CASE STUDY

Saudi Arabian operator provides outstanding Hajj experience by trusting in automation

- Consistent end user throughput maintained while traffic volume increased by 40%
- Overall 20% OPEX savings
- 200,000 mobility parameters changed to improve handover success

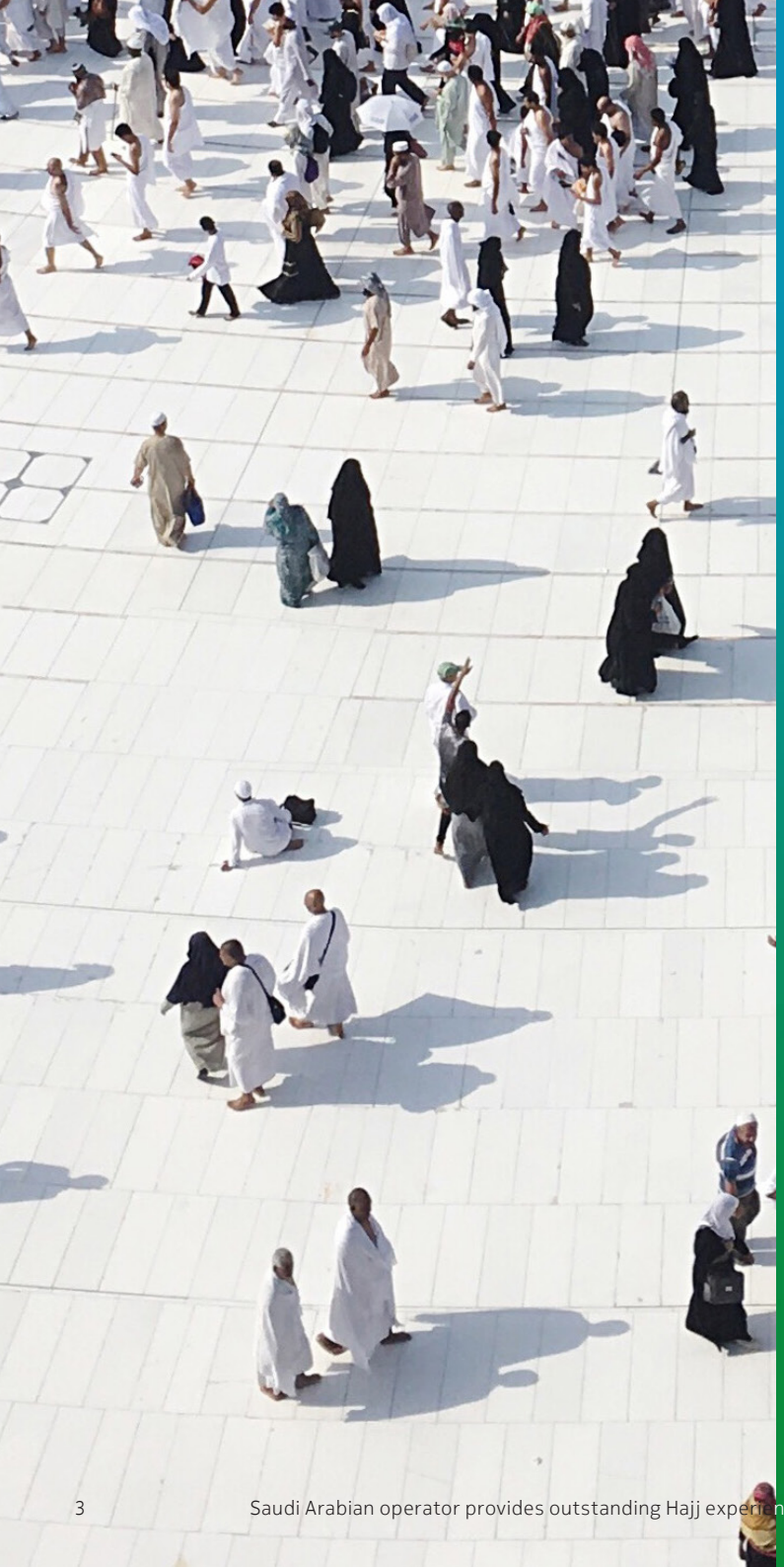
NOKIA

Introduction

One of the largest operators in Saudi Arabia is focused on innovation and evolution of technologies that enable digital transformation in this fast-growing market.

In the recent years, the operator's network has grown significantly in terms of coverage, number of cells and layers of technology. The operator is continuously evolving its network by acquiring new spectrum bands and reallocating some of its spectrum frequencies from earlier generations of technology to increase the available bandwidth for 4G and 5G networks.

To maintain high performance and optimize use of the available spectrum assets across all technology layers, the operator chose Nokia Self-Organizing Networks (SON), a market-leading solution paving the path towards Cognitive SON that will leverage artificial intelligence and machine learning based network optimization.



OBJECTIVE

Optimizing radio network performance with automated operations

One of the largest telecommunications service providers in Saudi Arabia is running 2G, 3G, 4G and 5G networks with more than 100,000 radio cells across the country.

In the recent years, its subscriber base and mobile network traffic have grown significantly. When the operator deployed Nokia SON in 2021, its networks were carrying 38 times more traffic compared to 2015 with 6 times more radio cells.

The operator's key target is to provide superior user experience for all of its subscribers.

The growing complexity of the networks also brings pressure for optimizing the cost structure and making network operations faster. The operator chose to automate its operations with Nokia SON.

SOLUTION

Closed loop automation with Nokia SON

Nokia SON provided a game-changing solution for the Saudi Arabian operator, taking its radio network optimization to a whole new level.

Trust in automation was the key to achieving significant improvements in network performance. Executing SON modules in closed loop provided 24/7 radio network optimization across the operator's 2G, 3G, 4G and 5G networks.

To help the operator gain trust in the results of automated optimization, SON modules were first running in open loop in a limited section of the network, giving the operator the possibility to manually approve the proposed optimization tasks before they were executed as well as review their results. After successful open loop testing, the next phase was to implement closed loop automation in the same section of the network.

The operator carefully evaluated the impact on network performance and stability. The closed loop automation brought significant performance improvements without compromising the availability of service, and the operator decided to expand the automation in the network..

With help of Nokia SON, the operator was able to achieve overall 20% savings in OPEX without impacting the network throughput even when the traffic volume increased significantly. The next step in the automation journey will be adopting Cognitive SON, which will help the operator leverage artificial intelligence and machine learning based network optimization.

Maintaining consistent throughput with Mobility Load Balancing (MLB)

Radio network congestion can happen when massive amounts of people who are using mobile services at the same time accumulate in a certain area. For operators in Saudi Arabia, a particularly important event takes place at the time of Hajj when they need to provide reliable connectivity for the millions of participants to the pilgrimage in Mecca with a dramatic increase in data traffic and network capacity load.

4G
Consistent user throughput maintained

4G
Increase in traffic volume

40%

The Mobility Load Balancing module of Nokia SON helped the Saudi Arabian operator tackle the network congestion also in the most demanding conditions. The operator was able to maintain consistent end user throughput in the 4G network, while the traffic base increased by 40%.

The MLB module identifies congested cells and optimizes parameters for offloading traffic to the surrounding cells. For identifying overloaded cells, it analyses KPIs such as data access failures, call drop rates and average power levels received by the base station, which is an indicator of uplink interference impacting performance.

The MLB algorithm triggers 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. Closed loop automation is the key to reaching the best results.

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At the time of writing this case study, the Saudi Arabian operator was using 5G Non-Standalone (NSA) architecture, which means that 5G RAN leverages 4G Core for control plane functions.

As a result, improvements in the operator’s 4G performance were also impacting 5G performance.

The operator used independent speed test software to verify the improvements presented in this case study.

Improved mobility with Automated Neighbor Relations (ANR) Optimization

Mobile subscribers expect reliable service and stable connectivity while on the move, for example, when using mobile devices while travelling in a car.

The operator deployed the Automatic Neighbor Relations Optimization module to introduce improvements that help maintain the stability of established calls.

The ANR module of Nokia SON made over 200,000 parameter changes in automated continuous loop mode before and during the event to improve mobility across the operator's multi-layer 2G, 3G, 4G and 5G networks.

The ANR module implements one of the key features of automated self-organizing networks. Provisioning and managing neighboring cells manually is too time-consuming and difficult as the complexity of the network increases. ANR automatically establishes relations between radio network entities to enable mobility and load balancing.

This module optimizes intra-frequency, inter-frequency and inter-RAT neighbor lists, which are used for handovers, and automatically initializes neighbor lists for newly provisioned cells. It detects and ranks the cells, adds the missing neighbors and can remove poorly performing neighbors.

ANR optimization helps increase the number of successful handovers and leads to less dropped connections related to missing or incorrect neighbor relations. Executing the module in closed loop brings the optimal benefits as no human intervention is needed.

2G / 3G / 4G / 5G

200,000

mobility parameters changes in continuous loop before and during the mass event

Ensuring stable network configuration with Parameter Consistency Enforcement (PCE)

To gain trust in network automation, operators need to be sure that the resulting optimizations in network configuration are not impacting network stability. The Saudi Arabian operator implemented the Parameter Consistency Enforcement module to keep the network configuration stable in all conditions.

The PCE module audits and monitors the configuration throughout the network. It detects RAN parameters that are not correctly configured or that have been recently changed.

The module reads a configuration file that contains the baseline parameter settings recommended by the operator and compares the changes made by the optimization algorithm to the baseline. Additionally, the module monitors and enforces permanent parameter settings that the operator has configured for locations where the traffic patterns are known to vary from the typical network conditions.

If the PCE module detects invalid parameter values or changes that are not within the allowed limits, the algorithm reverts the network back to the baseline or the permanent settings. In closed loop automation, SON manages all the needed tasks without human intervention.

Nokia SON is proven to enhance customer experience in one of the world's largest human gatherings

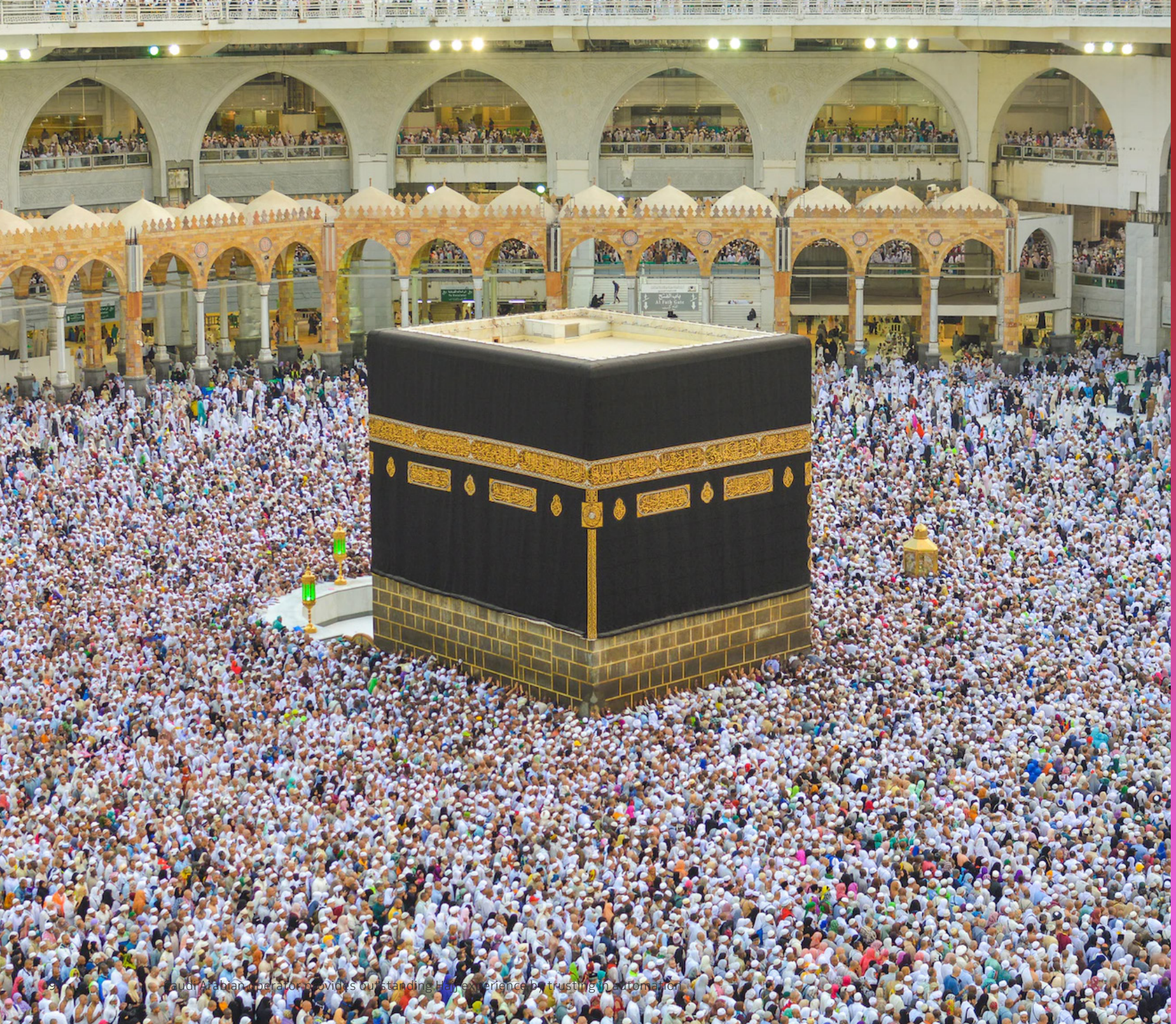
Hajj pilgrimage in the city of Mecca brings together millions of people who want to share their experiences using phone calls and mobile applications. In 2022, 13 million phone calls were made on the day before Hajj started across all operator networks in Saudi Arabia. This case study is based on a network that has over 50% share of the mobile traffic volume.

This dramatic increase in data traffic and network capacity load on multiple generations of telecommunications technology from 2G, 3G, and 4G to 5G creates pressure for operators to maintain a constant level of reliable service.

Trust in closed loop automation helps achieve the best results for optimizing multi-layered networks in demanding conditions, as it takes away the burden from humans and shifts it to machine learning algorithms. This can also enable OPEX savings.

The SON modules described in this case study are part of the comprehensive Nokia SON solution with the industry's widest range of SON modules for self-configuration, self-healing and self-optimization.

With Nokia SON, performance improvements and boosting quality is possible in all types of radio networks. The end result is superior customer experience with constant level of service even at times of exceptional network load.



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Visit Nokia SON webpage to learn more

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

As a B2B technology innovation leader, we are pioneering the future where networks meet cloud to realize the full potential of digital in every industry.

Through networks that sense, think and act, we work with our customers and partners to create the digital services and applications of the future.