



WORKING PAPER

SATELLITE DISTRIBUTION SYSTEM OPERATIONS GROUP (SADISOPSG)

THIRTEENTH MEETING

Dakar, Senegal, 27 to 29 May 2008

Agenda Item 4: Operation of the SADIS

4.1: SADIS management report

RESOLUTION OF SADIS 2G DATA PACKET LOSSES

(Presented by the SADIS Provider State)

SUMMARY

This information paper presents an summary of data packet losses encountered on the SADIS 2G service since SADISOPSG/12, and provides an overview of the remedial action the SADIS Provider has taken to resolve the difficulties.

1. INTRODUCTION

1.1 The group will recall that SADISOPSG Conclusion 12/25 called on the SADIS Provider State to take measures to resolve data losses occurring at two SADIS 2G VSAT receiving stations operated by Lufthansa Systems. This matter is dealt with under IP/03 of this meeting, and will not be addressed here.

1.2 In September 2007, the Met Office became aware of (further) data packet losses on the SADIS 2G service. This fault was primarily resulting in a loss of a random number of bulletins during dissemination of the WAFS gridded binary (GRIB 1) data, and appeared to be affecting all SADIS 2G users, not just the two users expressed in IP/03.

1.3 This paper presents an overview of the difficulties, details the remedial action the Met Office employed to overcome the losses, and determines the cause of the data losses.

2. SADIS 2G DATA LOSS REPORTS

2.1 On 26 and 27 September 2007, a small number of SADIS 2G users, in different countries, reported to the Met Office that there appeared to be data packet losses occurring on the SADIS 2G service. SADIS 1G and SADIS FTP services appeared to be unaffected. The fault was manifesting itself

primarily as a loss of a random number of bulletins during the transmission or reception phase of the WAFS upper air GRIB data. However, supply and receipt of OPMET and SIGWX data may have also been affected.

2.2 At first it was a little unclear as to whether the problem was simply related to end-user receiving systems, or whether the problem was occurring during the transmission phase of the data from the Met Office.

2.3 Through the valuable involvement of SADIS users in Germany and Switzerland, as well as SADIS workstation vendors in Slovakia and South Africa, the UK Met Office was able to determine that identical data losses were occurring across all SADIS 2G users, and that the problem was related to the transmission aspect of the service as opposed to the reception aspect.

2.4 Cable and Wireless, from whom the SADIS satellite bandwidth is leased, were able to confirm that there were no known problems affecting Intelsat 904 at the time. Similarly, VADOS Systems, who provide support and maintenance for SADIS 2G, were unable to find fault with transmission of data – i.e. there appear to be no drop-out of the line across the primary communications link. Thorough line tests by British Telecom, who support the primary communications line between Exeter and Whitehill, also determined that there was no fault on the line.

2.5 In parallel with investigations in the UK, detailed investigations (notably by MeteoSwiss, IBL Software Engineering and NetSys International) confirmed that, on occasion, the data packet losses amounted to only a small number of bulletins (10-20, say), whilst on other occasions the losses were more substantial (100-200 bulletins, say). The probability that identical data losses occurring across a number of different sites was not related was very small.

3. REMEDIAL ACTION AND FAULT FINDING

3.1 As outlined in 2.4 above, investigations by a number of SADIS 2G support teams was unable to determine any fault with the systems/equipment used to transmit the data. Nevertheless, based on the information to hand, a decision was taken to transfer SADIS 2G communications from a primary chain (Chain A) to a secondary chain (Chain B). This was implemented following completion of the 0600 UTC GRIB model run on 27 September 2007. At this stage it was not known whether similar difficulties would be encountered on the secondary line (supported by Cable and Wireless as opposed to British Telecom). However, subsequent model runs would soon provide the answer.

3.2 The users outlined in 2.5 above were able to validate that transmission on the secondary communication chain had eradicated any data losses. The Met Office decided that it was important to remain on Chain B until further notice, or at least until further information was known, to allow technical engineers the opportunity to interrogate the primary communication chain more fully.

3.3 Regrettably, failovers of the Met Office WMO message switch (Frost) and firewall in mid-October and early-December resulted in the primary communications chain being re-established. Whilst SADIS 2G appeared to run without issue for a prolonged period following these failovers, data losses (notably to GRIB) did eventually occur. As soon as Met Office management were aware of the situation, the secondary communications chain was reinstated. IT Operations staff were reminded of their duty to ensure SADIS 2G utilised the secondary communications chain until further notice.

3.4 Between October and December 2007, technical engineers convened a series of meetings and conducted a series of managed tests to determine the probable cause of the data losses. In November and December, bit error ratio (BER) tests were carried out on the primary communications chain between Exeter and Whitehill (supported by BT). These tests, lasting 24 hours, showed no problems with the inter-site connection. Further investigation indicated that the failures of SADIS 2G on the primary communications chain were often linked with other network activity – such as WMO message switch or firewall failovers alluded to above..

3.5 The Met Office has since modified the process for carrying out a WMO message switch failover to ensure that no disruption to the SADIS 2G broadcast should occur. Work has also been completed (end-January 2008) to install new network firewalls, which will ensure that a sockets-based connection remains unaffected by a failover of the firewall itself.

3.6 As a result of these improvements to the firewall and message switch failover, the Met Office decided to perform a live/operational evaluation of the SADIS 2G primary communications chain (Chain A). All users were notified in advance of the work via SADIS administrative message.

3.7 On 18 February 2008, between 0900 UTC and 1600 UTC, SADIS 2G data transfer was migrated to the primary communications chain. The users outlined at 2.3 were invited to offer their support during the evaluation, and to notify the Met Office if data losses occurred, or if the system ran error free. The Met Office also monitored their receiver system for cross-comparison. At the end of the evaluation, the secondary communications chain was reinstated without issue.

3.8 During the 7 hour evaluation, two GRIB model runs (DT 0600 and 1200 UTC), one SIGWX issue (DT 0600 UTC), and the continuous OPMET data stream were monitored. IBL Software Engineering and NetSys International were able to corroborate Met Office findings that, during this evaluation period, there were no data losses across all three channels on SADIS 2G. This was very pleasing feedback, and lent tremendous support to the opinion that the firewall had been a contributory factor (if not the main factor) causing the earlier data losses on SADIS 2G. KNMI in the Netherlands initially reported that their system (in TCP configuration) had encountered data losses across all three data channels during the evaluation. However, these findings were considered to be related to the configuration of their receiving system, as opposed to a data transmission problem.

3.9 The Met Office concluded that whilst this 7 hour evaluation of chain A had been very positive, a further test over a longer period should be performed. Subsequently, a test was arranged for 0900 UTC on 17th March until 1600 UTC on 18th March 2008 – in excess of 30 hours utilising the primary link. The same users as outlined in 2.3 were invited to monitor reception of data across all three SADIS channels during the evaluation, so that results could be compared with those at the Met Office. Again, users were notified in advance that the testing was taking place, by way of an administrative message.

3.10 Results from this second evaluation confirmed that all data was successfully transmitted by the Met Office, and successfully received by end-users, during the 30+ hour period. This reconfirmed the belief that the SADIS 2G data losses were as a result of firewall and/or message switch failover issues during 2007 which have now been resolved.

4. **CONCLUSIONS**

4.1 In light of a) the modification to the processes that the Met Office employs when performing a WMO message switch failover; b) the installation of new Met Office firewalls; and c) the results of the two evaluations that have been performed on the primary communications chain, the SADIS Provider State is confident that the data packet losses on SADIS 2G have been overcome.

4.2 In April 2008, the Met Office will revert to the primary communications chain on a more permanent basis, with utilisation of the secondary communications chain expected during contingency periods.

5. **ACTION BY THE SADISOPSG**

5.1 The group is invited to note the information contained in this paper.

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