RIC-Sphere: BubbleRAN RAN Intelligent Controller DataSheet

Version: 2026-01

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1 General Description

BubbleRAN RAN Intelligent Controller, **RIC-Sphere**, is an O-RAN compliant interoperable RIC platform that brings fine grained programmability, automation, and AI driven optimization to 5G/6G Open and AI RAN deployments. It combines an O-RAN Near-Real Time RIC and Non-Real Time RIC, plus a rich portfolio of customizable and extendable xApps and rApps. Use-cases such as SLA assurance, Eco-RAN, Auto-RAN, mobility load balancing (MLB), interference management, and localization are few validated examples that highlight the fine-grain programmability provided by RIC-Sphere to control both legacy 5G gNBs, as well as Distributed Units (DUs) and O-RAN Central Units (CUs). RIC-Sphere is part of the BubbleRAN Sphere product family (e.g. SMO-Sphere, Opti-Sphere) built with consistent workflows from lab to production and validated across multi-vendor RAN 5G stacks and tested with Viavi TeraVM AI RSG or Keysight RICTest.

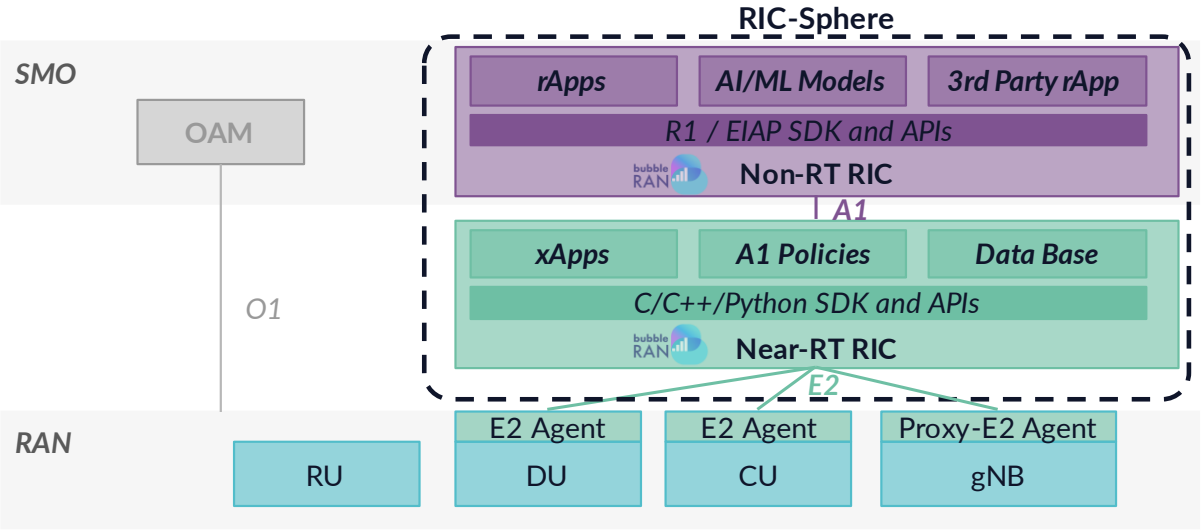

Figure 1: RIC-Sphere is fully compliant with O-RAN specifications and interfaces with xApp and rApp SDK)

As shown in Figure 2, RIC-Sphere delivers an agile DevOps cycle from development and testing to integration and on-boarding of O-RAN Compliant xApps and rApps enabled by software development kits (SDKs) and container development kit (CDK). In addition, the rApp SDK is aligned with the Ericsson's EIAP platform and can be integrated with any O-RAN Compliant Service Management and Orchestration (SMO) solution.

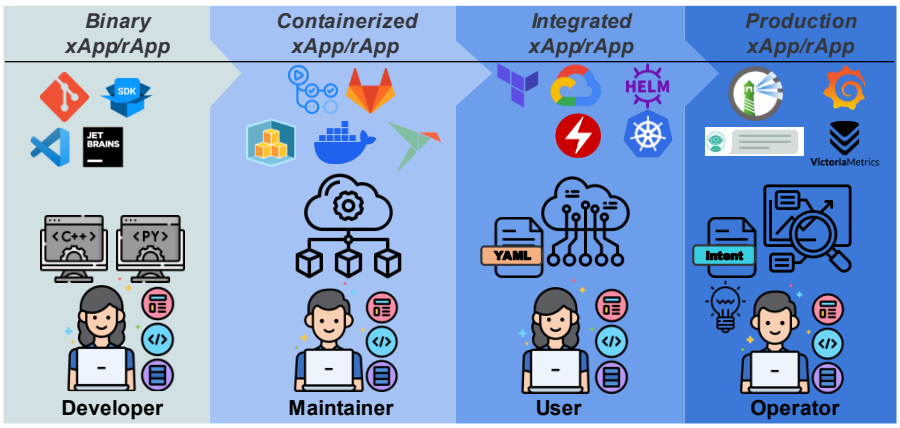

Figure 2: Agile DevOps from xApp/rApp development to use-case enabled by BubbleRAN SDKs and CDKs

2 Software Components

BubbleRAN RIC product, **RIC-Sphere**, follows the O-RAN architecture and specifications, where the Near-RT RIC resides at the network edge (controlling CU/DU/E2 nodes via the E2 interface) while the Non-RT RIC is a logical function in the SMO framework, providing long-term policies, analytics and AI/ML orchestration via A1 and R1. **RIC-Sphere** includes the following distinct software components:

- **Non-RT RIC:** enables latency sensitive services such as policy enforcement and AI/ML capabilities for the RAN elements and their resources by means of rApps. It exposes the R1 interface to rApps and A1 to Near-RT RIC.
- **Near-RT RIC:** responsible for fast loop control down to sub-millisecond latency of the RAN network functions. It can host and deploy specialized xApps logic for monitoring, control, coordination, and optimization. It has E2 and A1 interfaces terminations.
- **Proxy-E2 Agent:** Provides O-RAN E2 adaptor for legacy RAN and E2 Node emulation capabilities.
- **xApp and rApp SDKs**, development kits and reusable xApps/rApps samples with built-in tests and interface to DB.

The following tables list the features sets of the **RIC-Sphere** software components.

Non-RT RIC Feature Sets

Non-RT RIC	Feature Set	
Control Latency	1-100ms	
Interfaces	• A1 Interface (A1AP v4.04, A1-P) • R1 Interface (R1AP v8.0, or K8s CRD) • Ericsson EIAP (v6.x)	
R1AP	• A1-P related services • R1 OAM related services • AI/ML related services • R1 Data management Service via SMO • R1 Data exposure services via SMO	
rApp	**Capabilities**	• Intent-driven RAN Automation (performance, monitoring, Data collection, Policy Job) • QoS/QoE Optimization (A1 Services) • CM Optimization (OAM Services) • AI-powered Slice Enforcement (A1 Services) • AI/ML deployment capabilities • SLA Assurance (A1 Services) • Slice Provisioning & Assurance (OAM & A1 Services)
	Dev. Kit	rApp SDK
	Language	C, Python

Near-RT RIC Feature Sets

Near-RT RIC	Feature Set	
Control Latency	300us-1ms	
Interfaces	• E2 Interface (E2AP v3.0) • A1-Related APIs (A1AP v4.04, A1-P) • E2-Related Open APIs	
Service Models	• O-RAN Key Performance Measurement (KPM v3.0) • O-RAN RAN Control (RC v1.03) • O-RAN Cell Configuration and Control (CCC v3.01) • O-RAN Low Layer Control (LLC v1.0) • BubbleRAN Traffic Control (TC v0.2) • BubbleRAN Slice Control (SC v2.0) • BubbleRAN L2 Statistics (LS v2.0)	
xApp	**Example Capabilities**	• RAN and UE performance measurement (traffic steering) • UE handover control (inter/intra cell) • RAN reconfiguration (band, bandwidth part) • RAN Sensing via SRS I/Q signal samples • Interference detection • Object Detection
	Dev. Kit	xApp User SDK xApp Developer SDK
	Language	C, C++, Python
	Database	• VictoriaMetrics, VictoriaLogs, VictoriaTrace • MySQL, SQLite3 (Optional)

Proxy-E2 Agent Feature Sets

Proxy-E2 Agent	Feature Set
Control Latency	1-10ms (E2-Agent to Amarisoft RAN via WS)
Interfaces (south-bound)	• Websocket • Rest APIs • Dataset File
Interface (North bound)	• E2 Interface (E2AP v3.0)
Service Models	• O-RAN Key Performance Measurement (KPM v3.0) • O-RAN RAN Control (RC v1.03) • O-RAN Cell Configuration and Control (CCC v3.01) • O-RAN Low Layer Control (LLC v1.0)
Mode	• Test • Operational

3 Catalog of Existing xApps, rApps and Use-Cases

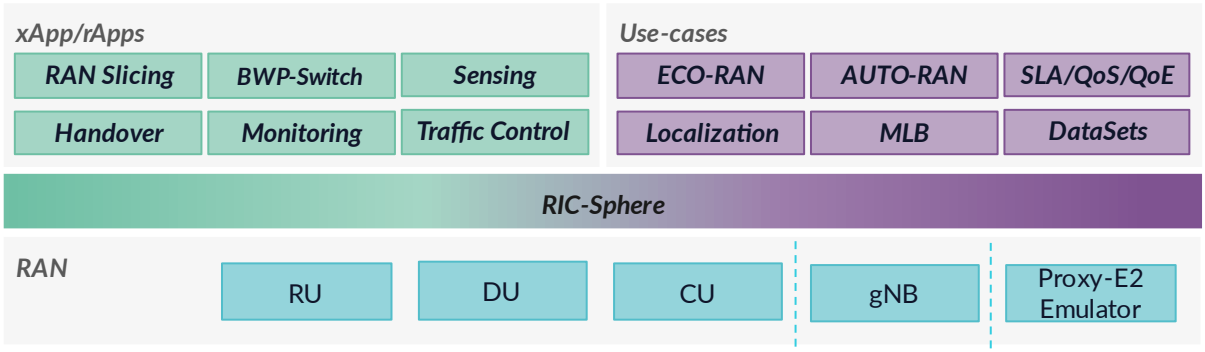

Figure 3: RIC-Sphere Supported RAN deployment models, xApps/rApps, and use-cases

While xApp and rApp samples are designed to reflect the workflow and messages, the use-cases reflect a concrete scenario and objective as described in the table below.

Use-Case	Summary
ECO-RAN	• **Summary:** Policy-driven switching of cells or carrier configurations, energy-aware radio resource allocation and BWP reconfiguration. • **Service Models:** O-RAN KPM, RC, and CCC E2SMs • **Maturity:** Lab
AUTO-RAN	• **Summary:** Near-RT xApp analyzes application traffic by TC E2SM, performs automated application-centric RAN Slicing and association (Auto-RAN) to dynamically meet spatio-temporal application traffic variability. • **Service Models:** BubbleRAN LS, SC, and TC E2SMs • **Maturity:** Lab
SLA/QoS/QoE	• **Summary:** Create and update slices and enforce QoS per 5QI by allocating PRB quotas asymmetrically in UL and DL. • **Service Models:** O-RAN KPM, RC, CCC, and BubbleRAN SC E2SMs • **Maturity:** Production
Localization	• **Summary:** Near-RT xApp captures I/Q samples and low -level metrics in realtime (<500us) to perform localization and sensing driven services such as object detection. • **Service Models:** O-RAN LLC E2SM • **Maturity:** Lab
Mobility Load Balancing (MLB)	• **Summary:** Near-RT xApps handle handovers (intra- and inter-gNB) and distribute traffic across cells while Non-RT rApps set targets for PRB utilization and mobility policies. • **Service Models:** O-RAN KPM and RC E2SMs • **Maturity:** Lab
Dataset Collection	• **Summary:** Near-RT xApp fetches the data from RAN, adds meta data, and push them in batch into the DB • **Service Models:** O-RAN KPM and BubbleRAN LS E2SM • **Maturity:** Production

4 Benefits

1. **Open and interoperable O-RAN platform**
    a. Full compliance with O-RAN architecture and key interfaces: E2, A1, and R1.
    b. O-RAN E2SMs: KPM, RC, CCC, and LLC.
    c. BubbleRAN E2SMs: TC, SC, and LS.
2. **Real time and near real time control**
    a. Near-RT RIC supports standard 10–1000 ms loops and extends this with sub millisecond control for advanced use-cases such as beamforming, localization and Integrated Sensing and Communication (ISAC).
3. **AI ready and data driven**
    a. Non-RT RIC manages AI/ML pipelines (model training, model update, policy inference) and distributes models to Near-RT RIC via A1 within 1-100ms latency.
4. **Cloud native deployment**
    a. Delivered as both binaries and containerized micro services, supporting on premise, bare metal, and public cloud (e.g., GKE) deployments.
5. **Brownfield and greenfield friendly**
    a. Northbound EIAP compatibility allows RIC-Sphere to coexist and interoperate with existing Ericsson intelligent Automation Platform (EIAP) and rApps.
    b. Expose a unified converged R1 interface with smooth integration from lab to production.
6. **Open Ecosystem and Leadership**
    a. BubbleRAN is a strong advocate and active contributor to Open RAN and AI-RAN technologies, all developed in-house. To accelerate their validation, evolution, and adoption, BubbleRAN established BubbleRAN Labs (B-Labs), an international collaboration and membership program that brings together industry and research organizations.
    b. B-Labs provides access to TelcoFabric, a shared innovation platform hosting a wide range of assets, including xApp/rApp samples and SDKs, datasets, benchmarks, telco agents, AI models, tools, documentation, and lab-based training.

Links: Ericsson Intelligent Automation Platform, Ericsson rApps

5 Frequently Asked Questions

Q1: What makes BubbleRAN RIC-Sphere different from other RIC platforms?

RIC-Sphere combines O-RAN compliance, cloud-native design, fine-grain programmability, and real-time in one platform. It helps you develop differentiating use cases faster (slicing, QoE/QoS control, Optimization) and expand into next-gen capabilities like sensing without switching platforms. A key differentiator is the support below 1ms time-scale enabling advanced capabilities (e.g., sensing/localization-style workflows) beyond typical Near-RT RICs.

Q2: What are the benefits of could-native deployment?

Cloud-native deployment enables dynamic and agile DevOps cycles at scale, automated configuration, support for large-scale networks, and seamless integration with other services (e.g., O-RAN x/rApp ecosystems). This accelerates repeatable releases, upgrades, and onboarding of xApps/rApps so teams can iterate quickly from lab trials to production.

Q3: How multi-vendor interoperability is supported in RIC-Sphere?

Interoperability is achieved via O-RAN standard interfaces and service models (e.g., E2/A1 with standardized E2SMs where applicable). RIC-Sphere has also been validated with third-party test tools such as VIAVI TeraVM AI RSG and Keysight RICTest, supporting integration, validation, and regression testing across vendors. RIC-Sphere is designed to enable a broader partner ecosystem and faster onboarding of third party applications.

Q4: What level of customization and extension is supported?

RIC-Sphere supports customization at multiple layers: custom xApps (Near-RT), custom rApps (Non-RT), and AI/ML model integration. In addition, BubbleRAN provides built-in service models that can be extended and tailored to the telemetry and control capabilities exposed by the RAN node, enabling deeper optimization and advanced use cases.

Q5: How fast can a customer get started and prove value?

Using BubbleRAN's DevOps workflows, SDKs, and existing xApp/rApp examples, your team can rapidly design, develop, and integrate with the platform, validate interoperability, and build an initial closed loop. This reduces integration friction and speeds up measurable outcomes in KPIs, automation, and operational workflows.

Q6: What business value does RIC-Sphere deliver?

RIC-Sphere lowers OPEX and reduces operational complexity by standardizing RAN programmability and automation across vendors. It streamlines DevOps and integration efforts with an open ecosystem of reusable artifacts, helping teams deploy, optimize, and evolve networks more efficiently.

6 Change History

6.1 Denim 2026-01

- Enhanced cloud-native Non-RT RIC.
- Enhanced Near-RT RIC and Proxy-E2 Agent, including performance improvements and bug fixes.
- Achieved enhanced compliance with E2AP, A1AP, and R1 interfaces.
- Introduced dynamic rApp lifecycle management.
- Added E2 interoperability with LITEON All-in-One RAN nodes.
- Added O-RAN RC E2SM support for handover control and LLC E2SM support for sensing use cases.
- Enhanced RAN slicing capabilities, including ePR-based algorithms and multi-downlink slice support.
- Expanded enablement content with additional O-RAN labs, new deployment blueprints, and technical blogs.

6.2 Crimson 2025-07

- Enhanced Near-RT RIC, Non-RT RIC, and Proxy-E2 Agent, including stability and performance improvements.
- Added support for KPM v3, RC v1.x, and CCC v3.x E2 Service Models.
- Introduced dynamic xApp lifecycle management.
- Released xApp/rApp SDKs and an initial xApp/rApp catalog.
- Introduced A1 integration with OEM services, exposed as Kubernetes Custom Resources (CRDs).
- Added xApp/rApp labs and hands-on lessons for developers and operators.

6.3 Bronze 2024-10

- Released the Cloud-Native Non-RT RIC platform.
- Enhanced Near-RT RIC with support for E2AP v2/v3, KPM v2/v3, and RC v1.
- Introduced E2AP and A1AP exposure as Kubernetes CRDs for R1 and A1 services.
- Released the Proxy-E2 Agent.
- Added initial xApp labs and training content.

6.4 Azure 2022-10

- Initial release of the Near-RT RIC platform.
- Introduced E2AP compatibility with early O-RAN nodes.
- Delivered initial xApp examples and xApp SDK.
- Released tutorials, API specifications, and academic enablement material.

7 License

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8 Terminology

RAN	Radio Access Network
CN	Core Network
IMS	IP Multimedia Subsystem
UE	User Equipment
O-RAN	Open RAN Access Network
AI-RAN	Artificial Intelligence Radio Access Network
SMO	Service Management and Orchestration
RIC	RAN Intelligent Controller
Non-RT RIC	Non-Real-Time RIC
Near-RT RIC	Near-Real-Time RIC
E2	E2 Interface (Near-RT RIC to RAN Agent)
A1	A1 Interface (Non-RT-RIC to Near-RT RIC)
R1	R1 interface (rApps)
RF	RAN Function
E2SM	E2 Service Model
xApp	eXternal App (Near-RT RIC)
rApp	RAN Application (Non-RT RIC)
CU	3GPP Central Unit
DU	3GPP Distributed Unit
O-RU	O-RAN Radio Unit
E2E	End-to-End
AI-for-RAN	Artificial Intelligence for Radio Access Network
AI-on-RAN	Artificial Intelligence on Radio Access Network
AI-and-RAN	Artificial Intelligence and Radio Access Network
SDK	Software Development Kit
CDK	Container Development Kit
SMO-Sphere	BubbleRAN SMO-Sphere Product
RIC-Sphere	BubbleRAN RIC-Sphere Product

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