CS 4251: Computer Networking II February 18, 2008

Problem Set 1

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This problem set has three questions, each with several parts. Answer them as clearly and concisely as possible. You may discuss ideas with others in the class, but your solutions and presentation must be your own. Do not look at anyone else's solutions or copy them from anywhere. (Please refer to the Georgia Tech honor code, posted on the course Web site).

Turn in your solutions in on **March 3, 2008** in class.

1 BGP Routing Table Dumps

For this question, you will need to download the Routeviews routing table from `http://www.gtnoise.net/classes/cs4251/spring_2008/psets/ps1/aux/oix-full-snapshot-2007-01-22-2200.dat.bz2` This file contains a Cisco BGP4 routing table snapshot, taken at Oregon Route Views (`http://www.routeviews.org/`) on January 22, 2007. (*Beware:* This is a text file that is 13MB, compressed. You should be able to analyze it without uncompressing it using, for example `bzcat`.)

If you are curious about what other snapshots look like, you can find daily snapshots at `http://archive.routeviews.org/`

1. Find the routing table entry for the Georgia Tech campus network.

   (a) What is the IP address of the best next hop from this router to Georgia Tech? How does this router know how to reach that next hop IP address?

   (b) From the routing table file, what is the AS number for Georgia Tech?

   (c) How many routes are there to get from this router to Georgia Tech?

   (d) What is the best route to Georgia Tech? Why was this route selected as the best route?[1]

   (e) How many ASes must a packet traverse between the time it leaves the router and the time that it arrives at Georgia Tech?

   (f) What are the AS numbers of all of Georgia Tech's upstream providers? What ISP does the above AS correspond to? (*Hint:* You can discover this information using a whois query, similar to the one from L2.)

   (g) In paths where Georgia Tech uses Cogent (AS 174) as an upstream, the AS path ends with five instances of the same AS number. Why? What is the likely relationship between this AS number and Cogent?

   (h) Look at all of the routes for which the AS path contains the sequence `11537 10490`. What do the ASes that appear first in those AS paths all have in common? Why wouldn't the ASes that select paths that don't have `11537 10490` in them not be selecting those paths?

[1] If you're interested, see the L4 notes or for an overview of the BGP decision process. Note that the process is slightly vendor-specific.

(i) Use `traceroute` to measure route from some machine at Georgia Tech to the router that took the snapshot. Please include the output of your traceroute with your problem set.

Is the sequence of ASes from Georgia Tech to the router the same as the reverse route in the trace data? Why might the reverse path differ? (Please list reasons other than the fact that your traceroute was performed at a different time as the table snapshot!)

2. Look at the routing table entry for 12.1.225.0/24. This entry has several routes marked with a "d", for "damped". Give a short, one-to-two sentence explanation for (1) why routers damp routes and (2) why routers keep damped routes. To answer this question, you may want to look at RFC 2439.

3. Several of the IP prefixes in the table are formatted as w.x.y.z/m. The mask field, m, specifies the length of the network mask to use when matching input destination addresses to entries in the table.

4. RouteViews makes available table snapshots from 1997 to present. Suppose you had access to all of these snapshots, as well as some routing table snapshots from pre-CIDR. For each of the following pieces of information available in the table snapshot, what information might you be able to infer about the evolution of the Internet?

   (a) Only the destination addresses.

   (b) Only the lines marked `*>`.

   (c) Only the paths, with best next-hops marked.