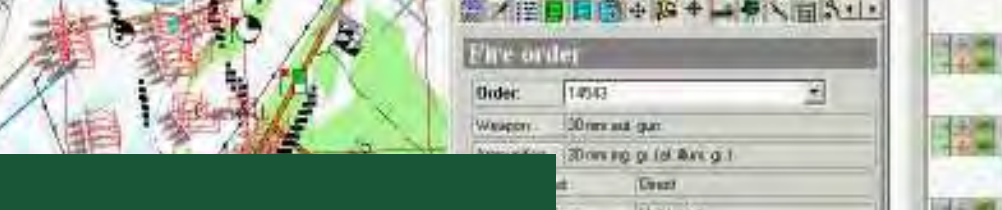# ARTIFEX
Simulation and Training Systems

MARCUS
CAX simulation

constructive simulation

KRONOS
simulator

virtual simulation

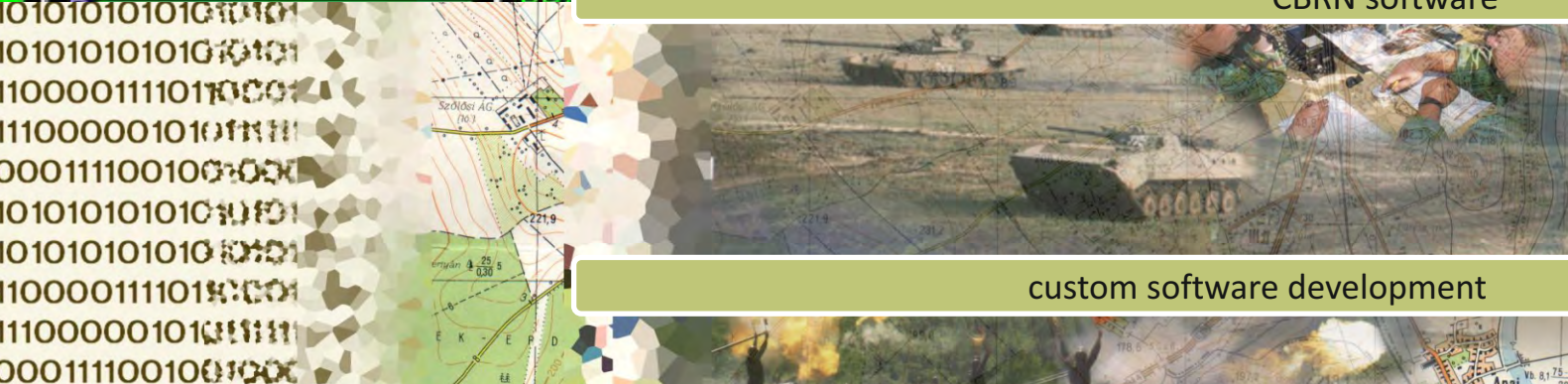# MTR
Operation planning and execution support system

decision support system

training support services

CBRN software

custom software development

ARTIFEX Simulation and Training Systems

Dear Reader,

it is my great pleasure to introduce the activity and product line of the ARTIFEX Simulation and Training Systems Ltd., a significant simulation developer company, with the wide range of product portfolio in Hungary.

Our multidisciplinary engineering and scientific staff with a history of long-term support to the military training industry is headquartered in Budapest, Hungary. ARTIFEX has been a well-established defence contractor of the Hungarian MoD since 1989, which is currently using more than 15 of our simulation systems. ARTIFEX's ongoing commitment to develop quality software is reflected in its quality management system, certified according to ISO 9001 and AQAP 2110.

ARTIFEX is a part of the GAMMA Group.

Having been in the simulation and training industry for thirty years, ARTIFEX provides its customers the following benefits:

- long-term and well-founded IT expertise in cutting edge technologies
- independence, responsiveness, cost effective and highly flexible operations
- considerable experience in working with military personnel, with an understanding of the technical and training needs of the military
- using very effective and proven methods in integrating IT, system engineering, simulation principles and GIS into state-oft he-art training systems, simulations and other applications

In the followings, we are glad to give you some information about ARTIFEX, a short summary of our product portfolio and capabilities what we think and hope to be of interest to you.

Should you need any further information please do not hesitate to contact us, we will always be at your service with pleasure.

Yours faithfully,

László Horváth
Executive director

ARTIFEX Simulation and Training Systems

Short historical retrospection

1989 IPR 89
Antitank Guided Missile Training Simulator

1991 HVSZ'91
Company level battle management simulator

1991 VEZ'91
Tank and armoured infantry fighting vehicle driving simulator

1991 KLSZ'91
Shooting simulator family

1993 BAGLYAS v1
Artillery fire control simulation

1996 HVSZ'96
Battalion level battle management simulation

1996 HK100
100m tank shooting range

2000 Foundation of the Hungarian Simulation Centre
Division level CAX simulation

2003 MTR v1
Decision support system

2003 Orientation simulator v2

2005 ZEUS
Artillery Simulator v3

2009 KRONOS v1
Platoon level Reconfigurable Virtual Simulator

2010 KRONOS v2
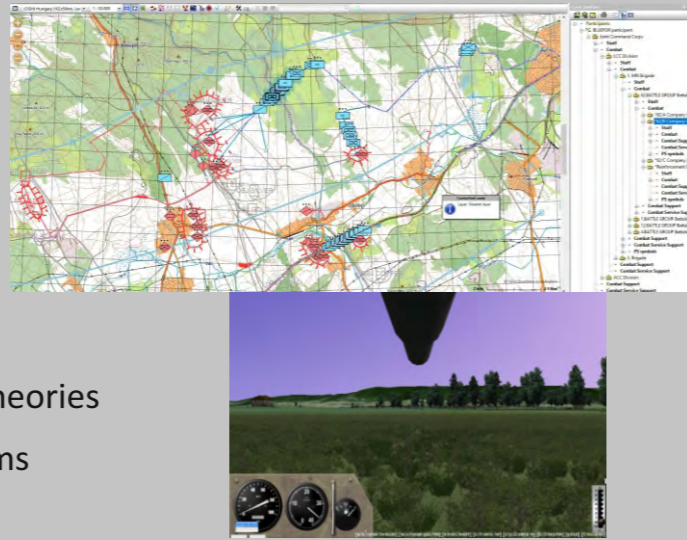Platoon level Reconfigurable Virtual Simulator

Table of contents

Expertise

- Providing integrated training solutions
  - Training need analysis
  - Training systems development
  - Training support
  - Simulation instruction
- Applied modeling, principles and simulation theories
- Applied built-in GIS and real time expert systems
- Real time visualization

Simulation systems software development

The main focus of Artifex is the development of cost effective military simulation systems. We deliver training solutions for individual soldiers and up to corps level units as well. We use low cost PC based technology even for the most complex constructive simulation system.

Our customers are those military users, who look for elaborated, state-of-the-art, customized solutions based on COTS or low-cost hardware for their training needs.

Military expert software development

Based on our thirty years of experience on knowledge engineering we are developing military expert software, which includes among others a GIS system with terrain assessment functions and a database of military equipment and weapons containing items from pistol ammunition to aircraft carriers. This system supports group work in the military decision making process executed at different levels of the military organization structure.

Support services

With our excellent network of connections we provide translation, deployment and local support for our partner's software.

The deployment of our own simulation software includes training and continuous vendor support.

We have been developing an operating technology for our Marcus CAX simulation system by customizing and improving international experiences. The Simulation Centre of the Hungarian Defence Forces has been using it for more than 25 years. Our development team and military experts support their activity.
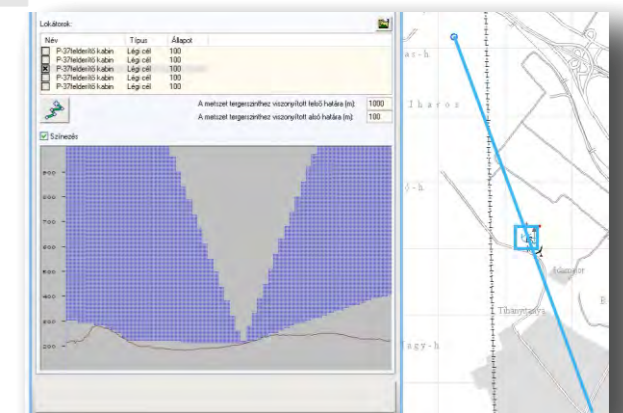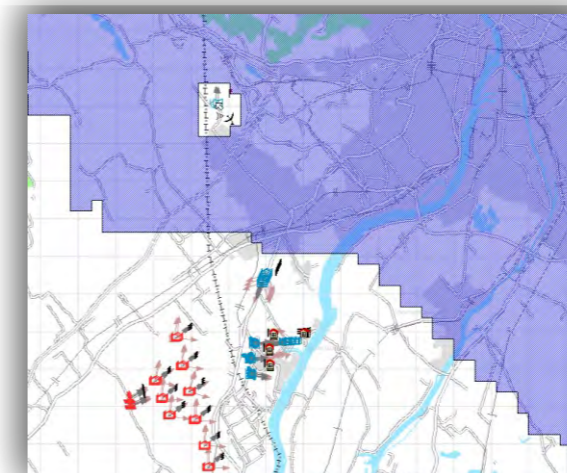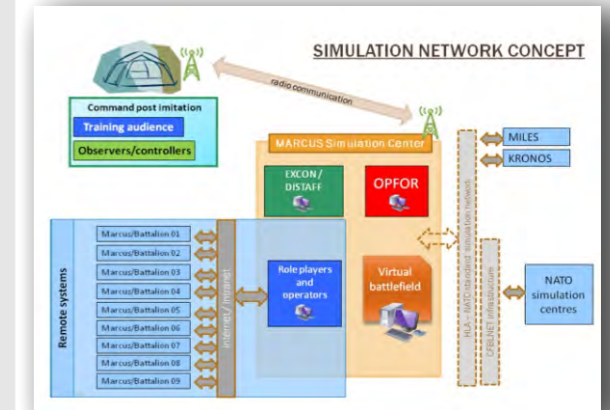
Artifex is world-wide known for its

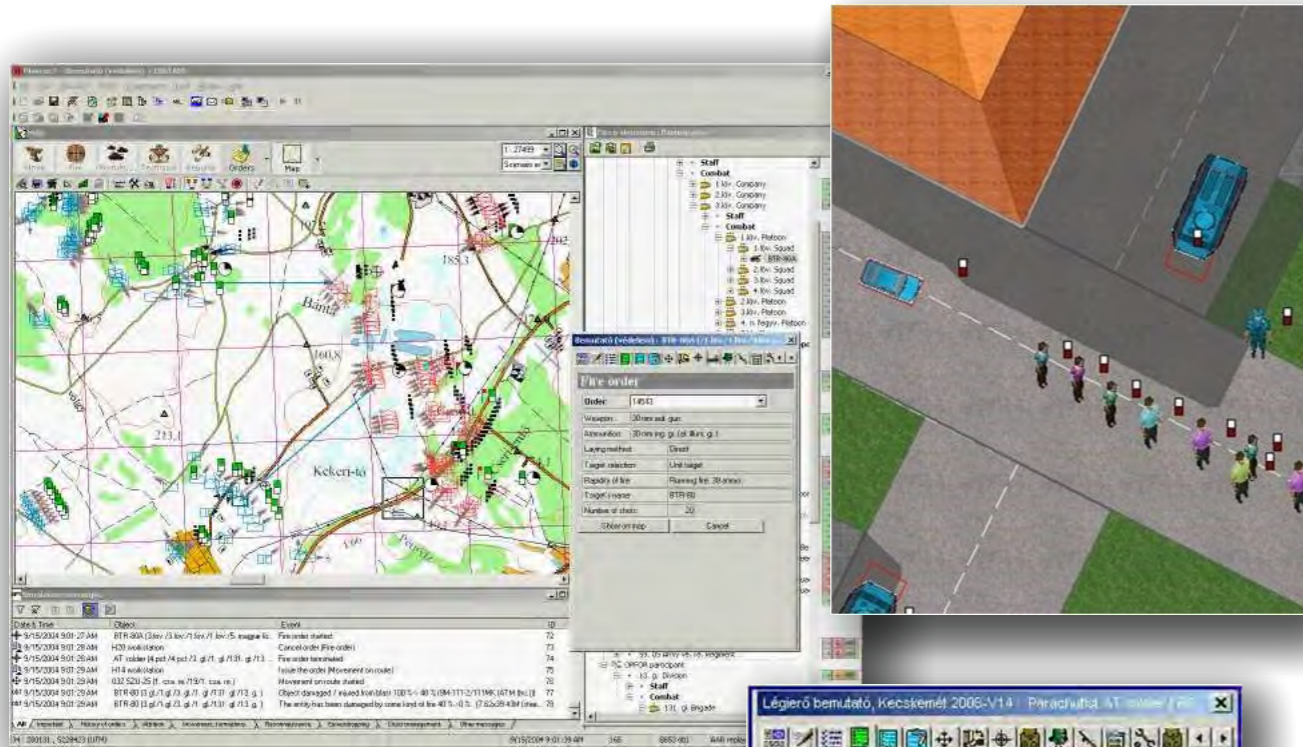**MARCUS constructive simulation**.
The CAX (Computer Aided eXercise) driver and combat simulation development started in the '90s, since then several hundred man-years of work of competent experts has been built into the software. Now it is one of the World's most sophisticated entity level commander and staff training simulator system. It models the different aspects of the military activities, such as: conventional warfare, MOUT, combat service support, CBRN and electronic warfare, air warfare and air defence, naval forces, MOOTW/SASO.

KRONOS 3D tactical simulator is a platoon level "serious game", which is installed on a networked PC environment with a single joystick (without expensive weapon models and vehicle mockups). Squad and platoon leaders and its members can be trained how to cooperate in a combat. It also provides detailed functions for individual training.

Artifex has developed the **MTR** (Operation planning and control support) **system** as well. It facilitates the whole military planning and decision making process on computers, support the staff team work, and gives invaluable help to the military leaders during the execution of the prepared plans.
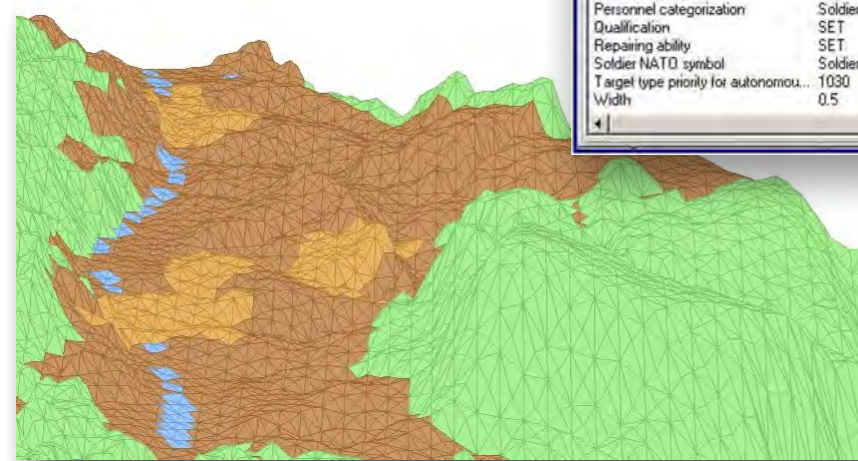Software development based on customer requirements.

MARCUS
CAX simulation

**Constructive simulation system
CAX driver**

Simulation model's key features
- Real time execution, the virtual battlefield is updated in every few seconds
- All major aspects of the battlefield, physical objects and phenomena, aspects of human factors are modeled
- High resolution digitized terrain
- Engineering obstacles, dynamic terrain
- Attrition algorithms based on physical data
- Environmental Factors: light condition, wind, rain, snow, temperature
- Battle scenarios contain any desired formations, weapons capability and force deployment in the battlefield, both for own forces and the enemy
- Tracks all major categories of supply (ammunition, fuel, food, water, repair material, personal protective equipment, etc.)

Other features
- Easy operation, menu-driven, windows-oriented user interface
- Fast and flexible scenario preparation
- Flexible, user defined force structures / OBA
- Terrain assessment functions
- MEL/MIL preparation and injections
- Embedded AAR functions

Scalable and mixable multiresolution model
Simulation model contains two detail levels:
- entity level
- aggregated units level

These levels can be mixed in a scenario, and the detail level of a unit can be changed during a scenario execution. Units can be converted from any levels of detail to another.

Other simulation detail options
- active/passive state of the units
- multiresolution terrain model
- simulation model features can be enabled/disabled

200+ simulated actions, orders:

- Movement on terrain, in the air and waterways
- Direct and indirect fire, detonate mines
- Mounting/ dismounting infantry and auxiliary equipment
- Logistics: transporting, loading, towing, repairing, medical treatment
- Reconnaissance: visual, radar, sound ranging
- Engineering: minefield deployment, explosive devices, road construction, bridge laying
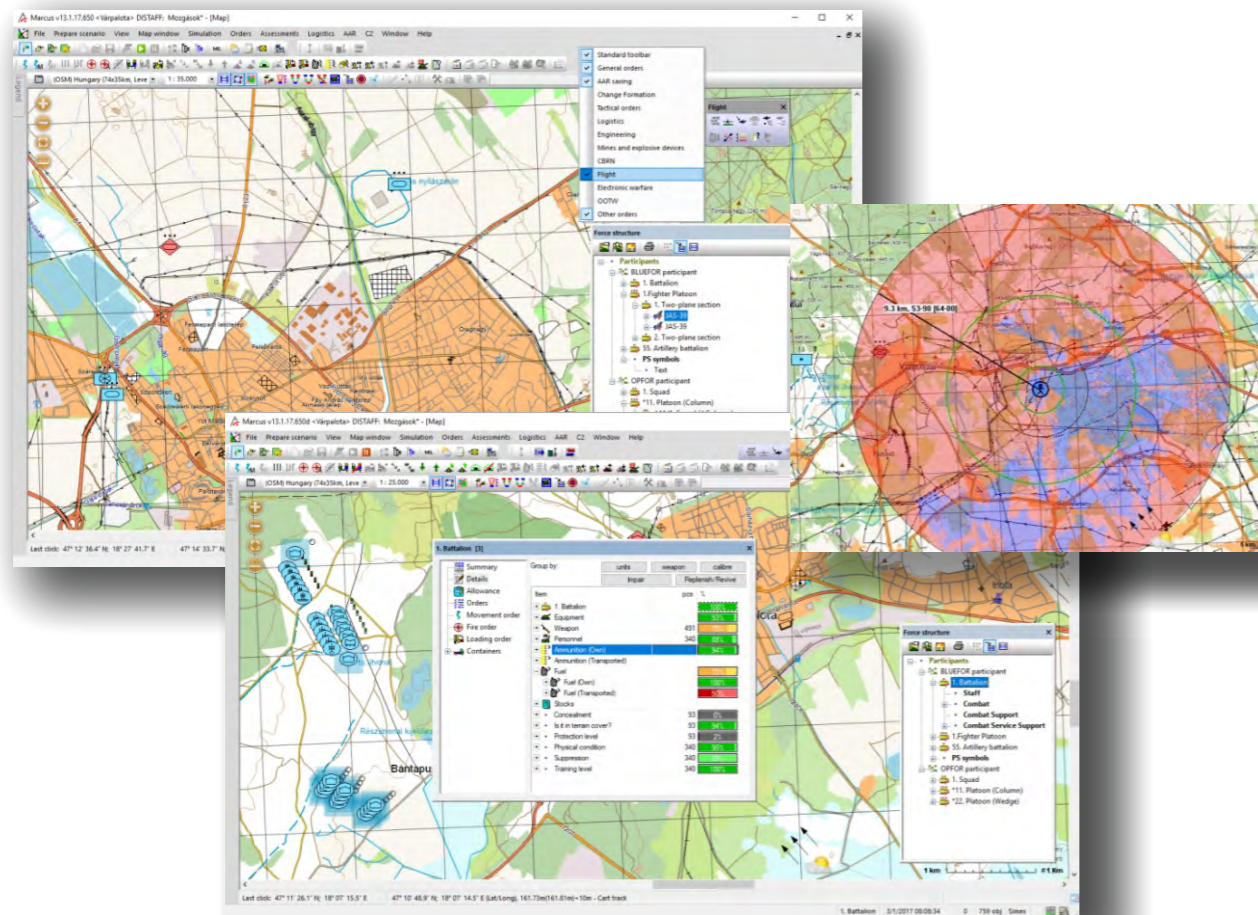
- CBRN modeling: contamination (grenades, industrial accidents), detection, decontamination
- Air warfare: airports, dogfight, air defense, air refueling
- Navy: warships, submarines, sonars, torpedoes, cruise missiles
- Non-conventional military operations: examination, escorting, handling refugees, prisoners of war
- Disasters: flood, fire

The Hungarian distributed simulation network
- HUN SIM Centre + 11 locations (barracks, University, Joint Command)
- Integrated MARCUS-KRONOS-ZEUS-MTR environment

Brave Warrior 2016 – multinational, distributed CAX exercise, powered by MARCUS
- Hungary: simulation centre and 3 other sites
- Slovenia: Maribor, 6 MARCUS workstations
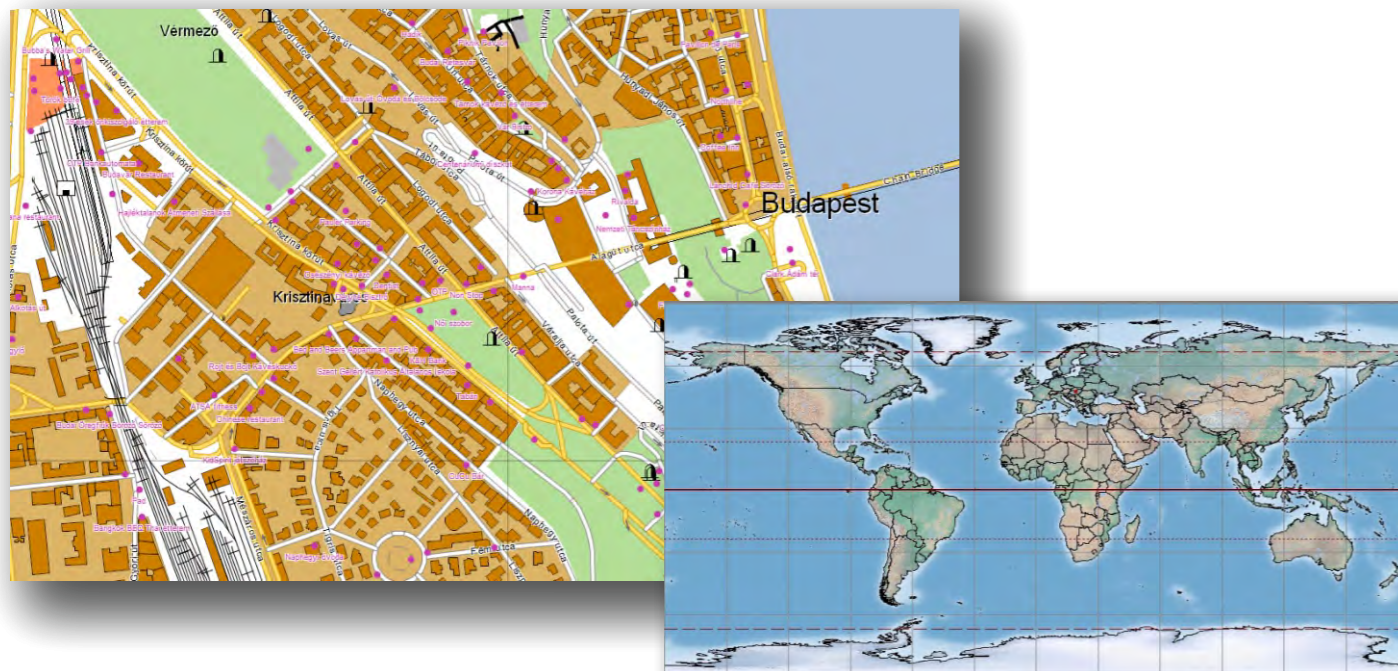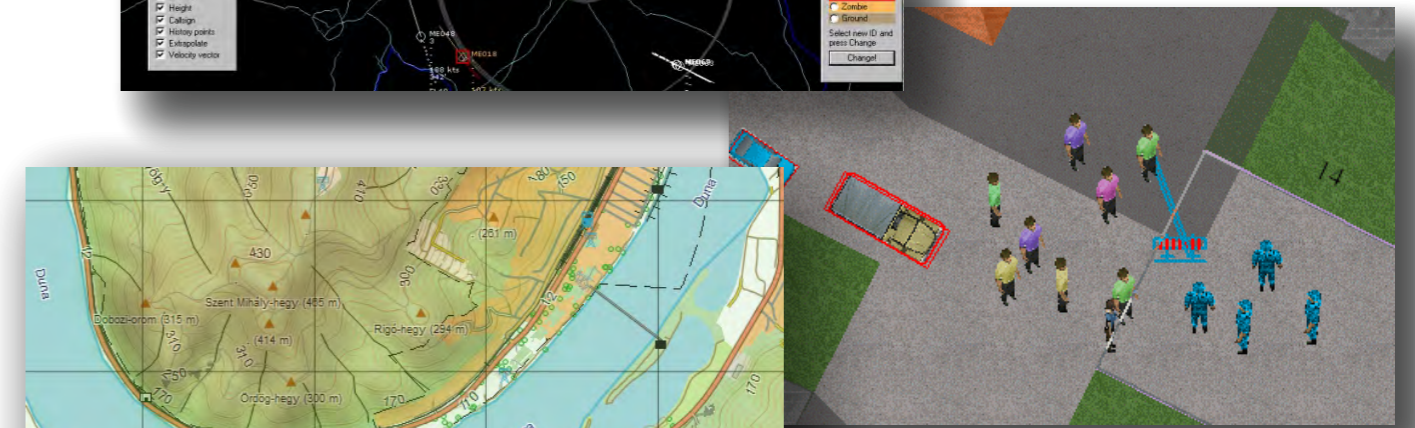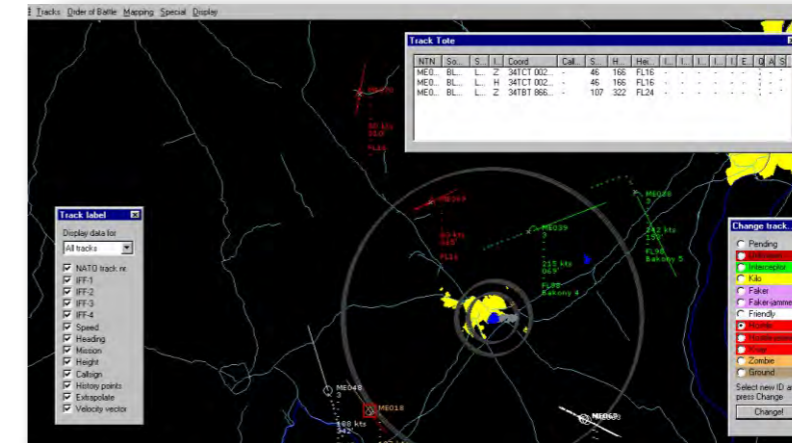- Croatia: Karlovac, 12 MARCUS workstations
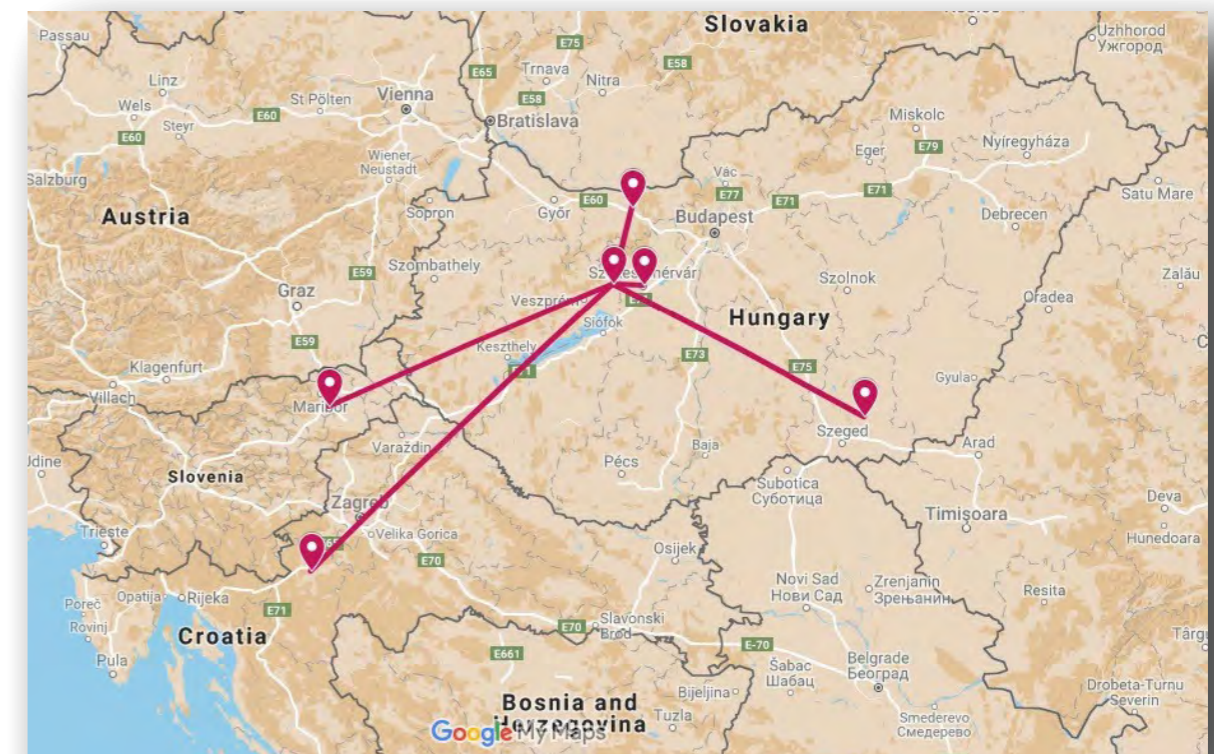
Compatible vector formats:
- DTA-50 2.0 (Hungary specific)
- NGA (NIMA)-DFAD
- VMAP
- SHAPE
- OpenStreetMap (OSM), (the whole Earth can be used as an operational area)
- DXF (for special, non GIS specific databases)

Digital elevation database:
- DDM (Hungary specific)
- DTED (Aster GDEM, SRTM)

Raster databases:
- Georeferenced images, every frequently used format handled (satellite pictures, air pictures, scanned maps, etc.)
- World map for air and navy operation
- NATO air picture
- 1500x1500km size operational area (can be extended if the hw is powerful), with unlimited number of high resolution tiles, 5 selectable terrain resolution
- Multiple, independent operational areas
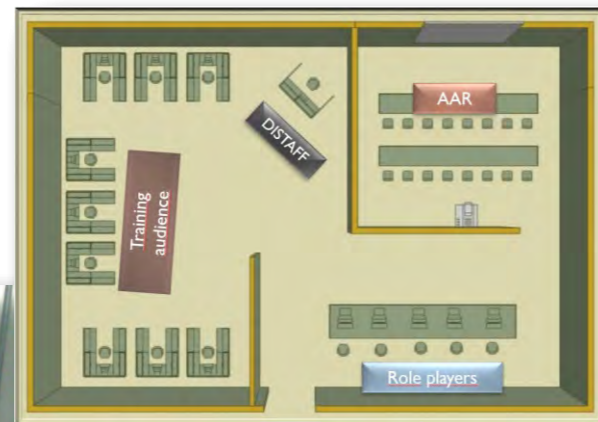- Dynamic terrain (e.g. explosions affect the terrain)

C2 stimulation from MARCUS (ADatP-3)

Successful tests:
- DOLPHIN (CZE-C2)
- JASMIN (POL-C2)
- FAMA (POL-C2)
- SEALION (FIN-C2)
- TOPAZ (POL-C2)

HLA Evolved interface

MARCUS ⟷ JCATS

MARCUS ⟷ KRONOS

C2 screenshots with MARCUS situation

KRONOS
simulator

Virtual simulator

- KRONOS is a 3D, real-time, platoon-level tactical and gun laying simulator
- Crews of land force infantry fighting and carrier vehicles can exercise their job
- Simulates antitank missiles, artillery equipment, etc.
- Besides crew teamwork, weapons handling tasks can be practiced as well, providing cost effective training environment for gun laying
- Reconfigurable simulator system: In the same hardware configuration different equipment can be simulated and different units can use them after minimal reconfiguration
- Vehicle crew and unit personnel can communicate with each other using an imitated radio network.
- It can be connected to other HLA compliant simulator.

- Dismounted infantry
- Soldiers can use hand signs
- Uniforms of 5 different nations
- Vehicle interiors modeled in detail
- Terrain editing functions
- Street furniture
- Civil vehicles
- Aircrafts
- Digitized terrain is more detailed
- Large size Afghanistan and Iraq settlement
- Kronos VR extension (OCULUS Rift)
- Realistic 3D environment

MTR
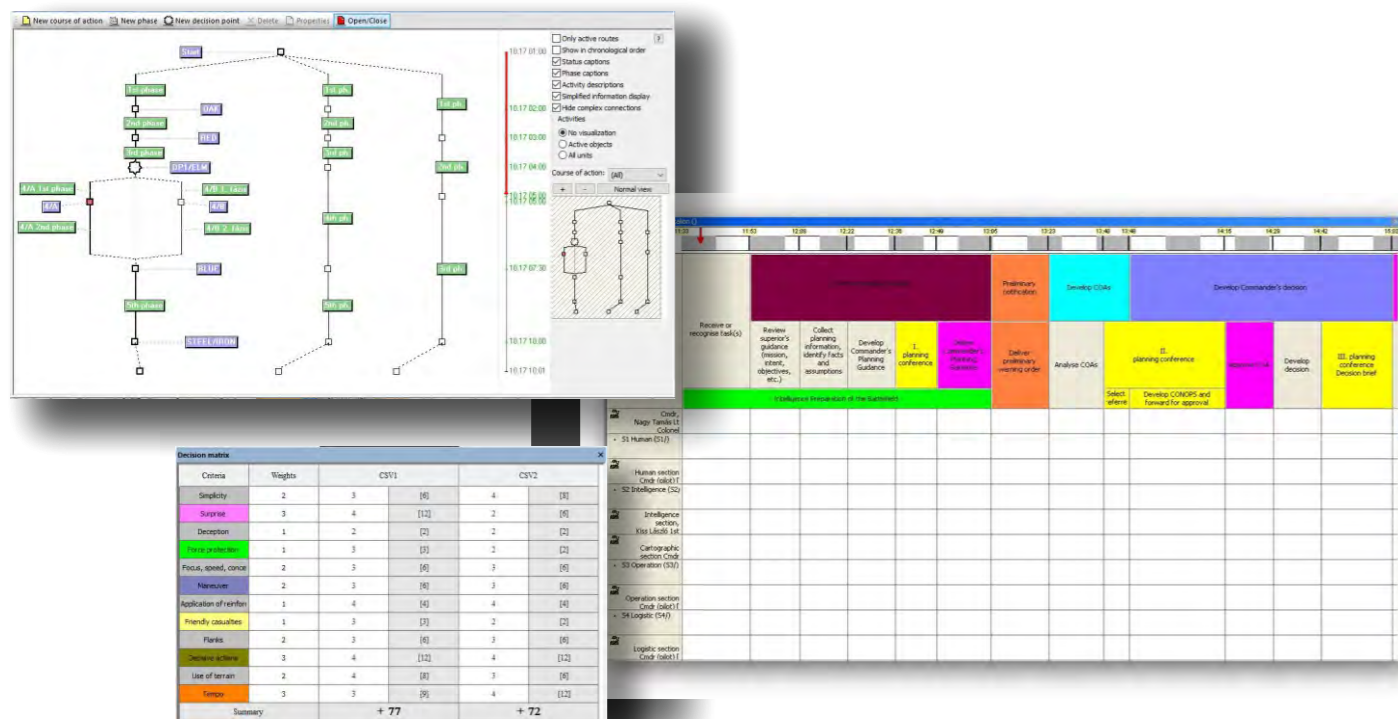## Operation planning and execution support system
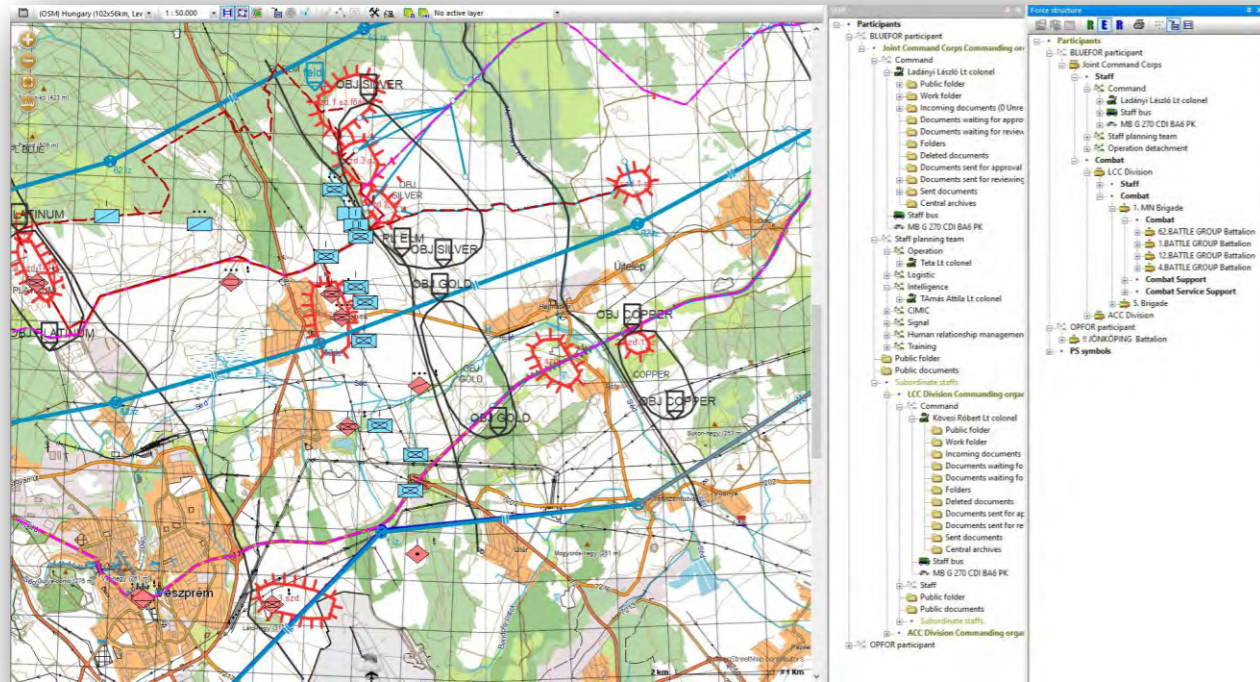
**Military decision making process support system**

CAX model

MTR Operation planning and execution support system

▶ MTR provides an advanced environment for practicing the elaboration and execution process of an operation plan

▶ The military planning and decision making process can be carried out with the support of a computer aided expert system

▶ Gives the possibility to plan and try out disaster relief and crisis management plans as well

▶ The operational plans and the related documents can be created on an integrated network of workstations using team-work technologies

MTR general features

▶ Digital terrain database usage (mixed raster and vector representation, usage of different standards /NIMA-DFAD/DTED, Shape, VMAP, DXF, OSM/)

▶ Illustration of the current or planned operational situation shown on digital or scanned map or satellite picture using APP6 symbology

▶ Force structures, order of battle handling (participants, force deployment dislocation, formations, manpower, equipment)

▶ Tactical databases (weapons, weapons capability, typical structures)

▶ Logistical levels of equipment, materiel stock data and staffing

▶ Sophisticated tactical and terrain assessment functions

▶ Representation of the battlefield environment factors (Light condition, wind, rain, snow, temperature, cloud-base)

▶ User-friendly, menu-driven, windows-oriented user interface

▶ Easy customization (User defined echelons and force structures, user defined workstation assignment)
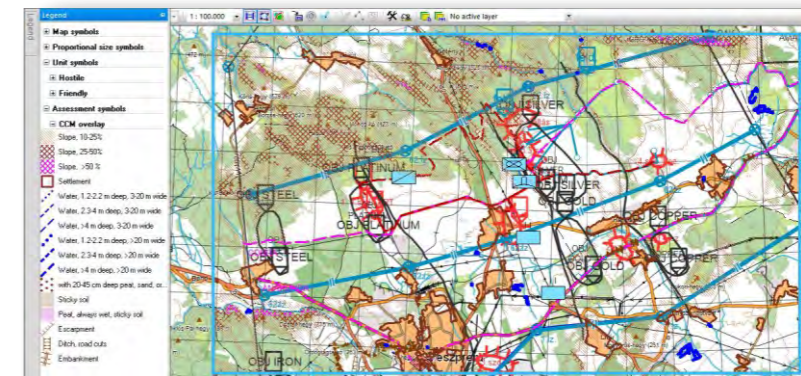
MTR specific features / 1

▶ Supports the special map drawing functions of the operational planning and the digital command and control
  ▶ creating layers
  ▶ drawing coordinate labels, inserting coordinate data into texts
  ▶ linking texts, multimedia data to map symbols or terrain features

▶ Provides flexible data mining, comparison tables, surplus/deficiency tracking

▶ Has a semi-automatic report generation tool based on user defined templates

▶ Data security based on user identification and data logging

▶ Interoperable with other systems (e.g. Marcus)

MTR specific features / 2

▶ Courses of actions (COA) versions can be defined and handled along with operation phase layers and decision support matrix

▶ Teamwork support functions linked to the structure of the planning staff

▶ Staff work schedule table managing

▶ Distributed planning

Download our catalogs and company presentation via the following links

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MARCUS
CAX simulation

http://www.artifex.hu/
downloads/cat/
Marcus_constructive_simulation.pdf

MTR
Operation planning and execution support system

http://www.artifex.hu/
downloads/cat/
MTR.pdf
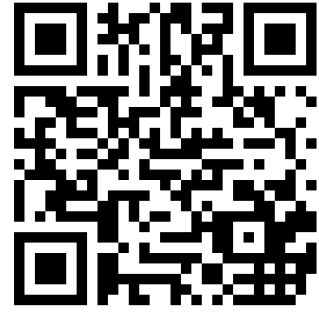
KRONOS
simulator

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Kronos_simulator.pdf