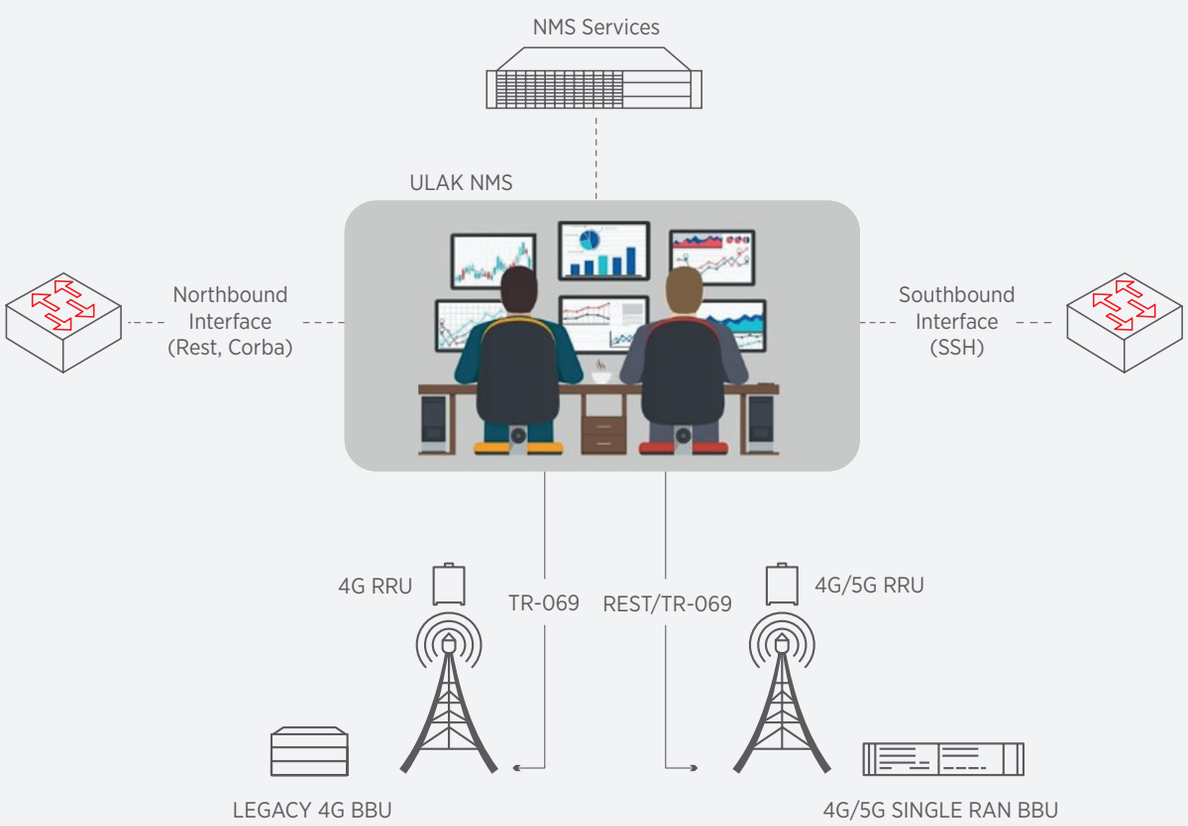
CNF with Kubernetes & Docker

Mongo DB

High Available Clusters

New UI Technologies

# System Architecture



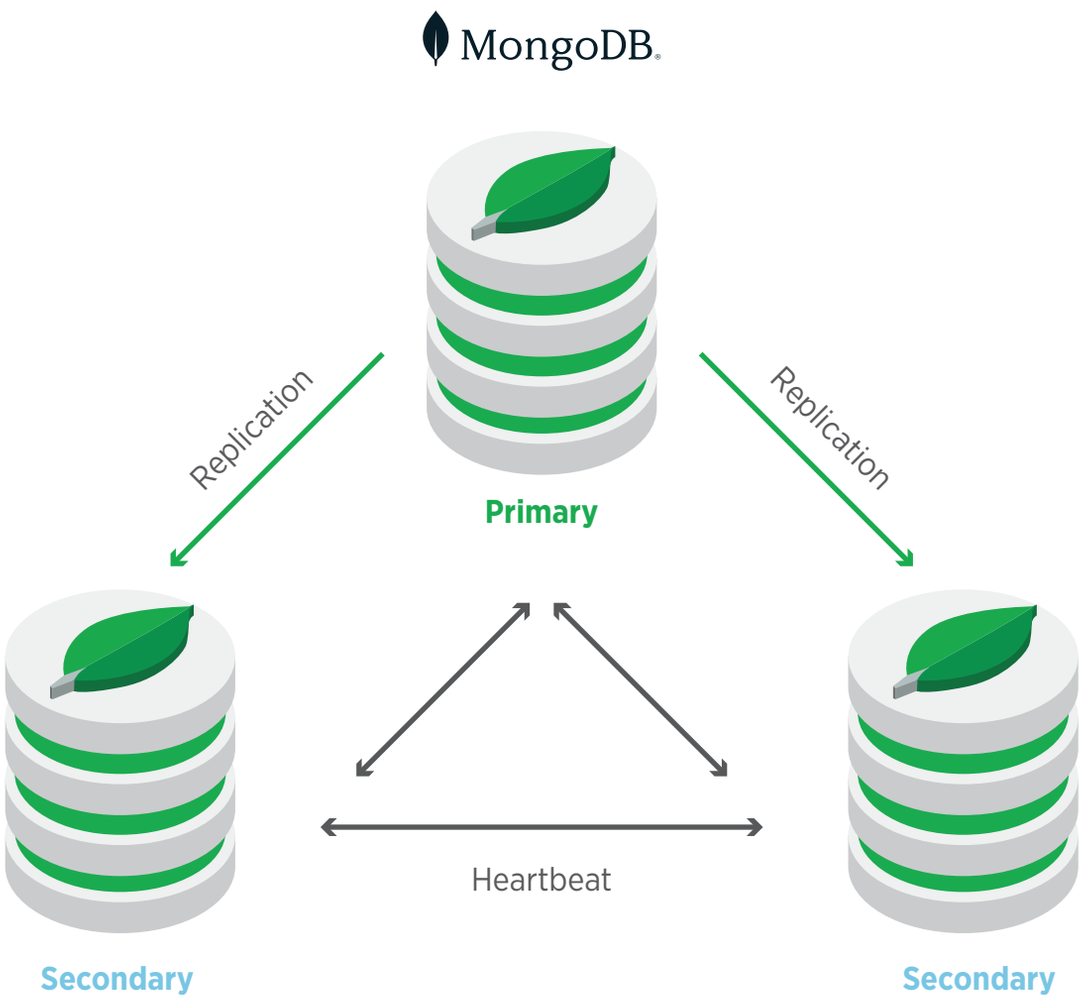
# Solution Supported Key Feature List

| |
|---|
| Microservices Architecture |
| Capability to Manage 5G and 4G Base Stations Together |
| Centralized Configuration |
| Real-Time Performance and Alarm Monitoring (Live Monitoring) |
| Authentication and Authorization |
| MML |
| Log Monitoring |
| Web-Based User Interface (Web UI) |
| 3rd-Party Tool Integration |
| Geographical Redundancy |
| Scalability |
| High Availability (HA) |
| Big Data Analytics |
| KPI Monitoring |
| System Metrics Monitoring (CPU, RAM, Disk) |
| Database and Network Element (NE) Backup |
| Cell Tracing |
| SON Support |
| Support for TR-069, REST API, and CORBA |
| Pre-Shared Key (PSK) Support |
| User-Based Planned Area |

# Geographic Redundancy

Geographical redundancy is supported in Active–Passive mode.

MongoDB deployments are configured across two separate clusters using replica sets to ensure high availability.

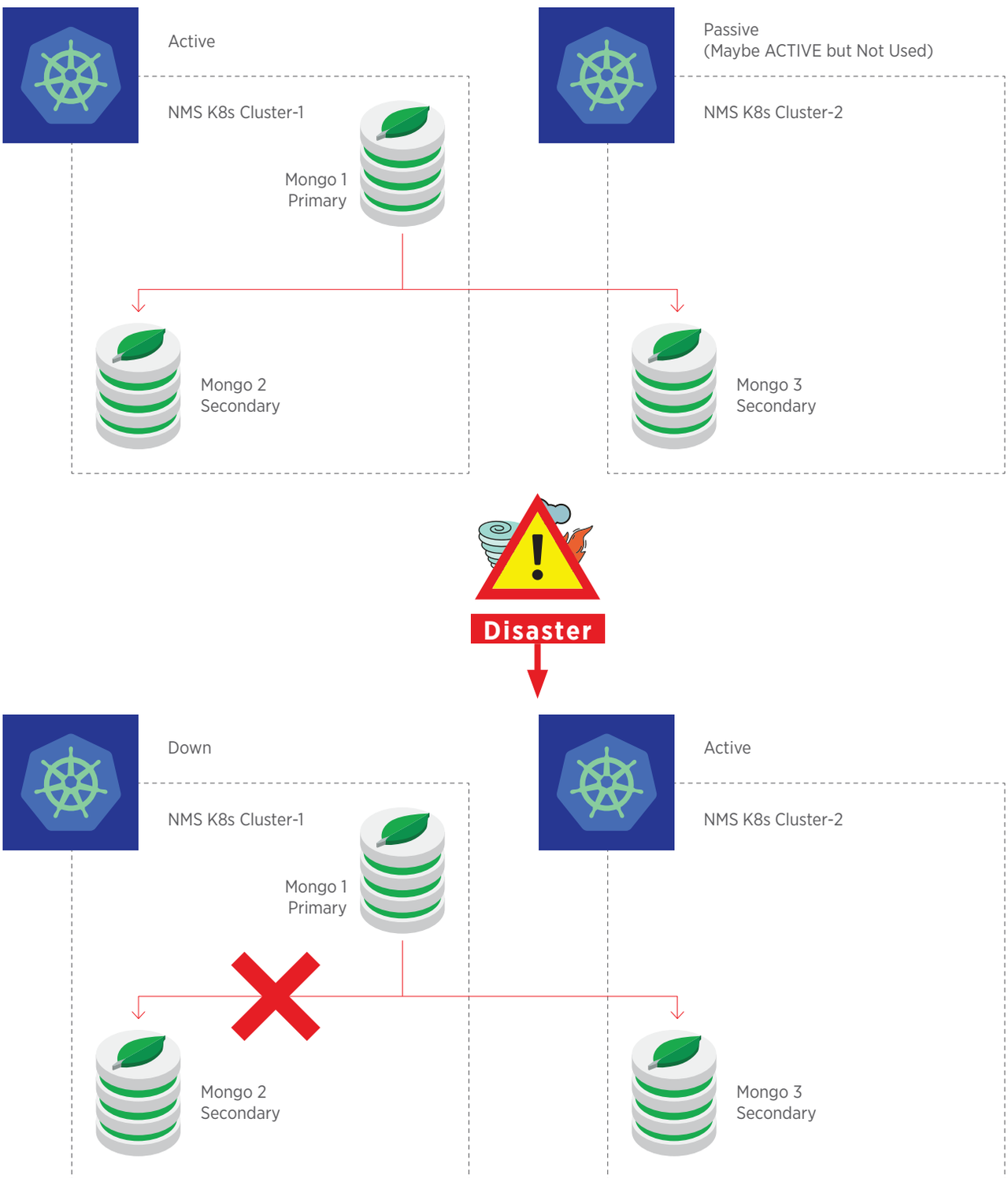



The NMS must be deployed separately for each of the two clusters.

In case of a disaster, network planning can be performed according to the customer's disaster plan.

- Load Balancer-Based Traffic Distribution
- Activation of a passive device using the same IP address

# Active & Passive




Resources will be used only for MongoDB.

NMS pods on the second cluster will not be operational.

In case of a disaster, NMS pods will become active.

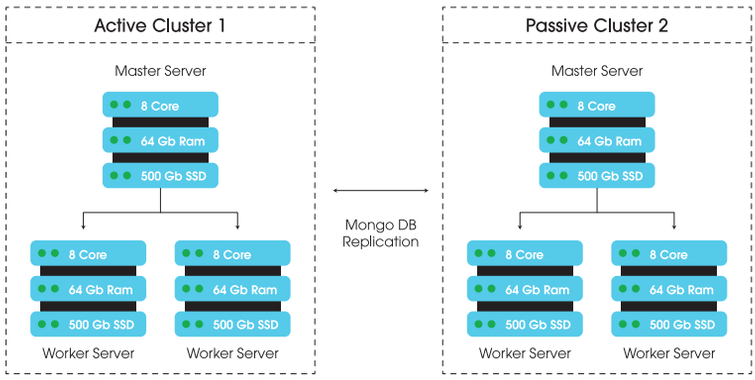
Network Elements can be redirected to the new environment via HW Load Balancer.

# Hardware Requirements

MPN Deployment – Support up to 50 Sites

Setup consisting of 1 master node and 2 worker nodes (3 VMs in total)

- 24 vCPU
- 192 GB RAM
- 1.5 TB SSD Disk
- x2 for geographic redundancy

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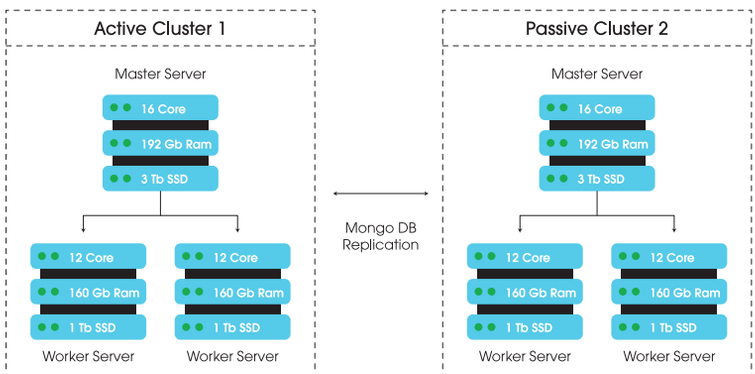
Public Network Deployment – supports up to 2000 sites

Setup consisting of 1 master node and 2 worker nodes (3 VMs in total)

- 96 vCPU
- 512 GB RAM
- 5 TB SSD Disk
- x2 for geographic redundancy

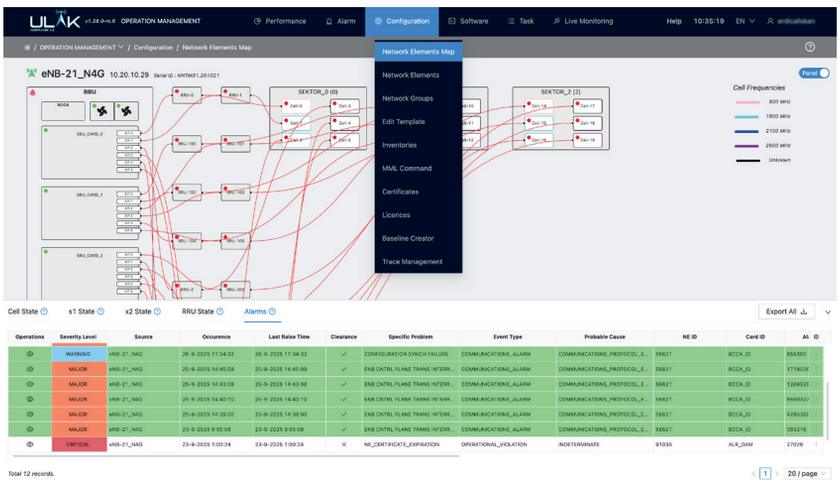
*may vary based on the add-on

*may scale in the cloud when needed



# NMS User Interfaces

## Operation Management




It contains the configuration information of the device. It provides operations such as writing, reading, deleting, updating on this information. It also supports extracting or importing this information into a template in json format.

Capabilities of the Configuration Management;

- Network Elements Maps
- Network Groups
- Edit Configuration Template
- Inventories
- MML Command
- Certificates
- Licences
- Baseline Creator
- Trace Management

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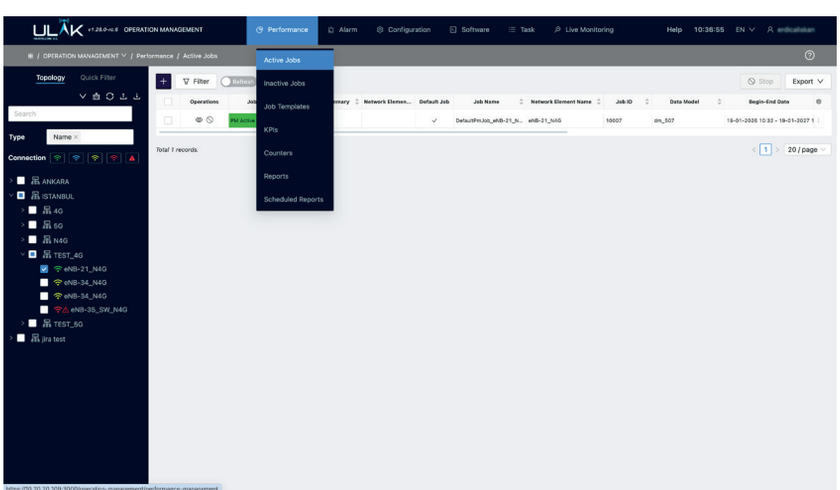
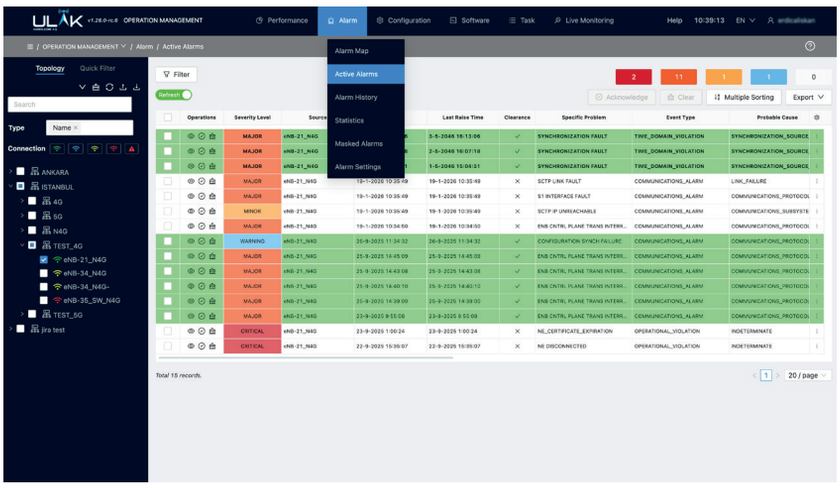



It initiates or terminates a new performance management job on the eNodeB & gNodeB. It also collects the metric data of this performance job from the devices and provides the transition to the NBI layers.

Capabilities of the Performance Management;

- Active Jobs
- Inactive Jobs
- Job Templates
- KPIs
- Counters
- Reports
- Scheduled Reports




It enables querying of alarms generated at the device card and software layers, as well as alarms produced by the NMS, through the NMS/NBI layers.

Capabilities of the Fault Management;

- Alarm Map
- Active Alarms
- Alarm History
- Statistics
- Masked Alarms
- Alarm Settings

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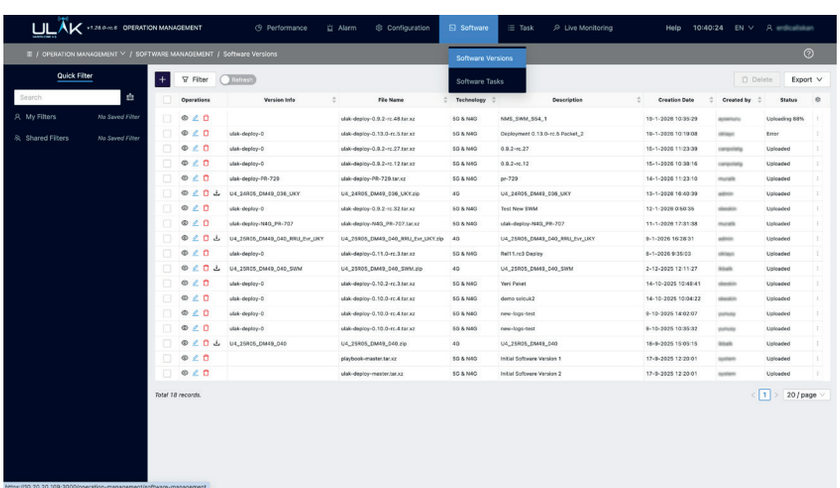
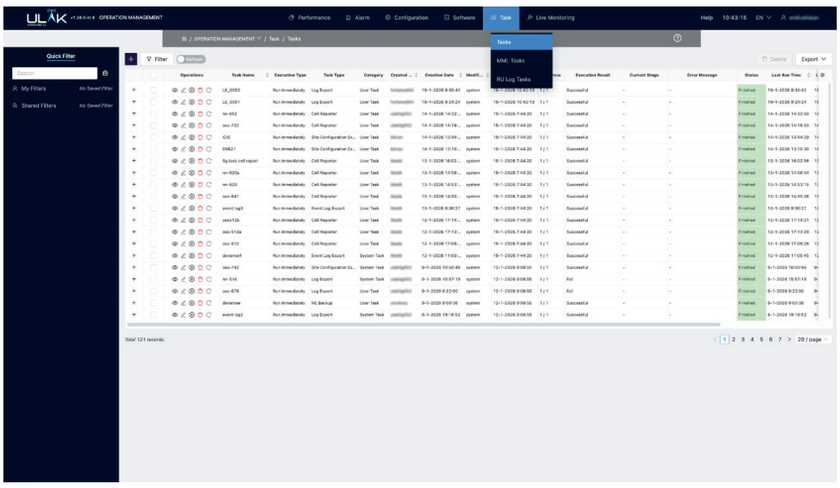



Software Management is used to install new software on the card and RRU devices.

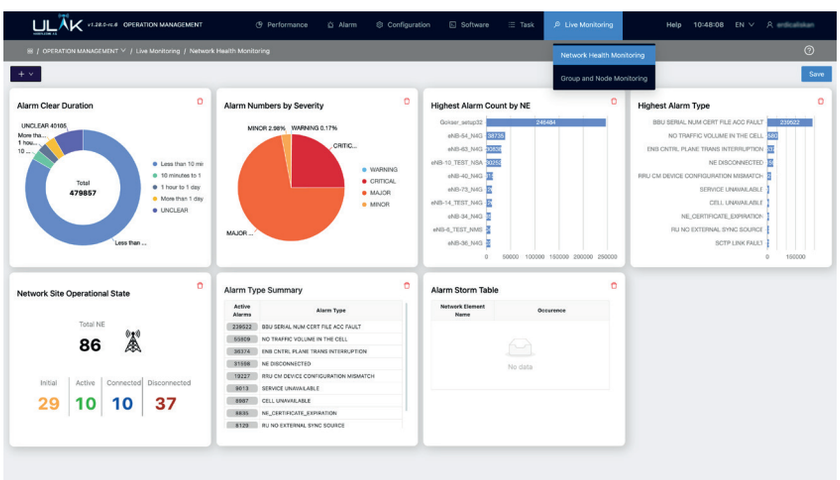
Capabilities of the Software Management;

- Software Versions
- Software Tasks




Capabilities of the Task Management;

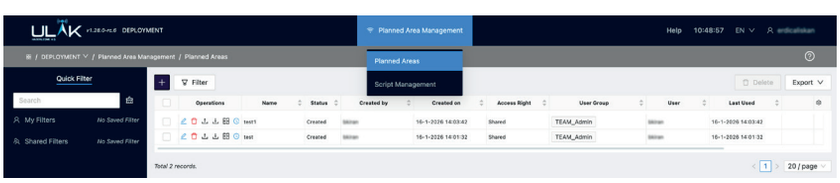
- Tasks
- MML Tasks
- RU Log Tasks



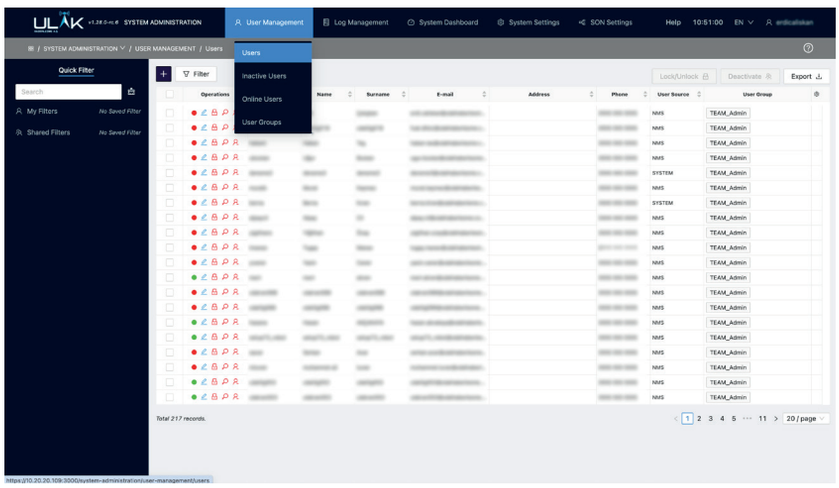

Capabilities of the Live Monitoring;

- Network Health Monitoring
- Group and Node Monitoring

# Deployment



# System Administration




NMS can be arranged according to group-level authority. This enables separate and controlled access to eNodeBs & gNodeBs or services.

Capabilities of the User Management;

- Users
- Inactive Users
- Online Users
- User Groups

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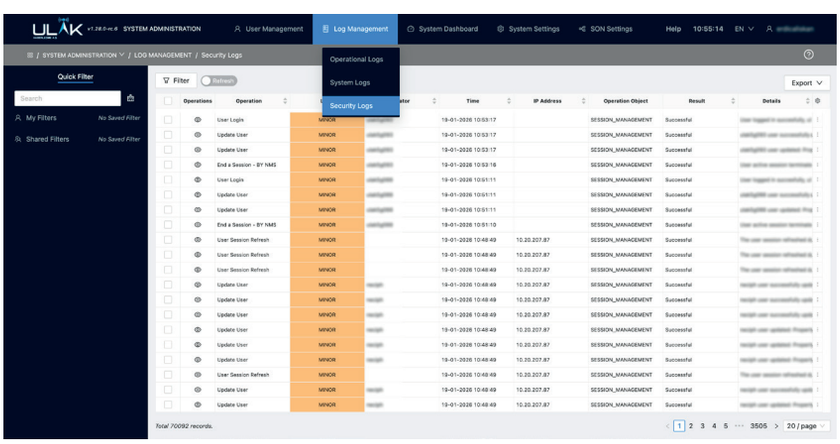
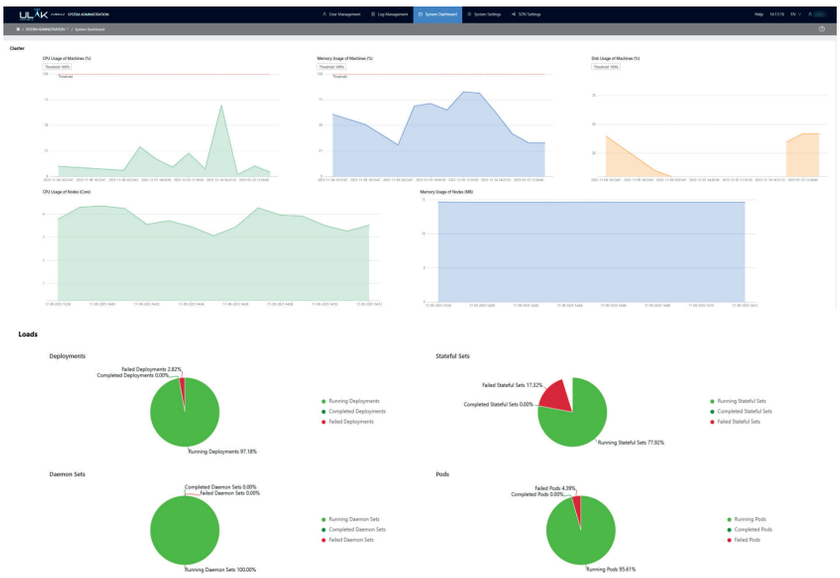



Capabilities of the Log Management;

- Operational Logs
- System Logs
- Security Logs




Capabilities of the System Dashboard;

- System Metrics
- K8s Microservice Loads

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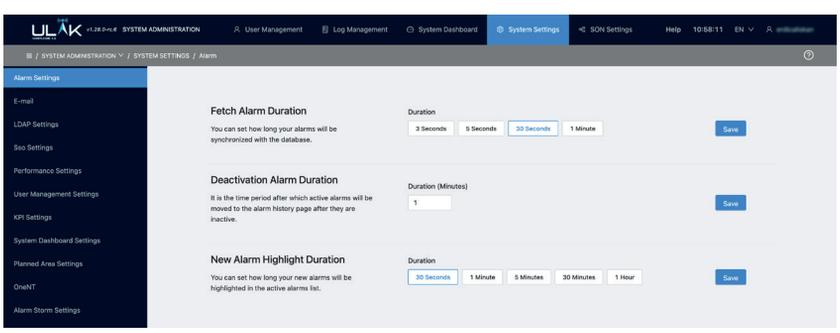


Capabilities of the System Settings;

- Alarm Settings
- E-mail
- LDAP Settings
- Sso Settings
- Performance Settings
- User Management Settings
- KPI Settings
- System Dashboard Settings
- Planned Area Settings
- OneNT
- Alarm Storm Settings

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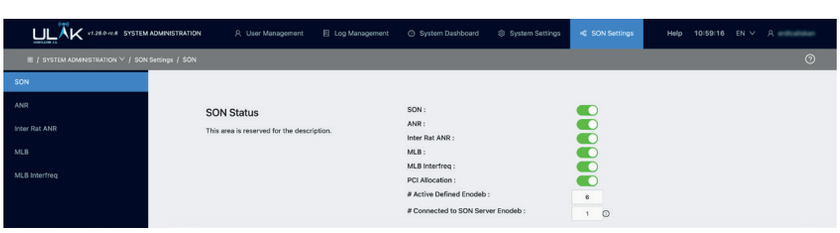


Capabilities of the SON Settings;

- SON
- ANR
- Inter Rat ANR
- MLB
- MLB Interfreq

Notes:


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