

Mid-Atlantic Technology,  
Research & Innovation Center

**MATRIC**

**Modeling & Simulation  
Consequence Management System**

*Life-Changing Innovation*



Chemical, Energy and Environmental  
Technologies



Health and Life Sciences



Advanced Systems  
Technologies

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# MATRIC

- **MATRIC is an independent, nonprofit, 501(c)(3) research corporation headquartered in WV.**
- **Specializing in Advanced Systems Technologies, Chemical and Environmental Technologies, and Health and Life Sciences research.**



# Modeling & Simulation (M&S)

- Acknowledgments:



MATRIC



# Modeling & Simulation (M&S)

- A software simulation tool to create and explore “what if” mass evacuation scenarios:
  - ∅ Enables users create and customize their own scenarios based on over 30 SME approved parameters
  - ∅ Generates interactive, time-aware maps
  - ∅ Features a robust set of reporting tools
  - ∅ Enables users to test and revise response plans





### Rich Simulation

Plan for the impacts of mass evacuation upon infrastructure and resources.

### Portal

Browser-based portal that allows extensive simulation and user management.

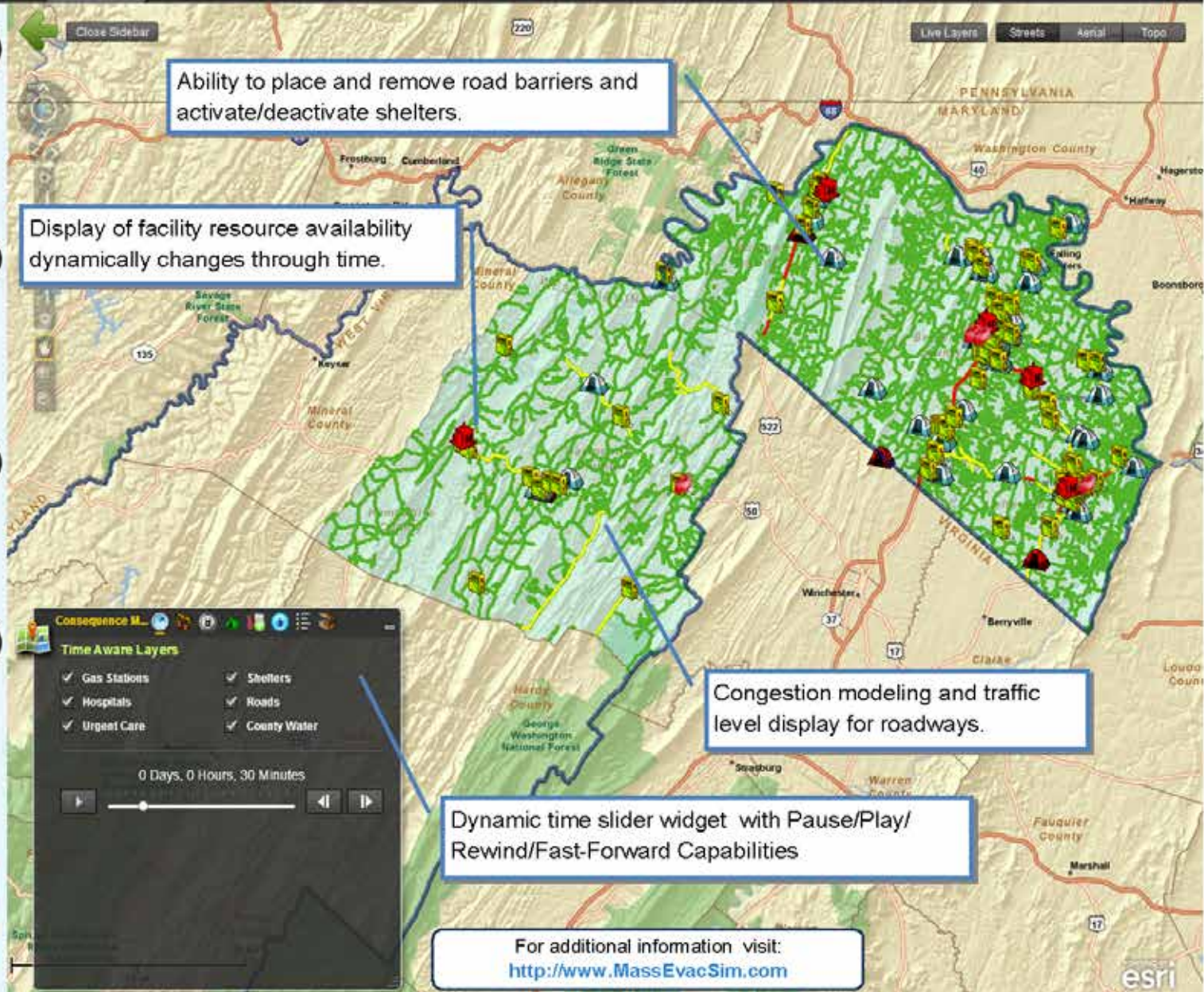
### Extensibility

Extensible simulation can be utilized in any region or city.

### Customization

Over 30 user-driven parameters allow for completely unique simulation experiences.

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# Resources and Consequences

## Simulation Parameters



# M&S System Demonstration



**Modeling & Simulation Consequence Management System**  
 Developed by Azimuth & MATRIC, Powered by ArcGIS Server

home user management my simulations all simulations comparative analytics reports feedback logout about

**Fuel Stations**  
 Fuel Stock Level (%): 90  
 Fuel Rationing: No  
 Fuel Rationing Amount: 5  
 Vehicle Delay (min): 0

**Hospitals**  
 Average Beds Available (%): 50

**Initial Warchest**  
 Cots: 80000  
 MRE: 250000  
 Police: 40  
 TrafficCone: 300  
 Volunteer: 600

**Shelter Base Cost**  
 Volunteer: 2

**Shelter Cost Per Occupant**  
 Cots: 1  
 MRE: 2

**Barrier Cost**  
 Police: 1  
 TrafficCone: 5

**Legend**  
 Urgent Care  
 Resources Remaining < 60%  
 Resources Remaining 60% - 85%  
 Resources Remaining > 85%  
 Hospitals  
 Cap. Remaining < 60%  
 Cap. Remaining 60% - 85%  
 Cap. Remaining > 85%  
 Gas Stations  
 Fuel Remaining < 60%

**Time Aware Layers**  
 Gas Stations  
 Hospitals  
 Urgent Care

0 Days

**Consequence M...**  
 Time Aware Layers  
 Gas Stations  
 Hospitals  
 Urgent Care

0 Days

**JEFFERSON HIGH SCHOOL**  
 shelterId => 242418  
 facility => EIVAC  
 address1 => 4194 FLOWING BRIDGE RD  
 address2 => CLOSED  
 intersection => 200  
 spaceCapPOST => 100  
 spaceCapEIVAC => 200  
 responsible => 121389  
 population => GENERAL  
 spaceRampPOST => 100  
 timeRamp => 1350193451000  
 zip => 25442  
 perRamp => 9999  
 equal\_1 => General Public  
 Activate Deactivate Current Status: Active

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**Vehicles**

**Simulate Congestion**  
 Congestion: Yes  
 Spawn Size: 1500

**Water Consumption**  
 Average Gallons/hr Used per Shelter Occupant: 12  
 Average Gallons/hr Used per Hospital Patient: 15  
 Average Gallons Used per Minor Medical Patient Treated: 5  
 Average Gallons Used per Fuel Station Visit: 3  
 Baseline Water Usage (%): 25

**Fuel Stations**  
 Fuel Stock Level (%): 75  
 Fuel Rationing: No  
 Fuel Rationing Amount: 5  
 Vehicle Delay (min): 10

**Hospitals**  
 Average Beds Available (%): 50

**Initial Warchest**

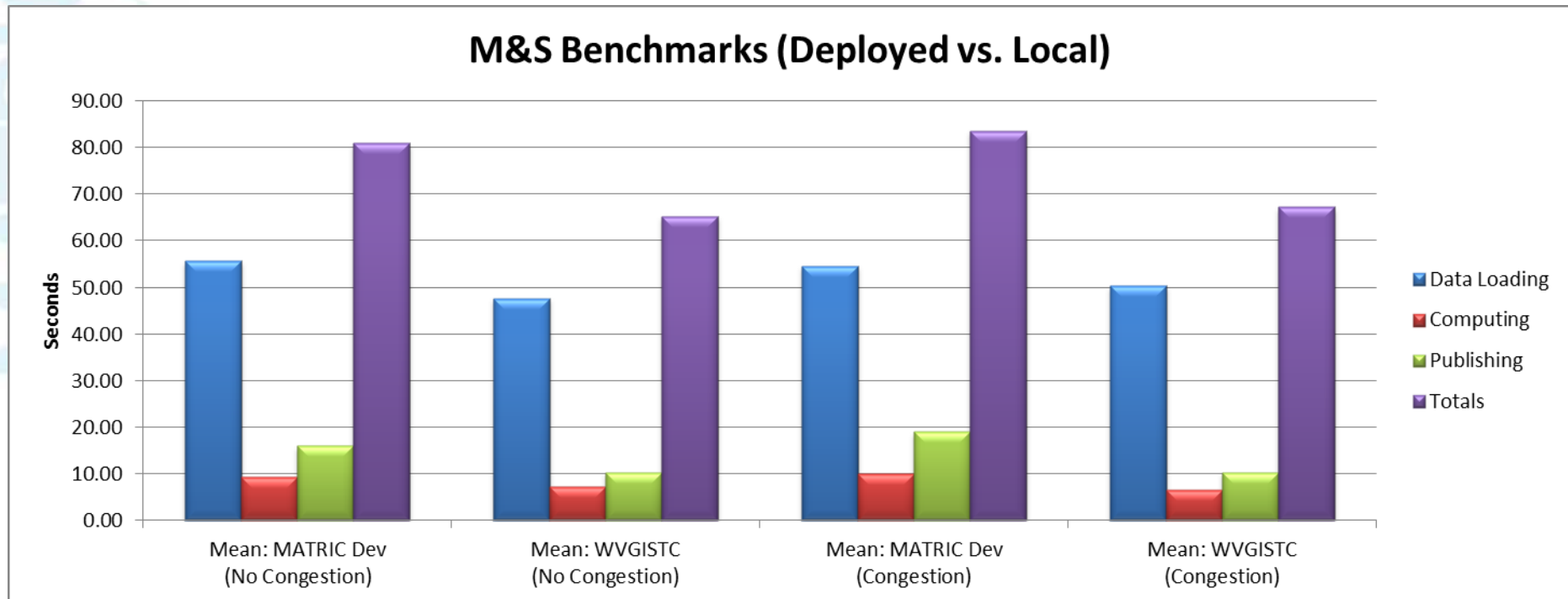
**Legend**  
 Urgent Care  
 Resources Remaining < 60%  
 Resources Remaining 60% - 85%  
 Resources Remaining > 85%  
 Hospitals  
 Cap. Remaining < 60%  
 Cap. Remaining 60% - 85%  
 Cap. Remaining > 85%

**Consequence M...**  
 Time Aware Layers  
 Gas Stations  
 Hospitals  
 Urgent Care  
 Shelters  
 Roads  
 County Water

0 Days, 3 Hours, 10 Minutes

# Development Environment & Performance

- **MATRIC conducted extensive benchmarking and performance analysis to determine the ideal conditions (both hardware and software) for the simulation environment.**





# Next Steps

## ● Performance Optimizations

- ∅ Faster data access using custom Server Object Extension
- ∅ Migration of all Python scripts to C#
- ∅ Expanded use of multi-threading and parallel processing

## ● Community & User Driven Data

- ∅ Enabling users to form groups and share GIS data
- ∅ Customizable areas of interest and data sources
- ∅ User created impromptu shelters

## ● Enhanced Functionality

- ∅ Polygon barriers to simulate quarantine zones, floods, etc.
- ∅ Improved “After Action” reporting tools

# Contact

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