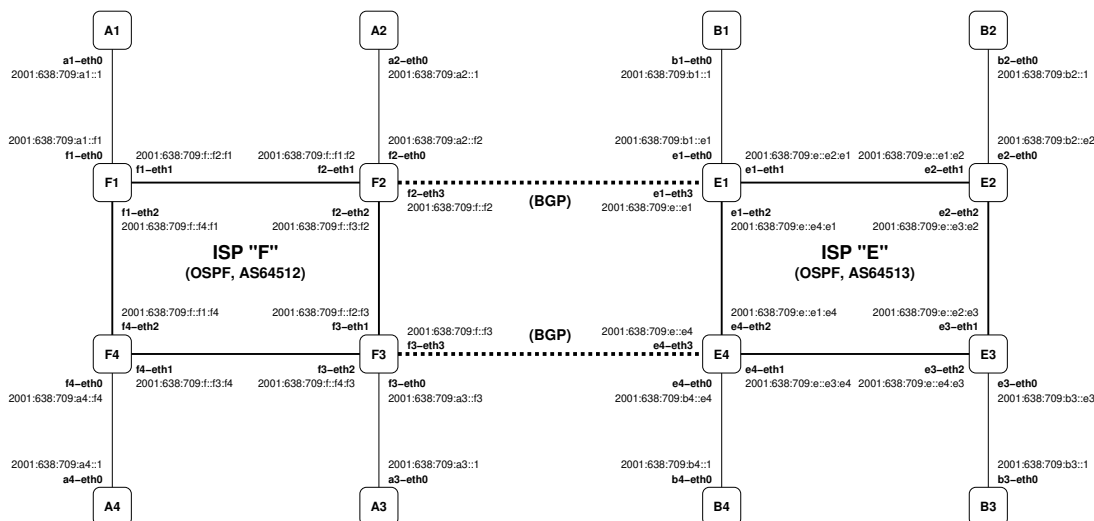## CN 2018 Problem Sheet #3

Problem 3.1: *ospf and bgp routing*   (2+2+2+2+2 = 10 points)

In this assignment, you will create two ISP networks and a peering relationship between them. You will make yourself familiar with the BIRD routing daemon.


The figure shows the topology of the network. ISP F runs an internal network using the prefix 2001:638:709:f::/64 and ISP E runs an internal network using the prefix 2001:638:709:e::/64. Both ISPs have four customer networks (A1-A4 are customers of ISP F and B1-B4 are customers of ISP E). Each customer network has a separate /64 prefix. You will be provided with a mininet script that creates the topology shown above and empty template for the BIRD configuration files. In the following, work with the BIRD routing configuration, nothing needs to change in the mininet script.

1. Create an OSPF network for ISP F and an OSPF network ISP E. Make sure all hosts Ai can reach each other and all host Bi can reach each other.

2. Test that the OSPF networks handle link failures. Take a link down and verify that OSPF calculates alternate paths.

3. ISP F and ISP E create two BGP peerings. Configure the two BGP peering sessions.

4. ISP F is interested to announce his customer networks to ISP E but he prefers to not announce his internal network to ISP E. Similarly, ISP F is interested to announce his customer networks to ISP F but he prefers to not announce his internal network to ISP F. Create filters implementing these policies.

5. ISP F prefers to use routes announced by E1 with a fallback option to routes announced by E4 in case the link to E1 fails. Similarly, ISP E prefers to use routes announced by F3 with a fallback option to routes announced by F2 in case the link to F3 fails. Create filters implementing these policies and verify that they work correctly.

Background information:

The BIRD routing daemon uses internally a central routing table, lets call it the BIRD routing table. (There can actually be multiple routing tables but lets keep things simple here.) The BIRD routing table has import/export relationships to sources / sinks of routing information. The following figure shows a BIRD configuration that is relevant for this assignment.
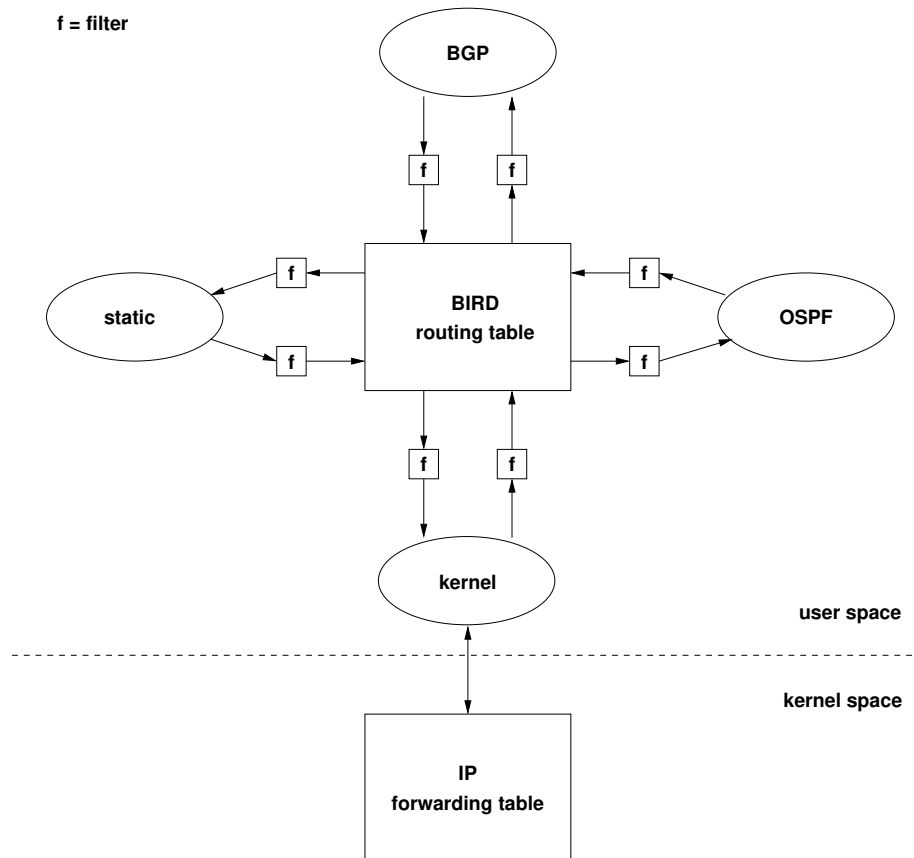
The central BIRD routing table interacts with the following routing protocols:

- The BGP routing protocol. You will use this routing protocol to establish the peering relationships between the two ISPs.

- The OSPF routing protocol. You will use this routing protocol to establish shortest paths within the ISP network.

- The kernel pseudo-routing protocol. This is used to communicate routes from the central routing table to the kernel forwarding table.

- The static pseudo-routing protocol. This is used to define static routes that are fed into the central routing table.

The exchange of routes between the routing protocols and the central routing table is controlled by filters (the f-boxes in the graph). For example, it is possible to filter which routes from the BIRD routing table into the BGP routing protocol. Similarly, it is possible to filter which routes obtained via the BGP routing protocol flow into the BIRD routing table.

To get started, it may be a good idea to simply import and export all routes. In a second step, you may want to write filters that are then used to control how routes are exchanged within the BIRD daemon.