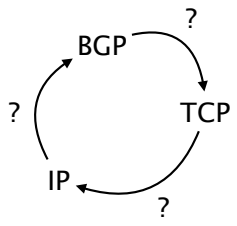
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Prof. Laurent Vanbever
Networked Systems Group

Communication Networks

Additional Exam Preparation Questions

Circularity



Chicken or the egg?

Consider two directly-connected routers A and B that have an eBGP session (running over TCP) between them. Explain how BGP, which is used to propagate *IP-based* routing information, can rely on establishing a TCP connection to exchange routes, which itself relies on IP. How is this circularity resolved? How do the two TCP endpoints manage to reach each other?

Curious students

Consider that ITET has a local DNS server serving the DNS requests for all students' devices connected in the department. How could you determine if an external website has been visited recently by a fellow colleague of yours? Explain.

Name it or Route it: pick one

DNS *vs.* BGP Anycast

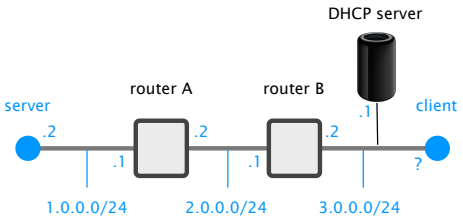
Any clear winner?

In the course, we saw two ways to replicate and load-balance content: *(i)* using Anycast routing; or *(ii)* using DNS.

a) List and briefly justify three pros and cons of each;

b) We saw that CDNs often rely on DNS for distributing their load. Could they also use Anycast routing instead? Explain why or why not.

Putting everything together

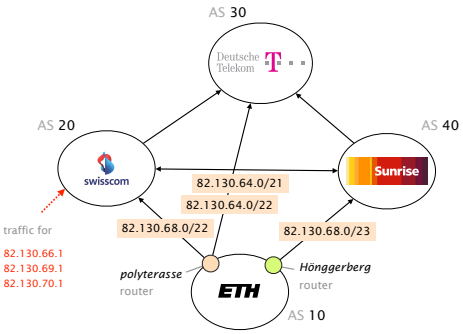


Describe everything that happens to the packets sent between the client and the server

Consider the network on the left composed of three Ethernet segments separated by two intermediate routers (A and B). In this network, the server's interface along with the routers' interfaces are configured with static IP addresses. While clients connected to the 3.0.0.0/24 Ethernet segment obtain an IP address via DHCP.

Assuming that the client has just started, with a perfectly empty state, precisely describe all packets that are generated when the command "ping 1.0.0.2" is issued (until the server answers back). Among others, your answer *must* include the content of the Layer 2 and Layer 3 headers.

Traffic (not so much) Engineered



Where are my packets going?

After passing the Communication Networks exam with flying colors, ETH hires you as a junior network engineer. *Congrats!*

Your first mission is to analyze their BGP configuration. They indeed suspect that something might be wrong, especially since they installed this box from Sisco Systems that automatically configure BGP announcements according to Traffic Engineering objectives. For the sake of simplicity, assume again that ETH has only one prefix: 82.130.64.0/21 and three providers: Swisscom, Deutsche Telekom and Sunrise. The actual announcements are depicted on the left. Customers are drawn below their providers (Swisscom is a customer of Deutsche Telekom), while peers are drawn next to each other (Swisccom is a peer of Sunrise).

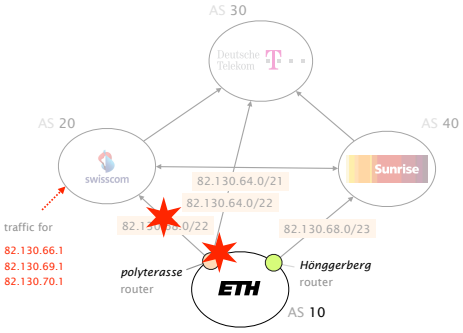
Consider the incoming traffic from Swisscom. What path is taken for packets destined to:

a) 82.130.66.1?

b) 82.130.69.1?

c) 82.130.70.1?

Are Swisscom, Deutsche Telekom and Sunrise happy about these announcements? Can they do anything about that? Explain briefly.



Is this network as redundant as it looks?

As the *polyterasse* router is getting older, its reliability starts to suffer. In theory, this should not be a big problem as ETH is *triple*-homed! Yet, in practice, the ETH engineers observe regular network connectivity upon failures.

Assuming the same announcements, what path ends up being taken by the packets destined to the above three IP addresses when:

a) the link between *polyterasse* and Swisscom goes down?
   (i) 82.130.66.1?
   (ii) 82.130.69.1?
   (iii) 82.130.70.1?

b) the *polyterasse* router dies?
   (i) 82.130.66.1?
   (ii) 82.130.69.1?
   (iii) 82.130.70.1?

What would you change in the ETH announcements to improve reliability, without disturbing the inbound Traffic Engineering performed by the Sisco box in the steady case (without failures)? Explain briefly.