A leading operator in the Middle East enhances 5G radio network quality with closed-loop automation

- Closed-loop automation in a 4G/5G network in a major capital city

- 29 percent improvement in busy hour downlink throughput

- 22 percent reduction in 5G drop call rate

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In Middle Eastern cities, mobile subscribers have been quick to adopt the new services that 5G has made possible. They expect high data speeds and reliable connectivity.

In this highly competitive market, operators are constantly looking for ways to enhance the mobile user experience by optimizing network performance and quality.

This case study illustrates how Nokia MantaRay SON helped the operator achieve higher throughput and fewer dropped calls by automating performance optimizations in its radio network.

MantaRay SON was deployed in the operator's commercial 4G and 5G radio networks in a major Middle Eastern capital city.

OBJECTIVE

Enhancing network quality with automation

The Middle Eastern operator was looking for innovative ways to enhance mobile user experience in its 4G and 5G networks, and set these objectives for the project:

- Achieve better radio network quality
- React faster to radio network incidents and correct the issues with no need for human intervention
- Allow radio network engineers to concentrate on more value-adding tasks

Previously, the operator was running Nokia's self-organizing networks solution, MantaRay SON, in an open loop, which means that engineers had to manually approve the proposed optimization tasks before they were executed and review the optimization results.

Nokia recommended implementing and running selected SON modules in a closed loop so that the operator could benefit from the advanced automation capabilities of MantaRay SON.

Closed-loop automation with MantaRay SON

The Middle Eastern operator decided to run MantaRay SON in a closed-loop mode without human intervention in its 4G and 5G networks in a major capital city.

The following sections of this case study describe in more detail the SON modules that were selected for the project.

For the operator, a key criterion was that Nokia MantaRay SON has proven capabilities in managing both single-supplier and large-scale multi-supplier networks.

In this implementation, SON was running on 4G and 5G radio networks provided by Nokia. As the next step, the operator will deploy MantaRay SON across the entire multi-supplier radio network environment in the capital city.
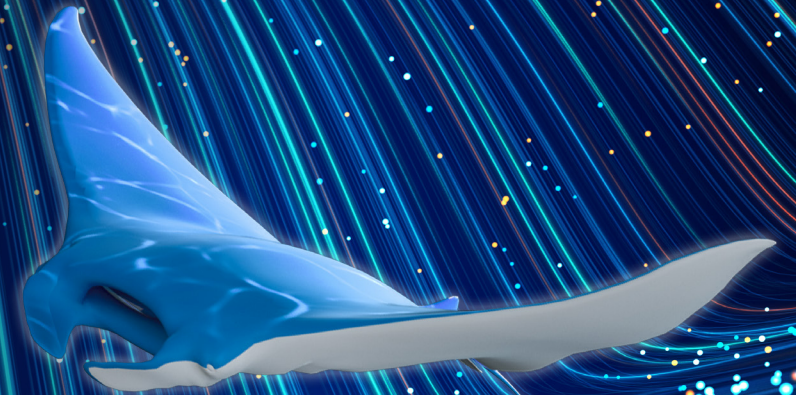
Enhancing downlink throughput with Mobility Load Balancing (MLB)

The Mobility Load Balancing module of MantaRay SON helped the operator enhance downlink throughput in its 4G network during busy hours.

Radio network congestion can occur when many people gather in the same area and use mobile services at the same time.

In the Middle East, families typically spend time at the malls where they use entertainment services such as video streaming and gaming. Subscribers are expecting reliable network performance and high-speed connectivity.

With MantaRay SON running in closed-loop automation, it took only minutes to balance the cell load in these congested areas whereas it would have been impossible to manage the task manually.

How does Mobility Load Balancing work?

The MLB module identifies congested cells and optimizes parameters for offloading traffic to the surrounding cells. To identify overloaded cells, it analyzes KPIs such as data access failures, call drop rates and average power levels received by the base station, which indicate uplink interference impacting performance.

The MLB algorithm then triggers the redistribution of traffic from congested cells to neighboring cells which have a lighter network load, while ensuring that none of the cells become overloaded as a result.

When the congestion is over, the algorithm reverts the network back to its original settings.

Reducing 5G drop call rate with Reuse Code Optimization (RCO)

The Reuse Code Optimization (RCO) module of MantaRay SON is essential for resolving conflicts related to incorrect code reuse assignments, which can typically lead to dropped calls or connections.

With automated optimization, MantaRay SON resolved the most significant reuse conflicts in just hours. Manually, the same task would have taken several days.

How does Reuse Code Optimization work?

The RCO module automatically and dynamically improves the performance of radio networks by developing optimal code reuse plans and resolving conflicts.

The functionality of the RCO module is necessary for the management of Automatic Neighbor Relations optimization, one of the key features of automated self-organizing networks. The identification and resolution of codes and their corresponding cells are required to resolve missing neighbor issues.

The RCO module detects and resolves different types of reuse conflicts. The most typical conflicts include reuse collisions, which means that multiple neighbors of a source cell share the same reuse code.

This module can also identify and resolve other reuse conflict scenarios that occur more rarely.

Optimizing coverage with Cell Outage Compensation (COC)

When a radio cell experiences an outage, it may result in a coverage gap in a certain area.

With the automated Cell Outage Compensation module, MantaRay SON was able to compensate for cell outages in just minutes.

With manual network optimization, cell outage compensation would not have been possible.

How does Cell Outage Compensation work?

The COC module monitors the network for outages, detects their occurrence and compensates for the coverage gaps.

The module also monitors network KPIs and fault management data to detect radio cells and cell sites that are experiencing an outage. It analyses the KPIs of the neighboring cells to determine whether the coverage gap has been created because of the cells in an outage.

The module monitors the replacement cells to detect any possible congestion based on the congestion threshold defined for the network.

If the replacement cell is experiencing congestion, the module makes no parameter adjustments but instead takes compensatory action by adjusting either the antenna tilt or the transmission power of these cells.

If the adjustments result in degraded cell performance, the COC module reverts to the original antenna tilt or transmission power settings. If the module operation stops, it also reverts to the original settings.

Once the outage is over, the module reverts to the original parameter settings in all the replacement cells.

Improved 5G downlink throughput and fewer dropped calls

Trust in automation was a true game-changer for the Middle Eastern operator.

Executing SON modules in a closed loop provided continuous, automated radio network optimization for the operator's 4G and 5G networks with no need for human intervention.

These optimizations would have taken several days to accomplish manually, and some would not even have been possible without automation.

The key results included:

- 29 percent improvement in busy-hour 4G downlink throughput with Mobility Load Balancing

- 22 percent reduction in 5G drop call rate with Reuse Code Optimization

- 14 percent improvement in 4G downlink throughput with Cell Outage Compensation

Moving away from manual operations allowed radio network engineers to spend their time on the most demanding, value-adding tasks that require human intelligence.

Based on the results, the operator decided to start running MantaRay SON in a fully automated, closed-loop mode in its commercial network. Next, the operator will implement SON across the entire multi-supplier environment.

Improvement in busy hour downlink throughput

29%

Reduction in drop call rate

22%

Improvement in downlink throughput

14%

MantaRay SON takes self-organizing network intelligence to the next level

With the wider adoption of 5G, the need for automated optimization to enhance the performance of radio networks becomes essential.

In increasingly complex, large-scale networks running multiple radio network generations from 2G, 3G, and 4G to 5G the number of parameters and needed optimizations becomes so high that human-led automation is no longer an option.

Nokia MantaRay SON is the market-leading, centralized solution for intelligent radio network automation and optimization. It comes with the industry's widest range of modules for self-configuration, self-healing and self-optimization with support for both single-supplier and multi-supplier environments.

With the help of artificial intelligence and machine learning, MantaRay SON automatically identifies network issues that can cause performance degradation, selects the right SON modules to tackle the issues, and applies the corrective solution.

As demonstrated in this case study, moving from manual optimization to closed-loop automation with MantaRay SON helped a customer achieve significant improvements in 4G and 5G network quality and performance.

Keeping the network continuously optimized has a direct impact on mobile user experience, leading to higher customer satisfaction.

Visit the MantaRay SON webpage to learn more:

At Nokia, we create technology that helps the world act together.

As a B2B technology innovation leader, we are pioneering networks that sense, think and act by leveraging our work across mobile, fixed and cloud networks. In addition, we create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

With truly open architectures that seamlessly integrate into any ecosystem, our high-performance networks create new opportunities for monetization and scale. Service providers, enterprises and partners worldwide trust Nokia to deliver secure, reliable and sustainable networks today – and work with us to create the digital services and applications of the future.