



ARTICLE OFFPRINT

EUROCONTROL'S ARTAS –
A CONTINUOUS SUCCESS STORY & A CHALLENGING FUTURE



Author: Robert Clauß, Team Leader, SMA-SDP
Published at: www.airport-int.com, June 2008

COMSOFT

EUROCONTROL'S ARTAS – A CONTINUOUS SUCCESS STORY & A CHALLENGING FUTURE

In 2007 the successful partnership between EUROCONTROL and COMSOFT has been reinforced by the CAMOS follow-up contract awarded to the German ATC/ATM supplier. After six outstanding years of cooperation, the partners are ready to face the new challenges for the future of ARTAS.

ARTAS, the European ATM SuRveillance Tracker and Server, is one of the core elements of the surveillance chain of more than 20 European air navigation service providers. It is employed both for civil and military purposes. As a state-of-the-art multi-sensor tracking system its purpose is to make use of all available sensor input data and to provide an up-to-date and accurate air situation picture to its users. Based on the universal exchange format ASTERIX, ARTAS processes a wide range of sensor data types, such as for classical radars (PSR, SSR, CMB), for Mode S (elementary and enhanced surveillance) and for ADS-B sensors. Processing of surveillance data from Wide Area Multilateration (WAM) and ADS-C sources will be integrated into the next version of the system. The ARTAS application software is free of charge to all ECAC member states and comes with a centralised maintenance service for all users.

1 – ARTAS - PAST TO PRESENT

ARTAS was developed by EUROCONTROL on behalf of its member states back in the late 80's. In June 1998 the first system went operational in Schiphol, the Netherlands. In 2001 COMSOFT was selected as industry partner to support the member states with their existing and forthcoming ARTAS installations. At that time, with 3 operational and 9 test sites ARTAS was still in its fledgling stage. Since then the situation has changed significantly (see figure below); over the past years, COMSOFT – on behalf



Development of ARTAS installations

of EUROCONTROL – has worked constantly on enhancing the ARTAS functionality and technology and on improving the ARTAS service model. Today ARTAS is operational in 19 ATC centres of 14 countries; including test sites the number exceeds 30 centres.

The most important advancements in the recent past have been the development of the ARTAS V7 versions (V7A0, V7A1). They introduced tracking based on aircraft-derived data, now enhanced with ADS-B and Mode S surveillance information in addition to the classical radar data sources. Another major step forward has been the introduction of a new development and system platform using Linux OS, thus disengaging ARTAS from the dependency on a single hardware and operating system vendor, and opening up a wide range of additional possibilities for future ARTAS system platforms.

2 – CHALLENGES OF THE FUTURE

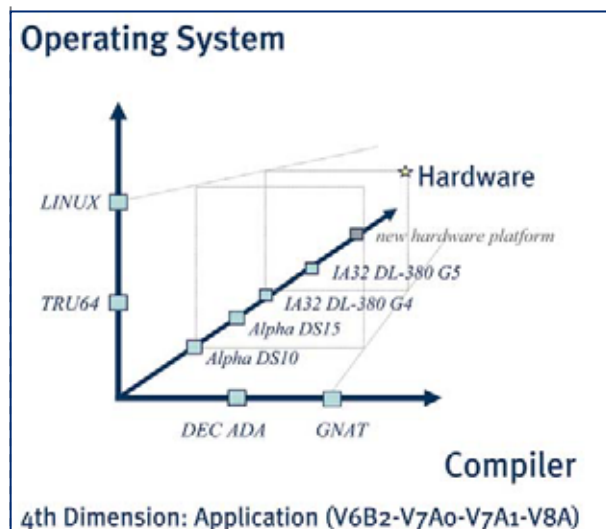
The evolution of the ARTAS tracker is far from having reached its end: On the contrary – new challenges are on the horizon and in the near future a host of innovations and adaptations will further enhance the system, delivering new products, functionalities and support tools for the ARTAS user community. The EUROCONTROL and COMSOFT teams now focus on their realization.

On the functional side the focal point is the development of the new ARTAS version V8 which will include the processing of Wide Area Multilateration and ADS-C data, thus ensuring that soon ARTAS is also ready to take advantage of these new surveillance infrastructure elements. A strong software team works highly motivated, embarked on upgrading the system for the processing of multilateration target reports and ADS-C messages. The new version V8 will be released in 2009 together with an updated development and system platform based on new versions of operating system and COTS software.

Further objectives for the ARTAS future are:

- The realisation and enhancement of tool sets for automated tracker verification and validation,
- the simplification of the ARTAS system architecture, including the flexible allocation of software to hardware components aiming at a reduction of the number of required hardware nodes,
- and the integration of an enhanced middleware component into ARTAS.

On the logistics side the focal point is to further improve and continue to keep up with the high demands on the CAMOS service. As a result of an escalating number of ARTAS installations paired with an increasing number of operational system platforms, the number of ARTAS users claiming services is multiplying. The increasing complexity of the system in terms of quantity of software versions, hardware and OS platforms along with required development environments will be a tremendous challenge for CAMOS, the centralised ARTAS maintenance service.



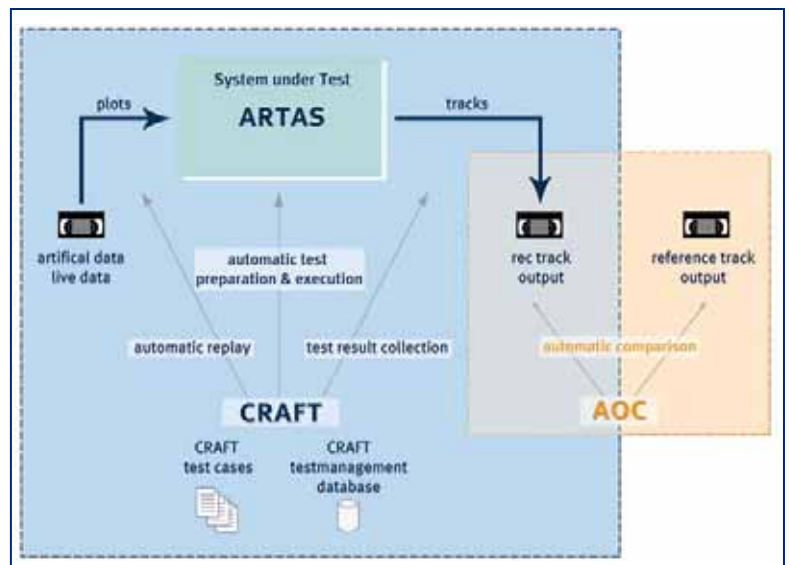
ARTAS system platforms



ARTAS G5 Baseline system

2.1 – Automated Tracker Verification & Validation

Verification and validation of the operational use of the ARTAS tracker as a part of a specific surveillance infrastructure becomes more and more important. At the same time, considering the increase in functionality, applied surveillance sensor techniques, software versions and number of ARTAS users, this procedure has also become more and more complex and labour-intensive. In order to render these verification and validation activities as efficient as possible for the ARTAS user community, it will be vital to implement as much automated testing procedures as possible. As a consequence, to succeed with this venture, the employment of proper tools is necessary, especially in the area of automated test preparation and execution as well as in test result analysis. In order to meet these demands, two innovative tools have been developed by COMSOFT: The first, CRAFT (Common geneRiC Application Framework for Testing), is a generic test framework for the testing of function, performance, load, stability and endurance of the system. The second tool, AOC (Automated track Output Comparer) is an analysis tool for tracking evaluations, providing systematical comparison with reference track outputs.



New tools for ARTAS verification and validation, CRAFT and AOC

CRAFT

CRAFT is a tool for fully automated test execution, suitable for all ARTAS versions. It allows to create ARTAS-version-independent test cases, and thus provides enhanced regression testing-capabilities for the periodically released software updates: CRAFT conceals the software version's specific interfaces, configuration and parameterisation. The preparation of the system under test, as well as the actual execution of the tests, the collection of test results and its analysis is done automatically by CRAFT. All generated reports can be stored and re-used at any time for statistical analysis (the

complete history of the testing process remains available). With CRAFT the exchange of test information and the repetition of test executions are no time-consuming tasks anymore.

AOC

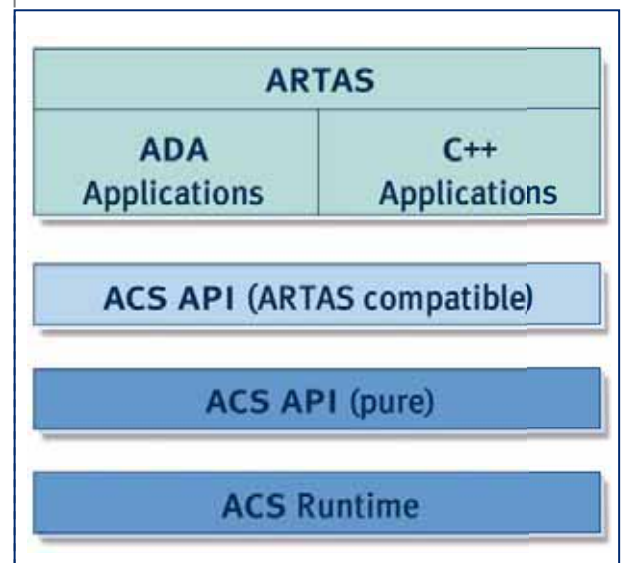
AOC is a tool capable of comparing a track output recording from a version under test with a stored reference track recording: it detects and flags all potential deviations in the test recording, comparing the track attributes, such as position information, speed vector information, accuracy information, track update states etc. AOC allows the flexible definition of thresholds, when a deviation shall be considered as a warning or error. Analysis runs can be automated and integrated into CRAFT-controlled testing processes. AOC is perfectly suited for automated regression testing; together with CRAFT the tools make up an effective set for buildup, automatic execution and result analysis of entire tracker regression test suites.

2.2 – Simplification of the ARTAS system architecture

With the migration of ARTAS onto a LINUX platform, COMSOFT has enabled a wide range of possibilities for operating systems and hardware platforms for future ARTAS versions. State-of-the-art ARTAS systems employ the Red Hat Linux distribution and IA-32 based server hardware, which comes with a significant increase in processing performance compared to the legacy Alpha architecture. At the same time the increase in processing performance makes old design decisions obsolete which dealt with the distribution of capacity-intensive ARTAS software processes onto several supporting hardware nodes. An objective for future ARTAS architectures is to achieve a reduction of hardware platforms combined with an improved level of hardware independency, while ensuring the same level of high reliability, stability, performance and safety. In ongoing studies the use of a virtualisation software like XEN or Vmware as an interim solution for a leaner ARTAS system platform, e. g. for evaluation and training purposes, is considered. As a mid-term solution the clean re-hosting of the ARTAS software onto a reduced amount of hardware servers is planned, thereby simplifying the ARTAS system architecture. This new design will at the same time remove inherent complexity and caters for the needs of present-day and future ARTAS users.

2.3 – Middleware replacement

A further important milestone in the evolution of the ARTAS tracker is the release of the ARTAS Common Services (ACS) library: it will introduce a new collection of middleware components and replace the predecessor OTS middleware, a proprietary and therefore inflexible solution. COMSOFT is implementing a completely new middleware solution which will become an integral part of ARTAS, equipped with a lean and modular architecture optimised for ARTAS' processes. This development pushes ARTAS ahead

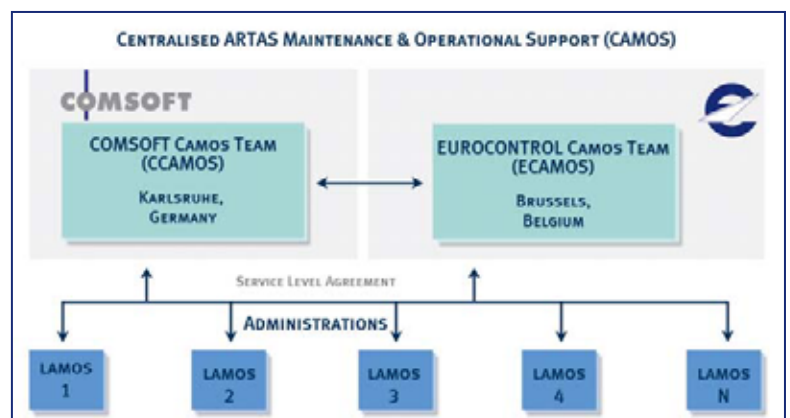


ACS middleware composition

towards becoming an open-source product. ACS will provide the middleware services to all distributed ARTAS applications, and will further improve the efficiency of the maintenance and development work in the future, especially in the area of the ARTAS middleware component. Another benefit is that ACS will be developed in ADA and will remove existing areas of uncertainty within ARTAS with respect to safety assurance.

2.4. – Challenges for the CAMOS Service

One of the major business advantages of the ARTAS tracker is EUROCONTROL's centralized maintenance service CAMOS (Central ARTAS Maintenance and Operational Support), which is free of charge for all ECAC member states. The service is executed by the CAMOS team formed by EUROCONTROL and COMSOFT. CAMOS support is organised around a service level agreement (SLA) between the ARTAS users and EUROCONTROL, which defines scope and volume of work as well as response time for user requests. ARTAS users maintain a LAMOS (Local ARTAS Maintenance and Operational Support) team which addresses the EUROCONTROL CAMOS team (ECAMOS), located in Maastricht and Brussels. ECAMOS is responsible for initial analysis of requests, and assignment of priorities. COMSOFT's CAMOS (CCAMOS) team will perform required actions, including troubleshooting, problem resolution or implementation of ARTAS change requests.



CAMOS service structure

The ARTAS product, hand in hand with the CAMOS service has a very successful history. Today, the provision of CAMOS services shape up to a more and more complex mission, due to the increasing number of ANSPs involving ARTAS in operational environments or in test installations. On top the service team encounters an increasing number of software versions and supported development and system environments. The challenge will be to maintain the high quality level of the centralized service, satisfying the needs of the ARTAS users while being as efficient as possible with respect to product maintenance and evolution.

As part of the CAMOS framework, COMSOFT is also entitled to perform turnkey supply of ARTAS systems, including system procurement, training and tuning at the ANSP's premises, in order to assist them with their continued successful use of ARTAS. The offered services include standardised and field-proven training suites, addressing different types of customer staff and expert levels, including management staff, maintenance staff and LAMOS staff. Training is carried out at the customer's premises by a team of senior ARTAS specialists, all with several years of experience in ARTAS development and ARTAS maintenance.

Two alternative training suites are offered:

- A "Basic Training" course for introducing the customer's staff into the operational use of ARTAS.
- A "Full Training Suite" covering all aspects of ARTAS both in theoretical and practical aspects.

At the end of the course each trainee receives a completion certificate, identifying him as a trained ARTAS operator or maintenance personnel.



Complete list of ARTAS services

3 – CONCLUSION

During the past years ARTAS has become the by far most sophisticated and successful tracking system available on the market. The challenge of the future will be maintaining, and further improving this status: the goal for ARTAS is to remain on the frontier of state-of-the-art surveillance technology by continued functional enhancement for the modern surveillance techniques, by further optimising the installation, customisation, commissioning and maintenance processes for ARTAS and by remaining the most cost-efficient SDP solution available on the market and at the same time keeping the lowest level of time and effort involved.

Concluding one should also take a final look at SESAR which is the Single European Sky ATM Research program initiated by EUROCONTROL. This program in three major phases takes up to the year 2020 until completion. Its main objectives are to improve and reinforce safety and to increase the overall efficiency of the air traffic management system. Achieving these objectives implies on the employment of modern and future-proof products and ARTAS is one of them. The EUROCONTROL and COMSOFT ARTAS team is prepared for this ambitious project.



Your Contact:
Manfred Schmid
Wachhausstr. 5a
76227 Karlsruhe
Germany

Tel.: +49-721-9497-0
Fax: +49-721-9497-119
E-Mail: info@comsoft.aero
Internet: www.comsoft.aero