

C U S T O M I Z E • O P E R A T E • C A P I T A L I Z E



MX-PRO

Spec V1.2

An Industrial-grade Professional 4G/5G Network

OUR TECHNOLOGY

**bubble
ran**

YOUR NETWORK

1. General Description & Features

The MX-PRO is a high-performance industry-grade ready-to-deploy 4G/5G product allowing to deploy 3GPP compliant 4G LTE, 5G NR (NSA/FR1/FR2 and SA/FR2), NB-IOT, NTN end-to-end networks in a production environment at scale. The package includes eNodeB, gNodeB, EPC, 5GC, IMS, and software-based operator for deployment lifecycle management featuring **cloud-native automation, network realtime observability, security with access control, fault tolerancy, and CI/CD/DevOps (optional).**

BubbleRAN MX-PRO is designed for staging, trials, and deployment in operational or production environments. It can also be extended with the O-RAN compliant Stack, namely Near-RT and Non-RT RIC, SMO, and an ecosystem of xApps/rApps to allow monitor, control and coordinate network parameters on runtime. Example includes RAN Sharing, Traffic Control, Mobility Management, Power Control, and Load Balancing among the others. MK-PRO comes with a set of user interfaces, including CLI, APIs, GUI, and dashboard.

MX-PRO Features: simple to use and (re-)configure, cloud-native automation, 3GPP and OpenRAN compliant, Standardized interfaces, customizable, open documentation and resources.

O-RAN Stack: E2 Agent, Near-RT-RIC, Non-RT-RIC, SMO, xApps, rApps.

Example Usage: private 4G/5G, hotspot, small-cell, rural coverage, Industry 4.0, IoT, and e-Mobility.

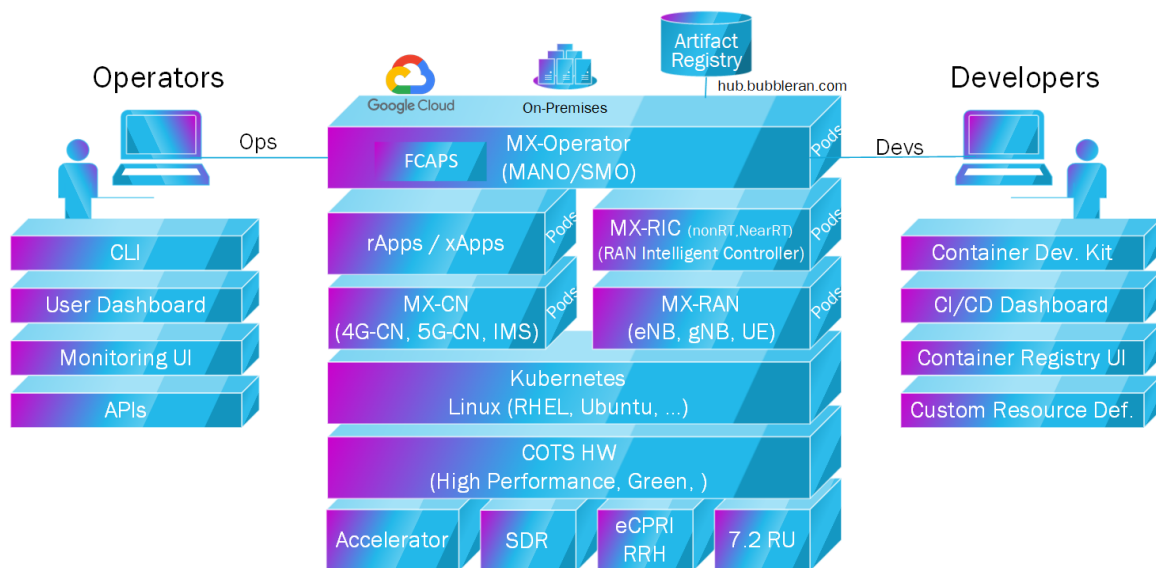
The BubbleRAN MX-PRO hardware platform is composed of (1) one or multiple compute nodes (typically AMD Epyc or Ryzen or Xeon) under RHEL low latency kernel or Ubuntu, (2) an eCPRI RRH (Typically AW2S or Sunwave); or an 7.2-compliant O-RU (typically Lite-on, VVDN, Benetel, or Foxconn), and (3) Antenna and accessories, and optionally 4G/5G Quectel UEs and SIM cards.



2. Software Stack

The software stack of the BubbleRAN is shown below.

- **MX-RAN:** 4G eNB, 5G gNB in FR1 (NSA, SA) and FR2 (NSA), 4x4MIMO 100MHz.
- **MX-CN:** 4GC, 5GC, IMS
- **MX-Operator:** 4G/5G full Life-cycle management, CI/CD, user interface
- **Artifact Registry Hub:** serving archives, packages, images, models, Operator bundles, and configurations
- **MX-RIC(Optional):** Both near-RT-RIC and Non-RT -RIC for both 4G and 5G
- **rApps/xApps(Optional):** an ecosystem of RAN xApps and rApps supporting monitoring, slicing, traffic control, scheduling, and mobility management;



MAIN FEATURES

1. 3GPP and O-RAN standard compliant
2. Open Documentation for developers & users (<https://bubbleran.com/docs/>)
3. Single pane-of-glass UI for vendors, operators, and developers (CLI, GUI, API, Dash Board)
4. Logging, events, alarms, and measurements
5. End-to-end data networking with COTS UEs and Application in the loop
6. Easy and agile declarative configuration and life-cycle management at scale (Level 1 – level 5)
7. Custom sub-6GHz frequency with the SDR cards (PCI-E) and eCPRI RRH (option 8), and O-RAN fronthaul 7.2 O-RU (contact us for the supported bands)
8. Cloud-Native Open RAN software stack



3. Hardware

3.1. PC SPEC: STANDARD, BOOSTED, EXTREME PROFILES

Features	Value
Format HxLxW	Workstation: 417,9 mm (16,45") 176,5 mm (6,94"), 518,3 mm RACK: 42,8 mm (1,68"), 482 mm (18,98"), 589,1 mm (23,19")
Number of PCIe SDR Cards	1-4 (depending on the configuration)
Weight	Workstation: 15Kg RACK: 12 kg
CPU	Typical: 9 (16C) or Xeon (16 Core) or AMD (16C)
RAM	Typical: 32GB
DISK	Typical: SSD 500GB Intensive RW
Ethernet	Typical: 2x10Gb SPFs, 3x1Gb
USB3/4	2 distinct ports
PCI-e Gen 3/4	4 slots (Gen 3)
Power supply voltage Input:	100 - 240V AC
Output	19.5V/9.23A
Power Consumption	Typical: 550W (i9 Workstation) – 1100 (i9 RACK), 1600 (Xeon RACK)
Operating System	Ubuntu or RHEL (optimized Bios)

3.2. ECPRI RRH OR O-RAN 7.2 O-RU

Please contact us for more information.



4. Multi-X Radio Access Network (RAN)

4.1. ENB AND NG-ENB SPEC

Features	Value
3GPP Release	16
Frequency bands	All bands. TDD and FDD
Bandwidth	1.4, 3, 5, 10, 15 and 20
Number of Component Carrier	3xDL and 3xUL
Transmission Mode	1 (single antenna) to 10 (MIMO 4x4)
Modulation and Coding Scheme	Up to 1024QAM in DL and 256QAM in UL
AS Integrity and Encryption	Snow3G and AES
Handover	S1, X2, Intra ng-eNodeB, NG, Xn EPS to 5GS handover support
eNodeB Network Interfaces	S1AP and GTP-U, X2AP between eNodeBs, NGAP and GTP-U to 5GC, XnAP between ng-eNodeBs

4.2. GNB SPEC

Features	Value
3GPP Release	16
Frequency Bands	FDD/TDD FR1 and FR2
Bandwidth	Up to 100MHz
Component Carriers	Up to 4
MIMO	2x2 and 4x4
Subcarrier Spacing	Data subcarrier spacing: 15, 30,60, 120 KHz, SSB subcarrier spacing: 15, 30, 120 or 240 KHz
Modulation and Coding Scheme	Up to 256QAM in DL and UL
Supported Modes NSA, SA	NSA and SA
Handover	Intra gNodeB, NG, Xn and 5GS to EPS HO
Use-case	eMBB, uRLLC, Non-Terrestrial Network (NTN) O-RAN RIC and xApps/rApps
eNodeB Network Interfaces	NG interface (NGAP and GTP-U) to 5GC XnAP between gNodeBs



5. Multi-X Core Network (CN)

5.1. 4GC SPEC

Features	Value
3GPP Release	16
Network elements	MME, SGW, PGW, HSS, ePDG, PCRF
AS integrity and encryption	Snow3G and AES
IP version	IPv4, IPv6
QoS	LTE QCI, TFT, and Dedicated Bearer
Handover	Intra-MME and and EPS 5GS IRAT handover support
Network	S1AP, GTP-U, RX to IMS, S6A, S13

5.2. 5GC SPEC

Features	Value
3GPP Release	16
Network elements	AMF, AUSF, SMF, UPF, UDM, NSSF,
AS integrity and encryption	Snow3G and AES
IP version	IPv4, IPv6, and unstructured PDUs support
QoS	Configurable QFI
PDU Session	Multi PDU sessions support
Handover	intra-AMF and 5GS to EPS IRAT support
Slicing	Multiple Slice (shared or dedicated NF)
Network	NG, Rx to IMS, N12 to AUSF, N8 to UDM, N17 to 5G-EIR, N50 to CBC



6. Multi-X Operator

Features	Value
Level 1 life cycle operation	Resource detection and discovery (day 0), deploy (day 1), and test (day 2)
Level 2 life cycle operation	Release and upgrade (day 2)
Level 3 life cycle operation	Full lifecycle control, including provisioning (day 0), configuration (day 1), and reconfiguration (day 2)
Level 4 life cycle operation	Deep insight with full observability, including monitoring, log processing, metrics, and alarms
Multi-X	Multi-vendor, multi-version, multi-container, multi-OS, multi-node, multi-RAT, multi-RF
Security	Isolation, Signed Artifacts, Unprivileged, Rootless (coming soon), Access Control (coming soon), RBAC
User Interface	API and CLI, GUI, and Dashboard.
Image registry	BubbleRAN hub (hub.bubbleran.com)
Networking	Calico (BGP, eBPF, IPVS) over Ethernet/Fiber, Multus
Storage	Host storage, Rook and Ceph (coming soon)
CI/CD	Consistent artifact generation, integration, validation, security, CDK, Jenkins, Argo and Flux (coming soon)
Infrastructure	K8s distribution on Kubeadm, MicroK8s, Openshift, cloud-init, hardware resource detection and automation
Container runtime	Docker, Containerd, Podman.

7. Multi-X RIC

Features	Value
O-RAN Spec	E2 V1.x, v2.x
Multi-Vendor	Enabled
NearRT Non-RT RIC	Yes Optional.
Service Models	KPM V2.0, RAN Control (Q1 2024), CCC (Q2/Q3 2024)
xApps, rApps	Data collections, performance monitoring, RAN stats, RAN slicing, RAN reconfiguration. SLA-Policy.
xApp Language	C, C++, Python, Go, Java.
O1	Yes (depends on the 4G/5G vendor support)



We are helping organizations to seamlessly build, customize, and operate their private 4G/5G infrastructure by consolidating open RAN and cloud-native architectures with a green MANO/SMO offering more than 10x efficiency and delivery cycle with lower carbon footprint for a wide range of R&D and enterprise use-cases from the lab to the production environment.

OUR TECHNOLOGY

bubble ran

YOUR NETWORK



Twitter @BubbleRANTech
LinkedIn @BubbleRAN
E-mail contact@bubblersan.com
Website https://bubblersan.com
Address 450 route des Chappes F-06410 BIOT Sophia Antipolis