



International Civil Aviation Organization and the Directorate General of Air Communication, Indonesia

SIXTH MEETING OF AERONAUTICAL TELECOMMUNICATION NETWORK (ATN) TRANSITION TASK FORCE OF APANPIRG



Bali, Indonesia, 26-30 April 2004

Agenda Item 2: Discussions and Review ATN Router Activities

REVIEW OF X.25 STUDY FOR THE ASIA PACIFIC REGION

(Presented by the Rapporteur of the ATNTTF Working Group)

SUMMARY

This paper presents the findings of the ATNTTF Ad Hoc Working Group on the longevity of the supply of vendor provided products that supports the X.25 protocol.

1. Introduction

1.1 The obsolescence of X.25 equipment has recently been raised as a concern regarding the implementation of the Asia/Pacific regional Aeronautical Telecommunication Network (ATN) ground network. The *ad hoc* Working Group of the ATN Transition Task Force was tasked to investigate this issue at the ATNTTF/5 meeting in Phuket in 2003.

2. Impact on the Asia/Pacific Region

2.1 The Asia/Pacific region is currently facing a 2005 timetable for implementing the regional ATN ground network that will support ATN applications, initially AMHS as a replacement for AFTN in the region.

2.2 Anecdotal evidence suggests that telecommunication service providers are increasingly unwilling to provide low-bandwidth connections, and are phasing out X.25 packet-switched network services. It had been a concern that this might affect the implementation of ATN in the Asia/Pacific region.

2.3 During its eighth meeting, the *ad hoc* Working Group observed that the regional ATN network is not dependent on X.25 packet switched networks, but will be a private network composed of point-to-point communication links between ATN routers, which implement the necessary data relay functionality. In most cases, the communication links will be "clear channel" links, and the only X.25 equipment required are the X.25 cards and software built into the ATN routers. A Digital Service Unit or Network Terminating Unit interfaces the router to the circuit.

2.4 It was also noted that point-to-point X.25 links may theoretically be supported on top of other sub-networks using appropriate equipment (*e.g.* protocol converters), such as X.25 over TCP/IP, X.25 over Frame Relay, and X.25 over ISDN (Integrated Services Digital Network), allowing the use of X.25 where direct support for these sub-networks is not built into the ATN router. The data channels

of ISDN use the X.25 protocol, and suitable Terminal Adapter (TA) allow X.25 DTEs to connect directly to ISDN circuits. Cisco Systems routers implement the XOT protocol which allows transmission of X.25 packets over TCP/IP.

2.5 It is anticipated that X.25 boards will be readily available for at least the next five years, and after that probably at increasing cost and diminishing availability. This will serve adequately to allow the regional ATN network to be established and to operate in the short-to-medium term. Acquisition of sufficient spares for a 10- to 15- year service life is recommended.

2.6 The incorporation of the IP SNDCF into SARPs is anticipated, but is expected to take at least a further year; after this, there can be expected to be a delay from formal publication in SARPs until the availability of such functionality in commercial (rather than experimental) ATN routers. The IP SNDCF should allow the replacement of point-to-point X.25 connections in the ATN ground network with IP connections in the medium-to-long term. However, there remain issues to be discussed at the Transition Task Force level and above, such as which version of IP to be preferred (IPv4 or IPv6), what measures should be taken for sub-network security *etc.*

2.7 Sub-networks such as Frame Relay may be supported either if directly supported by the ATN routers which implement the appropriate sub-network dependent convergence function (SNDCF) or by using X.25 with commercially-available encapsulation technologies. However, given the reported trend away from support of multiple sub-network types by telecommunication providers, it may be prudent to see these as short-to-medium term solutions, with IP the preferred long-term option.

3. Review of X.25 Board Suppliers

3.1 An X.25 board manufacturer was contacted regarding the state of the X.25 market. The following is a summary of the main comments received.

- While globally the use of X.25 is shrinking with the growth of IP, the X.25 board business is growing. This is suspected to be due to business shifting from larger vendors, who are withdrawing from the X.25 market due to its lower profitability, to smaller vendors. This growth is expected to continue for the next four years.
- Investment in X.25 products by the vendor is continuing: X.25 cards are being updated to remain compatible with the latest bus standards, and there is a stated intention to support newer emerging bus standards when they enter the mainstream.
- Revenue model-based organisations in the private sector currently make up the majority of organisations who are shedding their X.25 infrastructure in favour of IP, and in the case of these larger organisations a gradual transition from X.25 to IP has been taking place using protocol conversion. However, SITA and Siemens in Europe have both elected to re-invest in their X.25 infrastructure, and the FAA, US Army and US Air Force are continuing to deploy X.25 equipment.

4. Review of X.25 Switch Suppliers

4.1 A number of attempts had been made to contact various X.25 Switch Suppliers to ascertain the future of their X.25 Switch product lines. In general most X.25 Switch suppliers will be phasing their X.25 products out over the next several years due to the increase in IP products and high speed services that are now available on the market.

4.2 Companies such as Enterasys have advised they have dropped support for X.25 on their products.

4.3 Cisco Systems, which is not an X.25 Switch supplier, has stated in a document on its web site that it will still maintain support for X.25 on its routers in response to market requirements.

5. Network Trends

5.1 According to a series of articles in the 11 October 2003 issue of *The Economist* focusing on the telecommunications industry, the global telecommunications industry spent large amounts of money constructing network core infrastructure in anticipation of a boom in high-speed communications that never emerged. As part of the recovery, business is now shifting away from “core” networks, and the trend is to migrate from supporting multiple networks for different protocols (e.g. Frame Relay, X.25, ATM) to supporting multiple protocol services over a single type of network infrastructure (based on IP).

6. ATN Sub-Networks

6.1 The ATN protocol stack uses CLNP as the network protocol and allows different sub-networks to be used for CLNP relay through the SNDCF protocol sub-layer. For ground-ground communications, an SNDCF for X.25 (ISO/IEC 8202) is specified explicitly in the ATN SARPs (section 5.7.5) and is generally assumed to be a “standard” ATN sub-network along with Ethernet, and there is also provision for (although not specification of) SNDCFs for Frame Relay and ISDN.

6.2 In anticipation of the growth of IP communications, the internet communications sub-group of the former ATN Panel working group produced a draft SNDCF for IP that allows the use of IP networks as a sub-network for ATN communications: that is, it allows IP sub-networks to be used to carry CLNP packets between ATN systems. This is expected to be reviewed at the third meeting of ACP Working Group N, which will be held in Montréal in April 2004, and if approved by the Working Group, is expected to be forwarded to the ACP/1 meeting (anticipated in 2005) for ratification before incorporation into the ATN SARPs. However, the timing of publication in SARPs, and whether it will be added as an amendment to the current Edition 3 or will appear in a later Edition 4, is unknown.

7. Recommendation

7.1 It is recommended that in the short-to-medium term that X.25 will be suitable to be used with in the Asia Pacific Region for at least the next five years. Suitable spares should be acquired if the service is to operate over a longer period of time. In the medium-to-long term it is recommended that ATN equipment is able to be upgraded to interconnect by using IP when the ATN SARPs have been developed and are mature enough to be implemented.

8. Action By The Meeting

8.1 The meeting is invited to discuss the findings of the Ad Hoc Working Group and form a conclusion on whether or not the X.25 protocol is still a viable option in the short to medium term to operate in the Asia Pacific Region.
