MAVENIR

BUILDING THE FUTURE OF NETWORKS – TODAY.

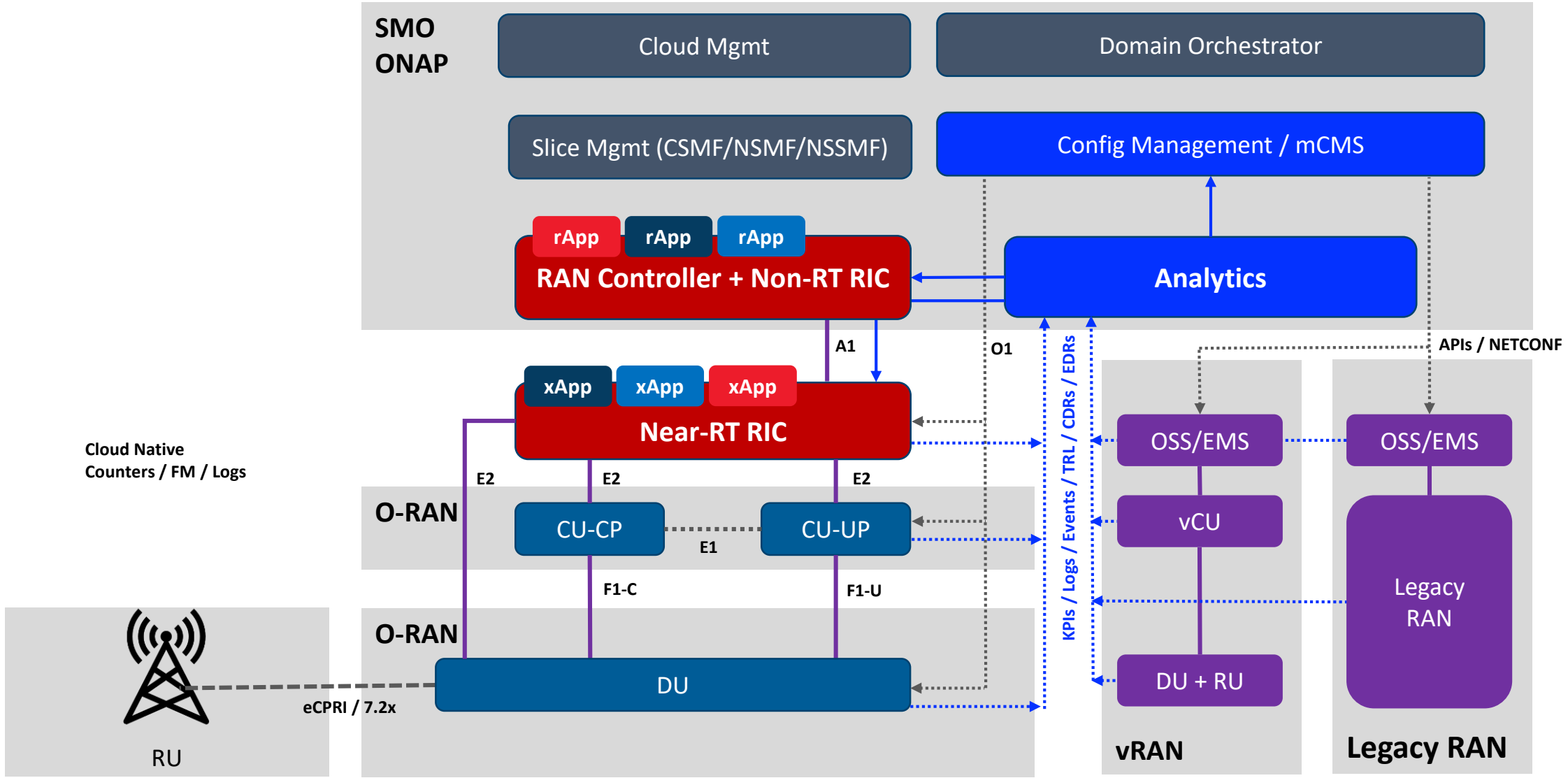
CLOUD-NATIVE. AI-ENABLED. GREEN BY DESIGN.

RAN Intelligent Controller

Orchestrating the Future of Open RAN Systems

Vikalp Dutt

RAN Intelligent Controller | High level Architecture



RIC Platform foundation

- Cloud-native Services-based architecture for Near-RT RIC and Non-RT RIC/SMO
  - Deployable in public cloud platforms like AWS, and leverages Kubernetes, VM nodes, pods/containers, micro-services
  - Scalability and flexibility with CNF provisioning, pods, etc.
- Offers fine-grained Network Intelligence-as-a-Service (NIaaS)
  - Apps can avail DRL/ML/AI model training, repository, data fit/analytics and pipeline services offered by the platform
- Multi vendor interoperability & partner ecosystem
  - Multiple developers and vendors can be onboarded to collaboratively build a best in breed RIC
- O-RAN standard spec-compliant interfaces and APIs
  - Mavenir RIC/SMO products are built in a spec-compliant manner, harnessing adapter functions.
  - Mavenir holds rapporteur and several key positions in O-RAN standards

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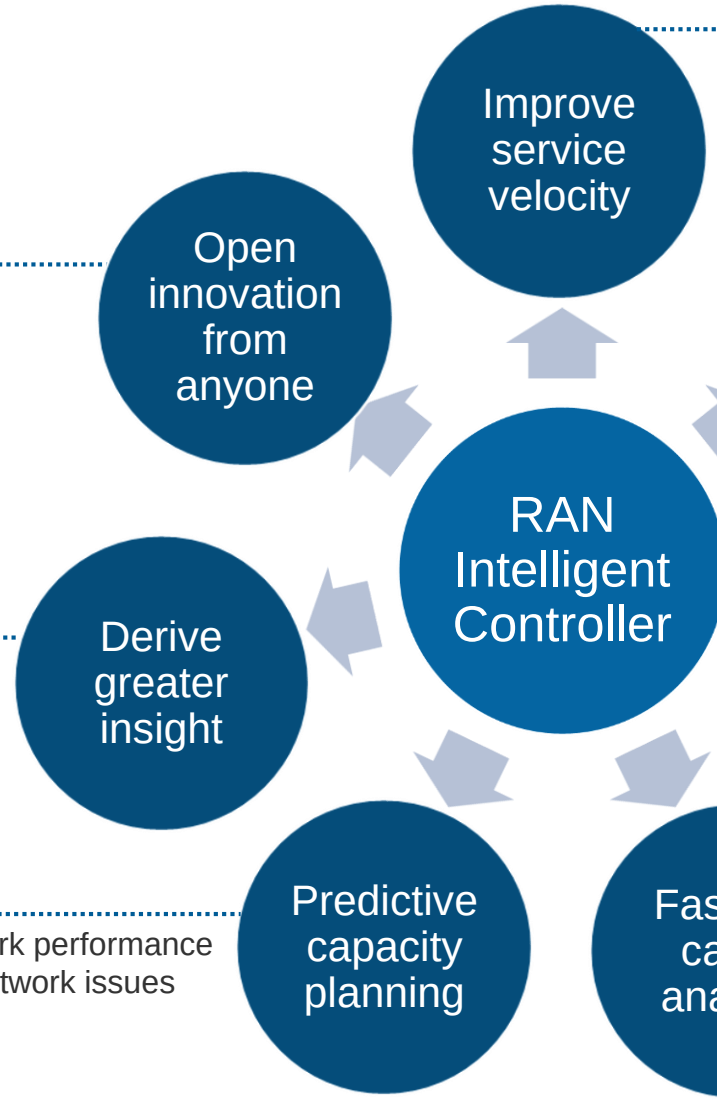
RAN Intelligent Controller | Offering to OpenRAN



- Automatic anomaly detection & resolution
- Benefits of E2E cloud-native environment

- RIC is the Network automation enabler

- Standardized Northbound interfaces
- Integration of the best AI/ML algorithms from the community

- Correlation of hundreds of KPIs
- PM, FM, RAN Traces, etc

- Forecast network performance
- Anticipate to network issues

- Better network visibility
- End-users QoE understanding

- On-boarding of 3rd-party Apps
- Open to data scientist

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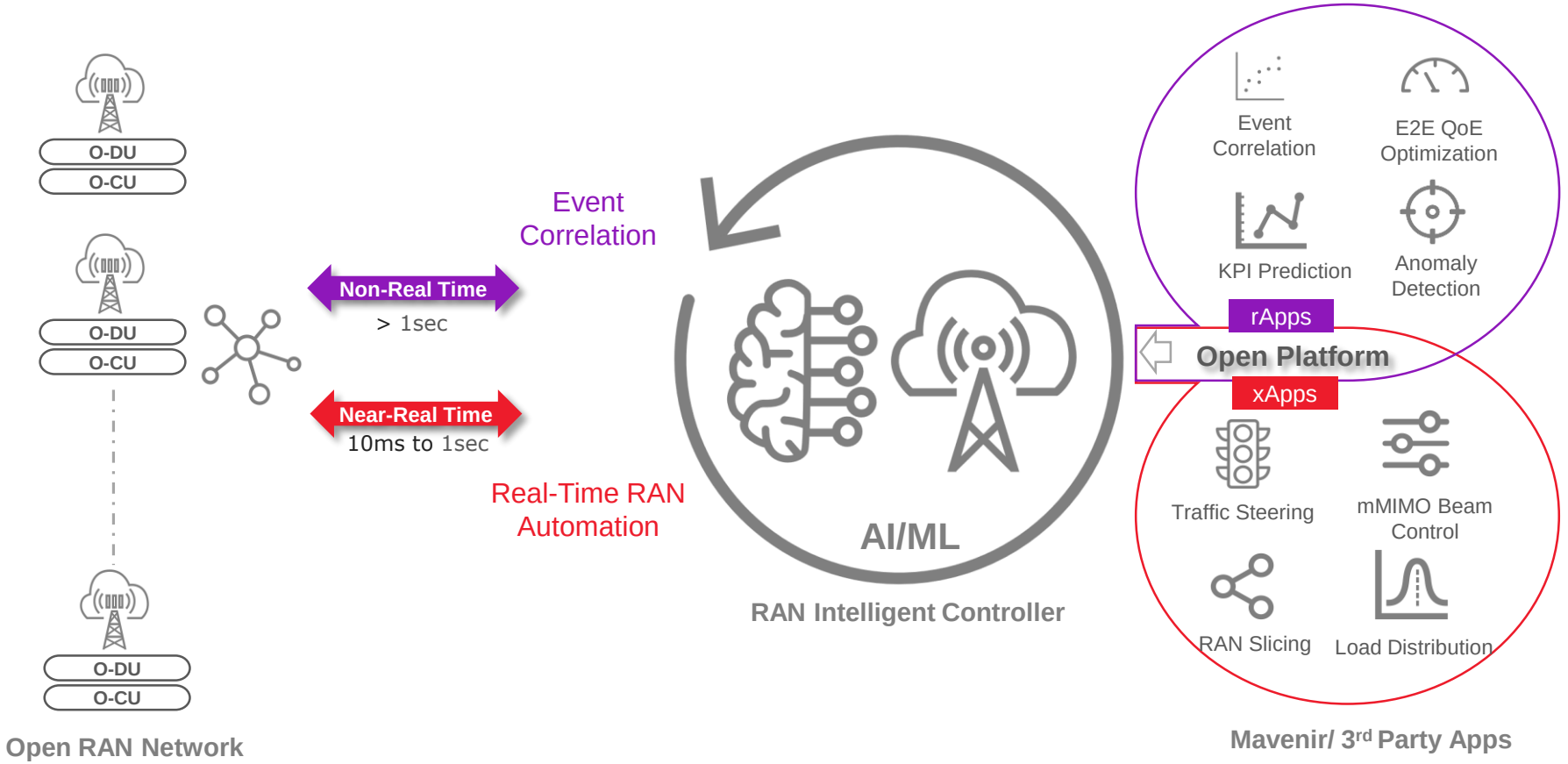
Building an Intelligent Network

Any Application
Any Vendor
Any Optimization

Innovation & Operational Efficiency with AI/ML tools, saving on CAPEX & OPEX



- **Open Innovation**
- **Real-Time Control**
- **Fine-Grained Deployment**
- **Proactive Management**
- **Simplifies Operations**

Predictive and Real-Time Network Decision enabling Programmable Business Outcomes

Delivering on the Vision of Intelligence Everywhere

Intelligent Network	Intelligent Operations	Intelligent Services	Intelligent Business
Channel estimation	Predictive maintenance	Auto SLA management	Computer vision apps (IVA)
Beam control	Auto root-cause analysis	Service QoE monitoring	IIoT analytics
Load balancing	Auto metrics correlation	QoE improvement for data	Robotics control
Traffic steering	Anomaly detection	Video quality improvement	Augmented & virtual reality
Cognitive policy	Predictive capacity planning	Auto language translation	Customer behavior insights
Predictive scheduler	Auto parameter tuning	Intent & mood recognition	Revenue assurance
Slicing control	Auto threat analysis		
Bearer control and mgmt.			
All telco network products from RAN to applications	E2E network operations	Telco services	Next-gen business
Data Science + Telco Domain Knowledge	Data Science + Telco Operations Knowledge	Data Science + Telco Services Knowledge	Data Science + Next-Gen Use Cases Over 5G

I-NOSB

Key Differentiators of RIC over SON

The RAN Intelligent Controller (RIC) and the apps (xApps/rApps) are to the RAN what the central nervous system and the brain are for the human body. The RIC, together with the apps, makes the RAN "smarter".

Aspects	SON	RIC (Additionally on top of SON)
Optimization	Optimizes Management-plane operations **cell-level** parameters	**Optimizes RRM for control-plane and user-plane procedures** on a **per-UE basis**
Intelligence	**Cell-level analytics** and performance data correlation across the RAN stack	**UE-level cross-layer analytics** and state/data correlation
Interfaces	**Proprietary interfaces** with network elements and apps	**O-RAN standardized open interfaces** with network elements and apps
Granularity	**Coarse-grained and non-real-time**	**Fine-grained and near real-time** (10ms to 1sec) using low-latencycontrol loops
Policies	Pre-built policies/objectives to operate on network data	**Adaptive training and update of policies/objectives** on-the-fly while operatingon network data
Performance monitoring	No standard procedures for continuous performance monitoring	Standard procedures for continuous performance monitoring and **AI/ML life cyclemanagement**

Customized UE-level decisions at fine granularities, by programmable and adaptive intelligence

Key Use Cases & Applications

Non-RT RIC

- CCO
- Anomaly Detection
- Smart Paging
- Slice Level QoE
- Infra Telemetry
- Predictive Monitoring
- Predictive Capacity
- e2e QoE
- MRO-NRT
- 3rd Party rApp
- ATO

Near-RT RIC

- MLB
- MRO-RT
- mMIMO Beam Control
- Dynamic v2x
- IIoT Predictive Maintenance
- Traffic Steering
- QoS Resource Mngt
- RAN Slice SLA
- RRM for UAV
- Predictive CQI

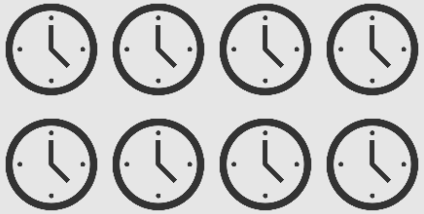
Open Innovation in RAN

Traditional RAN
(Closed Environment)

ALL RAN features have been developed by only a handful of vendors.

Higher Costs

Closed development requires more time and effort to be put into R&D, which raises costs.



More Time

Closed development limited to only those working for individual companies, which slows the speed of innovation.

RAN using RIC
(Open Environment)

RIC helps manage multi-vendor RAN components, allowing faster development of new features.

Lower Costs

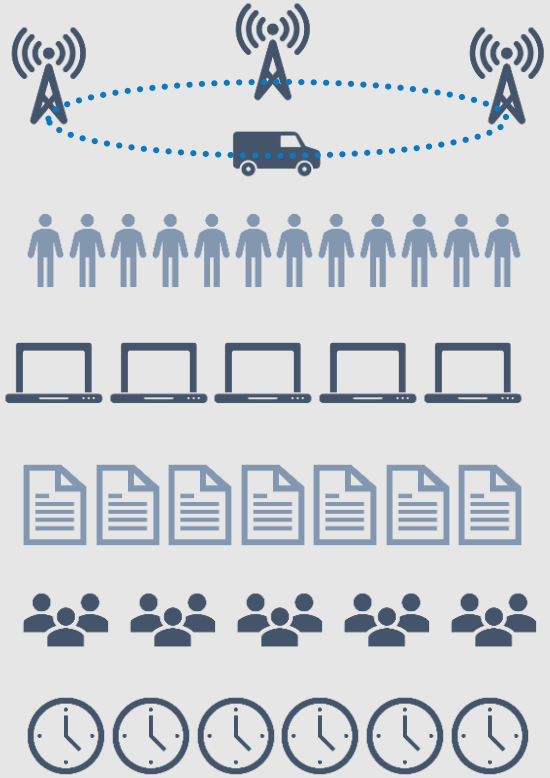
Open development allows for collaboration and use of ideas from outside the company, reducing R&D costs.

Less Time

Open development fosters collaboration, speeding the development of solutions & innovation.

RAN Automation | Time and Cost Saving

Traditional RAN Maintenance



Lots of driving from site to site

Lots of employees

Lots of equipment

Lots of paperwork

Lots of meetings

Lots of time

Real-Time Automation

Artificial Intelligence

Machine Learning

Automation

RIC enables Near Real-Time RAN automation to reduce cost and time spent on various age-old processes to manage RAN resources and achieve Zero-Touch, Self-Healing Networks.

Some Observed service experience analytics

Reduced Capex Spends

QoE prediction driven network expansion
On-demand cloud resources utilization

Reduced Churn

QoE prediction and RCA helps in reduced MTTR and proactive measures such as device, network or plan upgrades

Reduction in Opex

Automated Optimization
Dynamic Scaling
Efficient NOC

Increase in Revenue

Automated QoE management helps CSPs offer SLA bound new services for eMBB, URLCC, mMTC, NPN needs of enterprises

*Estimations savings; Benefits based on case studies and industry reports


Thank You