

Agent Simulation of SIGINT Sensors in Border Safeguarding

By Seanette van Rooyen



Outline

- Definitions
- Context Agent Based Modeling
- Purpose
- What is Agent Based Modeling?
- Experiments
- Results
- Conclusion

Definitions

- SIGINT
 - COMINT
 - ELINT
- Triangulation
 - C01 Track
 - C04 Bearing Track
- Electronic Order of Battle (EOB)
 - Decryption, Traffic analysis
 - Track Management (Air Picture)

Agent Based Modeling in C2

C2 Context

- Conventional warfare
- Border Safeguarding

Simulation scenarios

- Track Management
 - Battery -> Regiment -> Sector
- Constraint Programming
 - Dynamic Path Planning Red Forces(Threats)
- Border Safeguarding
 - Threat Evaluation Weapon Assignment (TEWA)

Purpose

- Use SIGINT sensors in Simulation
- Enhance Command and Control simulations

What is Agent Based Modeling?

- Multiple Individual or Groups of agents
 - blue forces
 - red forces
 - infantry
 - obstacles
 - sensors, radar
- Environment
 - GIS terrain map
 - Time Of Day
 - Weather

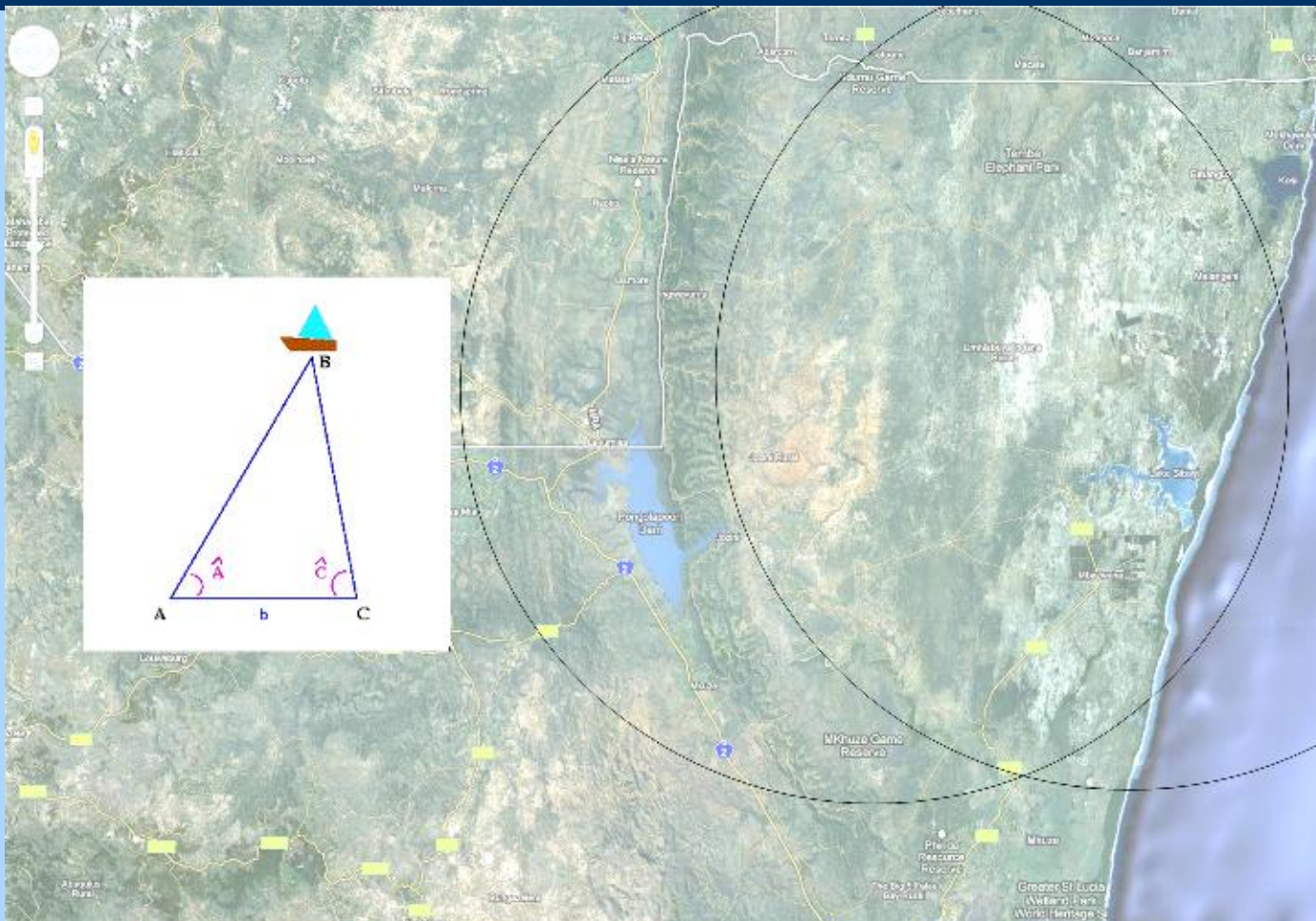
What is an Agent?

- Behaviour
 - act, move
- Presentation
 - color, shape, icon
- Properties
 - state variables, location, velocity
- Make decisions
 - Learn
- Random distribution space

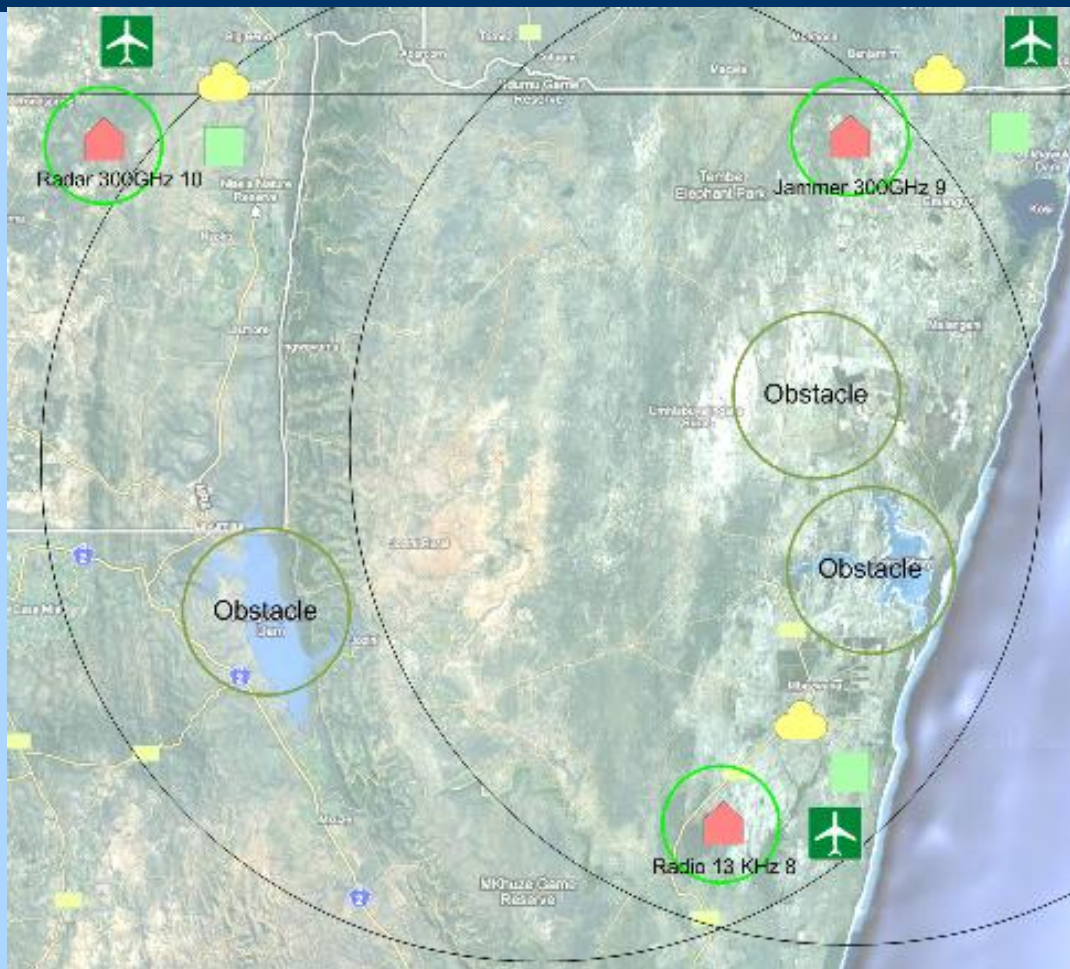
Simulated Elements

- Red forces
- Blue forces
- Environment

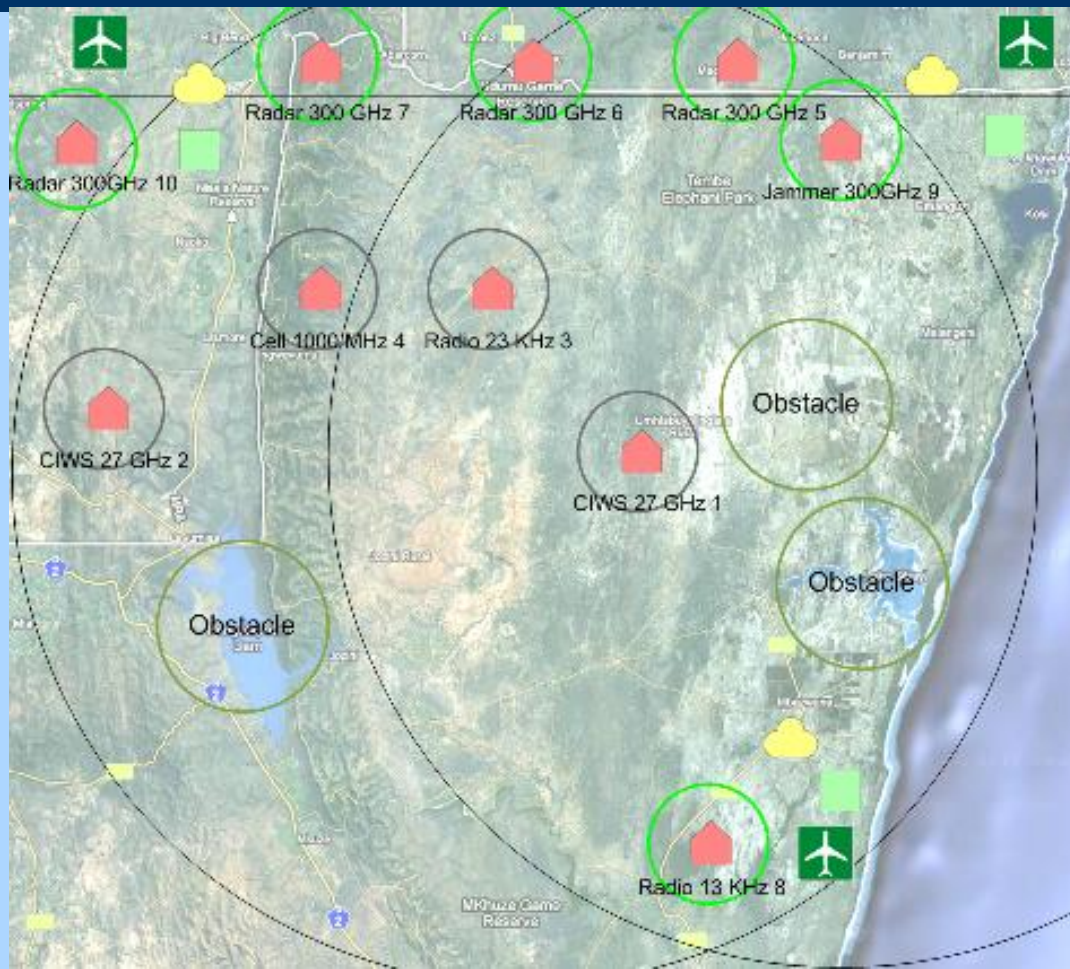
Experiment Design



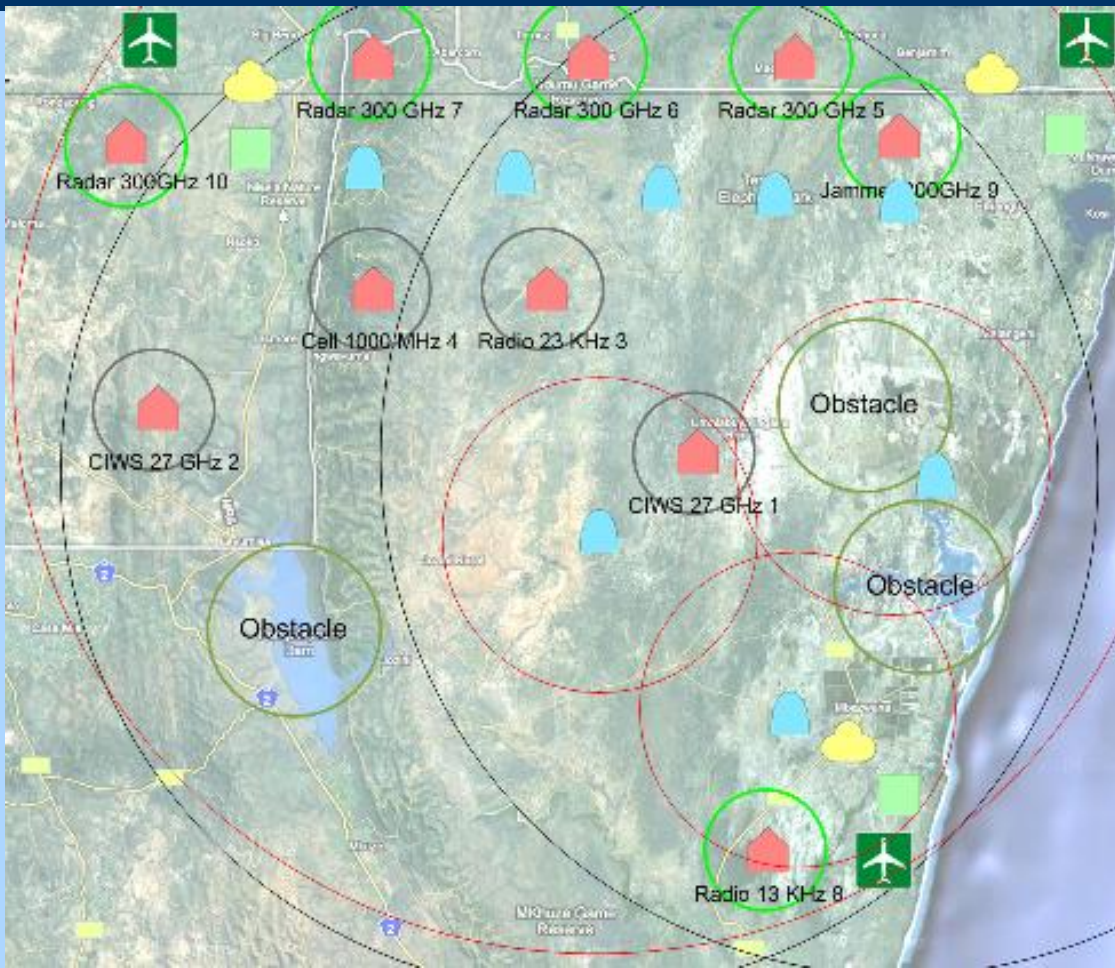
Red threats: radio, radar, jammer



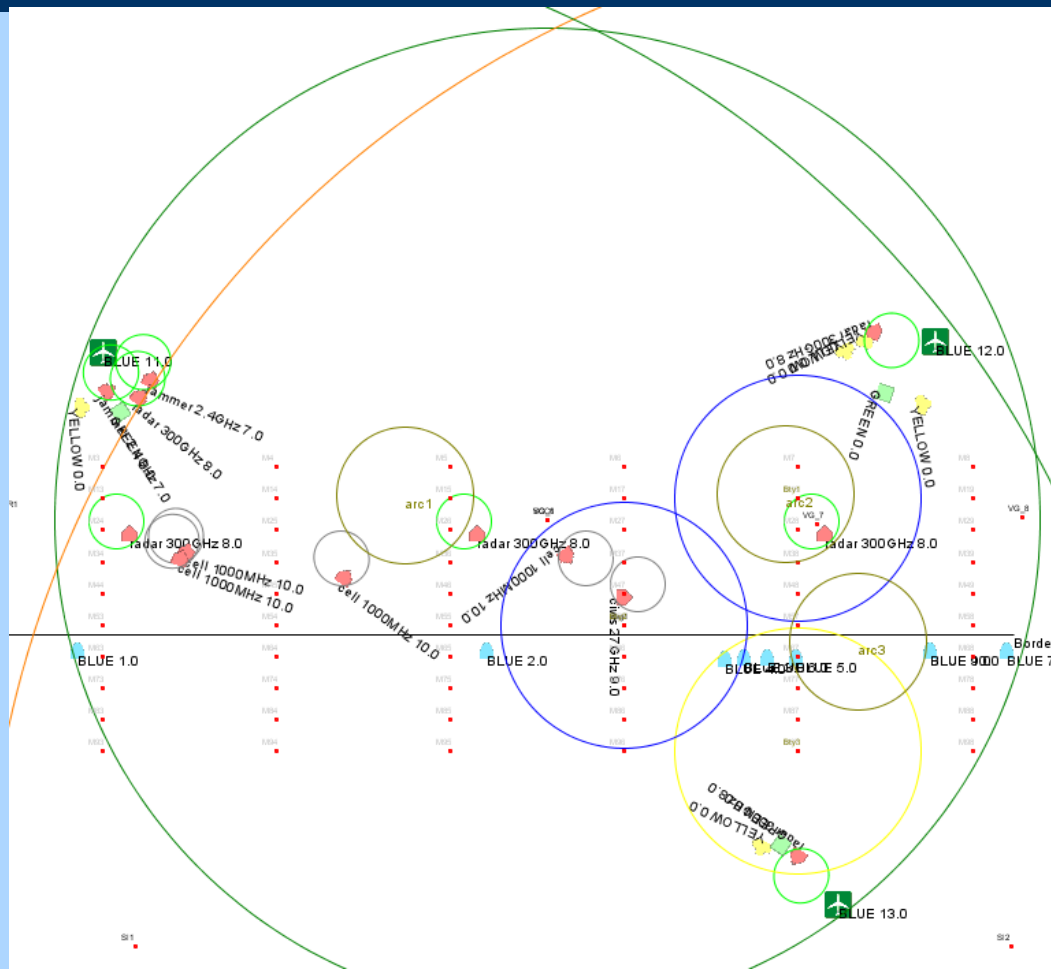
Red threats: radar, infantry, cell, radio, CIWS



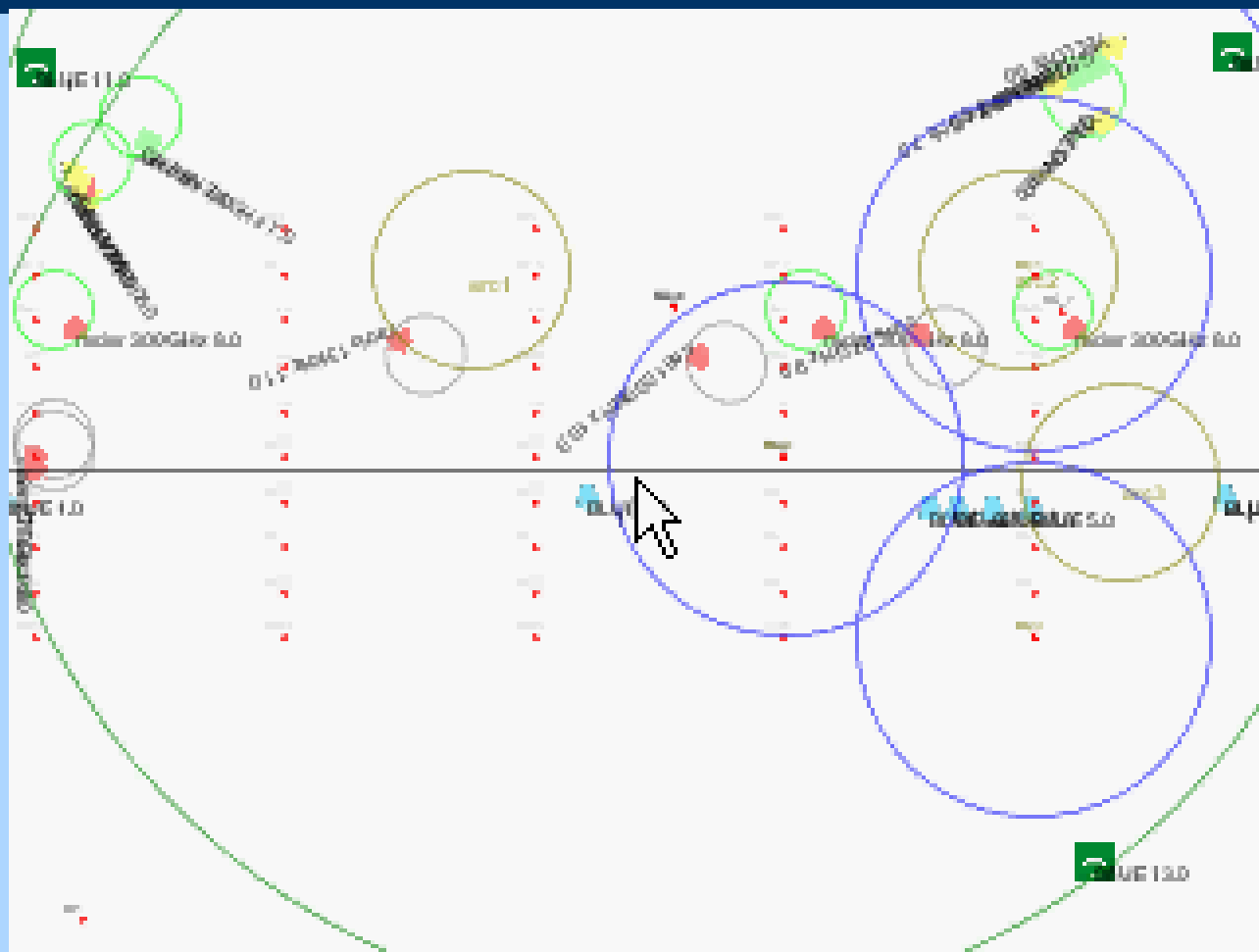
Blue forces: 3 Bty, 1 Reg, 1 SCC, Infantry



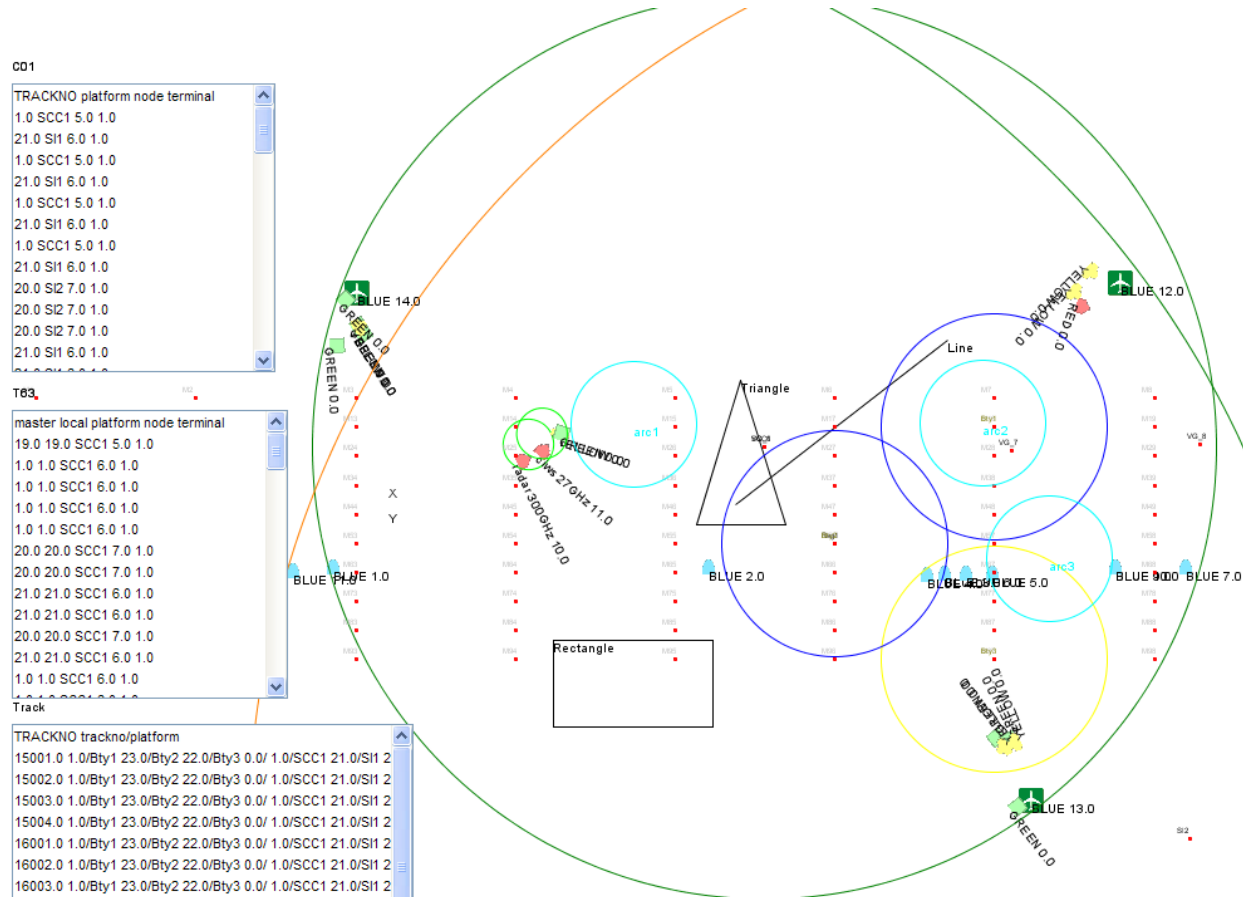
The whole air picture



Simulation



Track Management



Border Safeguarding



•Car and Stolen Vehicle



•Dismounted Soldier



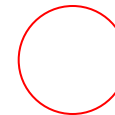
•Platoon car



•Walker



•Road



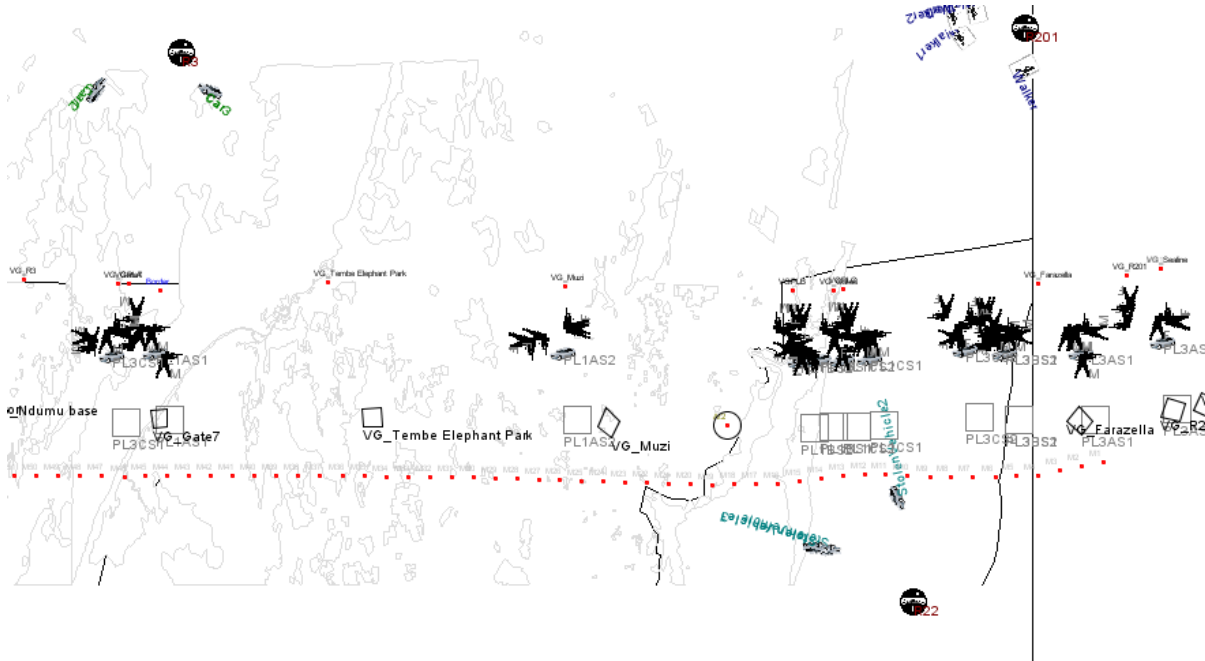
•Surveillance arc

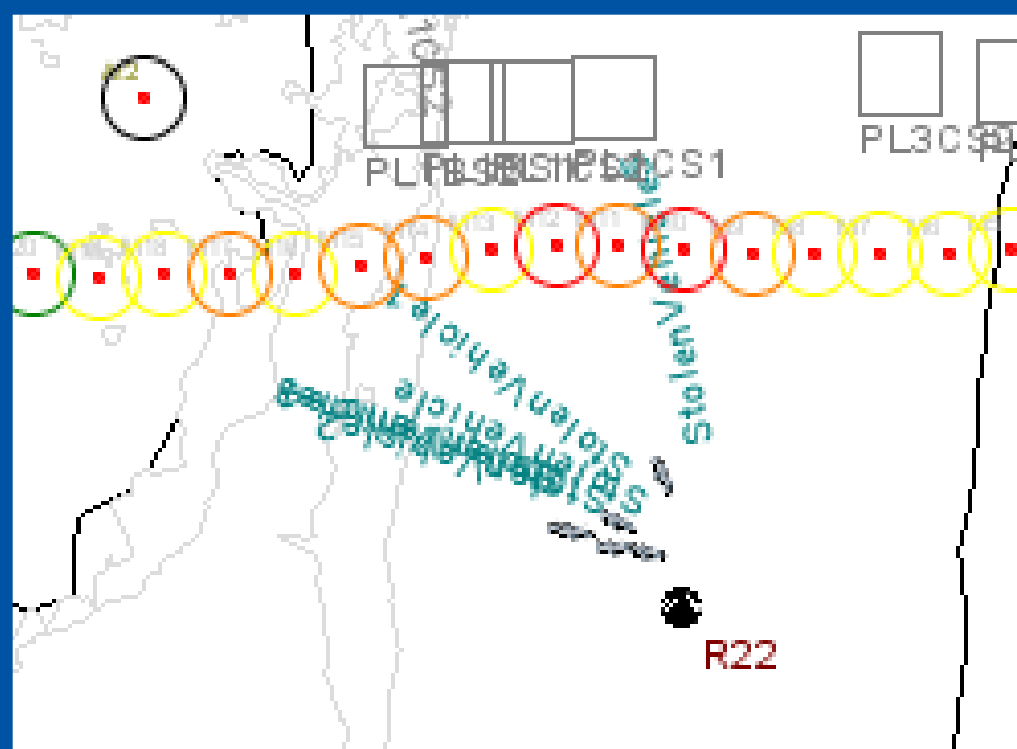
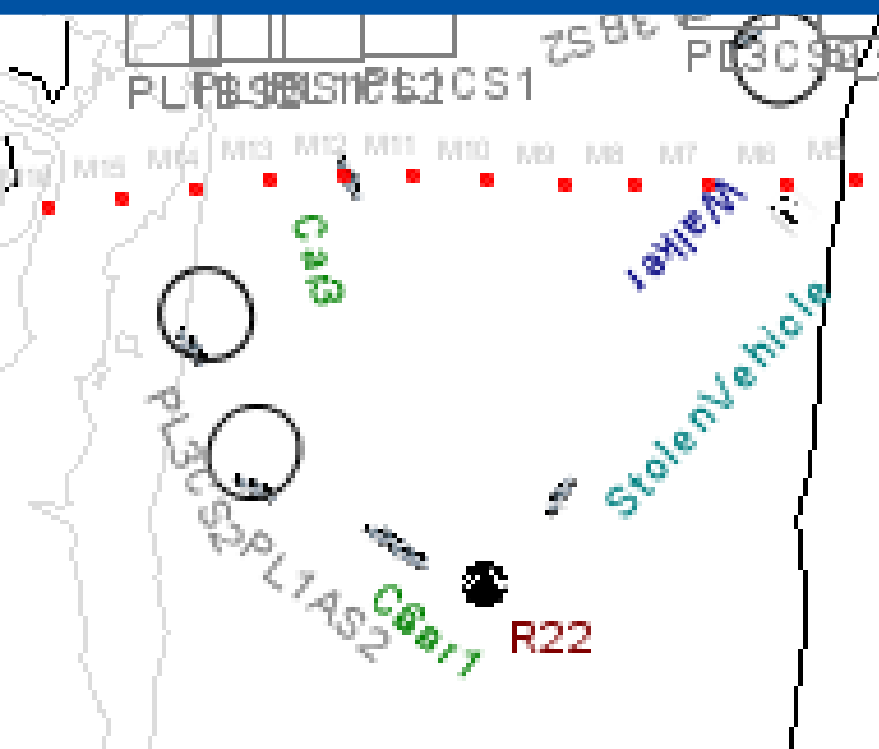
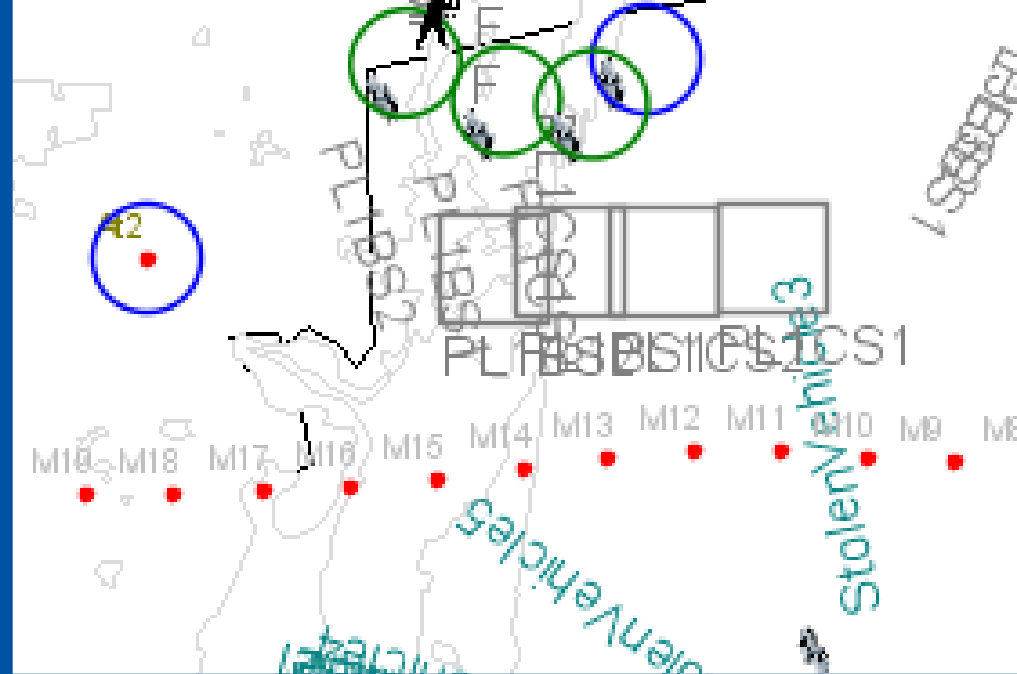
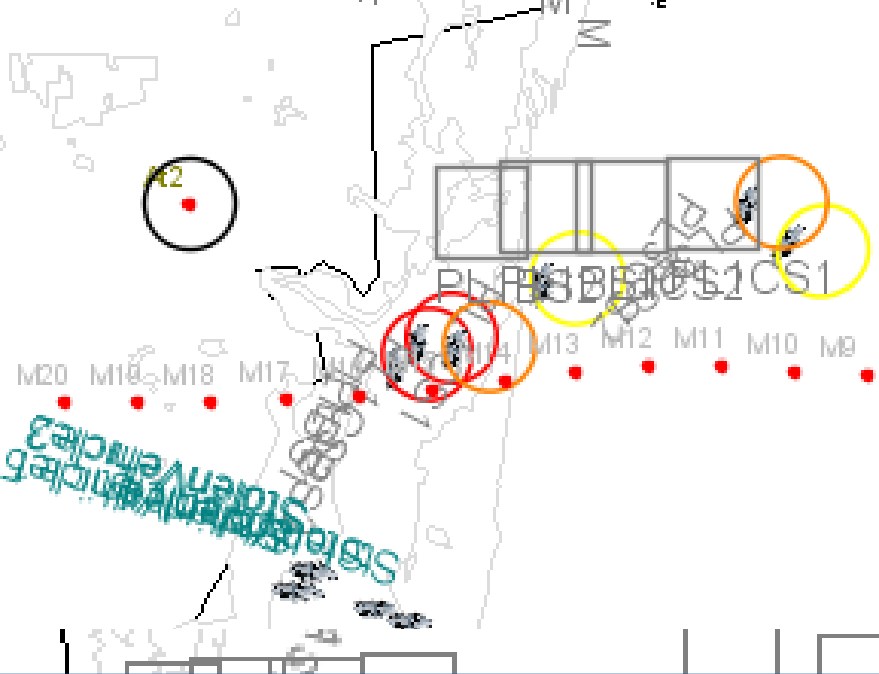


•Area

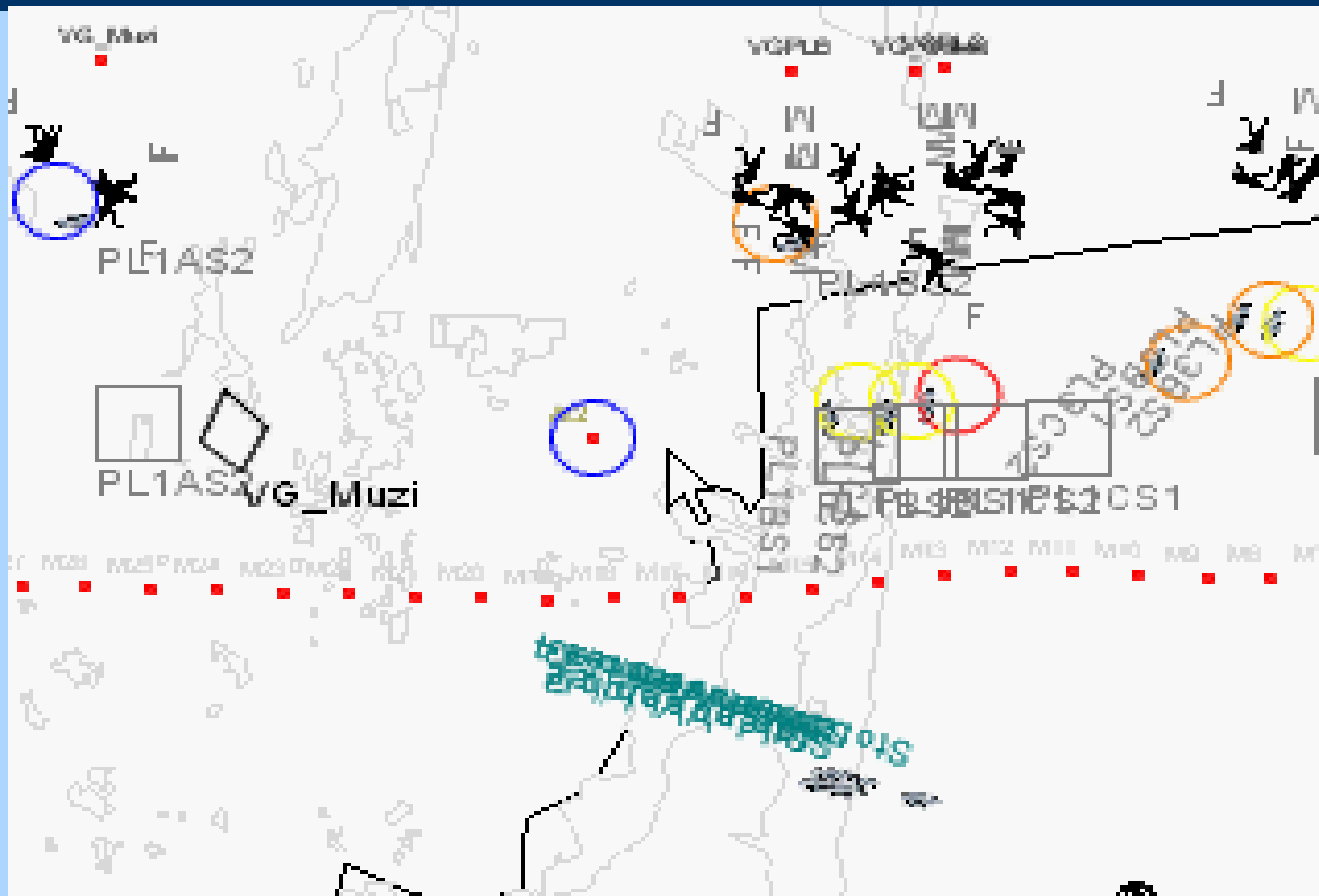


•Point of Interest





TERA Stolen Vehicles



Results

Measure Performance

- individual equipment
- system configurations
- Track Management with/without

Conclusion

- Contribution
- Other applications
- Future work

Other Applications for Simulation

Military sphere

- Joint CC
- GBADS
- Maritime
- Landwards
- Information Warfare
- Electronic Warfare

Civilian/ Commercial

- Perimeter control
- Supply chain
- Manufacturing plants
- Social networks
 - Spread of disease
 - Word of mouth

Future Work

- Add technology
 - Horses
 - Motorbikes
 - UAV
 - Radar
 - GPS
 - Cell phones
 - Fixed Wing
 - Weapons
- C2
 - Track Management
 - TEWA
 - Dynamic mast placement
- Architecture
 - Credibility and Validity
 - MODAF

Questions?

- Thank you
- More about Simulation?
- More about projects at CSIR?

svanrooyen@csir.co.za