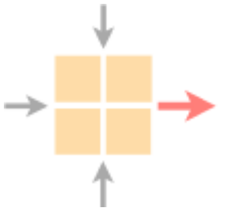
Communication Networks 2021
Project #1: Build you *own* mini-Internet

Introduction to the project



Networked Systems
ETH Zürich — seit 2015

Please do not forget to register your group of 3 students
Otherwise we will assign you to a group this afternoon

—> https://comm-net.ethz.ch/registration/php/index.php

Assignment available as a GitLab Wiki at:

https://gitlab.ethz.ch/nsg/lectures/lec_commnet/projects/2021/routing_project/assignment/-/wikis/home

Home

In this wiki you can find everything about the mini-Internet project, which is part of the Communication Networks Course at ETH taught by Prof. Laurent Vanbever from the Networked Systems Group.

Introduction to the project

In this project, you will build and operate your very own mini-Internet together with more than 100 of your fellow classmates. Your main goal? Enabling end-to-end connectivity across around 70 Autonomous Systems (ASes) composed of hundreds of network devices. In doing so, you will experiment with the most common switching and routing technologies used in the Internet today. You will also face the same challenges actual network operators experience every day.

To reach Internet-wide connectivity, you will first need to enable internal connectivity, **within** your own AS, before interconnecting your AS with other ASes, managed by other groups of students. To establish connectivity **within** your AS, you will configure IPv4 and IPv6 addresses and use Open Shortest Path First (OSPF). To establish connectivity **across** different ASes, you will use the only inter-domain routing protocol available today: the Border Gateway Protocol (BGP). At the end of the project, end-hosts should be able to communicate with each other, independently of the AS they are located in.

To help you, we have pre-built a base network topology on top of virtual layer-2 switches, running Open vSwitch and virtual routers, running the FRRouting software routing suite. You will configure the virtual switches and routers through a Command Line Interface (CLI). This interface is virtually identical to the one used by actual network operators.

Table of contents

This wiki consists of three main parts, an assignment, a tutorial and a FAQ section. The assignment section contains:

- General instructions about the project, including **submission instructions**.
- An overview of the mini-Internet and the network you will configure.
- The tasks you need to solve and what to include in your final report.
- The tools to help you testing and verifying your configuration.

The tutorial section explains how to:

- Access your devices such as routers, switches and hosts.
- Configure a host to e.g., give it an IP address.
- Configure an Open vSwitch to enable layer 2 connectivity.
- Configure 6in4 tunnels to allow IPv6 traffic to be forwarded over an IPv4 network.
- Configure IP routers to establish layer 3 connectivity within one AS and between ASes. More precisely, the tutorial covers:
  - The FRRouting CLI which you use to configure the routers.

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1. Assignment
   1.1 General Instructions
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   1.3 Questions
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   2.1 Accessing your devices
   2.2 Configuring a host
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   2.5 Configuring IP routers
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      2.5.2 Router interfaces
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      2.5.5 BGP
      2.5.6 BGP policies
   2.6 VPN Configuration
3. FAQ

Each group has its own GitLab repository

In which you can find the required information to access your virtual devices

—> gitlab.ethz.ch/nsg/lectures/lec_commnet/projects/2021/routing_project/group-X

Your group number

Routing Project - Group 10

This is your group repository it contains the credentials to access your network and the necessary information to setup the VPN from the bonus question. You will also use this repository to submit your work---both the configurations and the report---at the end of the project.

Accessing your network

To access your network, follow these instructions using the following credentials:

- **user:** `root`
- **port:** `2010`
- **password:** `278cfb3e2f836b2a`

For example, you can use:

```
ssh -p 2010 root@snowball.ethz.ch
```

Accessing the measurement container

The password to access the measurement container is `96d5d94d4477db5c`.

Setting up your VPN

When trying to solve the bonus question, you will need the certificate files and ports at which the VPN servers a listening:

- **VPN server at S1:**
  Port: `10021` Certificate: vnp1_ca.crt

In this project, we give each group a network that it has to operate
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ETH students working on the mini-Internet

Intra-Domain Routing
(April 12 -> April 22)

Inter-Domain Routing
(April 22 -> April 26)

Policy Routing
(April 26 -> May 7)

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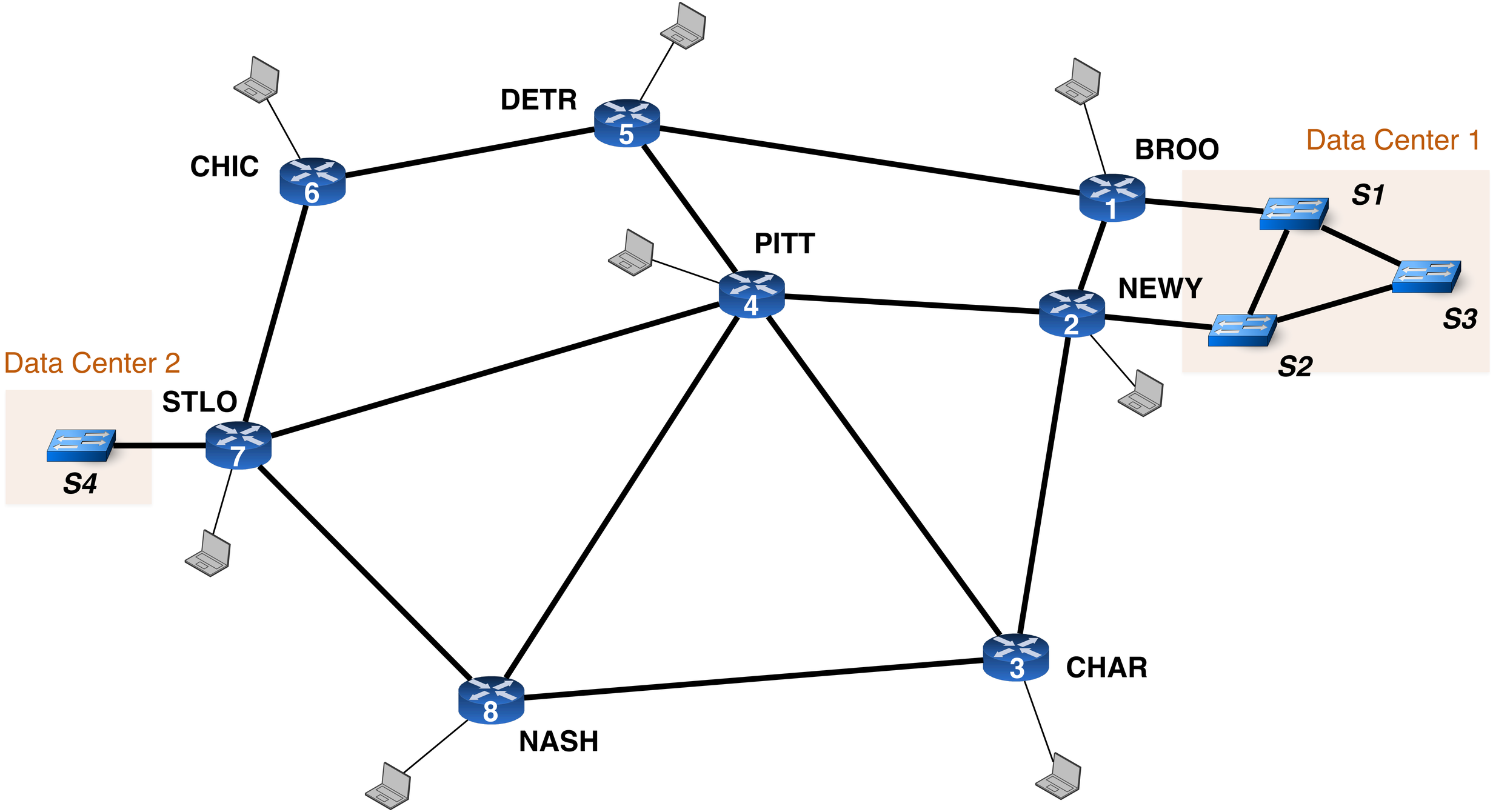
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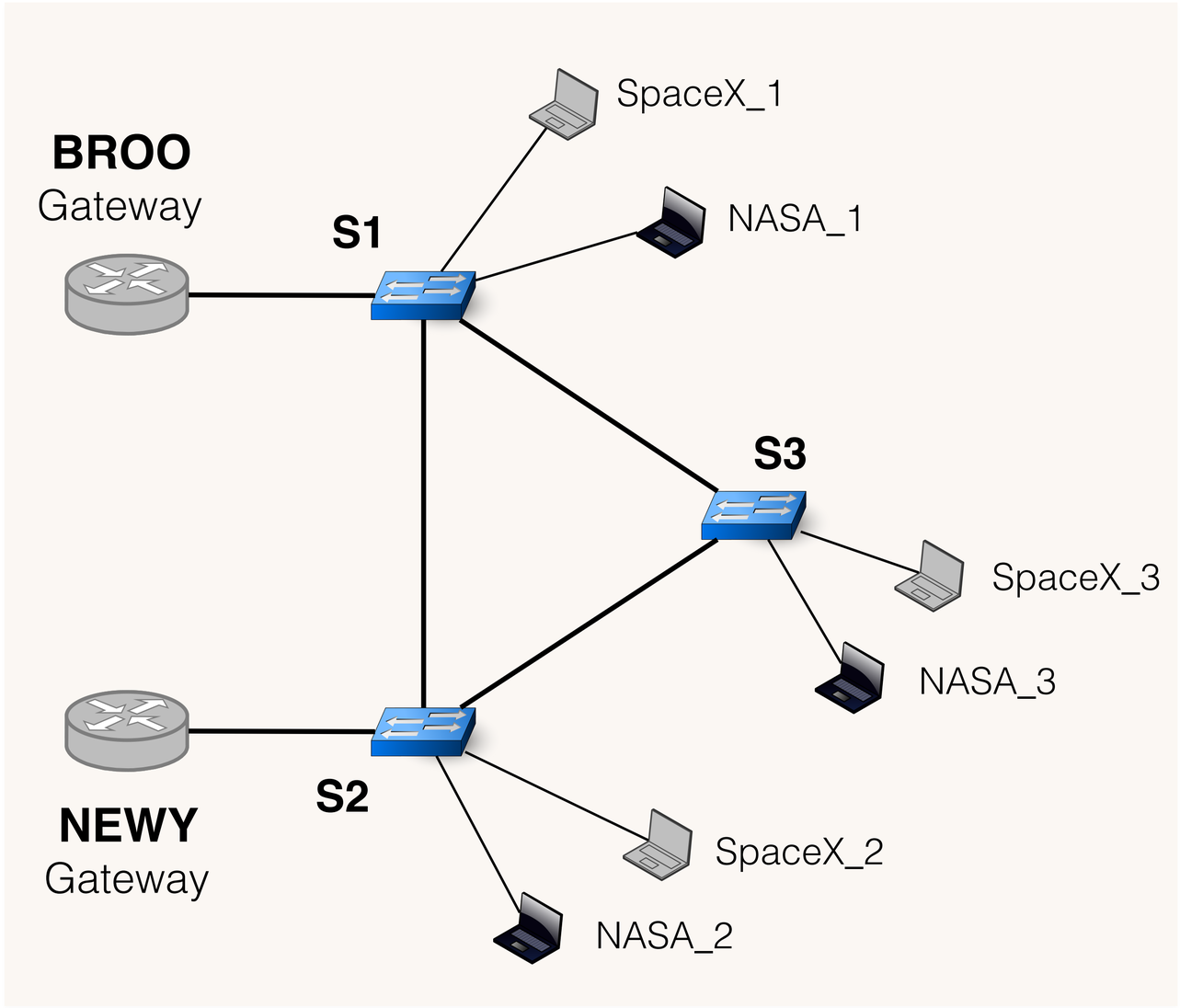
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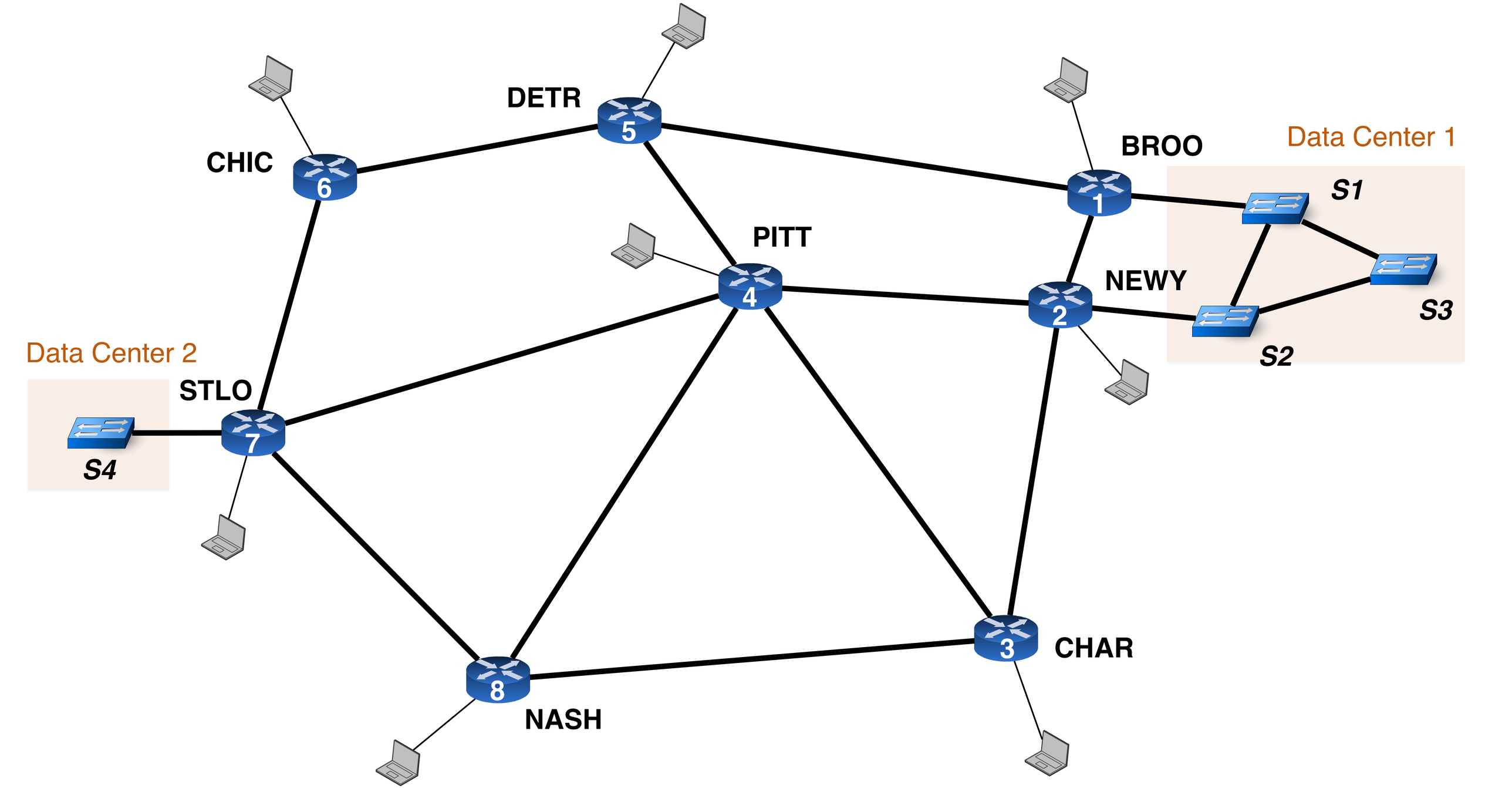
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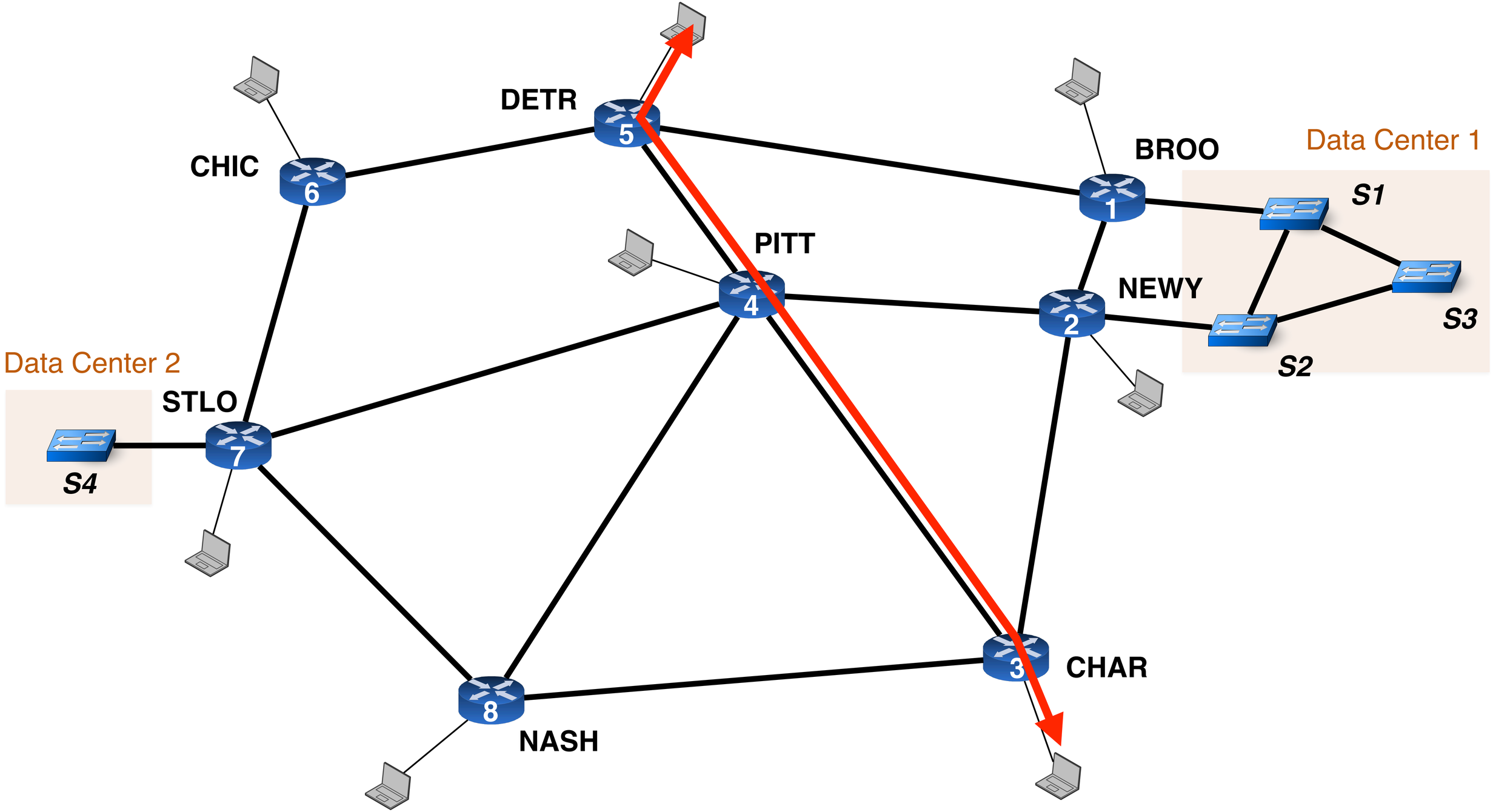
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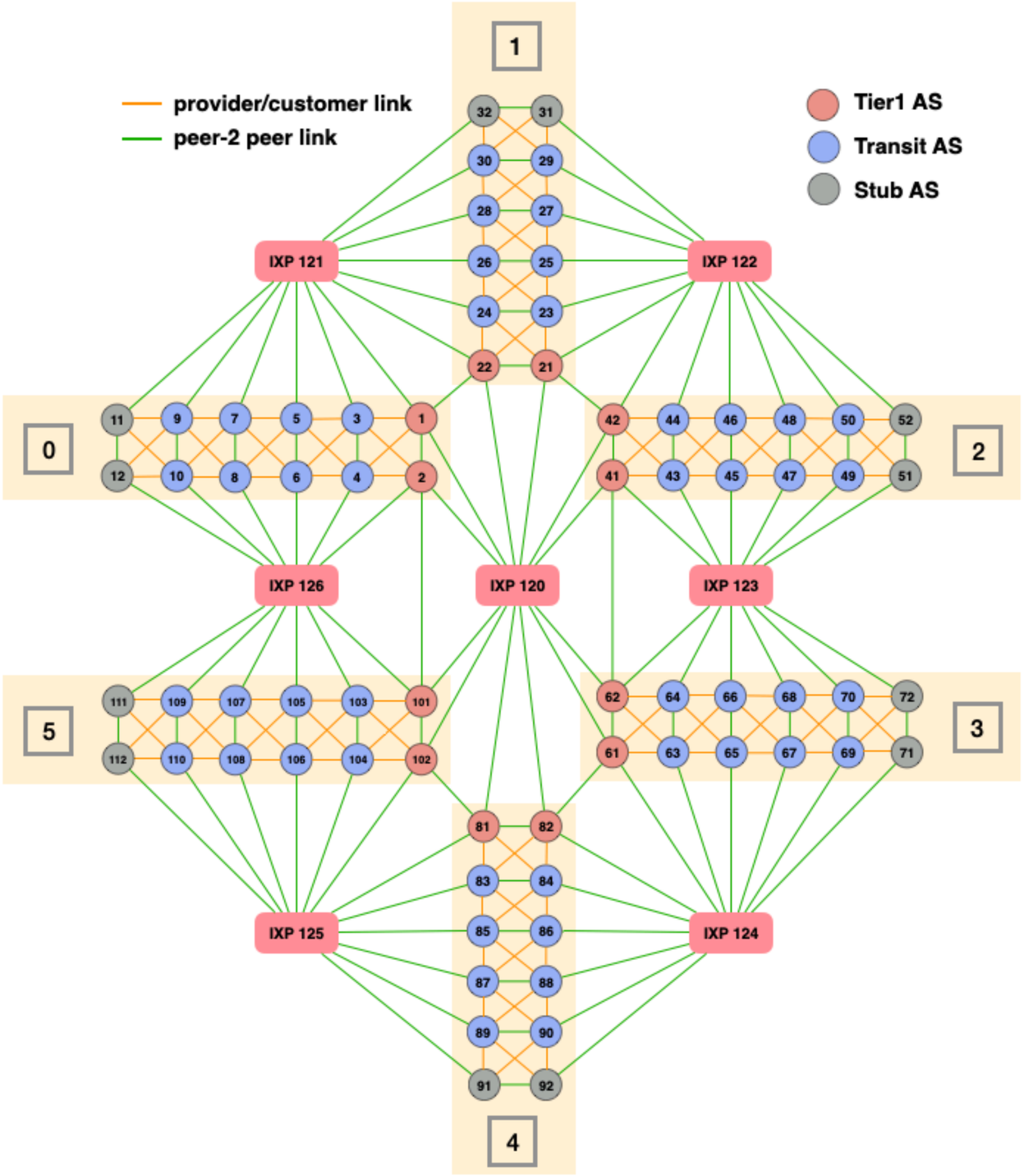
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peer-2 peer link
Tier1 AS
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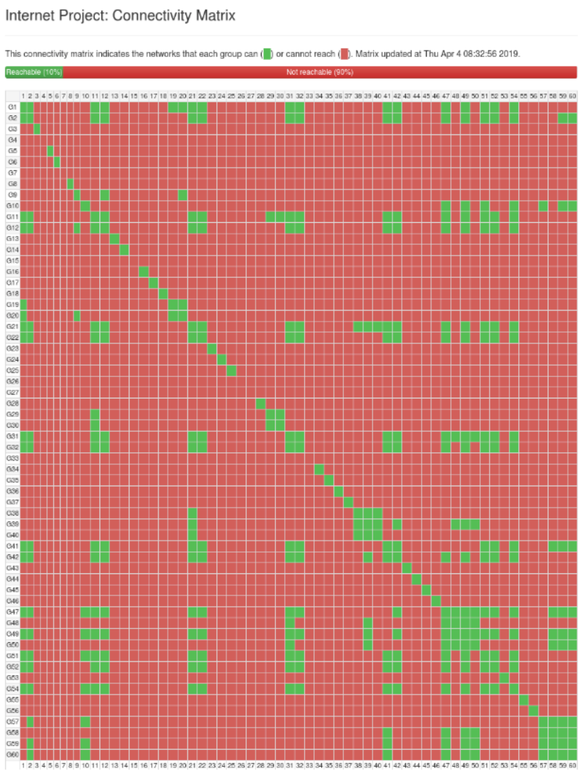
We periodically update a connectivity matrix

available at https://comm-net.ethz.ch/routing_project/matrix/matrix.html

Before configuring eBGP sessions



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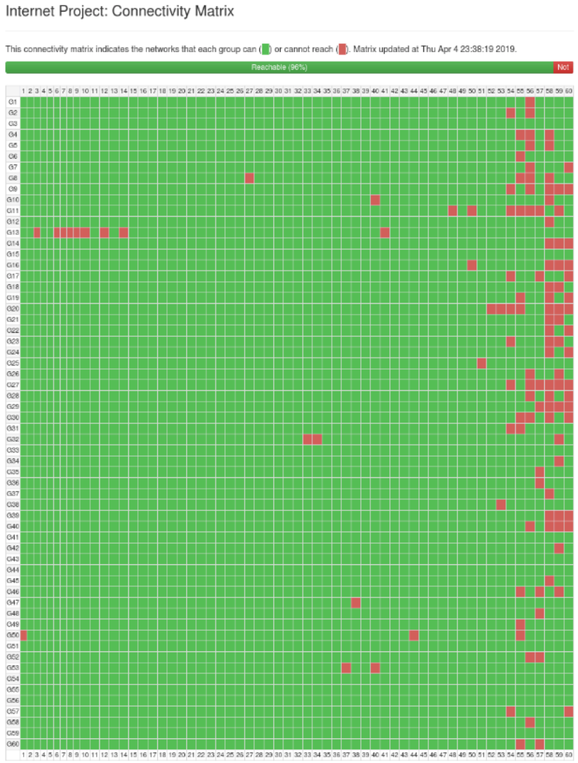

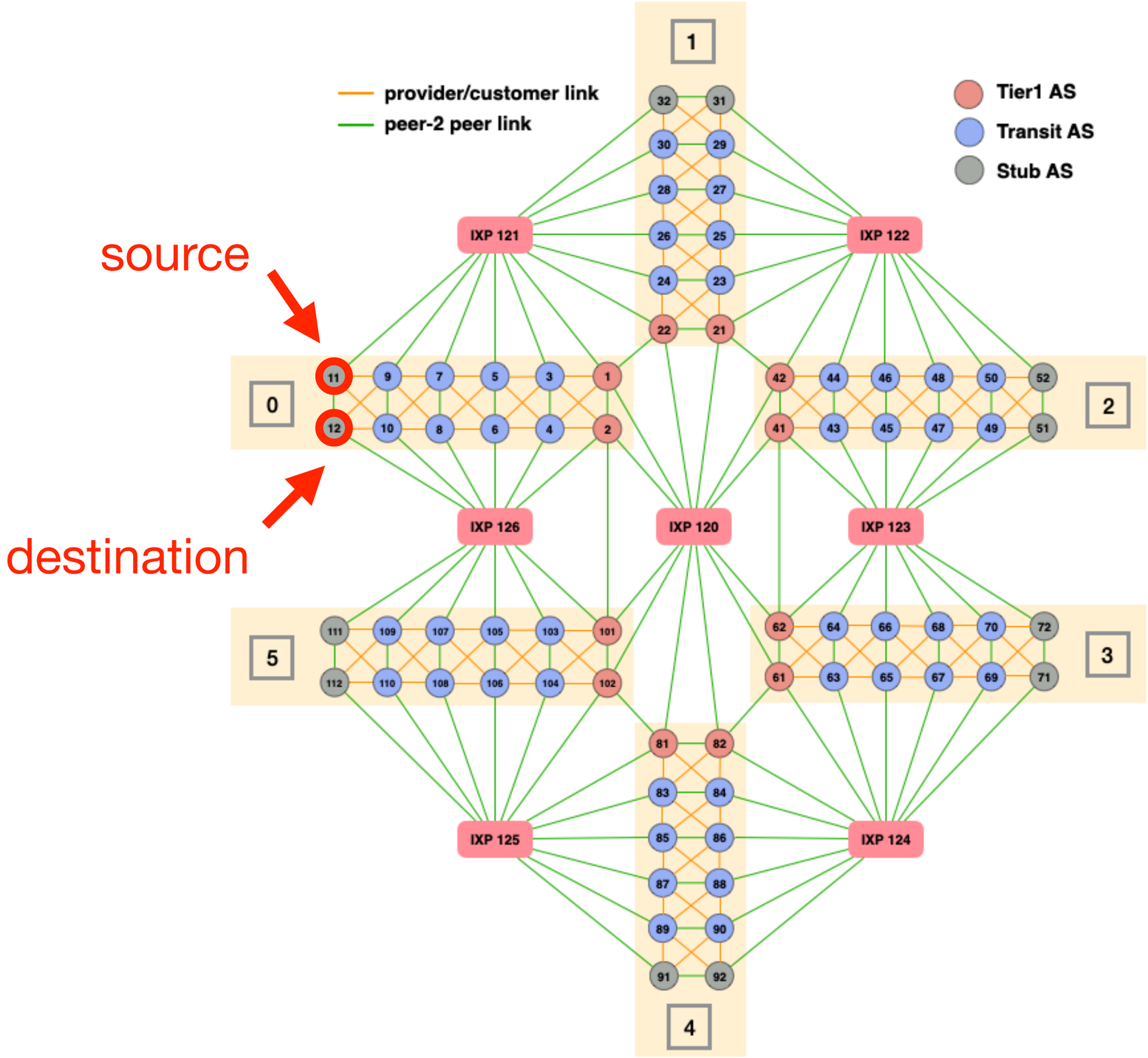
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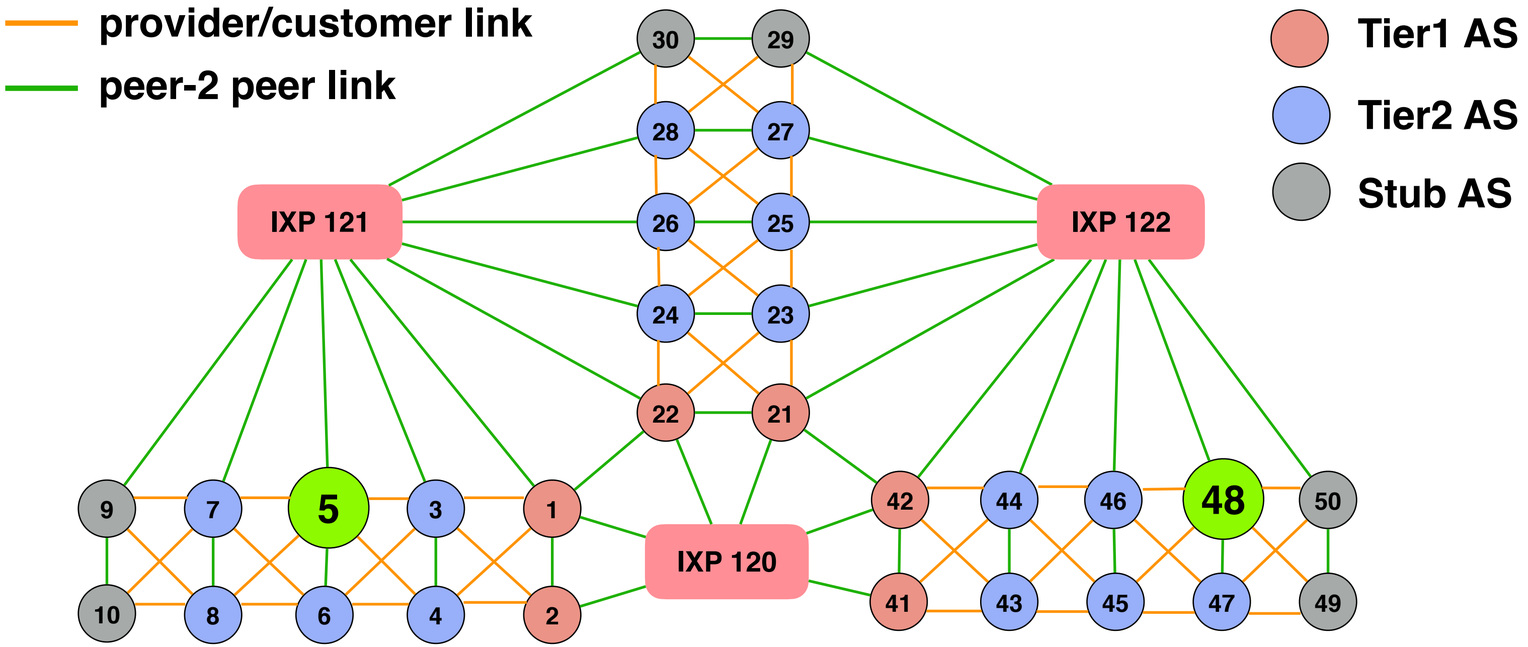
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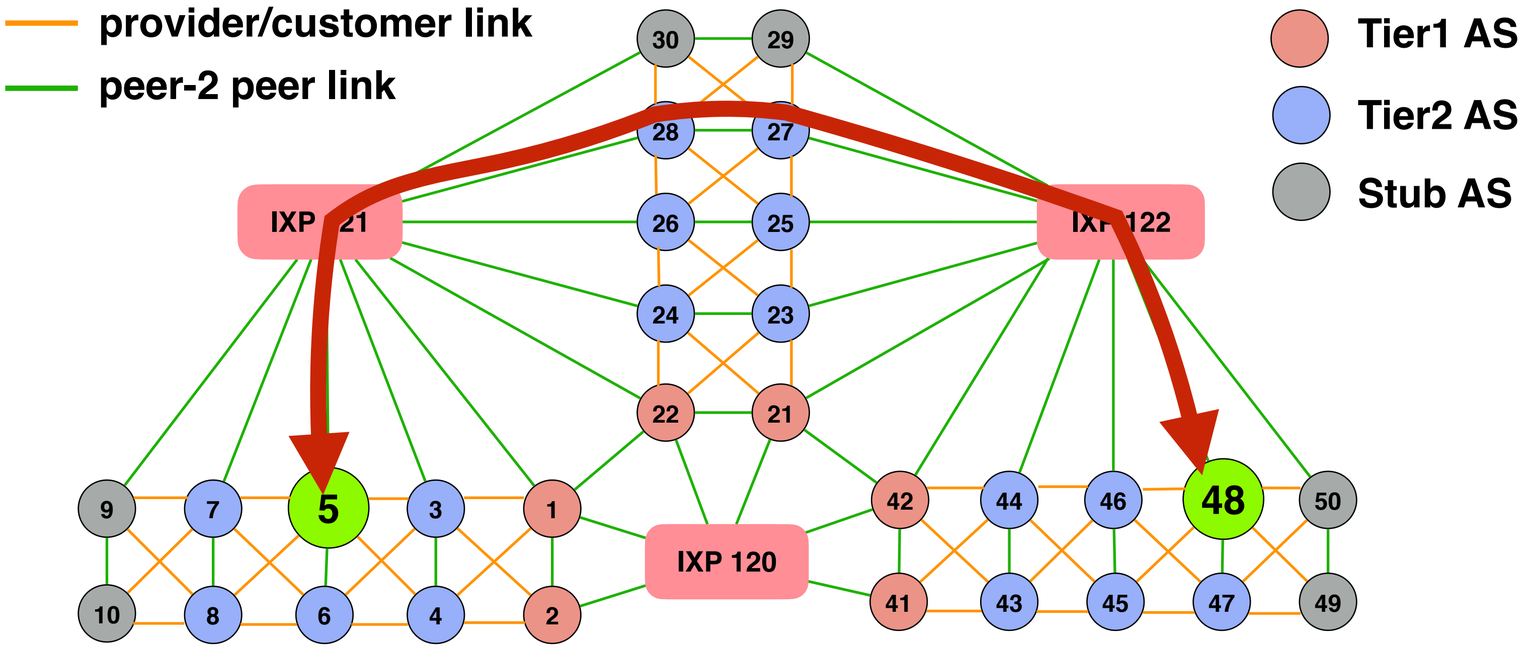
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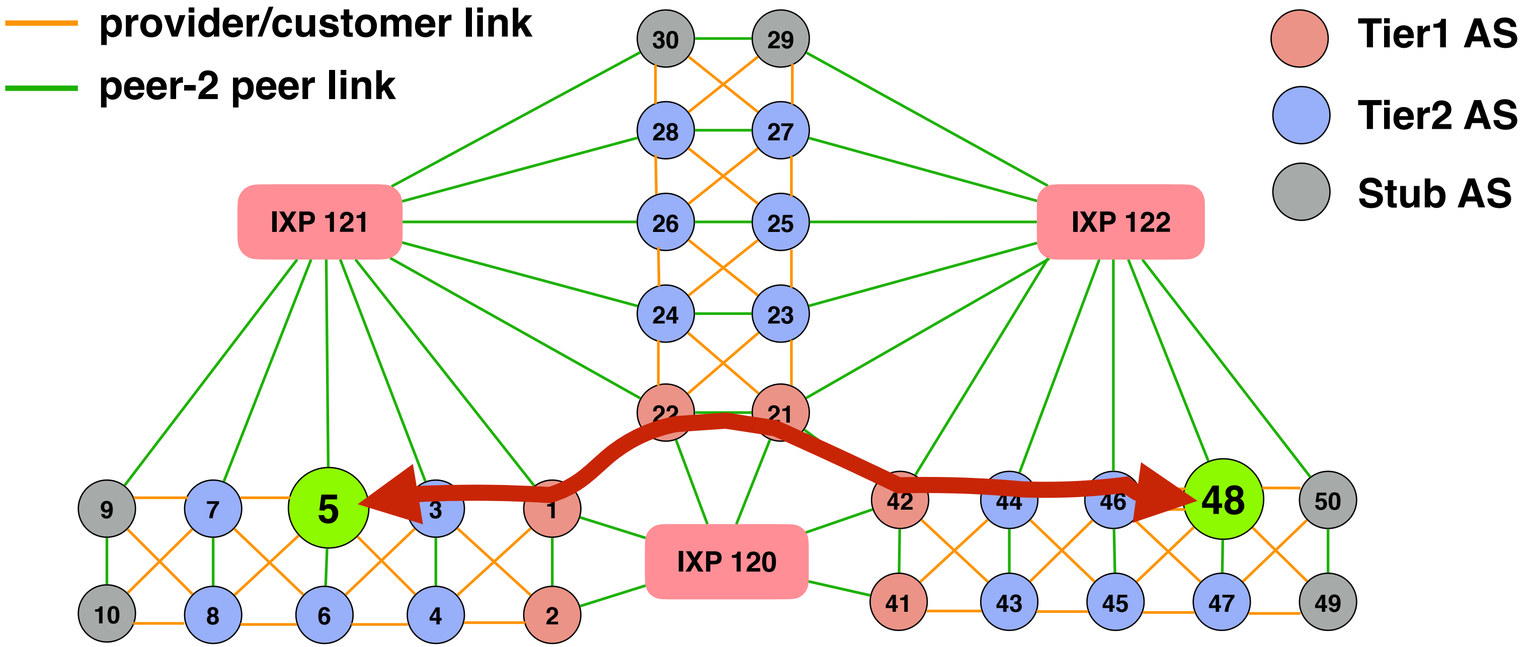
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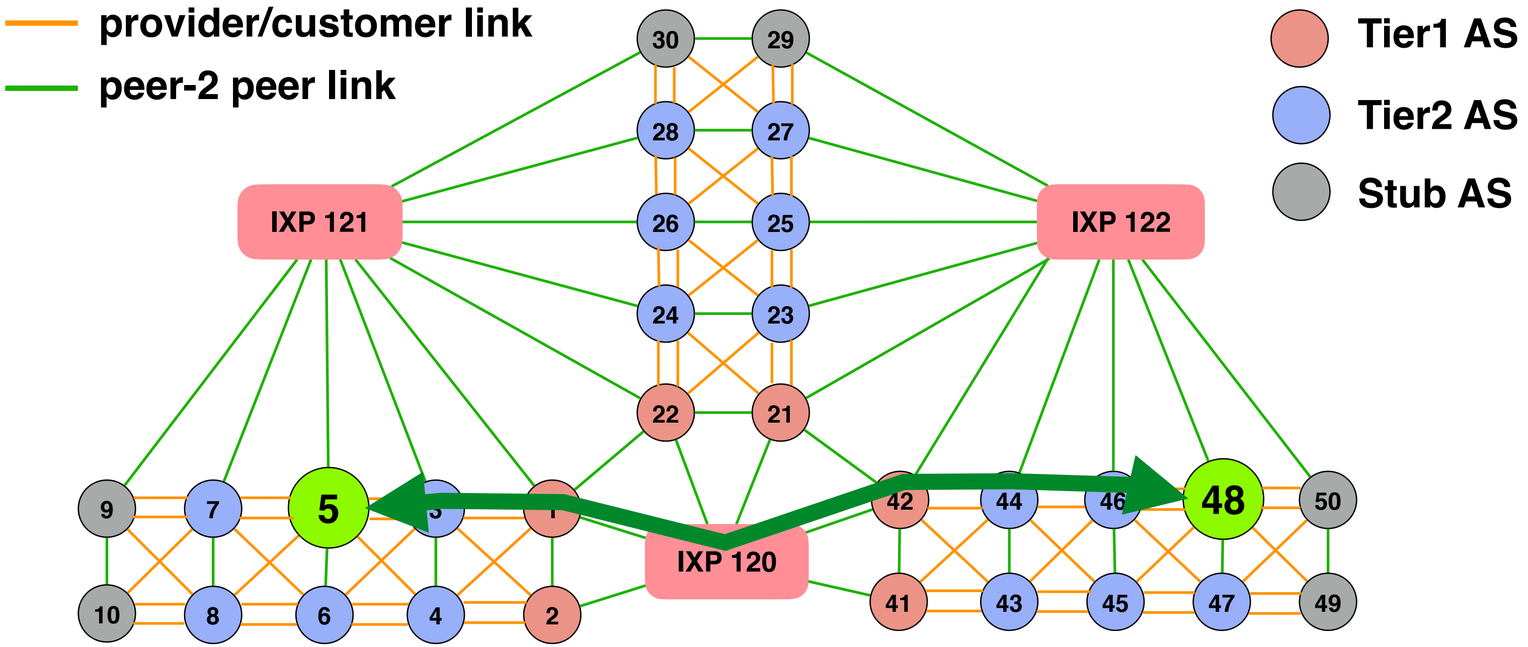
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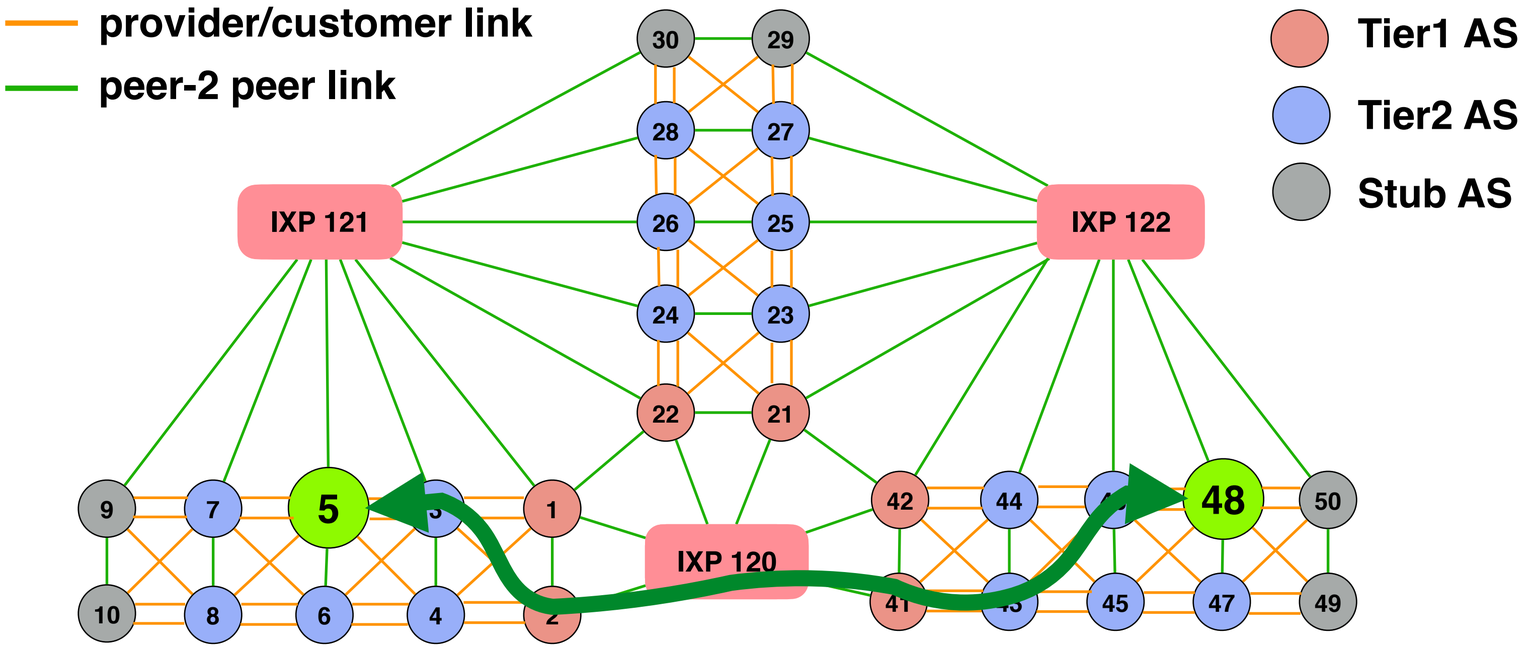
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Communication Networks with Prof. Laurent Vanbever
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Questions?
Slack channel: **@routing_project**