EUROCONTROL

LARA

Local and sub-Regional Airspace Management Support System

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Introduction

The world of air transport has endured a major crisis due to COVID-19 and recovery is still ongoing. However, a steady growth of air traffic is expected again while military activities will require larger volumes of airspace with the introduction of new weapons systems and the evolution of the armed forces missions. The key enablers to improve airspace management are more dynamic and flexible airspace structures and a more efficient and transparent decision-making process.

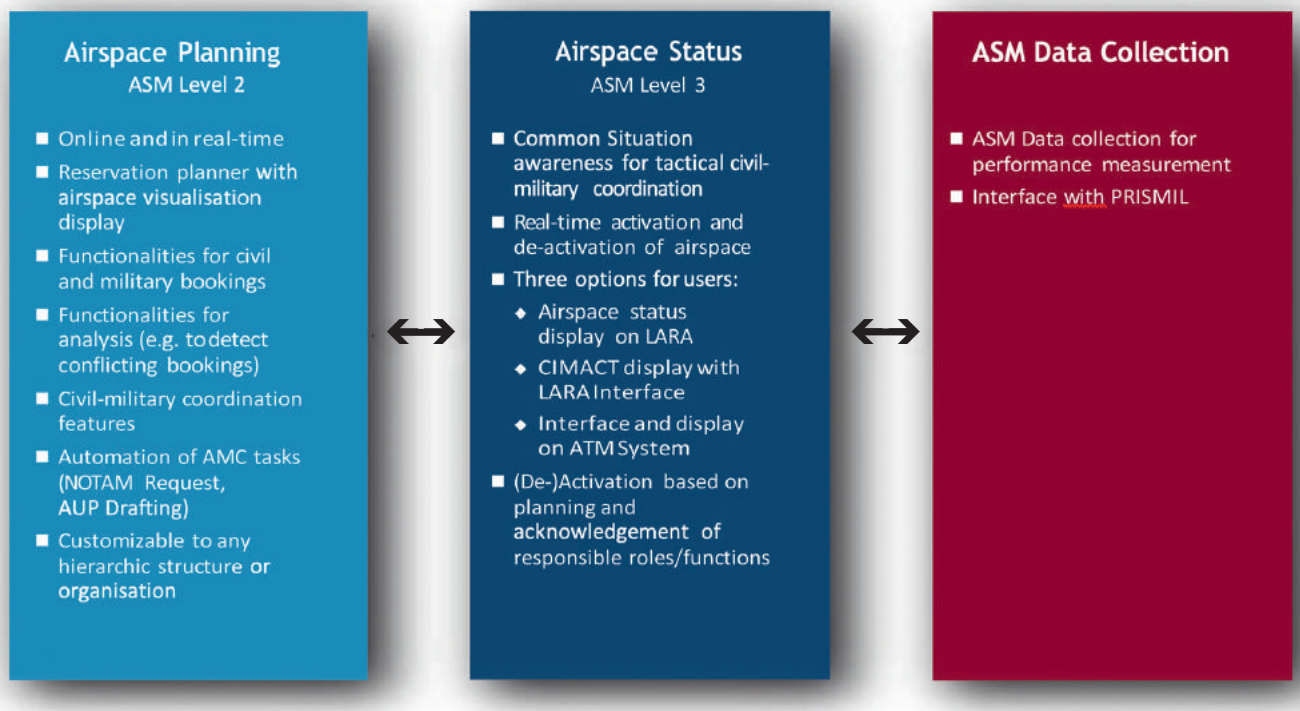
Although considerable progress has been made, current airspace management procedures, airspace availability notification processes and fragmented or lack of automation remain a challenge for the efficient allocation of airspace.

LARA (Local And sub-Regional Airspace Management Support System) was developed to improve airspace management processes at local and sub-regional level by providing mutual visibility and understanding on civil and military requirements and by enabling a more efficient collaborative decision-making process. The aim is to provide a harmonised ASM (Airspace Management) support system meeting the operational requirements of national stakeholders and conform to the European Union legislation and EUROCONTROL specifications and guidance material. LARA has proven to be an enabler for harmonisation and promoting good practices.

LARA is a EUROCONTROL software package provided without additional charge to ECAC (European Civil Aviation Conference) member States to support and enhance the airspace management process according to Advance Flexible Use of Airspace principles enabling collaborative decision-making and live situational awareness provision.

The aim of this document is to provide a high-level overview on the functionality offered by LARA. More detailed information can be obtained in the relevant LARA manuals and User Guides.

The LARA system is built around a robust, flexible and performant client-server architecture relying on a state-of-the-art GIS-enabled database, offering multiple clients' seamless access to a variety of sophisticated ASM functions.



The three modules supported by LARA

LARA's functionality encompasses all phases of airspace management as defined by the FUA concept. National procedures can be translated into customizable ASM and Collaborative Decision Making (CDM) processes in the tool.

The system supports long-term event planning and airspace management at level 2 and 3 - including real-time coordination of airspace activations. The capability to connect a national LARA system to neighbouring LARA systems allows seamless coordination between different States and facilitates efficient cross border operation. A variety of interfaces to other systems and the Network Manager enable improved collaborative decision-making.

LARA provides a user-friendly interface to allow online airspace reservation, enable transparent coordination and maximise automation of routine tasks. Through a shared real-time airspace status display, situational awareness of all players is enhanced, and flight safety improved. The system is designed to allow configuration of all relevant system parameters to adapt to national procedures, while contributing to harmonisation of the application of the Flexible Use of Airspace Concept in Europe.

The implementation of LARA supports States' compliance with the relevant provisions in the EU/EC Regulations and EUROCONTROL Specifications and guidance material.

All data exchanged is stored on a server and can be retrieved for national statistics on the use of airspace – including export functionality to PRISMIL[1] supporting the production of National Key Performance Indicators (KPI).

The LARA software[2] is developed by the UK-based company GRAFFICA under supervision of EUROCONTROL's Civil-Military Cooperation Division.

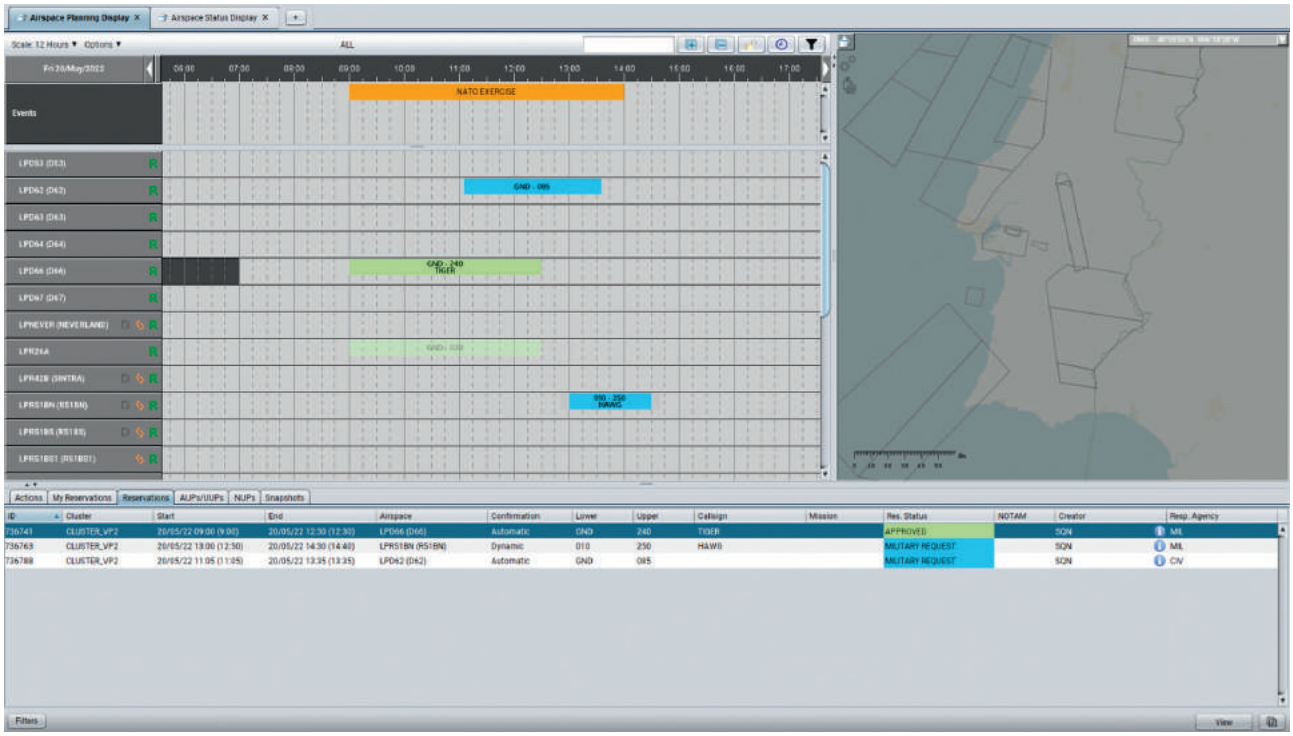
LARA development has been driven since its first prototype by its user's requirements and operational best practices. To ensure maximum compatibility with user expectations, an incremental development approach was chosen. The latest version of the software, LARA V4, available since April 2022, delivers a comprehensive set of new functionalities requested by users and required by the evolution of the Network Manager's systems.

1 PRISMIL is the Pan-European Repository of Information Supporting Civil Military KPIs (Key Performance Indicators). Its mission is to provide stakeholders with a single point of access to comprehensive and integrated high-quality information on ATM performance monitoring.

2 The LARA Software is developed in line with ESARR6 and the ISO 12207 standard considering the Software Assurance Level 3 and 4 for different parts of the software. A generic safety case is available to LARA Users to support their local safety case.

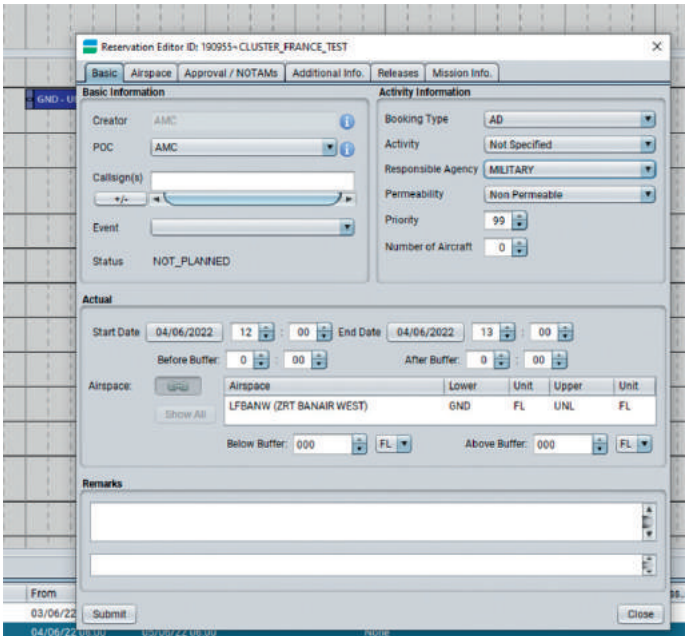
Airspace Planning

LARA interface allows to create and manage reservation requests for airspace. As all data is shared across the national network, every requestor benefits from an overview on all previously entered bookings in LARA and therefore base their own inputs on this information - allowing de-confliction of requests at an early stage.



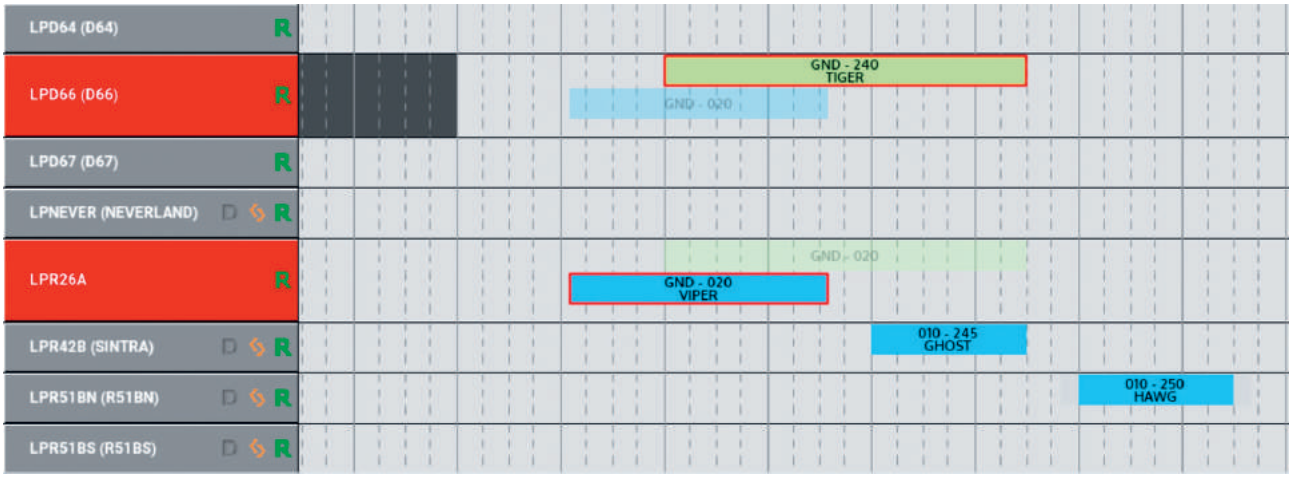
LARA Airspace Planning Display

Once a suitable airspace and associated time slot has been identified, the user calls the Airspace Reservation Editor by clicking on his desired airspace and period. This editor allows to fine-tune the request by selecting the requested levels, the type of usage and additional details on the planned mission.



LARA Airspace Reservation Editor

LARA offers the possibility to join multiple adjacent or overlapping airspaces together and create a single reservation for an airspace block, thus supporting the variable profile area design principle (VPA). LARA's interface provides a complete overview of the airspace structure in a graphical display and in textual form from dropdown menus available for each airspace.



LARA Conflict Detection

LARA is organised in "clusters". One cluster corresponds to a LARA System deployed within organizational (FAB) or national borders. A LARA Cluster can be connected to other clusters allowing a seamless exchange of data across borders. This allows airspace users to request airspace beyond national borders and provides an efficient way to manage commonly used cross-border areas and enable operations in a Functional Airspace Block (FAB) environment. When exchanging data with other LARA clusters are connected, the tool offers additional filtering capabilities to adequate the information flow to the operational requirements.

In addition to airspace reservation information, the user can add mission details for each reservation. This information is not mandatory, but can provide added value in joint operations, to produce statistics and to improve the coordination processes between different players. To address confidentiality, mission details are only accessible by authorized users.

Each airspace request will be subject to coordination and approval processes in line with national procedures and regulations. A wide variety of rules and configuration options are available in LARA allowing to tailor the Approval Process to reflect national procedures and regulations.

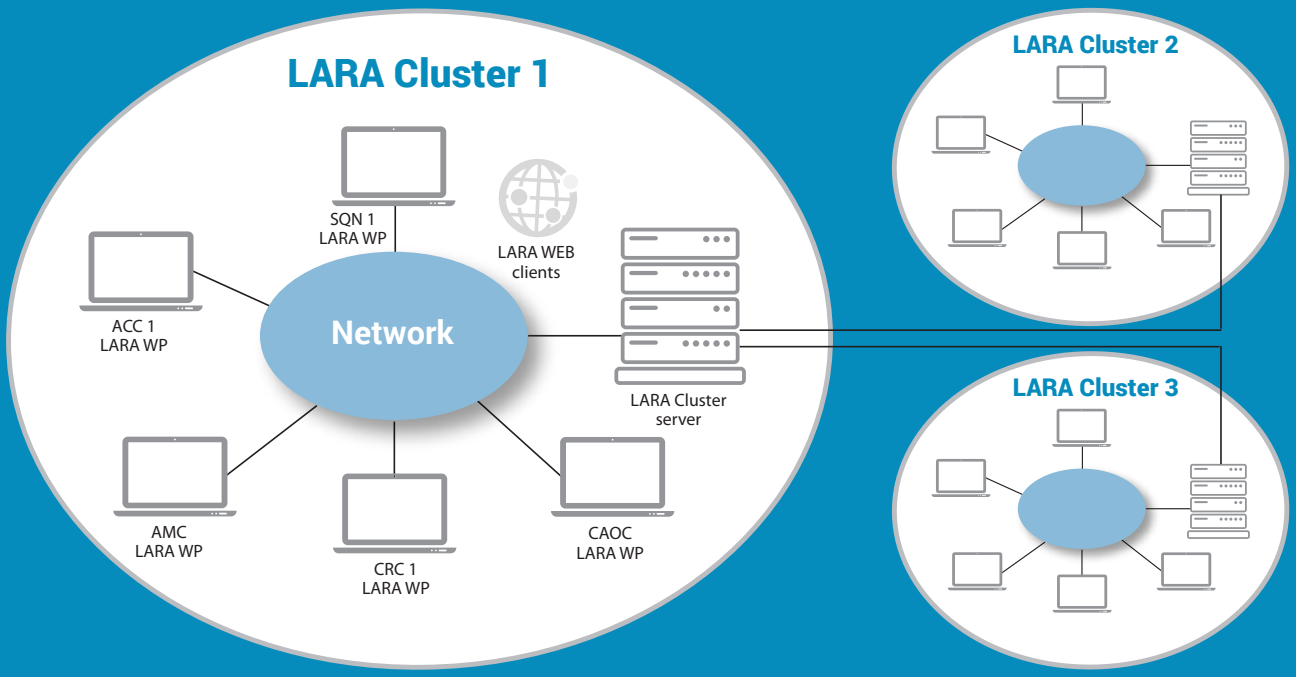
Every unit involved in the approval process is provided with an overview of reservations requiring their attention. Bookings will move up on the approval chain according to predefined rules and regulations until reaching the appropriate Airspace Management Cell. The system is provided with a Housekeeper function that allows each cluster administrator to configure the application and its approval chain to support national rules and agreements.

Each user on the approval chain has the option to approve a reservation request, or alternatively to send a proposal to the requestor, which can consist of a new timeslot, a change of levels, a different airspace, or any combination of these. The approval chain can be highly dynamic, i.e., following different approval paths depending on configurable parameters, timelines and rules.

LARA provides different means to establish communication between different actors to enable fast and system wide coordination. Comments and remarks can be entered for every reservation, which can be used and complemented throughout the approval chain.

The LARA System

The LARA software is coded in Java and can be operated on various operating systems including Windows, Linux and MacOS It communicates on standard IP-networks and supports common encryption standards. Additionally, SWIM compliant Web Services are also provided to allow remote users having hardware or networking constraints to still participate to this Collaborative Decision-Making planning process.

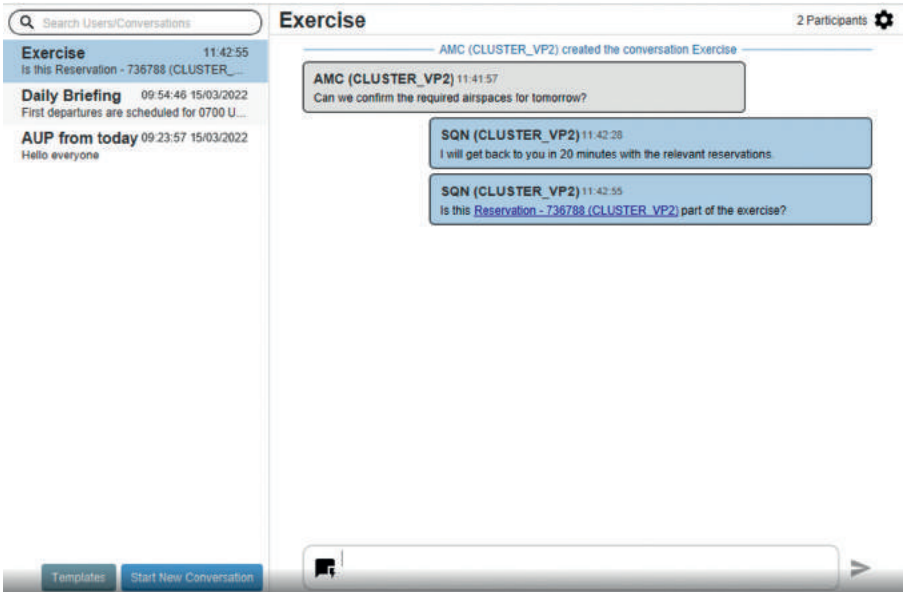


The LARA Server stores all static and dynamic data and manages the communication within the cluster. LARA's architecture allows deploying a second redundant server, ensuring seamless continuation of service even after a failure of the main server.

Airspace requests in LARA are not limited to military users booking areas for military missions. Civil airspace users – if provided with the privilege to do so - can book areas for their specific needs. Civil Area Control Centres have the option to book CDRs and Areas as Radar Vectoring or Off-Route Areas etc., depending on capacity and flow management requirements.

The closing of certain airspaces and routes may require the publication of a NOTAM to inform the aviation community. LARA automatically triggers and presents the user with a draft for the NOTAM to be issued for such airspaces. This draft can be adapted as required and used for filing a NOTAM Request at the appropriate NOTAM Office.

An online collaboration facility, similar to commonly known chat facilities, is available to allow direct and immediate communication between two or more users, including the possibility to use pre-defined templates, direct links to reservations and airspaces and a set of instant reactions to indicate approval, disapproval and alike . Email addresses, phone numbers and addresses can be retrieved for each user within the application. All previously described functionality and means of communication work seamlessly across all connected clusters.



LARA Client Collaboration Tool

LARA's Planning Prediction Tools (PPTs) support airspace managers in visually assessing AUP and UUPs, and to spot opportunities for allocation improvements. The current planning is made available on a designated Gantt chart, which allows the optimization of airspace utilisation by rearranging existing reservations. This specific Gantt chart will not have any immediate effect on the plan and will allow to carefully streamline the airspace allocation. Once this process is finalised, the system sends out automated proposals to the involved users.

The PPTs allow the user to fast forward the plan and to visualize the effect on the airspace structure highlighting the activation of areas and the resulting effect on the network through time assisting the user in spotting opportunities for improvements.

Different LARA users have specific responsibilities and may be required to focus on distinct aspects of the information contained within the LARA System. E.g., for some users, the status during the planning phase might be of lower importance, while the origin of a booking could be a primary concern. To cope with this requirement, LARA provides the user a wide range of filtering and configuration options to ease their task. By selecting the appropriate options, the display can be changed to highlight the required information. Users can also configure pre-defined views and switch between those instantly to focus on certain hotspots or specific areas of interest.

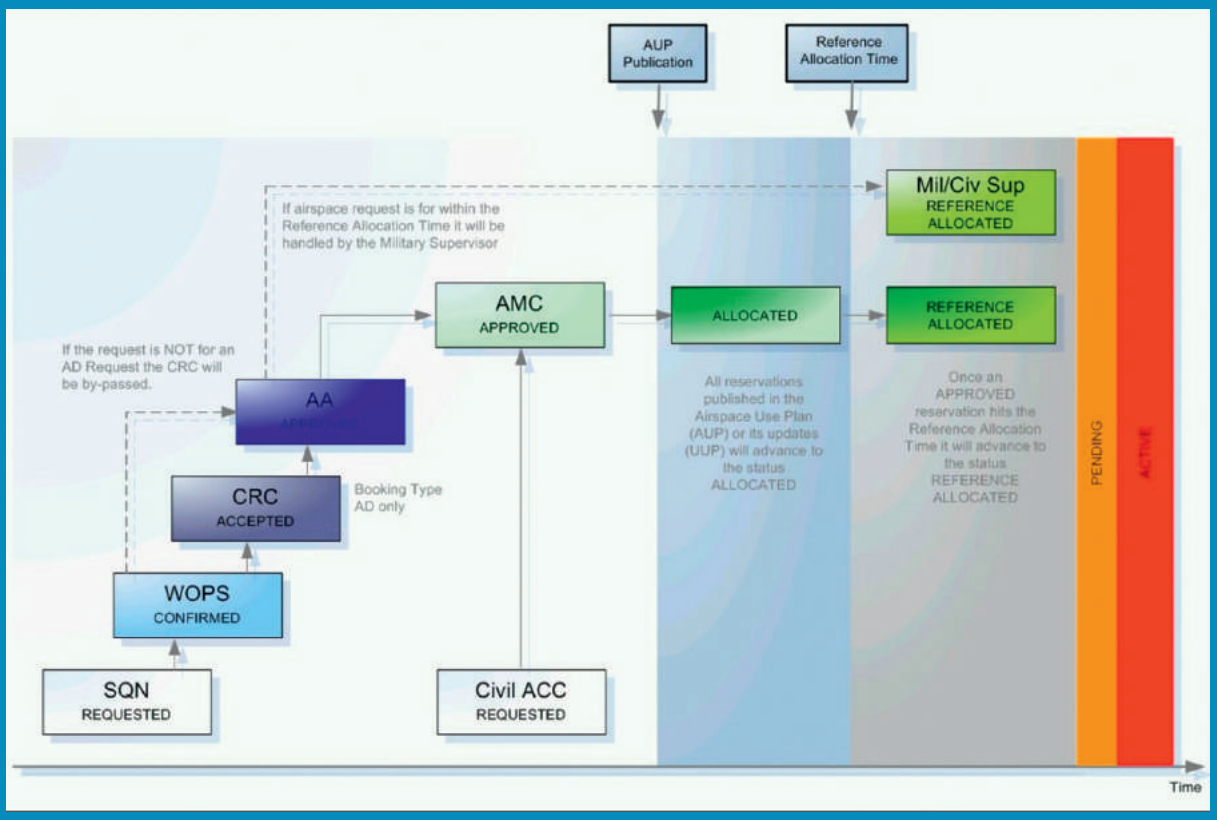
The Housekeeping Tool

Managing Environmental data, Users, Privileges and the Approval Chain

The LARA System is highly configurable to meet national requirements for an Airspace Management System across Europe. LARA is delivered with a set of tools to allow efficient management of all essential system parameters.

The LARA Housekeeper is in charge of managing the environmental data, users and roles and to establish and maintain the approval chain. Every role is granted certain privileges to book airspaces, approve certain reservations and to access specific tools. The housekeeper assigns these privileges and manages new and existing users, including their usernames and passwords.

The Housekeeper has access to the Housekeeping Tool to perform his task. This tool allows to setup and maintain the approval chain in a user friendly way through simple mouse operations - by dragging and dropping roles and approval groups. The approval chain allows additional rules and procedures to be incorporated to reflect a wide variety of national procedures.

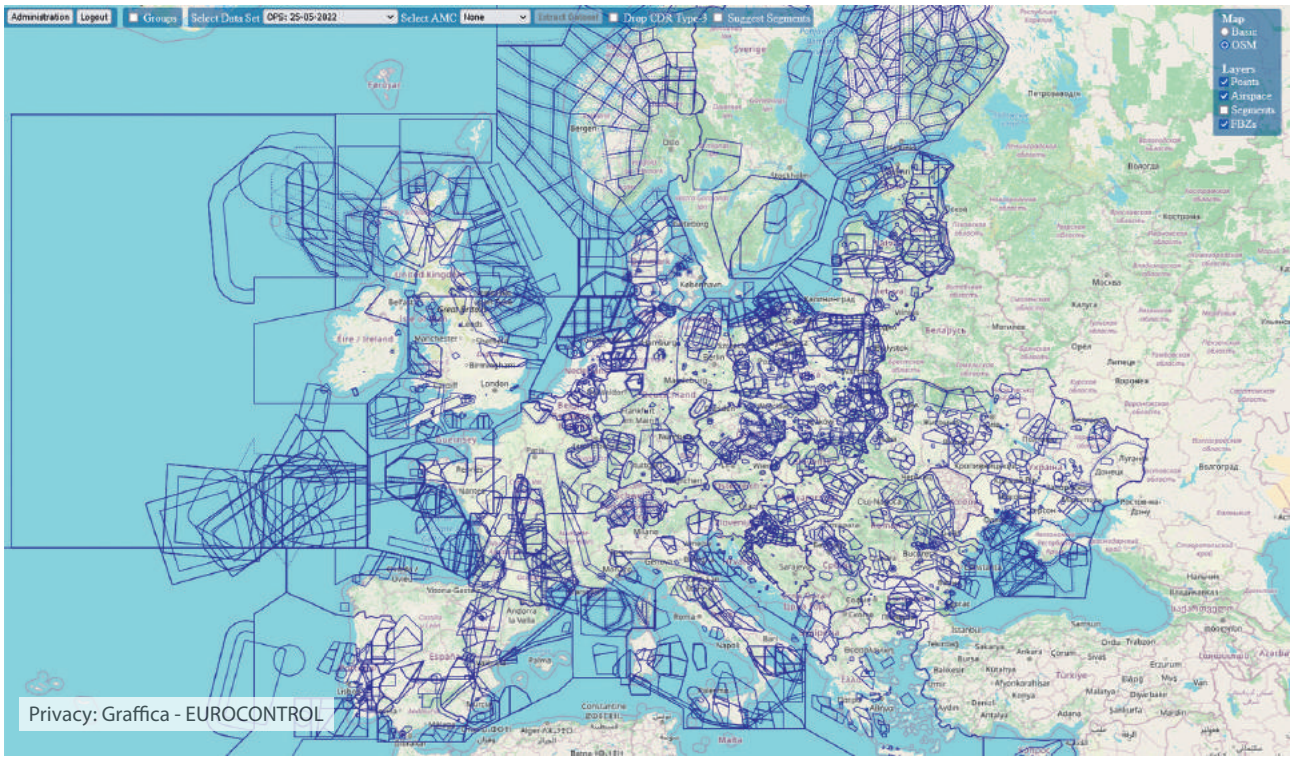


An Example LARA Approval Process

Managing Environmental Data

LARA requires a database containing up-to-date environmental data for operations. The Housekeeper of each cluster is responsible for ensuring the validity and completeness of the data.

EDQ (External Data Quality Tool for LARA) is a web-based tool which allows national Housekeepers to select and fine-tune aeronautical datasets for download and import into LARA. These datasets are defined per country and are provided via the EUROCONTROL NM B2B Airspace Structures Services. The data in EDQ is updated daily to ensure the most up to date data is available for use in LARA. EDQ can be accessed using both open Internet and NewPENS networks.



The External Data Quality Tool

The airspace data in the EDQ Tool is available for download in AIXM 5.1.1 format and MS Excel format which are both supported by LARA. The imported data can be reviewed, adapted and validated. New airspaces can be created and various configurations for each entity defined and set.

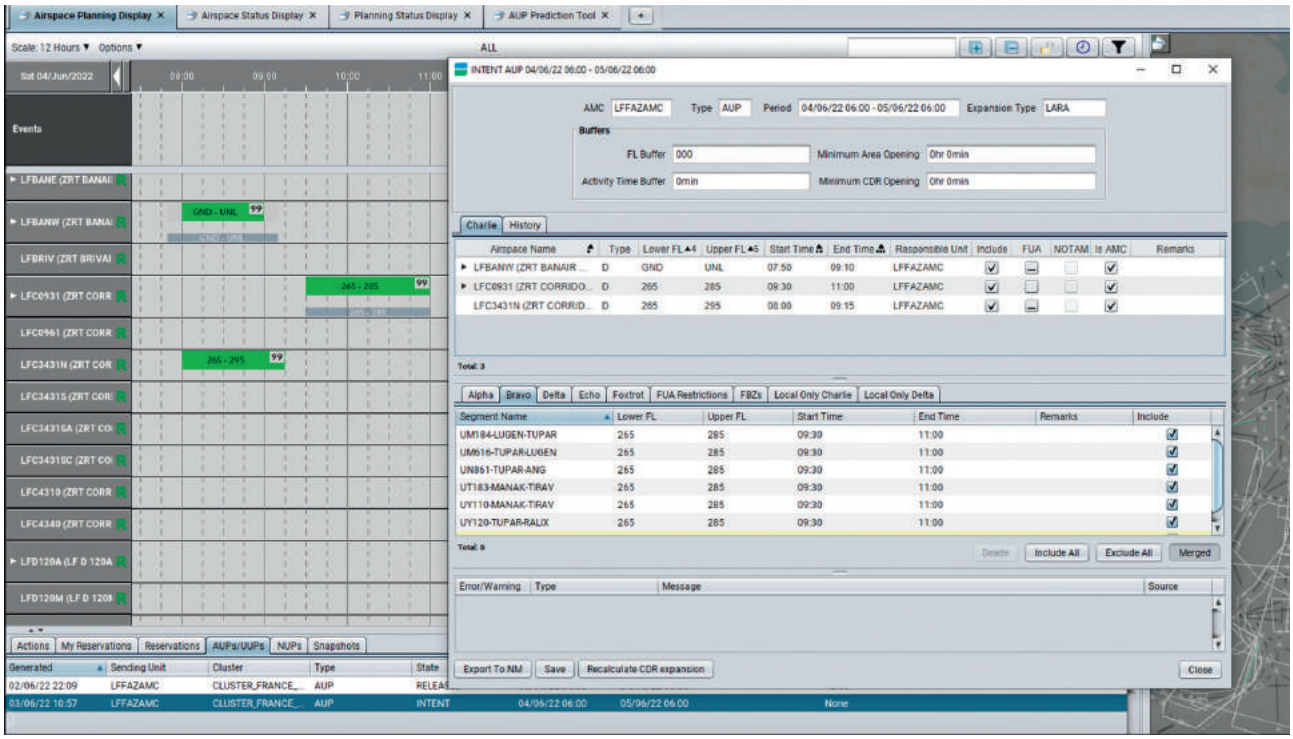
Airspace Use Plan

LARA has been designed to support the airspace management process – including the provision and distribution of the Airspace Use Plan (AUP) and its updates (UUP).

The AUP is generated by LARA based on all reservation data available for the referenced period. The local airspace manager can specify a set of parameters that are used to calculate correct closures of Conditional Routes. A user interface enables the airspace manager to remain in complete control of the AUP content, allowing adapting and changing data, as necessary. It also allows AMCs to activate particular Flight Restrictions on NM systems via the AUP.

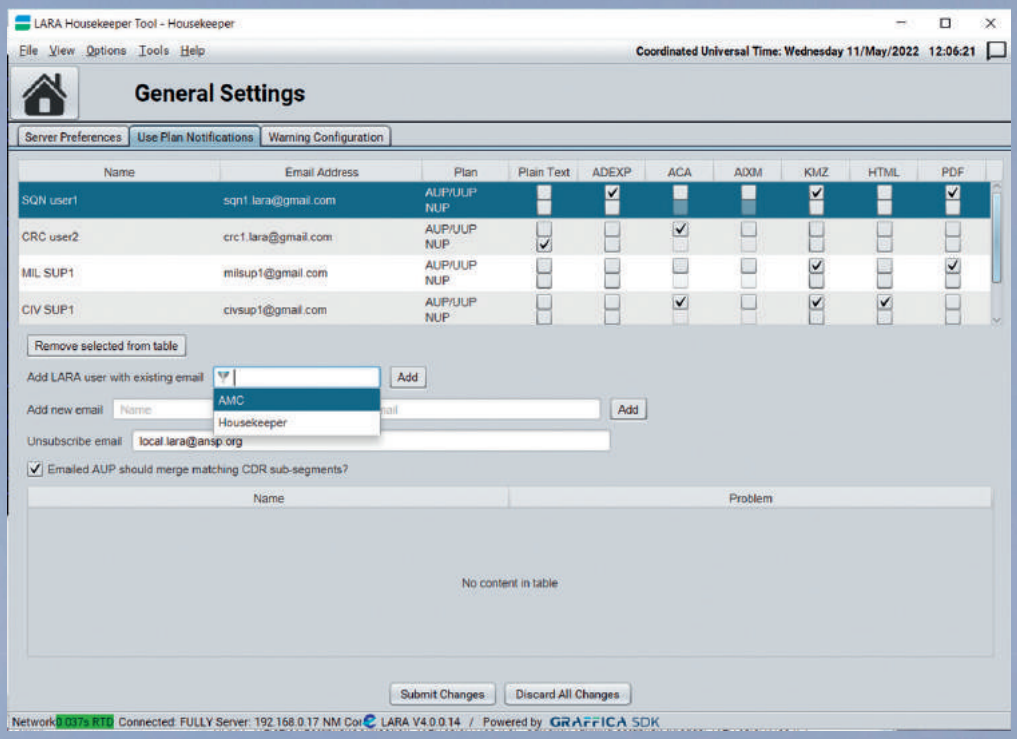
LARA is fully compatible with the latest NM B2B Web Services which allows LARA to create, update, delete, promote, and demote AUP/UUPs on the NM systems.

In addition, LARA offers functionalities to manage the National Airspace Use Plan (NUP) and its updates allowing the complete integration with existing ASM Level 2 processes.



The AUP view in LARA

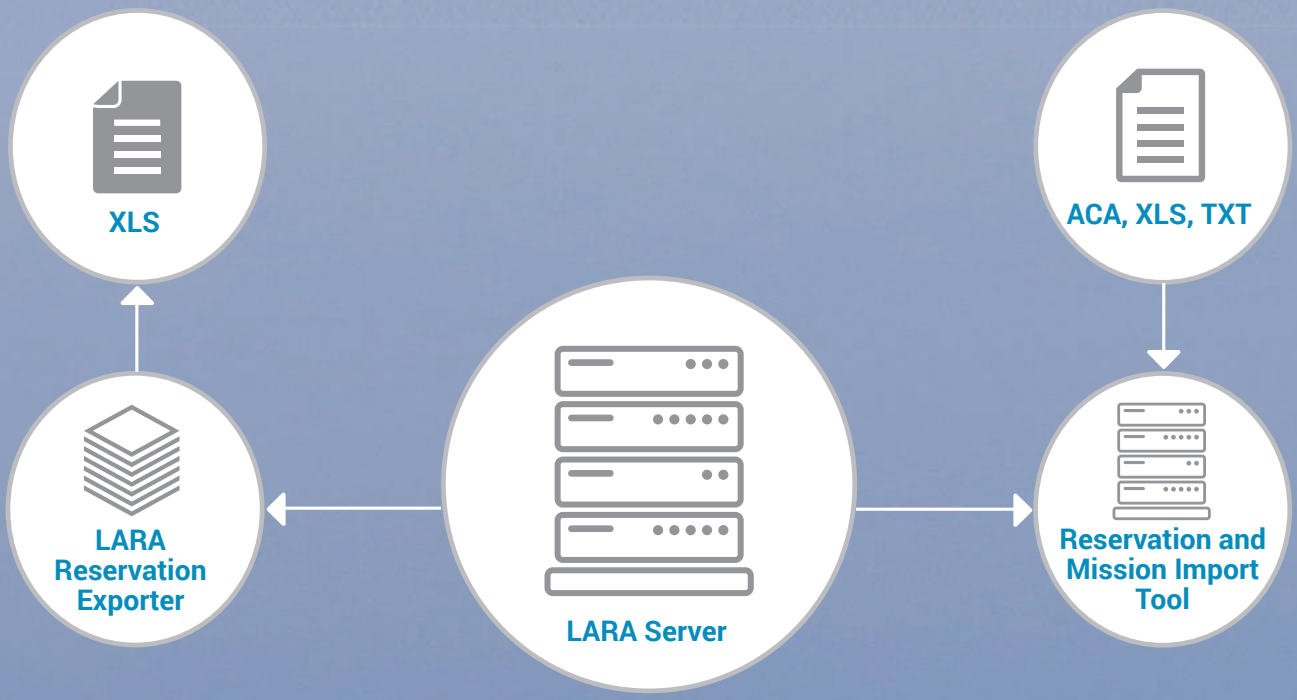
Although AUP/UUP exchanges via file transfer and/or mail is available at any time of the process, LARA can also notify to selected addresses via email and attach AUPs/UUPs and/or NUPs in customisable formats:



Released airspace usage publication notifications

LARA RaMIT and Reservation Exporter

LARA RaMIT (Reservation and Mission Import Tool) is an integrated tool which allows automatic import of reservations and missions from external sources into LARA. RaMIT supports a variety of formats, including ACA AUPs, CSV (comma-separated value) files, Excel spreadsheets, and plain text files. The full set of supported formats and the details on their contents are described in the LARA RaMIT User Guide.

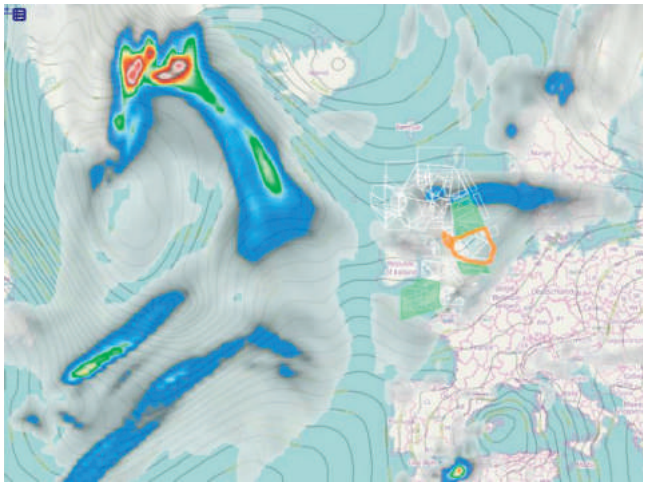


The LARA Reservation Exporter provided also as a LARA component, allows to export reservation data in a format that RaMIT understands. By combining RaMIT and the reservation exporter it is possible to mirror reservations from a given LARA System into another (shadow operations) to e.g., assess new functionalities/new concepts of operations without impacting operational LARA services.

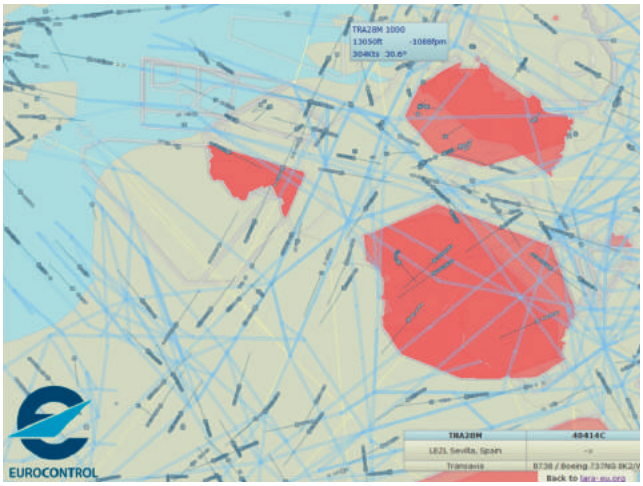
LARA Web Services

LARA provides its own web services which allow the data within LARA to be used by other external systems. The web services are provided using the REST protocol and the data is in JSON (JavaScript Object Notation) or HTML formats. The data sets retrievable through the REST web services are reservations, AUPs, activations, actions, missions and airspace. There are also services which allow reservations and missions to be created from external systems.

Web Socket feeds are available to allow external systems to subscribe to real-time updates of reservations and activations allowing LARA to be combined with other ATM data sources, like meteorological information or live traffic data.



LARA combined with Meteo



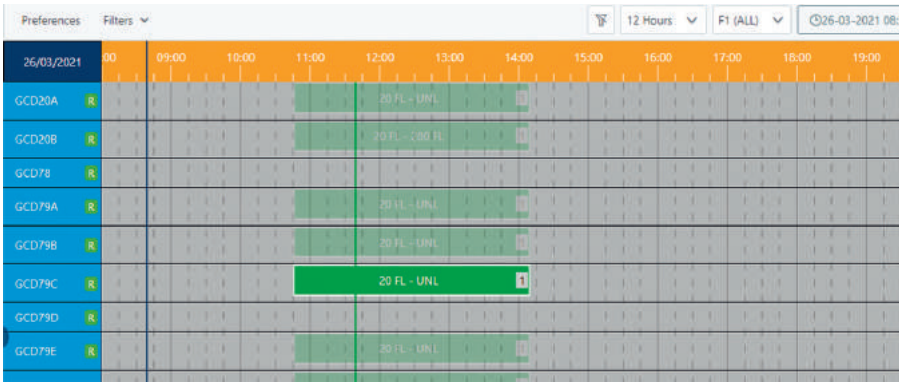
LARA combined with traffic data

LARA Web Booking Client

The integrated LARA Web Booking Client (WBC) interfaces with the LARA Web Services to provide a subset of the desktop client functionality via a web application which can run on any device with a modern browser, including tablets, without the need for any other software. Removing the requirement for Java on client devices allows for more flexible deployments and opens LARA to more stakeholders.

Key features of the LARA WBC include:

- A Gantt chart for viewing and managing airspace reservations
- Common situational awareness from wherever you are
- The ability to take part in the full collaborative decision-making process



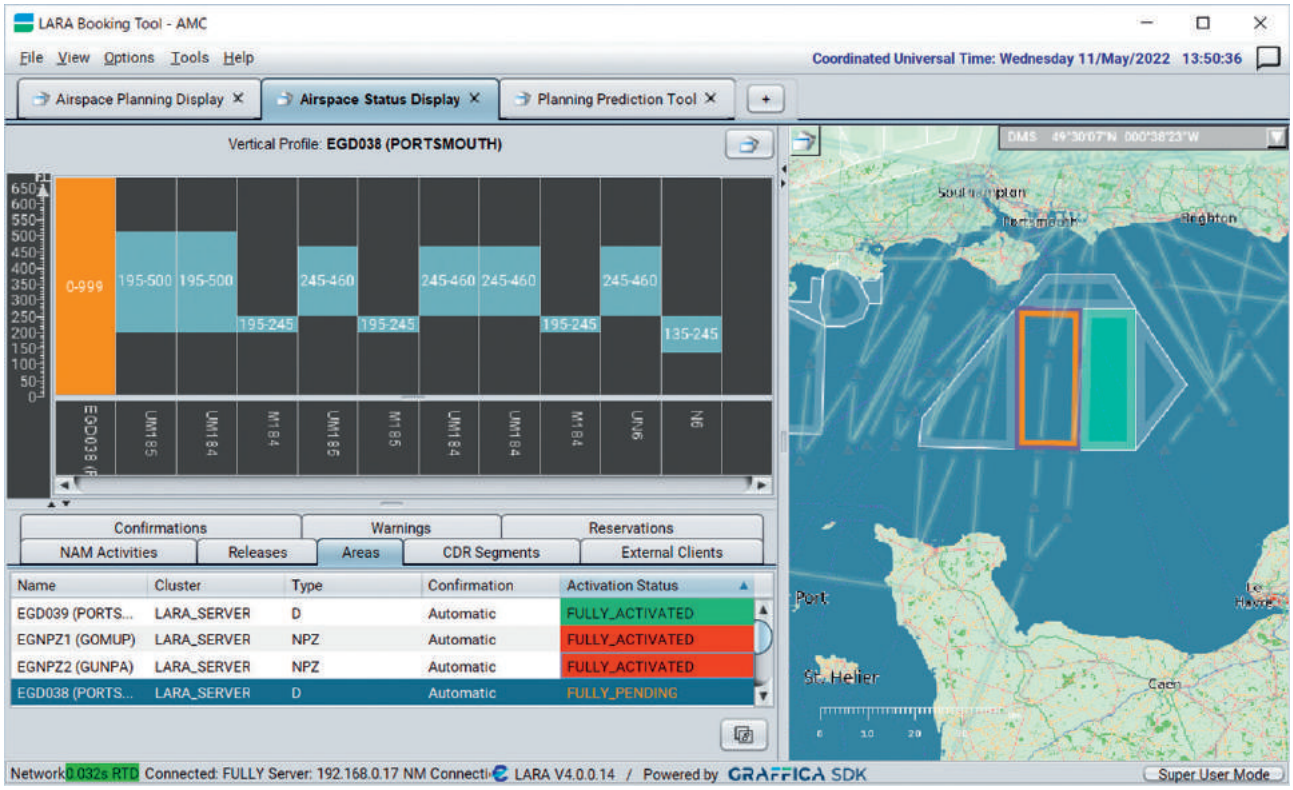
LARA Web Booking Client

Airspace Status

LARA transcends the planning phase and reaches seamlessly into the tactical phase of real-time airspace allocation. It supports activation and de-activation of airspaces and allows short-term changes to existing reservations. New requests can be introduced on short notice. Due to its network-based information sharing, all relevant users are instantly informed about every single change. Interfaces to ATM systems allow presenting the status information directly on the controller working position. All this is backed-up by appropriate safety measures.

The Reference Allocation Time is a configurable parameter in LARA, which allows defining a moment in time when the planning becomes consolidated and only minor changes are expected thereafter. This period is different in most countries and can be configured in LARA. The approval chain can be defined differently for changes and new requests before and after this time parameter. One common example would be that the Airspace Management Cell (AMC) oversees airspace allocation before the Reference Allocation Time and its authority is transferred to the responsible supervisor thereafter.

LARA provides the users with a designated overview for these tasks, the Airspace Situation Display (ASD). The ASD provides the users with all information regarding the status of airspaces. Once a reservation is approaching activation, its status is changed to "Pending" and is coloured orange on the ASD. The pending time is configurable. This "Pending"-state will inform all users about the scheduled activation of an airspace and allows them to prepare appropriately. All maps on LARA also supports integration with OpenStreetMaps, bringing additional situational awareness to the users.



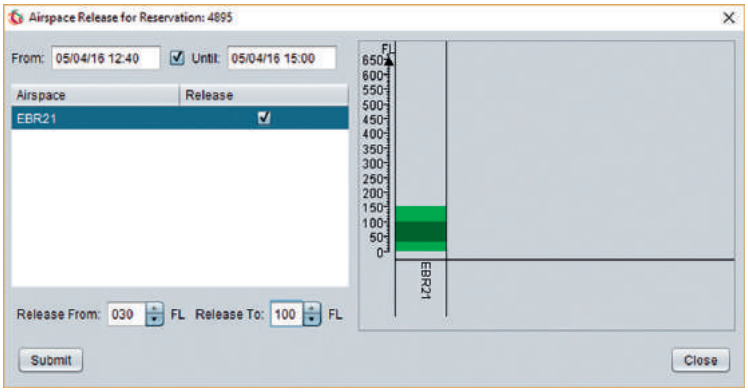
LARA Airspace Status Display

Once the pending state is reached, the supervisor in charge of the activated airspace (typically the military supervisor) can be triggered by the system to confirm the planned activation of the airspace. After his confirmation, the civil supervisor(s) will be prompted to acknowledge the activation to ensure their awareness. LARA offers the alternative to handle this process in an automated mode, not requiring manual intervention by the supervisors. Like for all LARA functionality, the modes of activation are configurable to suit different national procedures.

Once the airspace is activated it will be coloured green on the display of the agency responsible for service provision within the activated airspace - and in red for all others. The ASD provides a vertical view for each selected airspace to indicate the vertical limits of the activation and if two or more independent level blocks have been reserved for different missions.

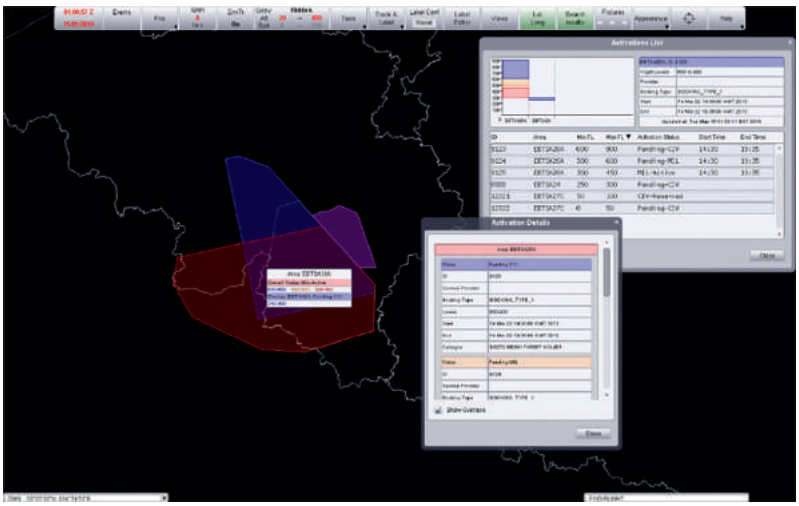
When a reservation is active, it is possible for the supervisor to release airspace, allowing temporarily unused blocks of airspace to be made available to other users.

Planning and Status views can be combined using the Planning Status Display (PSD), which integrates the planning Gantt chart with the real-time status map.



LARA Release Window

LARA can provide information on airspace status to external systems by several published interfaces. One of these allows a LARA embedded FMTP server to exchange ADEXP messages with Air Traffic Control Systems to indicate airspace status on the Controller Working Position (CWP) increasing situational awareness. In addition, this data can be made available via web interfaces to other clients and devices, e.g., to provide airspace status on a mobile device.



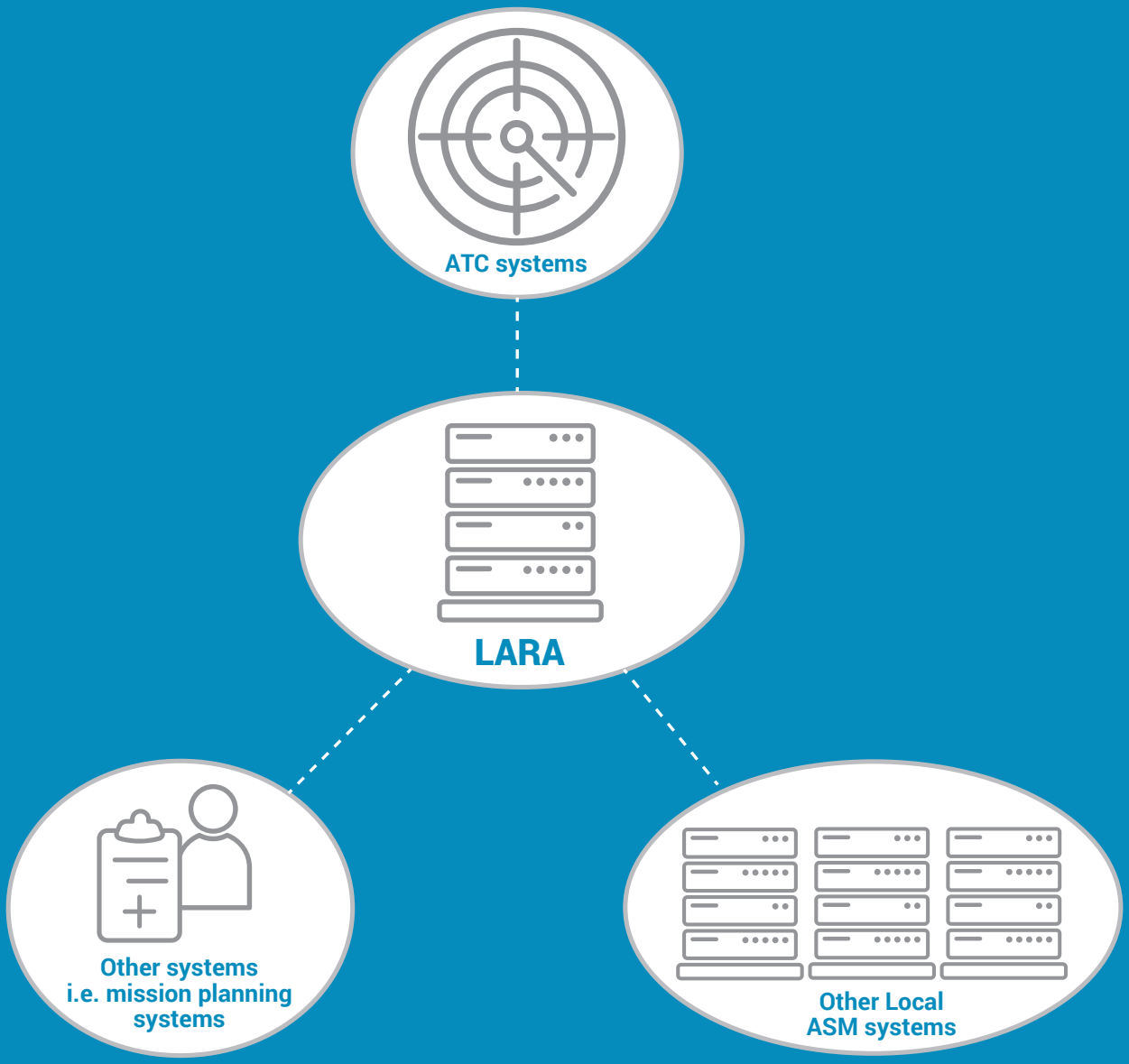
LARA – ATC Interface (FMTP)

LARA on mobile devices

LARA – EU CP1 Compliance

COMMISSION IMPLEMENTING REGULATION (EU) 2021/116 of 1 February 2021 on the establishment of the Common Project One (CP1) places requirements on ASM Support Systems for ATM functionalities and aeronautical information exchange using the SWIM yellow profile technical infrastructure.

LARA deployment ensures compliance with CP1 AF3 requirements. To address the AF5 ones, LARA is implementing the "EUROCONTROL Specification for Airspace Management (ASM) Support System Requirements supporting the ASM process at local and FAB level - Part II" thus ensuring states compliance with the relevant SWIM requirements.



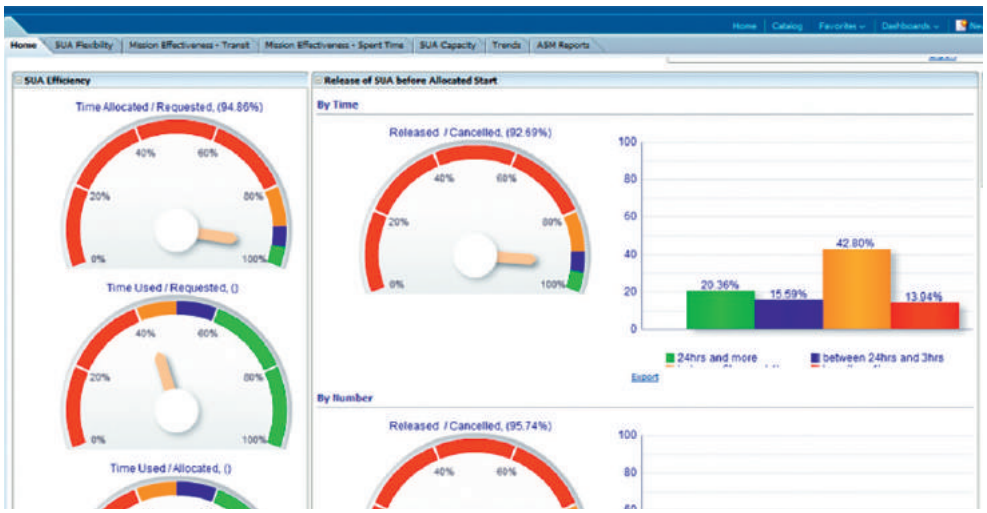
LARA – SWIM interfaces

Performance

All data managed and exchanged in LARA is maintained in a database which allows further processing and extraction. This stored information can be used to investigate and trace occurrences as all actions performed on the system can be tracked back to each user. It can as well be used to establish and maintain statistics on the allocation and use of airspaces by different users and provide a means for performance measurement.

If LARA is used in combination with an air situation display like CIMACT or any other modern Flight Data Processing System, the statistical data can be further enhanced by mapping actual flight profiles onto the airspace reservations to obtain a precise overview of actual use of airspaces, transit times and derived mission effectiveness.

An interface to PRISMIL supporting the production of standardised Key Performance Indicators (KPI) is available. Historical data contained in the system can also be provided via Web Services to third party applications.

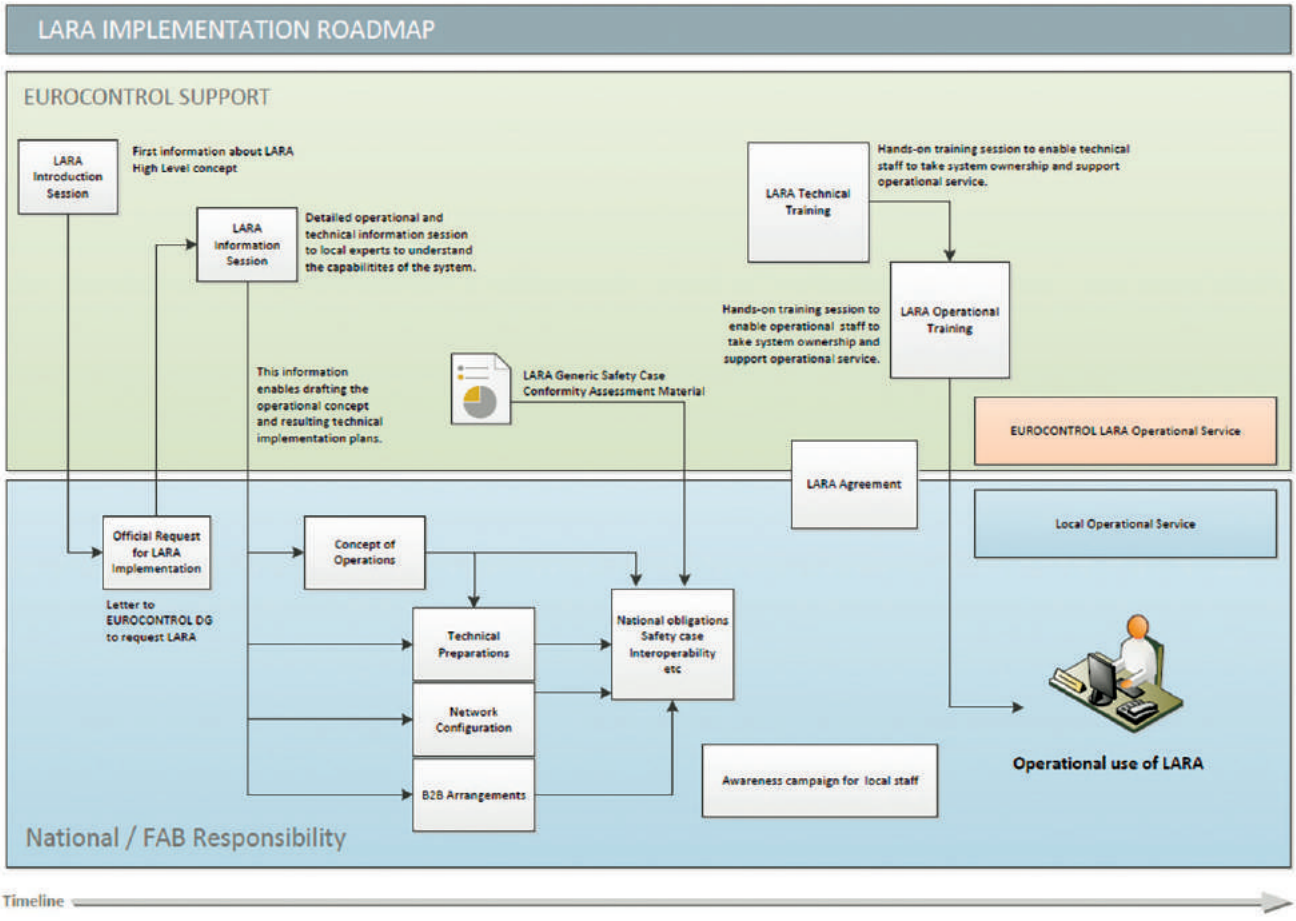


PRISMIL HMI

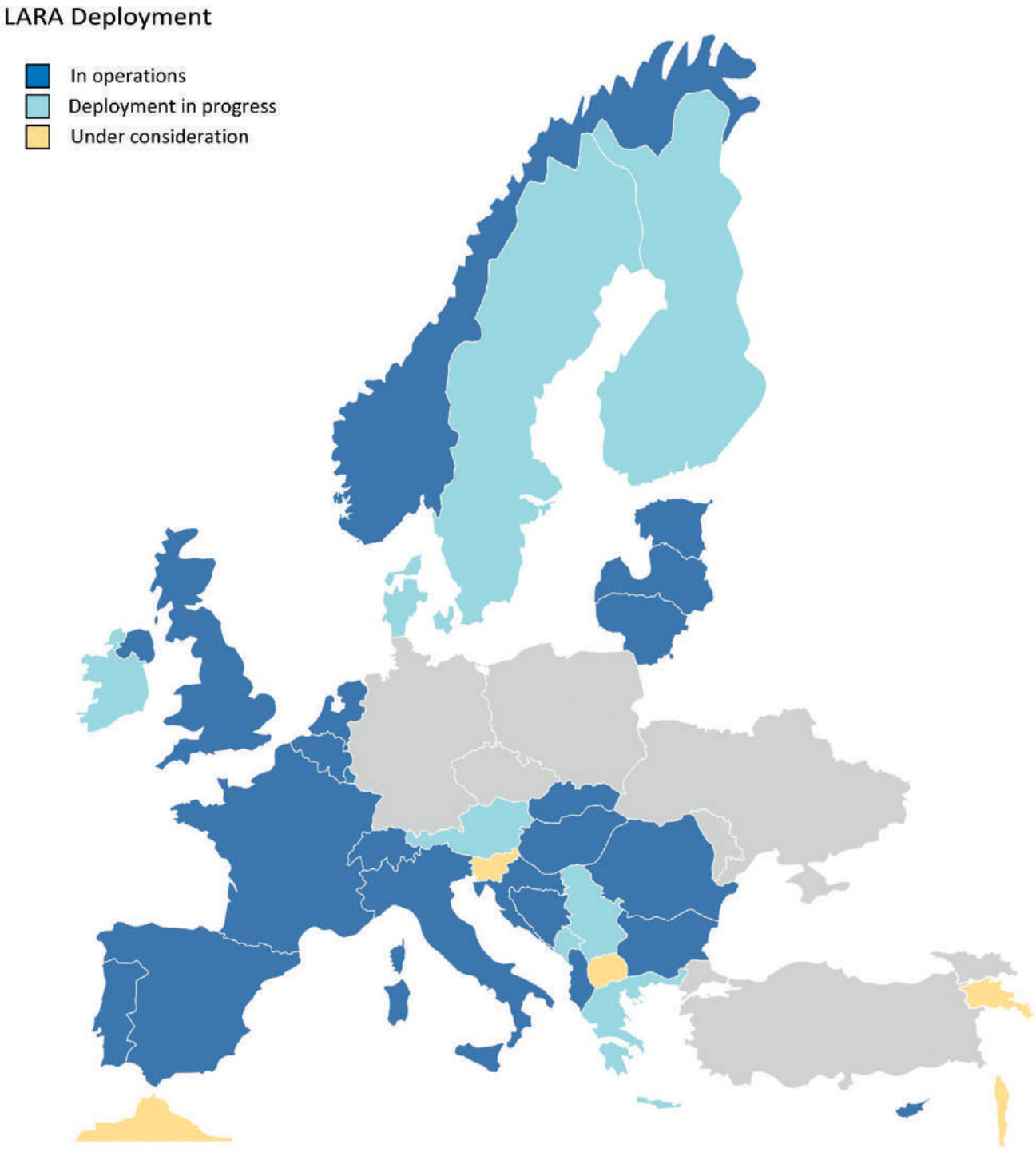
Implementation

The LARA system is implemented nationally according to a common established roadmap. Initial sessions aim at raising awareness within the different Organisations on the Tool and its functionalities, followed by in-depth explanations and theoretical training for both operational and technical staff.

A common Implementation Charter is defined describing the different steps leading to a successful implementation.



Implementation Status



LARA implementation status – May 2022.

Project Management

The LARA Program is managed by EUROCONTROL Civil-Military Cooperation Division. The concept and requirements for LARA are developed in close cooperation with stakeholders convening regularly in the LARA Users Group. The evolution of the LARA program is driven by the LARA User Group and LARA Steering Group.

EUROCONTROL provides initial training, service and maintenance for LARA without additional charge to EUROCONTROL Member States. A full set of documentation is available for further assessment of LARA and its capabilities.

For more information, please contact us:

lara@eurocontrol.int

Abbreviations

ACA	AUP/UUP Compilation Application
ADEXP	ATS Data Exchange Presentation
AIXM	Aeronautical Information eXchange Model
AMC	Airspace Management Cell
ASD	Airspace Status Display
ASM	Airspace Management
ATM	Air Traffic Management
ATS	Air Traffic Services
AUP	Airspace Use Plan
B2B	Business to business
CACD	Central Airspace and Capacity Database
CDR	Conditional Route
CIMACT	Civil-Military ATM Coordination Tool
CSV	Comma-separated Values
CWP	Controller Working Position
EDQ	External data quality tool
ESARR	EUROCONTROL Safety Regulatory Requirements
FAB	Functional Airspace Block
FMTP	Flight Message Transfer Protocol
FUA	Flexible use of airspace concept
GIS	Geographic Information system
IP	Internet protocol
JSON	JavaScript Object Notation
KPI	Key Performance Indicator
LARA	Local And sub-Regional ASM support system
NM	Network Manager
NOTAM	Notice to Airmen
PPT	Planning Prediction Tool
PRISMIL	Pan-European Repository of Information Supporting Military
RaMIT	Reservation and Mission Import Tool
REST	Representational State Transfer
SWAL	Software Assurance Level

Co-financed by the European Union

Trans-European Transport Network (TEN-T)

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