Energy Saving rApp Specifications

APP DESCRIPTION AND FUNCTIONAL GUIDELINES

Executive Summary

Net Reply has developed the Energy Saving (ES) rApp as part of the ARIANE project, designed to optimize RAN (Radio Access Network) energy consumption while maintaining high-quality network services (QoS). The rApp has been successfully tested in a simulated environment using VMware's Centralized RIC (cRIC) and VIAVI RIC Test platforms. These evaluations demonstrate the rApp's capability to adapt dynamically to diverse radio and traffic conditions. This innovation aligns with the broader ARIANE project goals of improving network efficiency through intelligent automation.

App Description

The Energy Saving rApp is a sophisticated application deployed on a RAN Intelligent Controller (RIC) platform to monitor and optimize RAN energy usage in near real-time. Leveraging advanced algorithms, the rApp identifies low-traffic radio cells that can be deactivated without affecting user experience. Its integration with VMware's cRIC and VIAVI RIC Test ensures a robust framework for development and testing, providing insights into energy-saving opportunities across varied network conditions. The app's deployment and testing environment include:

- **VIAVI RIC Test Platform:** Simulates urban network scenarios with 62 cells across five frequency bands.
- **VMware cRIC and dRIC:** Cloud-native platforms that integrate with the rApp for operational testing.
- **Network Configuration:** Supports 600 user equipment (UEs) with diverse mobility patterns and service slices, including eMBB, MIoT, and URLLC.

Key Features

- **Energy Optimization:** Identifies underutilized radio cells and implements dynamic deactivation strategies.
- **QoS Preservation:** Maintains service quality across enhanced Mobile Broadband (eMBB), IoT, and Ultra-Reliable Low-Latency Communications (URLLC) slices.
- **Near Real-Time Decision-Making:** Utilizes R1 interface for seamless integration and data-driven automation.
- **Comprehensive Testing Capabilities:** Evaluated under dense urban network scenarios with 600 UEs simulating varied traffic patterns.
- **Custom Integration:** Interoperates with VIAVI and VMware platforms via pre-standard interfaces and custom configurations. Extendable with emerging RIC platforms.

Technical Specifications

Development Environment and Interfaces

- **Platforms:** VMware cRIC, dRIC, and VIAVI RIC Test.
- **Integration Interfaces:**
  - **A1 Interface:** Custom-built pre-standard interface for Project ARIANE.
  - **R1 Interface:** For service and data management (SME/DME services).
- **Supported Data Types:** cmread, cmwrite, PM live, and topology services.

Infrastructure Requirements

- **Hardware Requirements:**
  - x86 Virtual Machine with 8 vCPUs, 64GB memory, and 100GB storage.
- **Software Dependencies:**
  - Docker >= 20.10.17
  - Kubernetes (Kind Cluster)
  - Ubuntu-based OS for CRIC installation.

Simulation Configurations

- **Cell Setup:** 62 cells across five frequency bands in an urban propagation model.
- **UE Setup:** 600 UEs with diverse mobility patterns (pedestrians, vehicles).
- **Service Slices:** eMBB, MIoT, and URLLC with applications such as V2X and district automation.

Testing Metrics

- **Performance Metrics:**
  - Energy savings percentage across deactivated cells.
  - Quality of Service (QoS) impact metrics.
  - Network adaptability under anomalies.
- **Test Phases:**
  - Unit, Integration, Functional, and Performance Evaluation tests.

5. Conclusion

The Energy Saving rApp by Net Reply marks a significant step toward energy-efficient RAN operations without compromising service quality. The app's successful deployment and evaluation in VMware's cRIC and VIAVI RIC Test environments underline its operational readiness and resilience. As a critical component of the ARIANE project, the ES rApp paves the way for intelligent automation in telecommunications, setting the stage for large-scale deployments and interoperability with other xApps and rApps.

With its proven capabilities, the ES rApp is well-positioned to address the industry's pressing need for sustainable and efficient network management. Future evaluations at the BT Lab will further validate its scalability and integration potential in multi-app environments.