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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

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

# Motivations

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- 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

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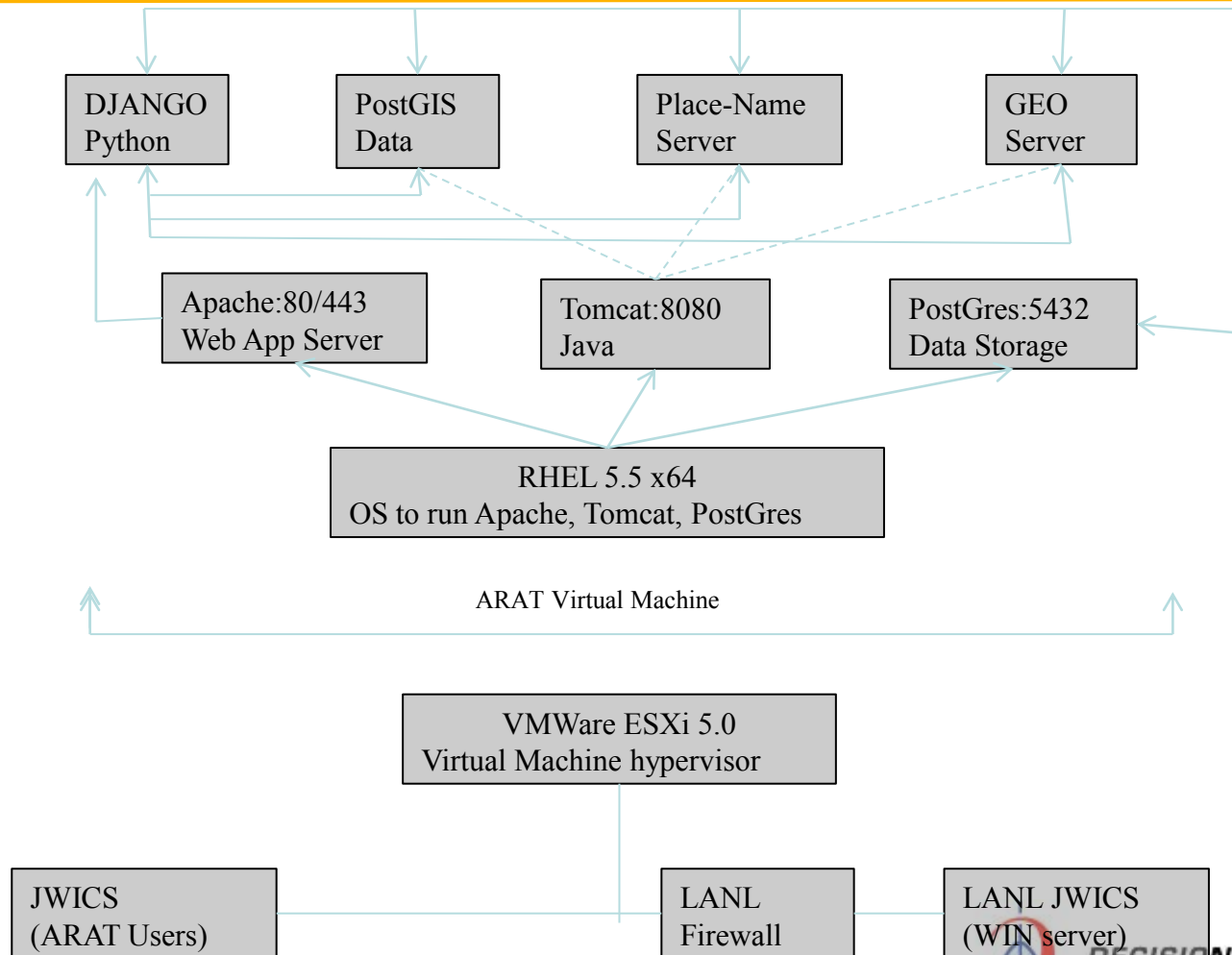
- ARAT is a web-based Geospatial application similar to Google Maps
- The application is available 24/7
- Allow the analyst to modify parameters used in route finding
- ARAT can determine the set of roads to block to separate one set of places from another

# My Contributions

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- 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



# Software Stack

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



# ARAT Demonstration

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- 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

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