White paper: ARTAS Services

EUROCONTROL's ATM Surveillance Tracker and Server, ARTAS, is one of the most advanced and successful surveillance data processing systems in the world.

To maintain safe separation between aircraft, air traffic controllers (ATCO) need continuous, complete and accurate situational awareness of the traffic flows in their sector of airspace — defined as the Air Situation Picture, ASP. Surveillance Trackers are at the heart of the ground infrastructure that generates the ASP, fusing information from different cooperative and non-cooperative surveillance data sources into one seamless view of air traffic that is continuously updated at the ATCO's working position. The ASP is a fundamental tool for the critical task of keeping all flights safe while at the same time making optimal use of airspace capacity.

Available as a turnkey solution from FREQUENTIS COMSOFT, the EUROCONTROL ARTAS tracker (Air traffic management suRveillance Tracker And Server) has been developed and maintained to promote the harmonisation of ATM in the Single European Sky. The product boasts an impressive installed base: ARTAS tracks close to 90 percent of European flights at 43 air traffic control centres, around 100 ARTAS units are currently deployed, and almost every European state uses ARTAS as its Surveillance Tracker for en-route and approach applications.

Air Traffic Management

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ARTAS excellence

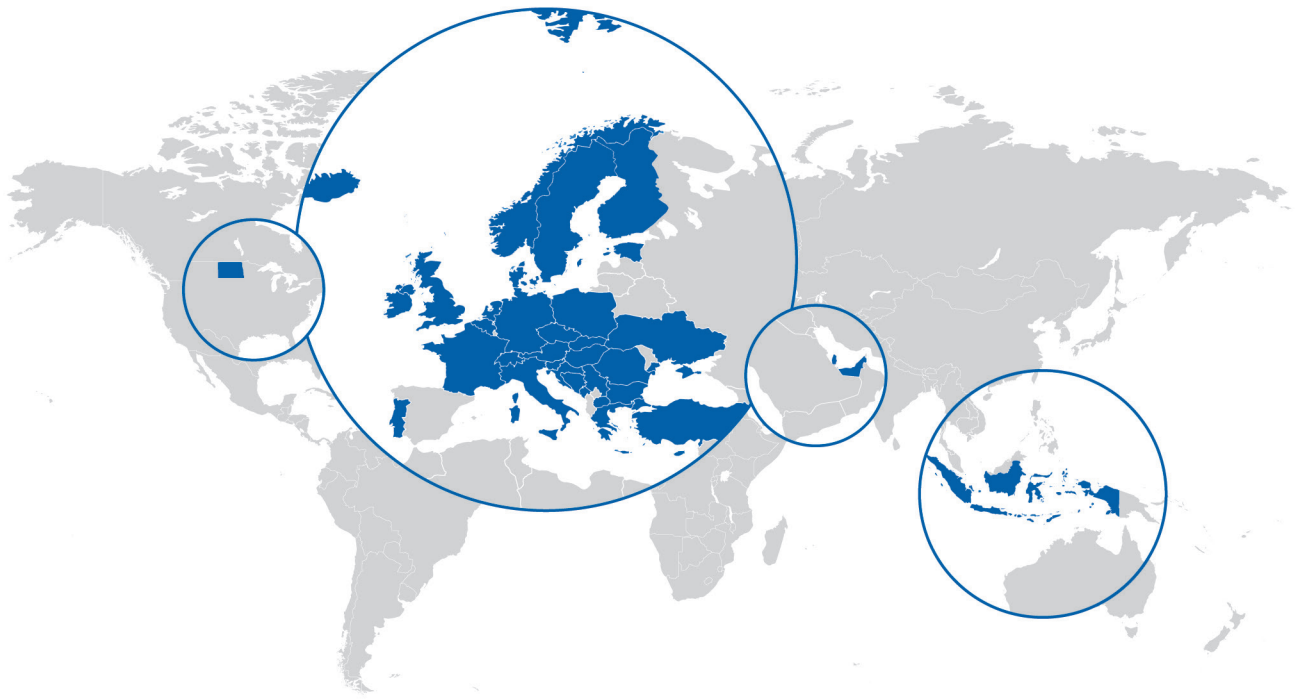
The EUROCONTROL ARTAS has evolved into a European-wide distributed system. It processes surveillance data reports (measurements) from classical primary and secondary radars, Mode-S radars, wide area multilateration systems and ADS-B to establish the ASP, which it then distributes to a wide range of system users. ARTAS, the Surveillance Tracker at the core of the ground infrastructure, is also an important building block of SESAR (Single European Sky ATM Research Programme).

The system enables interoperability and seamless operation by ensuring a uniform high accuracy for the ASP based on all surveillance technologies. As the de facto standard in Europe, ARTAS offers the potential to defragment system topologies as well as airspace, as ARTAS capacity is ready for the larger airspace volumes that constitute Functional Airspace Blocks.

Frequentis Comsoft has made a key contribution to the ARTAS success story: the Karlsruhe-based company has been a permanent fixture as an industrial partner for the EUROCONTROL CAMOS service (Centralised ARTAS Maintenance and Operational Support) since its establishment in 2001. The CAMOS service is a further pivotal point for the success of ARTAS, providing ANSPs (Air Navigation Service Providers) with software support services, continuous development and enhancements.

The EUROCONTROL ARTAS tracker is under constant evolution to meet the required levels of functional performance, and the CAMOS service enables a very efficient approach with a centralised, common roadmap development and the regular provision of baseline software versions.

Figure 1: Global reference customers for ARTAS



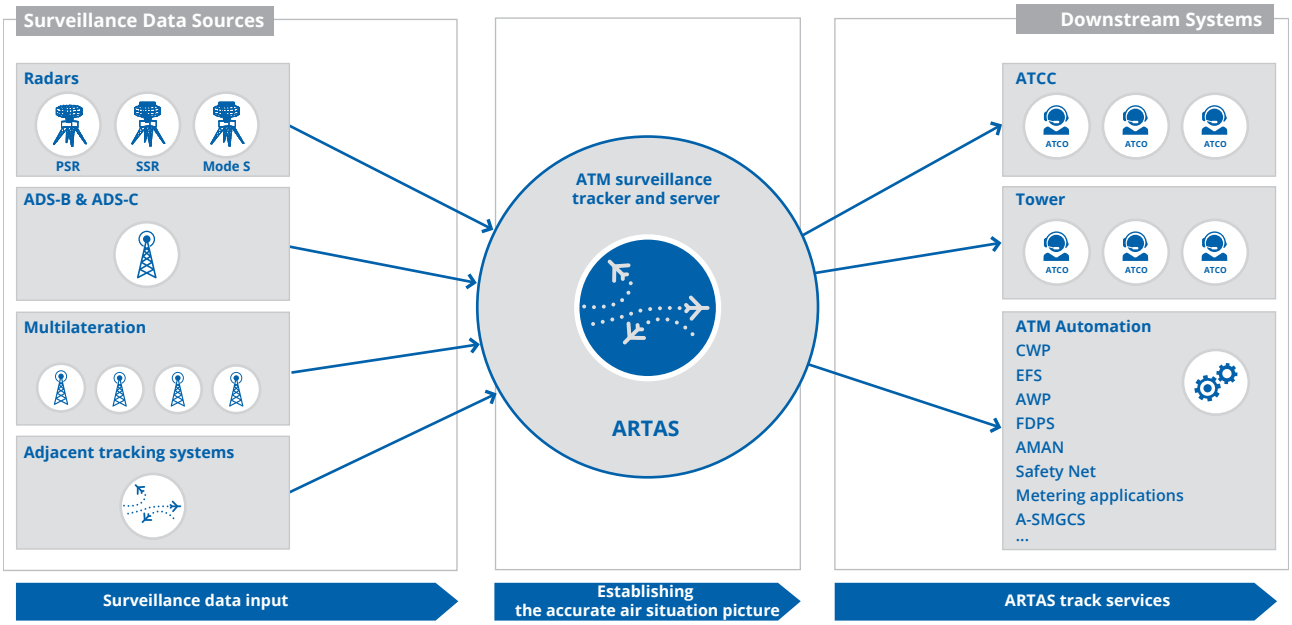


Figure 2: Schematic of ARTAS inputs and outputs

Frequentis Comsoft offers a comprehensive and field-proven service portfolio, covering turnkey ARTAS installations and upgrades, service level agreements for ARTAS maintenance for non-EUROCONTROL member-state organisations, ARTAS Training and Tracker Tuning. These expert support services are provided by a multi-national team of highly qualified professionals, holding degrees in computer science and communication, physics, mathematics and meteorology.

Services for ARTAS system roll-out and upgrades

Hardware Acquisition, ARTAS System Integration, On-Site Installation

As part of the service package, Frequentis Comsoft handles the procurement, set-up, assembly and delivery of the system, including all hardware and software options. All supplied hardware complies with the hardware baseline specified by EUROCONTROL for each respective ARTAS software version. The service package includes the baseline-compliant installation of all required software components, any necessary adjustments to prepare the interfacing with the customer's target environment and an initial quality analysis of the surveillance data (ARTAS basic tuning).

Factory Acceptance Testing (FAT)

This service package covers the pre-integration of the equipment at the Frequentis Comsoft factory and the execution of joint Factory Acceptance Testing (FAT) with the customer.

The FAT applies to the fully integrated system, but is completed within a simulated environment. It includes the use of recorded data from the respective surveillance data sources that the customer will feed into ARTAS, as well as the recording and analysis of the output (for example, recordings for use in the basic tuning activity). The objective of the FAT is to demonstrate that the system is complete, fully installed and prepared (after the basic configuration and tuning activities), and aligned with the specific requirements of the customer. FAT testing includes hardware testing, software testing and integration testing aspects, as well as endurance and load testing aspects.

On-site Training

Training services comprise the preparation, execution and wrapping-up of ARTAS training courses:

1. ARTAS Introductory Course (FCO-ARTAS-INTRO)

2. ARTAS Operational Support & Maintenance Course (FCO-ARTAS-MAINT)

In both courses, participants use ARTAS demo systems, enabling them to carry out the practical exercises of the courses themselves.

The courses shown below and overleaf are the off-the-shelf ARTAS courses, covering a standard curriculum recommended for the operation and maintenance of ARTAS, similar to the corresponding courses given at the EUROCONTROL Institute of Air Navigation Services (IANS), EUROCONTROL's training centre.

On request, Frequentis Comsoft can also offer tailored ARTAS courses, which are adapted to meet specific customer needs, for example, to cover specifics for the customer's local environment or to focus on certain aspects.

Course Name	ARTAS Introductory Course (FCO-ARTAS-INTRO)
Target Audience:	Technical Watch Operators, Operational Engineering Support, Management Staff
Delivery Strategy:	Formal classroom training course with theoretical content and practical exercises
Course Locations:	User's premises
No. of Courses:	1
No. of Trainers:	1
Duration:	3,5 days
No. of Students:	12 students max.
Course Aim:	This course is intended for users who want to have an initial introduction to the ARTAS architecture and operation, focusing on the most important topics, but without covering all aspects in depth.
High-level description of Course Contents:	ARTAS in a Nutshell
	Communication Architecture and Routerbridge
	Current Radar Data Processing & Multi-Radar Tracking Methods
	ARTAS Tracker
	ARTAS Server
	ARTAS System and Database Manager
	ARTAS Recording & Data Analysis Function
	ARTAS Implementation

Table 1: ARTAS Introductory Course

Course Name	ARTAS Operational Support & Maintenance Course (FCO-ARTAS-MAINT)
Target Audience:	Technical Watch Operators, Operational Engineering Support, Local ARTAS Maintenance & Operational Support
Delivery Strategy:	Formal classroom training course with theoretical content and practical exercises
Course Locations:	User's premises
No. of Courses:	1
No. of Trainers:	1
Duration:	4,5 days
No. of Students:	10 students max.
Course Aim:	This course is intended for engineers responsible for level A/B maintenance, system installation, troubleshooting, configuration and evaluation, and covers all relevant theoretical and practical aspects.
High-level description of Course Contents:	ARTAS Overview
	Software Overview
	ARTAS Operation
	ARTAS Installation
	ARTAS Maintenance
	Trouble Shooting
	Working Arrangement (CAMOS/LAMOS)
	Tools

Table 2: ARTAS Operational Support & Maintenance Course

ARTAS Tuning Services

The EUROCONTROL ARTAS tracker is a highly configurable system that needs to be adapted and tuned for the optimal fit for the customer's target environment.

The fine-tuning activity is initially executed after the conclusion of the personalisation and basic tuning activities on a system that can, in principle, process surveillance input but is not yet fully adapted to the target environment of the customer.

The integration and fine tuning is performed in the real environment in close cooperation with the customer's operational and technical staff. The fine tuning is an iterative process that starts with on-site data collection and then alternates between phases of in-depth analysis at the factory and configuration adjustment on-site.

The customer will be involved in this process to meet individual tuning requirements. Standard tools such as EUROCONTROL SASS-C and RAPS 3 (Radar Recording Analysis Playback and Simulation System) will be used for interoperability testing, radar performance analysis and track accuracy & detection analysis.

All results will be documented and made available to the customer in the form of a fine-tuning report. After the integration and fine-tuning phase, the ARTAS unit will be functionally prepared to handle operational traffic.
Fine tuning activities can be triggered by changes in the sensor environment (new/changed radars, addition of ADS-B, addition of WAM, addition of space-based ADS-B), changes in air space or operational target environment (altered/enlarged domain of interest, addition of airport areas, etc.) or a regular intervals to ensure that any such changes are reflected in the tuned ARTAS configuration.

ESASSP Assessment

The services cover the assessment of the following set of ESASSP (EUROCONTROL Specification for ATM Surveillance System Performance) mandatory requirements for 3 and 5 NM separation:

- Measurement interval
- Percentage of flights with probability of update of horizontal position ⩾ 97%
- Ratio of missed 3D position involved in long gaps
- Horizontal position RMS error
- Percentage of flights with horizontal position RMS error ⩽ 330 metres
- Probability of update of pressure altitude with correct value
- Forwarded pressure altitude average data age
- Ratio of incorrect forwarded pressure altitude
- Percentage of cases without large pressure altitude unsigned error ⩽ 200/300 ft for stable flights
- Percentage of cases without large pressure altitude unsigned error ⩽ 300 ft for C/D flights
- Percentage of cases with delay of change in SPI report ⩽ 7.5 seconds
- Percentage of cases with delay of change in emergency indicator ⩽ 7.5 seconds
- Percentage of cases with delay of change in mode A code ⩽ 15 seconds
- Percentage of cases with delay of change in aircraft identification ⩽ 15 seconds
- Probability of update of mode A code with correct value
- Probability of update of aircraft identification with correct value
- Ratio of incorrect mode A code
- Ratio of incorrect aircraft identification

The EUROCONTROL SASS-C tool is used to evaluate these requirements for the complete surveillance chain based on recorded data provided by the customer.

In the event that a customer opts for this service, the ARTAS fine-tuning report is enhanced to include also the results of the ESASSP evaluation activities.

Site Acceptance Support

Qualified site acceptance tests conclude the installation, integration and tuning of the ARTAS units. The acceptance tests include:

- The verification of the completeness of delivered hardware, COTS software, application, system configuration, specific adaptations and documentation
- The verification of the correct installation and cabling
- The verification of the proper installation of the software builds
- Demonstration of system operation in the target environment (breadth testing)

The SAT demonstrates the whole interconnected system in operation.

ARTAS Expert Services

ARTAS experts are on hand to respond to any customer questions regarding installing, configuring, tuning, operating or maintaining the ARTAS tracker.

FREQUENTIS COMSOFT GmbH
Wachhausstr. 5a
76227 Karlsruhe, Germany
Tel: +49-721-9497-0
www.frequentis.com