Problem 1.3 – Case Study – Load Balancing with OpenFlow

Note: This is a sample solution. If you have solved the problem in a different way, your solution maybe also correct, even though it differs.

With the correct ruleset and controller behavior, an OpenFlow-capable switch can act as a Layer 3 load balancer, which we require here.

First, we connect every server to the OpenFlow switch on Port 2 ff., as well as the WAN access side (the internet) on Port 1. We assume the external IP address to be 2.2.2.2, we configure this IP address on every server*.

We now install rules on the OpenFlow switch that distribute incoming packets on Port 1 to the internal servers based on their *source* IP address, for example with a modulo operation. A simple solution would be to use the last bits of the source IP address as the server number to redirect to. In the following example, we have 4 load-balancing servers:

srcIP= ....00 → Output on Port 2,

srcIP= ....01 → Output on Port 3,

srcIP= ....10 → Output on Port 4,

srcIP= ....11 → Output on Port 5.

We furthermore should not forget rules for the answer packets to go back to the WAN interface: This is very simple: We just configure the switch that every packet entering the server interfaces (2 ff.) to be forwarded to the WAN interface (1). This is a static flow rule set, which does not need to be changed during operation.

Alternatively, a rule per client could be installed. However, this has several drawbacks, for example the control plane would be heavily utilized (namely per session).

* The server addressing intersects, thus the servers cannot communicate to each other over the external network. In practice, they could use a backend network for internal communication. Additionally, the same MAC address should be configured on every server for the external interface.