Cell ON/OFF Switching rApp

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Rimedo Labs: Cell ON/OFF Switching rApp

Brief introduction

Rimedo Labs COOS rApp is a specialized application that automates the deactivation of redundant network capacity during low-traffic periods. It delivers significant OPEX reductions while protecting service continuity through intelligent traffic steering coordination.

Setting the scene

Radio Access Networks (RAN) account for over 70% of a mobile operator's energy consumption. With 5G, operators are deploying dense capacity layers (Small Cells, C-Band) that are vital during peak hours but often sit idle at night. Powering these stations 24/7 generates massive energy waste and carbon emissions. However, simply switching them off risks dropping calls and creating coverage gaps. Operators need a solution that balances aggressive energy savings with carrier-grade reliability.

Introduction to solution

The COOS rApp provides a safe, automated framework for powering down underloaded cells. Operating within the SMO/Non-RT RIC, it leverages a unique coordination mechanism with the Traffic Steering rApp. Instead of abruptly cutting power, the rApp acts as a traffic orchestrator. It identifies sleep candidates, and notifies TS-rApp who manages user migration to coverage layers. Then, COOS-rApp executes the shutdown via O1 only when the cell is confirmed empty by TS-rApp. This "Make-Before-Break" approach ensures sustainability does not come at the cost of subscriber satisfaction.

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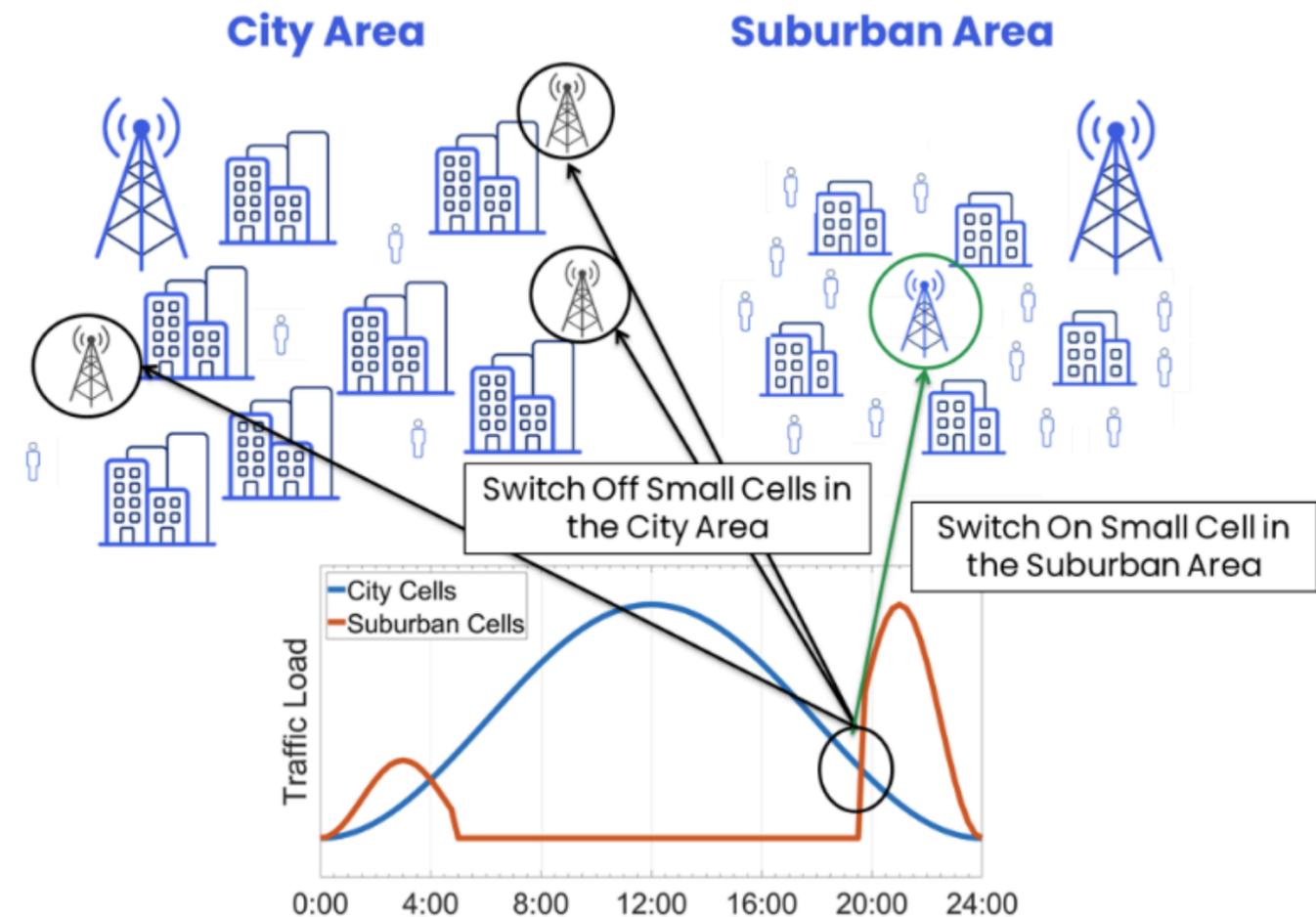
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Explanation of the solution

Rimedo Labs COOS rApp implements an intelligent state machine for RAN energy management. The application continuously analyzes Performance Management (PM) data from the O1 interface, monitoring load across both coverage (Macro/Low-band) and capacity (Small Cell/High-band) layers.

When the rApp detects that a capacity cell's load has dropped below a configurable threshold for a set hysteresis period, it initiates a shutdown sequence. The key innovation is that it does not disable hardware immediately. Instead, it sends a notification to the Traffic Steering rApp. This notification instructs the TS-rApp to move all active users (UEs) from the target cell to the underlying coverage layer. The rApp monitors RRC connections in real-time. Only when the cell is empty is the O1 command sent to switch to inactive/sleep.

This loop remains active. If the coverage layer approaches congestion, the rApp detects the traffic spike and initiates a "Wake-Up" sequence. It reactivates the capacity cell via O1 and sends dedicated notificatio, allowing the Traffic Steering rApp to naturally rebalance traffic back to the high-capacity layer. This solution supports Multi-Carrier and HetNet scenarios.

Key benefits

- **Significant OPEX Reduction:** Achieves ~25% energy savings on capacity layers by maximizing sleep time off-peak, directly improving the bottom line.
- **Zero Service Impact:** The "Evacuation" phase ensures full availability. Active data and voice sessions are seamlessly handed over before cell shutdown.
- **Reduced Carbon Footprint:** Supports Net Zero goals by reducing absolute electricity consumption.
- **Automated Lifecycle Management:** Eliminates rigid time schedules. The system adapts to real-time events (e.g., night concert) rather than a fixed clock.
- **Fail-Safe Reliability:** "Coverage Layer Protection" logic guarantees capacity is restored instantly if the anchor layer becomes stressed.
- **O-RAN Compliance:** Fully aligned with O-RAN Alliance Energy Saving use cases, utilizing standard O1 interfaces.
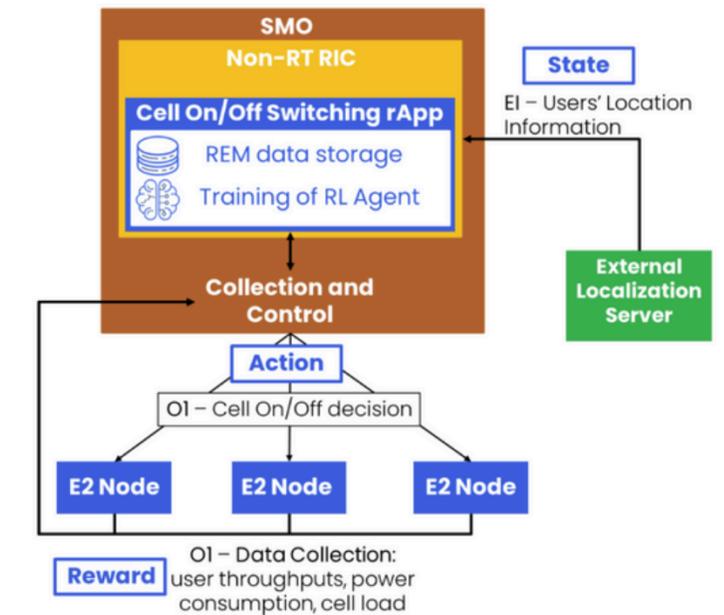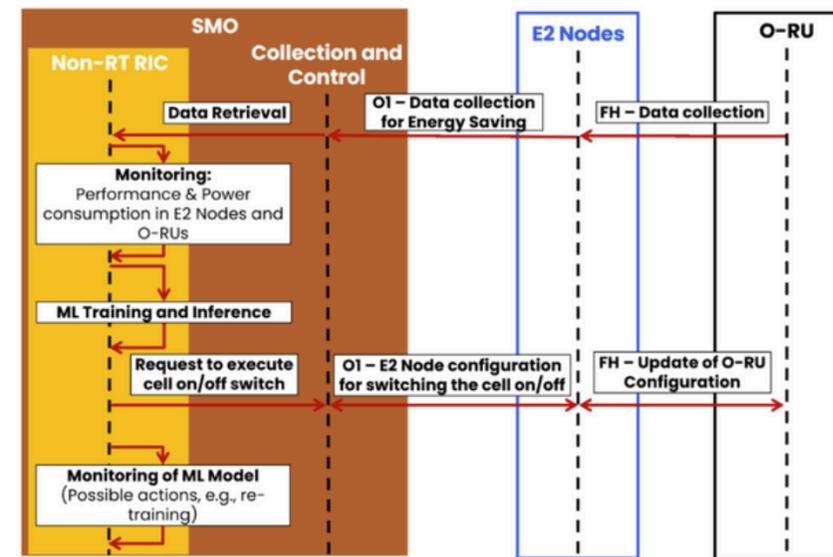
rApp characteristics

- **Supported technologies:** 4G, 5G, O-RAN
- **RAN technology:** O-RAN
- **RAN vendor:** multi-vendor
- **Interfaces:** O1 (CM/PM)
- **Deployment:** Non-RT RIC (SMO)
- **Algorithm:** AI/ML-based state machine
- **Application:** Energy Saving, Capacity Management

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