ICZ LETVIS® - MST
Multi–Source Tracking

A SYSTEM FOR CREATING UNIFIED AIRSPACE INFORMATION

THE ICZ LETVIS® MST (MULTI-SOURCE TRACKING) PRODUCT IS A SYSTEM THAT MERGES LOCATION DATA FROM RADAR AND OTHER SOURCES OF LOCATION INFORMATION.

The ICZ LETVIS® MST product is a system for creating unified airspace information for the ICZ LETVIS® system. The ICZ LETVIS® MST system receives data from multiple surveillance sources. Based on these input data, the system, using sophisticated algorithms, creates unified airspace information – "multi radar data MRD (system tracks)". The system tracks are enriched with additional information (correlations, altitude, etc.) and sent using the IP/UDP protocol to the node LAN, from where they are available for all ICZ LETVIS® workstations of the given node. It is also possible to distribute system tracks outside the node through the communication subsystem. The MST system also has functions for filtering, routing, and distributing data from the separate sources of report information (plots, local tracks) to ICZ LETVIS® workstations both inside and outside the LAN node.

[BASIC FUNCTIONS]

ICZ LETVIS® MST provides main and support functions.

Main functions:

▸ Receiving and decoding input data.

▸ Sophisticated merging of plots (or local tracks) from the separate sources of report information to the resulting MRDs.

▸ Supplementation of MRDs with additional information.

▸ Filtering, routing, and distribution of input data in configurable directions.

Support functions:

▸ Main/backup system.

▸ Monitoring the functionality of surveillance sources.

▸ Monitoring current activity.

▸ Data archiving.

Tvar kovariančnej matice diskrétneho šumu procesu $\mathbf{Q}$ je v tomto prípade

$$\mathbf{Q} = \begin{bmatrix} \frac{1}{252}T^7 & 0 & \frac{1}{72}T^6 & 0 & \frac{1}{30}T^5 & 0 & \frac{1}{24}T^4 & 0 \\ 0 & \frac{1}{252}T^7 & 0 & \frac{1}{72}T^6 & 0 & \frac{1}{30}T^5 & 0 & \frac{1}{24}T^4 \\ \frac{1}{72}T^6 & 0 & \frac{1}{20}T^5 & 0 & \frac{1}{8}T^4 & 0 & \frac{1}{6}T^3 & 0 \\ 0 & \frac{1}{72}T^6 & 0 & \frac{1}{20}T^5 & 0 & \frac{1}{8}T^4 & 0 & \frac{1}{6}T^3 \\ \frac{1}{30}T^5 & 0 & \frac{1}{8}T^4 & 0 & \frac{1}{3}T^3 & 0 & \frac{1}{2}T^2 & 0 \\ 0 & \frac{1}{30}T^5 & 0 & \frac{1}{8}T^4 & 0 & \frac{1}{3}T^3 & 0 & \frac{1}{2}T^2 \\ \frac{1}{24}T^4 & 0 & \frac{1}{6}T^3 & 0 & \frac{1}{2}T^2 & 0 & T & 0 \\ 0 & \frac{1}{24}T^4 & 0 & \frac{1}{6}T^3 & 0 & \frac{1}{2}T^2 & 0 & T \end{bmatrix}$$

a kovariančná matica diskrétneho šumu merania

$$\mathbf{R} = \begin{bmatrix} \frac{1}{252}T^7 + \sigma_{w,x}^2 & 0 \\ 0 & \frac{1}{252}T^7 + \sigma_{wy}^2 \end{bmatrix}$$

ICZ LETVIS® MST enables merging up to 64 sources of report data. The data from the surveillance sources may be in the form of plots or tracks, while plots are preferred. If the source also provides Mode S information, then it is used in the merger. The maximum number of managed plots or tracks from a single source is set at between 100 and 500 plots/tracks per revolution/data renewal period. The accuracy of the input surveillance information must comply with Eurocontrol Standard Document for Radar Surveillance in EN-Route Aerospace and Major Terminal Areas (Eurocontrol, March 1997).
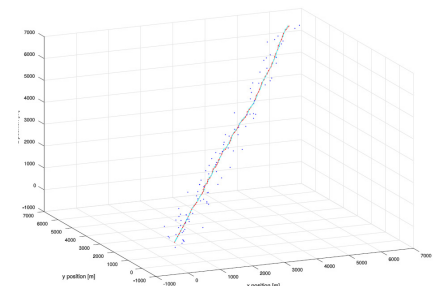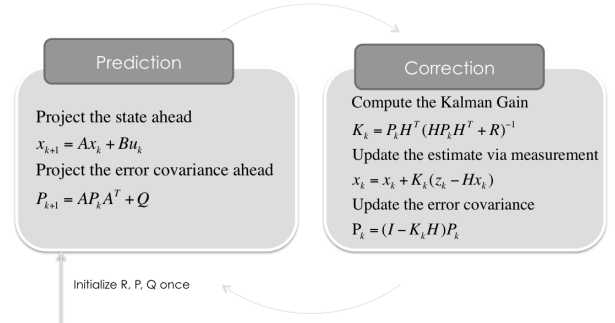
The methods for merging data from the separate sources of report information:

▸ IMM - Interactive Multiple Model

▸ EKF - Extended Kalman Filtering

▸ PAD - Probabilistic Data Association.

Output of MRD data using the IP/UDP protocol in the data format:
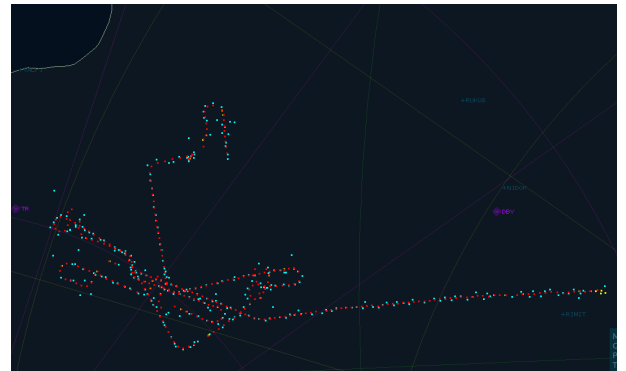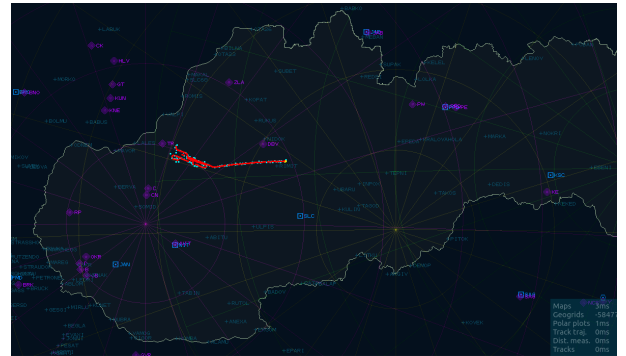
▸ ASTERIX cat62/65, UAP ALas6.

■ APPLICATION SW AND OPERATING SYSTEM

OPERATING SYSTEM	LINUX SLED/SLES 12 AND HIGHER
Application SW (minimum option)	The ICZ LETVIS® MST SW product includes: ▸ ICZ LETVIS® MSTser process ▸ ICZ LETVIS® MSTccl control client ▸ ICZ LETVIS® ArchDrec process
Application SW (full option)	The ICZ LETVIS® MST SW product includes: ▸ ICZ LETVIS® MSTser process ▸ ICZ LETVIS® MSTccl control client ▸ ICZ LETVIS® ArchDrec process ▸ ICZ LETVIS® HDtrack process

■ HARDWARE AND TECHNICAL PARAMETERS

Basic HW	HP/DELL/COTS – INTEL platform
LAN	Ethernet, TCP/TCP, UDP/IP
Maximum number of connectable sources of surveillance information	64
Processed number of plots/tracks from a single source per revolution/data renewal period	100-500 (configurable)
Max. DSA dimensions	2500x2500 km
Max. number of generated system tracks	2047
System tracks renewal mode	▸ In horizontal bands (1-32) with a period of 6-12 seconds ▸ Synchronised according to the selected master radar ▸ Asynchronously immediately after renewing the system track within 3 seconds

Prediction

Project the state ahead
$$x_{k+1} = Ax_k + Bu_k$$
Project the error covariance ahead
$$P_{k+1} = AP_kA^T + Q$$

Correction

Compute the Kalman Gain
$$K_k = P_kH^T(HP_kH^T + R)^{-1}$$
Update the estimate via measurement
$$x_k = x_k + K_k(z_k - Hx_k)$$
Update the error covariance
$$P_k = (I - K_kH)P_k$$

Initialize R, P, Q once

COMMERCIAL CONTACT

ALES a.s. Soblahovská 2050
911 01 Trenčín
TEL.: +421 326 582 580
E-MAIL: sales@ales.sk

COMMERCIAL CONTACT

ICZ a.s. Na hrebenech II 1718/10
140 00 Prague 4
TEL.: +420 222 271 111
E-MAIL: marketing@i.cz