



Modelling crisis management for improved action and preparedness

Tallinn University of Technology: Expertise in agent-based simulations based on the DynMap platform

**CRISMA Business Day
4th June 2015, Brussels
Dr Kuldar Taveter - TTU**



Agent-based simulation models on the DynMap platform

- **The Offer:**

We offer a methodology and platform for developing agent-based simulation models of complex systems

- **The targeted market(s):**

- Profiles of the Clients/users:

- *National civil protection and emergency services*
 - *Governmental organizations*
 - *Application developers for monitoring and surveillance technologies.*

- Geographical areas:

- *Europe*
 - *Australia (bush fires)*
 - *United States (storms)*
 - *The rest of the world*

Why agent-based simulation models?

1. Dynamic unpredictable environment
2. The behaviour of the involved actors strongly depends on the state of the environment
3. Emergent behavioural patterns of the involved actors because of 1 and 2

How do we engineer agent-based simulations?

- The software engineering methodology of Agent-Oriented Modeling is applied for analysis and design of agent-based simulations
- Dynamic environment is represented in terms of Objects Of Interest (OOI)
- Careful design of two types of OOIs:
 - Proactive agents
 - Data objects
- Careful design of interaction patterns between proactive agents and manipulation of data objects by the agents
- Iterative development of agent-based simulations

Visualizing the layers of OoIs on the DynMap platform

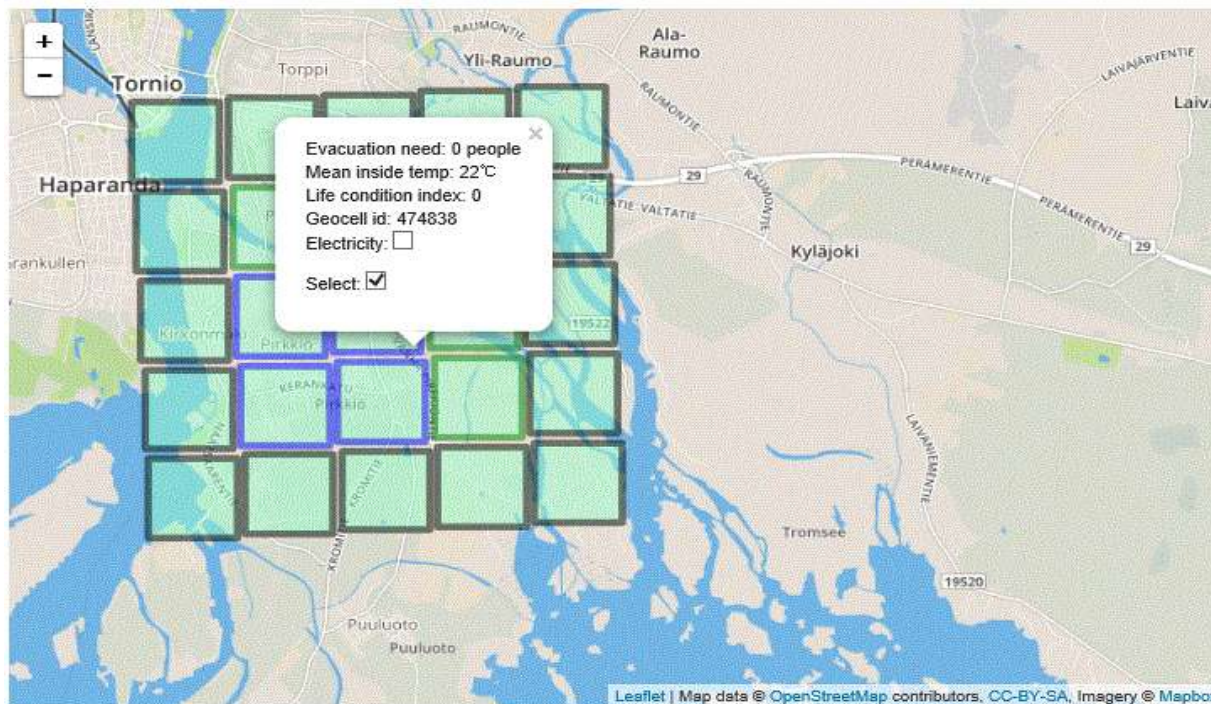


Results of environment simulations, where DynMap is used as a remotely controlled Web-service

CRISMA Pilot A simulation system: configure power

main.php

Init parameters & simulation



Actions

- Life Condition
- Building Condition
- Emergency Level
- Evacuation Needed

Preparedness Planner

Economic Impacts

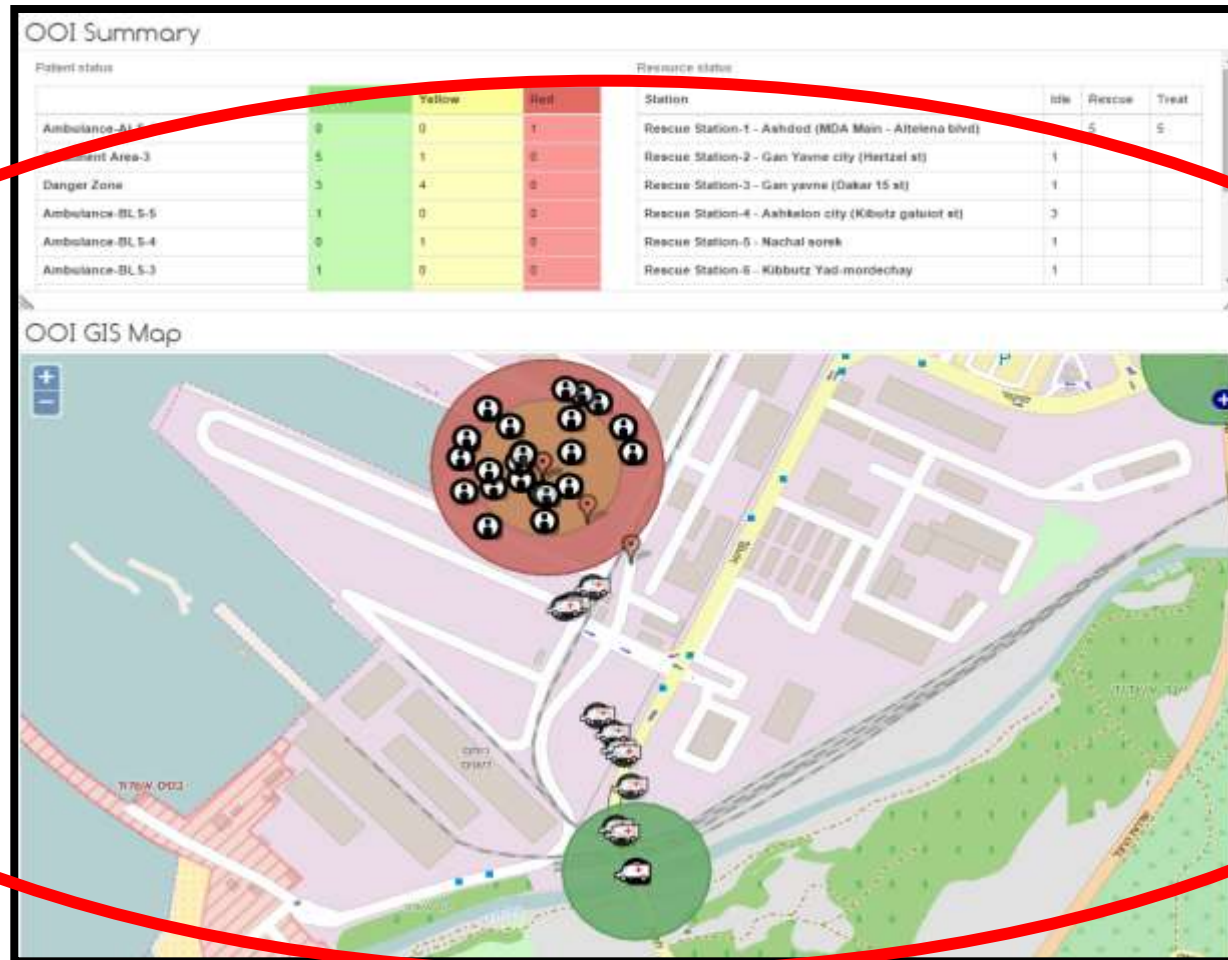
Make new branch

Start simulation

Evacuate people

Compare

Agent-based resource management with DynMap visualized by CRISMA GIS Map Widget (by AIT)



Conditions of the offer by TTU

- TTU does not offer any ready-to-use component for third parties, but can offer expertise in developing agent-based simulation models, such as the ones implemented for reference applications in CRISMA
- TTU intends to utilize and extend its agent-based simulation modelling capabilities in future R&D projects
- TTU is also willing to provide training, know-how transfer and development support for third parties interested in applying this concept

Added value

- The end-user can be involved in developing their domain-specific agent-based simulation models by **systematically** following the requirements stated by them
- DynMap facilitates the integration of different third party models into one application

Demonstrations and Contact

- **Demonstration material:**
 - *Available at request (please see below)*
- **Contact:**
 - *Tallinn University of Technology, Estonia:*
 - *Prof Kuldar Taveter, kuldar.taveter@ttu.ee*
 - *Dr Kalev Rannat, kalev.rannat@ttu.ee*