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The Adversarial Route Analysis Tool: A Web Application

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D-6: Risk Analysis & Decision Support Systems

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Introduction

- Motivation for the Adversarial Route Analysis Tool (ARAT)
- What is ARAT?
- My role in developing ARAT
- The ARAT software framework

Motivations

- Google Maps for adversaries
- Help the U.S. government plan operations that predict where an adversary might be
- Easily accessible and maintainable
- Simple to use without much training

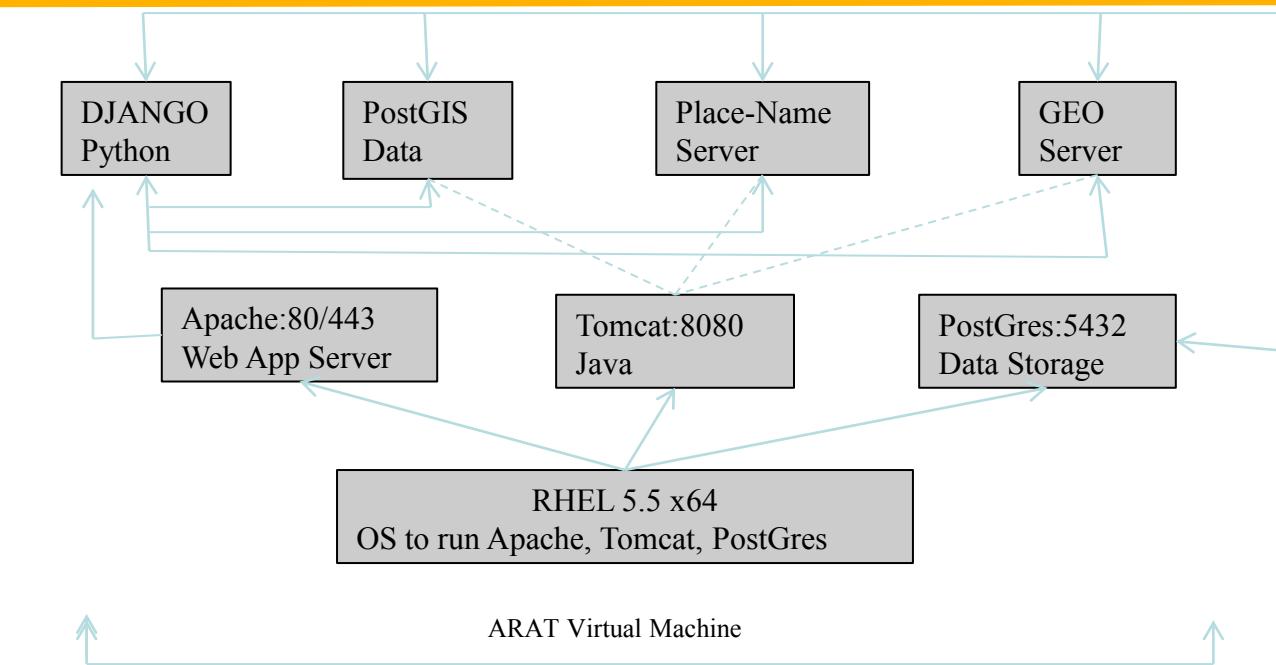
ARAT: A Brief Description

- ARAT is a web-based Geospatial application similar to Google Maps
- The application is available 24/7
- Allow the analyst to modify parameters used in route finding
- ARAT can determine the set of roads to block to separate one set of places from another

My Contributions

- Wrote most of the backend code that generates the server responses
 - Designed the session and user management
 - Implemented solver algorithms in Python
 - Designed the database tables and relations that store the data and results
- Wrote most of the javascript that controls the interface
 - Designed and implemented the map user interface and interactions
- Designed some of the front end layout
- Setup the web server

ARAT Architecture



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Software Stack

- Servers
 - Tomcat
 - Geoserver
 - SLD
 - Layer Definitions
 - Solr
 - Apache
 - WSGI
 - Python
 - Django
 - PostGIS
 - SQL
 - Geospatial extensions
- Client
 - HTML
 - Javascript
 - OpenLayers
 - jQuery
 - CSS

ARAT Demonstration

- Basic route analysis
 - Dijkstra's shortest path algorithm
- Inference model scenario parameters; arc weights
- Weighted route analysis
 - waypoints
 - checkpoints
- Time rings; breadth first search algorithm
- Adversary isolation
 - minimum cut sets
 - Ford-Fulkerson algorithm

Summary

- ARAT is live
- Implemented on Joint Worldwide Intelligence Communications System (JWICS)
- Real users, real problems, in near real-time