

Virtual USA – Real Time Evacuation Planning Model (RtePM)

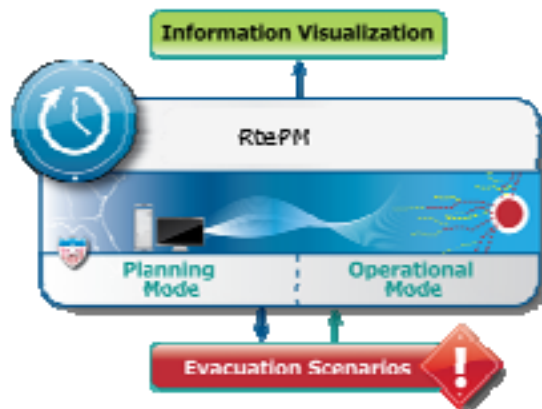
*2010 ESRI Homeland Security
GIS Summit*

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Background

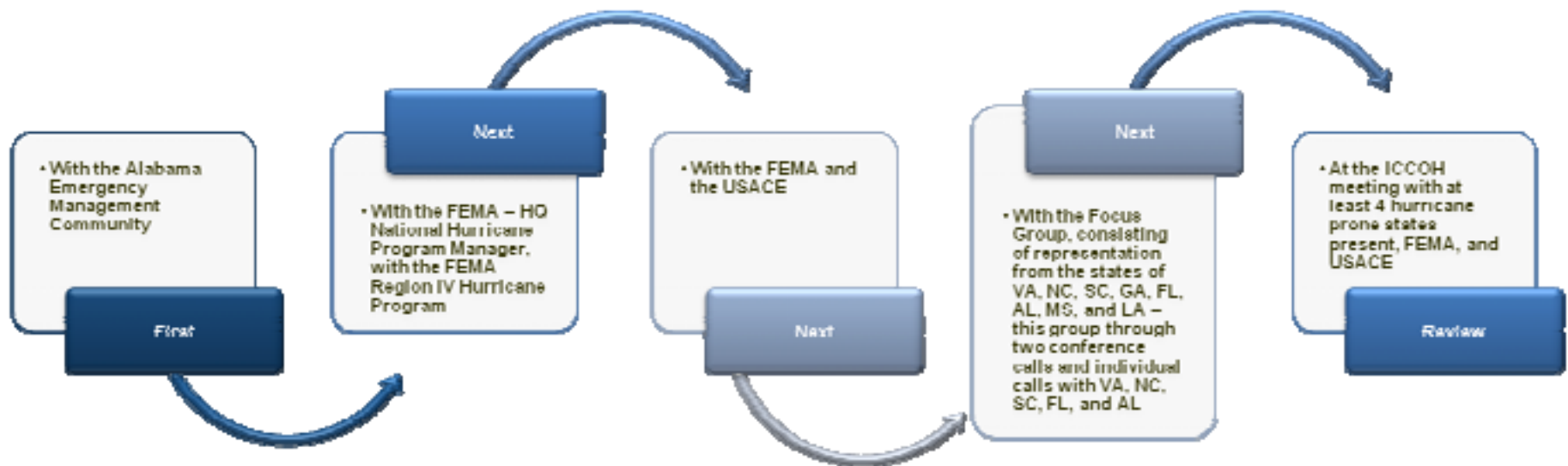
- Development is being funded through the Department of Homeland Security Science and Technology (DHS S&T) as part of the Virtual USA Project
- One of the initial capabilities being developed under Virtual USA. Project is the Real Time Evacuation Planning Model (RtePM)



- ❖ The users requested the ability to “draw an area on a map and tell me how long it will take to evacuate the people there”

Census and Consensus Building Process

How we "arrived" at this point ...



Multi-purpose evacuation tool

- Large scale evacuations (Hurricane evacuations addressed in Pilot)
- Nuclear Power Plants
- CSEPP areas (Chemical Stockpile Emergency Preparedness Program)
- Flood plans for dams
- Hazardous materials incidents
- Special events/sporting events with large crowds
- *Tool is designed to be used anywhere road and population data can be obtained*

Evacuations never go well

- Lack of sophisticated planning tools
- Inability to rapidly identify changing evacuation conditions and adjust plans



How it's often done now

- Expensive individual studies
- Time consuming; often takes many months
- Can be rendered obsolete with changes in population and/or traffic network



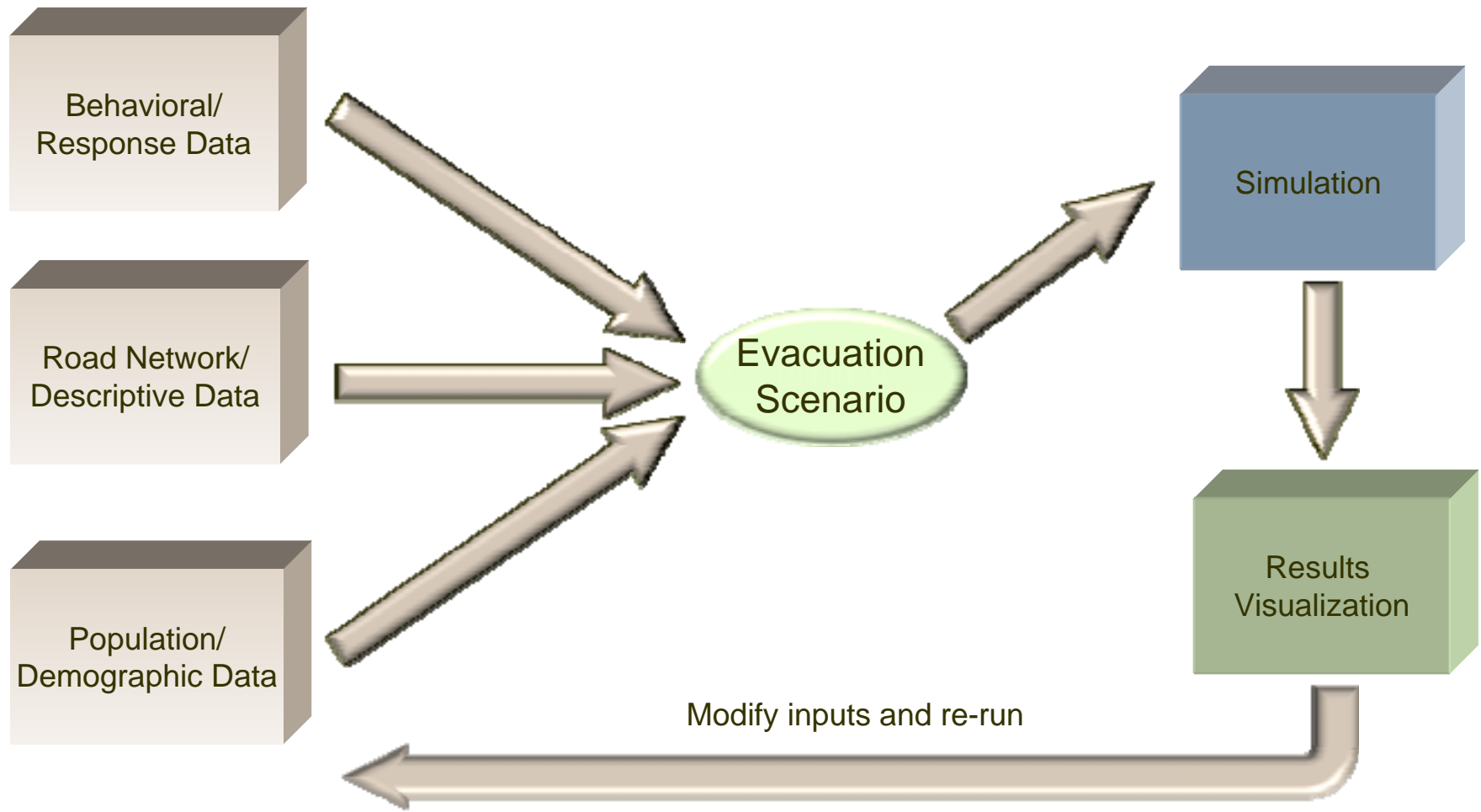
Goals

- **Develop a GIS-based evacuation tool that can easily calculate an estimated clearance time for any area drawn on a map**
- **Use real roadway capacity data and real demographic data to characterize area**
- **Sophisticated behavioral model a design goal**
 - **Ability to address shadow evacuations**
 - **Ability to model phased evacuation**
 - **Address multiday evacuations, time of day evacuation orders, mandatory versus voluntary, etc.**
- **Use real-time traffic information to dynamically recalculate results**

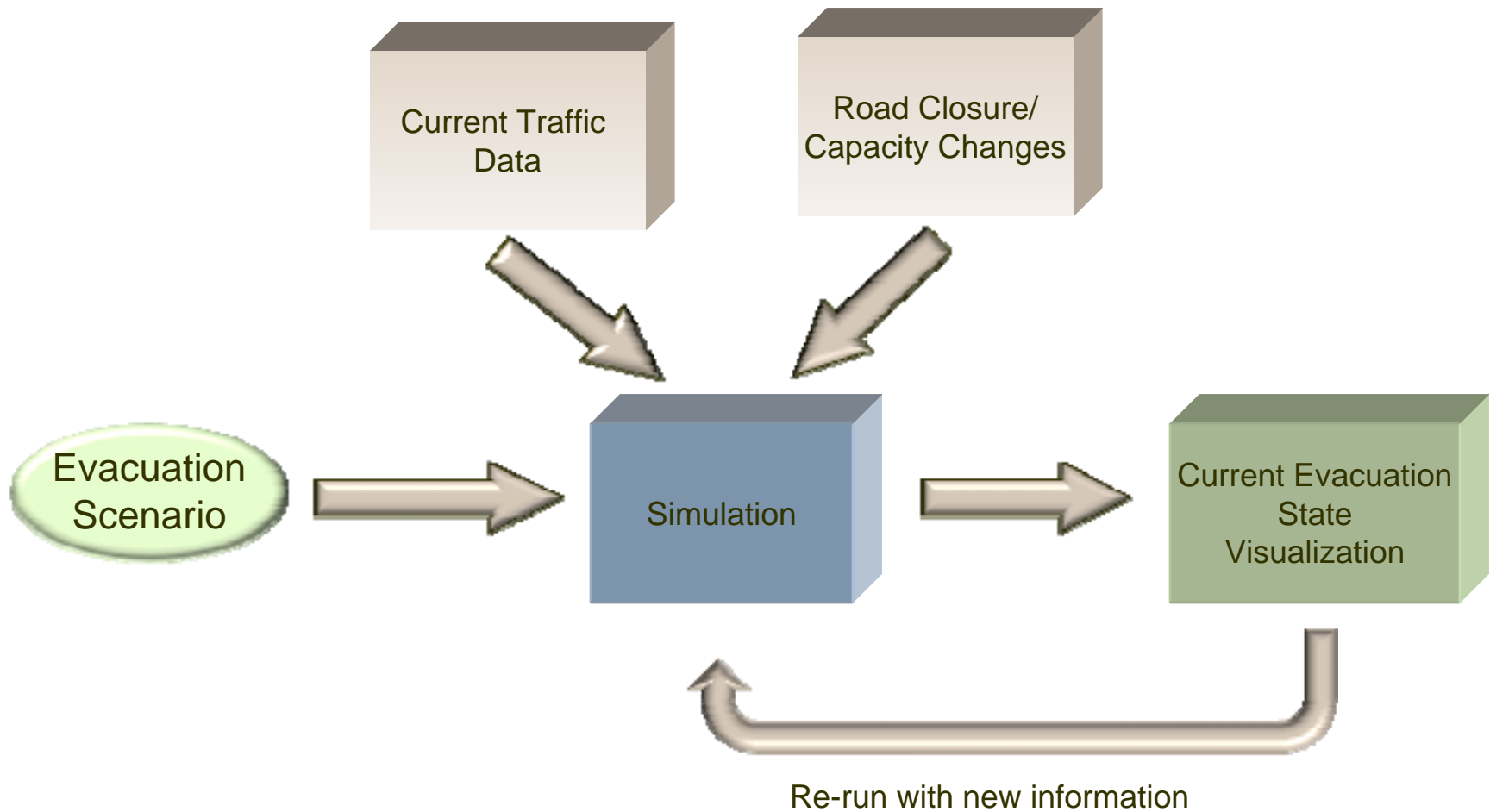
Parameters Used in Calculations

- **Population:**
 - Area to evacuate
 - Number of Households
 - Vehicles per household
- **Road Network:**
 - Network interconnectivity
 - Road category (I.e. Highway, Major Arterial etc)
 - Number of lanes
 - Length of road segment
 - Freeflow speed of road segment
 - Nodes where people enter road network
 - Destination nodes for evacuation
- **Behavioral:**
 - Participation rate
 - Response curve

Planning Mode



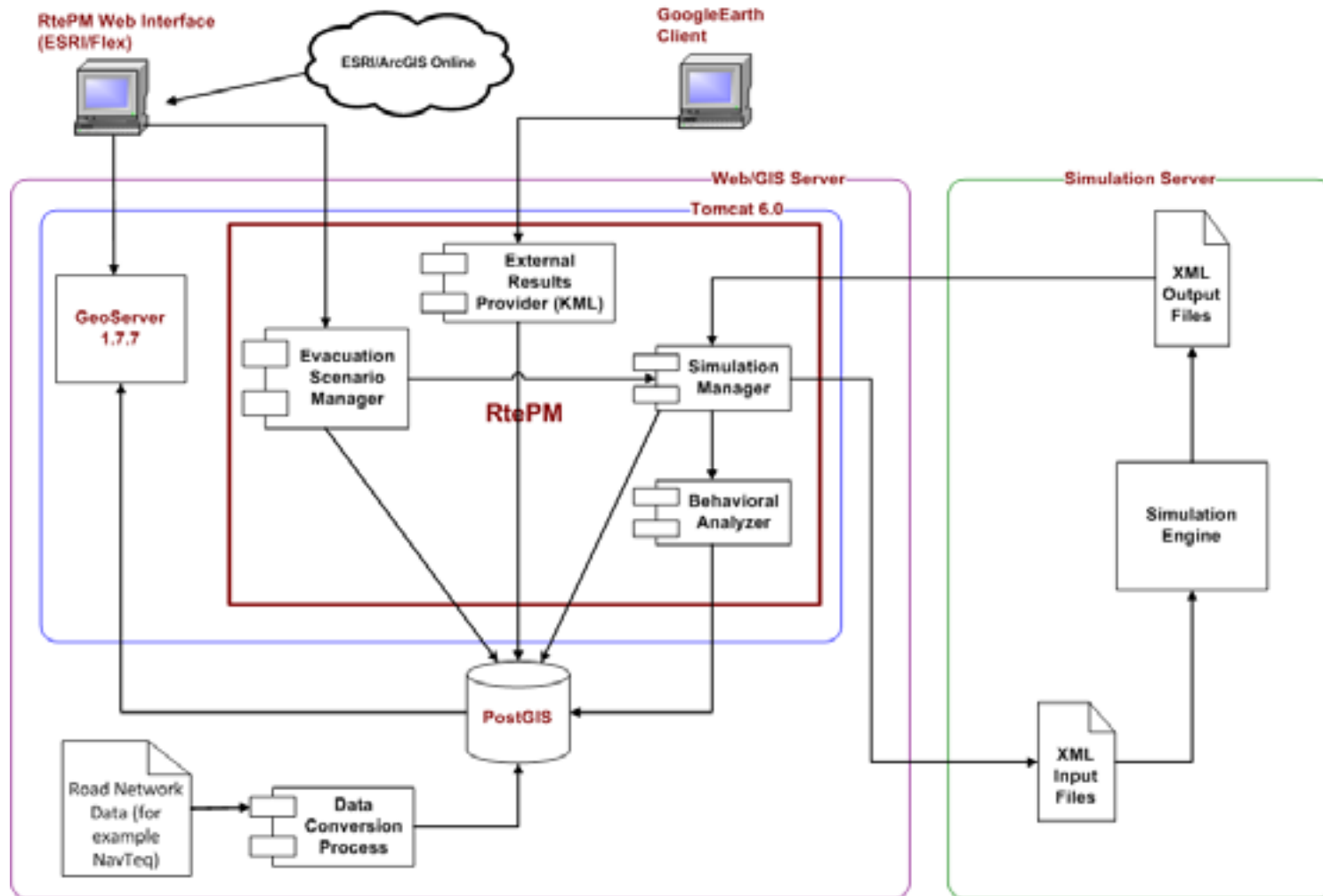
Operational Mode

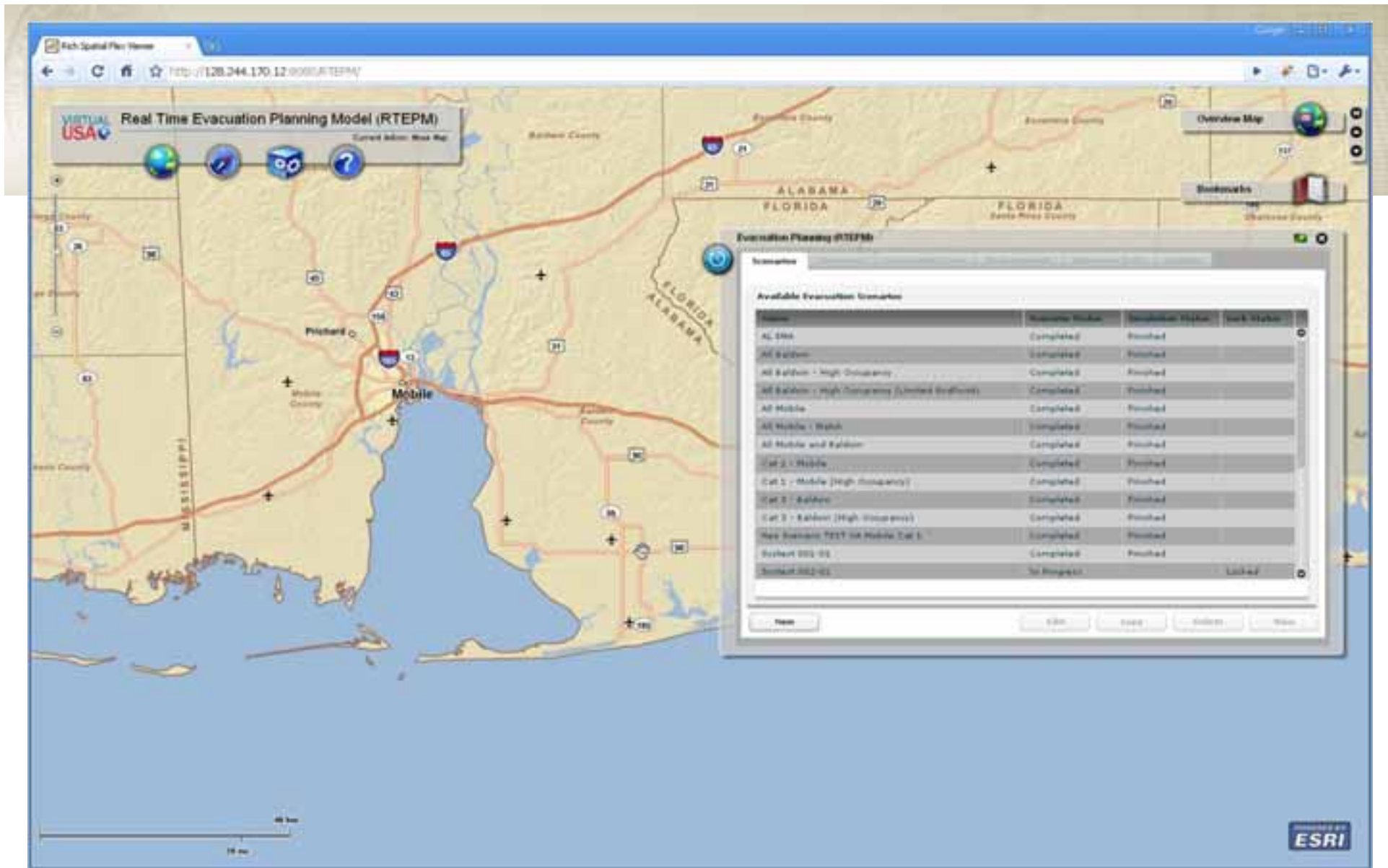


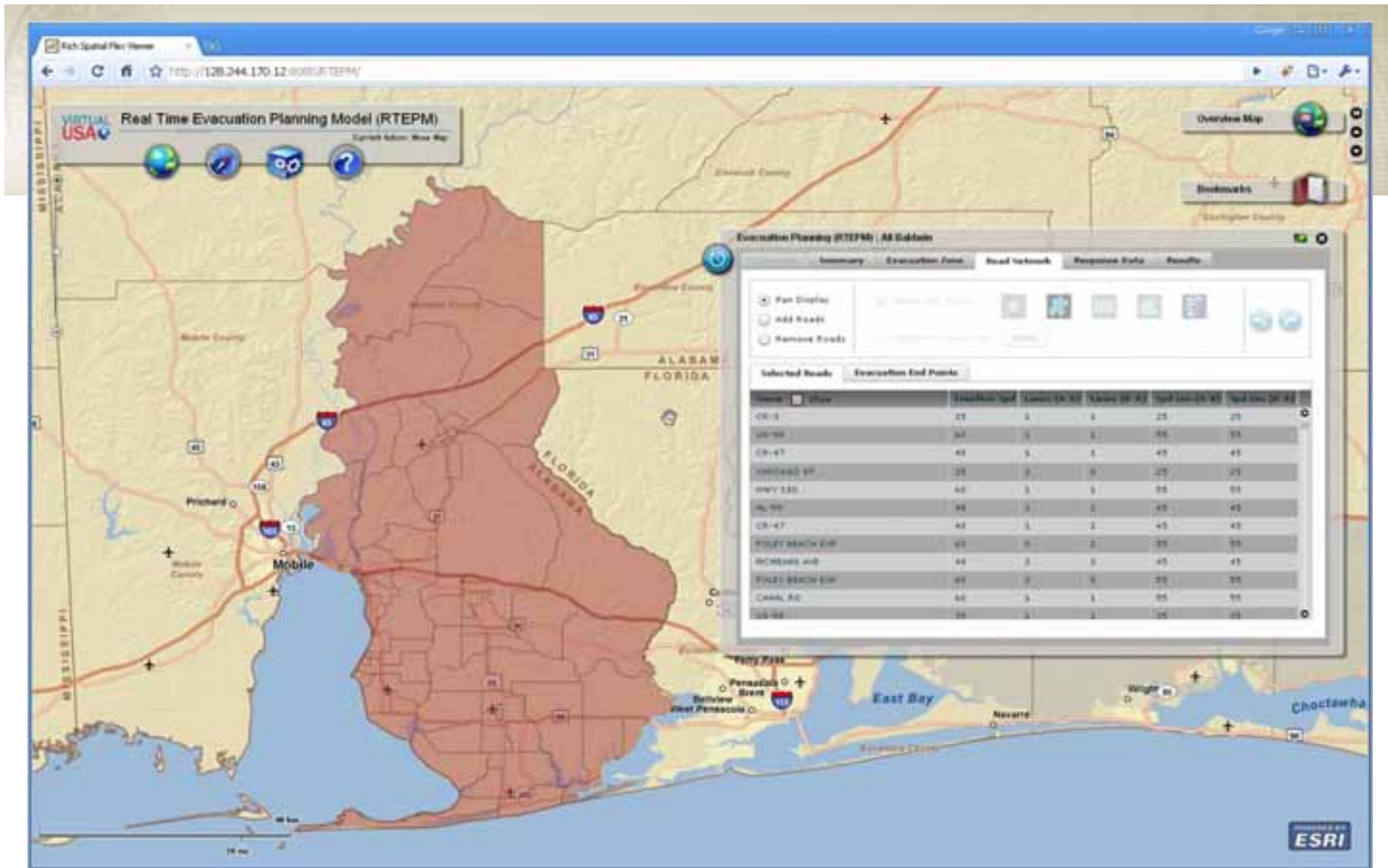
Current Software

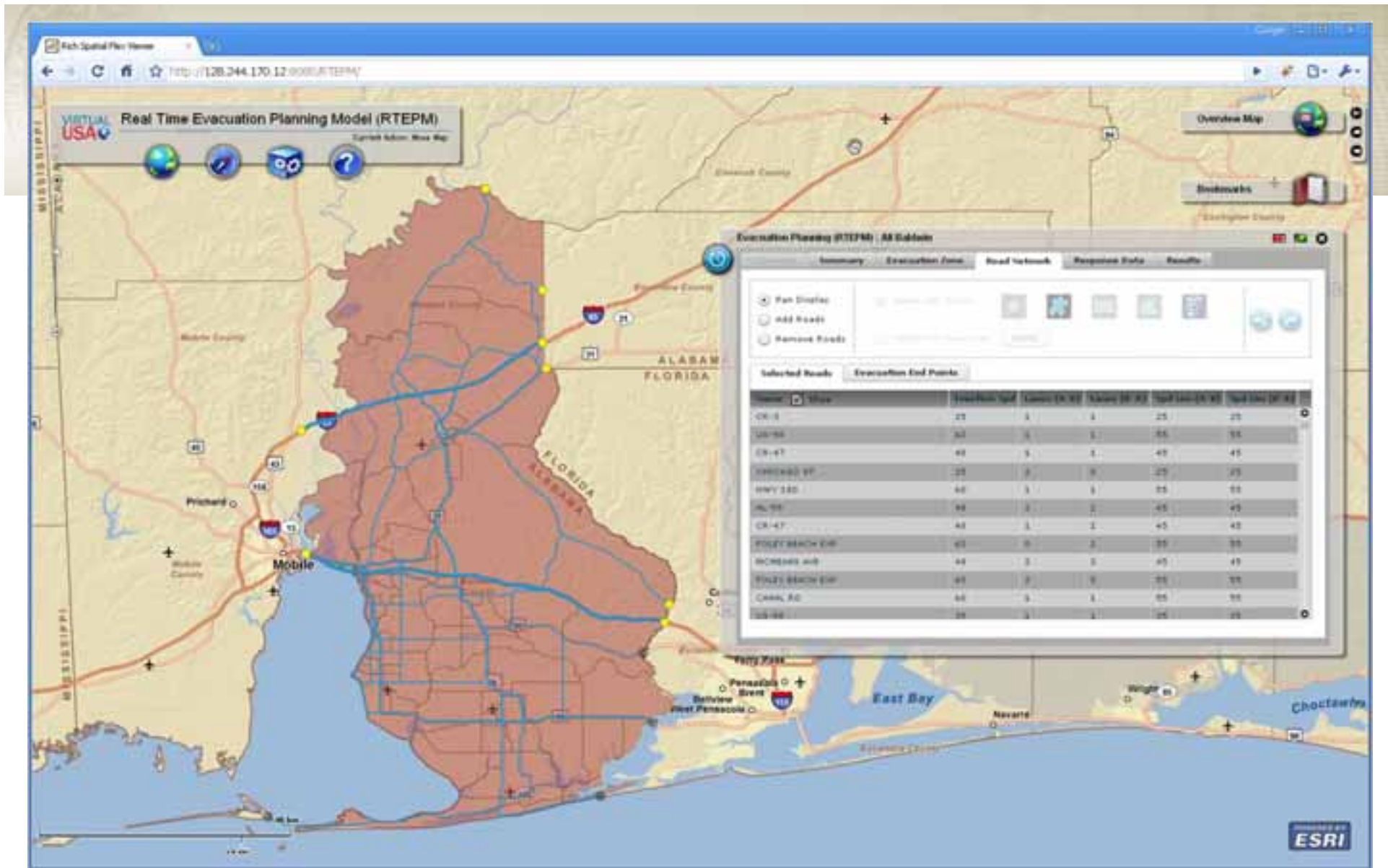
- **Currently built on free/open source software.**
 - **Web based front end using ESRI ArcGIS API for Flex communicating to a Java J2EE back end.**
 - **Uses GeoServer as the GIS server.**
 - **Uses PostGIS as data store (Postgres with geospatial extentions)**

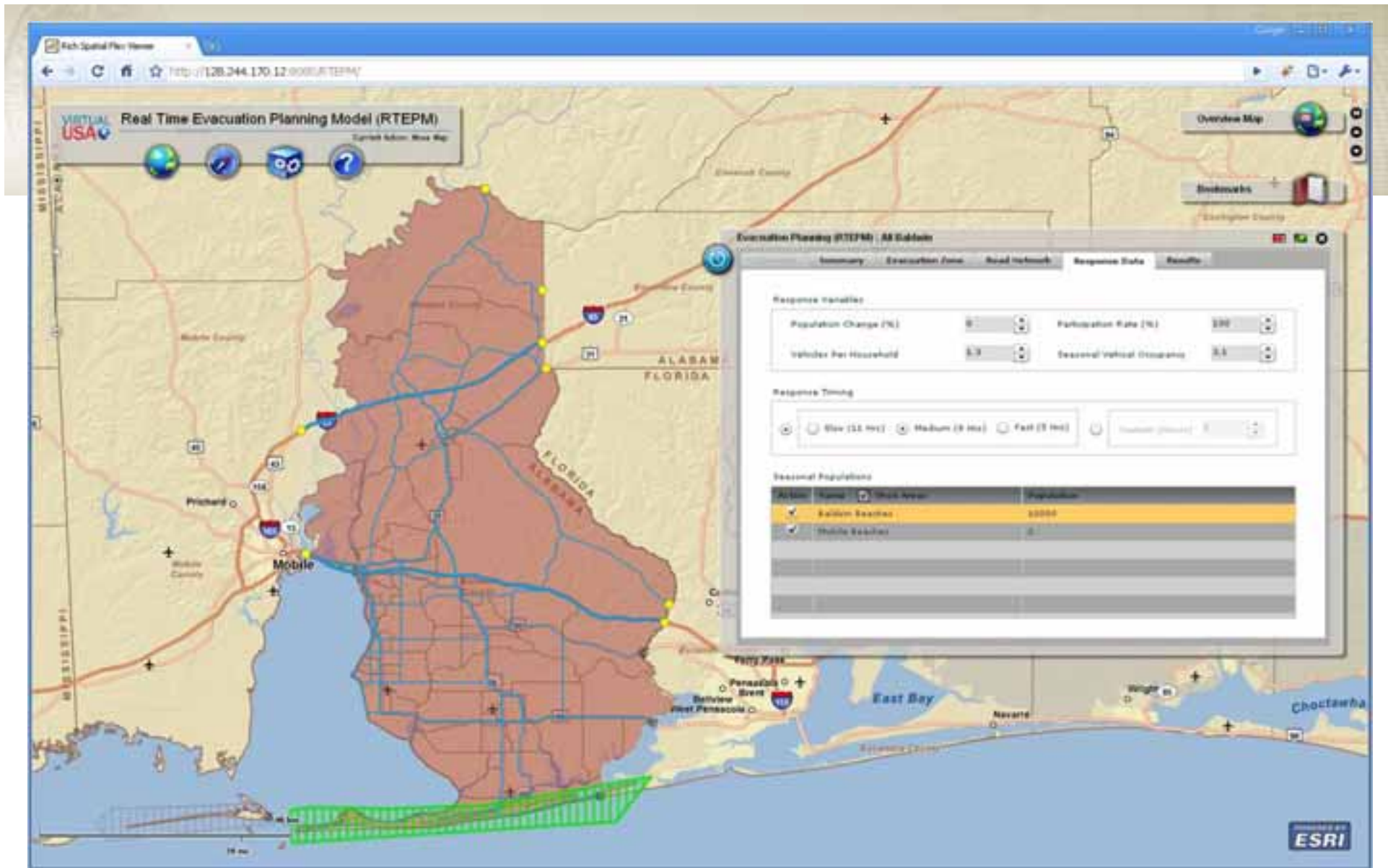
Architecture

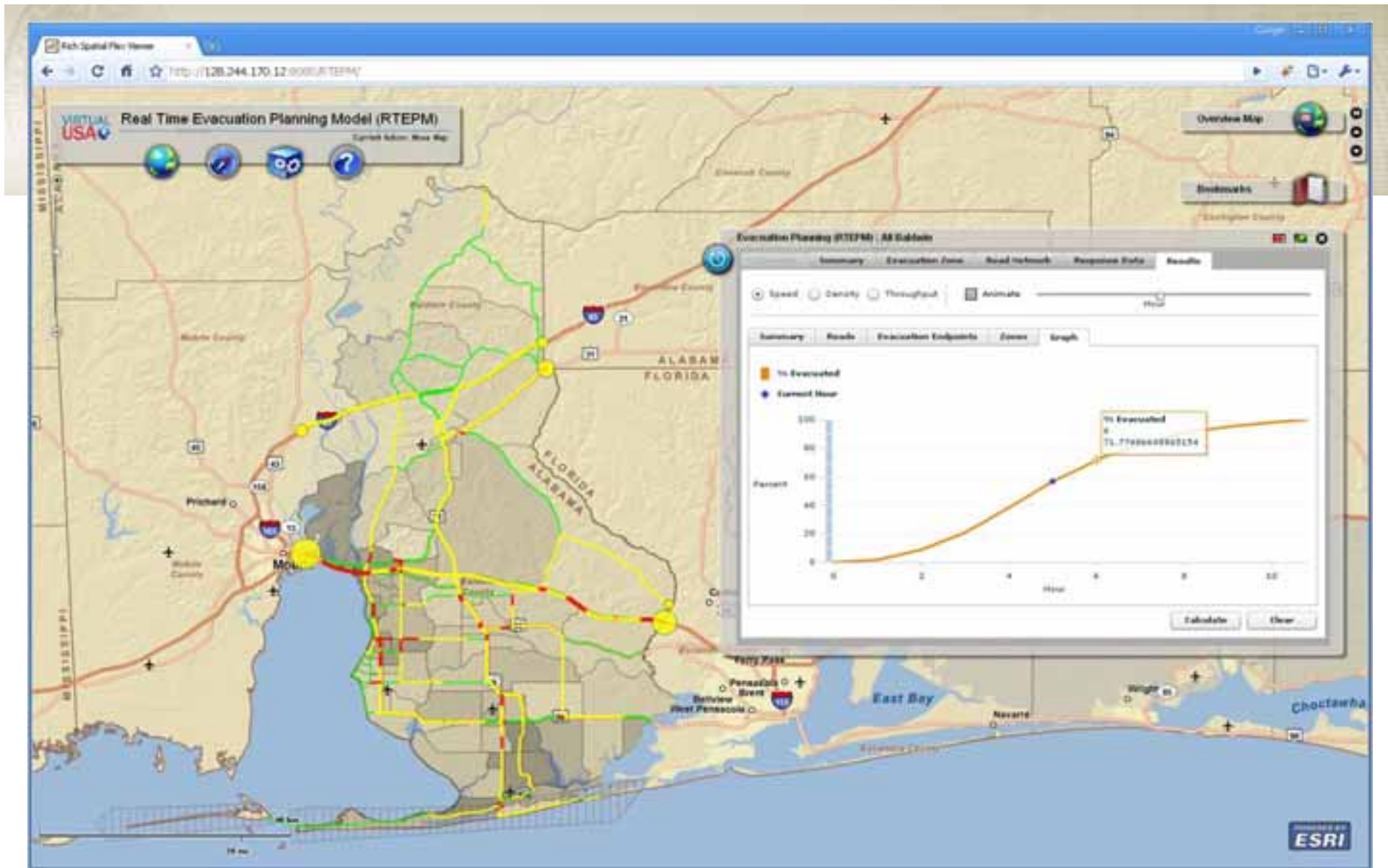


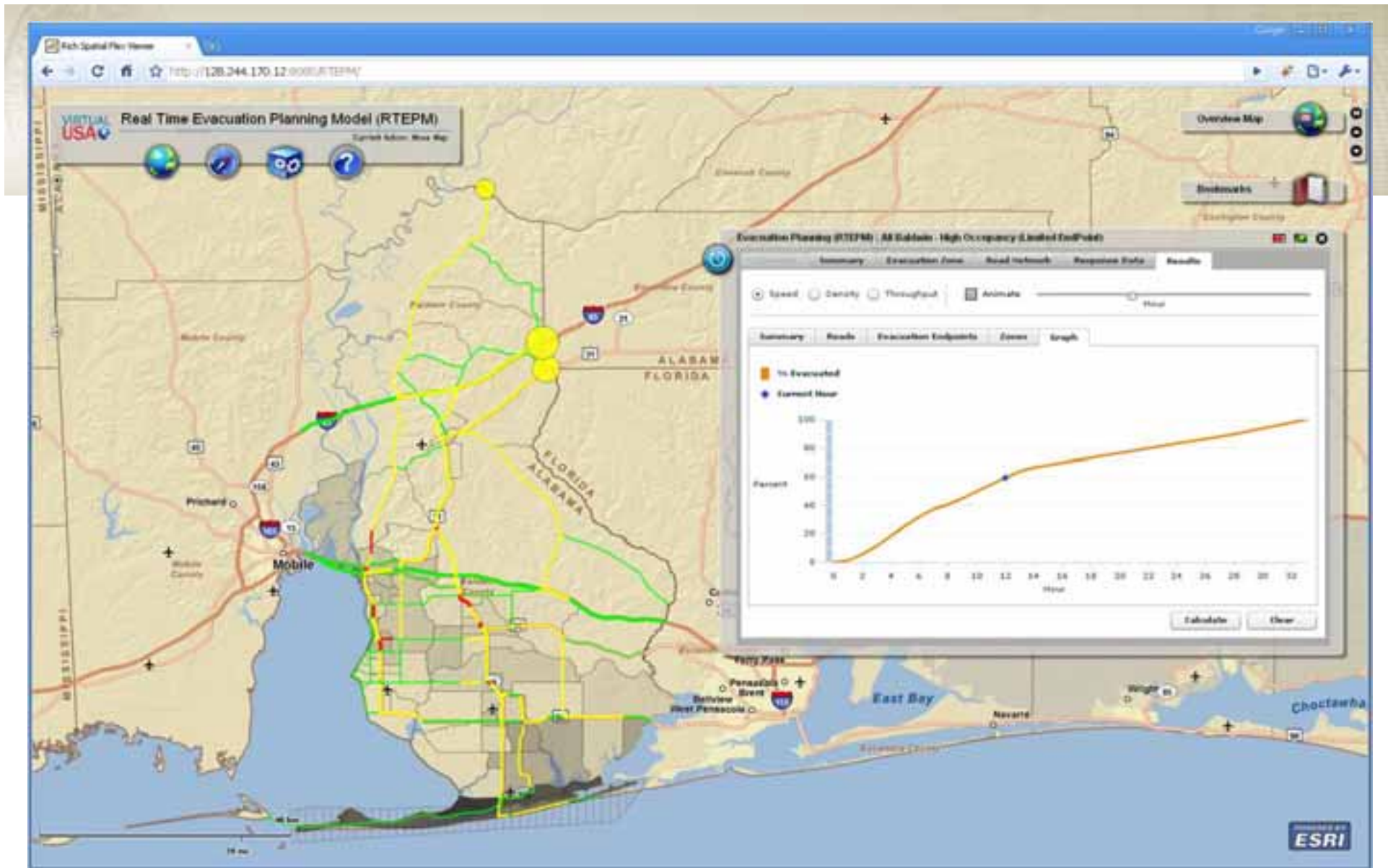












Current State

- **Phase 1 of the project consisting of static planning functionality was successfully concluded.**
- **Phase 2 is underway; working on extending static planning functionality as requested by end-users, as well as initial stages of dynamic capabilities.**

Future Work

- **Inputs from real-time traffic sensors to monitor flow and destination of traffic during evacuation**
- **Recalculation of results based on current traffic conditions**
- **Incorporate CBRNE downwind hazard and plume model results with the GIS application.**
- **Larger scale phased evacuations**
- **Integration of shelter location and dynamic shelter information**
- **Incorporation of public transportation into model**
- **Transition of tool to smaller area evacuations using different sources for population data (for example cell phone data as a proxy for population)**

Questions?