Manage RAN Energy Usage Through AI/ML Modeling

Saving Energy Dynamically in the Radio Access Network with the Auptim rApp from AirHop

PARTNER SOLUTION AT A GLANCE

AirHop's rApp leverages AI-based learning and RAN programmability to predict traffic changes in the network, and automatically turns RAN elements off or on in the capacity carriers to save energy without compromising user experience.

MWC rAppathon PARTICIPANT

AirHop's rApp was one of seven applications demonstrated during the rAppathon RIC developer's competition hosted by VMware and Intel at MWC Barcelona 2023.

COMPANY OVERVIEW

AirHop Communications provides cloud-native open RAN automation and real-time optimization software solutions that deliver improved network performance, lower operating costs, and improved end-user quality of experience for 4G and 5G mobile networks. AirHop's solutions include the Auptim family of O-RAN standard-compliant xApps and rApps and the eSON and eSON360 platforms for pre-standard architecture deployments. *https://www.airhopcomm.com/*

Balancing Energy Savings and Network Performance

As communications service providers, or CSPs, expand their RAN footprint to enhance connectivity and services, a major challenge is finding the right compromise between the cost of energy consumption and guaranteeing network accessibility as well as network performance.

In 5G networks, CSPs use carrier aggregation to provide both wide-area coverage and high-capacity throughput for data-heavy applications. However, they need to find the right balance between resources assigned to coverage and capacity. If insufficient resources are provided for capacity, user experience will suffer, but if full resources are permanently allocated for both coverage and capacity, energy consumption in the RAN will be higher than needed to meet end-user service expectations.

Ideally, CSPs would like the RAN's energy consumption to dynamically adapt to mobile network service demand. But the question is how?

AirHop's Auptim AI/ML-based Energy Savings rApp intelligently manages energy consumption in multi-carrier cellular networks while maintaining the highest level of end-user quality of service. The rApp optimizes network-wide energy usage by switching on and off capacity carriers in response to service demand levels. Using the Energy Savings rApp results in a reduction of operating expenses in the form of energy costs, assurance of the end-user quality of service, and a greener, more sustainable network.

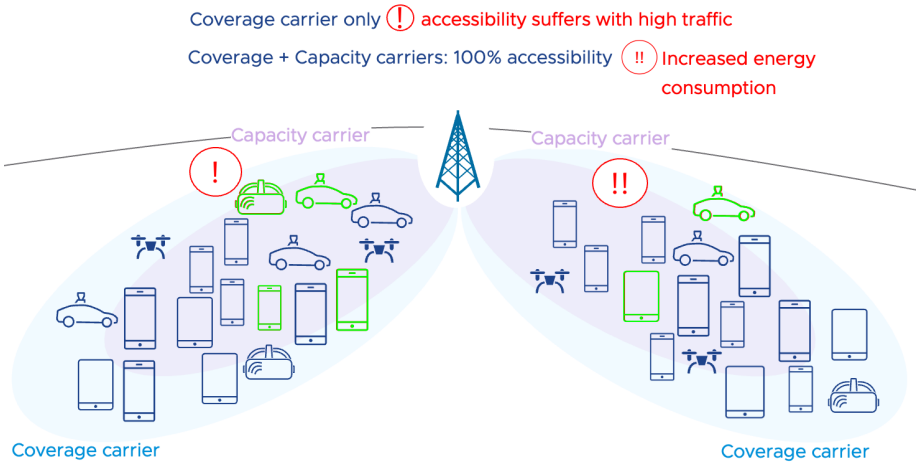
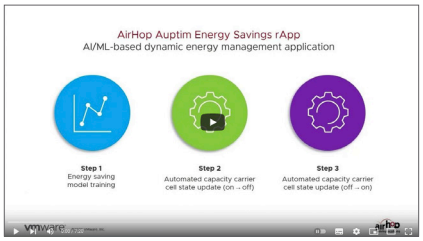


FIGURE 1: The trade-off between RAN capacity and energy consumption.

VIDEO DEMONSTRATION OF THE PARTNER'S SOLUTION ON VMWARE RIC



Managing RAN energy consumption with AirHop's Energy Savings rApp

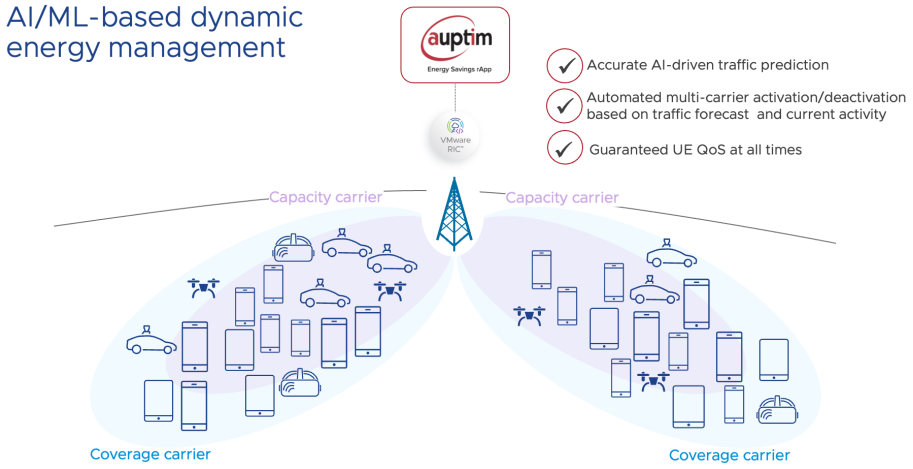


FIGURE 2: How the Auptim Energy Savings rApp dynamically manages energy consumption in a radio access network by using artificial intelligence and machine learning. The rApp runs on VMware RIC.

Technical Description

By using AI/ML-based learning and RAN programmability to predict traffic changes in the network, AirHop's Energy Savings rApp automatically turns RAN elements on and off in the capacity carrier as needed without compromising user experience.

Initially, the rApp performs offline training of the AI/ML energy savings model by ingesting historical RAN data composed of unique traffic demand profiles and by exploring the ES action space through making mistakes and exploiting what it learns. The model formulates its understanding from the patterns it recognizes during training, enabling it to make intelligent decisions for previously unseen situations. Then, the application establishes a single trained model that is deployed on the centralized RIC, with distributed inferences in the rApp optimizing energy savings across all the cells in the network.

Energy Savings Modeling

Supported by the policy-based guidance, data analytics, and AI/ML model management provided by VMware Centralized RIC, the AirHop Communications Auptim rApp uses machine learning to predict energy savings actions in the network. The training process begins by ingesting historical RAN data composed of unique traffic profiles characterizing demand variations due to time windows and by types of customers, network configurations, and performance KPIs. Then the application establishes a single trained model deployed as distributed inferences across cells in the network. The deployed model is periodically updated based on several inputs:

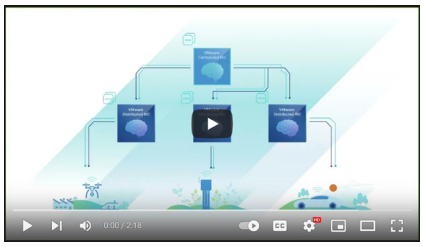
- New data about current network traffic demand
- Resource utilization and network configuration
- Information on the trade-off between optimizing energy consumption and end-user quality of service

Finally, the rApp makes an intelligent decision about the on or off state of the capacity carrier in order to maximize energy savings.

As a result, the energy consumption of the RAN fluctuates with traffic demand without affecting user quality of service.

RAN PROGRAMMABILITY

The RAN intelligent controller gives applications from different vendors access to the functions running in the control and management planes of your radio access network, empowering you to program and optimize your RAN by using methods like artificial intelligence and machine learning.



Demo Video: Activating Network Programmability with VMware RIC

VMWARE RIC AT A GLANCE

VMware RIC lets you programmatically manage and control your radio access network (RAN). The RAN intelligent controllers from VMware enable third-party application developers to tap into network data, process it, and use it to modify RAN behavior.

VMware Distributed RIC hosts near-real-time applications (xApps), and VMware Centralized RIC runs non-real-time applications (rApps). These apps introduce new use cases — automation, optimization, and service customization — that fuel innovation across a telecommunications network.

KEY BENEFITS

- **Multi-vendor interoperability and a vibrant partner ecosystem** – use a vendor- and technology-agnostic platform and tap pioneering solutions.
- **Network optimization** – gain network-wide observability and automate optimization with AI/ML.
- **Efficiency** – reduce energy consumption and improve spectrum utilization by using applications from various partners.

RIC SDK PARTNER PROGRAM

A rich developer ecosystem is critical to the successful adoption of open RAN technology. The VMware RIC SDK Partner Program expands access to and simplifies the development of RIC applications. The program gives partners access to RIC SDKs as well as training videos and application developer support. To find out more, visit *https://techpartnerhub.vmware.com/programs/vmware-ric*

LEARN MORE

For more information about the VMware Telco Cloud or VMware RIC, call 1-877-VMWARE (outside North America, dial +1-650-427-5000) or visit *https://telco.vmware.com/*

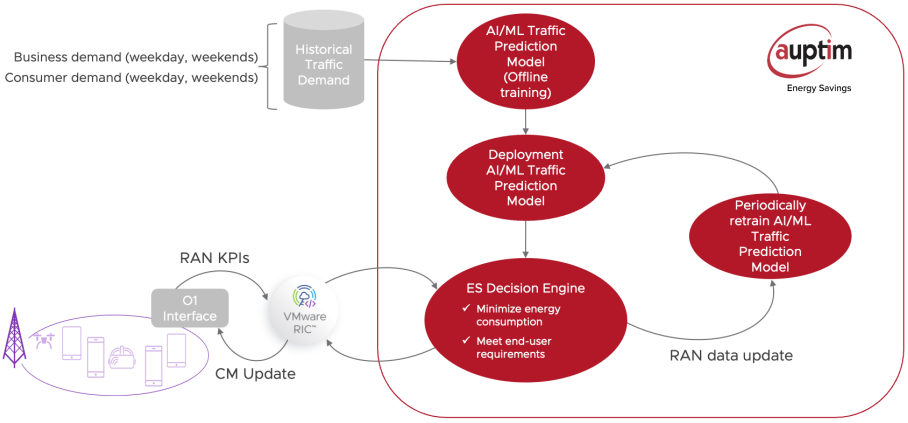


FIGURE 3: The use of artificial intelligence and machine learning in AirHop's Energy Savings rApp and how the rApp works with VMware RIC to manage energy consumption in the RAN.

Benefits

By using AirHop's Energy Saving rApp, CSPs can reduce the energy consumption for delivering wireless services while ensuring user quality of service and guaranteeing customer SLAs. CSPs can reduce their carbon footprint, resulting in greater operational sustainability and a greener network.

VMware and the Path to a Disaggregated, Programmable RAN

For the past five years, VMware has been methodically introducing new telco cloud solutions and changing expectations in the service provider industry about modernization. With an established footprint in telco cloud deployments globally, VMware has been expanding its capabilities to address the challenges in the disaggregation of the RAN.

With a horizontal platform that enables workload consistency from the core and the RAN to the public cloud, we've revealed what is possible—simplicity, speed, agility, and far-reaching automation. The objective is to enable our customers to modernize their entire networks, simplify their operations with end-to-end consistency, and further disaggregate their RAN.

VMware, Inc. 3401 Hillview Avenue Palo Alto CA 94304 USA Tel 877-486-9273 Fax 650-427-5001 vmware.com