

Running Test and Evaluation Processes in a Modern AMHS Communication Environment

The AMHS Test Suite supports verification of conformance to the AMHS Technical Specification (ICAO Doc 9880) with a set of automated test scripts.

The AMHS Test Suite is a software package consisting of a test tool application, a set of test scripts and a pool of data samples for AMHS messages, reports and probes to be used in conformance and acceptance tests. The software package runs on a Linux computer and implements the following components:

- a Test Control and Evaluation Application with a graphical user interface to prepare and run test scenarios and analyze test results,
- several test drivers to send and receive data in AMHS- and AFTN-format,
- an XML Message Viewer to analyze communication flows.

Motivation for the creation of the AMHS Test Suite

The German Civil Aviation Authority (Deutsche Flugsicherung GmbH - DFS) and AC-B GmbH launched the development of the AMHS Test Suite to:

- complement interoperability tests,
- prepare the installation of international AMHS links,
- verify the robustness of the AMHS product,
- have means for fault analysis and trouble shooting .

Conformance tests are indispensable for successful migration to the AMHS standard. SARPs conformance is a prerequisite for interoperability. AMHS is a complex protocol and communication service budgets moderate. Furthermore, it is necessary to visualize AMHS objects that normally do not appear at the user level, such as envelope fields or trace info. There is also a need to enforce fault situations (=negative testing) to verify the stability of an AMHS implementation.

Test environment

The AMHS Test Tool builds a simulated operational environment, in which the Implementation Under Test (IUT) is embedded as shown in figure 1. Three AMHS test drivers supply three MTA instances that constitute three neighbouring PRMDs. One AFTN test driver emulates an AFTN source/sink representing an adjacent AFTN or CIDIN environment.

The IUT is assumed to have an AMHS user agent (UA) attached that will be used during the tests. The IUT's Monitor and Control Position is used to observe events presented to the operator, in particular when erroneous situations occur during the AMHS-to-AFTN or AFTN-to-AMHS conversion process.

The AMHS Test Tool will be interconnected with the IUT's standardized external message interfaces, which are:

- three AMHS transfer ports supporting the X.400/P1 protocol over a TCP/IP or ATN network connection, and
- one AFTN interface supporting either asynchronous communication over serial line, the CIDIN/X.25 protocols or the TCP/IP protocols for AFTN message exchanges.

Features

The test tool supports test preparation, automated test execution and test evaluation.

Test preparation

The user creates test scenarios in a graphical user interface. Test steps can be combined to complex scenarios by selection of available modules and provided test commands/scripts. A pool of test data, i.e. templates and samples of messages, reports and probes are delivered with the test tool. They can be re-

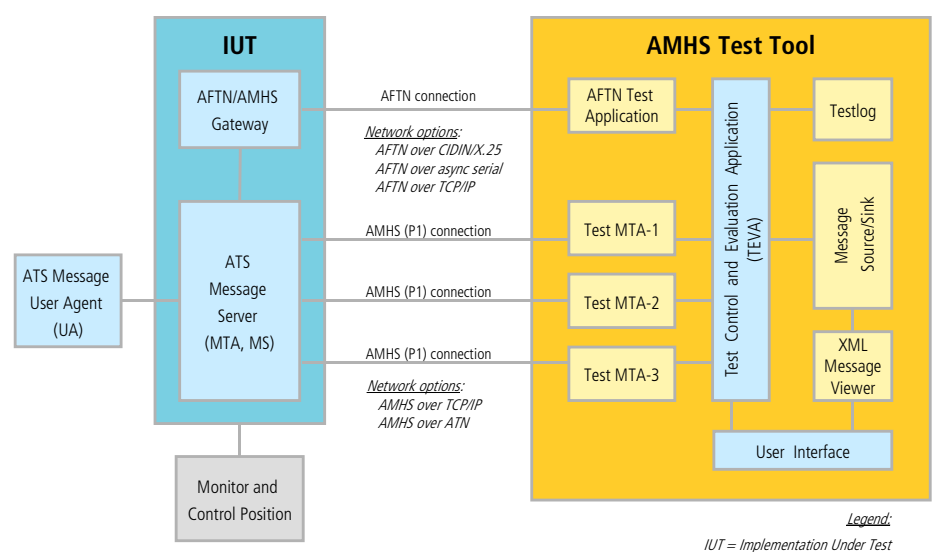


Figure 1: The AMHS Conformance Test Environment

used or modified with a text editor. There is no need to know any scripting language to create new tests.

Test execution

Test messages can be sent to the IUT timely controlled and in a predefined sequence. Test procedures (test scenarios) are presented at the user interface in table-like formats. Each line contains a test step with commands and parameters for actions and/or queries. Test procedures can run in full automatic mode or may manually be controlled, step by step. On-line modification is possible to optimize a test procedure in the course of a dry run. Several test sequences can be combined to support complex scenarios.

Test evaluation and trouble shooting

The AMHS Test Tool analyzes data captured from the IUT's interfaces and compares the received data in detail with all expected AFTN or AMHS parameter values. A user-friendly presentation of the complex AMHS data structure is given by the XML message viewer for further analysis and - in general - for trouble shooting. When a test step has been executed, a green or red result field indicates success or failure. All executed test steps and results are automatically recorded.

Supported test scenarios

The test tool supports the 59 test scenarios, which are defined in Appendix D of the EUR AMHS Manual (ICAO EUR Doc 020). The test cases cover native AMHS communication and AFTN/AMHS message conversion in either direction.

The test tool is able to send:

- messages with IAS-text or general-text body part
- messages with intentional errors in the ATS-Message-Header for negative testing,
- notifications, reports and probes with user-provided values.

With the test tool, the user (test personnel) is able to observe and verify:

- AMHS parameter values of the envelope and content for every incoming/outgoing message,
- external/internal trace information conveyed in the envelope of messages received from the IUT,
- contents of delivery and non-delivery reports showing reason and diagnostic code in plain text.
- translations from AFTN addresses to XF- or CAAS addresses and vice versa.

AC-B Products and Services

AMHS Conformance Test Services:

- on-site conformance testing
- test result analysis and reporting
- regression tests

AMHS Conformance Test Tool:

- Linux PC with test drivers, the test control and evaluation application TEVA and the EURAMHS test package that includes all standardized AMHS conformance tests
- training for the operation of the test tool

Advanced Test Scripting:

- development of AMHS test scenarios to verify customer specific system requirements
- implementation of customized tests

AMHS Seminars:

- AMHS engineering training courses
- AMHS operator training courses

Your Benefits

- Efficient testing: Automation reduces test duration down to 25%-33%.
- Easy regression testing: Once prepared, an automated test can run multiple regression tests every time the IUT software is upgraded. Every test can be reproduced in an authentic way.
- Enhanced fault analysis: Detailed view of all message exchanges.
- Smart reporting: The test tool records all test steps and stores test results in a file.

AC-B specializes in providing IT-solutions for communication, information, monitoring and control in distributed and heterogeneous environments. We transform your business needs and define testable requirements, custom design system architecture and successfully implement your IT-solution. To modernize already productive systems, migration solutions help realize new targets. AC-B's comprehensive services include overall feasibility studies, dedicated consulting services in technical or project-specific matters, project management support as well as turn-key project execution from requirements acquisition to commissioning. AC-B provides maintenance and support for existing systems, with an optional 24/7 helpdesk / hotline service. Included in our client base are several well-known companies and organizations such as the German Civil Aviation Authority (DFS), the German Aerospace Centre (DLR) and the European Aeronautic Defence and Space Company (EADS). Projects awarded to AC-B include: the maintenance and support of VAN - the national messaging network of the DFS - used for the exchange of air traffic control information; project management and quality assurance support for the Meteosat weather satellite ground station operated by the DLR.

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References

Since 2006, AC-B performed ten official AMHS conformance test sessions and verified AMHS systems built by six different manufacturers. AMHS systems for the following ANSPs have been verified by AC-B:

- Germany—DFS, Deutsche Flugsicherung GmbH
- Germany—BATSO, Bundeswehr Air Traffic Services Office
- Austria—Austro Control GmbH
- Malta—MATS, Malta Air Traffic Services
- Denmark—NAVIAR, Danish Air Navigation Services
- Russia—RADTELCOM, Radio Telecommunication Centre of Civil Aviation