

9. Routing

9.1 Definition

A router is a network component that is connecting at least two separate networks together.

The default gateway is a router that will be used from the hosts by default (= as a standard).

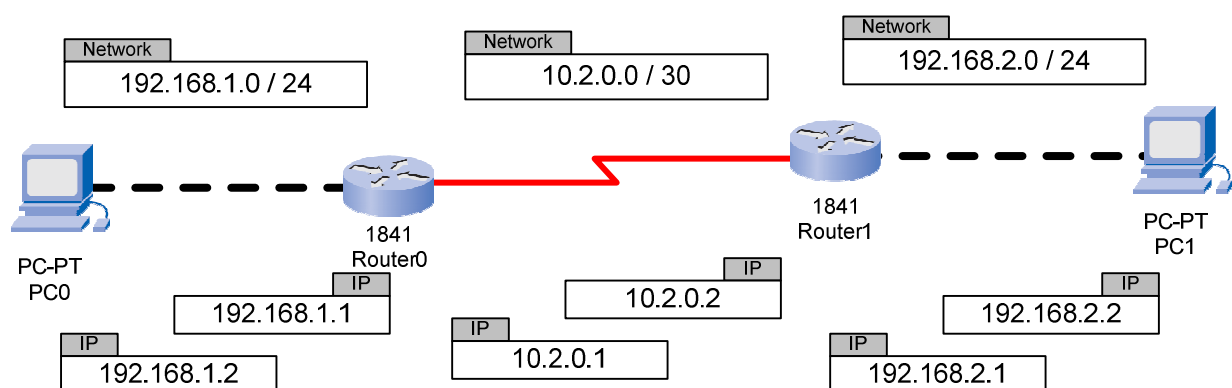
9.2 Routing table

The routing table tells the router what network is connected to which interface (plug) on the router. Every line in the routing table is called a route. The routing table is structured as follows:

Destination Network		Interface or next hop	Metric
network address	subnet mask		

Exercise 1:

Plan the IP-address ranges for the following internetwork:



9.3 Static routing

In static routing all routes are manually entered into the routers.

Example of the static routes for the internetwork in exercise 1:

Router0

Destination Network			
network address	subnet mask	Interface or next hop	Metric
192.168.2.0	24	10.2.0.2	

Router1

Destination Network			
network address	subnet mask	Interface or next hop	Metric
192.168.1.0	24	10.2.0.1	

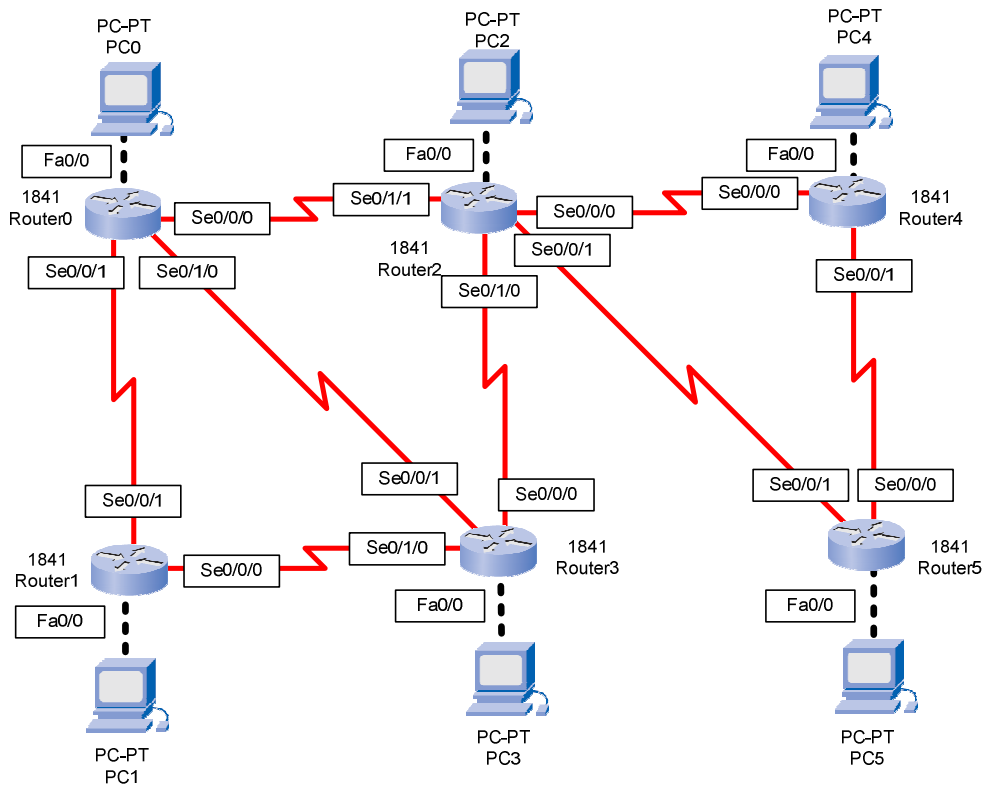
In static routing the routing table only contains routes to networks that are **NOT** connected to the router itself.

The metric is relevant when the internetwork allows several alternative routes to the same network.

The lower the value of the metric is the higher the priority of the route will be.

Exercise 2:

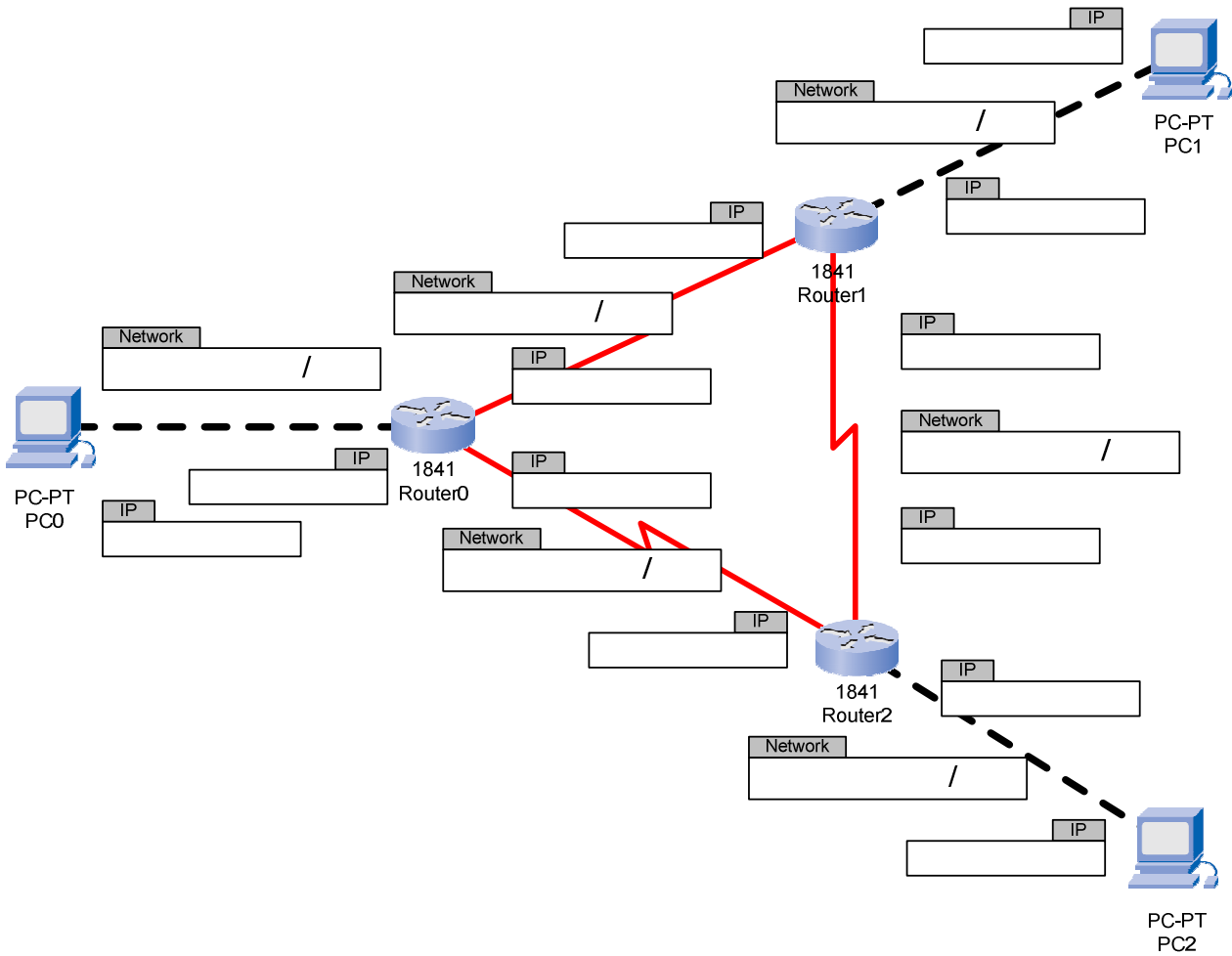
- Mark the way a ping will take from PC1 to the IPv4 address 15.150.0.10 through the following internetwork with the static routing tables below.
- Convert the destination IP address and the network addresses on the way to the destination in binary numbers.
- Mark the corresponding routes in the routing tables.



<i>Router0</i>			<i>Router2</i>			<i>Router4</i>		
network address	subnet mask	interface	network address	subnet mask	interface	network address	subnet mask	interface
0.0.0.0	/0	Se0/0/1	0.0.0.0	/0	Se0/1/1	15.160.0.0	/11	Se0/0/1
15.0.0.0	/11	Se0/0/1	15.0.0.0	/10	Se0/1/1	15.0.0.0	/9	Se0/0/0
15.64.0.0	/10	Se0/1/0	15.96.0.0	/11	Se0/1/1	15.128.0.0	/11	Fa0/0
15.128.0.0	/9	Se0/0/0	15.128.0.0	/9	Se0/0/1			
15.32.0.0	/11	Fa0/0	15.64.0.0	/11	Fa0/0			
<i>Router1</i>			<i>Router3</i>			<i>Router5</i>		
network address	subnet mask	interface	network address	subnet mask	interface	network address	subnet mask	interface
0.0.0.0	/0	Se0/0/0	0.0.0.0	/0	Se0/0/0	15.128.0.0	/11	Se0/0/0
15.32.0.0	/11	Se0/0/1	15.64.0.0	/11	Se0/0/0	15.160.0.0	/11	Fa0/0
15.0.0.0	/11	Fa0/0	15.92.0.0	/11	Fa0/0	15.0.0.0	/9	Se0/0/1
			15.0.0.0	/10	Se0/1/0			

Exercise 3:

Plan the following internetwork and prepare the static routing tables for all three routers.



9.4 Dynamic routing

Static routing can get very complex in huge internetworks as the internet. This makes the static routing quite fault-prone (deut.: fehleranfällig).

Dynamic routing protocols allow routers to communicate between each other and to generate the routes automatically. An example of a dynamic routing protocol is EIGRP (Enhanced Interior Gateway Routing Protocol). All that needs to be done is to enter the networks that a router is connected to.