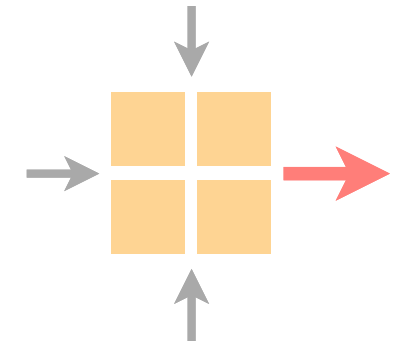


# Communication Networks

Spring 2021



Coralie Busse-Grawitz

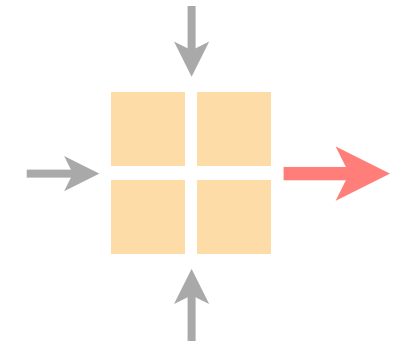
<http://comm-net.ethz.ch/>

ETH Zürich

22 April 2021

# Communication Networks

Spring 2021



Previous exercise

Exercise overview

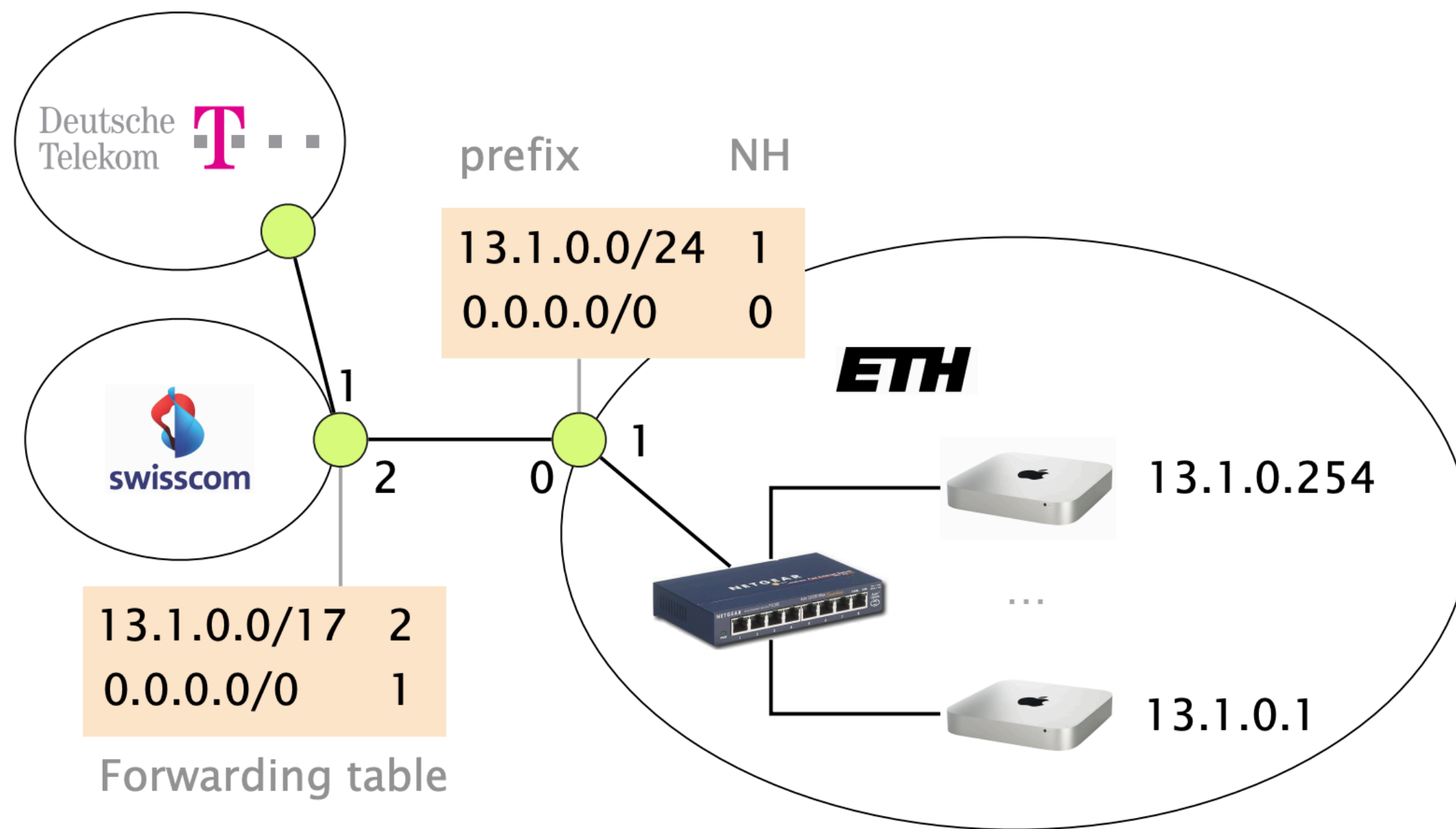
Understanding traceroute

Time to solve tasks



# Task 4

## The Art of Defaulting Properly

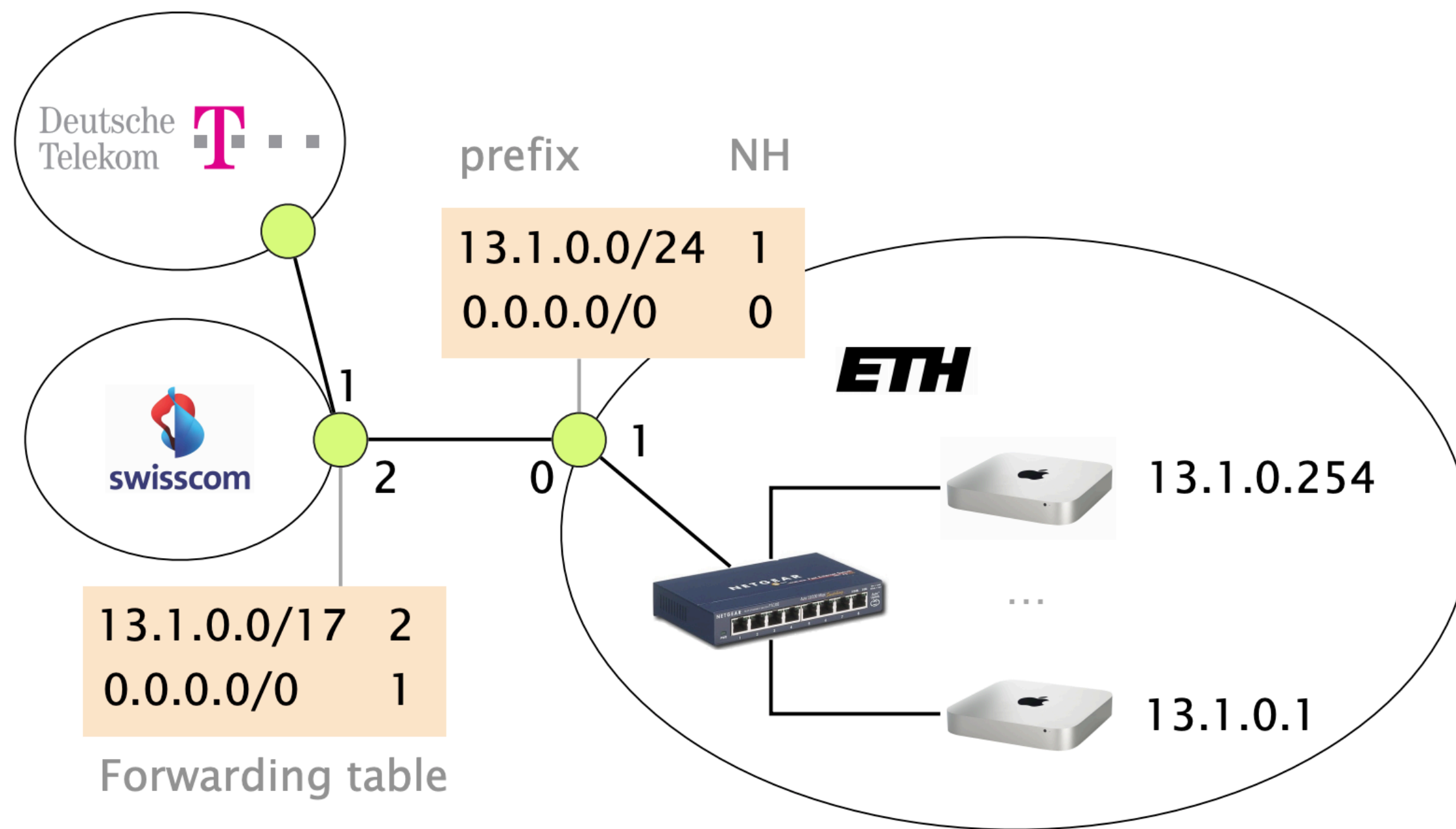


Consider this simple network configuration between ETH and Swisscom. Assume that ETH owns a large IP prefix 13.1.0.0/17, but only uses 13.1.0.0/24 to address its internal hosts. For simplicity, we assume that ETH and Swisscom operators configure their forwarding table statically and rely on the use of a default route (0.0.0.0/0).

- a) How many IP addressable addresses does ETH “own” in total?

# Task 4

## The Art of Defaulting Properly



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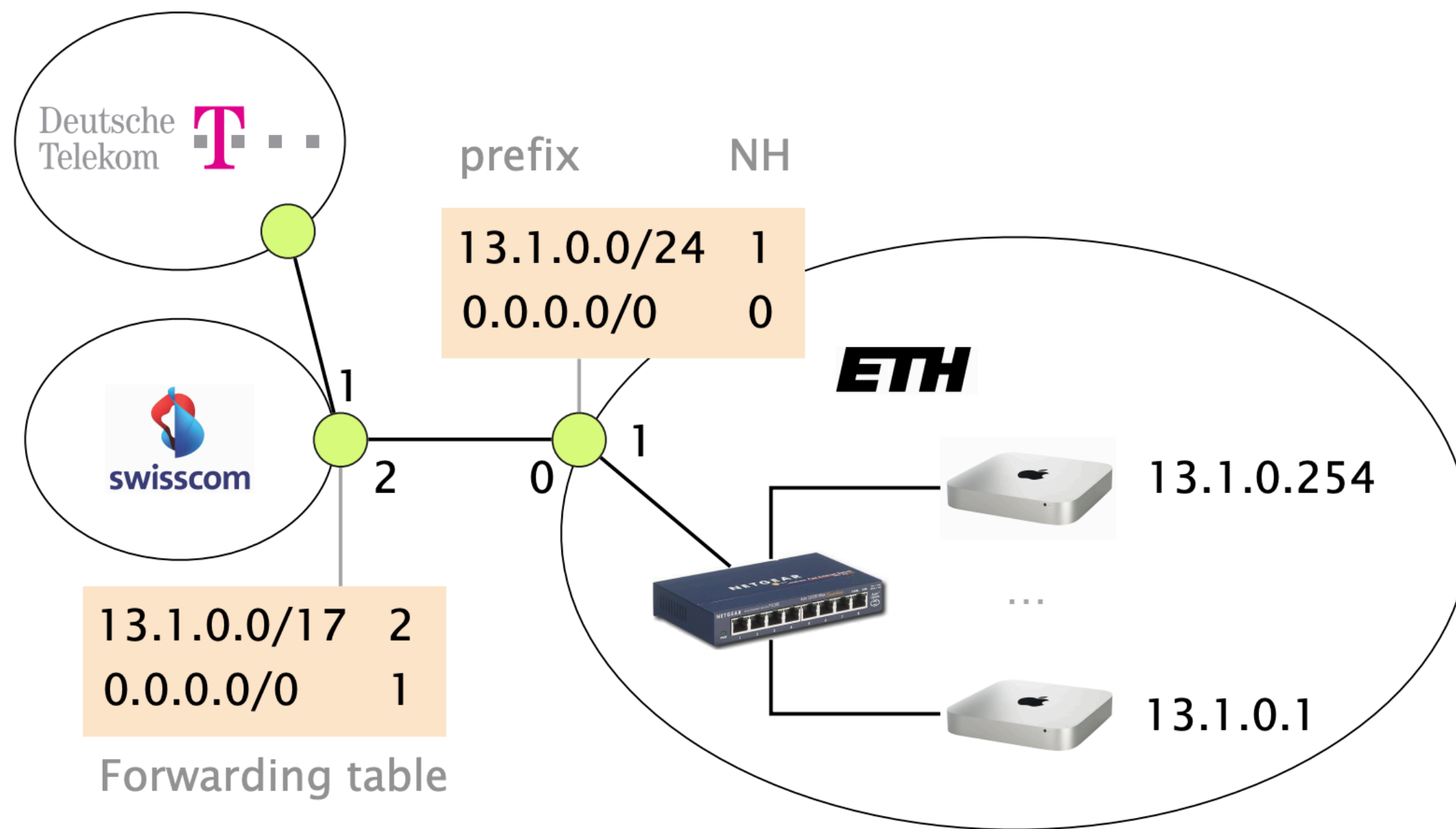
- a) How many IP addressable addresses does ETH “own” in total?

$$2^{(32-17)} - 2$$



# Task 4

## The Art of Defaulting Properly

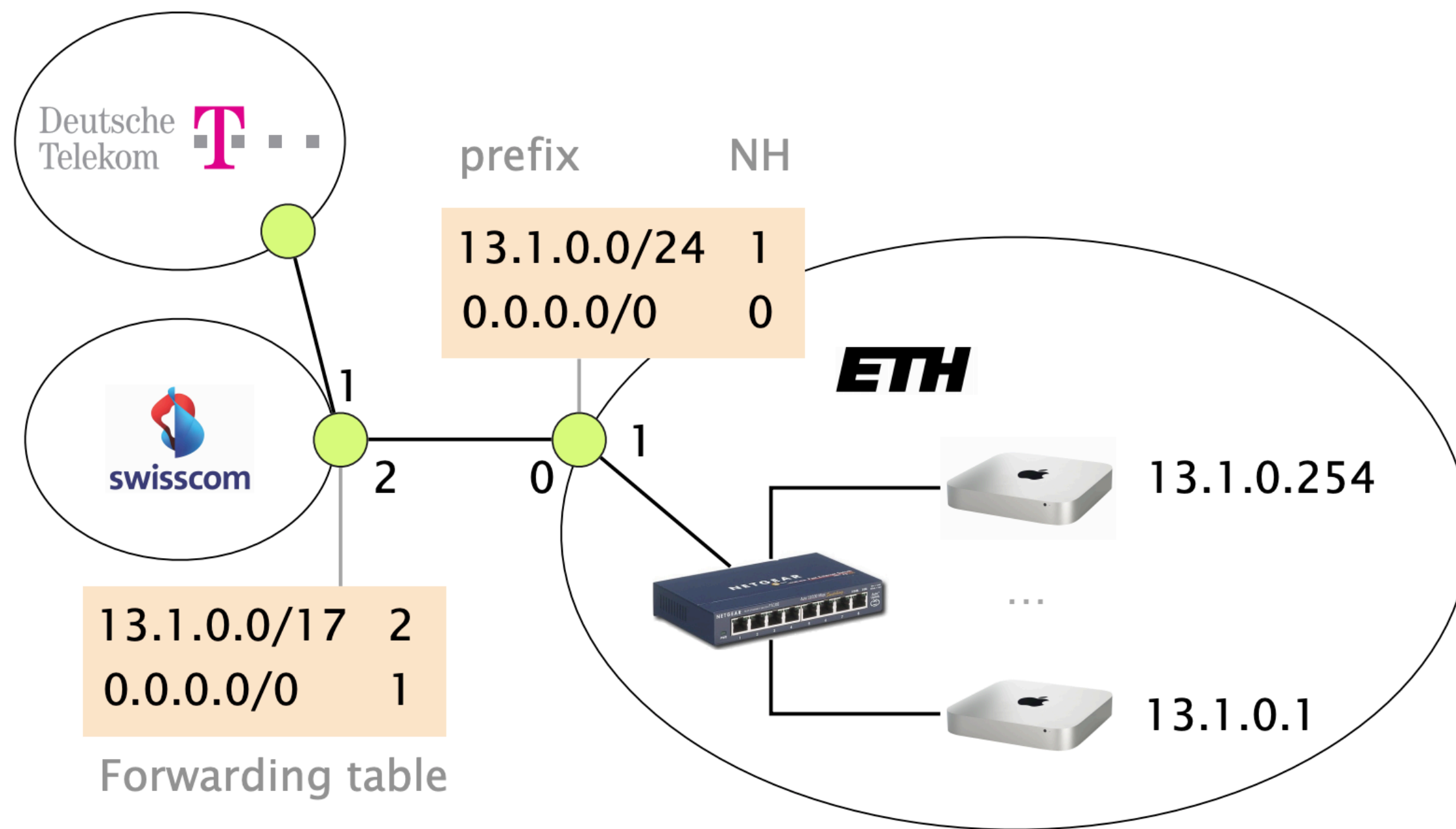


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- b)** Give the first and last IP address that ETH can use for addressing a host.

# Task 4

## The Art of Defaulting Properly



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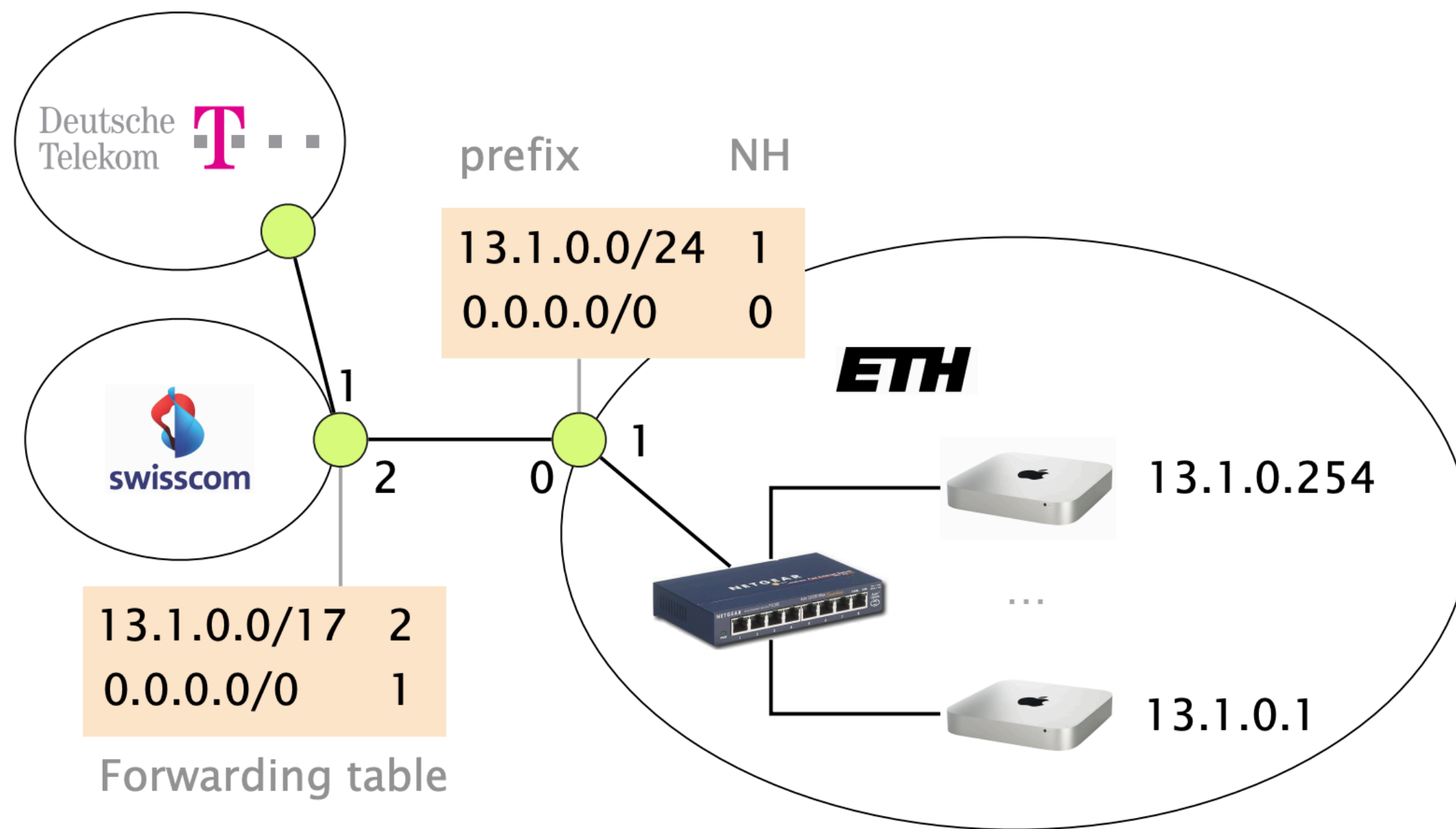
13.1.0.1

13 1 127 254  
xxxx.xxxx.0111.1110



# Task 4

## The Art of Defaulting Properly

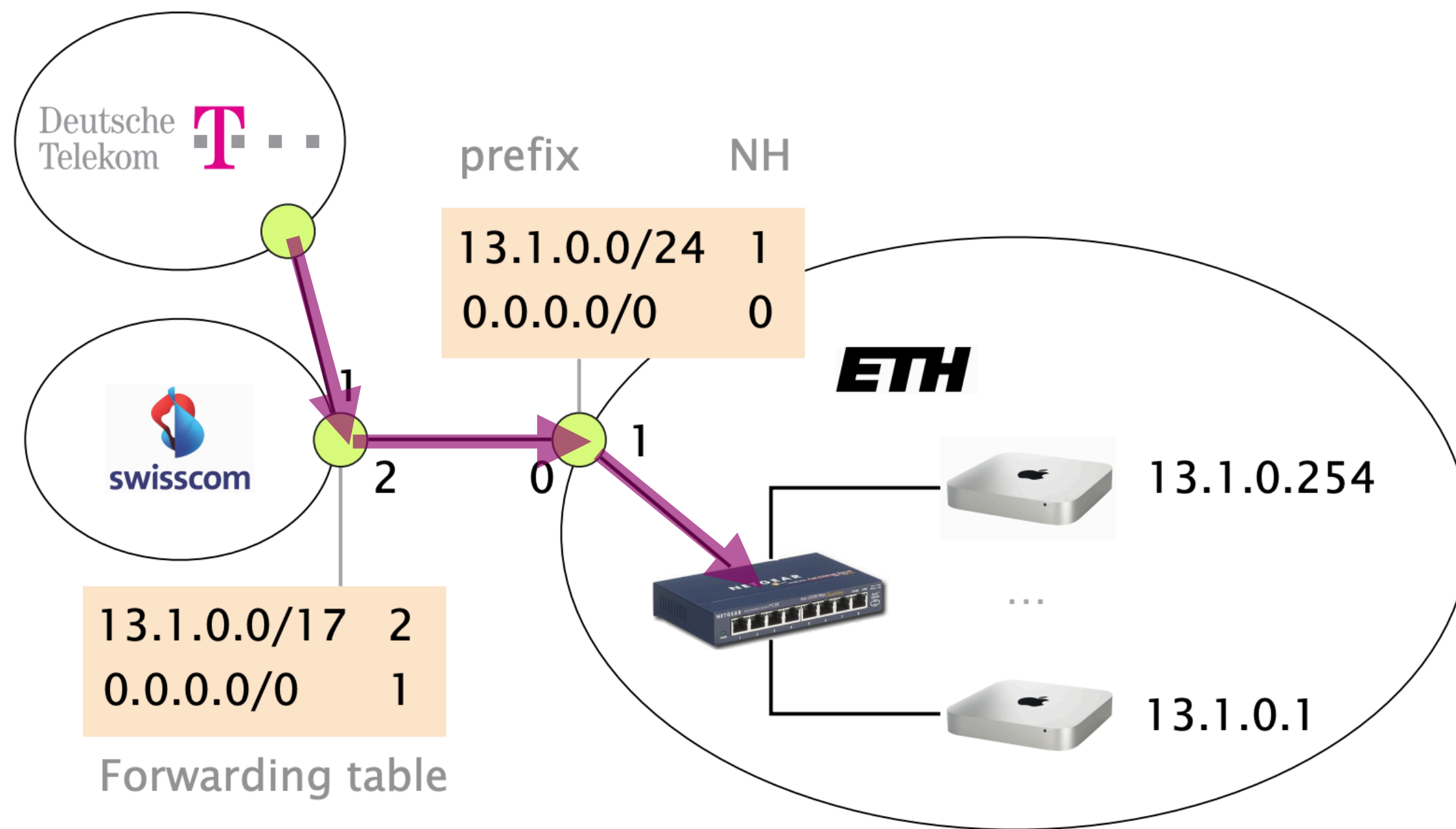


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- c) Suppose Swisscom receives a packet for 13.1.0.66 from Deutsche Telekom. What is the path taken by this IP packet?

# Task 4

## The Art of Defaulting Properly



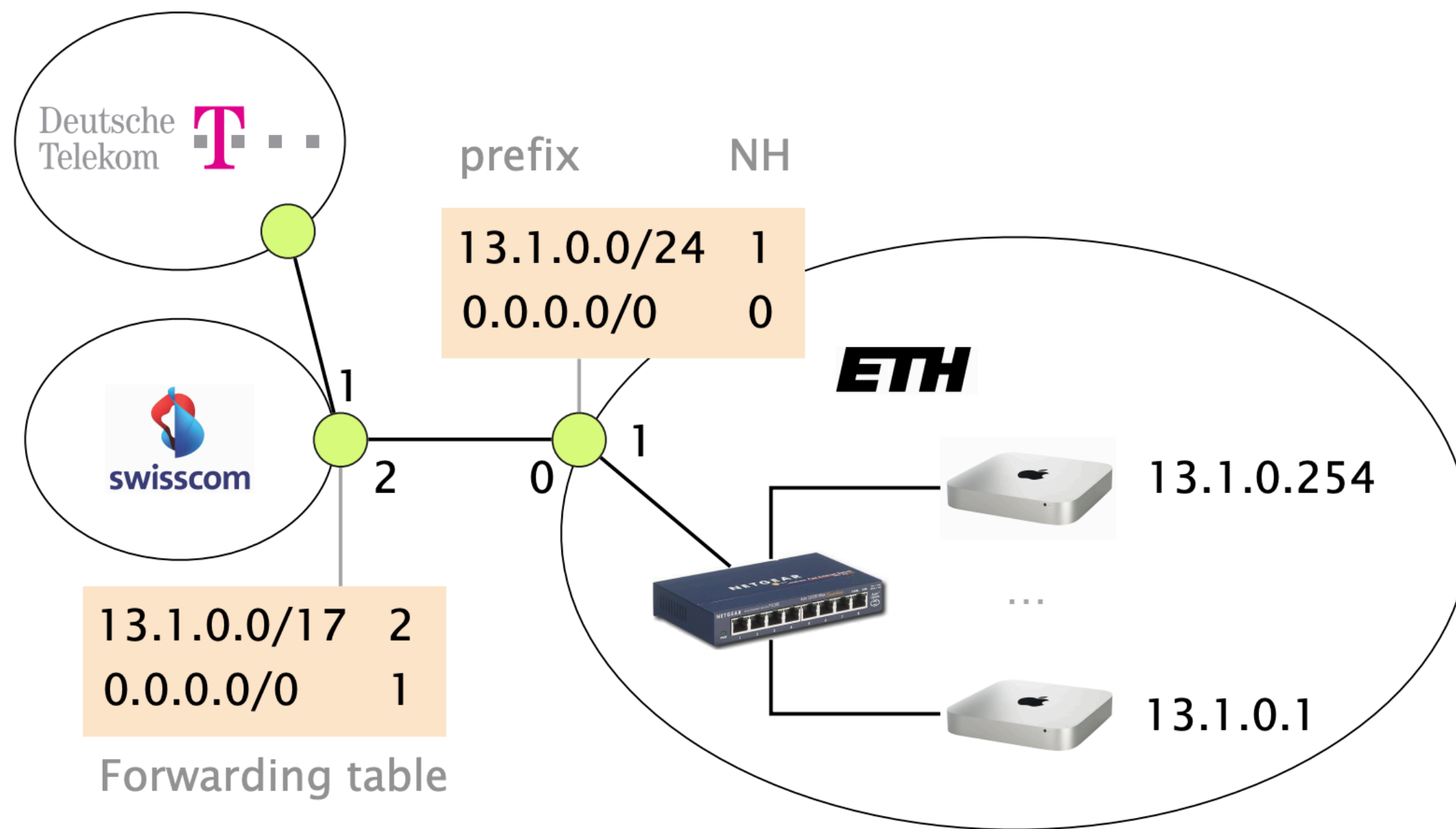
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# Task 4

## The Art of Defaulting Properly

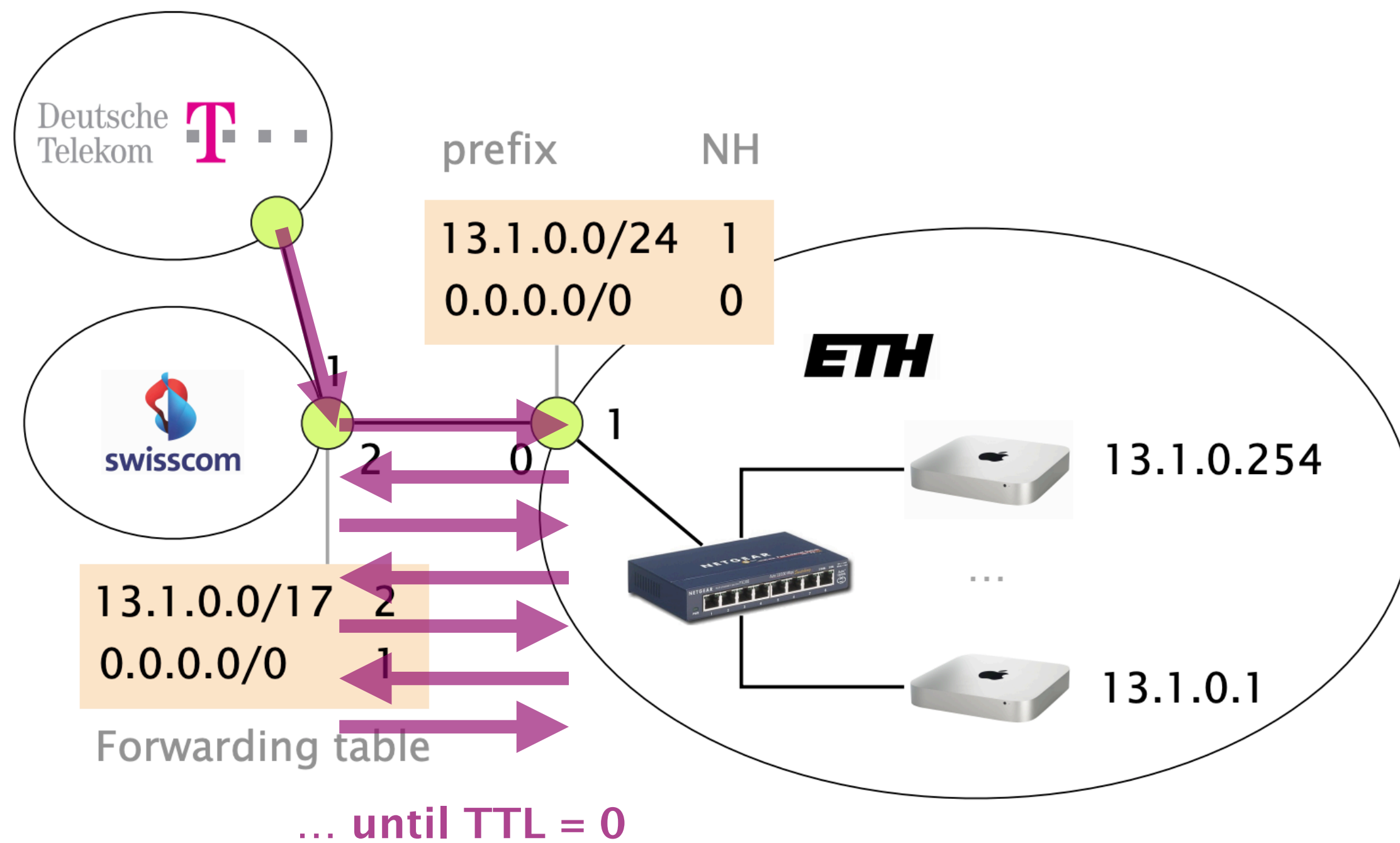


Consider this simple network configuration between ETH and Swisscom. Assume that ETH owns a large IP prefix 13.1.0.0/17, but only uses 13.1.0.0/24 to address its internal hosts. For simplicity, we assume that ETH and Swisscom operators configure their forwarding table statically and rely on the use of a default route (0.0.0.0/0).

- d) Suppose Swisscom receives a packet for 13.1.66.1 from Deutsche Telekom. What is the path taken by this IP packet?

# Task 4

## The Art of Defaulting Properly



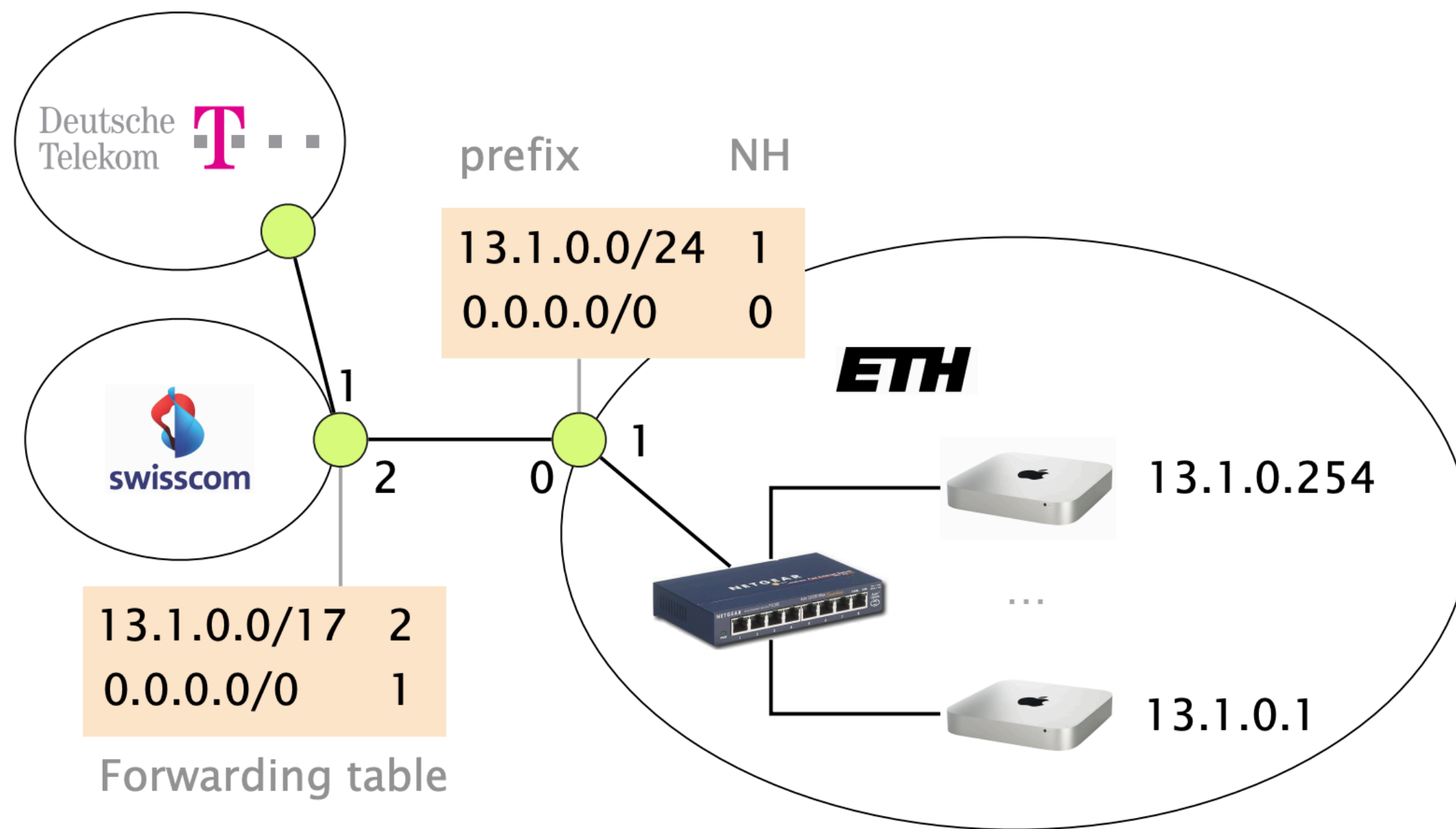
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- d) Suppose Swisscom receives a packet for 13.1.66.1 from Deutsche Telekom. What is the path taken by this IP packet?



# Task 4

## The Art of Defaulting Properly

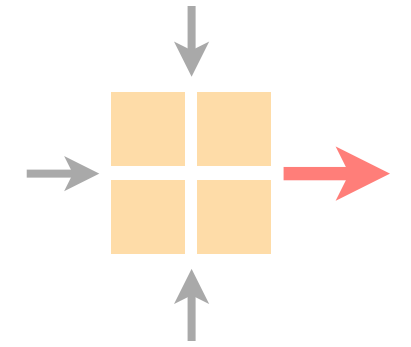


Consider this simple network configuration between ETH and Swisscom. Assume that ETH owns a large IP prefix 13.1.0.0/17, but only uses 13.1.0.0/24 to address its internal hosts. For simplicity, we assume that ETH and Swisscom operators configure their forwarding table statically and rely on the use of a default route (0.0.0.0/0).

- e) What eventually happens to the packet for 13.1.66.1? As an attacker observing this, could you use this observation to congest the ETH-Swisscom link more easily? Explain why (or why not).

# Communication Networks

Spring 2021



Previous exercise

**Exercise overview**

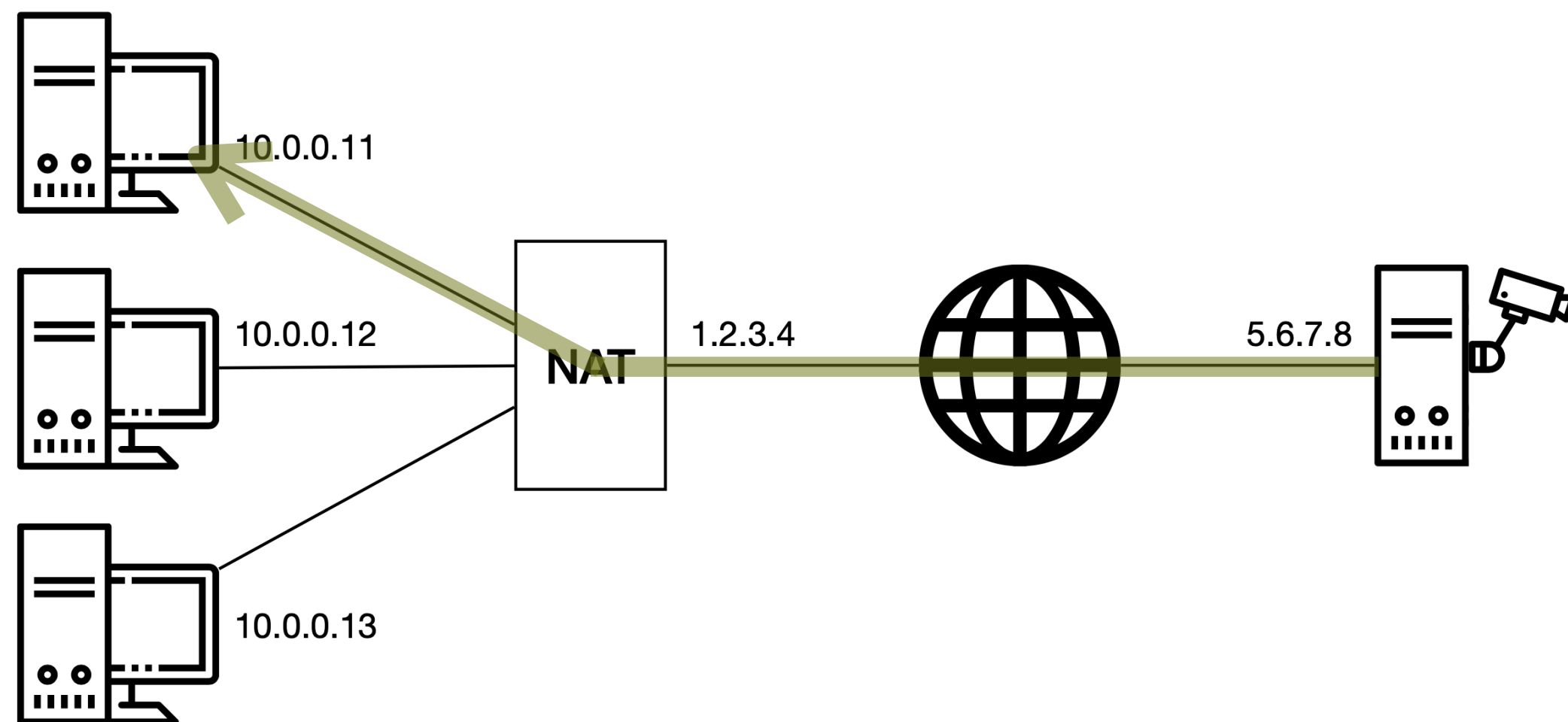
Understanding traceroute

Time to solve tasks



# Task 1

## NAT (Exam Question 2018)

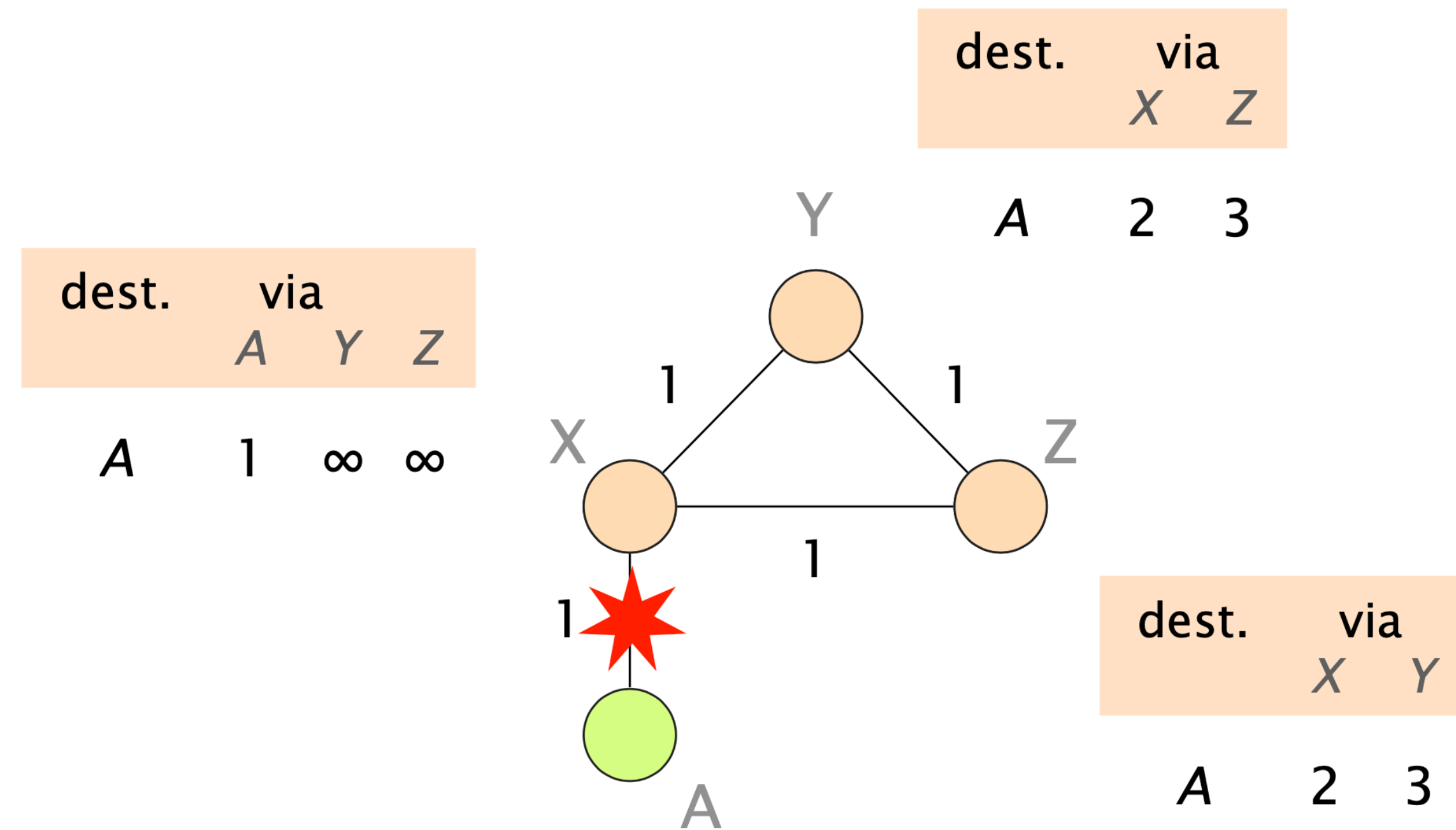


Alice has a camera and servers.

How can she receive the video stream on her PC with address 10.0.0.11 and at port 1234?

## Task 2

# Convergence with Poisoned Reverse



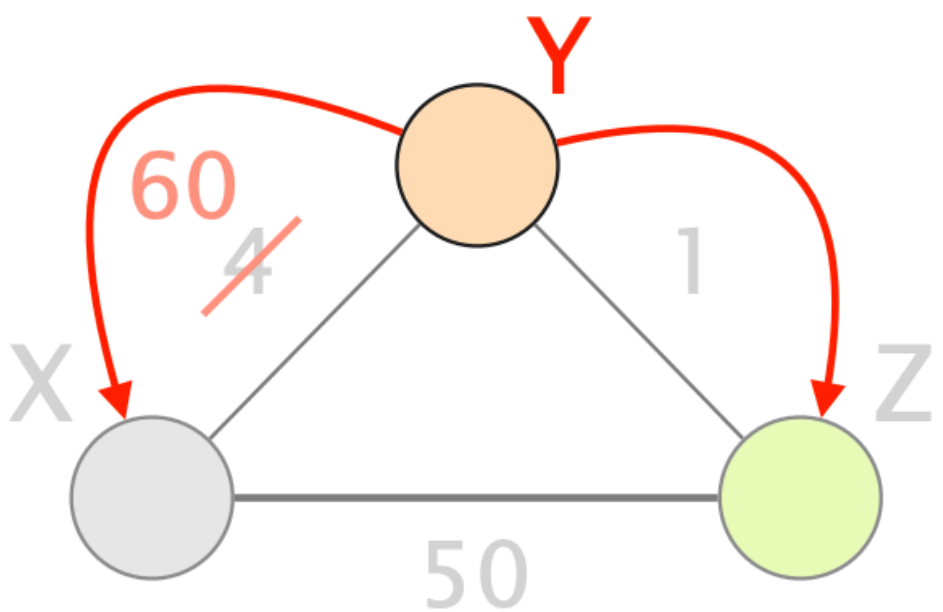
In the lecture: three nodes

What happens for four nodes?

# Lecture refresher

t = 1

Y updates its vector,  
sends it to X and Z



t=0

Y  
vector

dest.	via	
	X	Z
X	4	6

Z  
vector

dest.	via	
	X	Y
X	50	5

t=1

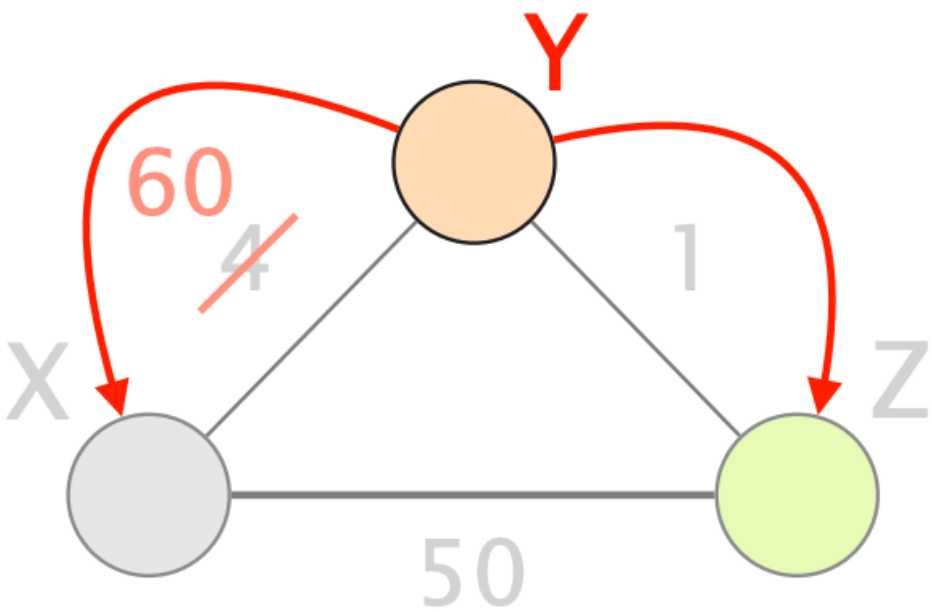
dest.	via	
	X	Z
X	60	6



# Lecture refresher

t = 1

Y updates its vector,  
sends it to X and Z



t=0

Y  
vector

dest.	via	
X	X	4
Z		$\infty$

t=1

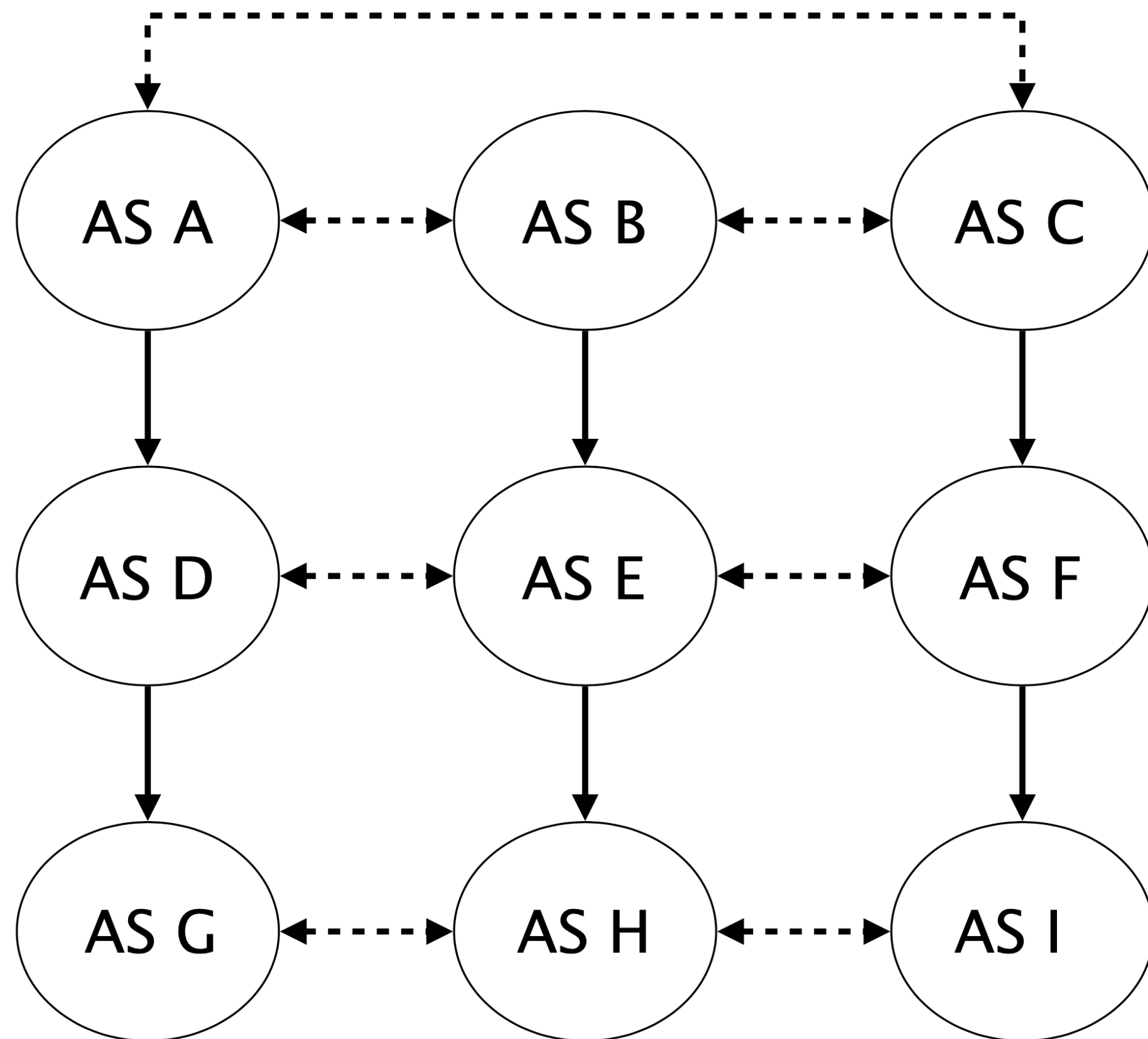
dest.	via	
X	X	60
Z		$\infty$

Z  
vector

dest.	via	
X	X	50
Y		5

## Task 3

### Visibility (Exam 2016)



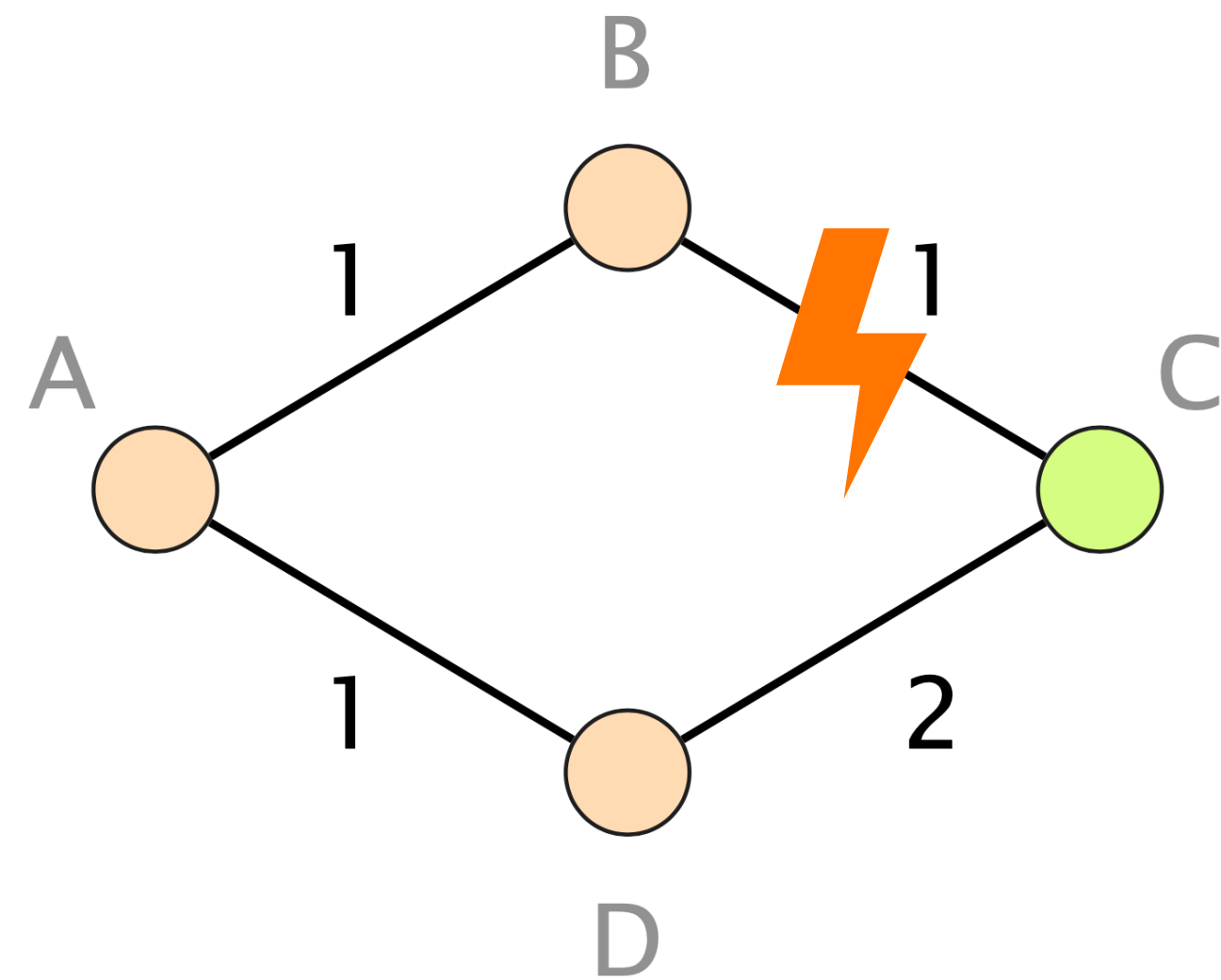
Which paths do packets take?

What network view has one AS?

How many ASes do you need to ask for their view in order to hear of each link at least once?

## Task 4

### Convergence



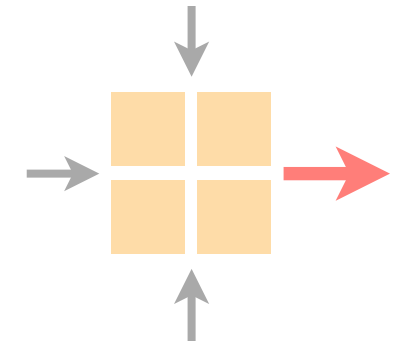
What transient loop could arise?

How can you intentionally take down the link without causing any transient forwarding loops?



# Communication Networks

Spring 2021



Previous exercise

Exercise overview

Understanding traceroute

Time to solve tasks

# traceroute — output

```
> traceroute www.nyu.edu
```

traceroute to web.gslb.nyu.edu (128.122.119.202), 64 hops max, 52 byte packets

1	82.130.102.1	(82.130.102.1)	0.849 ms	0.616 ms	0.820 ms
2	rou-ref-rz-bb-ref-rz-etx	(10.10.0.41)	0.741 ms	0.671 ms	0.643 ms
3	rou-fw-rz-ee-tik	(10.1.11.129)	0.892 ms	0.836 ms	5.057 ms
4	rou-fw-rz-gw-rz	(192.33.92.170)	1.040 ms	0.852 ms	0.892 ms
5	swiez2	(192.33.92.11)	0.982 ms	1.032 ms	0.974 ms
6	swizh1-100ge-0-1-0-0.switch.ch	(130.59.38.110)	0.913 ms	0.884 ms	0.959 ms
7	swice1-100ge-0-3-0-0.switch.ch	(130.59.36.93)	5.796 ms	6.485 ms	4.591 ms
8	switch.mx1.gen.ch.geant.net	(62.40.124.21)	4.213 ms	4.173 ms	4.203 ms
9	ae4.mx1.par.fr.geant.net	(62.40.98.152)	11.508 ms	13.460 ms	11.560 ms
10	et-3-1-0.102.rtsw.newy32aoa.net.internet2.edu	(198.71.45.236)	85.752 ms	82.767 ms	82.455 ms
11	nyc-9208-i2-newy.nysernet.net	(199.109.5.1)	82.457 ms	82.548 ms	82.434 ms
12	199.109.5.6	(199.109.5.6)	82.609 ms	82.624 ms	82.684 ms
13	dmzgwa-ntp-extgwa.net.nyu.edu	(128.122.254.65)	83.006 ms	83.225 ms	83.279 ms
14	nyugwa-ntp-dmzgwa.net.nyu.edu	(128.122.254.88)	82.815 ms	82.789 ms	82.701 ms
15	wsqdcgwa-vl902.net.nyu.edu	(128.122.1.38)	83.156 ms	83.194 ms	82.933 ms
16	* * *				

# Hop

No response/  
timeout

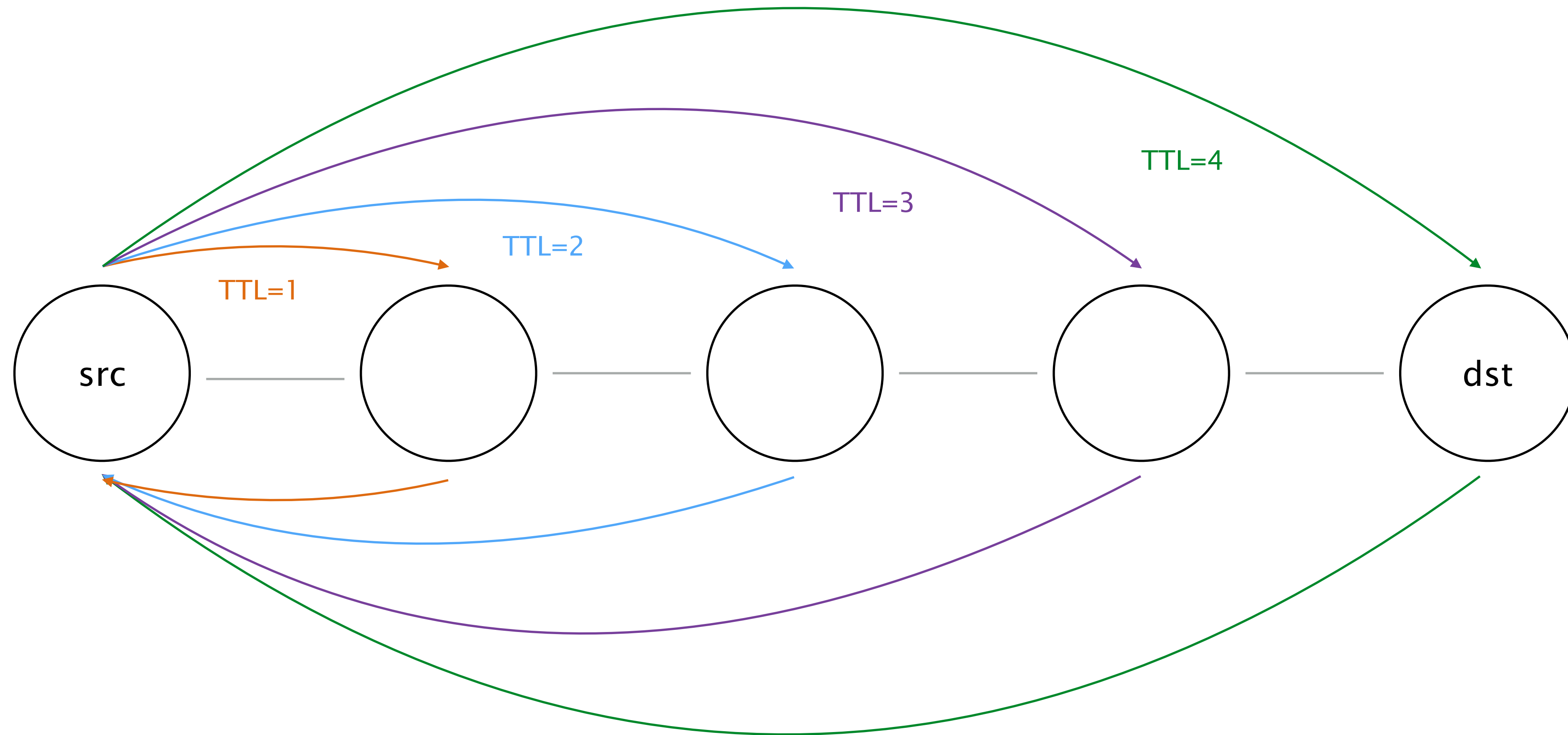
Domain name

IP address

RTT measurements

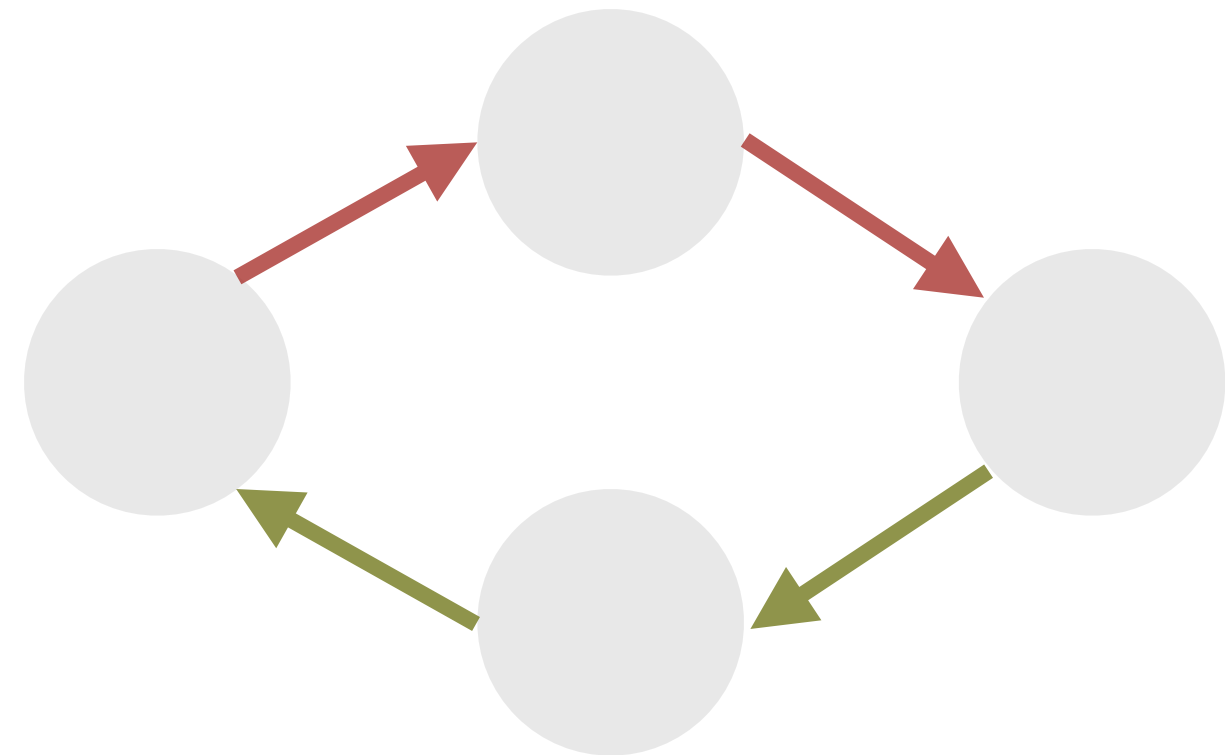
Round Trip Time  
Both directions!

# traceroute — working principle





# traceroute — problems



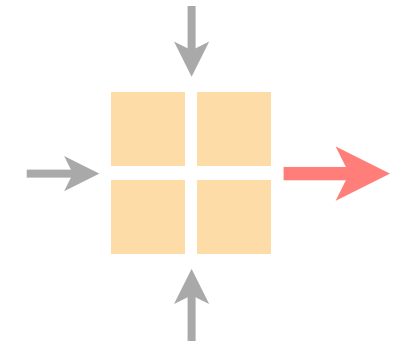
Behavior when multiple parallel paths exist

Devices that do not answer

Different forward and backward paths

# Communication Networks

Spring 2021



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Exercise overview

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Time to solve tasks