



## SOLUTION BRIEF

# MAVENIR'S RAN INTELLIGENT CONTROLLER

Mavenir's RAN Intelligent Controller (RIC) offers programmable control of RAN and addresses the shortfalls of various self-organizing network (SON) architecture. RIC helps communications service providers (CSPs) achieve granular, real-time control of RAN for efficient operations, automate service level agreement (SLA) management, and offer differentiated services such as enhanced quality of experience. Compliant with O-RAN Alliance specifications, Mavenir's RIC can control legacy RAN for SON use cases as RIC applications, helping CSPs achieve converged intelligent RAN management.

Mavenir's RIC is distributed, cloud-native, and supports Open RAN interfaces and legacy RAN connectors for converged RAN management. It supports applications using open APIs on top of the analytics framework which enables data collection and enrichment capabilities and machine learning (ML) model libraries. The RIC uses various ML models such as anomaly detection, time series prediction, clustering, and Bayesian optimization to enable numerous RAN control use cases.

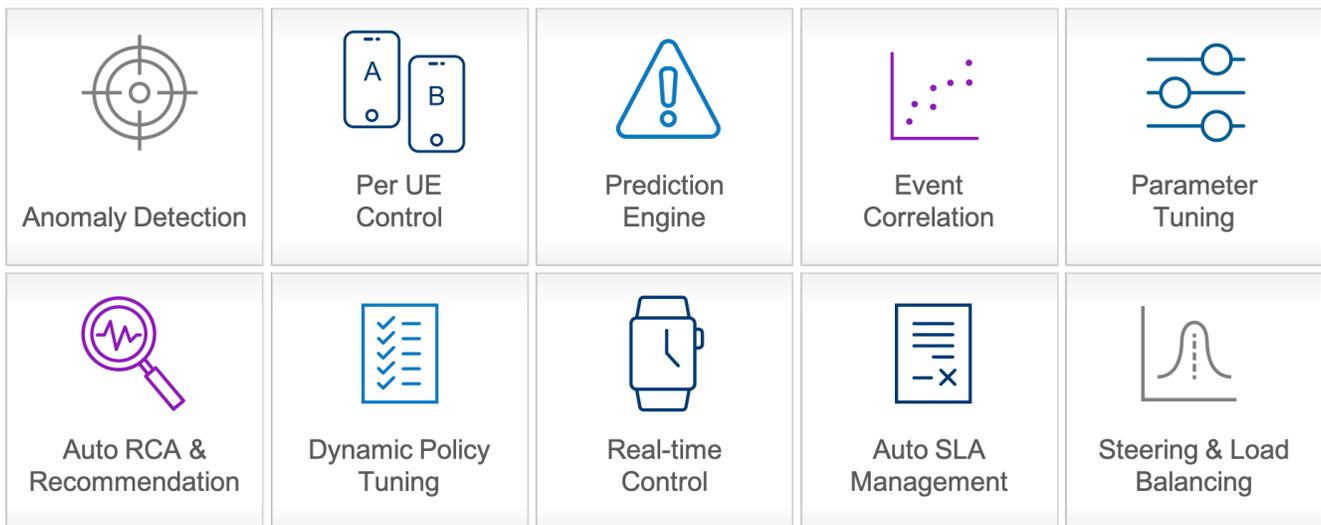


Figure 1: Key capabilities of Mavenir's RIC



Mavenir’s RIC solution consists of three components for intelligent RAN control:

- > **Non-Real-Time RIC** (Non-RT RIC) provides declarative policy for optimization, KPI targets, and predictive KPI guidance at non-real-time granularity. Applications that reside on the Non-RT RIC are called ‘**rApps**’ and include offline ML model training based on data collected in the SMO and feedback received from the Near-Real-Time RIC. All C-SON functionalities are provided as rApps in the Non-RT RIC.
- > **Near-Real-Time RIC** (Near-RT RIC) is responsible for receiving per user equipment (UE) fine-grained measurements across layers of the RAN protocol stack and further near real-time granular control of RAN. Applications implemented on the Near-RT RIC are called ‘**xApps**’ and have trained models for inference and RAN control actions at near-real-time having per UE or 5G Quality of Service Identifier (5QI) granularity. All D-SON functionalities are provided as xApps in the Near-RT RIC.

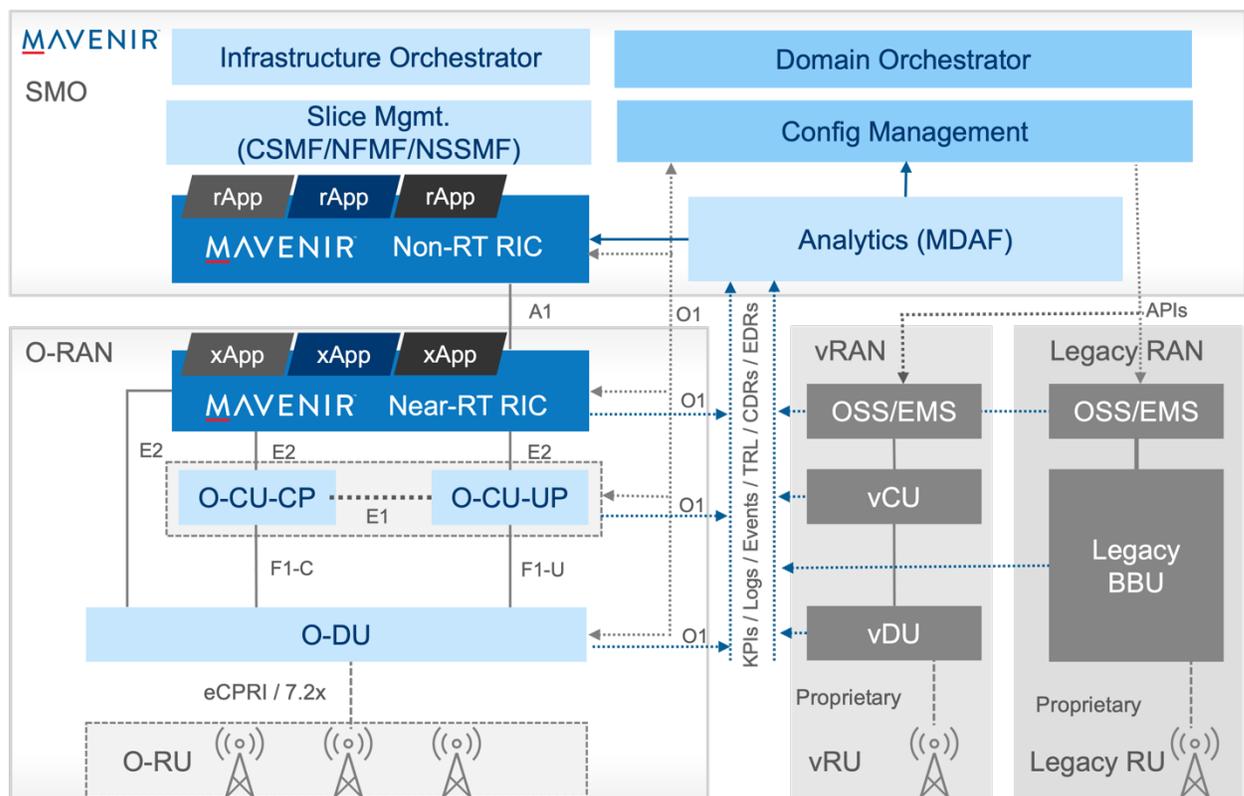


Figure 2: Mavenir’s All RAN Analytics Architecture



- > **Service Management Orchestration (SMO)** is a management plane function responsible for receiving PM reports from RAN and computing KPIs at an aggregated cell level or averaged across a UE session level. The SMO designs cell-level configuration parameters and cell/UE-level tracing at non-real-time granularity. It also includes slice manager, domain orchestrator for RAN, and infrastructure orchestrator for a cloud that is hosting RAN functions.

To collect data and to control the RAN, Mavenir's RIC solution supports the following interfaces for O-RAN compliant implementations and custom connectors for non-O-RAN compliant and previous generation RAN.

- > **O1 interface** is used for RAN functions to communicate with SMO and Non-RT RIC. This interface is used for collecting aggregated or averaged UE or cell-level performance measurement data generated at non-RT granularities (> 1 sec). It is also used to perform configuration changes in the RAN.
- > **E2 interface** is supported for RAN functions defined by O-RAN such as O-DU, O-CU-CP, O-CU-UP often referred to as E2 nodes to near-RT RIC communication. It is used for collecting per-UE measurements and session state data across the layers of the RAN protocol stack generated at near-RT granularities (10 ms to 1 sec). This interface is also used for near-RT and granular RAN control mainly involving various protocols of RAN stack such as radio link control (RLC), medium access control (MAC), radio resource control (RRC), service data adaptation protocol (SDAP), and packet data control protocol (PDCP). RIC provides imperative policies to E2 nodes for regulating procedures handled in them.
- > **A1 interface** is used for Non-RT RIC to Near-RT RIC communication. This interface helps Non-RT RIC in sending policies that include setting KPI targets and offering enrichment information such as predictive KPI guidance.
- > **R1 interface** is used for integrating rApps to the RIC platform, allowing third party application developers to innovate on this open framework.



Mavenir’s RIC solution helps reduce significant RAN capital expense by optimizing resource usage, decreasing operating costs with closed-loop automated operations, and enabling CSPs to offer differentiated services with programmable RAN control.

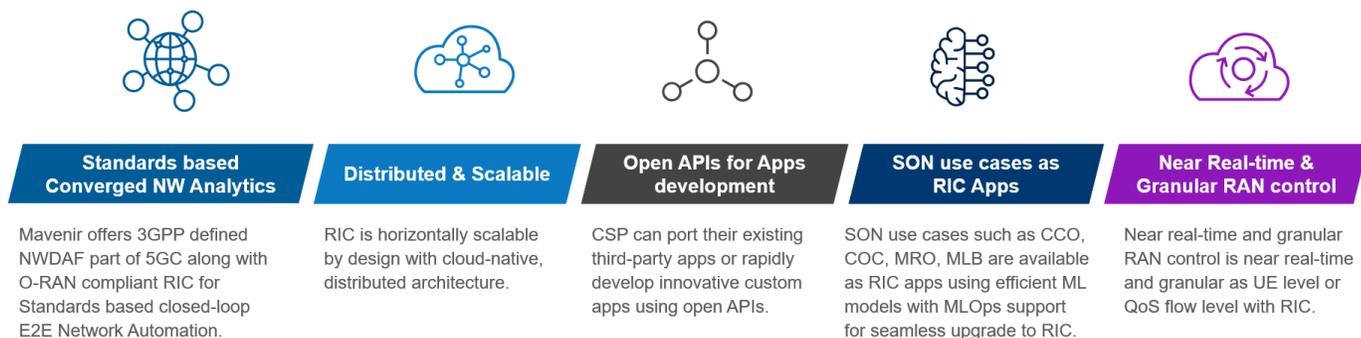


Figure 3: Key Tenets of Mavenir’s RIC solution

To ensure investment protection, Mavenir’s RIC solution supports converged and custom RAN control of all previous generations, proprietary RAN along with 5G. Mavenir’ solution delivers:

- > **SON use cases as RIC applications:** SON use cases such as coverage and capacity optimization (CCO), mobility robustness optimization (MRO), mobility load balancing (MLB), auto neighbor relations management (ANR), PCI conflict detection and mitigation, RACH optimization, cell outage compensation (COC), and auto SLA assurance are implemented as applications on Non-RT RIC. This enables an upgrade to existing SON deployments or enables 5G deployments to directly use RIC for investment protection.
- > **Open APIs:** Mavenir’s RIC supports open APIs for third-party application porting, and custom app developments by CSPs.
- > **Near real-time automation:** Near-RT RIC, deployed close to RAN in edge clouds, supports real-time data collection and near real-time RAN control using online ML models.
- > **Granular RAN control:** Near-RT RIC enables granular per-UE and Quality of Service (QoS) flow control use cases such as traffic steering, SLA management, and mMIMO beamforming optimization, along with many industry vertical use cases, such as unmanned aerial vehicles (UAV) and autonomous vehicle remote control.
- > **ML models for RAN:** Mavenir’s RIC solution offers various algorithms designed with ML models applied to RAN-specific input and output parameters. It also provides custom algorithm creation and tuning capability with an ML workbench for MLOps.



- > **Converged network analytics:** Mavenir offers 3GPP defined Network Data Analytics Function (NWDAF) as part of 5G Core for network analytics along with RIC for RAN control to enable efficient end-to-end closed-loop network automation and control architecture across the RAN and packet core.
- > **Standards compliant:** Mavenir's RIC solution supports O-RAN specifications compliant interfaces and procedures.
- > **Optimized footprint:** Mavenir's RIC and its applications are implemented as cloud-native, microservices that help in on-demand scaling and efficient resource usage.
- > **Distributed, scalable solution:** Mavenir's RIC utilizes edge and central cloud efficiently for use case needs with model training and Non-RT data collection at the central function while the edge function takes care of real-time data collection and RAN control. This architecture is scalable from small to large deployments.
- > **Efficient database design:** Mavenir's RIC uses an optimized database and schema along with patented user and flows identification logic that leads to faster actions and granular controls with minimal resources.

## Why Mavenir for Intelligent RAN Control

While the RIC was created to enable network automation per O-RAN Alliance specifications, Mavenir's RIC serves as the foundation of the next generation SON for any RAN environment, providing real-time RAN control and management. In addition, Mavenir's RIC gives more control back to CSPs by providing open APIs for RIC application development, enabling proactive network resource management and differentiation, and allowing fine-grained UE policy deployments.

## About Mavenir

Mavenir is building the future of networks and pioneering advanced technology, focusing on the vision of a single, software-based automated network that runs on any cloud. As the industry's only end-to-end, cloud-native network software provider, Mavenir is transforming the way the world connects, accelerating software network transformation for 250+ Communications Service Providers in over 120 countries, which serve more than 50% of the world's subscribers.

For more on Mavenir Solutions please visit our website at [www.mavenir.com](http://www.mavenir.com)