

Report for Telecom New Zealand

XT Network Independent Review

Recommendations and Findings

03 May 2010

16948-174



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1 Purpose

This document is the XT Independent Review Report aimed at communicating the main findings of the Review to non-Telecom stakeholders.

The XT Independent Review was a project carried out by Analysys Mason, an independent telecommunications consultancy, on behalf of Telecom New Zealand ('Telecom') to conduct an independent technical and operational review of the XT network following the network's recent failures.

The non-Telecom stakeholders include the Government, in particular the Ministry of Economic Development (MED), Gen-i customers, Telecom's corporate customers, consumer associations and the general public.

It is important to note that in carrying out the XT Independent Review, Analysys Mason was not asked or required to comment on the responsibility or accountability of either Telecom or Alcatel-Lucent for the issues experienced with the XT network. This will be a matter to be determined on the basis of the contractual arrangements between the parties. As such, no conclusions in respect of the attribution of responsibility have been drawn as part of this review.

2 Introduction

The Telecom XT network recently experienced degraded performance that culminated in failures leading to service unavailability over parts of the XT network in December 2009 and in January and February 2010.

The XT network is designed, built and operated by Alcatel-Lucent. Since commercial launch of the XT network in May 2009, both Telecom and Alcatel-Lucent have applied significant effort to identify and address key technical and operational issues, in order to address the network's apparent deficiencies. Although a number of network and operational issues have either been rectified, or are being addressed, by Telecom and Alcatel-Lucent and the performance and reliability of the XT network is much improved, the severity of the failures has undermined market confidence.

In order to ensure the future performance and reliability of the XT network and its supporting operations and to re-establish market confidence, Telecom called for an Independent Review (the Review) of the XT network design, build and operation as at 29 January 2010. Consequently, Telecom engaged Analysys Mason, a reputable, independent expert consultant, to undertake an objective review.

In order to gain an objective and clear understanding of the issues at hand, the Review comprised a comprehensive end-to-end analysis of the network's design, build and operation as at 29 January 2010, which (to the extent it has been possible to draw comparisons with other examples) were then benchmarked against industry best practice and standards. Analysys Mason was not tasked as part of this Review to seek to apportion responsibility for the issues experienced with the network to either Telecom or Alcatel-Lucent and no conclusions in this regard have been drawn. The question of responsibility can only be appropriately determined by reference to the contractual arrangements between Telecom and Alcatel-Lucent. In addition, a review of the current Telecom/Alcatel-Lucent recovery plans was undertaken. Based on the results of the Review and analysis, Analysys Mason has made a number of recommendations to help ensure the short-term stability and long-term health of the XT network.

The Review also examined the XT network 111 emergency protocol to ensure that it meets international best practice and to identify any potential risks to this service.

This document comprises Analysys Mason's main findings.

3 Main findings

In terms of network architecture, the XT network aligns with best practice industry standards and forms the platform for high-quality current and future 3G mobile services to be delivered across New Zealand. However, Analysys Mason's general view is that, at the time of the partial failures, the XT network and its supporting operations were not ready to effectively handle the large amounts of traffic the network experienced through the successful acquisition of XT customers and the migration of Telecom's CDMA customers to the XT network.

Analysys Mason has identified five main areas to help ensure ongoing network and operational readiness for short-term and longer-term XT network reliability and performance that will meet market expectations. Analysys Mason has also confirmed that the 111 service is aligned to international standards.

The areas of improvement include the design, build and operation of the XT network. Analysys Mason found that there were a number of parallel key factors that contributed to the reliability and performance issues experienced and the ultimate partial network outages.

Although the traffic volumes experienced following launch were within Telecom's forecast volumes, the XT network was, for the reasons discussed more fully in this report, not able to manage those volumes. In the context of the levels of traffic experienced, the radio network controller (RNC), a key element of the network, was the weakest link.

The resultant failure of the Christchurch RNC led to a partial failure of the network in the southern region of New Zealand. Due to the relatively new network's immature network management systems and processes, the pending issues were not quickly identified and rectified. This exacerbated issues that would ordinarily be addressed effectively and quickly within a mature network and well-practiced operational processes.

Telecom and Alcatel-Lucent have already initiated a number of pro-active projects to better prepare the network and improve operational readiness for future XT service requirements including:

- two additional RNCs in Christchurch and Auckland have already been deployed in the network to increase network reliability;
- additional RNCs are on order to increase network capacity so that the network is ready to handle future traffic growth;
- an XT network 2012 Target Architecture plan ensuring future reliability is currently being determined by Telecom;
- various network modifications are being implemented to improve coverage and performance;
- there is an in-depth capacity review underway between Telecom and Alcatel-Lucent; and
- operating model and procedural improvements are underway.

Analysys Mason fully supports the current Telecom and Alcatel-Lucent projects and Analysys Mason's key recommendations are covered in more detail below.

3.1 Key findings and recommendations from Analysys Mason's review

This section describes the five key findings and recommendations of Analysys Mason's Independent Review.

3.1.1 The network failed because the network and supporting operations were not ready to manage the levels of traffic it experienced

There were two key factors relating to network and operational readiness that contributed to the partial network outages. These factors being:

- Capacity planning within the network did not appropriately accommodate the level of traffic forecast and experienced or the specific characteristics of the market.
- The approach to operating the network was not appropriate for a new, quickly changing network that included leading-edge technology. Consequently, systems and processes were not capable of managing the rapid pace of customer and traffic acquisition and migration and the operational systems/processes were not mature enough to predict and pre-empt the issues.

The impacts of the resultant burgeoning traffic manifested in the failure of the RNC in Christchurch and associated network elements. The Christchurch RNC was the first 'bottleneck' network element to reach its capacity limits. Other elements have subsequently been identified as requiring capacity improvement and are being addressed.

Telecom and Alcatel-Lucent have recognised that capacity planning and network dimensioning is an area for improvement and are currently working to improve the capacity planning, network monitoring systems and operational capacity management processes.

Analysys Mason recommends that capacity planning:

1. Takes a longer-term view with installed network elements being capable to at least manage up to 12 months of traffic capacity.
2. Methods, tools and processes should be improved to include detailed geographical network analysis as well as improved market analysis.

3.1.2 Software issues contributed to network instability

As network traffic increased, as yet unidentified software issues, in particular those related to the RNC software, contributed to parts of the network becoming unstable under certain conditions.

These issues were difficult to identify and rectify quickly. Typically, issues of this nature occur with any software that is deployed in a network and, ordinarily, introduce a manageable risk with appropriate mitigation in place. However, with other parallel contributing factors the network and operational support were not ready to mitigate the risks. As all the contributing factors had not been accounted for, inadequate mitigation plans could not quickly resolve them.

Analysys Mason recommends that:

1. Until the XT network is reliably stable, fully understood and manageable, and operational processes and systems are improved, technical and operational risks are minimised, which includes the slowing down of customer acquisition and migration.

3.1.3 Although the XT network was designed to initially provide planned coverage that matched the CDMA network, the initial configuration of the XT network and some network build issues led to coverage variability

Although the network was designed to offer at least the same coverage as Telecom's CDMA network, at times some subscribers experienced different coverage in certain locations on the XT network compared to that of the CDMA network. A number of network build 'teething problems' contributed to the variable coverage. A number of target network design parameters were not achieved when building the network due to physical limitations. Also an error in setting one parameter on the network meant that it was possible for coverage to vary from the designed level under certain conditions.

In addition, in order to maximise performance and coverage for any 3G network, continuous network optimisation is required. Due to the lack of operational system and process maturity, in particular the lack of effective network performance measuring systems, it was difficult to address coverage issues quickly.

Telecom and Alcatel-Lucent have already initiated several individual programmes to address the identified coverage and performance issues including addressing the network build issues. There are many methods for improving the network coverage and performance of any 3G network, with some methods being better than others depending on the circumstances. Some methods, for example, work better in rural areas than in city centre areas. To ensure the optimum, long-term network coverage and performance solutions, the individual programmes should be co-ordinated and complementary.

Analysys Mason recommends that:

1. An ongoing review of the network performance monitoring and measurement system is undertaken to continually improve the system to allow Telecom and Alcatel-Lucent to proactively manage and continually improve network performance including coverage.
2. Ongoing improvement to and definition of a set of measurements to measure the performance and coverage of the network is made.

3. In particular, due to the ever-changing characteristics of any 3G network, the performance monitoring system should include regular geographical measurements to allow effective and targeted performance maintenance and improvement activities.

3.1.4 Some aspects of the network architecture are overly complex meaning that any faults are difficult to find and rectify

Some aspects of the network architecture are overly complex, partially impacted by the requirements for a highly secure network. With immature operational support systems and processes, this contributes to constrained network management and poor fault resolution performance.

Compared to industry standards, there is scope to improve some aspects of the network architecture and element resilience and the automatic resolution of faults, which will lead to improved network reliability.

Analysys Mason recommends that:

1. Telecom continues with its review of the network architecture and security requirements with a five-year planning horizon and migrates to a less complex and more robust network architecture.
2. Telecom and Alcatel-Lucent consider implementing additional methods to increase network reliability to those already employed in the network.

3.1.5 Immature operational management systems and process failures contributed to the impact of network issues

A number of faults can be attributed to the failure of operational processes that were more appropriate for a mature, well-established network, rather than for a network that was in its early stages of life. The process failures have been driven by a number of factors, including some unclear areas of responsibility, the change management process not being able to manage the high level of change being introduced in this new and rapidly evolving network and inadequate support systems to be able to monitor, identify, prioritise and manage faults. Some of this has been exacerbated by the overly complex nature of the network architecture as described above.

Analysys Mason recommends that Telecom:

1. Improves the support systems and processes required to better perform network monitoring and fault analysis and prioritisation.
2. Ensures that the operating model clearly defines processes and areas of responsibility.