Boat Traffic Model
Example Simulation
Introduction

• Implementation of the Boat Traffic model is a multi-step process. This example demonstrates some of the steps in the mesh generation, configuration and implementation of the model.
Master Mesh

• Generating and geo-referencing the master grid is the first step in the mesh generation process.
• The bottom left corner of the map is georeferenced in space using the Albers Projection.
• The number of rows and columns as well as cell size is chosen.
• The vertex mesh is grown from the bottom left corner, implementing the appropriate number of rows and columns and calculating the geo-referenced offset positions for each vertex.
General Parameters

- Bottom Left Corner: (510000,380000) (FDEP Albers HARN)
- Rows: 3000
- Cols: 1650
- Cell size: 30 meters
- Vertices: 4,950,000
- Total coverage area: 160,032,074 m²
- Shapefile size: 220 meg
Zoomed View of Master Mesh
Input Generation

- Mesh vertex points can be associated with e.g. bathymetry, regulatory areas, speed zones, facility locations, or destination locations as possible model inputs.
- An ESRI ArcGIS shapefile is generated for each map layer as an input to the model.
- The Master Mesh extracts data from these shapefiles for model implementation.
- Two input maps are currently designed for implementation: water mask and speed zones.
Water/Land Mask

- A bathymetry shapefile was converted to a 90 meter raster layer. 90 m was used to facilitate connectivity of vertices spaced at 30 m intervals.
- A cluster analysis was performed to identify and exclude all inland bodies of water.
- The primary sea-cluster was used as the simulation area.
- ~2 million of the 4.95 million mesh vertices are in water.
Water/Land Mask

The raster water mask, in combination with the Master Mesh, identifies the water vertices used in the model. Green vertices, representing land, will be trimmed away by the model during run time.
Speed Zones

• The model uses weights associated with the edges to determine optimal trip routes. Use of speed limits averaged between vertices and combined with the length of the edge provides a “time to traverse” that is used as an edge weight.

• Bathymetry values are used to represent speed zones for this test application. Values were capped at 30 mph outside of channels, which were assigned 35 mph.
Facilities

• Facilities are designated using ESRI ArcGIS tools for implementation by the model.

• The test example bypasses Arc assignment and uses a random placement of facilities.

• Ten facilities were generated for the run.
Destinations

- Destinations are also designed to be identified using ESRI ArcGIS tools.
- The test run randomly selects 2000 of the ~2 million active vertices as destinations.
- The destination for each trip is selected after launch.
- Outbound and inbound routes are identical.
Boat Types

- Two boat types are implemented in the model.
- No distinctions between boat types are currently modeled.
- Each boat type has its own launch queue and generates its own shortest path (Dijkstra) map.
Model Run

• The model runs over 10 boating facilities with 2 boat types at each facility, generating 20 shortest path maps over 8,193,464 edges.

• Complete run time: 10 min 20 secs or 30 sec per map generation.

• Memory usage: ~2 gigabytes
The model generates ~ 3300 trips per year per facility. The map at right shows trip routes generated for a single facility over a 365 day simulation.
Trip Density

A calculation of trip line density within ESRI ArcGIS for the previous trip map shows corridors of high use in the simulation.