Scenario Development Tool: Rapid & Agile Planning

James Hilton
Old Dominion University

Saikou Diallo & Ross Gore
Virginia Modeling Analysis and Simulation Center

Problem

- Planning is a manual, communication intensive exercise that is expected to be carried out in a short amount of time and while employing minimal resources.

- Why aren't we using existing simulations (ONESAF, Combat XXI)?

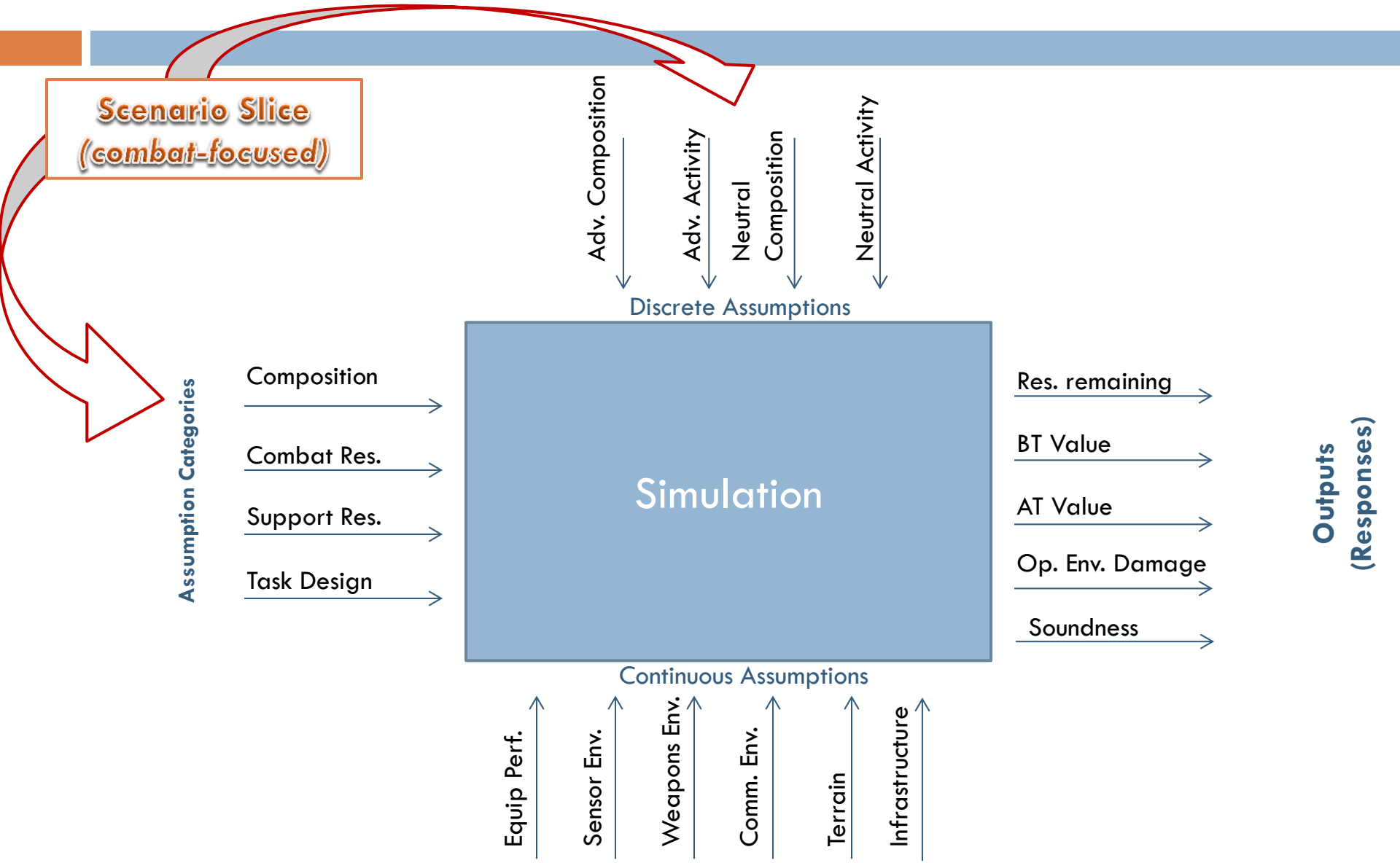
Example: Amphibious Force Landing

- SMEs from Navy & Marines - Surface, Aviation, Mine Warfare, Logistics.
- What is the difference between Fires supplying 100 bombs per day vs. 80?
- Effect on Landing Force Rate of advance? Success?
- Currently, everyone must know everything and plan for every scenario!

Scenario Development Tool

- Enable rapid and agile exploration by interfacing inputs & outputs with existing sims.
- Web-based, domain-specific, graphical user interface for input specification.
- Multivariable output visualization via response surfaces.

Exploration Concept



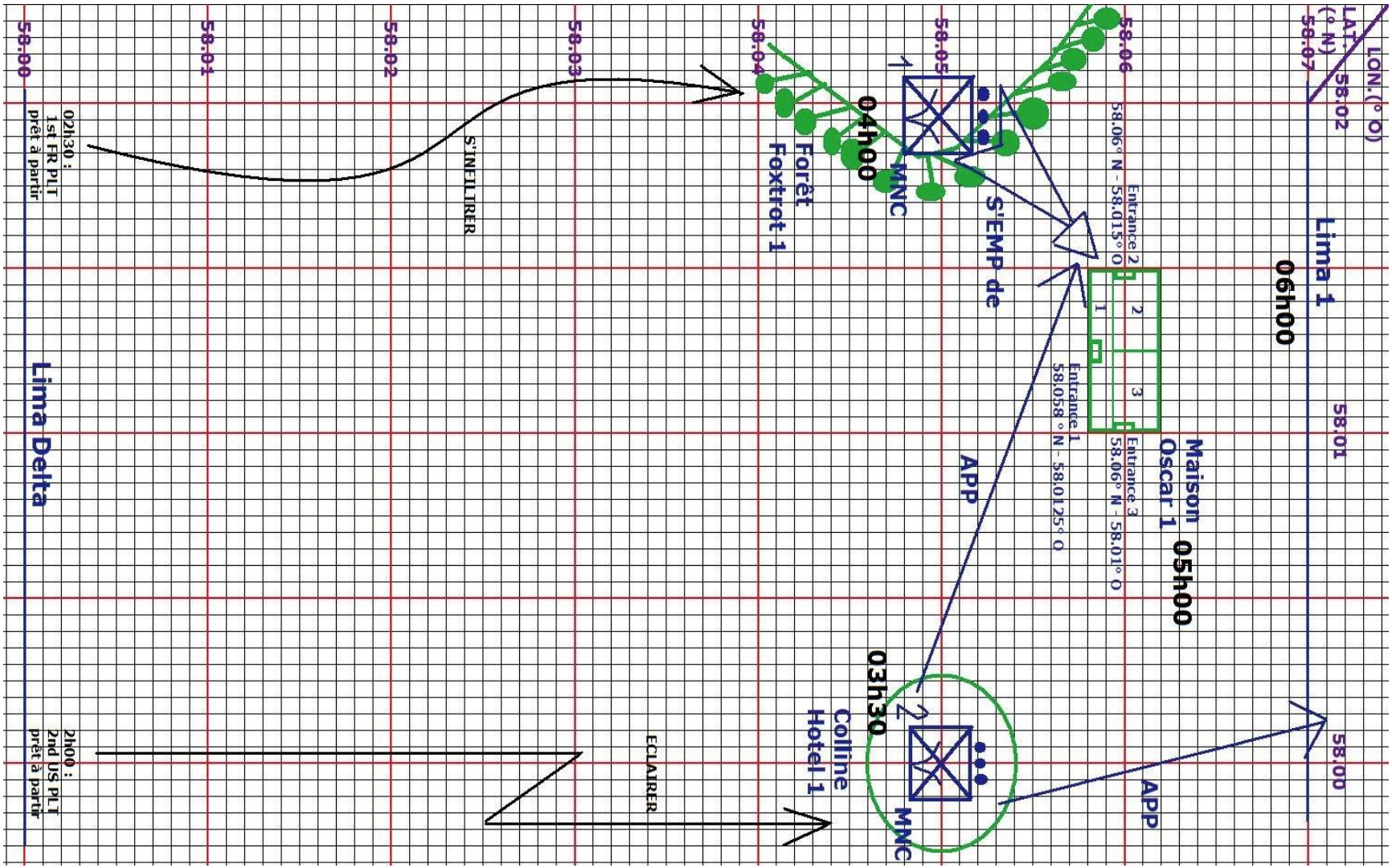
Outputs/Responses

1. **Feasibility** (0-100) – Percent of friendly resources (fuel, ammunition, etc.) remaining at end of scenario.
2. **Break-Through (BT) Value** (attack or defense). To what extent is the attacker able to bring forces into the back of the defender.
3. **Attrition (AT) Value** (attack or defense). To what extent is the attacker able to neutralize the defending forces.
4. **Operational Environment Damage (OED)** Total percent of non-friendly and non-adversary entities (i.e., infrastructure, neutral forces) within the boundaries of the scenario that remain usable.
5. **Soundness** – Can every task be carried out given the course specified?

SDT Workflow

1. Scenario and value ranges of input variables are specified via graphical interface.
2. A formal specification of the scenario is built (i.e. C-BML, MSDL).
3. CBMS links the specification to the computer simulation (ONESAF, Combat XXI).
4. Simulation is executed for all specified value ranges.
5. Outputs of the simulation are visualized via response surface.

Use Case: Multi-national Company



Use Case: Multi-national Company

A Multi-national Company plans to take possession of Oscar 1, a house surrounded by an Enemy force.

For mission success:

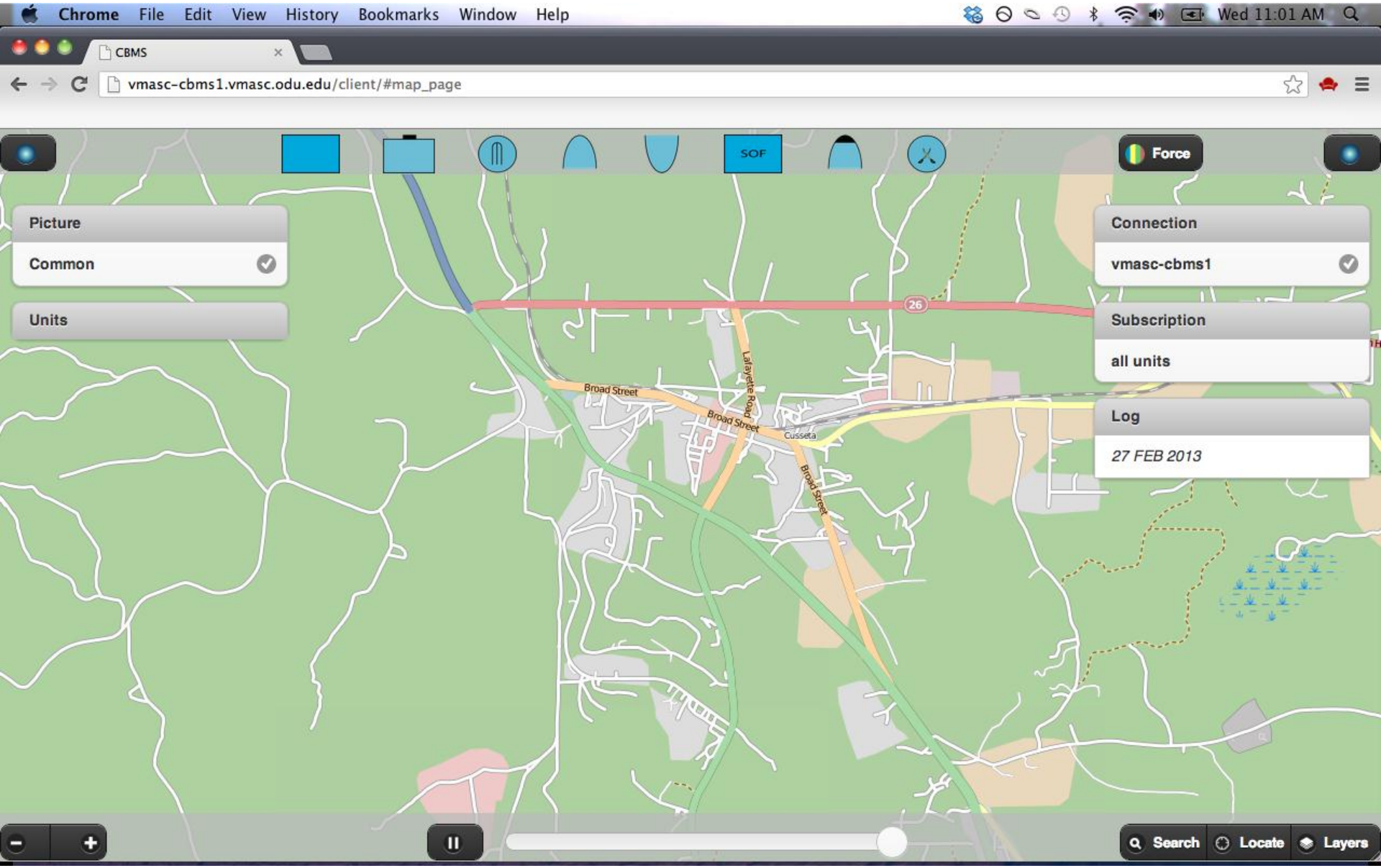
1. **Move to a secure area and place a device monitoring on Oscar 1.**
2. **Move along a discrete path to a location close to Oscar 1 to settle in for an assault.**
3. **Assault and clean the enemies at Oscar 1, seize possession of the house.**
4. **Fall north of Oscar 1 and install a monitoring device to the North, West and East of the seized location.**

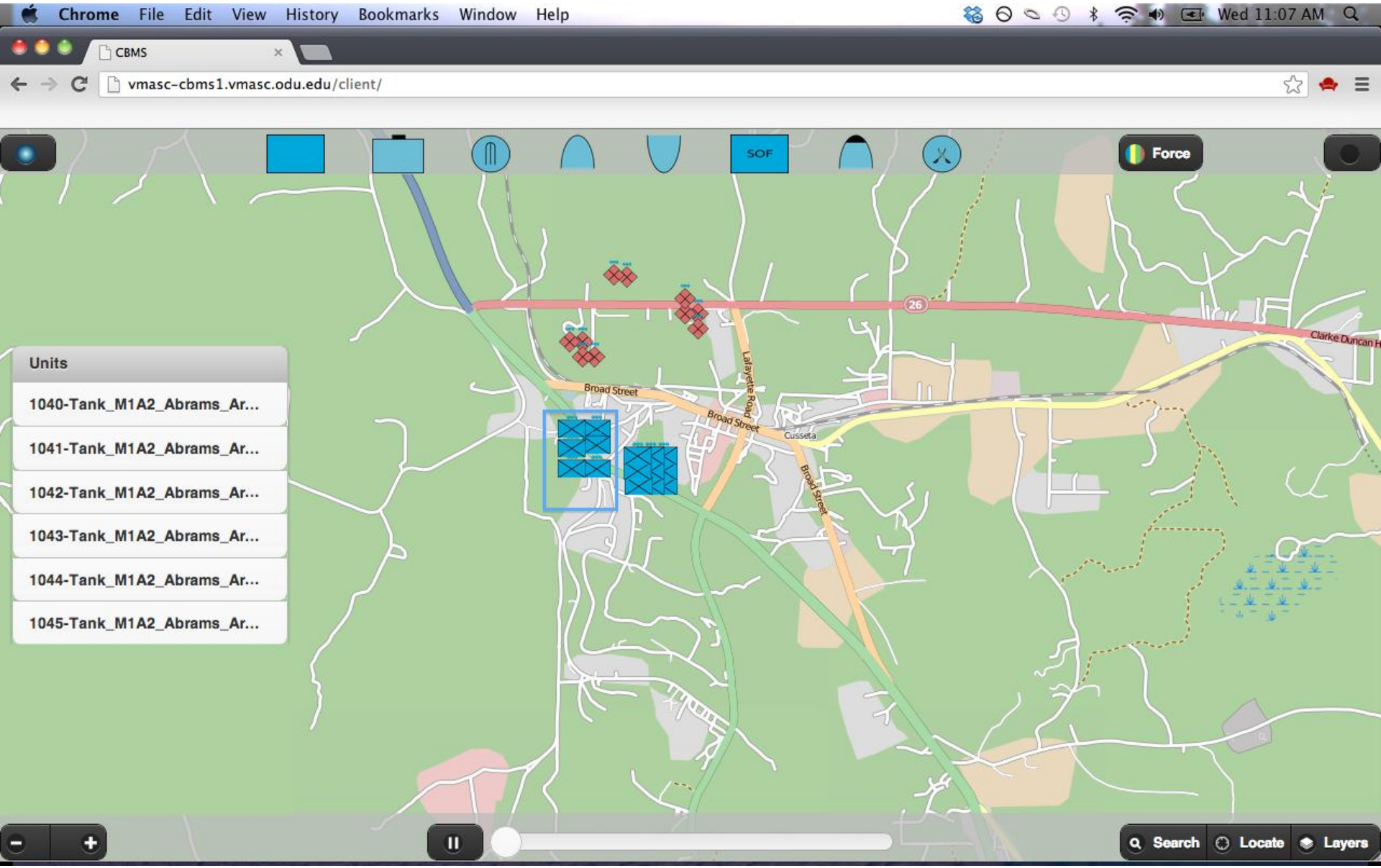
Assumptions to Explore

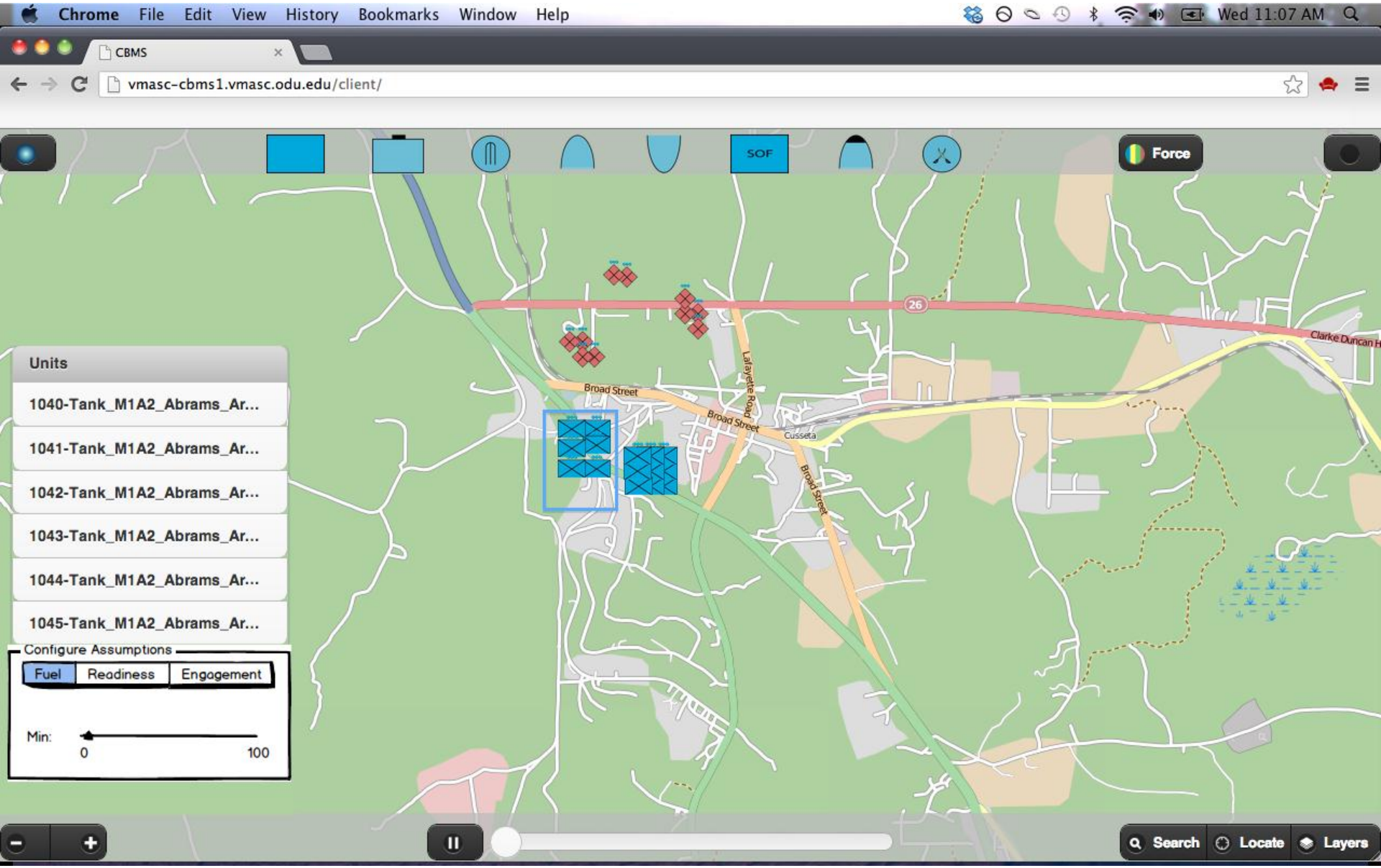
- Level of Fuel
  - Friendly Tanks
- Readiness Level
  - Friendly Tanks
  - Enemy (Oscar 1) Equipment

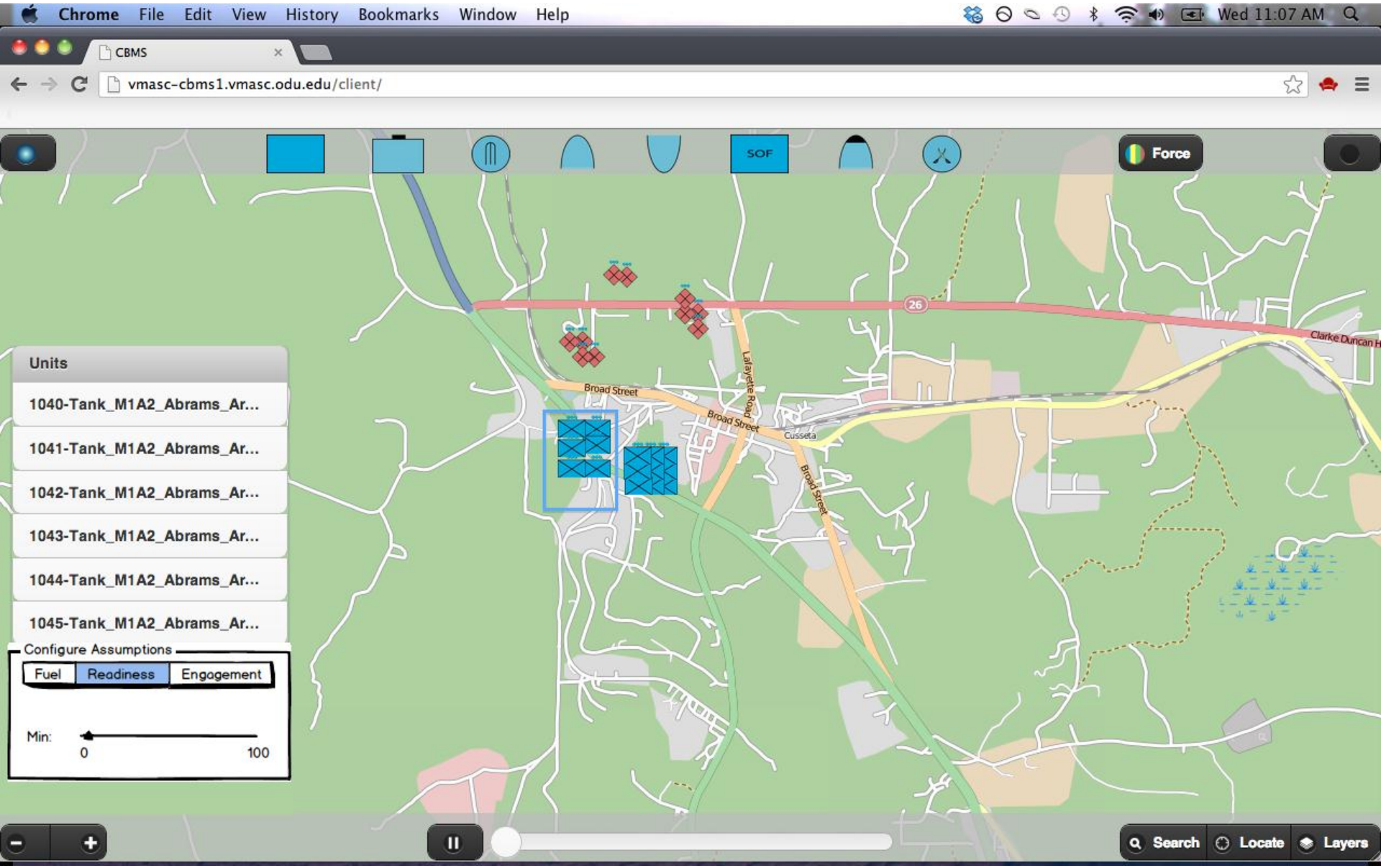
- Goal: See how changes in resources and readiness affect MNC attrition.

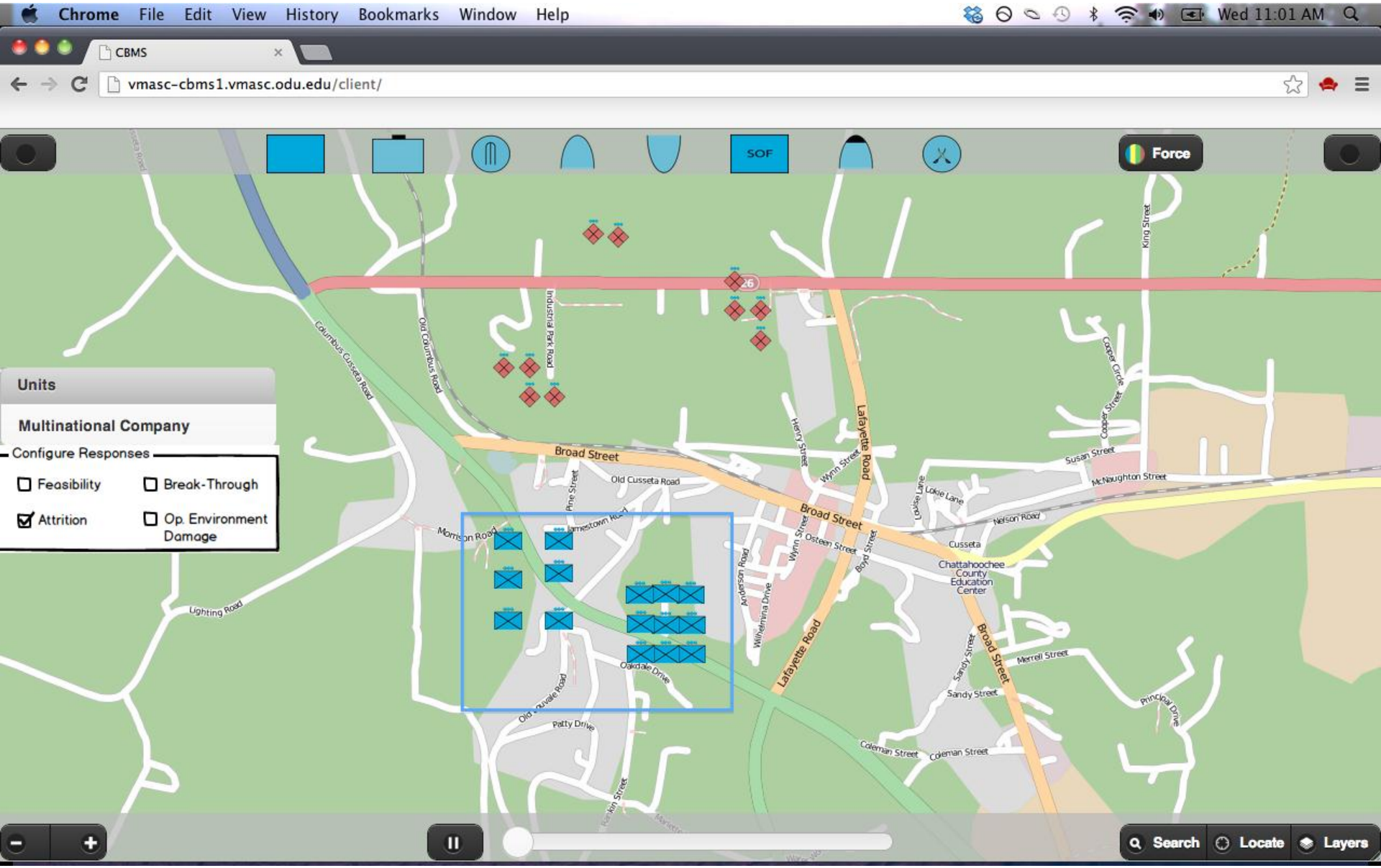
Demo


Chrome File Edit View History Bookmarks Window Help
Wed 11:01 AM
CBMS
vmasc-cbms1.vmasc.odu.edu/client/#map_page
SOF
Force
Picture
Common
Units
Connection
vmasc-cbms1
Subscription
all units
Log
27 FEB 2013
26
Broad Street
Lafayette Road
Broad Street
Cusseta
Broad Street
Search
Locate
Layers


Chrome File Edit View History Bookmarks Window Help
Wed 11:07 AM
CBMS
vmasc-cbms1.vmasc.odu.edu/client/
SOF
Force
Units
1040-Tank_M1A2_Abrams_Ar...
1041-Tank_M1A2_Abrams_Ar...
1042-Tank_M1A2_Abrams_Ar...
1043-Tank_M1A2_Abrams_Ar...
1044-Tank_M1A2_Abrams_Ar...
1045-Tank_M1A2_Abrams_Ar...
26
Broad Street
Broad Street
Lafayette Road
Broad Street
Cusseta
Search
Locate
Layers


Chrome File Edit View History Bookmarks Window Help
Wed 11:07 AM
CBMS
vmasc-cbms1.vmasc.odu.edu/client/
SOF
Force
26
Broad Street
Broad Street
Broad Street
Lafayette Road
Cusseta
Clarke Duncan H
Units
1040-Tank_M1A2_Abrams_Ar...
1041-Tank_M1A2_Abrams_Ar...
1042-Tank_M1A2_Abrams_Ar...
1043-Tank_M1A2_Abrams_Ar...
1044-Tank_M1A2_Abrams_Ar...
1045-Tank_M1A2_Abrams_Ar...
Configure Assumptions
Fuel
Readiness
Engagement
Min:
0
100
Search
Locate
Layers

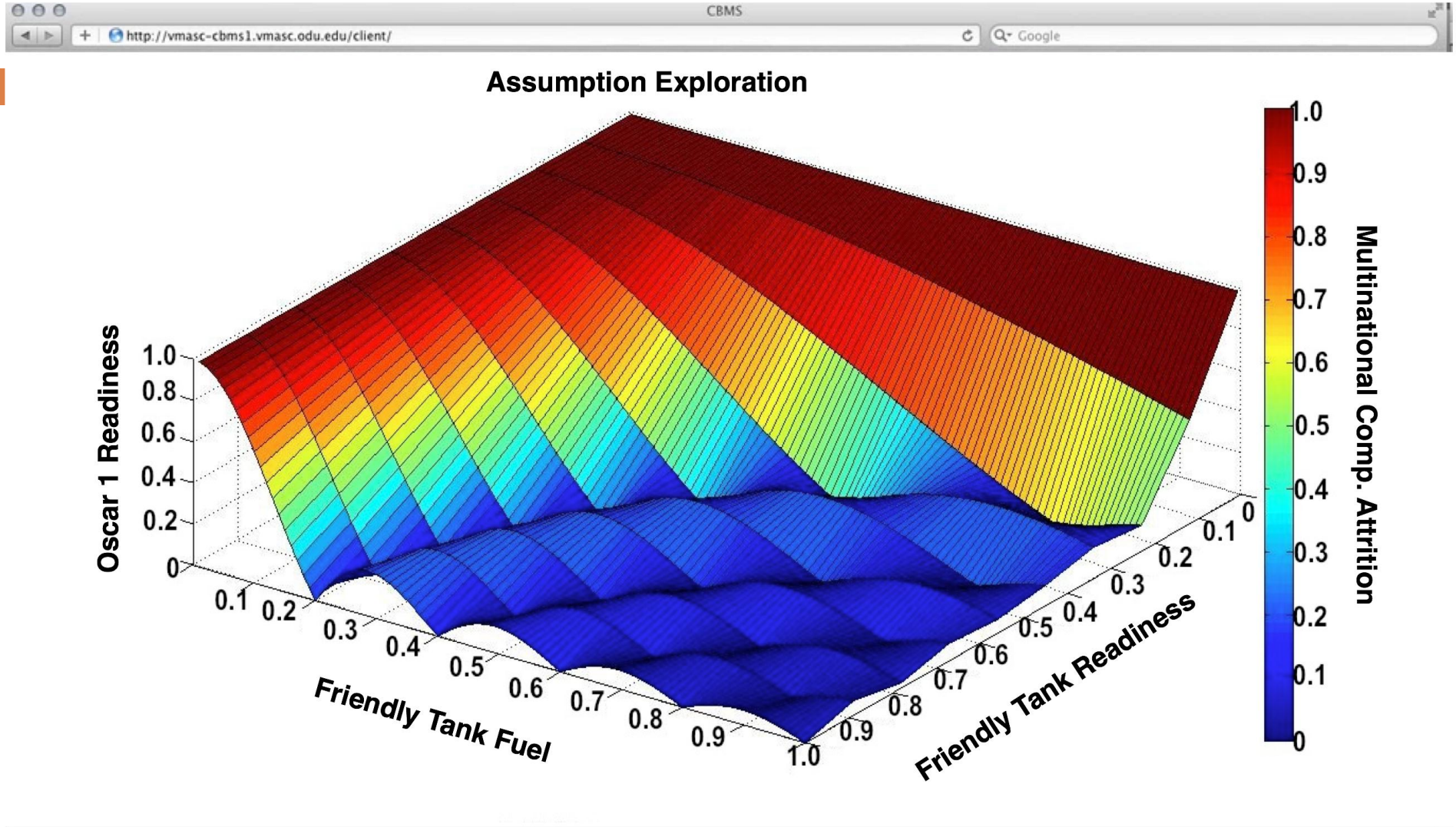

Chrome File Edit View History Bookmarks Window Help
Wed 11:07 AM
CBMS
vmasc-cbms1.vmasc.odu.edu/client/
SOF
Force
26
Broad Street
Broad Street
Broad Street
Lafayette Road
Cusseta
Clarke Duncan H
Units
1040-Tank_M1A2_Abrams_Ar...
1041-Tank_M1A2_Abrams_Ar...
1042-Tank_M1A2_Abrams_Ar...
1043-Tank_M1A2_Abrams_Ar...
1044-Tank_M1A2_Abrams_Ar...
1045-Tank_M1A2_Abrams_Ar...
Configure Assumptions
Fuel
Readiness
Engagement
Min:
0
100
Search
Locate
Layers


Chrome File Edit View History Bookmarks Window Help
Wed 11:01 AM
CBMS
vmasc-cbms1.vmasc.odu.edu/client/
SOF
Force
Units
Multinational Company
Configure Responses
Feasibility
Break-Through
Attrition
Op. Environment Damage
Broad Street
Old Cusseta Road
Columbus Cusseta Road
Old Columbus Road
Industrial Park Road
Lafayette Road
Jamestown Road
Morrison Road
Lighting Road
Oakdale Drive
Patty Drive
Anderson Road
Wilhelmina Drive
Wynn Street
Osteen Street
Boyd Street
Cusseta
Chattahoochee County Education Center
Nelson Road
Louise Lane
Lokie Lane
Susan Street
McNaughton Street
Cooper Circle
Cooper Street
King Street
Henry Street
Pine Street
Sandy Street
Merrell Street
Principal Drive
Coleman Street
Search
Locate
Layers

Review of Exploration

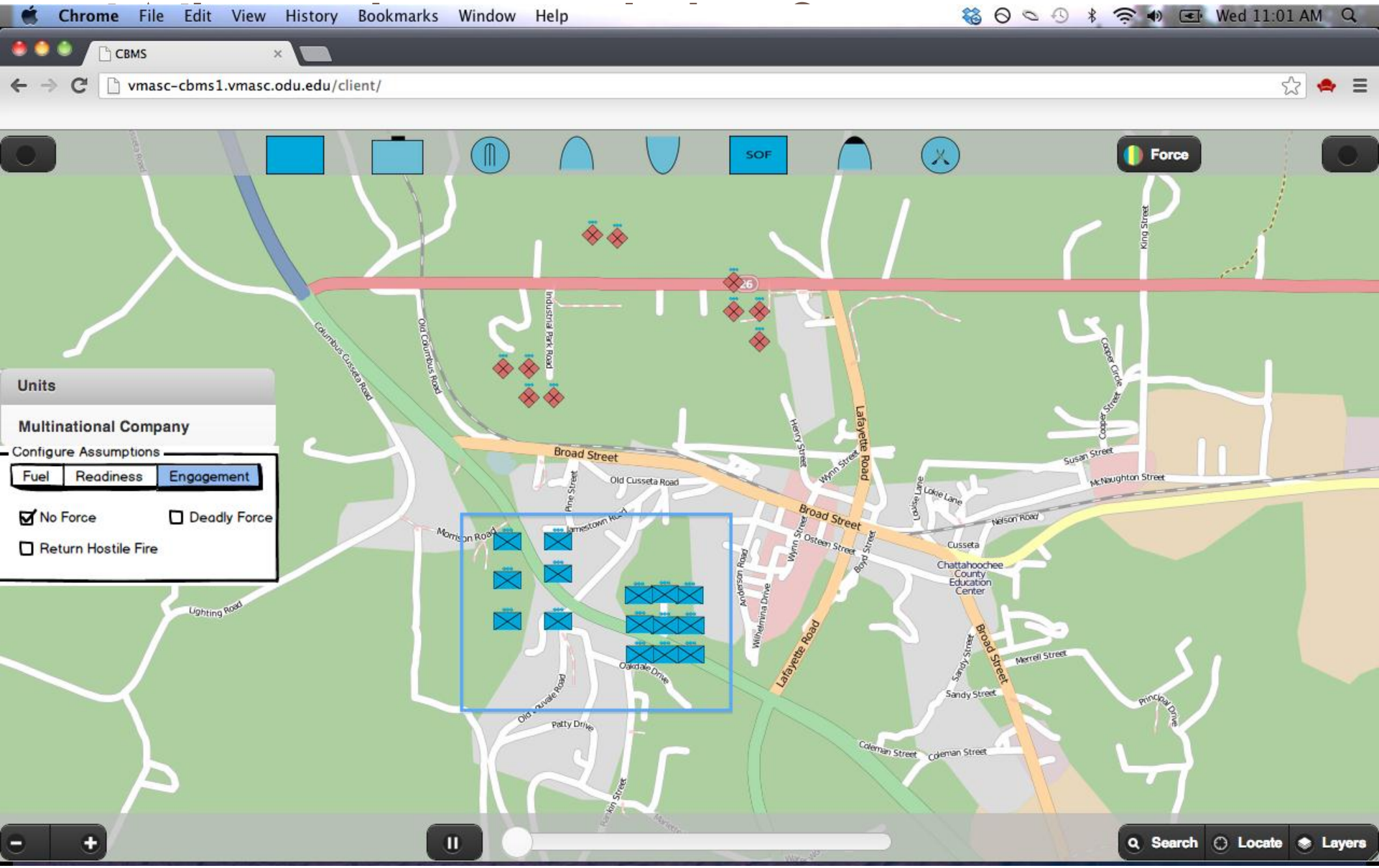
- Level of Fuel
  - Friendly Tanks
- Readiness Level
  - Friendly Tanks
  - Enemy Equipment

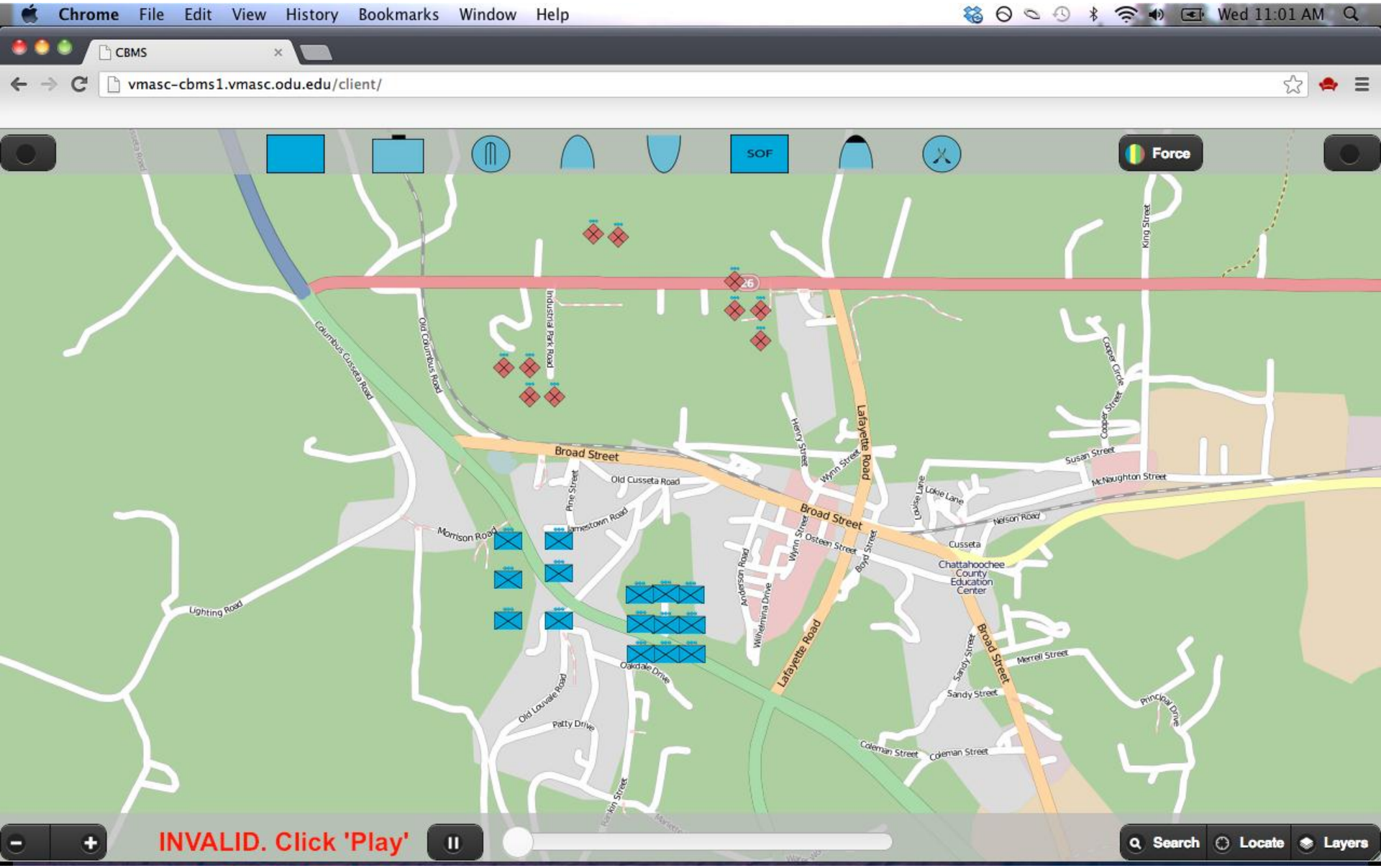
- Goal: See how changes in resources and readiness affect MNC attrition.

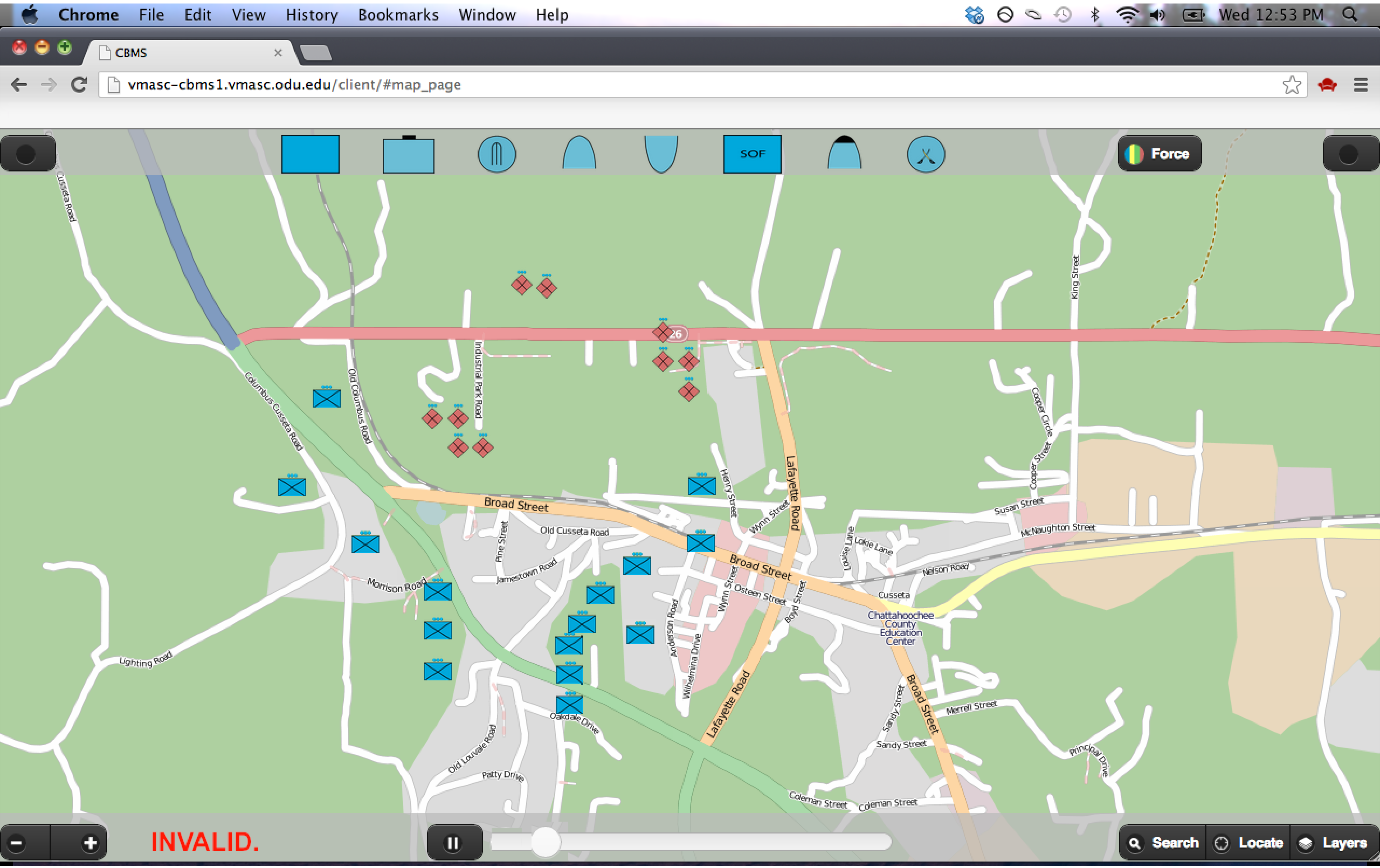

CBMS
http://vmasc-cbms1.vmasc.odu.edu/client/
Google
Assumption Exploration
Oscar 1 Readiness
1.0
0.8
0.6
0.4
0.2
0
Friendly Tank Fuel
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Friendly Tank Readiness
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Multinational Comp. Attrition
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

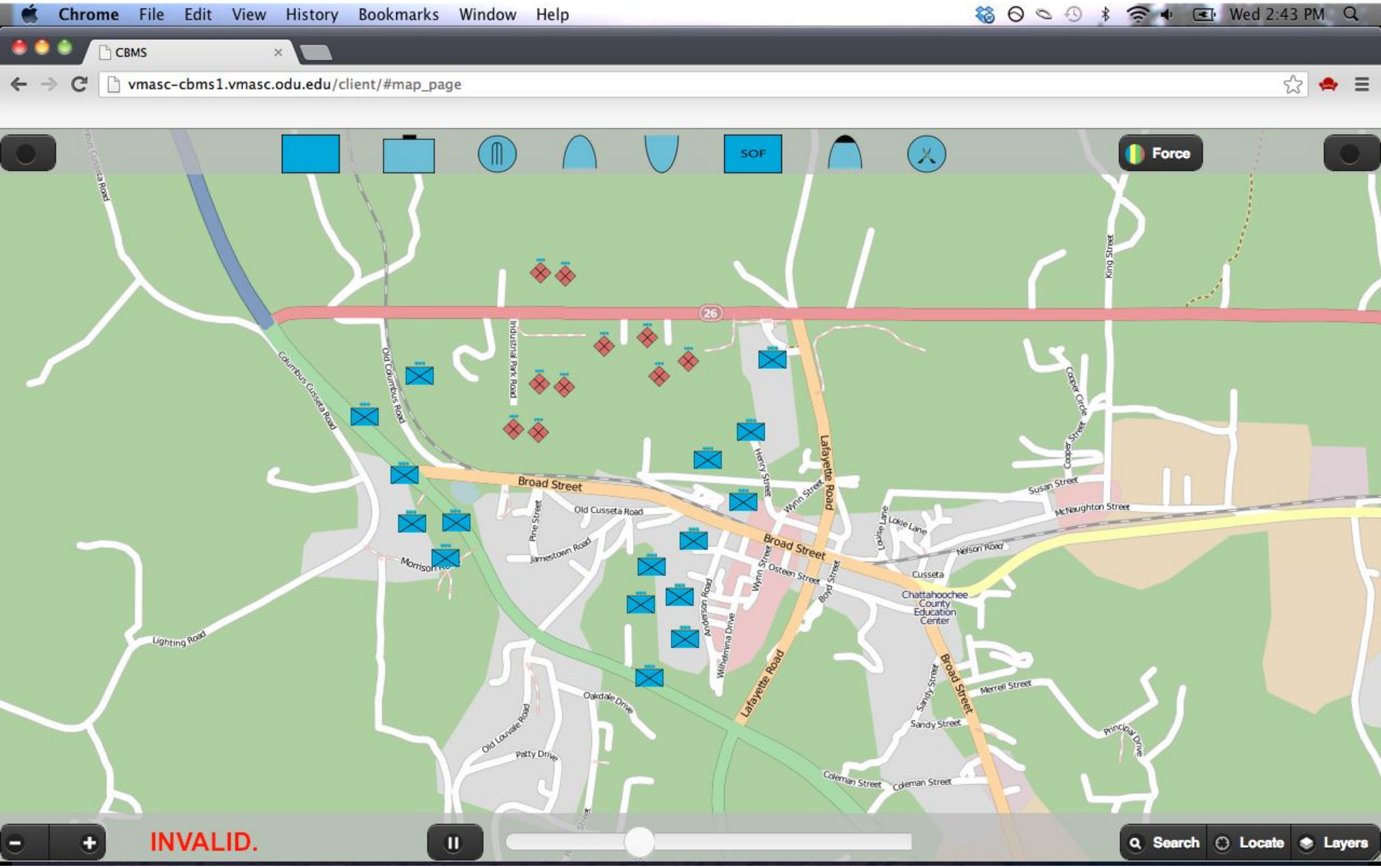
What about validity?

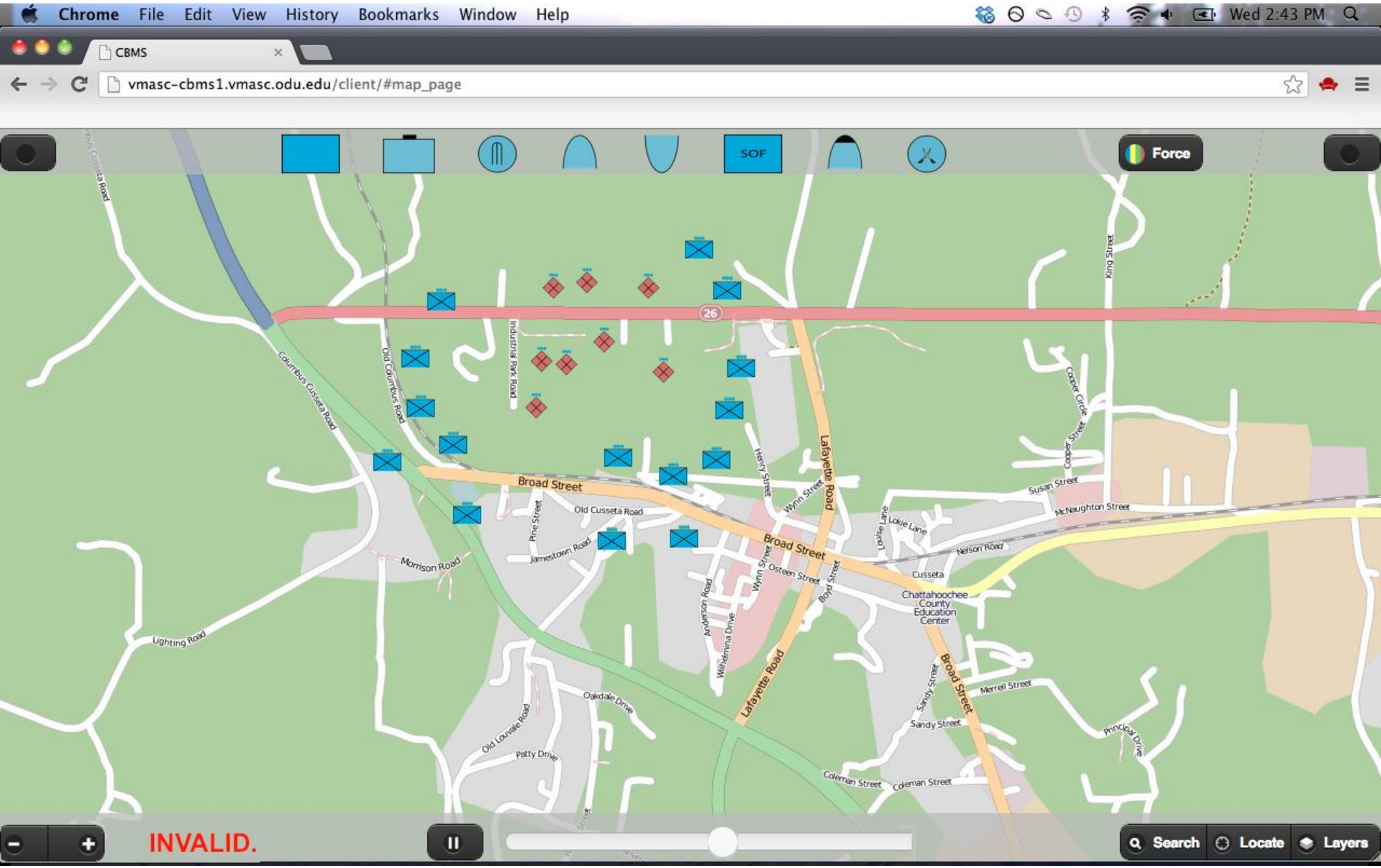
- Exploring assumptions gives us insight but what about validity?
- Is success - accomplishing every task - possible given the course specified in a scenario?
  - If not, how does failure occur?
- Feedback should be immediate
  - No simulation execution

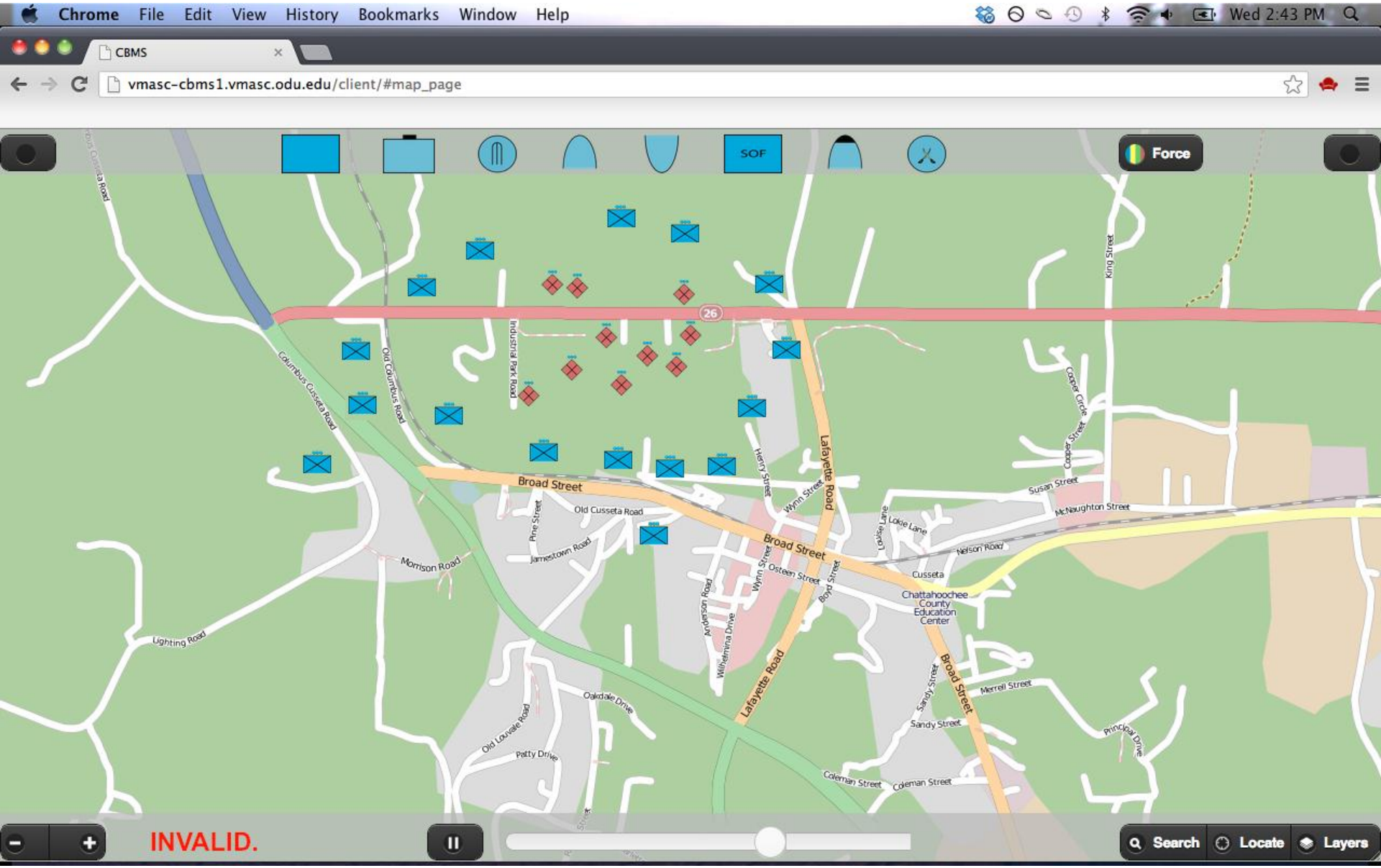

Chrome File Edit View History Bookmarks Window Help
Wed 11:01 AM
CBMS
vmasc-cbms1.vmasc.odu.edu/client/
SOF
Force
Units
Multinational Company
Configure Assumptions
Fuel
Readiness
Engagement
No Force
Deadly Force
Return Hostile Fire
Broad Street
Old Cusseta Road
Columbus Cusseta Road
Old Columbus Road
Industrial Park Road
Lafayette Road
Cusseta
Chattahoochee County Education Center
Jamestown Road
Morrison Road
Oakdale Drive
Patty Drive
Sandy Street
Merrell Street
Coleman Street
Search
Locate
Layers

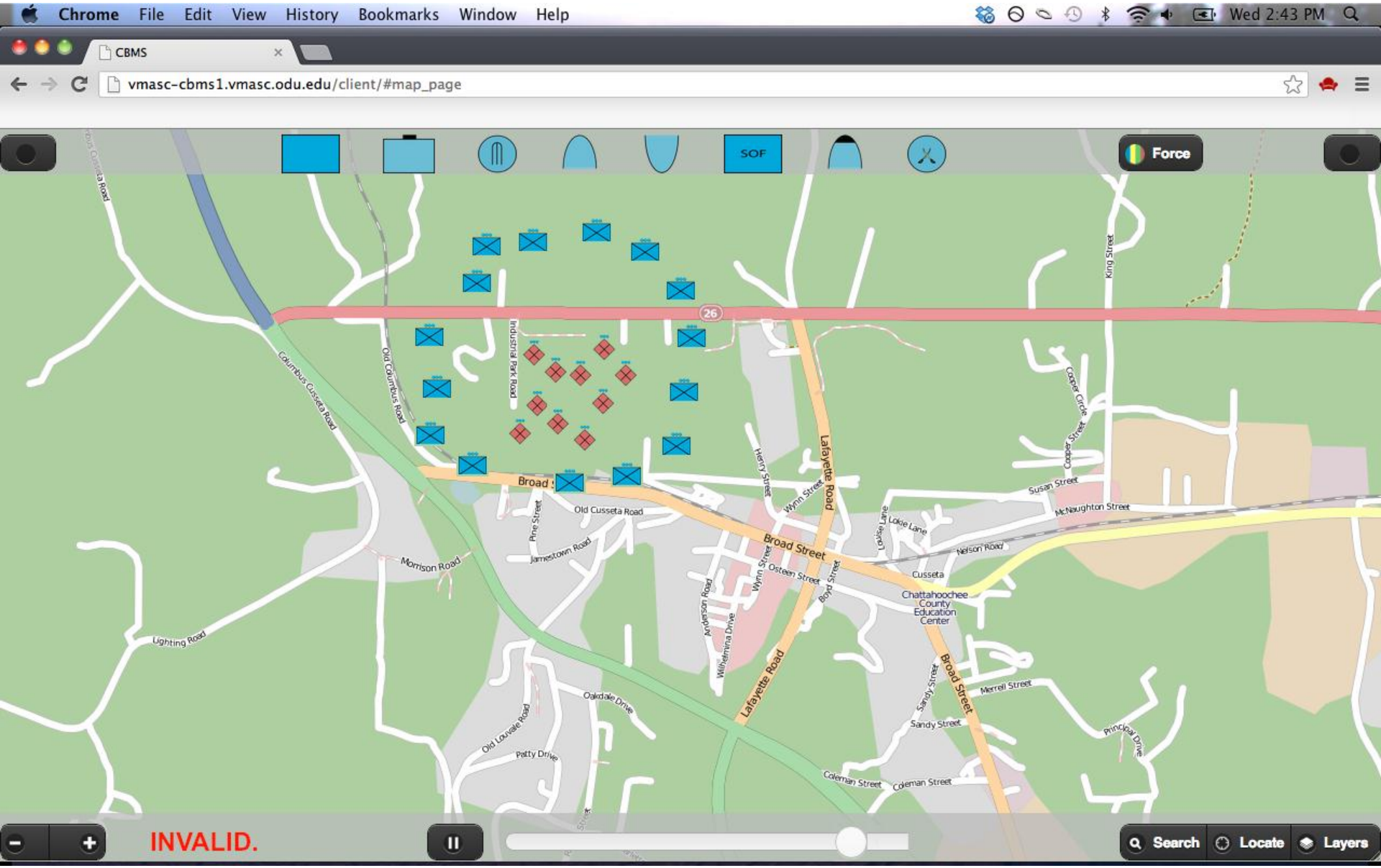

Chrome File Edit View History Bookmarks Window Help
Wed 11:01 AM
CBMS
vmasc-cbms1.vmasc.odu.edu/client/
SOF
Force
Broad Street
Old Cusseta Road
Columbus Cusseta Road
Old Columbus Road
Industrial Park Road
Lafayette Road
Henry Street
Wynn Street
Pine Street
Jamestown Road
Morrison Road
Lighting Road
Oakdale Drive
Old Louvale Road
Patty Drive
Anderson Road
Wilhelmina Drive
Osteen Street
Boyd Street
Louise Lane
Lokie Lane
Nelson Road
Cusseta
Chattahoochee County Education Center
King Street
Cooper Circle
Cooper Street
Susan Street
McNaughton Street
Sandy Street
Merrell Street
Principal Drive
Coleman Street
INVALID. Click 'Play'
Search
Locate
Layers

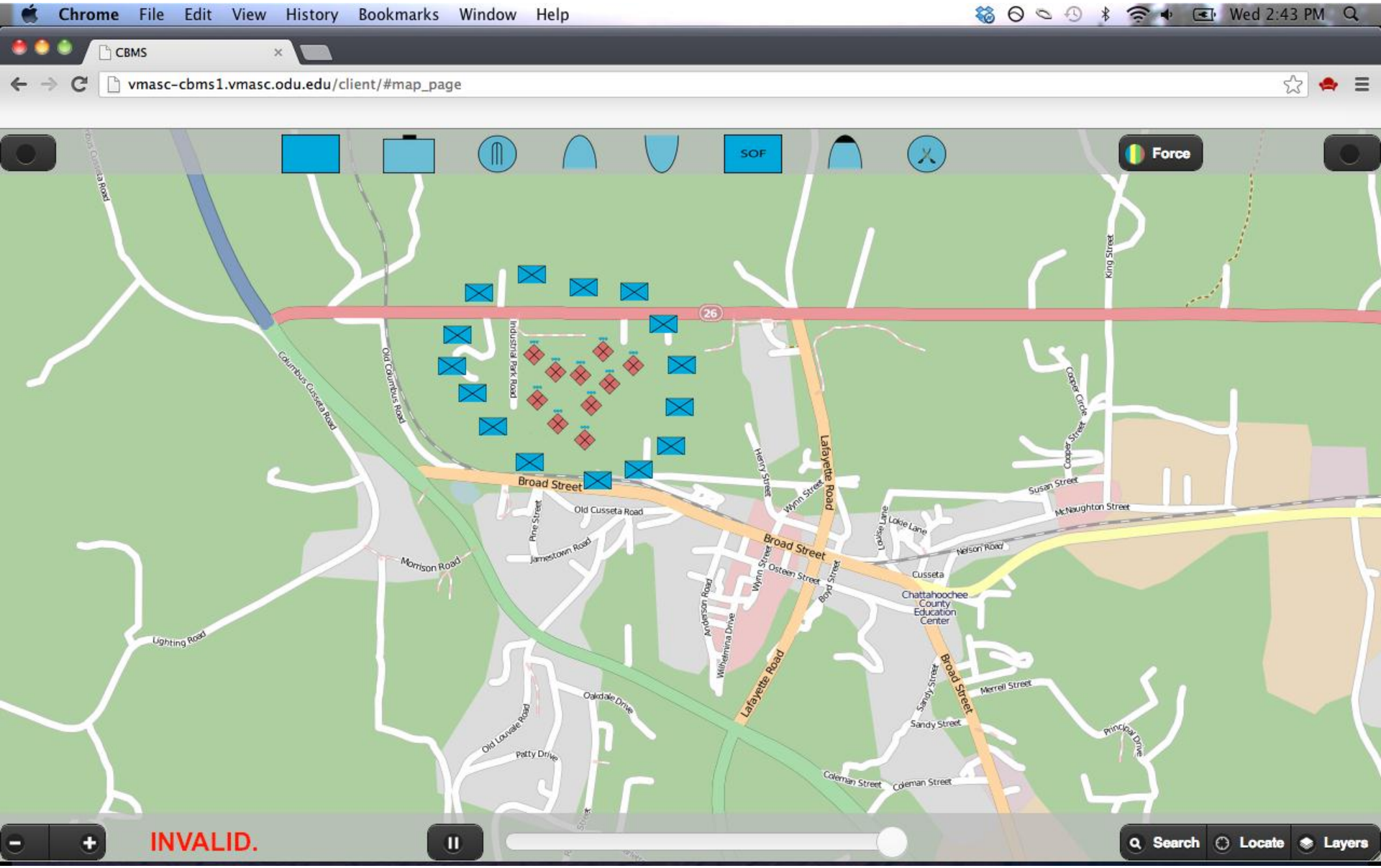

Chrome File Edit View History Bookmarks Window Help
Wed 12:53 PM
CBMS
vmasc-cbms1.vmasc.odu.edu/client/#map_page
SOF
Force
Broad Street
Old Cusseta Road
Jamestown Road
Morrison Road
Lighting Road
Columbus Cusseta Road
Old Columbus Road
Industrial Park Road
Lafayette Road
Henry Street
Wynn Street
Osteen Street
Boyd Street
Anderson Road
Wilhelmina Drive
Oakdale Drive
Old Louvale Road
Patty Drive
Coleman Street
Sandy Street
Merrell Street
Principal Drive
Cusseta
Chattahoochee County Education Center
Nelson Road
Lokie Lane
Louise Lane
McNaughton Street
Susan Street
Cooper Street
Cooper Circle
King Street
Pine Street
26
INVALID.
Search
Locate
Layers


Chrome File Edit View History Bookmarks Window Help
Wed 2:43 PM
CBMS
vmasc-cbms1.vmasc.odu.edu/client/#map_page
SOF
Force
26
Broad Street
Old Cusseta Road
Lafayette Road
Industrial Park Road
Columbus Cusseta Road
Old Columbus Road
Pine Street
Jamestown Road
Morrison Road
Lighting Road
Oakdale Drive
Old Louvale Road
Patty Drive
Wynn Street
Osteen Street
Boyd Street
Anderson Road
Wilhelmina Drive
Henry Street
King Street
Cooper Circle
Copper Street
Susan Street
McNaughton Street
Lokie Lane
Nelson Road
Cusseta
Chattahoochee County Education Center
Merrell Street
Sandy Street
Princeton Drive
Coleman Street
INVALID.
Search
Locate
Layers


Chrome File Edit View History Bookmarks Window Help
Wed 2:43 PM
CBMS
vmasc-cbms1.vmasc.odu.edu/client/#map_page
SOF
Force
26
Broad Street
Old Cusseta Road
Lafayette Road
Columbus Cusseta Road
Old Columbus Road
Industrial Park Road
Pine Street
Jamestown Road
Morrison Road
Lighting Road
Henry Street
Wynn Street
Osteen Street
Boyd Street
Anderson Road
Wilhelmina Drive
Cusseta
Chattahoochee County Education Center
Nelson Road
Susan Street
McNaughton Street
Cooper Circle
Copper Street
King Street
Oakdale Drive
Old Louvale Road
Patty Drive
Sandy Street
Merrell Street
Princeton Drive
Coleman Street
INVALID.
Search
Locate
Layers


Chrome File Edit View History Bookmarks Window Help
Wed 2:43 PM
CBMS
vmasc-cbms1.vmasc.odu.edu/client/#map_page
SOF
Force
26
Broad Street
Lafayette Road
Old Cusseta Road
Columbus Cusseta Road
Old Columbus Road
Industrial Park Road
Morrison Road
Lighting Road
Jamestown Road
Pine Street
Henry Street
Wynn Street
Osteen Street
Boyd Street
Anderson Road
Wilhelmina Drive
Cusseta
Chattahoochee County Education Center
Nelson Road
Susan Street
McNaughton Street
Cooper Circle
Copper Street
King Street
Loke Lane
Louise Lane
Oakdale Drive
Old Louvale Road
Patty Drive
Coleman Street
Sandy Street
Merrell Street
Principal Drive
INVALID.
Search
Locate
Layers


Chrome File Edit View History Bookmarks Window Help
Wed 2:43 PM
CBMS
vmasc-cbms1.vmasc.odu.edu/client/#map_page
SOF
Force
26
Broad Street
Lafayette Road
Old Cusseta Road
Columbus Cusseta Road
Old Columbus Road
Industrial Park Road
Morrison Road
Lighting Road
Jamestown Road
Pine Street
Henry Street
Wynn Street
Osteen Street
Boyd Street
Anderson Road
Wilhelmina Drive
Louise Lane
Lokie Lane
Nelson Road
Cusseta
Chattahoochee County Education Center
King Street
Cooper Circle
Copper Street
Susan Street
McNaughton Street
Merrell Street
Sandy Street
Principal Drive
Oakdale Drive
Old Louvale Road
Patty Drive
Coleman Street
INVALID.
Search
Locate
Layers


Chrome File Edit View History Bookmarks Window Help
Wed 2:43 PM
CBMS
vmasc-cbms1.vmasc.odu.edu/client/#map_page
SOF
Force
26
Broad Street
Old Cusseta Road
Lafayette Road
Industrial Park Road
Columbus Cusseta Road
Old Columbus Road
Morrison Road
Lighting Road
Jamestown Road
Pine Street
Henry Street
Wynn Street
Osteen Street
Boyd Street
Anderson Road
Wilhelmina Drive
Loke Lane
Nelson Road
Cusseta
Chattahoochee County Education Center
King Street
Cooper Circle
Copper Street
Susan Street
McNaughton Street
Merrell Street
Sandy Street
Principal Drive
Oakdale Drive
Old Louvale Road
Patty Drive
Coleman Street
INVALID.
Search
Locate
Layers

Future Work

How can we make this more useful?

- Polish existing solution
  - from development to production
- Pursue problems of larger scale.
  - make applicable to larger scenarios, different assumptions
- Key Limitation: A simulation related to the scenario must exist.