Alternative to Traditional Routing

A Openflow-Inspired Routing Approach

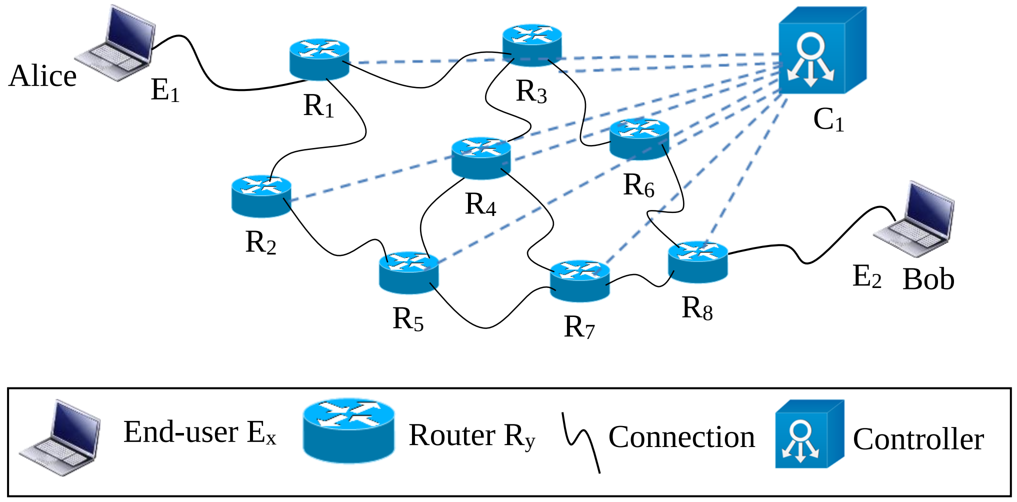
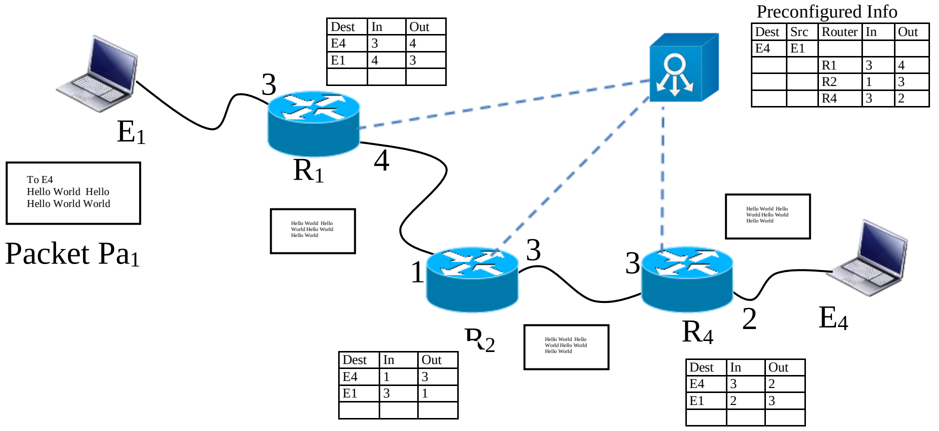


Figure 1: Sample Scenario

Assume that you have been assigned to develop an Openflow-like controller that configures flows in routers in a network when a packet enters the network. End-users are associated with routers and send out packets addressed to other end-users. Each router has a number of ports, can communicate with a subset of other routers and end-user devices and route packets based on rules that associate destinations with incoming and outgoing ports. All routers are connected to a controller and contact the controller when they receive a packet for which they do not have a rule.


3
E1
R1
4
1
3
3
R2
R4
2
E4
Packet Pa1
Hello World Hello World Hello World Hello World
Hello World Hello World Hello World Hello World
Hello World Hello World Hello World Hello World

To E4
Hello World Hello
Hello World World

Dest	In	Out
E4	3	4
E1	4	3

Preconfigured Info

Dest	Src	Router	In	Out
E4	E1			
		R1	3	4
		R2	1	3
		R4	3	2

Dest	In	Out
E4	1	3
E1	3	1

Dest	In	Out
E4	3	2
E1	2	3

Figure 2: Scenario of a delivery of packet Pa_1 from E_1 to E_4. The message flows along the path on the data plane while the routers receive information about flows from the controller on the control plane.

As a first step, the controller should have preconfigured (hardcoded) routing information and should inform all routers along a path, when it is contacted about a packet entering its network. For example if E_1 would send a packet Pa_1 addressed to E_4 to R_1, R_1 would contact the controller, which then would look up how to get from R_1 to

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E_4 and send configurations to R_2, R_4 and R_1 about a new flow. Subsequent packets from E_1 to E_4 should not require any messages between the routers and the controller.

The second step in the development of the controller is the replacement of the preconfigured information with an implementation of a Link State or Distance Vector Routing approach. The individual routers would have preconfigured/hardcoded information about their connections to other routers and end-devices. At the start of the execution, the routers transfer this information to the controller and the controller builds a routing table that should be similar to the preconfigured information in the first step.

The implementation should be accompanied by a report that explains the design and implementation of the protocols, the choices that you have made and the advantages and disadvantages that these decisions introduced. The description of the design should be accompanied by snapshots of some of the packets that were transmitted by your implementation. The explanations of the packets should highlight the management information in these packets and illustrate how this information is used by your implementation. The report should conclude with a reflection on the assignment as a whole, what went well for you and what you could have done better, and an estimation of the time that you spent on the assignment.

Submission Details

The files that contain the implementation and the report should be submitted through Blackboard. Every file should contain the name of the author and the student number. The source files of the implementation should be submitted as an archived file e.g. “.zip” or “.tar.gz”. The report should be submitted as either word- or pdf-document.

The name of the archive file and the report should be include the name and the student number of the author; for example, “123456-John-Doe-FlowC-implement.zip” and “123456-John-Doe-FlowC-Report.pdf” where the name of the student is John Doe and the student # is 123456. The deadline for the submission is given in Blackboard.

Marking Scheme

The marks for the assignment will be split into 60% for the implementation of the first step with preconfigured information about routes at the controller and 40% for the implementation of the transfer of the local information to the controller and of the calculation of routes at the controller. The marks for the implementations will be split 50% for the implementation and 50% for the documentation through the report.