ROUTER PROJECT
CS 4/55231 INTERNET ENGINEERING
Spring 2004, Department of Computer Science, Kent State University
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Due Date: _____ (3 weeks)

The purpose of this project is to design an experiment to illustrate a given key idea. Solve any one of the following. First look at the **key concept** what you need to highlight. For each problem there is a suggested router network. But you may change it to enhance the presentation. You may add local networks and hosts as required. Then see how you would like the routers to be configured and connected that will best illustrate the point. Then identify the detail router instructions and configuration commands those will be needed to achieve the result. For part b of each you can assume that routers can be connected and organized in other ways.

1. **Hot Potato:** Design an experiment that will illustrate the phenomena of "Hot Potato" routing that may appear in ISP routing. Suggested Network: Consider two AS, each with at least two BGP speaker routers similar to fig-a. Attach networks at the back of each router. Let both AS can be reached using two different paths.

   (a) Here is the "Hot Potato" policy:

   - Both ISP will try to forward packet to the other ISP using the nearest border router.

   How each of the AS administrators in AS1, and AS2 will configure their routers to reflect these policies? (ii) How the packets will be routed for each pair of source and destination networks under this setup? (iv) How packets will be routed if one of the links between the ASs is down? (v) How can you verify the routes via traceroute and pings?

   (b) Can you suggest another preference model and show the experiment and how it can be set up?

2. **Hostile Federation:** (5 routers) Design an experiment to illustrate the idea of using policy engine to satisfy various trust models, when each AS has varying degree of trust on other AS. Suggested Network: There are five AS, each with one border router. Connected as shown in fig-c.

   (c) Here is an example trust/ mistrust situation-SNOOPY:

   - AS1 and AS3 are friends. AS2 and AS4 are friends.
   - AS1 does not trust sending transit packets via AS2.
   - AS1 does not mind intercepting transit packets from AS2.

- Similarly, AS2 does not trust AS1.
- AS5 does not want to accept any transit packet from AS3.

How each of the AS administrators in AS1, AS2 and AS5 will configure their routers to reflect these policies? (ii) How the packets will be routed for each pair of source and destinations under this setup? (iv) How packets will be routed if link the physical links R1-R4 and R3-R5 is withdrawn? (v) How can you verify the routes via traceroute and pings?

(d) Can you suggest another preference model and show the experiment and how it can be set up?

3. **Exit Preference Policy:** (5 routers) Design an experiment to illustrate the idea of using MED values to influence the inbound traffic preferences. Suggested Network: There are three ASs. The middle one AS2 is the transit AS between the two and it has two border routers both connected to other two AS. A suggested configuration is shown in fig-b.

   (a) Here is an example preference model of AS2:
   - AS2 prefers to receive transit packets via router 1 and local traffic via the other.

   (i) Show how AS2 should advertise the MED values to its neighbors. (ii) What specific configuration commands must be used to enforce this policy? (iii) How you can show by traceroute and pings that it has been enforced?

   (b) Can you suggest another preference model and show the experiment and how it can be set up?

4. **Policy Routing:** You are given five AS with one router each. They are connected in similar to fig-d. There is one Policy Router at the center, and two other as input and two more as output to this Policy Router.

   (a) As a first example: use the input/output policy routing ideas similar to the one discussed in the class.

   (i) Show how AS3 should set up its RIB acceptance policies. (ii) What specific configuration commands must be used to enforce this policy? (iii) How you can show by traceroute and pings that it has been enforced?

   (c) Can you suggest another network model and show the experiment and how it can be set up?
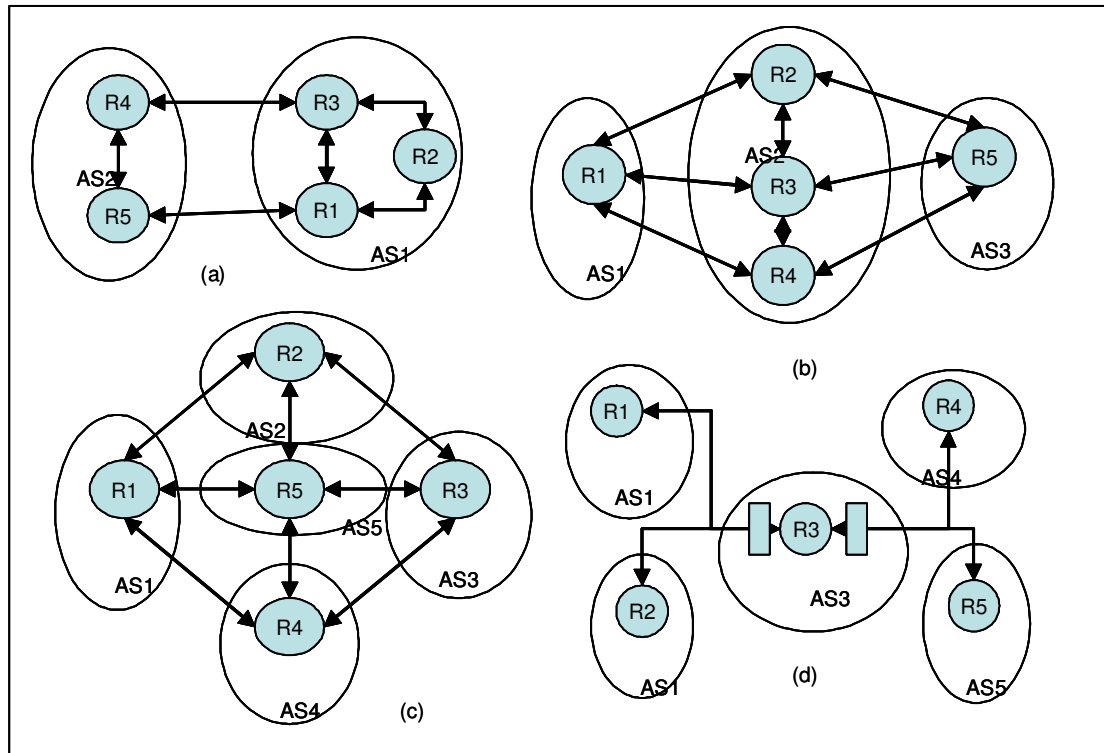
Steps Involved, Submission & Grading

1. Reserve at least two 3 hour time slots with IEL monitor.
2. Visit the lab to find out what is there (how many routers, extra network, switches, hubs etc.).
3. Plan the detail experiment on paper.
4. Go to the lab and actually set it up.

5. Part-A: Prepare a PowerPoint slide explaining the entire experiment with
   a. The Experiment Goal (10 points)
   b. Overview of Experiment Plan (10 points)
   c. Connection Diagram (AS, subnets, routers, switch, hubs etc.) (10 points).
   d. Steps: How to Connect the Network (20 points)
   e. Steps: How to Configure each Router (include commands and response sequences). (25 points)
   f. Steps: How to Test (include the commands & responses). (25 points)
   g. Submit it by email on the deadline to grader and copy it to me.
6. Part-B: Repeat the above (50 points)
7. Experiment presentation of part A to the grader. (100 points)

5. Route Aggregation in Stub Networking: Can you design a three router experiment which will demonstrate various combinations of EBGP and IGP those can be used to create a stub customer connection from an ISP?

6. Multi-Homed Networking: Design a four router arrangement that will explain the concepts of multi-homed transit and non-transit routing. A five router arrangement will explain the EBGP multihop. A five router arrangement will be used to demonstrate IBGP Meshing.