



IMPROVING THE RELIABILITY OF OPTICAL NETWORKS

AN ALCATEL-LUCENT
PROFESSIONAL SERVICE USING
NETWORKMINING® SOFTWARE

APPLICATION NOTE

ABSTRACT

Alcatel-Lucent has established a partnership with NetworkMining in order to propose Professional Services to improve performance, utilization and reliability of optical networks. This paper presents a case study of a project for a major fixed-wireless service provider in EMEA. The service provider's SDH network has been deployed for more than 12 years and the network is managed by three different network management systems (NMSs), which makes it difficult to monitor and diagnose problems on the end-to-end path.

During the course of the project, approximately 280,000 SDH circuits were verified and 450 problems were detected and corrected. The efficiency of the verification and detection process was 20 times faster using the NetworkMining software than with traditional SDH circuit detection and verification processes. The project prevented potential revenue losses of 200,000 euros per hour of downtime associated with the identified problems.

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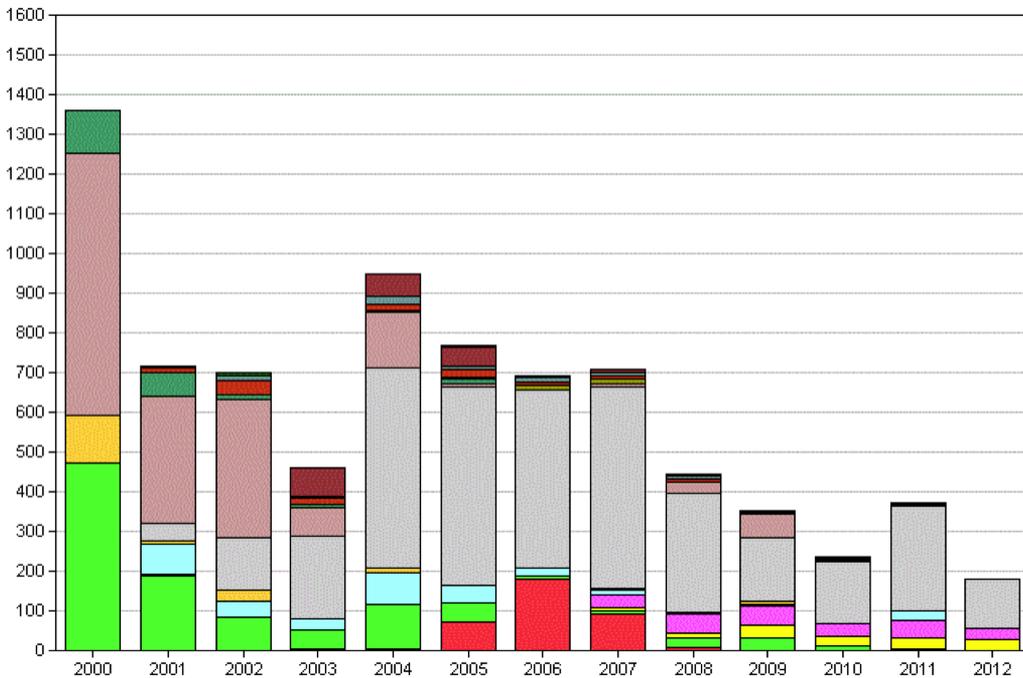
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INTRODUCTION

The number of SDH networks installed worldwide is very large. Most of these networks have been deployed for more than 15 years and contain several generations of equipment (see figure 1). Although investment in these networks is declining, service providers continue to rely on them to transport a wide variety of services. Many service providers will operate these large SDH networks for many years to come. Managing these SDH networks presents some specific challenges to service providers, particularly in terms of maintaining reliability.

Figure 1. Typical distribution of SDH installed base. The X-axis indicates year of deployment, the color indicates type of equipment



Source: NetworkMining

PROBLEM DESCRIPTION AND CASE STUDY OUTLINE

One issue in specific to managing SDH networks is the impact of circuit design rules on network reliability. Although operational budgets for SDH are constrained, service providers do not want to deal with unexpected network outages due to faulty designs. Such design flaws can occur because engineering rules have evolved over the lifetime of the network, rendering previously-compliant designs non-compliant. Some may also have been non-compliant from day one, for a variety of reasons.

The sheer size of these networks makes manual verification impossible. In addition, service providers increasingly lack the staff to perform SDH network quality operations. They must, therefore, turn to their suppliers and service partners for advice and support. Global suppliers are particularly well positioned to help service providers benefit from best practices developed through projects within their worldwide customer base.

Alcatel-Lucent Professional Services partnered with NetworkMining – a provider of specialized software and services for transport networks – to address reliability issues for a major service provider in EMEA. Some of the approximately 280,000 SDH circuits in the service provider’s SDH network were affected by the failure of individual digital cross-connects (DXCs) deployed in one of the major metropolitan areas within the service provider’s footprint. The number and identity of the circuits at fault, however, was unknown. The service provider asked Alcatel-Lucent to identify the circuits and propose a new design to correct the problem within a set timeline and budget.

A PROFESSIONAL APPROACH IS KEY

Many SDH networks carry voice and data services for large enterprises, government bodies and commercial organizations. The sensitivity and critical nature of these services combined with the size of many SDH networks means operational procedures must be undertaken securely and cautiously to eliminate the risk of outages.

With this in mind, Alcatel-Lucent has developed a portfolio of professional services delivered by experienced teams and supported by standardized processes and efficient toolsets. More than 60 tools – developed internally by Alcatel-Lucent or in partnership – are used daily to deliver professional services on more than 300 service provider networks across the globe.

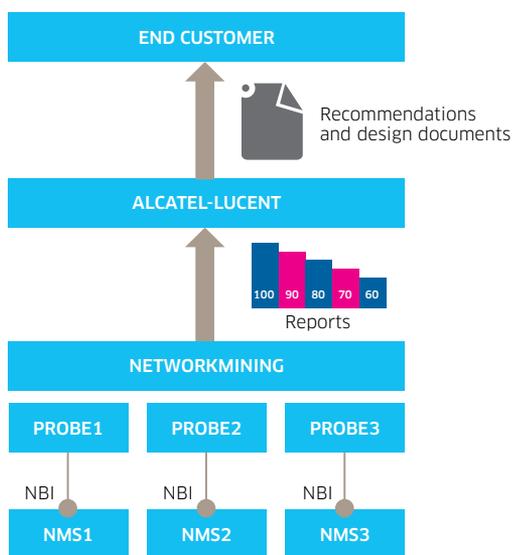
To efficiently provide reliable operations for multi-vendor SDH networks, Alcatel-Lucent has installed NetworkMining’s software in its customer network operations centers. Alcatel-Lucent experts deliver the operational service and have access to NetworkMining’s technical support.

NetworkMining software offers a consolidated view of the different SDH networks. This allows for automated end-to-end circuit checking, a process that would take days if done manually, a capability that is critical to efficiently detect problems. It also accelerates and standardizes the overall process, which makes it easy to replicate and allows operational service delivery on large scale projects while respecting budgets.

SERVICE DELIVERY MODEL

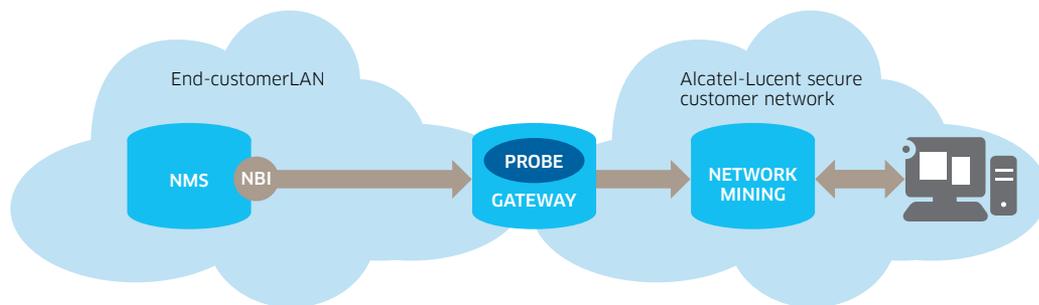
Figure 2 shows the model used to deliver the circuit-checking service. The NetworkMining software is connected to the northbound interfaces of the relevant NMS. It triggers the interfaces through NMS-specific probes. The data is processed on a central server and is updated daily. Alcatel-Lucent experts access the server through a web browser and retrieve the relevant reports and information. This information is further processed and analyzed so Alcatel-Lucent experts can make pertinent recommendations and propose network design improvements to the customer.

Figure 2. Service delivery model



The data is highly sensitive and needs to be handled according to strict security rules. In particular, the data must not transit public or unsecured networks. The ability of Alcatel-Lucent to access its customers' operations support systems through a highly secure worldwide network is critical to the delivery of this service. In this case study project, the Alcatel-Lucent network was extended to a gateway server on the end-customer's local area network (LAN), as shown in Figure 3. The gateway server executed the NetworkMining probes and the data was subsequently consolidated on the central NetworkMining server.

Figure 3. Service architecture



SERVICE DELIVERY PROCESS

The joint approach developed by Alcatel-Lucent and NetworkMining follows three steps:

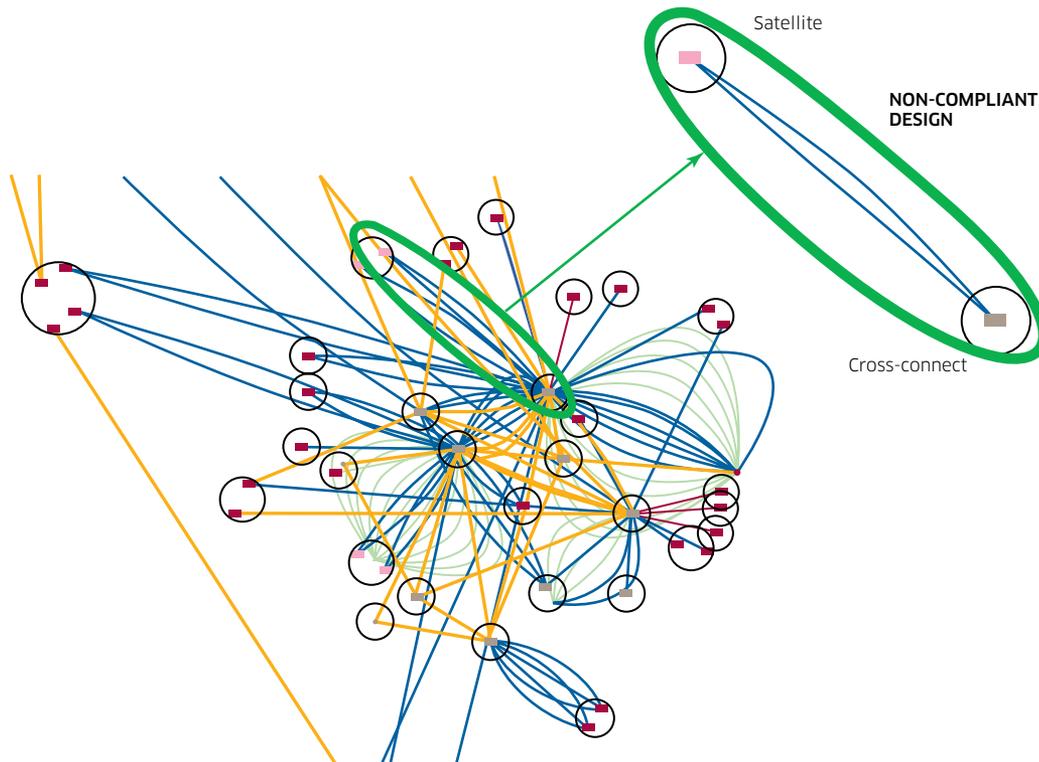
1. Retrieve and process high volumes of network data
2. Turn the data into business intelligence
3. Convert the business intelligence into high value added services

This approach is used consistently in each project so that lessons learned are carried on to the next engagement and contribute to a process of continuous improvement.

Figure 4 shows one of the network regions addressed in this project, detailing Synchronous Transport Module (STM) connectivity between the various nodes involved. It shows one example of a non-compliant design, in which insufficient routing diversity creates potential failure points.

In this example, the satellite equipment is connected by two STM links to the cross-connect. Detailed analysis reveals the main route for many circuits uses one of the STM links, while the protection route takes the other. The main path and the protected path from the satellite equipment are both routed via the same cross-connect, however, which represents a single point of failure. In total, 60 network element configurations were examined, including their immediate network neighborhood. Most of them carried traffic with non-compliant protection.

Figure 4. One of the network regions and a magnified example of non-compliant design



KEY BENEFITS

Process efficiency

In the first phase, Alcatel-Lucent followed a process to track and quantify problems. This also enabled Alcatel-Lucent to provide a fixed-price offer to remediate the problems. Once the setup was complete, the data was correctly extracted, loaded, and cleansed. Next, NetworkMining software enabled Alcatel-Lucent to execute the first two steps of the analysis process in a few days, compared to a few months for manual analysis, representing a reduction in the time required by a factor of 20. This short turnaround time enabled Alcatel-Lucent to proceed quickly and cost-effectively to propose remediation for the problems uncovered.

20 TIMES FASTER

Automating the analysis of the SDH data reduced the time required by a factor of 20 compared to a manual analysis.

Proactive error detection

In addition to the time saved, using NetworkMining allows problems to be systematically detected. The analysis showed that 20,000 circuits out of 280,000, or 7%, were faulty. The root cause of the problems was traced to approximately 450 VC-4 trails that had insufficient protection or routing diversity. In the second phase, Alcatel-Lucent crafted new high-level designs for all the impacted circuits.

7% FAULTY CIRCUITS

20,000 circuits out of a total of 280,000 were detected to be faulty.

NetworkMining software can be instrumental in helping service providers to proactively detect problems and to contribute to the recommended architecture (i.e., deploy additional equipment or redeploy existing equipment).

Business benefit

The potential revenue loss associated with the problems identified was estimated by Alcatel-Lucent to be 200,000 euros per hour of downtime. Proactively detecting and correcting hidden issues greatly reduces the risk of outage and, therefore, end-user dissatisfaction. NetworkMining software enabled Alcatel-Lucent to perform those designs at minimum costs and stay within the customer's budget.

200,000 EUROS SAVED PER HOUR OF DOWNTIME

Proactive detection and correction of problems prevented significant loss of revenue due to network outages.

In addition, Alcatel-Lucent was able to propose designs that minimized the capital expenditure required to meet the customer's reliability target and that optimized the field work required.

CONCLUSION

Many service providers rely on large SDH networks to transport a wide variety of services and will continue to do so for many years to come. Managing these SDH networks creates specific challenges for service providers, particularly with regards to their ongoing reliability.

Professional services for SDH network maintenance and operations must deliver results quickly, at low cost and must generate savings to be attractive to service providers with limited budgets. The partnership with NetworkMining enables Alcatel-Lucent to focus on delivering high value-added professional services that resolve problems in SDH networks rapidly and cost-effectively, without wasting time and effort on collecting, processing and presenting network data.

About Alcatel-Lucent Professional Services

Alcatel-Lucent is a long-trusted partner of service providers and has been involved with most of the large SDH network deployments worldwide. It has an industry leading expertise on the specific issues faced by service providers with large SDH networks.

For more information, please see www.alcatel-lucent.com/services/professional-services.

About NetworkMining

NetworkMining was established in 2004 by a group of seasoned telecommunications professionals to provide software and services to telecommunications service providers. For more information, please see www.networkmining.com.

ACRONYMS

DXC	Digital cross-connects
LAN	Local area network
NBI	Northbound interface
NMS	Network management systems
SDH	Synchronous Digital Hierarchy
STM	Synchronous Transport Module

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