1. I clipped the shapefiles for the roads (mozroads4) and ports (moz\_ports) to include only those that exist within Mozambique’s border.
2. Next, I added two fields to the roads shapefile, one for distance (km) and one for travel time (minutes). Calculating distance, which is necessary to calculate travel time, requires that the map be casted in a Projected Coordinate System opposed to a Geographic Coordinate System. For Mozambique there are a few options, but I rolled with [WGS\_1984\_UTM\_Zone\_37S].
3. I then created a Network Dataset (ND) based on the roads shapefile – this took me the longest to hammer out, and I’ll probably miss something if I try to recall every step accurately, so I’m not going to bother. You can create NDs from ArcCatalog, I think by right clicking on the shapefile you’re basing it off. You want to use travel time as the cost basis. The following two websites came in handy while I was figuring it out. <http://www.aubreyrhea.net/gis/index.php/2010/06/creating-a-network-dataset/>; <http://www.geotechcenter.org/uploads/2/4/8/8/24886299/unit_6_lab_activity.pdf>
4. When you create the ND another point shapefile of all the vertexes (vertices?) in the network is created. I considered using that shapefile to interpolate the travel time raster from, but instead I decided to create a shapefile with random points all over the roads (randompoints2).
5. Still in the Network Analyst toolbox, I then created an Origin-Destination (OD) Cost Matrix using the random points as the origins and the ports as destinations. That takes a bit of computing power and roughly 45-60 minutes. <http://www.cdc.gov/dhdsp/maps/gisx/training/module3/files/1b_network_analysis_exercise.pdf>
6. The finished OD Cost Matrix creates a table where it shows several possible destinations (~7 of the 11 ports) for each origin (~1650), the related travel time, and the rank of that path (1-7 or whatever). I created a new table by exporting all the routes ranked 1, so a table with all the fastest routes to port from the random points. Then I just needed to join that table to the random points shapefile and I would have another field for each point (z axis – travel time) that could be used to create the interpolated surface. Cool, right? Wrong. I’m not 100% confident that the join went off without a hitch, and it needs to be revisited if we follow this method – but it’s good enough for a first pass. The issue has to do with the point ID used to do the join, there is a choice between FID and CID and the way it all shook out wasn’t 1-to-1 which left me skeptical – I’m not sure how large an effect this had, the travel time raster looks decent, but it didn’t help things for sure. Because it took an hour to create the original OD Cost Matrix I didn’t bother doing it again to fix the potential mistake – but it’s something we can hammer out easily.
7. The last step is using Spatial Analyst tools to perform the interpolation and extracting it to the country borders. Once you perform an interpolation, use Extract by Mask to create a raster that shows the interpolated surface just inside the country borders.