International Civil Aviation Organization

MID Region AIS Database Study Group

First Meeting (MIDAD SG*/1)
(Cairo, Egypt, 20 – 22 February 2012)

Agenda Item 5: Technical issues/scenarios for the implementation of MIDAD

SYSTEM TOPOLOGY OPTIONS, INTERFACES, COMMUNICATION

(Presented by MIDAD Support Team)

SUMMARY

This working paper provides basic thoughts about the MIDAD System Topology and addresses also system interfaces and related communication.

Action by the meeting is at paragraph 3.

REFERENCES

- AIS/MAP TF/6 Report
- ATM/SAR/AIS SG/12 Report
- DGCA-MID/1 Report
- ICAO Aviation Systems Block Upgrades B0-30
- ICAO Strategic objective “Safety (A2)” and “Environment …” (C31)”

1 INTRODUCTION

1.1 In a collaborative environment like MIDAD there are always different possible topology solutions. The finally chosen topology must be based on sound requirements which have been assessed very carefully.

1.2 It is suggest to use the methodology of decision tables to compare the pros and cons of the different topologies.

2 DISCUSSION

2.1 System Topology Options

2.1.1 There are basically three different possible topologies for a regional ICAO database.

- Central solution,
- Replicated solution,
- Distributed solution.

2.1.2 All have advantages and disadvantages and all should be therefore compared and the best topology for implementing the operational concept shall be chosen. It should be noted that this discussion is on a very high level. It should only show that there are different scenarios available. Without discussing the scenarios and choosing one scenario based on the requirements one cannot make sure that the best scenario was chosen.

2.1.3 Central Solution

2.1.3.1 A central solution needs a responsible legal entity which manages the day to day operation of the central site in sense of:

1. Operation of the system,
2. Staffing,
3. IT infrastructure.

2.1.3.2 A central system might have more than one site for the operational offices. The servers and host computers do not necessarily need to be at the same location as the operational MIDAD Office(s) can be spread over more than one office. This means a centralised solution could have probably 1 to 4 different sites depending on the solution chosen. However, it can also be at one physical location.

2.1.3.3 A principle outline of such a solution is shown in

2.1.3.4 Figure 2-1.

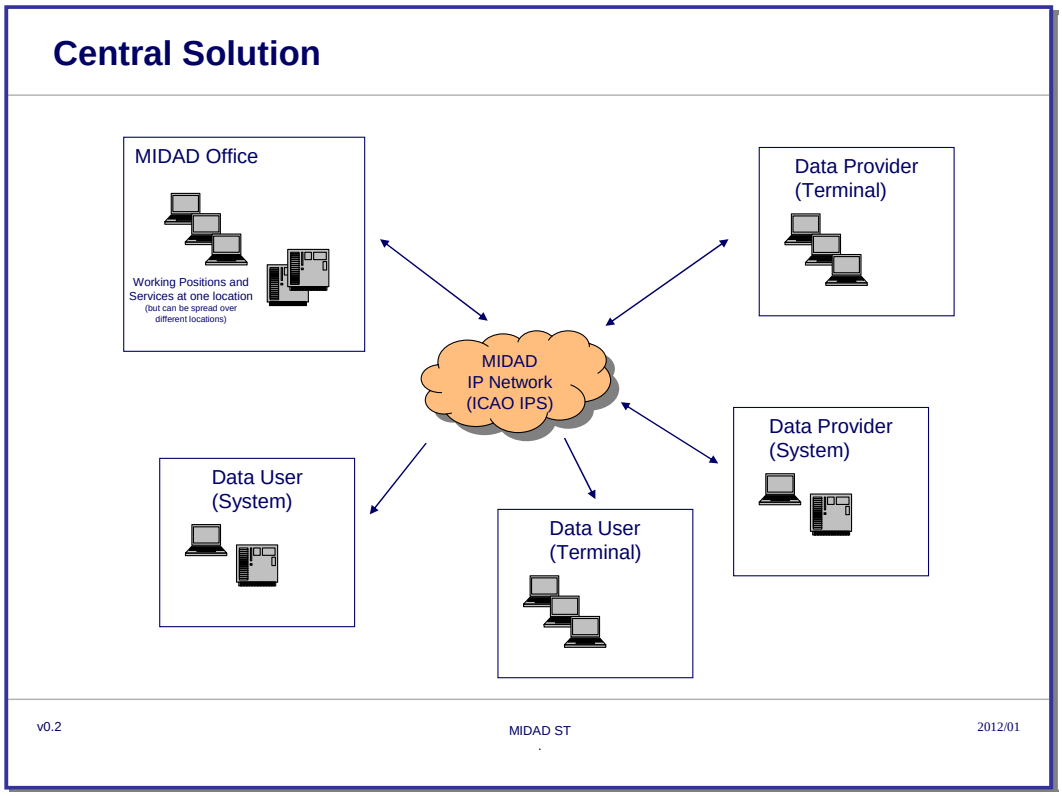

Figure 2-1: Central Solution

2.1.4 Replicated Solution

2.1.4.1 Replication is the process of sharing information so as to ensure consistency between redundant resources, such as software or hardware components, to improve reliability, fault-tolerance, or accessibility. Database replication is the creation and maintenance of multiple copies of the **same database**. In most implementations of database replication, one database server maintains the master copy of the database and additional database servers maintain slave copies of the database. Database writes are sent to the master database server and are then replicated by the slave database servers. Database reads are divided among all of the database servers, which results in a large performance advantage due to load sharing. In addition, database replication can also improve availability because the slave database servers can be configured to take over the master role if the master database server becomes unavailable.

2.1.4.2 Database replication turns out to be complicated when it increases in size and magnitude. It establishes considerably bigger expenses and intricacy which may make it not viable in several circumstances.

2.1.4.3 A replicated solution needs a responsible legal entity which manages a central server into which all Data Providers store there data (contents). The central server will then replicate **all** data to the Data Provider systems. At Data Provider systems Data User Terminals can be connected. Data User Systems can be connected at the central server and at the Data Provider server.

2.1.4.4 A principle outline of such a solution is shown in

2.1.4.5 Figure 2-2.

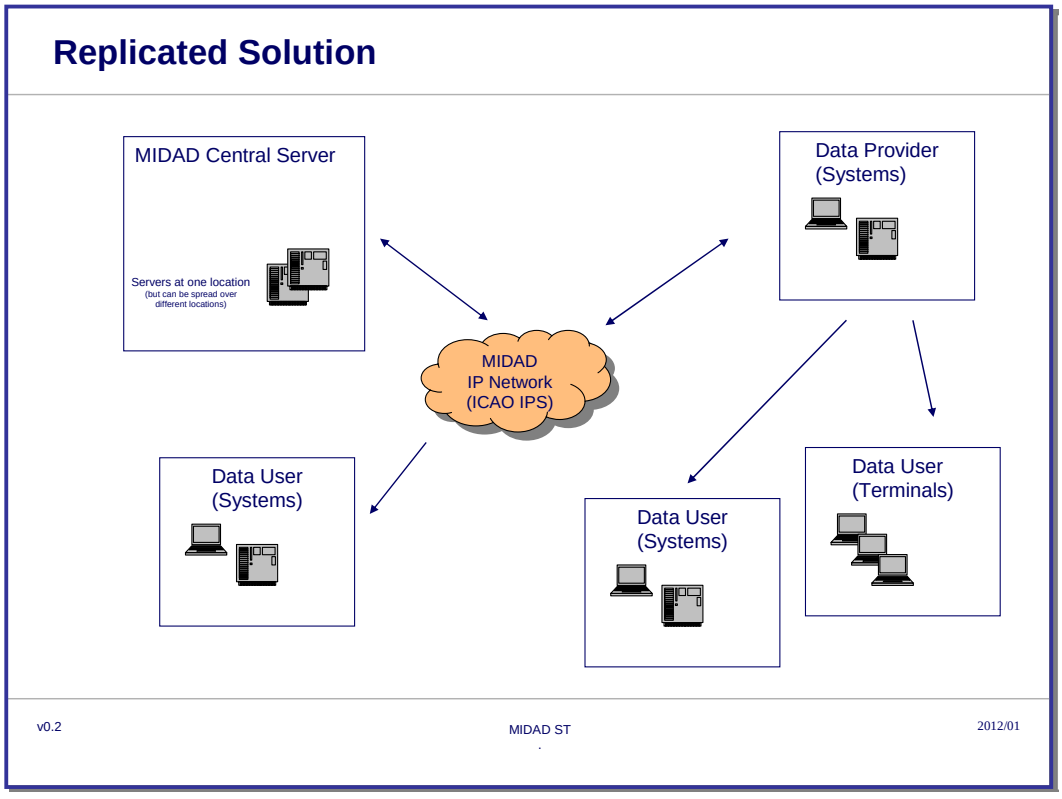

Figure 2-2: Replicated Solution

2.1.5 Distributed Solution

2.1.5.1 Distributed system is a collection of independent computers that appear to the users of the system as a single computer. A distributed database is a collection of multiple, logically interrelated databases distributed over a computer network. A distributed database is a database in which **portions** of the database are stored on multiple computers within a network. Users have access to the portion of the database at their location so that they can access the data relevant to their tasks without interfering with the work of others. A centralized distributed database management system (DDBMS) manages the database as if it were all stored on the same computer. The DDBMS synchronizes all the data periodically and, in cases where multiple users must access the same data, ensures that updates and deletes performed on the data at one location will be automatically reflected in the data stored elsewhere.

2.2 Interfaces

2.2.1 The internal and external interfaces of the MIDAD are critical areas as for each interface of each IT system because two different worlds interfacing each other. AIXM has more or less the data contents and data structure described but only limited rules, no error handling and no physical implementation.

2.2.2 EAD has its own proprietary physical implementation for system to system connection. The matter is addressed in the frame of the System Wide Information Management (SWIM) Network Layer and also under discussion in the ICAO Aeronautical Communication Panel (ACP[1]).

2.2.3 Therefore the internal and external interfaces of MIDAD shall be identified, the data contents and structure shall be agreed and physical implementation and error handling shall be explored.

2.2.4 Possibly the following interfaces are candidate interfaces for MIDAD:

1. Human – Machine,
2. MIDAD Terminal – MIDAD System,
3. MIDAD System – MIDAD System,
4. MIDAD System – 3rd Party System.

2.3 Communication

2.3.1 Communication capabilities are the pre-requisite for any interoperability between national AIS/AIM systems, the MIDAD, MIDAD Terminals, and Regional AIS databases in other ICAO Regions. The AFTN Network is not usable for the purpose of the MIDAD, except for NOTAM reception and distribution.

2.3.2 Therefore the study group should consider exploring other means of communications (VSAT, public internet, ICAO IPS[2] conform networks, etc).

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[1] ATN Dialogue Services (DS) as part of the Upper layer Communication Service (ULCS)

[2] ICAO Annex 10, Volume II and III, and Manual on the ATN using Internet Protocol Suite (IPS) Standards and Protocols (Doc 9896)

3 ACTION BY THE MEETING

3.1 The MIDAD SG/1 is invited to:

a) note the content of this paper; and take it into account when moving forward in discussing the topology and finally agreeing on the appropriate topology; and

b) take appropriate action with regard to the MIDAD Planning.

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