

Network Optimization Project for Telecom Carriers in Russia

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Abstract

The rapid expansion of mobile communications traffic that has taken place over the past few years has also led to the need for larger network capacity in mobile backhaul. However, telecom carriers around the world face severe price competition, making it difficult to pass on increased CAPEX and OPEX costs to subscribers. This means that it has become critical for telecom carriers to meet the needs of subscribers, while increasing network capacity and enhancing efficiency - all without increasing spending. This paper discusses the measures NEC's commitment is taking to solve these problems, focusing in particular on a solution tailored for telecom carriers in Russia.



mobile backhaul, PASOLINK, microwave communication system, mobile base station

1. Introduction

Spurred by rapid advances in high-speed mobile communications such as LTE and the increase in data-rich content, the volume of mobile communication traffic has seen explosive growth in recent years. This has put telecom carriers in a bind. Carriers are expected to provide communication infrastructure capable of supporting constantly increasing traffic, while, on the other hand, they are now exposed to fierce price competition, which leaves them unable to pass on some of the resulting costs to their subscribers, including expenses such as capital expenditures (CAPEX) and operating expenses (OPEX).

To survive in such an environment, telecom carriers need to find a way to handle the increasing traffic by maximizing efficiency, while minimizing expenses.

In this paper, we will discuss the issues telecom carriers are facing in the Russian market and examine how NEC has designed a system optimized to achieve highly efficient transmission using wireless transport. We will also look at future prospects.

2. Current Conditions in the Russian Telecom Market

The dilemma faced by telecom carriers is a worldwide phenomenon, including Russia. Although the monthly data usage per user is significantly increasing, telecom

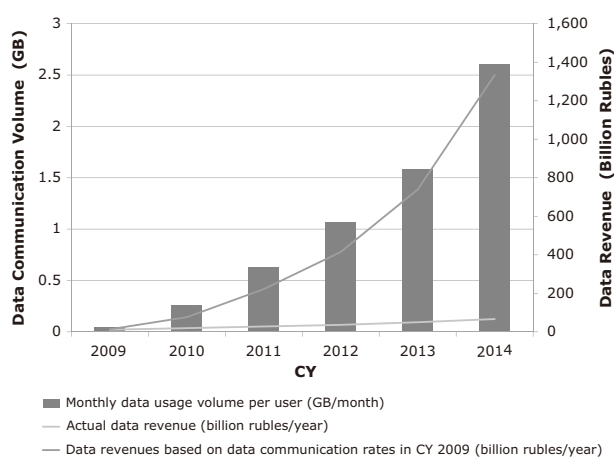


Fig. 1 Mobile data communication volume and data revenues of telecom carriers in Russia.

carriers are enjoying only a slight increase in revenues from data communications (Fig. 1).

Mobile phones are already hugely popular in Russia as in other countries, and the market has reached near saturation point. In order to further expand their business, Russian telecom carriers must find ways - such as ensuring reliable transmission of exponentially increasing mobile traffic or improving the quality of services they offer their subscribers - to improve customer satisfaction and increase their share of a limited number of subscribers, all while keeping costs to a minimum.

3. Issues in Wireless Transport Network

NEC's wireless communication equipment called PASOLINK is used in the wireless transport domain of the mobile backhaul (Fig. 2). Improving the quality of services offered to subscribers, with minimum additional spendings, requires making maximum use of the resources in the existing network.

Current transport networks were not designed with an overall picture of the networks in mind; instead, they have been built on an ad-hoc basis, gradually expanding to meet demands for large-volume data communication and to extend service areas. As a consequence, there has been no optimization at the overall network level,

making it impossible to maximize the network's existing transmission capability. The problems this has created are listed below.

- Deterioration in network performance
- Inability to build new base stations due to the shortage of installation space for additional mobile backhaul equipment
- Uneven traffic usage depending on transmission lines
- Inability to monitor network elements (NEs) from the network management system (NMS)

By optimizing these networks, telecom carriers will be able to improve the quality of services offered to subscribers, while minimizing expenses and maximizing the capabilities of existing networks.

However, in most cases, when telecom carriers try to solve these problems, they find them insurmountable. Either they do not know the solutions, or, they know the solutions but cannot implement them because they lack the skills or because they have put priority on establishment of new stations and are therefore unable to procure the necessary resources.

NEC has the know-how and expertise necessary to conceive and implement the necessary solutions thanks to our extensive experience in wireless transport. We have developed a proposal for network optimization that

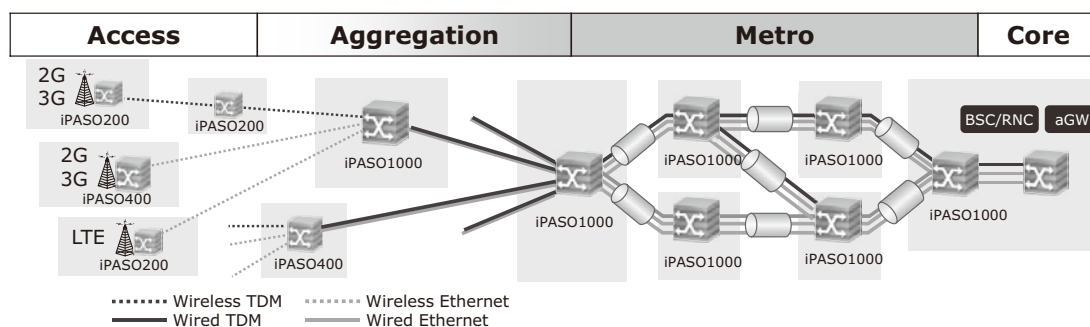


Fig. 2 PASOLINK's usage domain in mobile backhaul.

Table Examples of problems experienced by telecom carriers and suggested solutions.

Problem	Solution	Result
Deterioration of network performance	Rearrange frequency allocation.	Changing the topology enables transmission of higher volumes of data using existing equipment. Moreover, it eliminates factors such as frequency interference that cause performance to deteriorate, which improves network stability, resulting in improved customer satisfaction.
	Change the network topology.	
	Reconfigure links to make redundant configuration.	
Inability to build new base stations due to shortage of installation space for additional mobile backhaul equipment	Change the network topology.	These changes make it possible to build new base stations, which enables service areas to be expanded and improves customer satisfaction.
	Introduction of All Outdoor Radio (AOR).	
Uneven traffic usage depending on transmission lines	Optimize equipment allocation.	Alleviate congestion inside networks, even out the usage rates of nodes and improve overall quality of experience (QoE) in end user applications.
	Establish quality of service (QoS) protocols.	
NEs cannot be monitored from the NMS.	Reallocating NEs' IP addresses and register them to the NMS.	Visualize the NEs from the NMS and reduce network operation costs. Also shortens recovery time in the event of a line failure, which helps to maintain customer satisfaction.

will help solve the above-mentioned problems and we can also provide the services to execute the operations that will be needed to solve these problems.

4. NEC's Proposal for Network Optimization

4.1 An Example of Our Network Optimization Service

The proposals listed in **Table** offer potential solutions to the problems discussed in the preceding section.

The basic workflow of the system we have proposed is shown in the flow chart below (**Fig. 3**). One of the keys to successful network optimization is to thoroughly evaluate and understand the conditions currently prevailing. This involves working closely with the client (telecom company) and establishing an appropriate service level agreement (SLA) and scope of work (SoW).

To give a better idea of what NEC is offering in Russia, we have selected one of the network optimization proposals listed in the table below and elaborated on it in the next section (4-2).

4.2 Proposal to Increase the Capacity of a Transport Network

4.2.1 Background

When we presented our network optimization proposals to Russian telecom companies, we learned that there was a city that desperately needed to increase network capacity but lacked the budget to make it happen. NEC offered an affordable solution by proposing to increase capacity by changing the network's topology.

4.2.2 Evaluating Current Conditions

In order to get the current network status, we asked the client to provide us with the following information.

- Network topology (such as the location of mobile infrastructure equipment)
- Configuration of mobile backhaul equipment (such as frequency of use, line speed, and functions)
- Actual line speed of mobile backhaul devices

4.2.3 Our Solution

Based on the information provided by the client, we put together a proposal which, as shown in **Fig. 4**, recommended changing the network's topology from a star shape to a ring shape. This would make it possible to transmit traffic bidirectionally, helping increase the capacity of the network.

By changing the star-shaped topology to a ring-

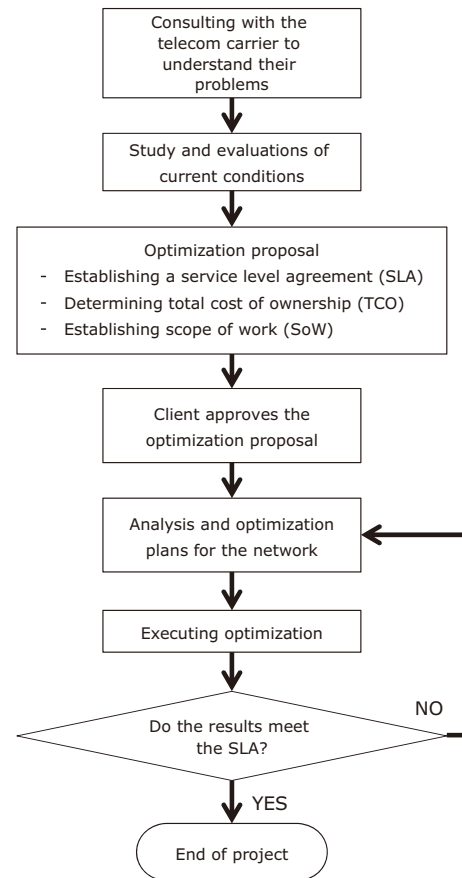


Fig. 3 Service proposal workflow.

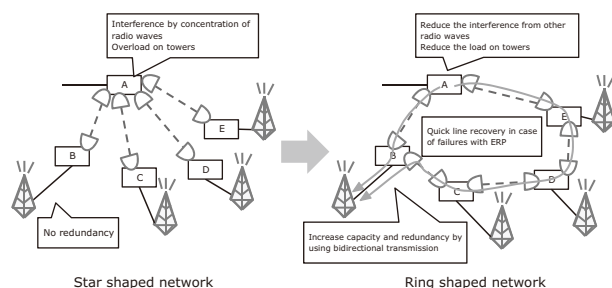


Fig. 4 Proposal for changing the topology.

shaped one, we expected to obtain the following results.

- Enables higher volumes of traffic to be handled at peak values because bidirectional data transmission is possible at each site
- Ensures more stable network performance by minimizing radio wave interference. This is achieved by, by reducing radio waves received at Site A from multiple directions to two directions
- Decrease the load on the towers by reducing the number of installed antennas at Site A

- Fast switching to backup transmission paths in the event of a failure by setting up Ethernet Ring Protection (ERP)

In this proposal, we set the KPIs by focusing on the network capacity.

4.2.4 Analysis of the Network and Optimization Plan

After the client accepted NEC's proposal, we conducted analysis of the actual network and drew up an optimization plan. We confirmed the accuracy of the information provided by the client by actually visiting each site. Doing this is critical as there may be discrepancies between the client's perspective of the site's condition and the site's actual condition. If plans are made without checking the actual conditions, work will inevitably have to be redone, which can negatively impact the project's timetable.

When changing the topology, we took the followings into consideration.

- Utilization of the existing network as much as possible to minimize any additional construction
- Selection of easy-to-access sites for topolog modification

Once we had planned out exactly how we were going to change the topologies at the various sites, and obtained approval to carry out the procedures necessary to make these changes, we implemented the optimization.

4.2.5 Evaluation of the Optimization Results

After completing the optimization process, we verified that the SLA standards established when the service was proposed had been met. As the increase in network capacity was the KPI in this project, we confirmed that we had achieved our goal by collecting communications traffic data for a specific period of time after the optimization, as well as by comparing packet drop rates and maximum transmission capacities before and after the optimization.

4.3 Issues in the Russian Optimization Projects

Since we only have a limited experience of actual network optimization project, an operation procedure has not yet been established. For this reason, it is difficult to determine how long the process will take and what details need to be worked out with the client. Moreover, since the effectiveness of the optimization recommendation depends largely on the skills of the individual engineers evaluating the situation, it is difficult for NEC to guarantee results beforehand. In order to expand this

service in the future, we will need to standardize our network optimization procedure and enforce homogenization of design quality.

5. Conclusion and Future Development

This paper has discussed NEC's commitment to network optimization for wireless transport network in order to achieve high-throughput data communication, while minimizing the need for any new spending.

In the future, we intend to resolve the current issues and proceed with the systematization of NEC's network optimization services in order to contribute to the achievement of high-volume data communication not only in Russia, but throughout the world.

- LTE is a registered trademark of European Telecommunications Standards Institute (ETSI).
- Ethernet is a registered trademark of Fuji Xerox Co. Ltd.

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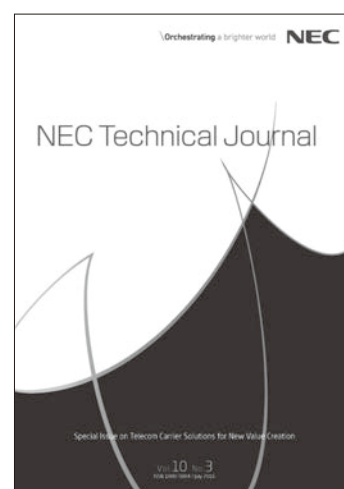
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