BGP Simulator

Simulator Design

Our program is a simulation of the BGP protocol but also includes inter-AS routing. We begin by reading in a file that contains AS data and routers internal to each AS. Each autonomous system has an IP prefix associated with it. The routers internal to each AS contain IP addresses that fall within that prefix. When we read in each router, we read in attribute information that includes: weight, local preference, MED, origin, and community. In addition, we read in the subnets that this router provides access to.

Once we have read in this data, we create a weighted list for each AS. From here, we add edges that correspond to internal paths in the AS, with arbitrary weights. At the end of this initialization, we have 3 weighted graphs that represent AS's. The vertices in these weighted graphs represent subnets and the edges represent a cost between them, these vertices and edges represent the internal state of each AS.

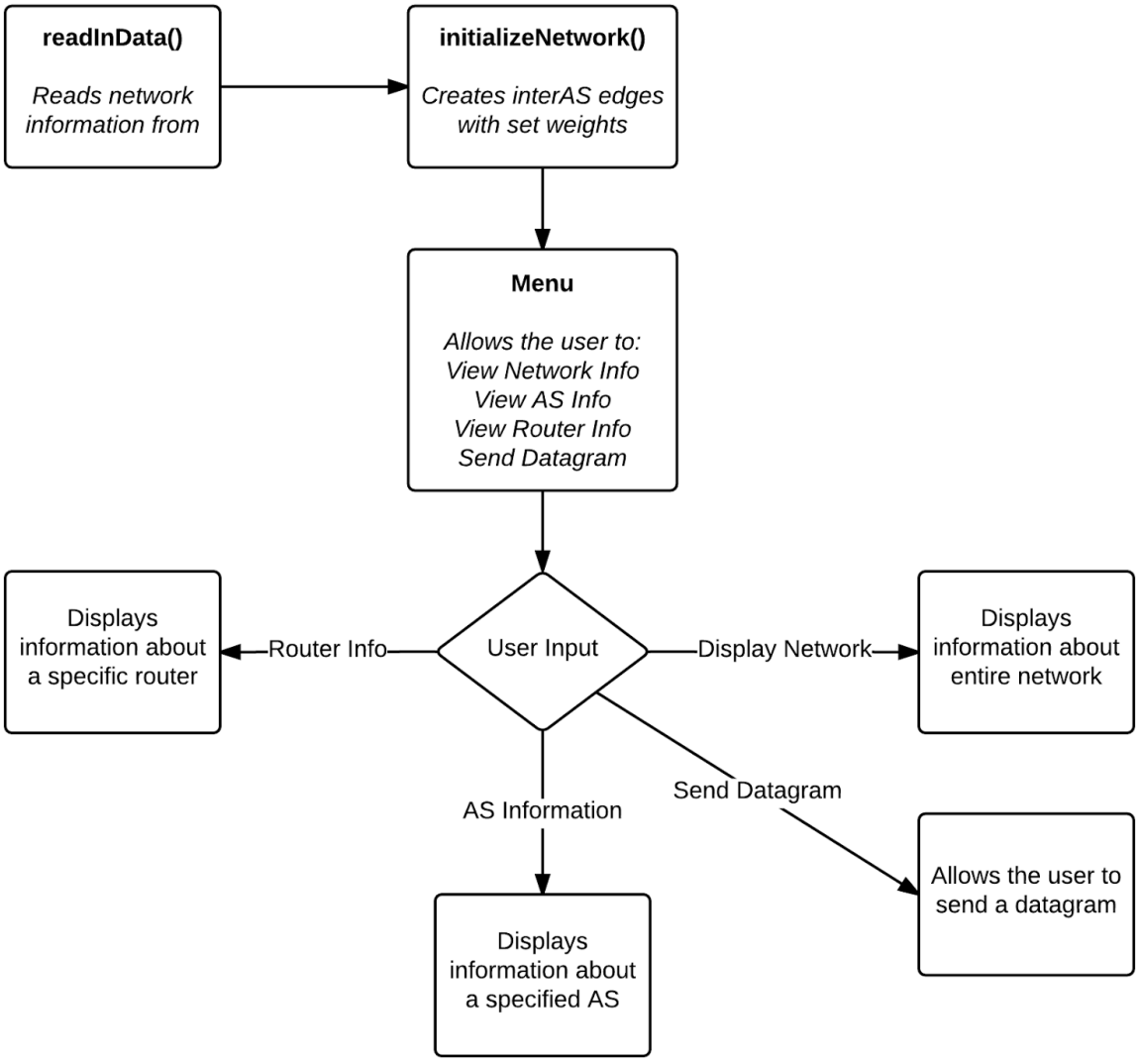
After building our network and the individual AS's, we allow the user several options: they can view details about the network as a whole, view details about a specific AS, or view details about a specific router contained within an AS.

Network Layers

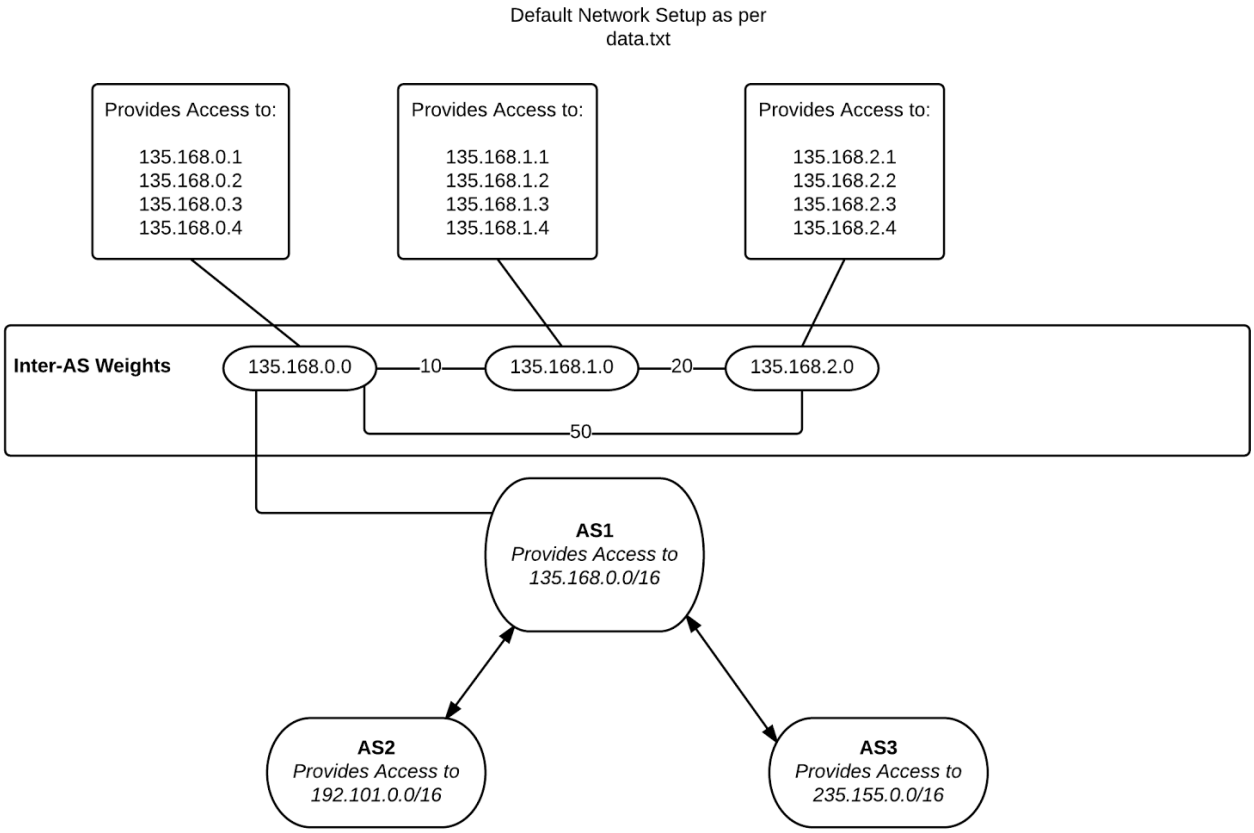
BGP is an application layer protocol that uses TCP to communicate. While we model the end result of BGP we don't actually simulate the TCP communication that takes place when advertising new AS-paths.

We do simulate the path-finding that occurs when a data packet is sent from a router within an AS to another router that may or may not be in another AS. By simulating the sending and receiving of mock data, we are exposing details of the Application layer(sending application data), the transport layer (TCP), and the network layer (IP routing). During the sending of mock packets, we simulate the sending and receiving of each individual packet as well as each acknowledgement that should be received. If packets are lost, they are retransmitted in accordance with the TCP protocol.

Flow Diagram



Autonomous system default setup, emphasizing details of AS1



This diagram shows the default setup of AS1, AS1 provides access to the 135.168.0.0/16 subnet, all traffic will then go through 135.168.0.0.