



MAVENIR™

BUILDING THE FUTURE OF NETWORKS – TODAY.
CLOUD-NATIVE. AI-ENABLED. GREEN BY DESIGN.

5G Evolution & 6G

Vikalp Dutt
May 2024



Evolution of 5G: Key Attributes



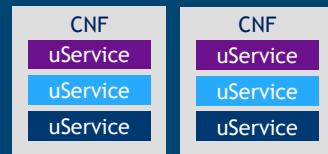
AI & ML and OpenRAN are vital for evolution of 5G, to improve the efficiency and performance multifold.

Pro AI Open Silicon



Advent of Chipset vendors empowering AI by design.

Multi-Cloud Partnerships



Multiple Clouds are vital for Enormous Data for AI/ML

Intelligent orchestration with RIC, AI/ML

- Programmable NWs
- RIC based features for Lower TCO
- Investment in Automation
- Near-RT RIC for new 5G use cases & permit UE Scheduler optimization -
 - Traffic Steering
 - ENERGY savings
 - NW SLAs



Common AI/ML processes

for E2E NW orchestration and dynamic NW management

- AI for Location , Compute and Communications
- AI for Radio Units
- AI for RAN Software
- AI for Network Optimization
- AI for advanced Use cases
- Sub-ms AI for Interference mitigation and online ML model update for real time L1 Operations



AI Driven E Saving Sol

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NW pow

- Nearly 80% of time lightly loaded
- AI enabled RIC m shutdown/ wake u load/traffic forecast
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AI Driven Energy Saving Solutions

70% of RAN consumes total NW power

- Nearly 80% of times cells are lightly loaded
- AI enabled RIC manages Cell shutdown/ wake up based on load/traffic forecast
- Load balancing between cell sites is enabled by AI-forecast before cell shutdown
- AI/ML enables smart channel shutdown based on Load
- Reduced Power on cells based on User Applications
- More components to switch off in idle mode and requires far fewer transmissions of always-on signaling in Deep Sleeps



Unique ORA for Energy Implemen

Which cell to Shut

- With E2/A1, UE information is co available to non Algos
- UE specific RSP
- Cell/ Node Spec

UE Load Balancing Shut down

- Near-RT RIC co aggregated Ener KPIs (Total PDC Energy consum UE mobility betv
- UEs are intellige best cells



tips



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Unique ORAN Abilities for Energy Savings Implementations

Which cell to Shut down

- With E2/A1, UE level information is continuously available to non-RT RIC AI/ML Algos
- UE specific RSRP/ RSRQ
- Cell/ Node Specific PMs

UE Load Balancing, before Shut down

- Near-RT RIC considers aggregated Energy Efficiency KPIs (Total PDCP volume / Energy consumed) to decide UE mobility between cells
- UEs are intelligently moved to best cells



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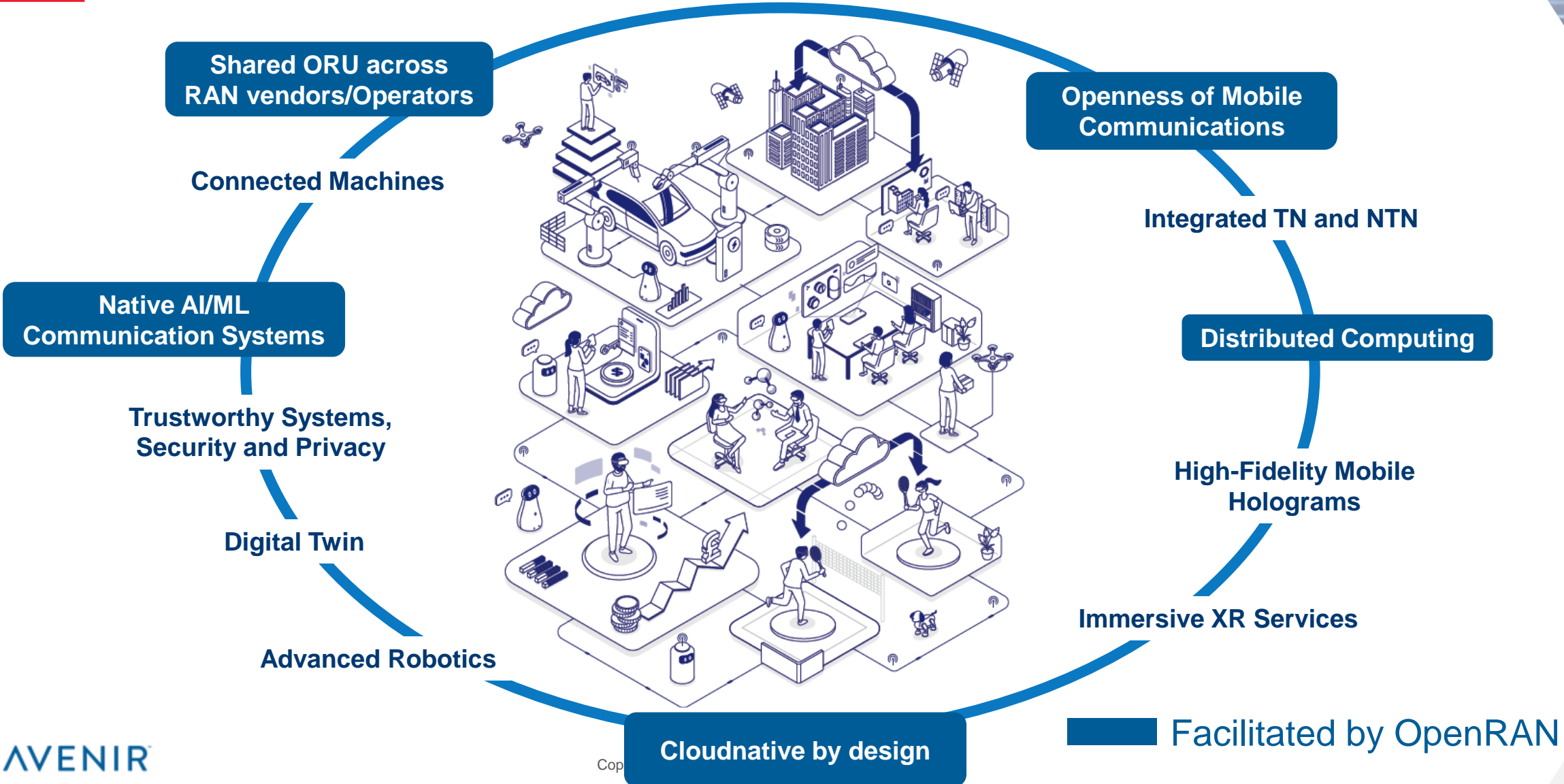
OpenRAN: Key Foundation for 6G[📶]

Top 10 Reasons



- 1 Multi-vendor eco-system** → More innovative solutions with Open and standard interfaces
- 2 Open RAN (disaggregated architecture, virtualized NFs, open interfaces)** → The computing, and storage resources are distributed across the network and connected via open and low-latency interfaces.
- 3 Disaggregation and interoperability across open interfaces** → Open RAN enables Independent upgrade of network elements; Multi-operator network sharing strategies
- 4 Open FH interface** → Cell-free distributed mMIMO wherein large antenna panels are geographically distributed and connected to a common DU via already existing FHI specified by O-RAN to allow uniform coverage, seamless mobility, and increased capacity
- 5 Centralized RRM (RIC)** → Intelligent optimization of network operation. Innovative, differentiable, intelligent RAN services and operation already enabled by O-RAN RIC platforms and interfaces.
- 6 Openness and Programmability** → OAM subsystem needs to have a common architectural framework that enables the 6G system to be programmable, open, and interoperable in a multi-vendor environment
- 7 Open/Merchant Silicon** → Open RAN allows use of open silicon thereby enabling different industry vertical solutions bundled with ubiquitous connectivity
- 8 Cloud-native and multi-tenant** → Open RAN architecture with disaggregated and virtualized NFs allow deployment on any cloud with multi-operator sharing solutions
- 9 AI/ML across the entire network & AI-as-a-Service** → Various use cases of AI-powered network automation including fault recovery/root cause analysis, AI-based energy optimization, optimal scheduling, and network planning are enabled based on innovative Open RAN intelligent controller
- 10 Edge Computing** → MEC is an enabler of delay-sensitive applications such as AR/VR, holographic communications and autonomous driving. Open RAN architecture has already enabled mobile edge computing and edge cloud operation.

Open RAN already facilitates key elements of 6G Vision



Contributions by Mavenir for 5G-Advanced and 6G

New spectrum and Real-time AI/ML

- > OTFS modulation to deliver high spectral efficiency, no intra-cell interference, resilience to fading, multipath diversity and increased throughput
- > Deeply embedded machine learning



Network slicing

- > Network slicing with nonRT RIC and near-RT RIC and a new RT-RIC with Testbeds
- > **Wireless Innovation towards Secure, Pervasive, Efficient and Resilient NextG Networks** (6 universities)



Security

- > Security of E2 interface,
- > Security of xAPPs
- > E2E - OpenRAN simulations
- > Core Testbed
- > Northeastern University – WiNES



Green RAN

- > Platform, BIOS, server optimizations for low power with real-time processing
- > Energy savings in gNB and UE enabled by AI/ML at near-Real Time and non-Real Time



Non-terrestrial networks

- > Ubiquitous coverage and resilience using dedicated, licensed mobile satellite spectrum.
- > UAV, Drones, HAPS



Mavenir Focus on technology evolution to 5G-Adv & 6G

Radio

- > Real-time AI/ML
- > Advanced positioning, sensing
- > Network slicing



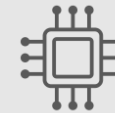
RAN in hybrid cloud

- > Private to Public networks
- > Scalable, elastic
SBA for RAN
- > Microservice based DU
- > Extend SBA core standardization to RAN in 3GPP and O-RAN



Hardware/Device

- > New processor architectures
- > Sensing, control, localization
- > AI native brand



Network architecture

- > Digital twinning
- > Computing vs. communication



Service enablement

- > Autonomous networks
- > Time sensitive networks



Trust & Security

- > Security aspects with AI
- > Physical layer security





Thank You