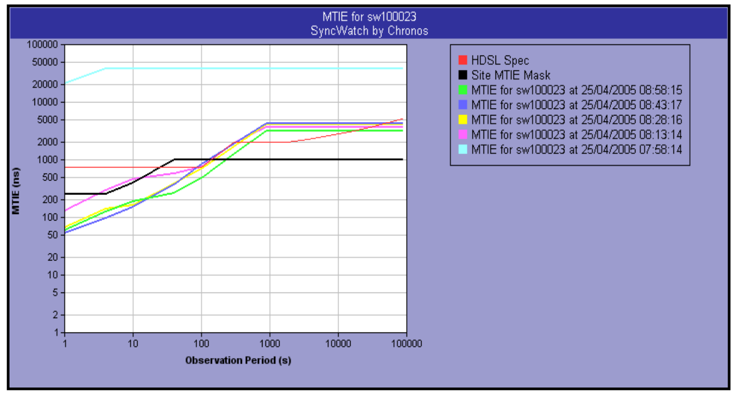
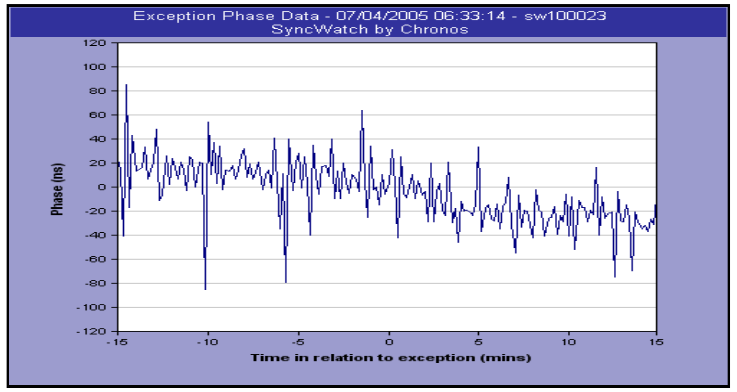
The typical phase measurements during normal operation was also captured:



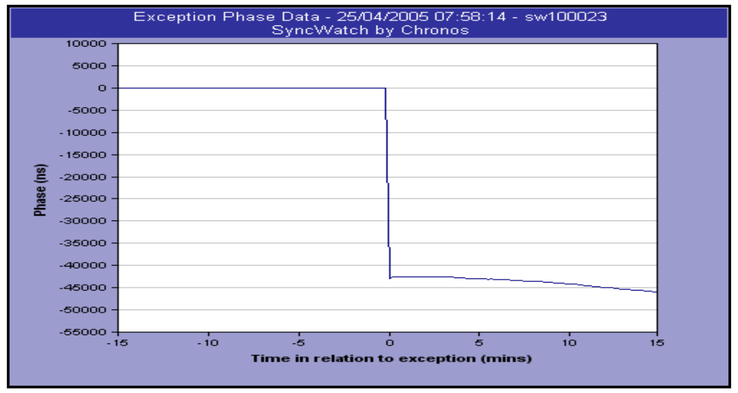
Typical Phase Plot of HDSL Delivery when working correctly

Having monitored the link for three weeks with no significant problems seen, a major synchronisation problem was detected. This can be seen in the MTIE plots shown below:



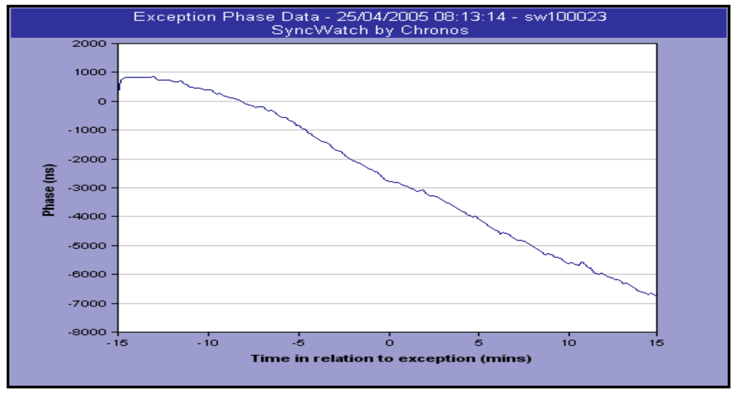
MTIE of HDSL Delivery when working incorrectly

MTIE plots are shown for a number of 15 minute samples which all had problems breaking the specification for HDSL delivery. Looking at the phase plots the start of the problem coincided with a very large phase jump followed by a gradually increasing slope indicating a frequency drift.



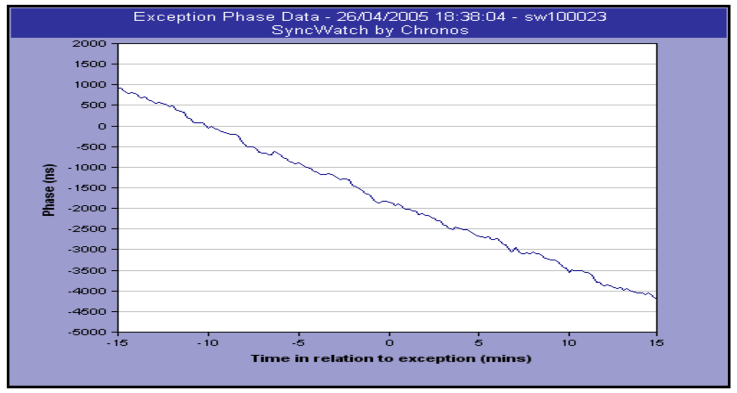
Phase plot at start of Synchronisation Problem

The phase then settled down to be an approximate straight line slope indicating a fixed frequency offset.



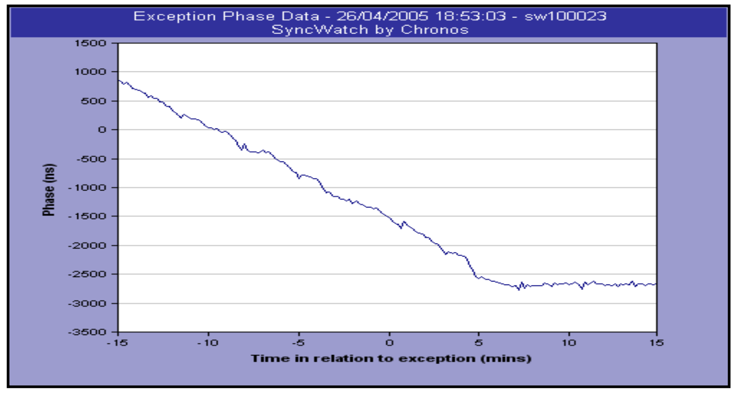
Phase plot at start of Frequency Offset

The frequency offset was around five parts in 10^{-9} at its worst. This indicates the sync source was an oscillator in holdover, for example an SDH MUX which had lost its traceability to the network PRC.



Phase plot during Frequency Offset

The frequency offset remained for over 35 hours before the feed again locked back onto a correctly referenced signal.

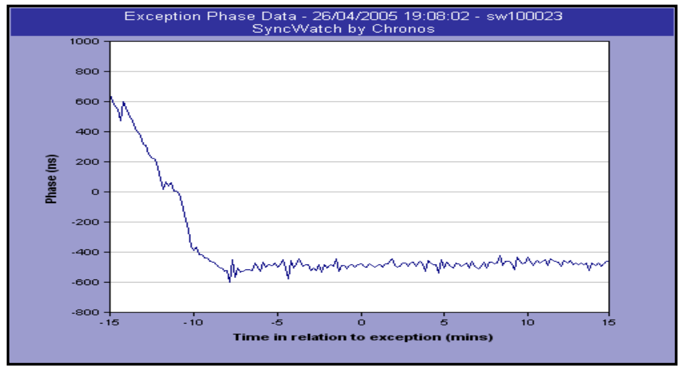


Phase plot at end of Frequency Offset

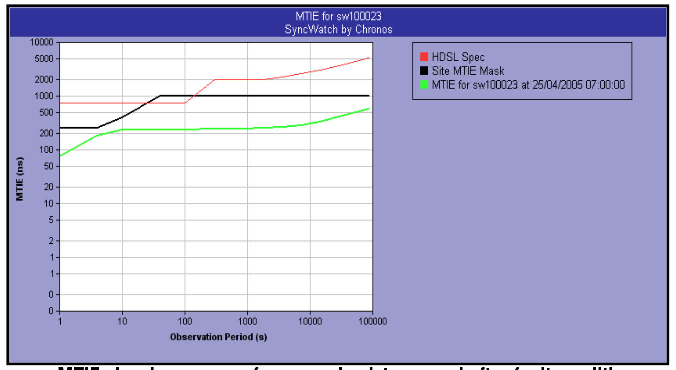
SyncWatch

3G Mobile Network Sync Failure in Backhaul

TIMING AND SYNCHRONISATION SOLUTIONS



Phase Plot at end of Frequency Offset showing return to normal operation



MTIE showing sync performance back to normal after fault condition

During this synchronisation problem, the Node B itself went into holdover rejecting the incoming signal as a valid synchronisation source. This particular alarm was not noticed by the management system for the Node B because the relevant alarm had been configured for the wrong alarm queue and it was only through the use of SyncWatch that the problem was flagged and ultimately fixed. The hard evidence produced by SyncWatch was easily shareable with everyone who needed to see it, including the backhaul partner. Time stamping of the alarm event aided tracking down of the original cause of the problem and SMS text and email alerts to the management team ensured a prompt response.

This mobile operator was able to justify the investment in a number of SyncWatch Probes based on the evidence seen with one unit. The deployment of a number of Probes across the network will allow the operator for the first time to “see” sync events that may ripple out from a root cause that lies higher in the network hierarchy. Traditional synchronisation testing with expensive stand alone test equipment and the constant attendance of a trained sync test engineer are not able to deliver this important capability—at least not cost effectively.

SyncWatch

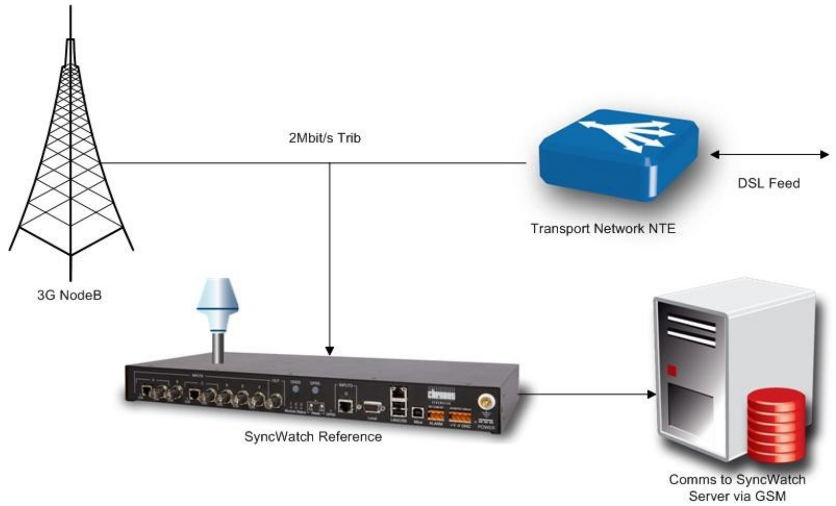
3G Mobile Network Sync Failure in Backhaul

TIMING AND SYNCHRONISATION SOLUTIONS

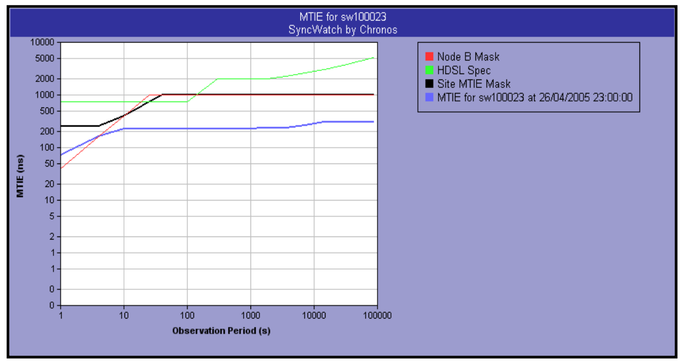
CASE STUDY

Introduction

SyncWatch was deployed in a new 3G Mobile Network monitoring the sync feed into a Node B. The sync was delivered to the Node B using the 2.048Mbit/s traffic interface over a HDSL line. A SyncWatch reference probe with the built-in GPS phase reference was deployed at the Node B. These events can be viewed online at www.syncwatch.com with the Username and Password "3gbackhaul".



NodeB configuration with SyncWatch



The green line corresponds to the measured performance, the red line to the ETSI specification for an HDSL line, the black line represents the mask set on the SyncWatch Probe. An alarm will be generated if this mask is exceeded in SMS text message to the support team mobile phone.