

Easy-to-Use, Web-Based Graphical User Interface for Controlling Entities in Constructive Simulations

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Agenda

- Introduction
- Background
- Simulation System
- Web-based GUI System – webSAF
 - Video
- Initial Experiences
- Future Work
- Summary and Conclusion

Introduction

- Research question: ***how to increase combat effectiveness in land force operations?***
- Detailed simulations of battalion to brigade level operations, to assess and compare the performance of different land force structures, that may vary with regard to:
 - Composition of ***material*** and ***equipment***
 - ***Tactical organization***
 - ***Operational concept***
- Shortcomings with traditional constructive simulation systems (for our use):
 - Do not have the required level of resolution
 - Too complex and cumbersome to use
 - Not flexible enough with respect to representation of new technologies (e.g. new sensor systems, weapon systems, and protection systems)
- We are developing ***webSAF***: an ***easy-to-use, web-based graphical user interface*** (GUI) system for ***controlling entities in constructive simulations*** (VBS & VR-Forces)

Simulation for experimentation and analysis

Platoon/company level: *virtual* simulations

- Detailed simulations of platforms and systems
- Experimenting with new technologies and new concepts at technical and tactical levels
- Tools: VBS

Battalion/brigade level: *constructive* simulations

- Semi-automated forces (SAF)
- Experimenting with new land force structures and new operational concepts
- Tools: mōsbē, GESI → VBS & VR-Forces



New system for constructive simulations

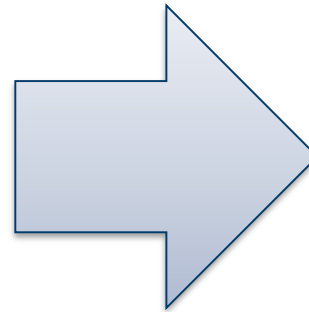
Two main factors that have the potential to improve the fidelity of our constructive simulations:

1. Increased **terrain resolution**
2. Better **tactical artificial intelligence** (AI) that can take advantage of this terrain

Composing simulation system based on VBS (ground-to-ground) & VR-Forces (air defence + air):

- Detailed, entity-level simulations of battalion to brigade level operations
- Web-based GUI (webSAF)
- Simulation-supported, two-sided (BLUE and RED) wargame
- Semi-automated forces (SAF):
 - One player should be able to control a manoeuvre battalion or an artillery battalion

New system for constructive simulations

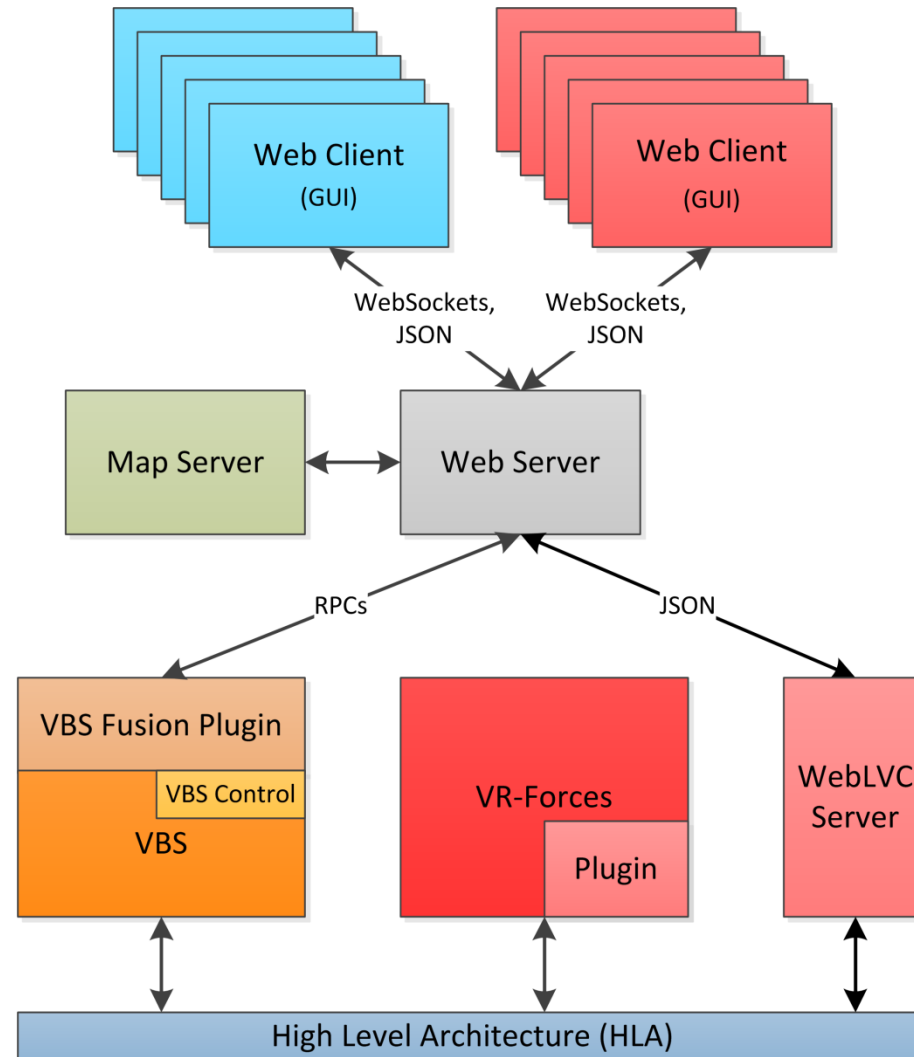


New system for constructive simulations

Requirements:

- Support **entity-level** simulations of battalion level operations, and use **simulation models with high resolution**
- Represent entities from the following capabilities: manoeuvre, indirect fire, air defence, aviation, combat engineering, and intelligence, surveillance, target acquisition, and reconnaissance (ISTAR)
- Support **high terrain resolution** and representation of **micro-terrain features**
- Have a **GUI that is easy to use**
- Have an **application programming interface** (API) for developing additional functionality
- Have a tactical AI where the operators are able to issue high-level orders at the company level and more detailed orders at the platoon level for vehicles and squad level for infantry
- Have a tactical AI where the entities are able to intelligently take advantage of the terrain

New system for constructive simulations



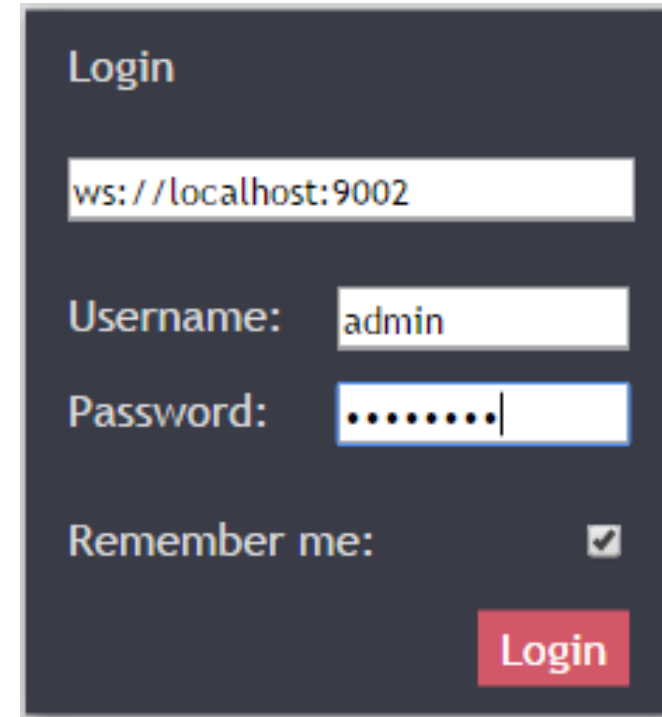
Web-based GUI system – webSAF

Side:

- BLUE or RED

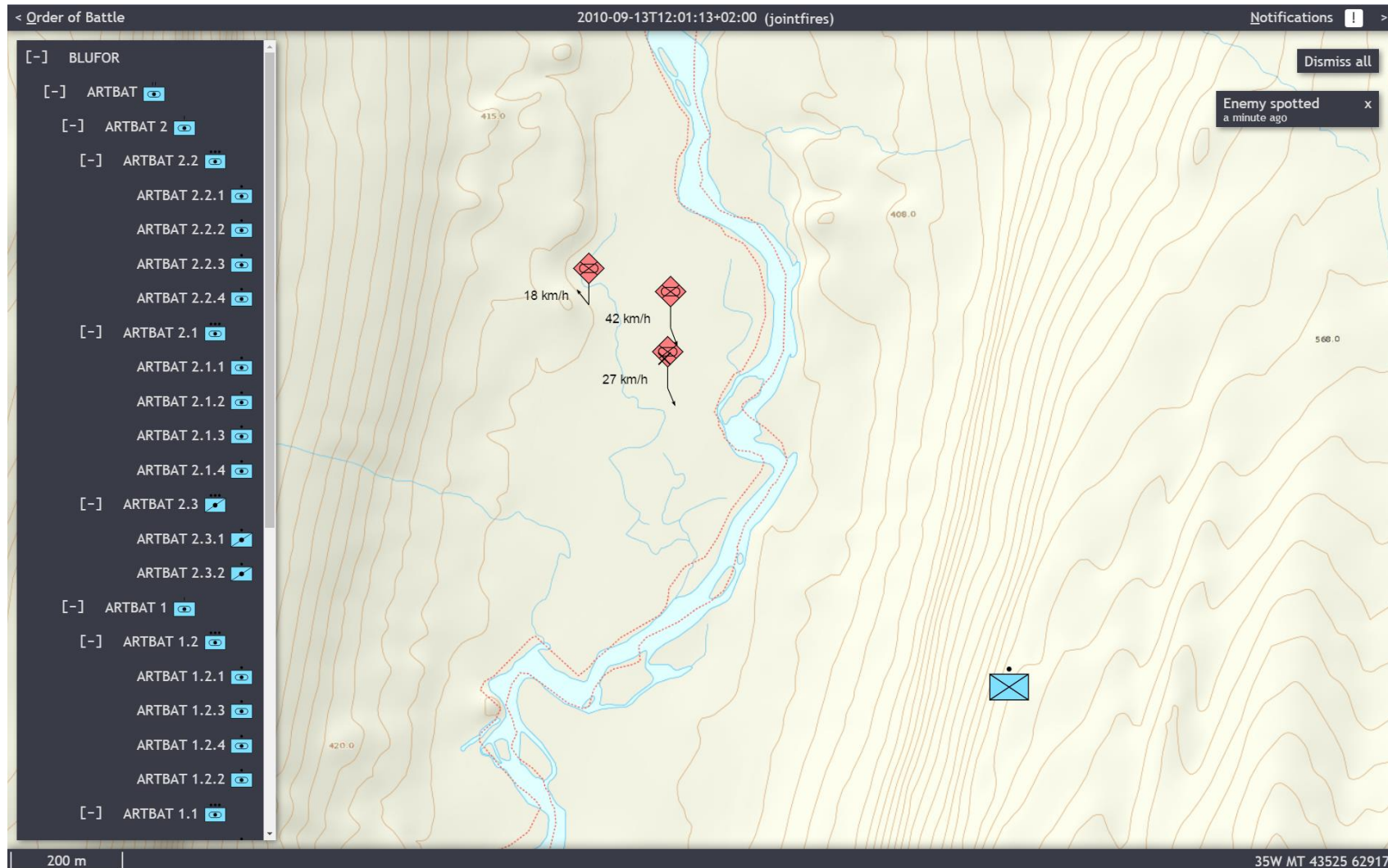
Roles:

- Manoeuvre
- Joint Fires
- Air Defence



The image shows a dark-themed login window titled "Login". It contains a text input field with the value "ws://localhost:9002". Below this are two input fields: "Username:" with the value "admin" and "Password:" with a masked password of ten dots. There is a "Remember me:" checkbox which is checked. A red "Login" button is located at the bottom right of the form.

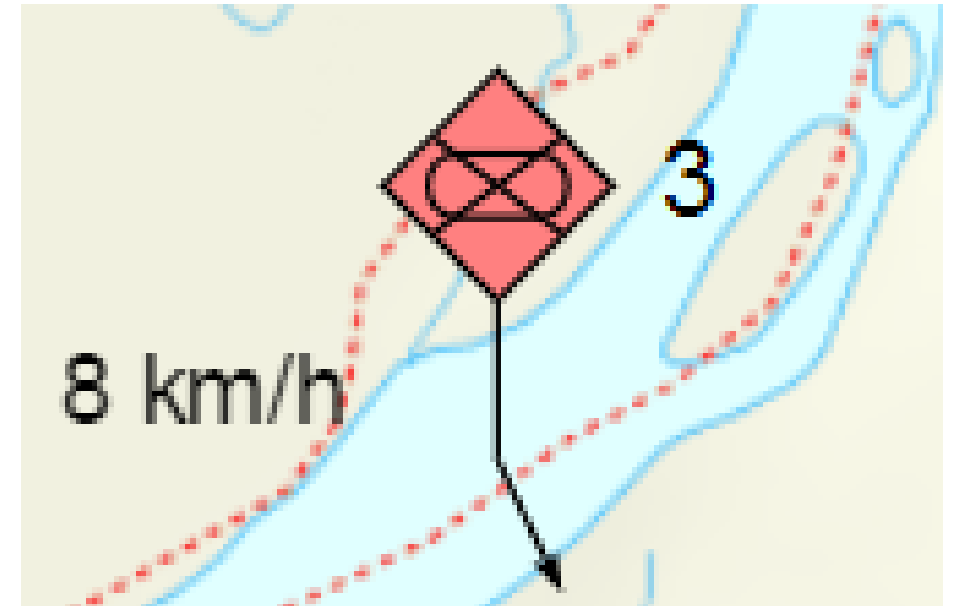
Web-based GUI system – webSAF



Web-based GUI system – webSAF

Fog of war:

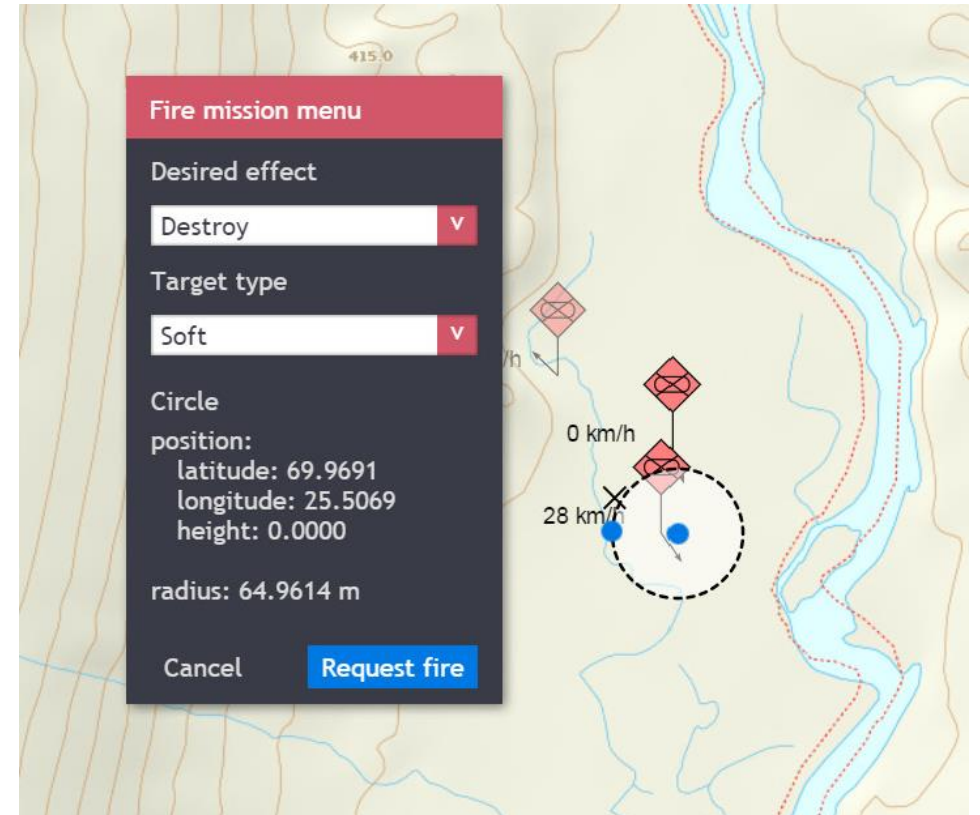
- Opposing side is hidden by default
- Spot report appears in map when a friendly unit spots the enemy
- Spot reports indicate:
 - Type (MIL-SDT-2525C equipment type symbol)
 - How many
 - Approximate heading and speed
- A spot report is updated at regular intervals as long as the enemy can be seen



Web-based GUI system – webSAF

Orders

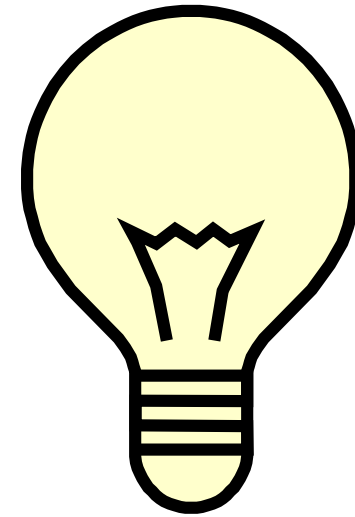
- Issued through the context menu (right-click in map)
- Options in context menu depends on operator role



Web-based GUI system – webSAF

GUI design philosophy:

- Time efficient user interaction
- Familiar user interaction: easy to learn
- Easy to implement
- Easy to maintain and extend
- Inviting aesthetic look



Web-based GUI system – webSAF

Technology stack:

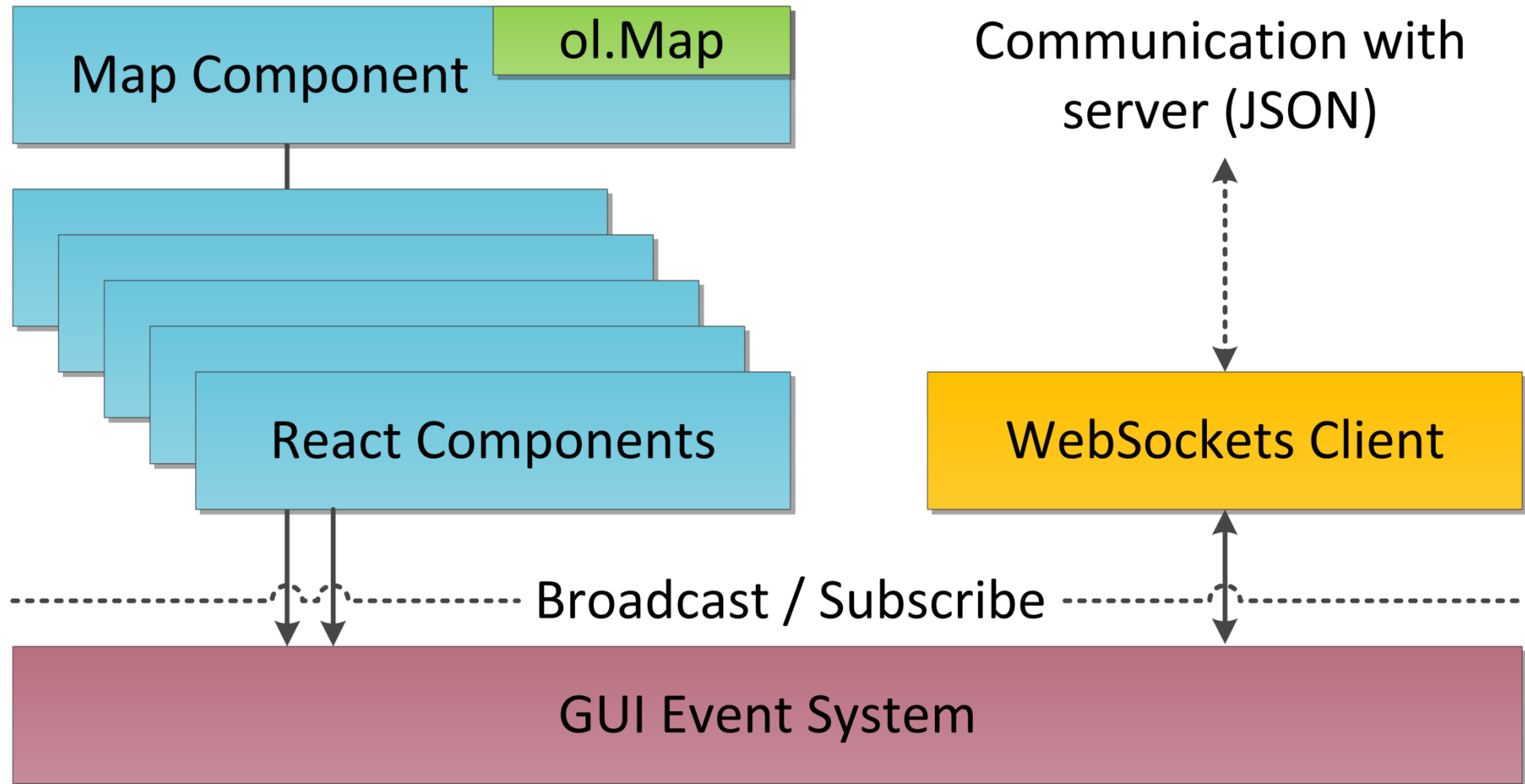
Web client:

- TypeScript
- React
- Open Layers
- WebSockets

Web server:

- C# .NET

Web-based GUI system – webSAF



Initial experiences with webSAF

Advantages to developing a web-based GUI system:

- Minimal hardware requirements for the operator clients
- No simulation software needs to be installed on the operator clients
- It can be ***tailored to a specific use*** (e.g. wargaming or command and staff training)
- It is in principle ***independent of the simulation tools*** in use, and can be used to control entities in a federation of different simulation tools
- There are a lot of tools and libraries available for developing web-based GUIs and applications
- Increased ***accessibility***

Initial experiences with webSAF

Initial tests:

- Setup: up to three operators on each side (manoeuvre, joint fires, air defence)
- Successful, so far no performance issues with the web server or GUI

Feedback from officers:

- Better than other GUI systems they have seen before, especially with regards to:
 - Accessibility
 - Ease of use
 - Visual feedback
- They want their command and staff training system, and also their C2 systems, to have GUIs with similar functionality

Future work

- Development of behaviour models of combat drills for manoeuvre platoons:
 - Behaviour trees for VBS Control
- Include additional capabilities like combat service support and ISTAR
- Calibration, validation and extensive testing
- Make the webSAF more interoperable by using:
 - Coalition Battle Management Language (C-BML) for sending orders to the simulated units
 - WebLVC for transferring entity status data from the whole simulation system

Summary and conclusion

- We are developing webSAF, a web-based GUI system for controlling entities in constructive simulations
- webSAF is in principle independent of the simulation tools in use
- GUI functionality is being developed in close collaboration with military subject matter experts (SMEs) and officers
- GUI functionality is designed to be easy to use, in order to reduce the number of operators required
- webSAF has been well received by officers
- We believe the web-based GUI approach is the way ahead to make constructive simulations and also C2 systems more accessible and easier to use

Questions?

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