

BATTLESPACE TERRAIN OWNERSHIP: A NEW SITUATION AWARENESS TOOL

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Background



- **Our team explores the applicability of combat simulation to networks, information, and integration**
 - **Course of action evaluation & metrics for planning**
 - **Decision methodologies for mobile battlefield commanders**
 - **Extension of combat modeling mathematics**
 - **Application of data mining techniques on simulation results to analyze tactical operations**

Battlespace Terrain Ownership



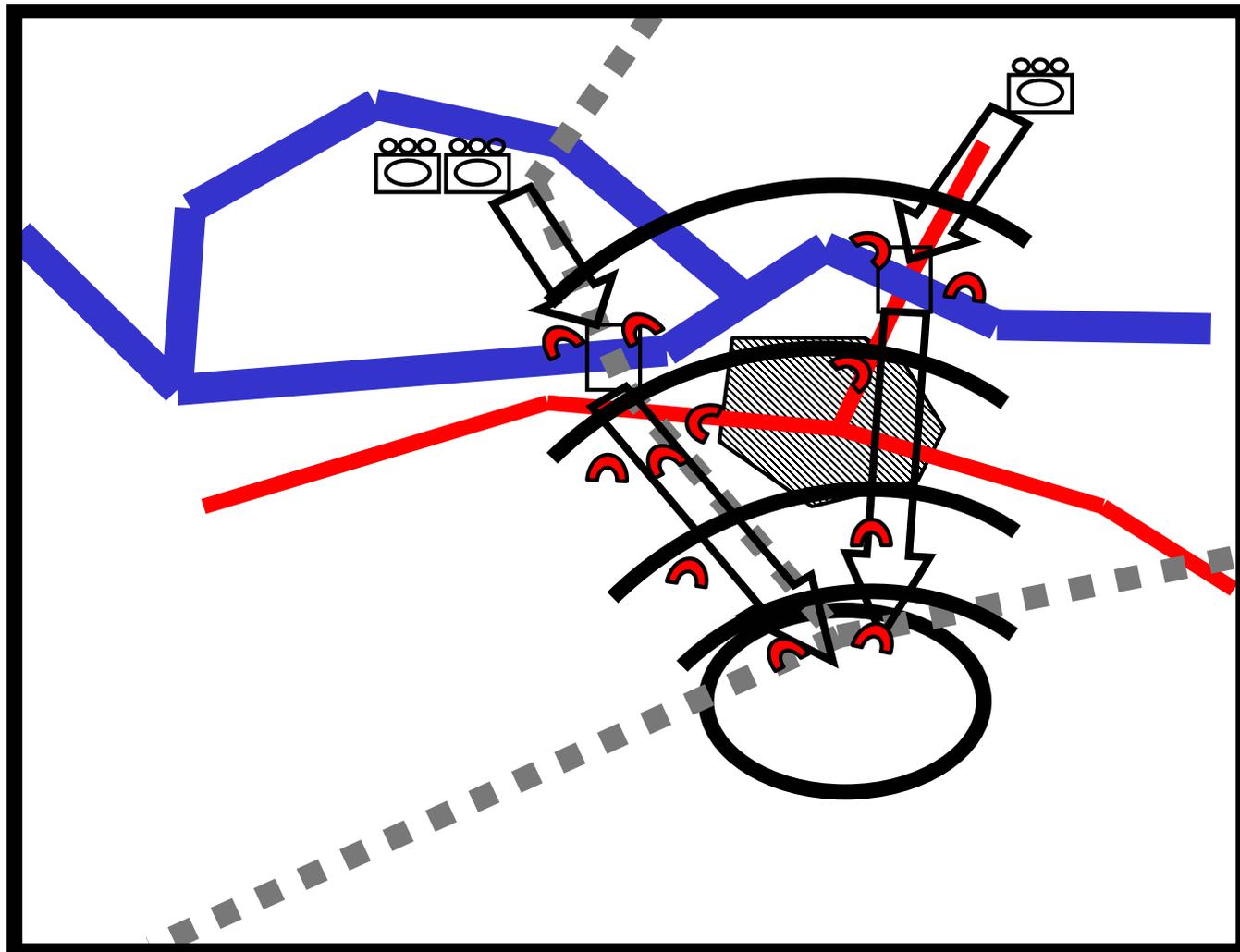
- ❑ **BTO computes control based on combat power projection as a function of position, asset distribution, weapon system effectiveness, probabilities of hit and kill, and damage**
- ❑ **A dynamic diagram updated as a battle progresses to aid the commander in timely prediction of crucial events**
- ❑ **The prototype is currently linked into streaming data from One Semi-Automated Forces (OneSAF) combat simulation to demonstrate ownership display**

Battlespace Data



- ❑ **To emulate battlespace data sources in laboratory conditions, we used OneSAF**
- ❑ **Modified OneSAF to produce data files containing both force interactions (combat) and entity status (logistics)**
- ❑ **Developed a Southwest Asia scenario depicting a company-sized assault on a numerically superior defense**

Scenario Schematic Diagram



Assumptions



- ❑ **Friendly (Blue) and Opposition (Red) force vehicle status and position are noted as they change**
- ❑ **For a given vehicle, any enemy vehicle may occupy a partitioned area being considered**
- ❑ **Each vehicle may fire whatever rounds are available**

BTO Algorithm



- ❑ **Partitions the battlefield into a number of rectangular areas for individual examination**
- ❑ **Determines the collective power that each force is able to project onto an individual area**
- ❑ **OneSAF yields probability of a certain round hitting a certain target**
- ❑ **Also have probability of various kill types (M, F, MF, K) given a hit for each type round against each type vehicle, as a function of range, round dispersion, angle of attack, and hit location**

BTO Algorithm (cont.)



- ❑ **Considers both friendly and opposition vehicles within range of the vehicle of interest (V)**
- ❑ **Calculates a probable effect that the distribution of all vehicles may have on V's ability to project the maximum power available to it**
- ❑ **Calculates "usable power" of V by degrading maximum power based on enemy vehicles within range and power projected by friendly vehicles onto enemy vehicles threatening V**

BTO Algorithm (cont.)



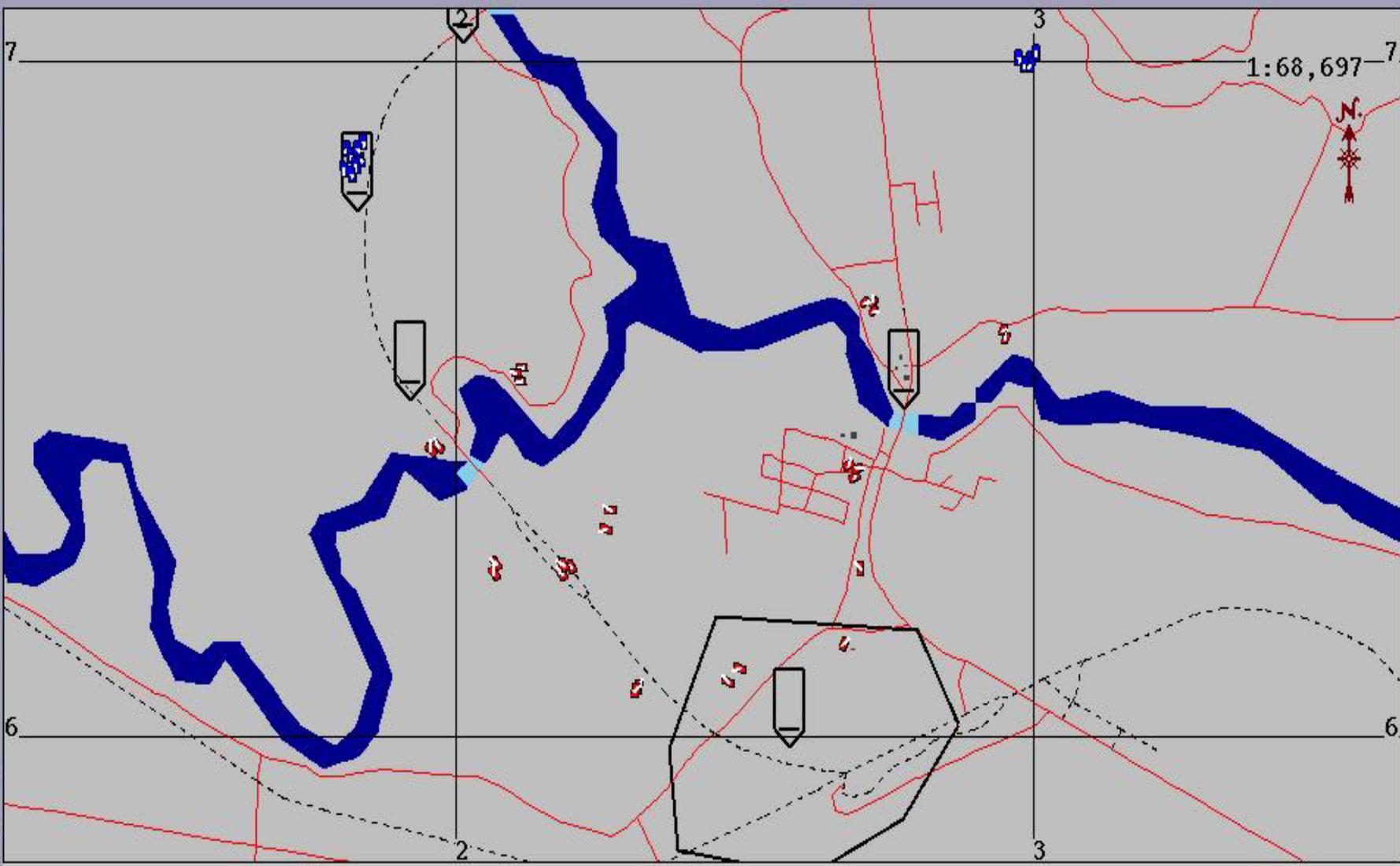
- **Six classifications of power ratios:**
 - **$\geq 3:1$ (Blue and Red)**
 - **$\geq 2:1$ and $< 3:1$ (Blue and Red)**
 - **$\geq 1:1$ and $< 2:1$ (Blue and Red combined)**
 - **an un-owned class (due to weapon range restrictions)**

- **Areas for each class are color coded and plotted**

- **Can plot, as a function of time, number of active vehicles, and overall percentage of ownership in the active area**

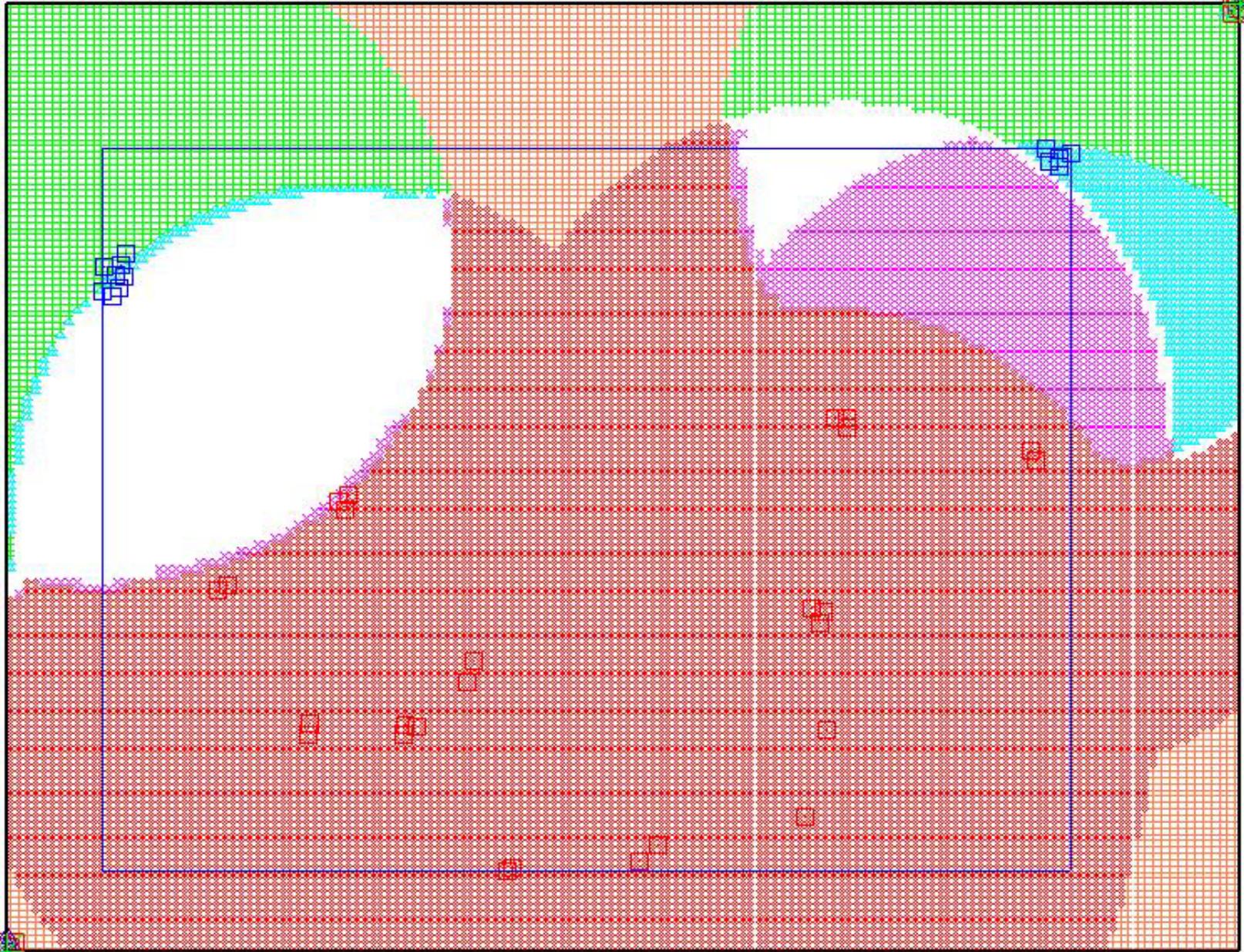


0A3
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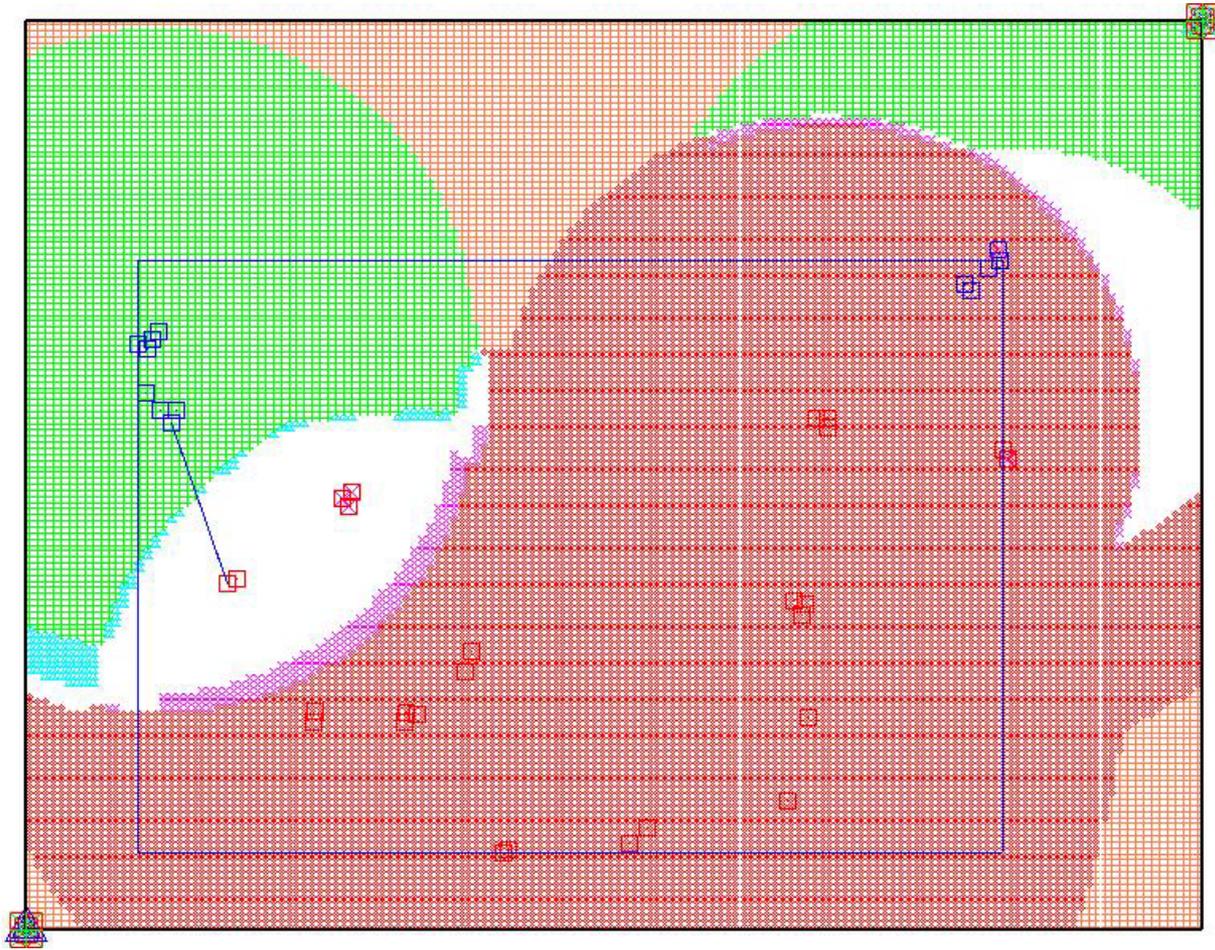
A set of four small icons for map navigation: a square with a crosshair, a square with a question mark, a square with a magnifying glass, and a square with a list icon.

Zoom: click middle to zoom in around point; click right to zoom out around point; click and drag middle to set screen area

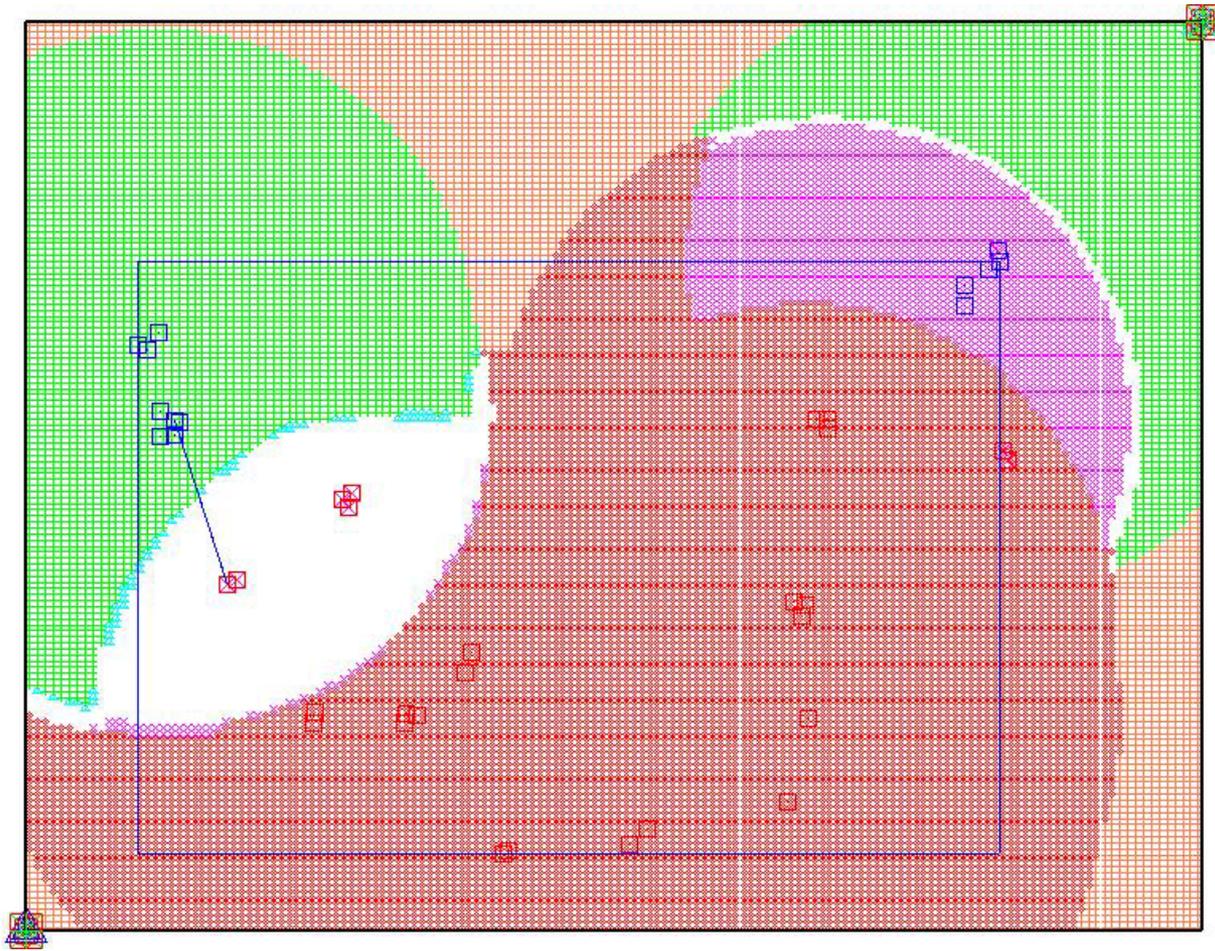
Select an item to edit



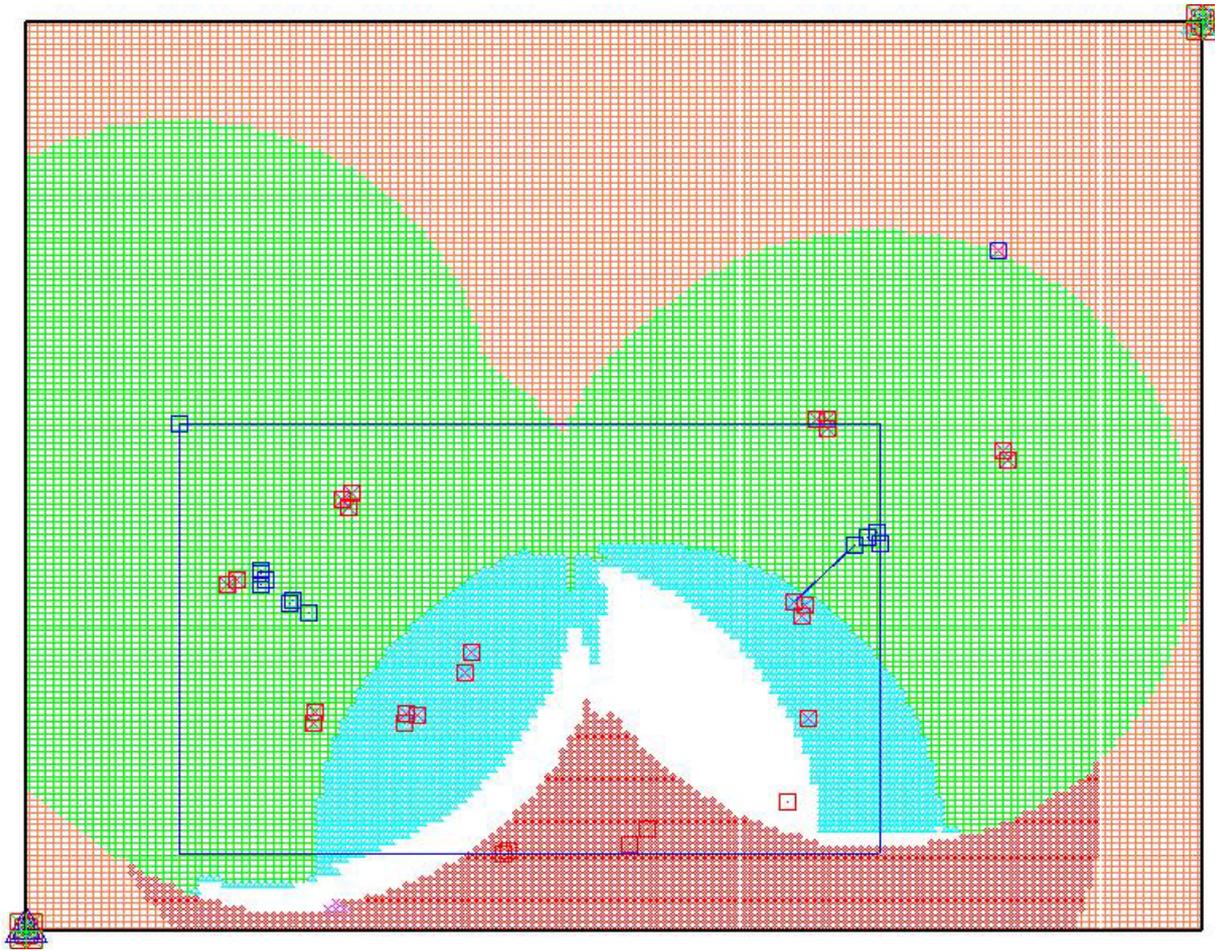
West Leg Progress



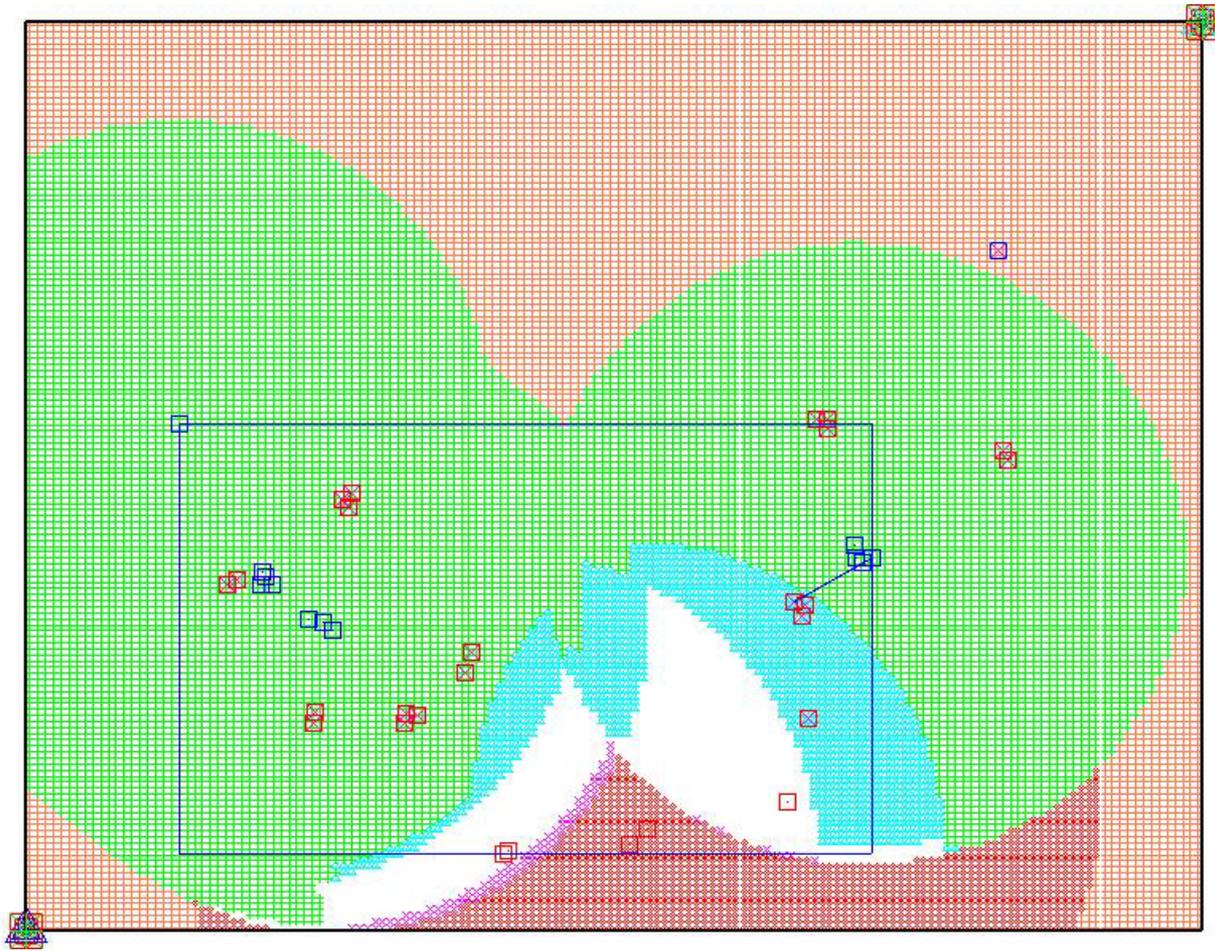
Blue Direct Fire



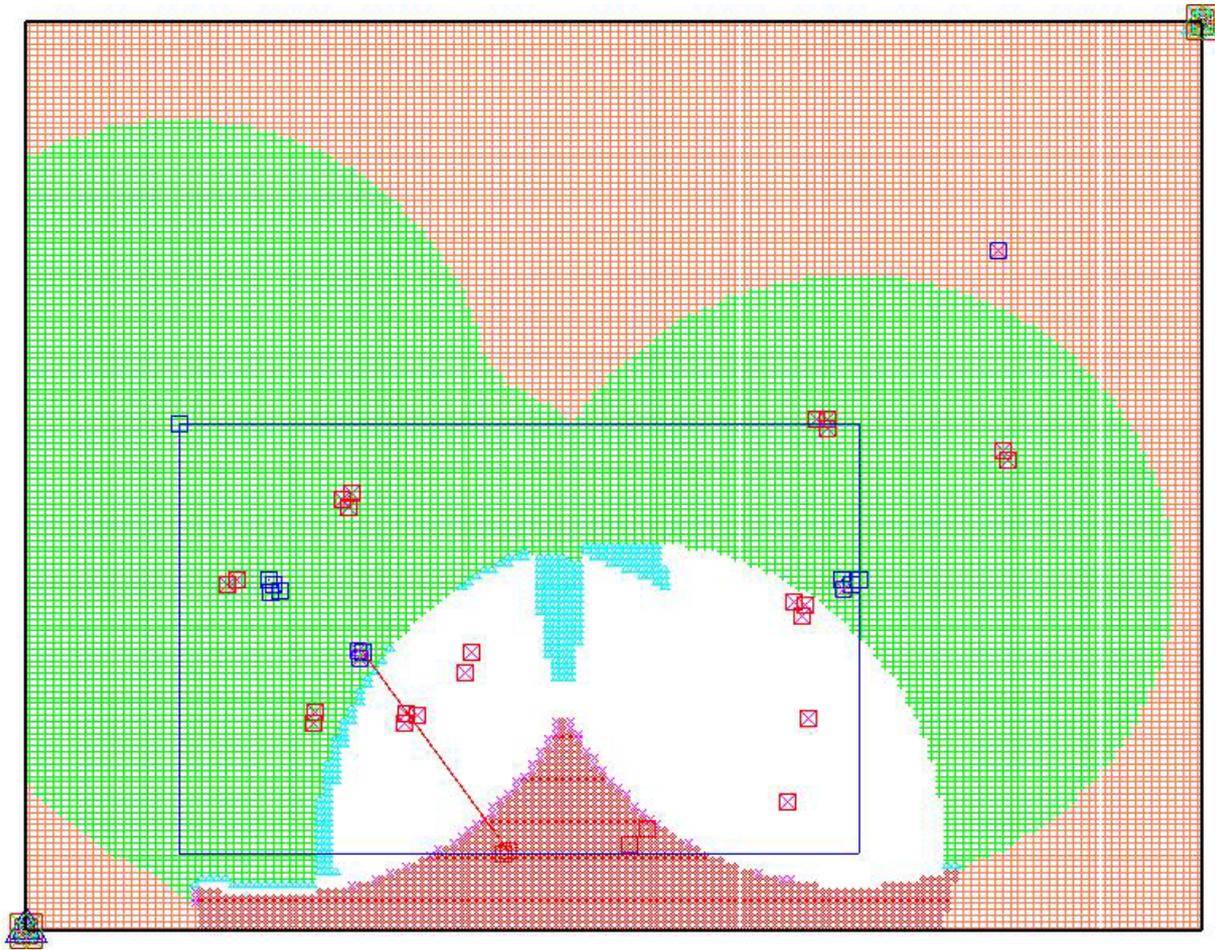
West and East Leg Progress



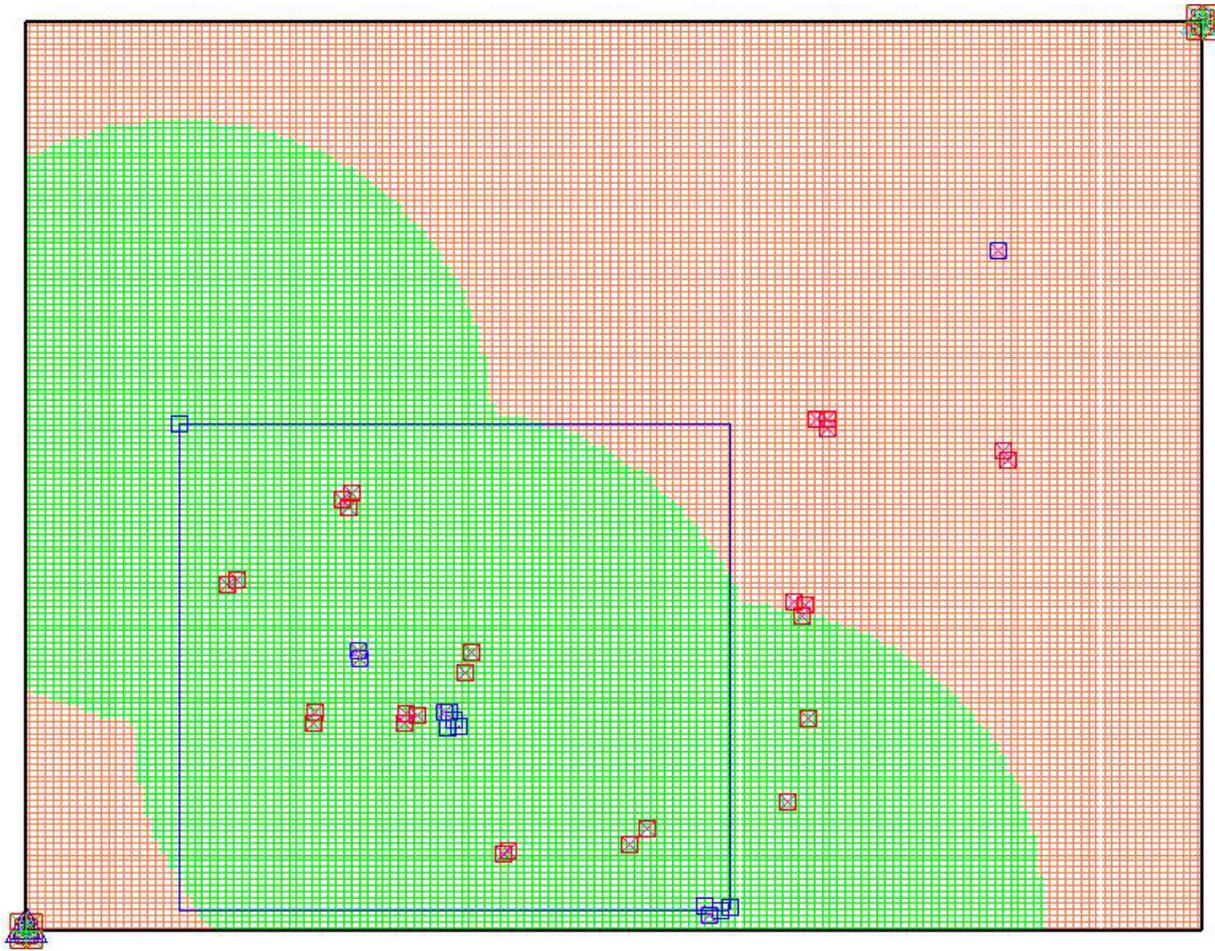
Direct Hit – Active Area Decreasing



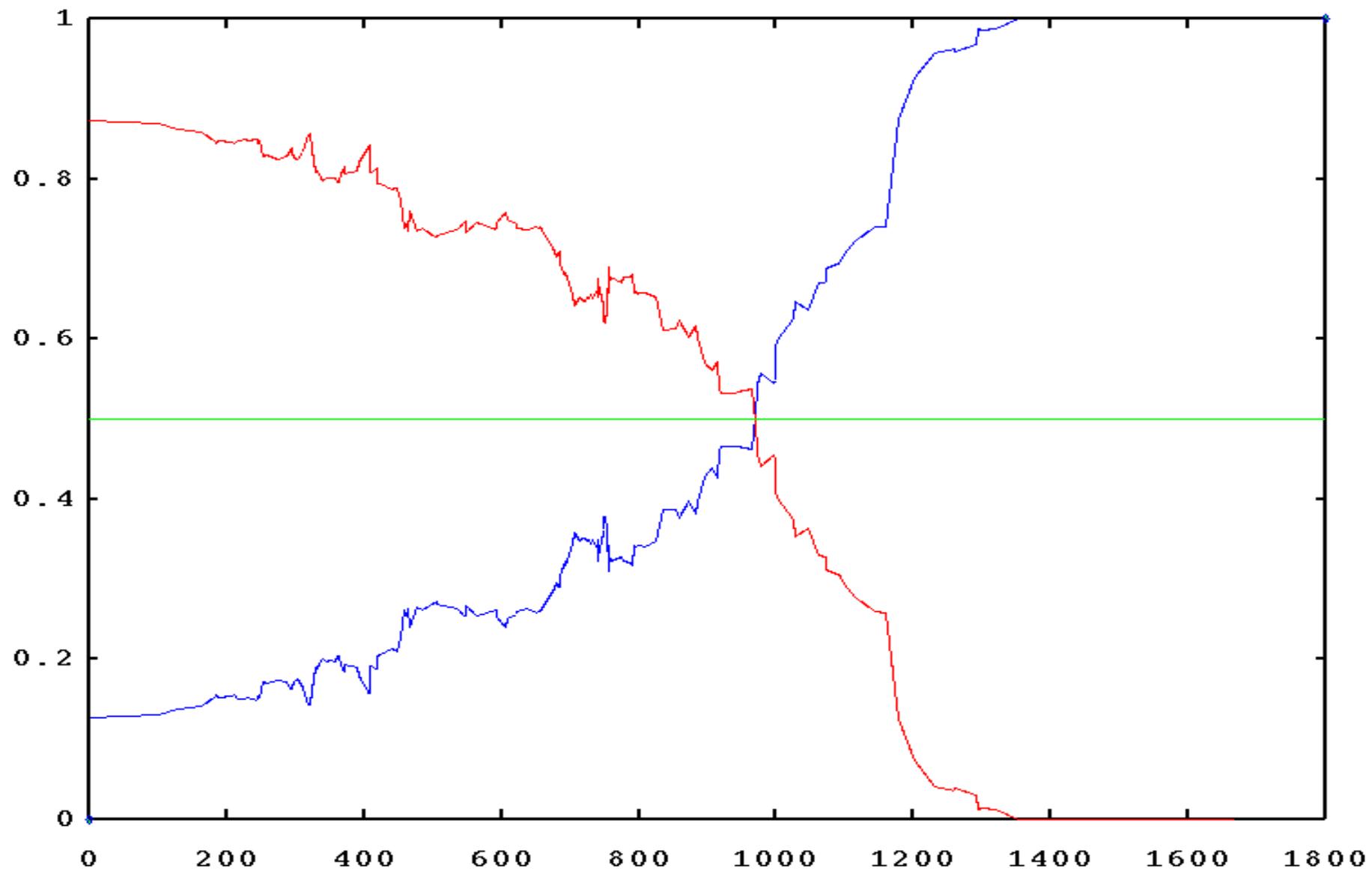
Red Direct Hit



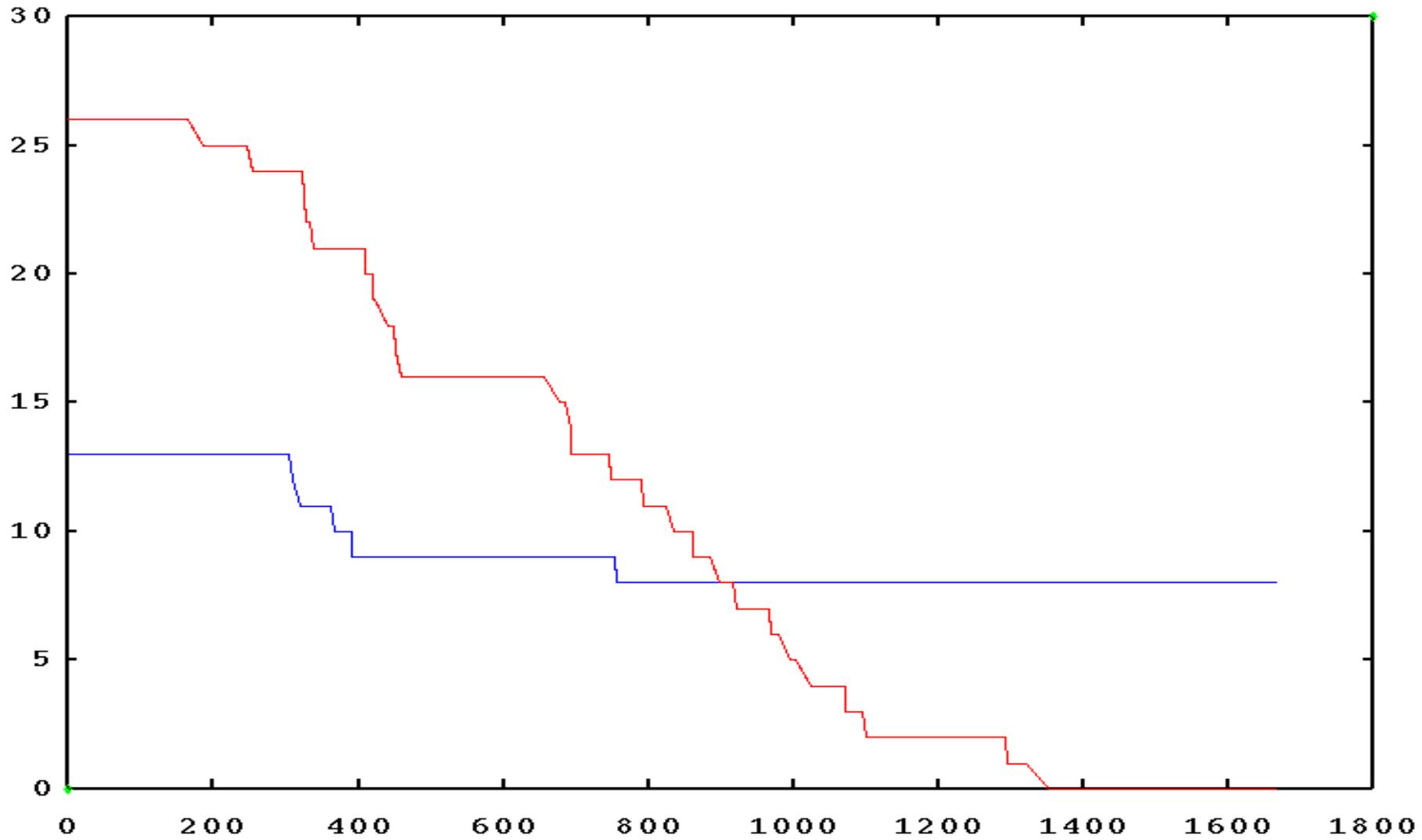
Battle Complete



Percentage of Ownership in Active Area (Time)



Number of Active Vehicles (Time)



BTO Enhancements



□ Completed

- Created JAVA GUI to launch OneSAF and BTO
- Ported BTO to Linux environment
- Improved OneSAF interface to reduce amount of human interaction necessary for data collection

□ In Progress

- Developing overlay so ownership graphic will display on map
- Taking BTO to Ft. Leavenworth for input on features and improvements
- Creating ownership algorithm for urban environments

Conclusion



BTO enables a real-time visualization of the battlespace, presented without excessive details, to help the commander recognize force potentials and terrain control in battle monitoring and execution.

Questions?

