



All things wireless ●

RF Channel Reconfiguration rApp

Rimedo Labs: RF Channel Reconfiguration rApp

The **Ericsson Intelligent Automation Platform (EIAP)** provides Service Management and Orchestration (SMO) for Open RAN and further enhances openness, network management, and automation by supporting multi-vendor and multi-technology RAN environments. EIAP is supported by open interfaces and the industry's leading Software Development Kit (SDK) to enable an ecosystem of developers with all the capabilities needed to innovate, build, validate, share and operate rApps.

Brief introduction

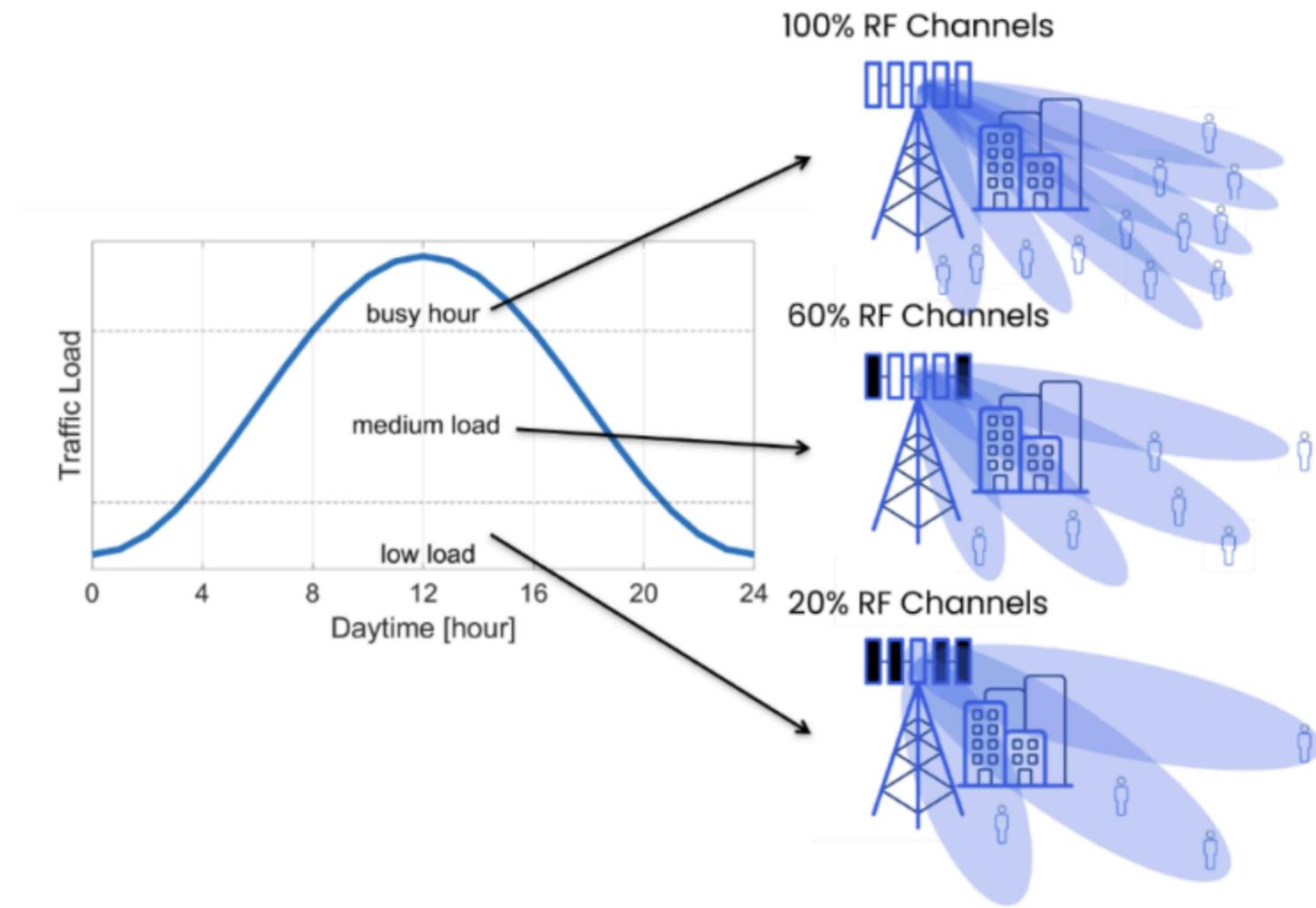
Rimedo Labs RF Channel Reconfiguration (RCR) rApp harnesses advanced AI to optimize energy consumption in Massive MIMO radios. By dynamically scaling the number of active RF chains, it ensures operators only spend energy proportional to actual capacity demand.

Setting the scene

Massive MIMO is the cornerstone of 5G capacity, but also a massive energy consumer. A typical 64T64R radio draws significant power even when serving just a few users. Static configurations force these units to run at full capacity 24/7, leading to inefficiency during off-peak hours. Operators need a way to dynamically "resize" the radio, reducing power consumption when demand drops, without completely shutting down the cell and creating coverage holes.

Introduction to solution

The RCR rApp introduces a Deep Reinforcement Learning (DRL) agent to the Non-RT RIC. This AI model treats antenna configuration as a dynamic variable rather than a static setting. It continuously evaluates the trade-off between energy savings and user throughput. Based on real-time inference, it reconfigures the O-RU to operate with fewer RF chains (e.g., switching to 32T32R or 16T16R modes) when traffic permits. This maintains service availability while drastically cutting the base station's hardware power draw.



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Explanation of the solution

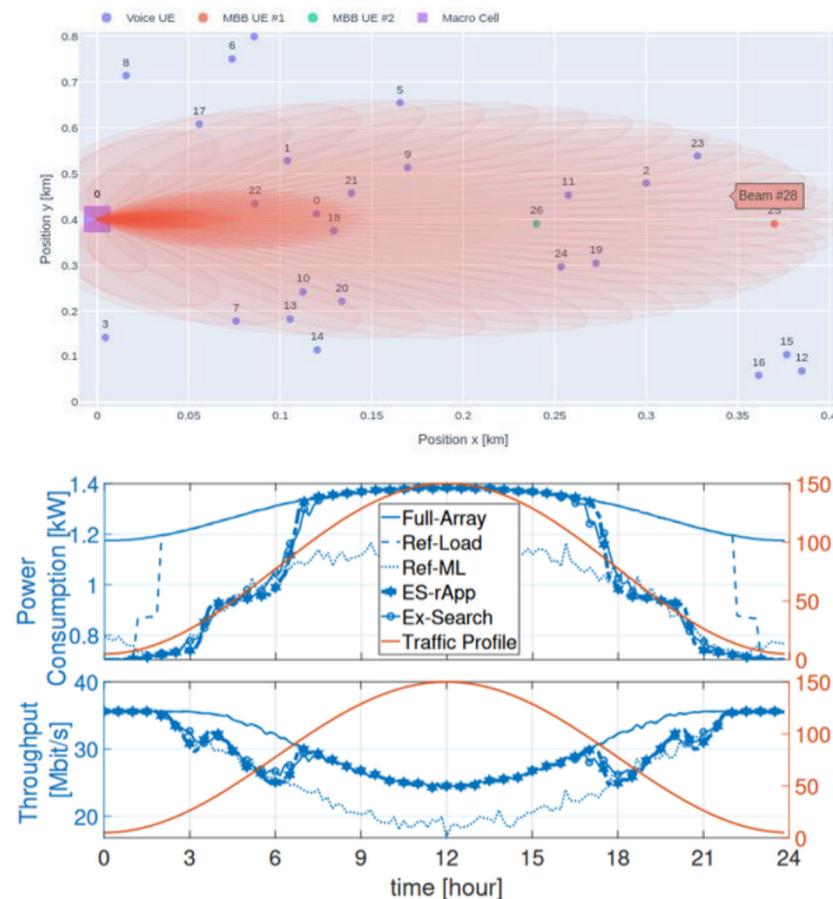
The RCR rApp utilizes a Deep Q-Learning (DQL) algorithm specifically designed for O-RAN architectures. Functioning as an intelligent agent in the Non-RT RIC, it aggregates data via the O1 interface, including spatial user distribution (Direction of Arrival - DoA), Channel Quality Indicators (CQI), and cell load.

The core logic focuses on the "Energy Efficiency" metric (bits per Joule). The agent explores various antenna configurations (actions) and observes the resulting throughput and power consumption (reward). Over time, it learns an optimal policy: knowing exactly when to scale down the antenna array to save energy, and when to scale up to maintain Quality of Service (QoS) during traffic bursts.

When a reconfiguration decision is made, the rApp sends a command via O1 to the O-RU to deactivate specific RF chains. Simultaneously, it coordinates with the Near-RT RIC to ensure beamforming weights are adapted to the new antenna geometry. This solution is particularly effective in heterogeneous 5G deployments where M-MIMO units overlay macro grids, transforming the radio from a static hardware block into a flexible, software-defined asset.

Key benefits

- **24.8% Energy Efficiency Gain:** Proven in simulations, improving the bits-per-joule ratio by nearly a quarter compared to static operations.
- **Granular Power Management:** Bridges the gap between "Full Power" and "Cell Off," providing an intermediate energy-saving state perfect for medium load.
- **AI-Driven Adaptation:** Deep Q-Learning model adapts to specific site characteristics and traffic patterns without manual tuning.
- **Coverage Preservation:** Unlike cell shutdown, RCR keeps the cell active. Users remain connected to the same PCI, avoiding "Signaling Storms" caused by mass handovers.
- **Extended Hardware Life:** Reducing thermal stress on RF components during off-peak hours can potentially extend the operational lifespan of radio units.



Energy Efficiency Statistics:



rApp characteristics

- **Supported technologies:** 4G, 5G, O-RAN
- **RAN technology:** O-RAN
- **RAN vendor:** multi-vendor
- **Interfaces:** O1 (CM/PM), A1 (Policy)
- **Deployment:** Non-RT RIC (SMO)
- **Algorithm:** Deep Q-Learning (Reinforcement Learning)
- **Application:** Energy Saving