International Civil Aviation Organization and
Aeronautical Radio of Thailand Limited

Aeronautical Telecommunication Network (ATN) Seminar

Chiang Mai, Thailand, 11 -14 December 2001

Information Paper for the ICAO Aeronautical Telecommunication Network (ATN) Seminar

(Chiang Mai, Thailand, 11-14 December 2001)

HONG KONG, CHINA'S EXPERIENCE IN ATN TRIALS

(Presented by Hong Kong, China)

SUMMARY

This paper presents Hong Kong, China's experience in conducting preliminary Aeronautical Telecommunication Network (ATN) trials with adjacent ATS Authorities.

Introduction

1. The ICAO Regional Aeronautical Telecommunication Network (ATN) Transition Plan stipulates an ATN backbone infrastructure for the Asia Pacific Region to be implemented by 2005. Being one of the ATN backbone locations, Hong Kong, China started planning in early 2000 and subsequently initiated ATN trials with adjacent ATS authorities with a view to acquiring operational and technical experience for early introduction of the ATN service. This paper highlights Hong Kong, China's experience gained in the preliminary ATN trials with Thailand, Japan and Australia since October 2000.

Objectives

2. The preliminary ATN trials aim to assess the performance of various ATN system elements in exchanging Aeronautical Fixed Telecommunication Network (AFTN) and ATS Message Handling System (AMHS) messages with emphases on:-

- Connectivity, integrity, functionality and interoperability of the ATN

ground-to-ground (G/G) routers and AFTN/AMHS gateway systems.

- Alternate routing capability of the ATN G/G routers under different network configurations.

- Message transit time, error rate, system reliability, etc. for the ATN/AFTN/AMHS equipment/services.

Trial Arrangements

3. The configuration of the ATN trial system employed by Hong Kong, China is given at the Attachment. Two ATN G/G routers act as Intermediate System (IS) to serve the End System (ES) that can be either ATN/AFTN gateway system (for exchange of AFTN messages) or ATN/AMHS gateway system (for exchange of AMHS/AFTN messages). Besides, these routers are connected to two different carrier media in main and standby mode (for alternate routing application) for connection to the opposite end.

4. A number of ATN trials have been conducted between Hong Kong, China and the adjacent ATS authorities as detailed below:-

- October 2000 – July 2001 with Bangkok, Thailand on ATN technical trial.

- July 2001 with Tokyo, Japan on ATN/AMHS technical trial.

- August – November 2001 with Canberra, Australia on ATN/AMHS technical trial.

- November 2001 onward with Bangkok, Thailand on further ATN technical trial.

5. Different routers, gateway systems and carrier media are employed by Hong Kong, China in the above trials to verify and assess their compatibility, interoperability and functionality. For the carrier media, IDD circuits, international private leased circuits (IPLC) and public X.25 packet switched data network (PSDN) had been tried. Relevant protocol messages were captured at each side to analyze the message transit time via different ATN structures.

6. During the early part of the trial, AFTN/AMHS test messages used were generated manually by a data terminal, and then automatically by a specially developed message generator.

When adequate experience had been obtained, live AFTN messages were then exchanged as in the case of ATN trial with Thailand, using the Automatic Message Switching System (AMSS) Development System at Hong Kong, China end. The live trial helped assess the overall end-to-end system's integrity, reliability and stability levels.

Results and Findings

7. The message transit times for different carrier media and messages with different lengths, as measured in the above trials are summarized below:-

International Carrier Media	Average Transit Time (second)	
	250 characters	2000 characters
a) IDD circuit	4	5.7
b) IPLC	3	4
c) Public X.25 PSDN	11	13

Note : Transit time includes the processing time of the ATN End Systems.

8. The use of different routers appears to place no significant effect on the message transit times. The results also indicate that the longest average message transit time of 13 seconds is better than the typical delivery times of 1 and 2 minutes respectively for the current HKG-TYO (9 600bps) and HKG-BKK (2 400bps) AFTN circuits.

9. As far as data integrity is concerned, the AFTN/AMHS messages transmitted during the trials are 100% error-free, though in the early part of the trial with Thailand, missing characters were occasionally observed during continuous transmission of the test messages. The problem was due to handshaking error inside the gateway system which was subsequently rectified.

10. Throughout the various trials, equipment compatibility problems were observed in the use of different gateway systems by the relevant authorities, giving rise to erroneous message format and much longer message transit times due to message holding within the gateway systems. In addition, appending of extra '0's at the end of the AFTN message was also encountered, thus causing character length mismatch compared with the original message. The use of different or 'outdated' AMHS Naming Conventions also caused format error resulting in incapability of converting and/or recovering the received AMHS messages by the gateway systems.

11. For the alternate routing tests on the ATN routers using different carrier media and network configurations to simulate the failure and switch-over of the ATN routers and communication paths between the gateway systems at different ends, the change-over time under the automatic mode was initially around 4 minutes. Subsequent fine-tuning in the IS-IS and ES-IS settings at both ends

has reduced the above time to less than 2 minutes that is well acceptable for automated AFTN operations.

12. Most of the above problems encountered in the Hong Kong, China's ATN trials are found mainly due to the inter-working protocols of IS-IS and ES-IS not clearly defined in the present ICAO ATN SARPs, which does include some undefined requirements classified as "local matter/implementation". Thus different equipment suppliers or ATS authorities may have their own interpretations on the ICAO SARPs, hence resulting equipment compatibility problems. Besides, use of 'outdated' naming convention by some gateway system suppliers also contributes to the interoperability problem, i.e. failure in converting/recovering the received AMHS messages.

Way Forward

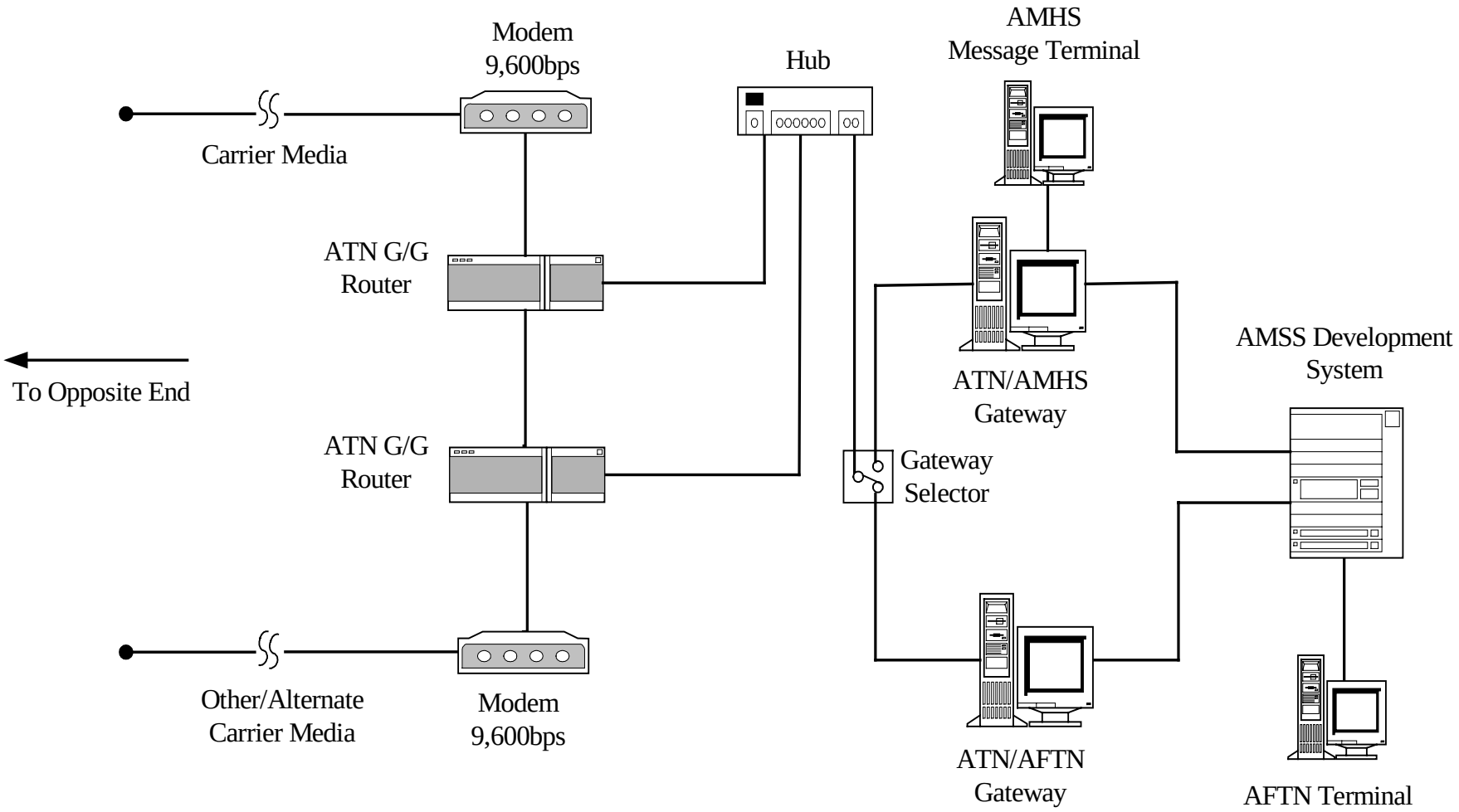
13. Hong Kong, China will continue the existing ATN trials with Thailand, Japan and Australia. Depending on the results and experience gained, Hong Kong, China may put the ATN into operational use initially for delivery of AFTN messages. Likewise, Hong Kong, China will be pleased to conduct ATN trials with other adjacent ATS authorities for early implementation of the ICAO Regional ATN Transition Plan.

14. To minimize equipment compatibility and interoperability problems, it is suggested that the ICAO ATN SARPs be reviewed and fine-tuned to define more clearly and precisely the various requirements.

Action by Meeting

15. The meeting is invited to note the experience of Hong Kong, China in conducting the ATN trials.

Attachment



Configuration of ATN Trial System Employed by Hong Kong, China