



**INTERNATIONAL CIVIL AVIATION ORGANIZATION**

*A United Nations Specialized Agency*

# AMHS Implementation Issues

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**III Workshop/Meeting on the Follow-up to the Implementation of the ATS Message Handling System (AMHS) in the NAM/CAR Regions**

Santo Domingo, Dominican Republic, 24 to 27 September 2013

# AMHS System: Knowledge and design



There are several advantages of AMHS over AFTN including:

- increased speed, capacity and throughput
- enhanced reliability
- extended functionality
- interoperability with other global messaging services
- security capabilities
- use of COTS equipment and services
- AMHS offers services meeting non-AFTN communication requirements

# AMHS System: Knowledge and design



In terms of functionality, the ATSMHS comprises the following components:

- the Message Transfer Agent (MTA) which performs the function of the message switch,
- the User Agent (UA) which performs the user access to the MTA and provides an appropriate user interface,
- the Message Store (MS) which provides the intermediary storage between MTA and UA and is usually co-located with the MTA, and
- the Access Unit (AU) which provides for intercommunication with other Messaging Systems.

# AMHS System: Knowledge and design



Three categories of ATN end systems are defined for the support of the ATS Message Handling Service:

- the ATS message server
- the ATS message user agent
- the AFTN/AMHS gateway
- Together, these systems provide connectivity between users at ATN end systems and users at AFTN Stations

# AMHS System: Knowledge and design



Two levels of service are defined within the ATS Message Handling Service:

- The Basic ATS Message Handling Service;
- The Extended ATS Message Handling Service.

The Basic ATS Message Handling Service meets the basic requirements of the MHS Profiles published by ISO as International Standardized Profiles (ISPs), and it incorporates additional features to support the service offered by the AFTN.

Compared to the service of the AFTN, the Basic ATS Message Handling Service offers some significant improvements such as:

- virtually no limit on the number of addressees of a message;
- practically unlimited message length;
- provision of non-delivery reports;
- indication of the subject of a message.



## Levels of service

- The Extended ATS Message Handling Service provides functionality in addition to those of the Basic ATS Message Handling Service such as the introduction of directory services and security mechanisms. Furthermore, in addition to IA-5 text, the extended service allows for the transfer of binary coded data, files etc.
- The Extended ATS Message Handling Service is backwards compatible with the Basic ATS Message Handling Service

# AMHS Implementation experiences from other Regions



## SAM Region:

From AMHS interconnection between the Quito (Ecuador) and Lima (Peru) MTAs, and the first AMHS interconnection between AMHS systems of different manufacturers.

- ✿ interconnection problem between AMHS systems: In accordance with RFC standard 1006: "ISO transport service in the upper part of the TCP", the OSI/TCP adaptation in the transport layer must be done using the TPO protocol.
- ✿ Due to this all the States of the SAM Region that had not implemented the TPO protocol were urged to implement it.

## ASIA/PAC Region:

SWIM implementation over AMHS.

- ✿ SWIM's flexibility was pointed out that it allows having not only one domain but also several domains IPv6, or IPv4 or AMHS etc.
- ✿ Trials to be planned

# AMHS Implementation experiences from other Regions



## EUR Region:

- ✿ EDS Project: two COMSOFT Directory Servers are currently being installed at EUROCONTROL DNM operational environment. The validation exercise will be announced worldwide and States will be invited to participate. After the EDS project completion, additional work is considered to cover the security of the AMHS in Europe. The start of the operational concept work has to be decided by the AFSG.
- ✿ SESAR P 15.2.10 deliverables on security will be finalised before the next WG-I meeting in November 2013. They could become relevant inputs for the development of Security implementation guidance for IPS.



# AMHS Interoperability Trials (EUR Reference)



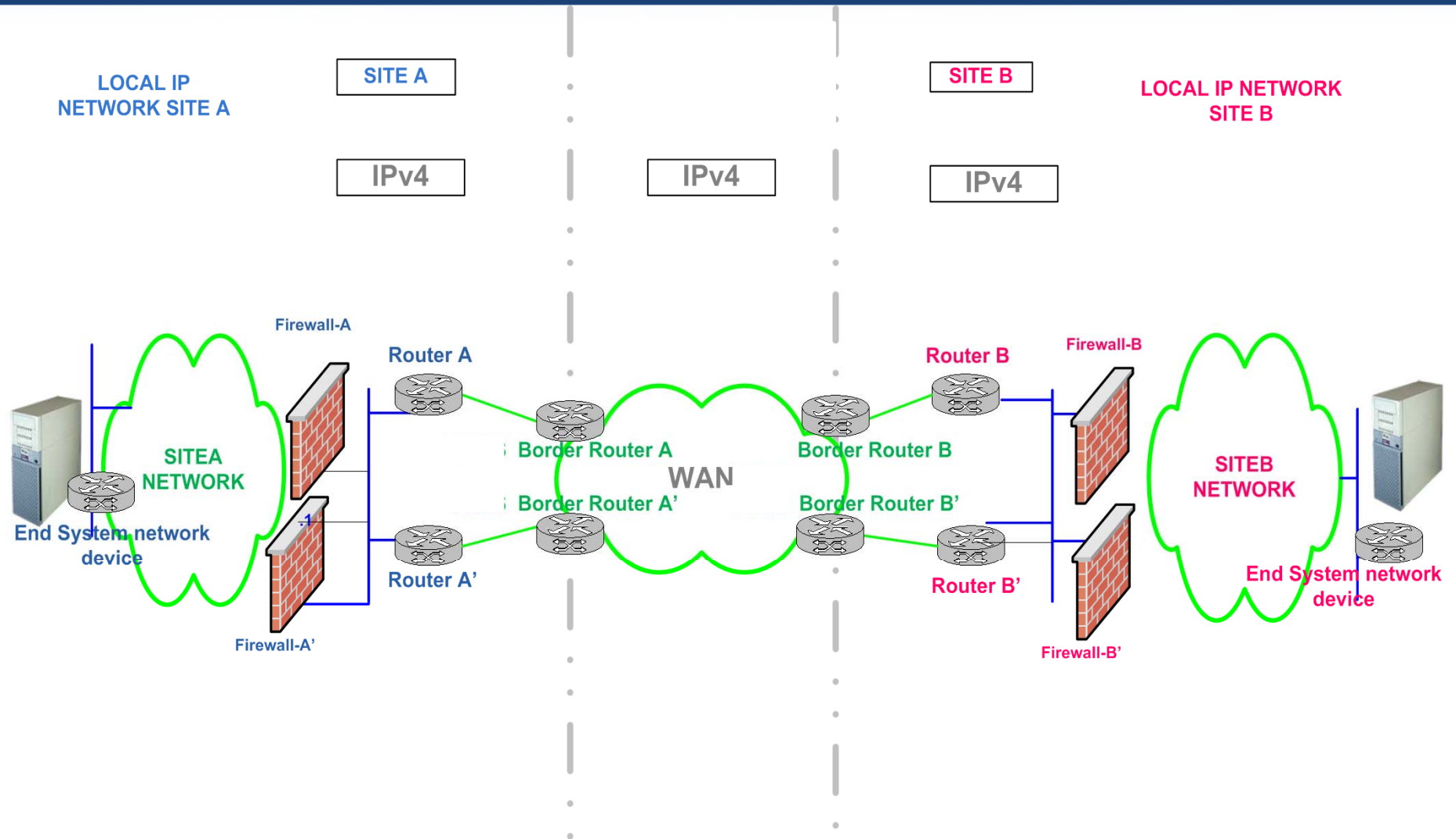
- ✓ to pass successfully and rapidly the AMHS Interoperability Trials.
- ✓ Pre-requisites:
  - Trials based on agreed protocol (ex. EUR AMHS Manual Appendix E document).
  - Countries must have performed and passed the CONFORMANCE TEST PROTOCOL (ex. EUR AMHS Manual Appendix D document).
  - Countries have to be connected by any mean which allows IP connection between both MTAs.

# AMHS trial Considerations



- ✓ Test-Bed and Operational MTAs must be the same SW versions
- ✓ use of Regional common network infrastructures (IP networks).
- ✓ Before Tests, check conformance tests results and perform connection trials using pings and MTA connection attempts.
- ✓ During Tests:
  - Save logs.
  - Timestamp the test cases. and use always UTC time.
  - Use AMHS application to communicate and exchange messages.
  - For the new stress test cases (IT601) suggested, it is highly recommended to perform a single message pre-test previous to the n x 1.000 message test.

# Configuration issues: interoperability trials



# For trial: Share information as Configuration Table



	COUNTRY 1	COUNTRY 2	References to EUR AMHS MANUAL and/or notes
IP	57.235.201.75		
TCP PORT	102		Recommended 102
MTA Software and release version	ISODE 14.4v11		
IUT REGION	IUTLAND A	IUTLAND B	To be agreed
MTA Name	MTA-LEEE-1		8.2.2 Default Values for international MTA names
MTA Password	PASSWORD-1		8.2.3 Default Values for international MTA passwords
Calling Presentation Address: - Yes - No	Yes		This parameter was found compulsory as some MTAs expect this parameter from the caller previous to accepting any connection attempt.
Authentication Requirements: - Simple authentication - Strong authentication - Bilateral authentication	Simple		
TSAP: - Hex - Text	0x35 0x39 0x31 Text "591"		Appendix F 3.3 Configuration Upper Layer It should be clearly defined if expressed in text or hex mode, as it originates confusion and errors

# For trial: Share information as Configuration Table



Protocol Type	X400/1988		Appendix F 3.2 Configuration Upper Layer
Connection: - Permanent - Dynamic	Dynamic		5.2 General requirements 5.2.5
N° of maximum associations - Inbound - Outbound	5 5		5.2 General requirements 5.2.2
Dialogue Mode - Monologue - Two way alternate	Monologue		Appendix B J.1 Introduction
Minimum message size supported	2Mbytes		Appendix F F.2.4.3
Addressing scheme	CAAS Single "0"		
	C = XX ADMD = ICAO PRMD = IUTLAND-A O = A-REGION OU1 = IUTA CN = IUTAXXX		Even though it may be helpful for the transition to use operational addressing, it is highly recommended to use addressing contained in the tables of Appendix E

# Interoperability Trials Protocol issues



- ✓ **Bilateral Test:**
  - IT 501/TC05 and TC06: BLIND COPY RECIPIENTS
  - IT 505: TEST PROBES
  - IT 601: STRESS TRAFFIC TESTS BEHAVIOR (no. msgs and char/msg)
  - IT 601: INBOUN&OUTBOUND ASSOCIATION BEHAVIOUR
- ✓ **Trilateral Tests** (Appendix E) have not been needed in any trials and also may require excessive efforts of coordination with a third country. If needed and if possible, additional MTA Test-beds may be configured to simulate a third and a fourth country.
- ✓ **BILATERAL CONFORMANCE TESTS** (EUR Reference)

# BILATERAL CONFORMANCE TESTS (EUR Reference)



- ✓ It is recommended to perform a subset of the conformance trials, which are listed below, as some of these may not be tested during the conformance tests due to application or facilities limitations:
  - CT304– Reject a message, if DL expansion is prohibited
  - CT306– Generate a NDR, if transfer fails
  - CT407 – Convert or reject an IPM, if the ATS-message-text contains lines with more than 69 Characters
  - CT418 – Convert an AFTN SVC “Unknown Addressee Indicator” to a NDR

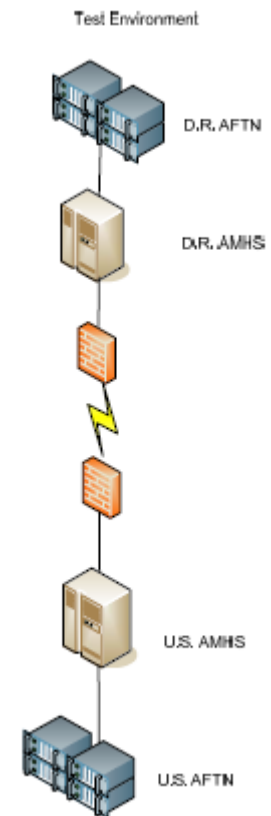
# CAR Experience TESTs



## Interoperability Test Plan of AMHS Service Between the United States and the Dominican Republic – Reference interoperability Tests for the CAR Region

objectives of the tests:

- Test that both systems successfully connect, in accordance with the stated Interoperability Test
- To highlight any potential issues in the connected systems and identify any mitigation required





# Samples of Trial/ Test Errors



Problem detected	Type of error /Solving	appearance
Message doesn't arrive properly	Wrong typing of the address: - Check address typed	common
Message doesn't arrive properly	Errors in addressing configuration. - Check configuration of the MTA addressing - Check distribution lists	very rare
Service message appear /do not appear when requested /not requested	- Check PRI - Check MTA <u>config</u> for service message	uncommon
Message rejected due to <u>bodypart</u> not accepted	- Check conformance tests passed	Very rare
Address translation Probes do not behave as expected	- Some MTAs manage/translate all incoming recipient addresses	common
Message rejected /wrong behaviour	- Check scripts of the generating tool. Most probably to typing errors	uncommon
Stress tests Active associations not in maximum while messages queued	- Some MTAs manage the number of outgoing associations to adequate link capacity and workload	common
Stress tests: Only one message arrives. The rest disappears	- Check Generating tool. If messages are identical, some MTAs may manage them as duplicated and then rejects the duplicated.	uncommon
	-	

# AMHS Implementation Issues



States shall organize training of personnel to provide necessary capability to maintain and operate the ground-to-ground ATN infrastructure and applications.

permit States with limited AFS connections or traffic with other States to operate only UA terminals and to use the MTA of another State, subject to bilateral agreement.

AFTN and AMHS expected to co-exist for considerable period of time (Transition)

Planning and Implementation of integrated ATS ground-ground network to include voice communication requirements and AIDC application.

# AMHS Implementation Issues



Follow-up AMHS Implementation according to Action Plans and CAR/SAM ATN Strategy Implementation.

Agreements: LOA/ MOU

Participating states to register to the AMC

Revision and definition of MF Addressing scheme (XF/CAAS)

Follow-up to IPv4 addressing scheme implementation in the CAR Region

Assist and support AMHS Test and cutover planning

# Updates and discussion by ICAO ACP



## Maintenance of Guidance Material

ICAO  
Working  
Group  
Internet  
(WG-I)

Developed Doc 9896  
“Manual for the ATN  
using IPS standards  
and protocols”

The ATN IPS is  
principally driven by  
de-facto IP industry  
standards

# ACP WG-I latest results



## **WG I – Internet Protocol Suite – 16th Meeting Montreal, Canada, 28th - 30th January 2013**

- ICAO Secretariat will work to obtain IPV6 address blocks for the Regions. – Still in progress.
- Secretary to include amendment proposals (static routing/point to point interface, additional AS numbering, 2.4.1.1 and 2.4.2.1 on TCP/UDP for host) into unedited version of 2nd edition of Doc 9896.
- develop global implementation guidance which will be included in Doc 9896 Part III: Improved IPS implementation guidance development.
- United States to draft guidance material for Doc 9896 on IPV4-IPV6 transition.

### ***New edition in preparation***

- Manual on detailed technical specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI standards and protocols (Doc 9880)
- Manual on the Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Standards and Protocols (Doc 9896) – Edition 2.0

# Implementation relevant references



## AMC references:

- ✓ Basic AMC Overview:

[https://trainingzone.eurocontrol.int/clix/data/scorm/decompressed/GEN\\_AMC\\_1253704/AMCMenu.htm](https://trainingzone.eurocontrol.int/clix/data/scorm/decompressed/GEN_AMC_1253704/AMCMenu.htm)

- ✓ Implementation supporting documentation
- ✓ common AMHS source of information
- ✓ Planning information

# Documentation for Test- AMC



<p>EUR AMHS Manual, Appendix D - AMHS Conformance Tests</p>	<p>The purpose of the document is to define the functional tests for an AMHS Conformance Test, which allows checking an AMHS implementation against the SARPs and AMHS Technical Specification [ICAO Doc 9880] as a first step to ensure the interoperability between compliant systems.</p>
<p>EUR AMHS Manual, Appendix E AMHS Interoperability Tests</p>	<p>The purpose of the document is to define the functional tests for AMHS Interoperability in order to ensure the end-to-end interoperability between AMHS systems under test. These tests are performed after the successful completion of AMHS conformance testing, through which the compliance of every one of the systems under test to the AMHS SARPs has been demonstrated.</p>
<p>EUR AMHS Manual, Appendix F AMHS Pre-operational Tests</p>	<p>The purpose of the document is to define AMHS Pre-operational Tests in order to ensure the interoperability between AMHS systems prepared for going into operation. The document defines the objectives and prerequisites as well as the tests themselves. The AMHS Pre-operational Tests are interoperability type tests. They are the last tests between Operational Systems and should be performed within the operational network environment before the 'AMHS cut-over'.</p>
<p>EUR AMHS Manual, Appendix C - AMHS Testing Requirements</p>	<p>The purpose of the document is to define the functional requirements for AMHS testing procedures.</p>
<p>EUR AMHS Manual, Attachment A - Change Control Mechanism</p>	<p>The purpose of this document is to describe the procedure for submission and processing of a Defect Report (DR) or a Change Proposal (CP)</p>

# Implementation Documentation - AMC



ATS Messaging Management Manual	The ATS Messaging Management Manual describes the framework in which the services of the ATS Messaging Management Centre (AMC) are provided to States/ANSPs in the EUR/NAT Regions, and, in a more limited manner, to States/ANSPs in other Regions, under control by the AFSG. This framework is largely based on the earlier CIDIN Management framework and organization.
AMC User Manual	Draft AMC User Manual for CCC Operators and AMF-I Users
AMC Operator Manual	Draft User Manual for AMC Operators
EUR AMHS Manual - Main Part, Appendix A-F	EUR AMHS Manual (EUR Doc 020) - Basic Regional reference document for AMHS implementation



# Regional CAR Implementation Reference



## AMHS

Subject	Language	
CAR-AMHS ImplementationPlan	en	
CAR Regions AMHS Implementation Matrix	en	
AMHS Interoperability Test Plan v1.0	en	
AMHS Implementation Workshop Web Page	<a href="#">Link</a> .....	
List of participants Web	en	
Draft Technical Letter of Agreement for AMHS	en	
1st Teleconf Meeting for AMHS Implementation	en	
FAA Transition Process	en	
ATS Messaging Management Centre (AMC) Users Training Including AMC Phase 2 functions	en	

<http://www.icao.int/NACC/Pages/edocs-cns.aspx>

# AMHS System: Training



The constant evolution of CNS/ATM technology brings new challenges to air navigation, such the case of the new systems like the AMHS. Training requirements have to be adapted regularly.

Air Traffic Safety  
Electronics  
Personnel  
(ATSEP)- ICAO  
DOC 7192 Part E

- In order to cover the various backgrounds of trainees and to ensure training standardization worldwide, it is recommended that training be divided into multiple levels as follows:
- Basic training
- Qualification training
- System and equipment rating training (also referred to as “Specific training”)
- Continuation training
- Conversion training
- Developmental training

# AMHS System: Training



The following considerations are to be taken in consideration by each ANSP when planning the AMHS training:

- ANSPs should establish their AMHS Training Plan based on an analysis of their particular training needs and operating practices.
- Similar to any ANS system, an AMHS System is subject to maintenance in line with the strategy and processes set out by the ANSP, so that the performance, reliability, availability and maintainability requirements are met.
- Maintenance responsibilities should be clearly defined and assigned, personnel should be trained accordingly and procedures of cooperation between the operation and the maintenance entities, when different, should be in place.
- When some levels of maintenance are assigned to third parties, the responsibilities on each side including training/qualification profiles for the third party personnel should be specified in the appropriate agreements.

# AMHS System: Training



## version 1.0 of the EUR AMHS COM Centre Training Guidelines

- Purpose: to provide information and guidance on the training and expertise required for personnel involved in the operation and maintenance of a COM Centre, defining training process and specify training guidelines in order to have a common level of training for staff that operates and maintains COM Centres with AMHS capabilities.
- COM Centre staff will obtain the appropriate skills to specify, evaluate, operate and maintain an AMHS system in an appropriate manner and consequently provide harmonized, homogenous and consistent AMHS services.
- Applicable to all AMHS involved personnel, e.g. System Supervisors, Operators, Maintainers, Engineers, End Users, etc. (the actual structure, naming and responsibilities of the personnel, varies among ANSPs).

# EUR AMHS COM Centre Training Guidelines



AMHS training could be distinguished as covering three major activities of AMHS deployment:

- a. AMHS Specification and Testing
- b. AMHS Installation and Technical Support
- c. AMHS Operation and Supervision

AMHS operational management is structured in the following macro areas (competences)

- Fault management;
- Configuration management;
- Accounting management;
- Preventive maintenance;
- Performance management;
- Security management

# EUR AMHS COM Centre Training Guidelines



In practical terms, the staff involved in the above tasks is performing the following functions:

- a. AMHS System Administration/Supervision (ASS)
- b. AMHS System Operation (ASO)
- c. AMHS System Technical Support (Maintenance) (ASM)
- d. AMHS End System Operation (AEO)

Depending on the organizational structure of each ANSP, the same personnel may be performing one or a combination of the above functions.

# EUR AMHS COM Centre Training Guidelines



Module Name	Type	ASS	ASO	ASM	AEO
Common Basic Communications Training	Basic training	X	X	X	
Common AMHS general training	Qualification training	X	X	X	X
COM Centre Operation	Qualification training	X	X		X
AMHS COM Centre Operation	System/equipment competence training	X	X		
Use of UAs	System/equipment competence training		X		X
System Maintenance – H/W	System/equipment competence training			X	
System Maintenance – S/W	System/equipment competence training			X	
COM Centre Supervision	System/equipment competence training	X	X		
System Monitoring and Control	System/equipment competence training	X			



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Dakar

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Middle East  
(MID) Office  
Cairo

Eastern and  
Southern African  
(ESAF) Office  
Nairobi

Asia and Pacific  
(APAC) Office  
Bangkok

Thank You

A world map is shown in a light blue color. Eight colored dots (one orange for Montreal, seven blue for other offices) are placed on the map. Lines connect these dots to text labels for each office. A large, rounded rectangular box with a grey gradient background and a black border is centered over the map, containing the text "Thank You".