

Sparq-2020-DRAN (O-DU)

Sparq-2020-RRH (O-RU)

The Fastest 5G Distribution Platform



General Information

The Sparq-2020-DRAN and Sparq-2020-RRH are the components of a unique Distributed Architecture design for a New Radio (NR, 5gNB) designated for 5G infrastructure that fully complies with 3GPP 5G Standards (Rel-15 and upgradable to Rel-16) Optimized for Ultra Reliable Low Latency Communication (URLLC) and supports enhanced Mobile Broadband (eMBB) and Massive Machine type Communication (mMTC). The Sparq- 2020-DRAN is based on the RunEL Sparq-2020-2 System on Chip (SoC) and the Sparq-2020-RRH is based on the RunEL Sparq-2020-3 System on Chip (SoC)



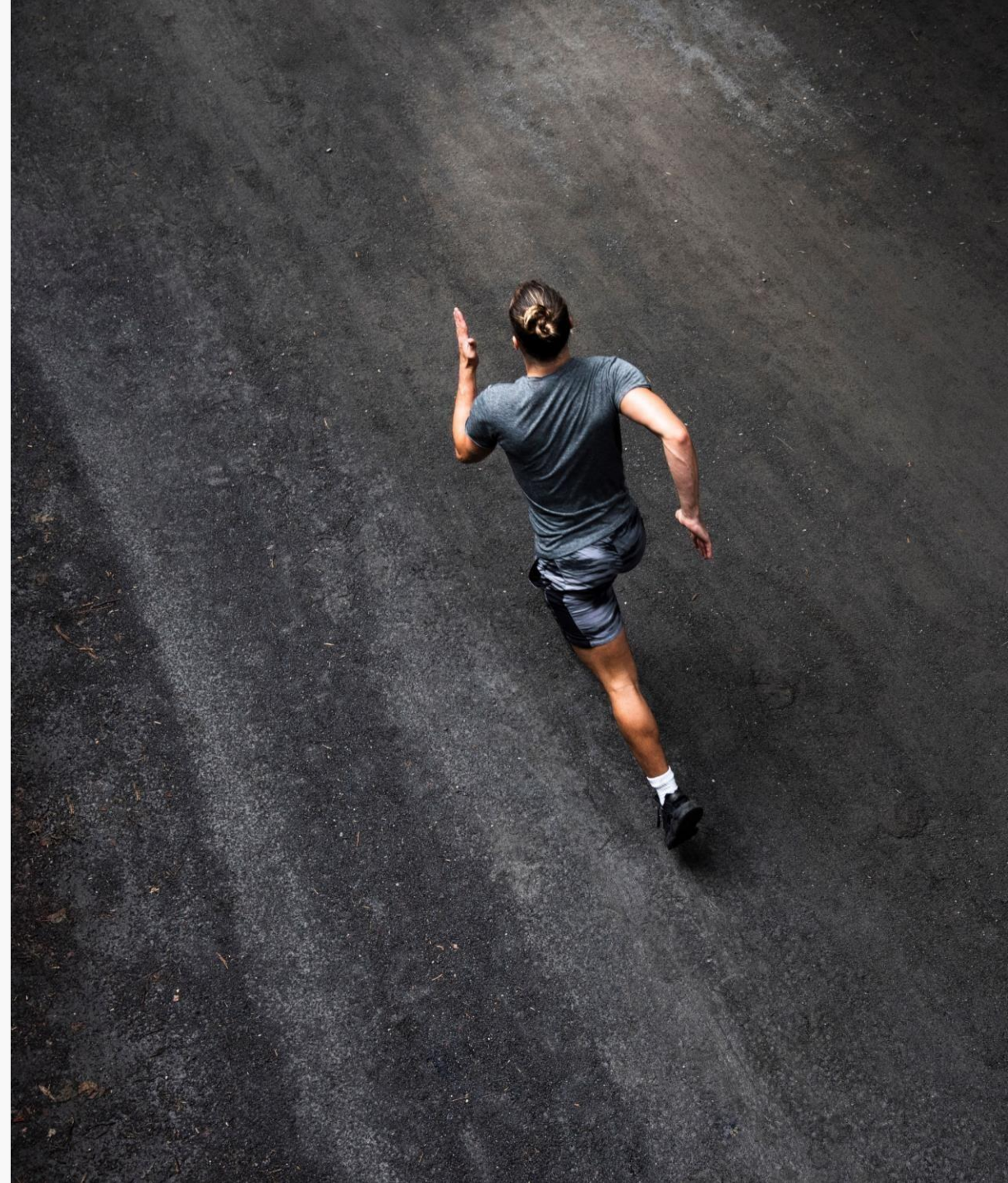
True Innovation

The Sparq-2020-DRAN and Sparq-2020-RRH include substantial innovation enhancing existing state of the art implementations such as: Distributed Architecture with PHY split 28GHz or 3.5GHz Beam Forming Phased Array, the Sparq Minislots, the Hardware based MAC and the I-MEC, that reduces the latency in wireless broadband cellular communication to unprecedented records in order to support applications such as: V2X, Remote Surgery, On line Gaming, Automated Factory, Augmented and Virtual Reality, IoT, Tactile Internet, etc.



A Competitive Edge

- ✓ First in the Market
- ✓ 5G 3GPP standard compliant (Rel-15)
- ✓ Includes 5G PHY (Layers 1) with PHY split (O-RAN option 7.2)
- ✓ Includes 3.5 GHz (or optionally 28GHz) multiple beam steerable Beam Forming Antenna
- ✓ Optimized for URLLC – including “Sparq Minislots”, Hardware based MAC, Cell-less instantaneous handoffs and integrated mobile edge computing (“I-MEC”)
- ✓ FPGA chip based on 16 nanometer technology
- ✓ Open Architecture enables customization via API’s
- ✓ Based on the RunEL Sparq-2020-2 and Sparq-2020-3 SoC
- ✓ Large coverage area using up to 64 RRHs with one DRAN
- ✓ Flexible deployment scenarios for indoor and outdoor



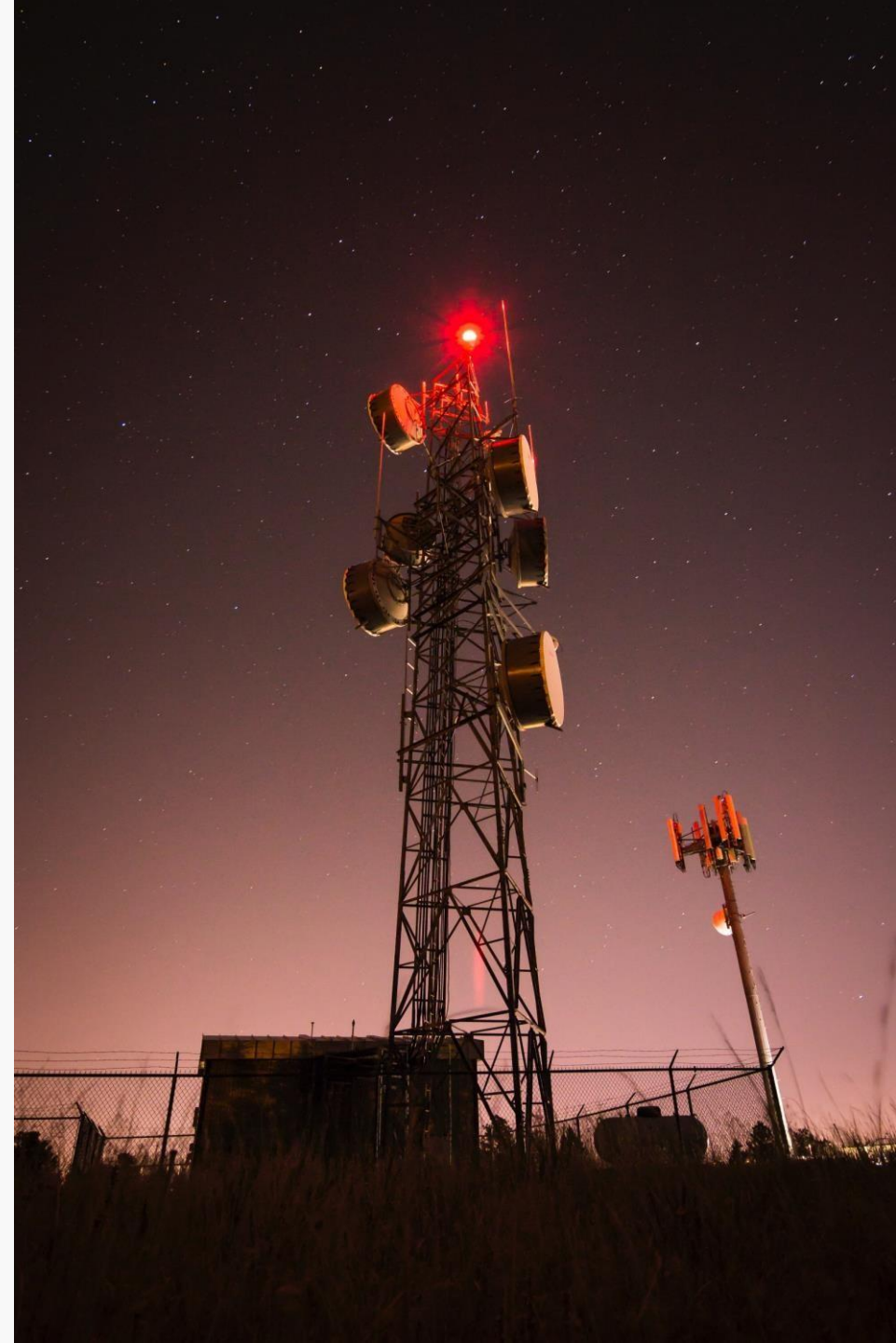
Main Features

Sparq-2020-DRAN (O-DU) and Sparq-2020-RRH (O-RU)

- ❖ Includes low PHY in RRH and high PHY, in DRAN (MAC and RLC Modules from third party are optional)
- ❖ Optional embedded CU with PDPC, SDAP, RRC, Light NgCore, UPF and MEC modules
- ❖ DRAN supports up to 64RRHs
- ❖ 27.5 to 30 GHz or 3.3 to 3.8 GHz operation (other frequency bands are optional)
- ❖ 4 x 200 MHz channel BW (50 and 100MHz available as well)
- ❖ 256 element on 28 GHz Antenna Array (1 or 4 independent beams)
- ❖ 64 element on 3.5 GHz Antenna Array (up to 4 independent beams)
- ❖ Up to 64 Gbps Capacity for DRAN
- ❖ Up to 4 Gbps Capacity (1Gbps per beam) for RRH
- ❖ Physical Layer split between DRAN and RRHs connected via fast Ethernet Ring (20 Gbps) or Hub and Stroke (Star) Architecture (4Gbps)- O-RAN Compliant
- ❖ Latency <0.5 msec
- ❖ Sub Carrier Spacing- 15,30, 60, 120,240 KHz
- ❖ TTISpacing – from 8.25 to 1000 msec (TTISpacing depends on Subcarrier-spacing and number of OFDM symbols)
- ❖ FDD and Dynamic TDD Supported
- ❖ CSI-RS, PTRS, DMRS- Supported
- ❖ LDPC (Data Plane) and Polar Codes (Control Plane) Supported
- ❖ CP-OFDMA implemented in UL and DL and DFT-S-OFDM for UL
- ❖ CoMP- Supported
- ❖ Indoor and Outdoor operation
- ❖ 64 bits DDR4 to FPGA Logic
- ❖ Embedded GPS receiver for outdoorsynchronization
- ❖ Battery option for GPS receiver, save RTC when power is off
- ❖ Support IEEE 1588synchronization

DRAN and RRH Interfaces

- ✓ 4 x 10GSFP+ (Aggregated 40 Gigabit Ethernet connection to XHaulring)
- ✓ 4 x CPRI SFP+ (can be used for Ethernet 10G instead or eCPRI) for additional external antennas
- ✓ 1x USB to control 4 UARTS: a- for CPU, b-for CPU, c- for FPGA, d- for GPS
- ✓ PCIe x 4 Gen2 for external server connection for external MAC or MEC
- ✓ Interface between DRAN and RRH – O-RAN (Category A or B)
- ✓ Interface between DRAN and CU - F1 (Optional with Third Party)

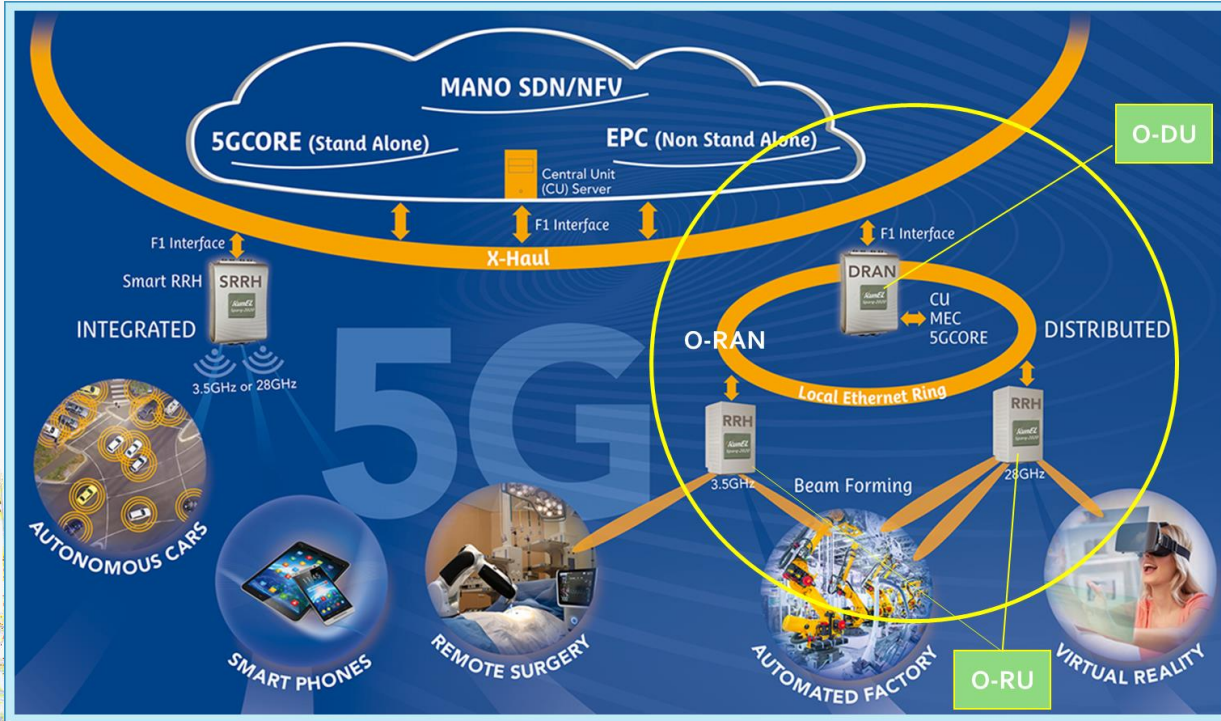


DRAN and RRH Power, Physical and Environmental

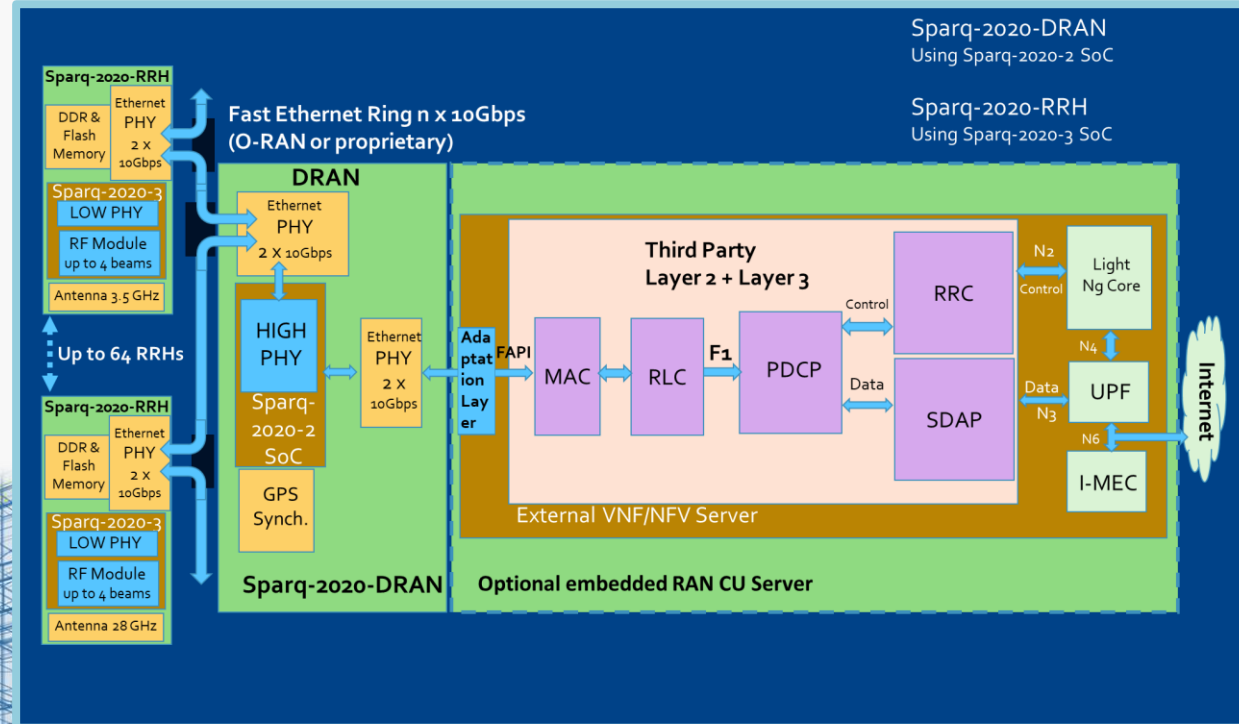
- ✓ Power Inputs: -48V (-35 to -75VDC)
- ✓ Weight- 5Kg
- ✓ Dimensions: 40 x 24 x 12 cm
- ✓ Temperature (Operational) - -45 to 55 degrees Celsius
- ✓ Humidity 5%- 95% non-condensing
- ✓ IP65 (Optional)
- ✓ ETS 300 019
- ✓ Environmental Standard Compliance -TBD



5G System Architecture Diagram



RunEL Distributed Architecture Block Diagram



Collaboration Proposal for OEM/ODM and Equipment Vendors

- RunEL will deliver complete DRAN and RRH Reference Design:
 - DRAN and RRH complete manufacturing files with: Gerber files, Part List, Manufacturing and Testing Instructions , APIs and Execution SW files that will enable customer Independent Manufacturing
 - DRAN and 4 X RRH working samples
 - 2 x Sparq-2020-2 SoC and 10 x Sparq-2020-3 RFSoc
 - DRAN and RRH on site Bring Up Support
 - 1 Year of Remote Support via email and phone
 - 1 Year of Bug fix and Remote SW upgrades (RELEASE - 15)
 - **Delivery NOW**





NGMT-Next Generation Mobile Technology