

Virtual Reality Environment in C3I Systems

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- **Current state of presentation layer of C3I systems**
- **Czech C3I system**
- **Questionnaire**
- **VR operator station**
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- **Conclusion**

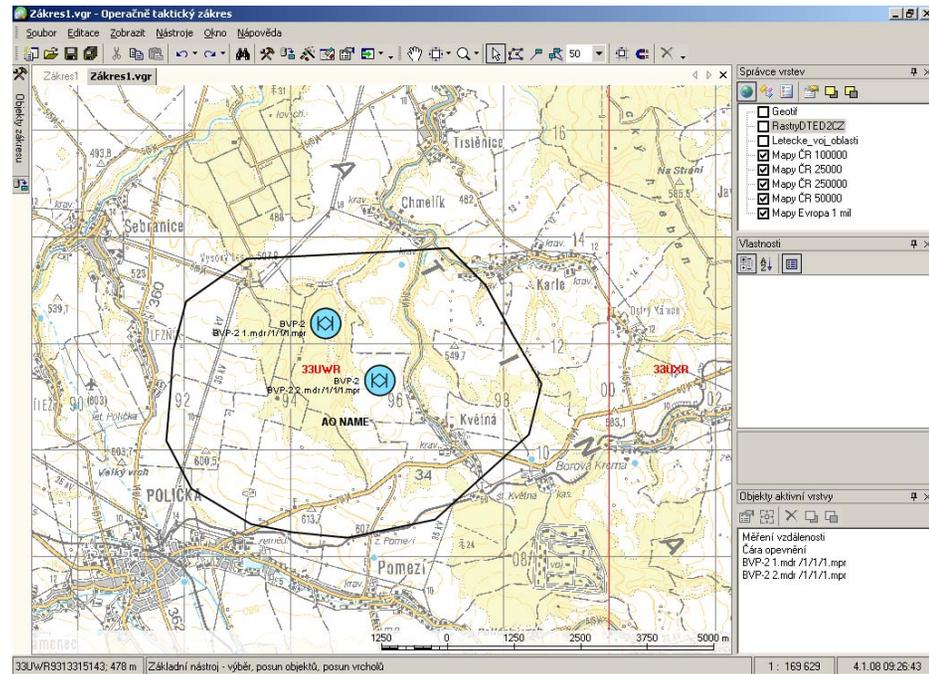
CURRENT STATE OF PRESENTATION LAYER OF C3I

- **FBCB2 (USA)**
- **CG2 - C3D**
- **RT - area of interest**



CZECH C3I SYSTEM

- First design Ground Forces Tactical Command and Control System (GFTCCS) in 1996
- Presentation layer - desktop application
- Limitations:
 - **Speed of interaction operator-system**
 - **Display resolution**
 - **2D visualization**



- Defense research project (2007-2008): VR devices in modernized conception of implementation of GFTCCS in the Czech Army Forces
- New presentation layer with VR devices – 3D

- **New presentation layer - only supporting tool of the current GFTCCS**
- **3D solution with implemented VR devices is a key factor to increase situational awareness**
- **The implementation of VR devices should be executed as a step-by-step process**
- **Details must not endanger lucidity**

VR OPERATOR STATION

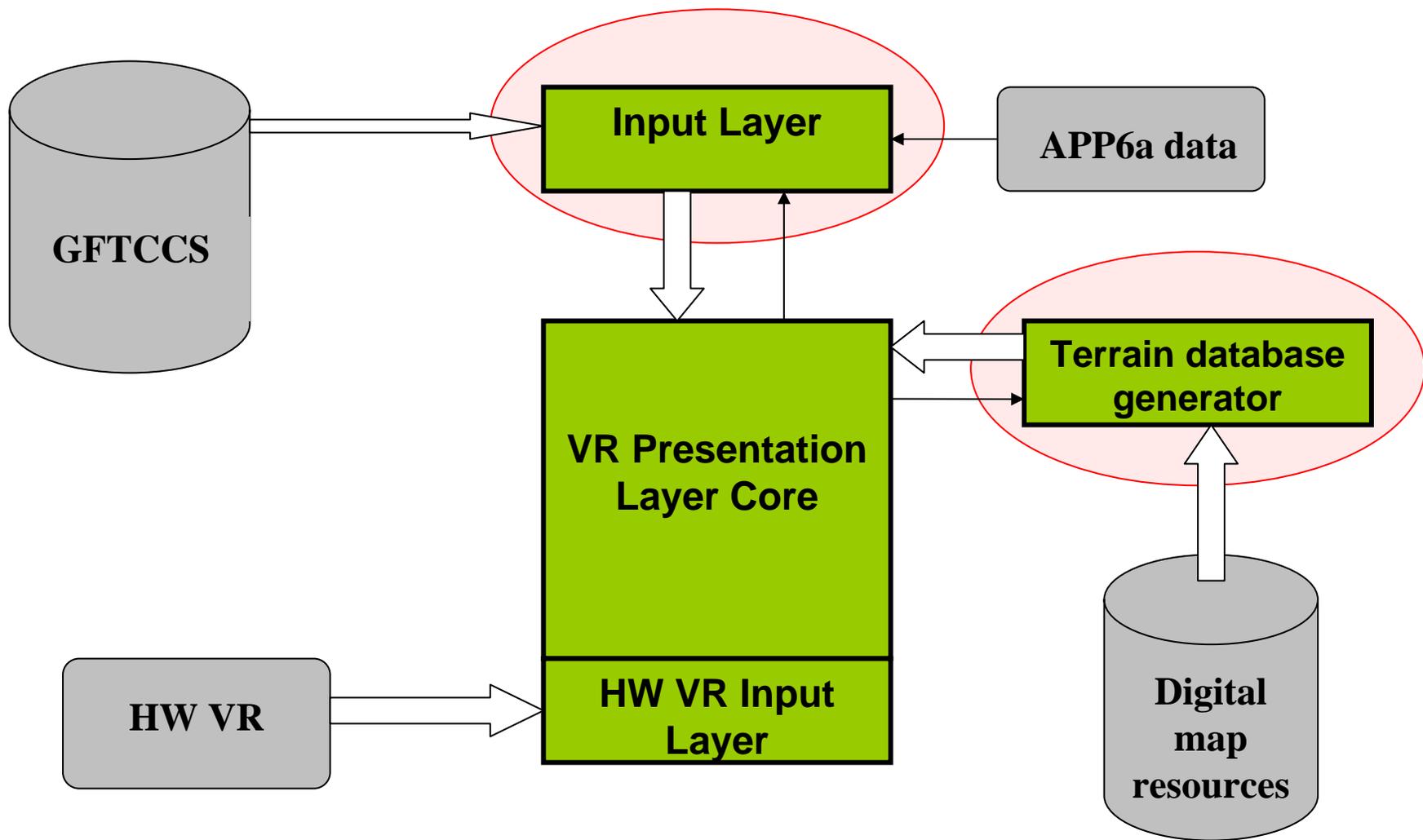
- **Head Mounted Display (HMD)**
- **6DOF tracking devices**
- **Data gloves**



ARCHITECTURE OVERVIEW

- **New 3D presentation layer**
- **VR devices used for user interaction**
- **3D terrain database generation on demand**
- **Uses digital terrain data sources of GFTCCS**
- **3D representation of tactical symbols**
- **Service Oriented Architecture**

ARCHITECTURE OVERVIEW



3D Terrain visualization including topographic objects and features

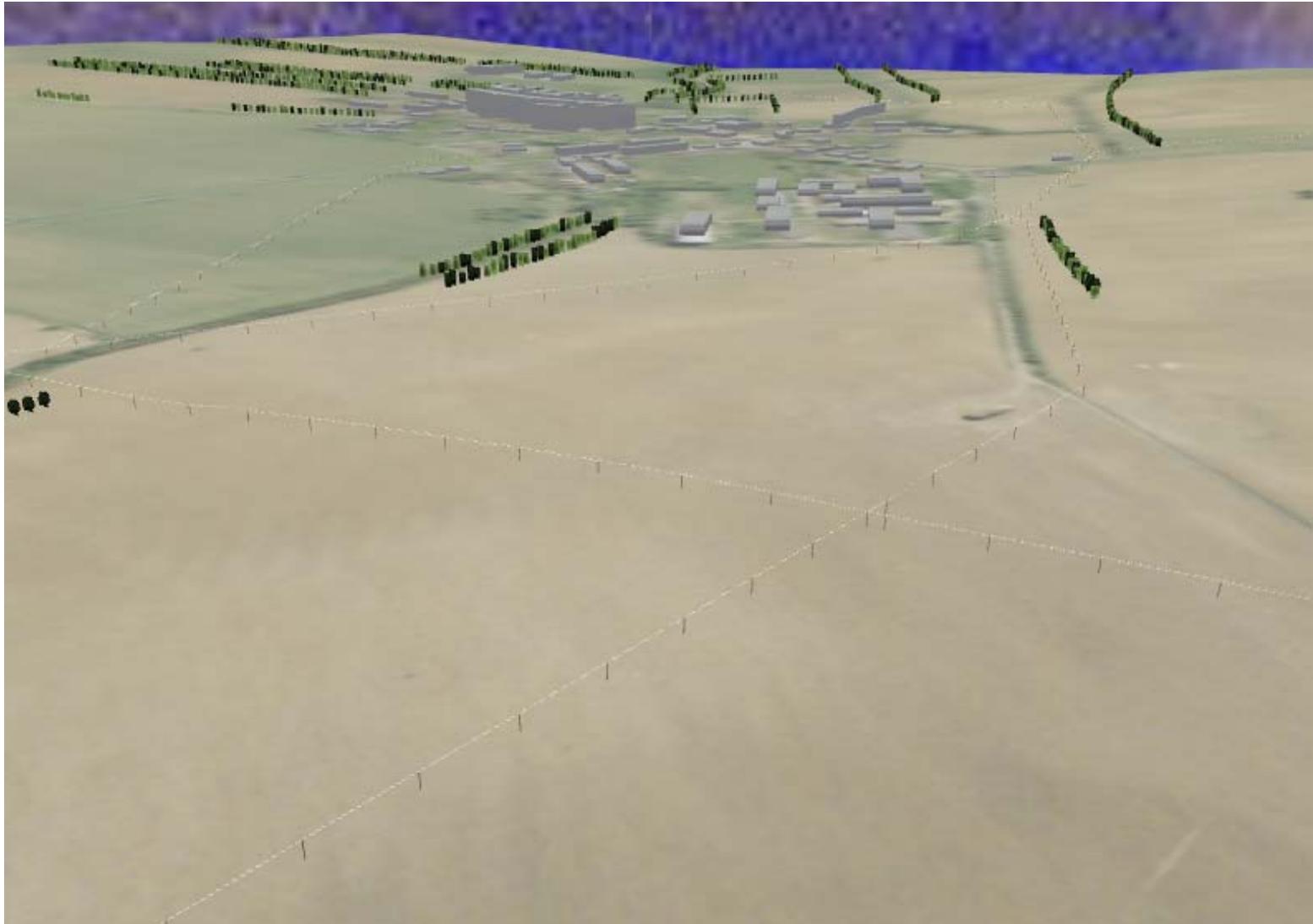
- Standard Army of the Czech Republic available (shared with the GFTCCS)
 - *digital elevation model*
 - *digital vector map*
 - *digital satellite or aero images*
 - *digital topographic maps*
- WGS-84 coordinate system
- Fast terrain and objects generation time

Topographic features and object reconstruction

- *Utilize low-resolution satellite images*
- *Adds details and emphasizes important topographic features and objects*
- *Combines vector and raster data*
- *Matches the original by its dimensions and shapes*
- *Uses pre-defined sets of textures*



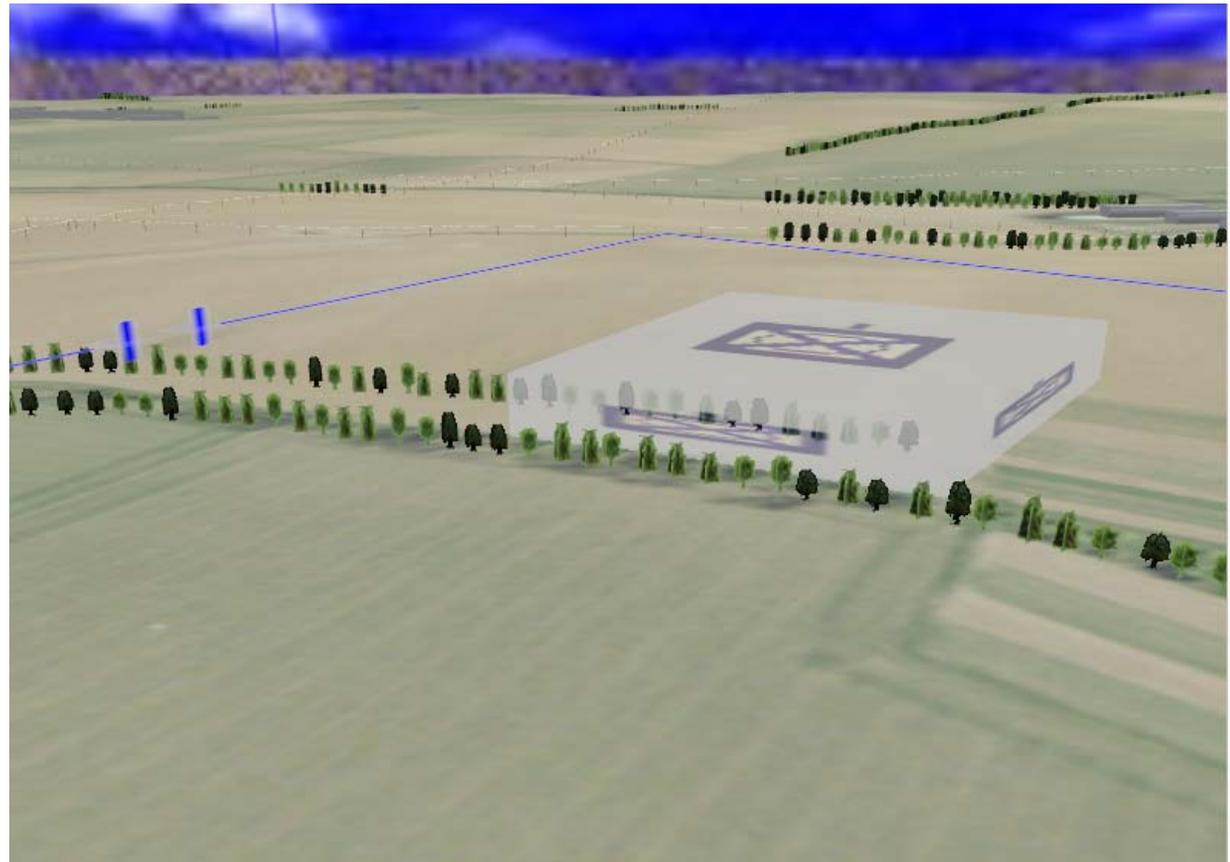
VISUALIZATION



VISUALIZATION

Military tactical symbol visualization

- *Represented as 3D objects*
- *Tactical symbols mapped on semi-transparent square block*
- *Tactical lines floating in 3D space*
- *Compatible with APP6a standard*



- **New presentation layer of GFTCCS**
 - 3D visualization
 - Immersion
 - Utilization of VR devices for user input
 - Versatility
- **Issues**
 - Quality of digital terrain data
 - Unit symbol placement

QUESTIONS

