

Topology Mapping

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1 Goal

In this project, you will develop a router-level internet topology mapping tool.

2 Introduction

ISPs generally regard their router-level topology as confidential, although some publish a very high-level view of their network. Router topologies are interesting from the perspective of simulating the Internet. An exact view of the Internet topology is impossible for an observer, if not situated within the network. However, considerable portions of it can be mapped out by using multiple end-points.

In this project, your goal is to come up with an Internet topology mapping tool which will map out the router level topology of Internet2. Internet2 is a high-speed network which connects U.S. research and educational institutions. To accomplish this you will use traceroutes from different vantage points on the network. Each traceroute yields the router path through the network traversed from the source to the destination. You need to run multiple traceroutes and then finally merge the results of these traceroutes to obtain a global view of the topology. For multiple vantage points, you will need to use planet-lab [3] nodes. *We will brief you about the process of creating planet lab accounts and planet lab etiquette.* You must read the paper on Rocketfuel [4], presented in SIGCOMM 2002, before proceeding to do the assignment.

3 Mapping Technique

You will use the planet lab nodes listed in the table below (Table 1). A '*' indicates you can use any node from the node group to carry out your measurement. If any of these of nodes are down, you may use your own set of planet lab nodes. For the replacement, pick a university node that is geographically close to the node that is down.

To construct a router level topology map, use a procedure as follows:

Node	Institution
*.jhu.edu	Johns Hopkins University, Baltimore
*.umd.edu	University of Maryland, College Park
*.ucla.edu	University of California, Los Angeles
*.colorado.edu	University of Colorado, Boulder
*.uta.edu	University of Texas, Arlington
*.caltech.edu	California Institute of Technology, Pasadena
*.washington.edu	University of Washington, Seattle
*.umkc.edu	University of Missouri, Kansas City
*.chicago.edu	University of Chicago, Chicago
*.uga.edu	University of Georgia, Athens

Table 1. List of Planetlab nodes to be used.

- Run traceroutes between each pair of nodes in either directions. Capture only the router names and do not worry about the latency and other parameters. For the internet2 domain, the routers are labelled as *.abilene.ucaid.edu. e.g iplsng-chinng.abilene.ucaid.edu.
- Merge these different routes into a single map. You may need to use an alias resolution tool like ally [4].
- Use a host name to location mapper to find out the geographical locations of these routers e.g. undns [2]. Usually, ISPs name their routers using geographical names. for e.g the traceroute from JHU to Washington passes through the router dnvrng-kscyng.abilene.ucaid.edu. In this name *dnvrng* stands for Denver and *kscyng* stands for Kansas City. This router resides in Kansas City.
- Create a graphical view of your map with location names. e.g.[1]

4 Deliverables

You need to submit a graphical representation of the router level topology of Internet2 labelled by their geographical locations. While not required - for extra credit - overlay this graph on the map of U.S. using a tool such as Google Earth.

References

- [1] A graph visualization software. Available at <http://www.graphviz.org/>.
- [2] A router hostname-to-location decoder. Available at <http://www.scriptroute.org/source/>.
- [3] I. Research. Planet Lab. <http://www.planet-lab.org/>, 2002.
- [4] N. Spring, R. Mahajan, and D. Wetherall. Measuring ISP Topologies with Rocketfuel. In *Proceedings of ACM SIGCOMM 2002*, Aug. 2002.