International Civil Aviation Organization

FOURTEENTH MEETING OF THE COMMUNICATIONS/NAVIGATION/SURVEILLANCE AND METEOROLOGY SUB-GROUP OF APANPIRG (CNS/MET SG/14)

Jakarta, Indonesia, 19 – 22 July 2010

Agenda Item 3: Aeronautical Fixed Service (AFS)

1) review report of the Fifth Meeting of the ATN Implementation Coordination Group (ATNICG/5)

PROPOSED AMHS IMPLEMENTATION PLAN

(Presented by Hong Kong, China)

SUMMARY

This Working Paper presents the proposed Implementation Plan for MTA and ATN Routers in the region with a view to facilitating an orderly implementation of AMHS over OSI ATN in 2010 and AMHS over IPS ATN in 2011.

This paper relates to:

Strategic Objectives:
D. Efficiency – Enhance the efficiency of aviation operations
E. Continuity – Maintain the continuity of aviation operations

Global Plan Initiative:
GPI – 22 Communication infrastructure

1. Background

1.1 To ensure early implementation of ATN in the region, the 3rd Meeting of the ATNICG adopted the draft conclusion that by 2010, all ATN OSI Backbone Boundary Intermediate Systems (BBIS) identified in FASID Table CNS – 1B should be operational and all backbone AMHS MTAs should support both OSI and IPS ATN by 2011. This draft conclusion was adopted in the 19th Meeting of the APANPIRG as follows:

Conclusion 19/20 - ATN Implementation Schedule

That, States hosting Backbone Boundary Intermediate Systems (BBIS) be urged to complete the implementation of an ATN Dual Stack (ATN/OSI and ATN/IPS) per the following schedule:

2011– All backbone AMHS MTAs must support ICAO-compliant IPS protocol (RFC1006/2126)

1.2 The introduction of new services such as XML OPMET messages and AFTN/AMHS gateways has increased the complexity of the operation of the Aeronautical Fixed Service (AFS). This could result in operational impacts such as longer time to identify the cause of network failure and delay in the restoration of service. In view of the potential impacts, there is imminent need to migrate from AFTN to AMHS.

1.3 Some States in the Asia/Pacific Region have completed the acceptance of AMHS and they are ready for testing and implementation. Many others are either in the process of procurement or planning to procure AMHS in the coming few years.

1.4 Despite the fact that IPS has been adopted by ICAO and other regions such as Europe, Caribbean and South America have indicated that they would use AMHS over IP, OSI ATN is still the adopted standard in the Asia/Pacific Region for the time being.

1.5 The USA proposed in ATNICG/4 that a coordinated waterfall schedule as well as procedures and associated parameters be jointly developed by members to expedite the AMHS implementation to meet the deadline set by the ICAO.

1.6 To address the above issues, this Working Paper provides the test procedures required and also the phased approach to ensure an orderly testing and implementation of AMHS in the region. Also, an AMHS Implementation Planner is developed to assist States to plan their testing and implementation activities.

2. AMHS Interoperability Test

2.1 Before putting the AMHS into operation, it is necessary to conduct interoperability test between MTAs to ensure that their AMHS are interoperable. However, as there are quite a number of AMHS in the region, it would be complicated and time consuming if each MTA pair has to conduct a comprehensive interoperability test. In order to resolve this problem, it is proposed to adopt different test procedures for directly connected MTAs and indirectly connected MTAs.

2.2 For MTAs with direct connection, Comprehensive Interoperability Test Procedure (CITP) consisting of Annex C and E of the AMHS Manual is recommended. For indirectly connected MTAs, Abridged Interoperability Test Procedure (AITP) consisting of the Bilateral Test items (except IT601) stipulated in paragraph 4, Annex E of the AMHS Manual is sufficient to verify the interoperability of their AMHS.

3. MTA Routing

3.1 Messages exchanged between MTAs are routed through the AMHS and the ATN routers. The AMHS provides static routing based on MTA routing table whereas the ATN router provides dynamic routing based on IDRP.

3.2 The MTA routing table has to be updated manually whereas the routing table of the ATN router is updated automatically through IDRP.

3.3 Static routing can further be divided into hop-by-hop routing and direct routing. For hop-by-hop routing, the originating MTA establishes binding with adjacent MTAs for onward relay of messages to the destination MTA. For direct routing, the originating MTA establishes binding with the destination MTA without going through intermediate MTAs.

3.4 The Asia/Pacific Regional AMHS MTA Routing Policy states that during the initial phase of implementation, hop-by-hop routing based on the AFTN Routing Directory should be used.

This is achieved by the use of MTA routing table where the location indicators are associated with the corresponding directly connected MTAs.

3.5 When direct routing is used, the MTA routing table should be updated such that the location indicators are associated with the destination MTAs. As the message carries the destination's NSAP address, it will be routed by the intermediate routers to the destination.

3.6 In comparison with direct routing, hop-by-hop routing is less efficient because the message has to traverse the intermediate MTAs. Therefore, it is necessary to commence the migration to direct routing once hop-by-hop routing is operational. To speed up the process, the Abridged Interoperability Test Procedure is to be used for the test with indirectly connected MTAs within the region.

3.7 It should be noted that during the initial phase of implementation where hop-by-hop routing is being used, messages may not be routed according to the AFTN Routing Directory. In addition, AFTN alternate routing may not apply when there is link failure because the ATN router will select the best alternate route through IDRP exchange. This is the characteristic of dynamic routing where the selection of outgoing route is based on the routing information advertised between routers. This will not be a problem as long as the message can be sent to the destination.

3.8 According to the AMHS MTA Routing Policy, direct routing is confined to MTAs within the region. Messages for other regions should be sent to Inter-regional MTAs for onward relay to the destinations.

4 Phased Approach Testing and Implementation

4.1 To ensure an orderly test arrangement and coordinated implementation, the following phased approach is recommended :

Phase I (Initial stage: AFTN routing at MTA)

(a) MTAs of BBIS, BIS and EBIS to conduct interoperability test using the CITP with direct connected MTAs. (e.g. Hong Kong – Japan, Hong Kong – Macao)
(b) Cutover from AFTN to AMHS after successful completion of the interoperability test.
(c) The MTA routing should follow the AFTN Routing Directory.

Phase II (Intermediate stage – MTA direct routing to end BBIS)

(a) MTAs of BBIS, BIS and EBIS to conduct interoperability test with MTAs of BBIS without direct connection. The AITP is to be used. (e.g. Hong Kong – Singapore, Hong Kong –Australia, Hong Kong – India etc)
(b) When all BBIS are up and running and interoperability test between each and every one of them is completed, the MTAs should change from AFTN routing to direct BBIS routing. This has to be executed by changing the static routing table of AMHS and ICAO should be informed of the change so that the progress can be monitored.

Note: The following prerequisites should be ready before cutover to direct BBIS routing:-

1. All States registered as an AMC user at Eurocontrol to follow AMHS address update procedures before AMC database for the Asia/Pacific Region is established.

2. Each BBIS has at least two BBIS links up and running and every BBIS is able to connect directly or indirectly with other BBIS in the region.
3. For BBIS with inter-regional connections, alternate links should be available to cater for inter-regional link interruptions.

Phase III (Final Stage: direct MTA-to-any MTA routing within the region)

(a) Subject to traffic pattern and resources available, MTA of BIS and EBIS should schedule to conduct interoperability test among themselves using the AITP.
(b) After successful completion of the interoperability test, the corresponding MTA pairs under test can be enhanced to direct MTA-to-any MTA routing instead of relaying through the end BBIS.

Note: Completion of Phase III would be subject to the resources available at each State. The target date may be decided by ATNICG depending on the progress.

Phase IV

(a) When IPS is ready and the AMHS within the region are able to support IPS, repeat the aforesaid interoperability tests using the IPS ATN.
(b) Transition the OSI router at BBIS to IPS first, then followed by BIS and EBIS.

4.2 A sample routing table showing the corresponding changes from AFTN routing in Phase I to direct MTA-to-any MTA routing in Phase III is given at Appendix A.

5 AMHS Implementation Planner

5.1 In accordance with the phased approach adopted for the AMHS testing and implementation, an AMHS Implementation Planner is developed to facilitate States to plan their testing and implementation activities. States are encouraged to coordinate with their counterparts and enter the target implementation dates in the planner so that the progress of AMHS implementation in the region can be monitored. The planner is shown at Appendix B.

5.2 The planner will also enable States to identify inconsistencies of implementation dates entered in the FASID Table CNS - 1B.

5.3 The planner shall preferably be circulated by ICAO Asia/Pacific Regional Office twice a year for States to update their implementation status.

6 Action required by the Meeting

6.1 The meeting is invited to consider the AMHS Implementation Plan for adoption by the region.

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Appendix A

Sample MTA Routing Table at Hong Kong

Phase I – MTA (AFTN) routing to adjacent BBIS/BIS/EBIS with physical connection

Location Indicators	Outgoing MTA	NSAP Address
RJ	RJJJ	NSAP of Japan
K	RJJJ	NSAP of Japan
VT	VTBB	NSAP of Thailand
WS	VTBB	NSAP of Thailand
Y	VTBB	NSAP of Thailand
VL	VTBB	NSAP of Thailand

Phase II – MTA routing to end BBIS

Location Indicators	Outgoing MTA	NSAP Address
RJ	RJJJ	NSAP of Japan
K	RJJJ (Note 1)	NSAP of USA
VT	VTBB	NSAP of Thailand
WS	WSSS (Note 2)	NSAP of Singapore
Y	YBBB (Note 2)	NSAP of Australia
VL	VTBB (Note 3)	NSAP of Thailand

Note 1: Message for K is inter-regional traffic so it is sent to the inter-regional MTA which in this case is RJJJ for onward relay to KSLC.

Note 2: Message addressed to WS and Y is intra-regional traffic. Hong Kong MTA will establish binding with WSSS and YBBB to send the message direct without going through intermediate MTA, Thailand.

Note 3: Message addressed to VL is intra-regional traffic. Hong Kong MTA will establish binding with VTBB, a BBIS that has direct connection to VL, to send the message.

Phase III – MTA-to-any MTA routing to BBIS/BIS/EBIS within the Region

Location Indicators	Outgoing MTA	NSAP Address
RJ	RJJJ	NSAP of Japan
K	RJJJ (Note 1)	NSAP of USA
VT	VTBB	NSAP of Thailand
WS	WSSS	NSAP of Singapore
Y	YBBB	NSAP of Australia
VL	VLVT (Note 2)	NSAP of Lao PDR

Note 1: Message for K is inter-regional traffic, it shall still be sent to the inter-regional MTA (RJJJ) for onward relay to KSLC.

Note 2: Message addressed to VL is intra-regional traffic. Hong Kong MTA will establish binding with VLVT, to send the message direct without going through intermediate MTA, Thailand.

Appendix B – AMHS Implementation Planner

Interconnection, Connected to router of: *Administration (Location of Router)*	Stage	BBIS										
		Australia (Brisbane)	Australia (Melbourne)	China (Beijing)	Hong Kong, China (Hong Kong)	India (Mumbai)	Fiji (Nadi)	Japan (Fukuoka)	Singapore (Singapore)	Thailand (Bangkok)	USA (Salt Lake City)	USA (Atlanta)
Australia (Brisbane)	A						Q2/10					
	B											
	C											
	D						Q3/10	2010				
Australia (Melbourne)	A								Q4/06			
	B								TBD			
	C								TBD			
	D								TBD		2010	
China (Beijing)	A				Q2/10							
	B				Q2/10							
	C				Q3/10							
	D				Q3/10	2009 / 2010		2010		2009		
Hong Kong, China (Hong Kong)	A			Q2/10				TBD		TBD		
	B			Q2/10				TBD		TBD		
	C			Q3/10				TBD		TBD		
	D			Q3/10				TBD		TBD		
India (Mumbai)	A								Q3/09			
	B								Q4/09			
	C								Q4/09			
	D			2009 / 2010					Q4/10	2009 / 2010		
Fiji (Nadi)	A	Q2/10									Q2/10	
	B										Q3/10	
	C										Q3/10	
	D	Q3/10									Q3/10	
Japan (Fukuoka)	A				TBD				TBD			
	B				TBD				TBD			
	C				TBD				TBD			
	D	2010		2010	TBD				TBD		2006/ Implemented	
Singapore (Sinagpore)	A		Q4/06			Q3/09		TBD		Q4/06		
	B		TBD			Q4/09		TBD		Q4/10		
	C		TBD			Q4/09		TBD		Q4/10		
	D		TBD			Q4/10		TBD		TBD		
Thailand (Bangkok)	A				TBD				Q4/06			
	B				TBD				Q4/10			
	C				TBD				Q4/10			
	D			2009	TBD	2009 / 2010			TBD			
USA (Salt Lake City)	A						Q2/10					
	B						Q3/10					
	C						Q3/10					
	D		2010				Q3/10	2006/ Implemented				
USA (Atlanta)	A											
	B											
	C											
	D											
Bahrain	A								2011			
	B								2011 (IPS-based connection)			
	C								2011			
	D								TBD			
Europe	A											
	B											
	C											
	D							TBD				
Italy	A											
	B											
	C											
	D									TBD		
Kuwait	A											
	B											
	C											
	D			TBD								

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Interconnection, Connected to router of: *Administration (Location of Router)*	Stage	BBIS										
2			Australia	Australia	China	Hong Kong, China	India	Fiji	Japan	Singapore	Thailand	USA	USA
3			(Brisbane)	(Melbourne)	(Beijing)	(Hong Kong)	(Mumbai)	(Nadi)	(Fukuoka)	(Singapore)	(Bangkok)	(Salt Lake City)	(Atlanta)
64	Russian Federation	A											
65		B											
66		C											
67		D			TBD				TBD				
68	South Africa	A	TBD										
69		B											
70		C											
71		D											
72	United Kingdom	A								Q4/10			
73		B								Q4/10 (IPS-based connection)			
74		C								Q4/10			
75		D								TBD			
76	Indonesia (Jakarta)	A								Q1/08			
77		B								Q1/09			
78		C								Q2/10			
79		D								TBD			
80	New Zealand (Christshurch)	A	Q4/12									Q4/12	
81		B	Q4/12 (IPS-based connection)									Q4/12 (IPS-based connection)	
82		C	Q1/13									Q1/13	
83		D	Q1/13									Q1/13	
84	Timor States (Dili)	A											
85		B											
86		C											
87		D											
88	Nauru (Nauru)	A											
89		B											
90		C											
91		D											
92	Papau New Guinea (Port Moresby)	A											
93		B											
94		C											
95		D											
96	Solomon Islands (Honiara)	A											
97		B											
98		C											
99		D											
100	Vanuatu (Port Vila)	A											
101		B											
102		C											
103		D											
104	DPRKorea (Pyongyang)	A											
105		B											
106		C											
107		D											
108	Macau, China (Macau)	A			Q1/09	Q2/09							
109		B			Q1 - Q2/09	Q3/09							
110		C			Q1 - Q2/09	Q3/09							
111		D			TBD	Q4/09							
112	Mongolia (Ulaanbaatar)	A											
113		B											
114		C											
115		D											
116	Myanmar (Yangoon)	A											
117		B											
118		C											
119		D											

	A	D	E	F	G	H	I	J	K	L	M
1	Interconnection, Connected to router of: *Administration (Location of Router)*	BBIS									
2		Australia	China	Hong Kong, China	India	Fiji	Japan	Singapore	Thailand	USA	USA
3		(Melbourne)	(Beijing)	(Hong Kong)	(Mumbai)	(Nadi)	(Fukuoka)	(Singapore)	(Bangkok)	(Salt Lake City)	(Atlanta)
120	Nepal (Kathmandu)		Q4/10		Q4/10						
121			Q4/10 (IP-based connection)		Q4/10 (IP-based connection)						
122			Q1/11		Q1/11						
123			Q1/11		Q1/11						
124	Pakistan (Karachi)				2009						
125					Q1/10						
126					Q1/10						
127					TBD						
128	Republic of Korea (Seoul)										
129											
130											
131											
132	Vietnam (Ho Chi Minh / Hanoi)			TBD				TBD			
133				TBD				TBD			
134				TBD				TBD			
135				TBD				TBD			
136	Philippines (Manila)			TBD				2011			
137				TBD				2011			
138				TBD				2011			
139				TBD				2011			
140	Taibei			TBD							
141				2009							
142				2009							
143				2012 - 13							
144	Bangladesh (Dhaka)										
145											
146											
147											
148	Bhutan (Paro)										
149											
150											
151											
152	Kenya										
153											
154											
155											
156	Oman										
157											
158											
159											
160	Sri Lanka (Colombo)							TBD			
161								TBD			
162								TBD			
163								TBD			
164	Kiribati (Tarawa)										
165											
166											
167											
168	New Caledonia (Noumea)										
169											
170											
171											
172	Tuvalu (Funafuti)										
173											
174											
175											
176	Wallis Island (Wallis)										
177											
178											
179											

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Interconnection, Connected to router of: *Administration (Location of Router)*	Stage	BBIS										
2			Australia	Australia	China	Hong Kong, China	India	Fiji	Japan	Singapore	Thailand	USA	USA
3			(Brisbane)	(Melbourne)	(Beijing)	(Hong Kong)	(Mumbai)	(Nadi)	(Fukuoka)	(Singapore)	(Bangkok)	(Salt Lake City)	(Atlanta)
180		A								TBD			
181	Brunei Darussalam	B								TBD			
182	(Brunei)	C								TBD			
183		D								TBD			
184		A								Q1/2007	Q2/2010		
185	Malaysia	B								Q1/2007	Q2/2010		
186	(Kuala Lumpur)	C								Q4/2011	Q4/2011		
187		D								Q4/2011	Q4/2011		
188		A											
189	Cambodia	B											
190	(Phnom Penh)	C											
191		D											
192		A											
193	Lao PDR	B											
194	(Vientiane)	C											
195		D											
196		A											
197	American Samoa	B											
198	(Pago Pago)	C											
199		D											
200		A											
201	Marshall Islands	B											
202		C											
203		D											
204		A											
205	Micronesia,	B											
206	Federated	C											
207	State of Chuuk	D											
208		A											
209	Micronesia,	B											
210	Federated	C											
211	State of Kosrae	D											
212		A											
213	Micronesia,	B											
214	Federated	C											
215	State of Ponapei	D											
216		A											
217	Micronesia,	B											
218	State of Yap	C											
219		D											
220		A											
221	Palau	B											
222		C											
223		D											

Note:

A	Physical connections
B	Router Connection Tests
C	MTA Interoperability Tests
D	AMHS Commission
Q1/09	e.g. 1st Quarter in 2009