



LabIX

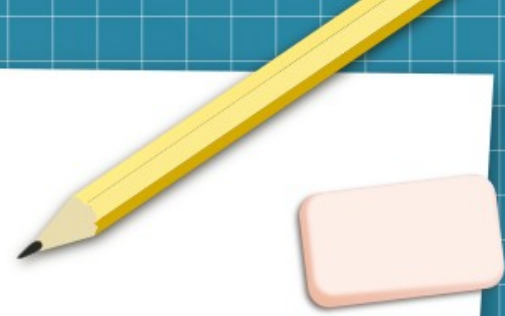
Creating an Internet Exchange in Your Local Hackerspace

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2023-08-03. BornHack 2023

ix.labitat.dk

Why am I making this talk?



- Difficult to find information on IXP operation
 - Everything is acronym soup
- Difficult to understand the administration of IP allocation
 - Everything is acronym soup
 - Many policies

What is Labitat Internet Exchange (LabIX)?



- A community run internet exchange in Labitat, Copenhagen
- A place to learn network routing, including:
 - BGP
 - Route Server ([AS60247](#))
 - ASN and IP allocation
 - BGP security (RPKI, filtering, GTSM)
 - 9000 MTU (very soon)

What is an Internet Exchange?



- Extremely simplified:
 - A VLAN on a layer 2 switch, with a bunch of connected network operators
- Its more than that, so lets first explain the internet

How do you do internet routing?



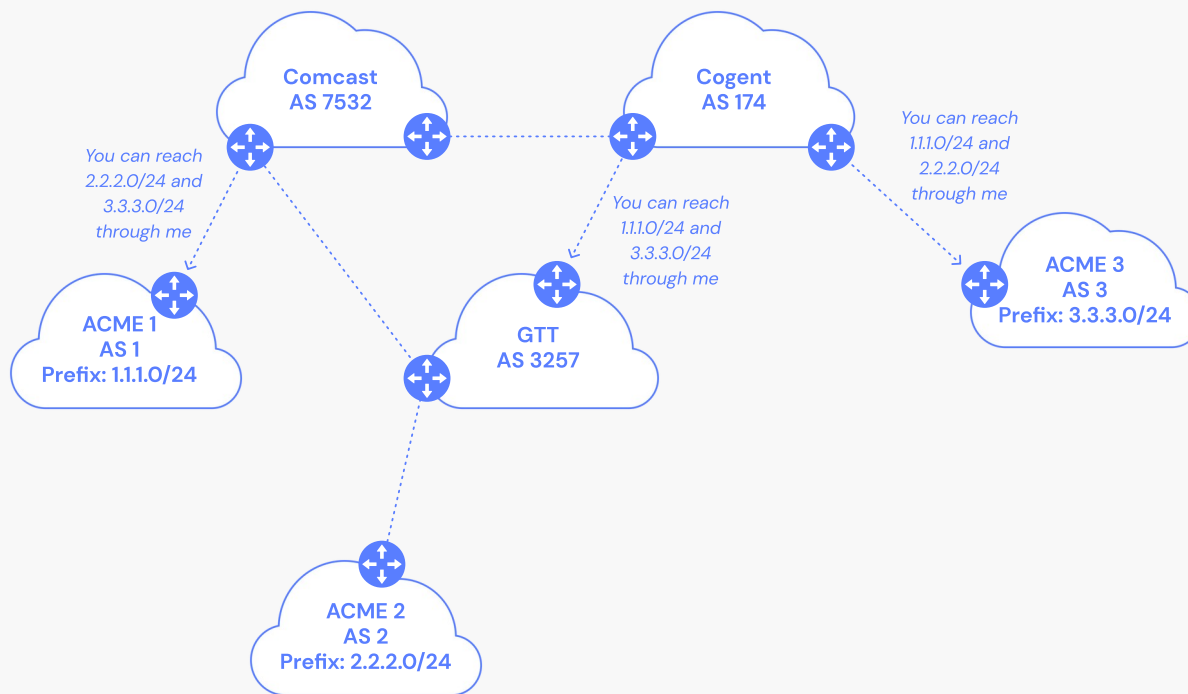
- 1) Get IP prefixes allocated to you
- 2) Find hosting facility
- 3) Install machine
- 4) Setup an (eBGP) routing daemon
- 5) Find peers and peer with them
- 6) Find a transit uplink for connecting to everyone else
- 7) Profit?

Let us set a senario

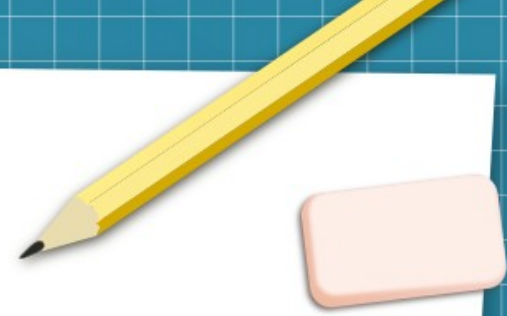


- You are a (eyeball) network provider at Hylkedam, Gelsted
 - Meaning: Customers consuming content with their eyeballs
- You need to get content from content providers
- You need IP addresses for your customers and servers
- You need server housing and fiber stuff.

Networks connect to networks



Autonomous System



- RFC 1930 describes an AS as
 - “a connected group of one or more IP prefixes run by one or more network operators which has a SINGLE and CLEARLY DEFINED routing policy”.
- Each AS is assigned a unique 16- or 32-bit Autonomous System Number (ASN)
 - Used to identify organizations and their prefixes

So what is a routing policy?

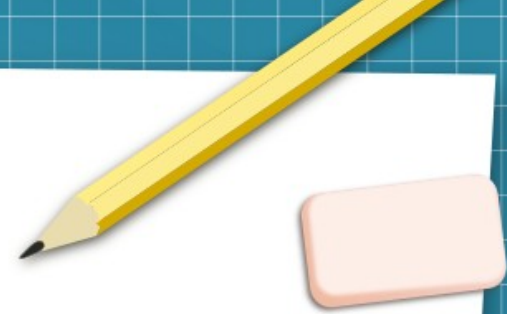


- These are called Internet Routing Registry (IRR) objects
 - Found in the RIR databases like RIPE DB
- Example:
 - These IP prefixes should be destined to me
 - AND I accept prefixes destined to and from my business customers AS 65536 and AS 65537.

Read more:

- RFC 2622: Routing Policy Specification Language (RPSL)
- RIPE NCC. [“BGP Security: IRR and Filtering”](#). Feb. 15, 2021

Peering and transit



- Peering
 - Free (but includes a setup cost for things like cross-connects and optics)
 - “We only send traffic destined to each other”
- Transit
 - €-cost / Mbit
 - “I will transport traffic from you to other networks”

The Internet Exchange

- Keep local traffic local
 - Avoid the trambone effect
- Lower latency
- Easier to interconnect with other networks
 - Recuring cost for data-centre cross-connects

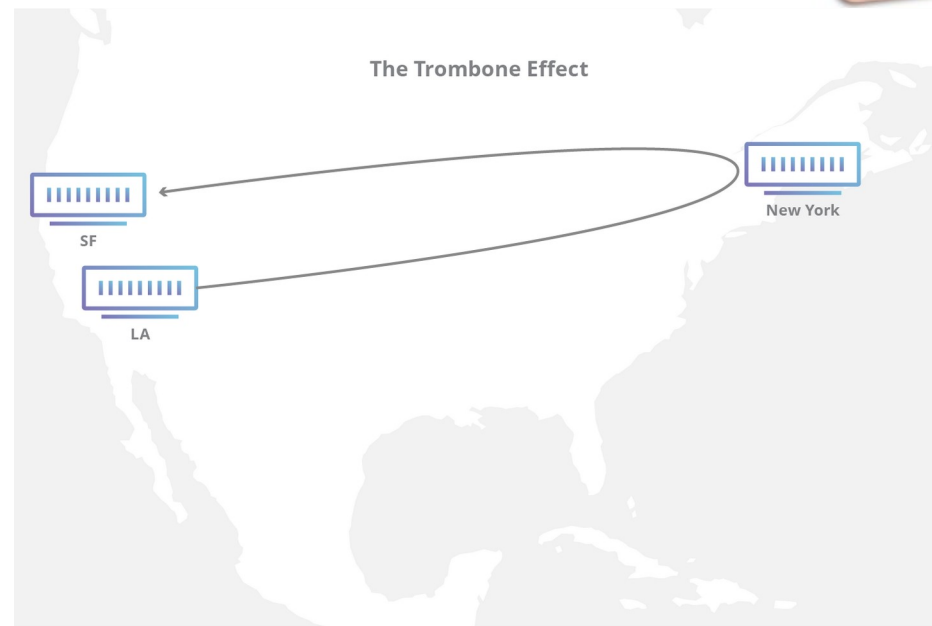
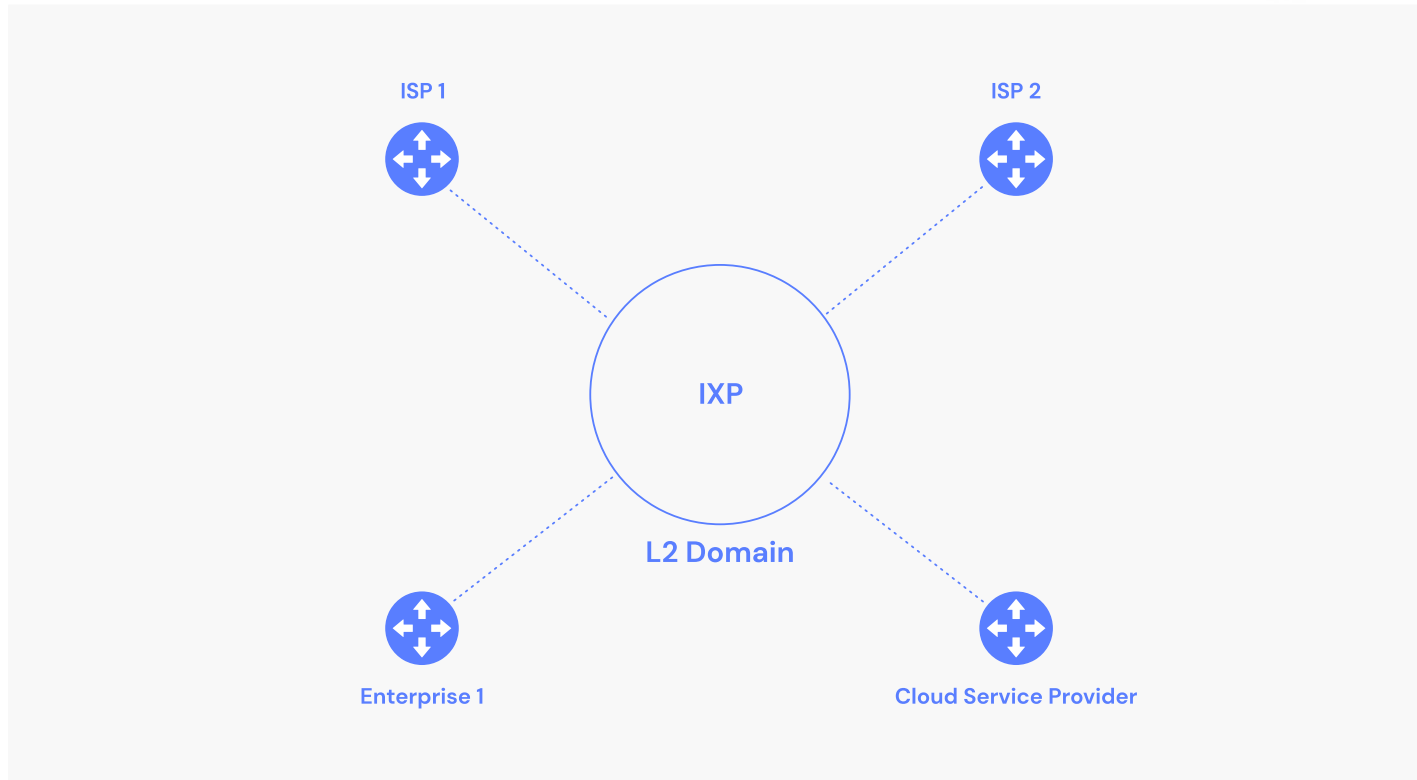


Image source: [Cloudflare](#)

Simplified IXP topology



What is a Route Server?

- Peering interconnections changes
 - From: Many-to-Many (Bi-lateral)
 - To: One-to-Many (Multi-Lateral)
- Control-plane traffic is aggregated by the route server

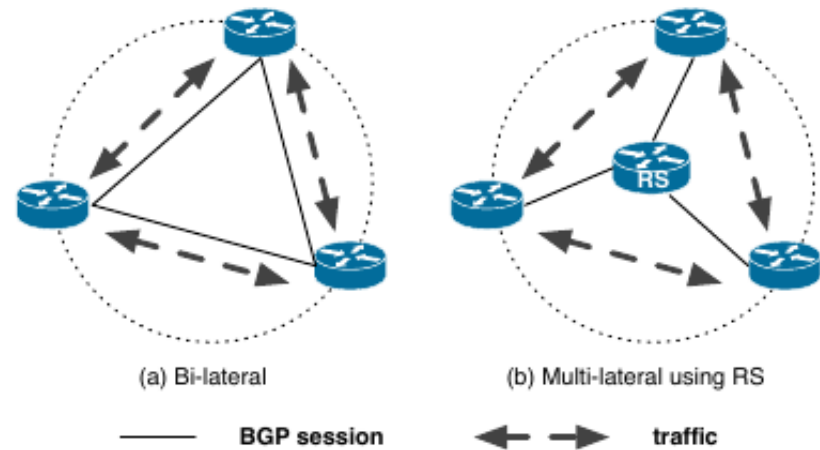
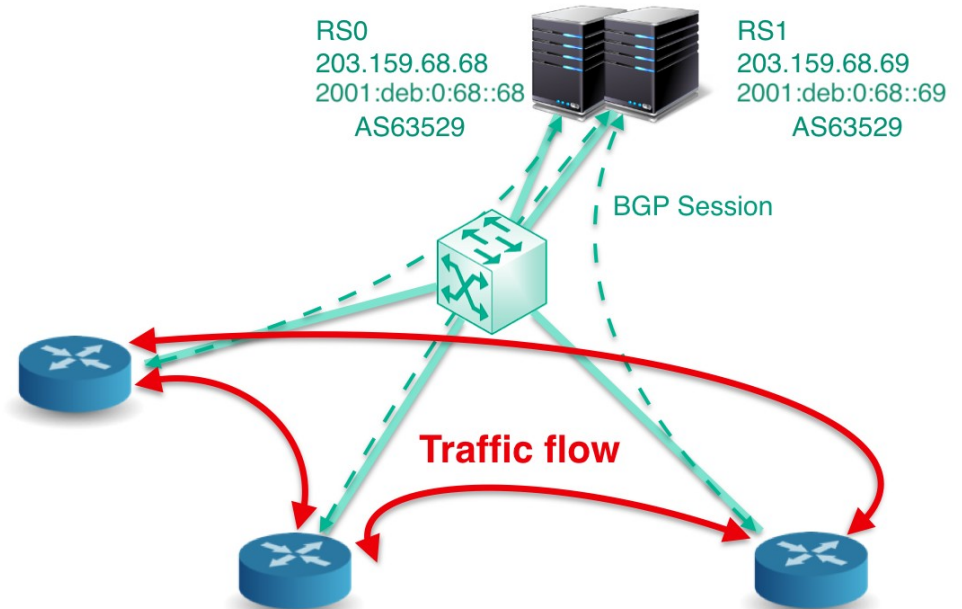


Figure 1: IXP peering options.
Richter, et al, 2014

Advantages of route servers

- Low maintenance aggregation point sessions
- Immediate value for newcomers.
- Debugging tools to have a sense what's going on at the IX



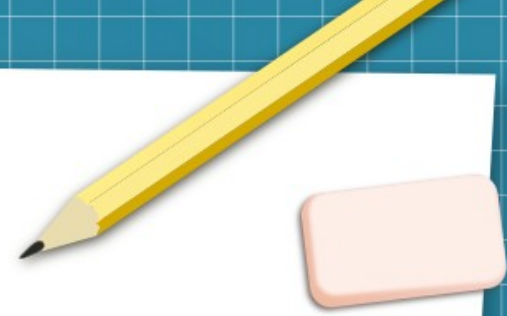
Job Snijders, [LACNIC29](#), image by [bknix.co.th](#)

Our route server

- Hardware: Wyse 3030 LT
 - Power usage: 6 Watts
 - Free and available at hand
- Software
 - Debian as operating system
 - [Arouteserver](#) as config parser
 - [BIRD](#) as BGP speaker



Server Hosting

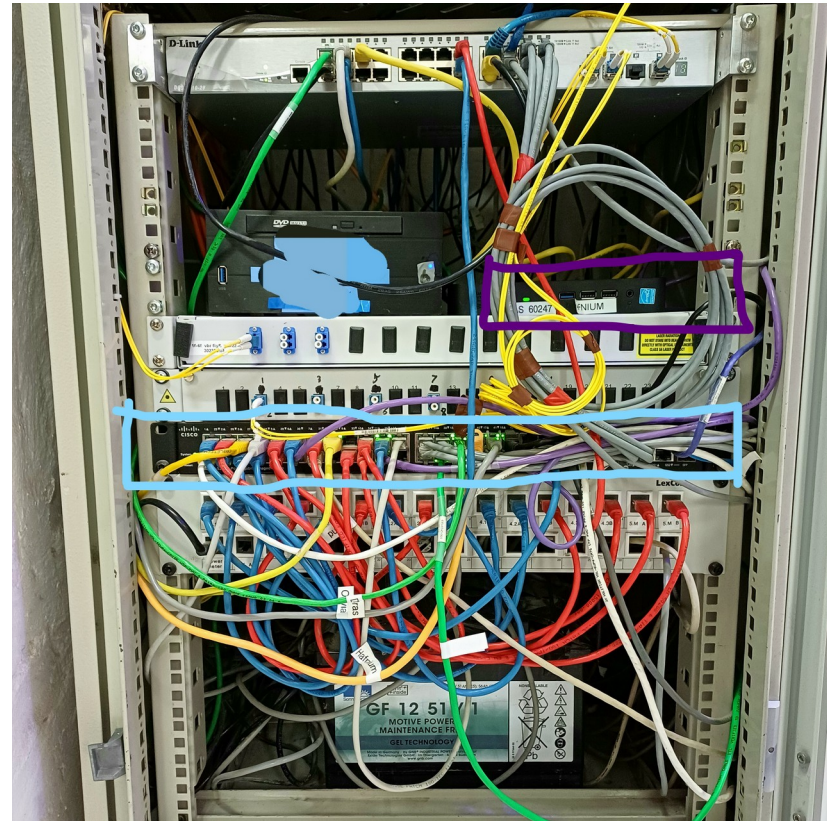


- Machine can be colocated in LabiColo, in Labitat
 - [Internal wikipage \(PeeringDB facility\)](#)
 - Talk on Sunday at 13:30
- Intended for small embedded devices such as Raspberry Pi and APU2 ([EOL](#))
- You can connect at BorhHack in the Labifur village or via VLAN <TBD>

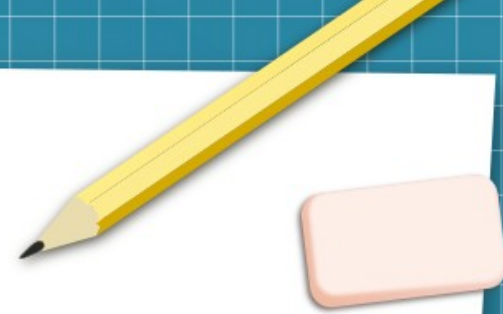
Short introduction: [IBM.com](https://www.ibm.com)

Our switch and rack

- Pre-used Cisco SG300
 - Was already in use at Labitat
 - Can do MAC port filtering



Peering Policy



- Allowed Ethernet frames:
 - 0x0800 - IPv4
 - 0x0806 - ARP
 - 0x86dd - IPv6
- Proxy ARP, OSPF, DHCP, STP/RSTP/VSTP with any kind of CDP/ZEROTIER are not allowed
- MAC-addresses are filtered per port
- Routes learnt through peering network are not allowed to be announced by BGP
- Connecting via any type of tunnel or VPN/Defragmented MTU is prohibited.

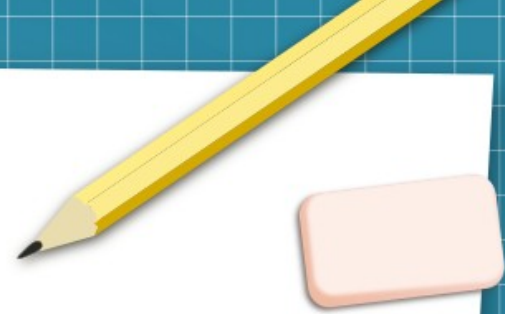
Based on [LocIX peering policy](#)

Getting internet resources allocated



- IANA -> RIPE -> LIR -> Me
 - Network operator: Eyeball and/or business customers, servers and routers
 - Globally routable
 - IXP: For uniquely identify routers of IX members
 - Not globally routed-ish

RIPE Database



- Create objects:
 - org, create new or use to existing org
 - mnt
 - person
- Optionally, but required for non-IXPs:
 - AS-Set

Course: [RIPE Database](#) from RIPE academy

Miscellaneous info when talking to LIR



- IX name
- Want route server? YES, then:
 - ASN required
 - Request 16-bit ASN as client can potentially bring old equipment
 - IXP prefix?
 - RIPE has a prefix dedicated for IXPs
 - Specify only announce withing peering LAN
 - Size: /24 Legacy IP and /48 IPv6
- Get hold of a receipt or contract confirming connectivity to IXP colo site
- Have at least three customers that is willing to peer at IXP.
- Facility postal address, that is able to receive physical mail
- Contact person name, organisation and phone number

Finding Local Internet Registry (LIR)



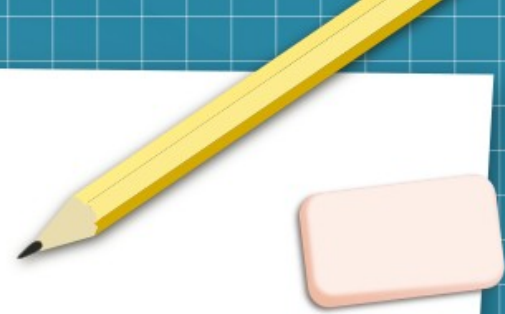
- We asked the [Freetransit.ch](https://freetransit.ch) project.
 - Bias: We personally know some of the nice people behind it
- Search “RIPE LIR services” in a web search engine

Similar projects



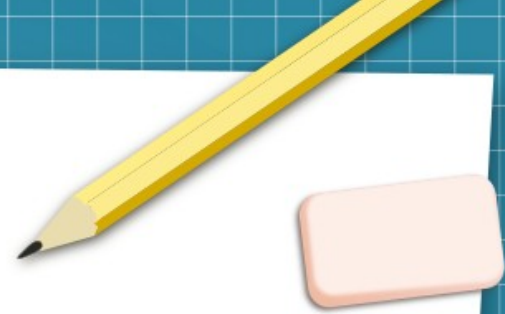
- The many community run internet exchanges around the globe
- Hosting
 - Coloclue in Amsterdam (PeeringDB)
 - K-space in Tallinn
 - communityrack.org in Zürich (PeeringDB)
- bgp.wtf in Warsaw Hackerspace (PeeringDB)
- Individual Network Berlin (in-berlin.de), in Berlin (PeeringDB)

Thanks to...



- Project collaborators:
 - Olivia Wenya ([AS199750](#))
 - Daniel Brasholt ([AS198886](#))
- Jori from the [Freetransit.ch](#) project for LIR and RIPE matters
- Asbjorn Tønnesen ([AS207727](#)) for sharing networking knowledge

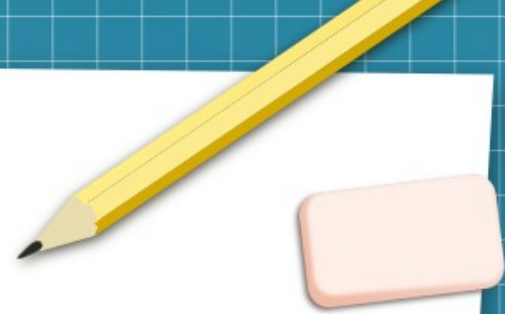
Good resources



- [PeeringDB.com](https://www.peeringdb.com)
 - The interconnection database
- Local Network Operator Meetups ex. DKNOG in Denmark
- RIPE academy. academy.ripe.net
 - Free courses in IPv6, BGP security, RPKI
- Network Startup Research Center. nsrc.org
 - BGP and IXP introduction
- NLNOG [BGP Filter Guide](#)
- NLNOG [ring](#)

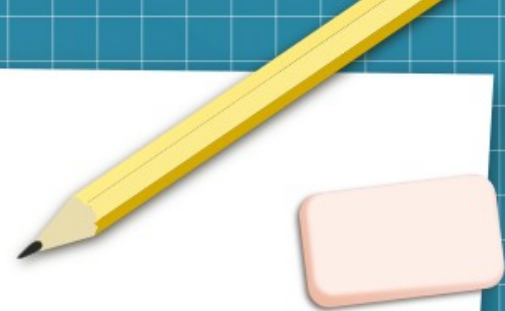
Find us

- Bornhack
 - Labitat and Labifur village (DECT: 7303)
- Every other day
 - Labitat in Copenhagen
- Website: ix.labitat.dk
- PeeringDB: peeringdb.com/ix/4193



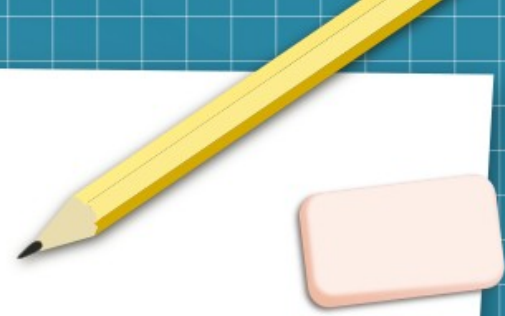
Already got an ASN?

- Join LabIX at BornHack 2023
 - VLAN <TBD>
 - MTU size: 9000
 - We can offer hosting in the Labifur village



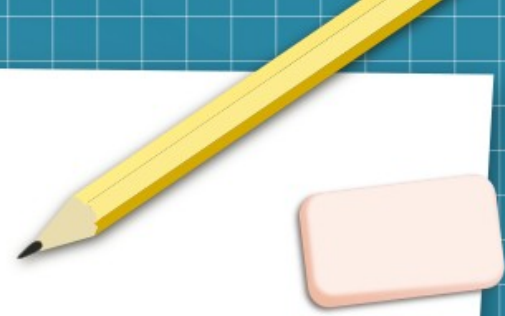
Sponsors?

- All hardware is pre-used
- We are looking for newer hardware, second uplink and stickers!
- LIR fees paid from out of own (student) pocket



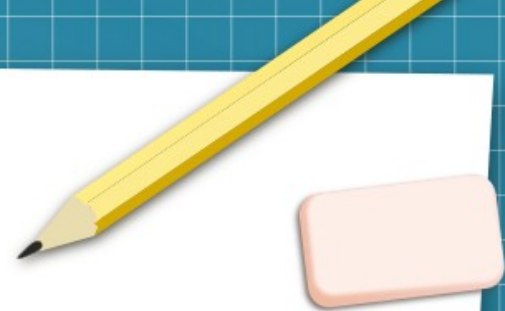
Whats next?

- Looking Glass for easier debugging
- Limit ARP broadcast storm with ARP Sponge
- Birdwatch: Prometheus Exporter
- Much more documentation
- Setup RPKI relay



Thank you for listening

- Download the presentation
 - URL: <https://labix-presentation-v1.hafnium.me>





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