

RUNNING AN ISP BY YOUR OWN **in your dormitory bedroom**

Wencey Wang



(spoken) Finally! I get to teach a whole lesson
all by myself! And I'm gonna teach something
relevant...something modern...the internet!
Haha!

(singing) The internet is really, really great.

AVENUE Q

QUESTIONS

- How does Internet works?
- What do we have in a typical home network?
- How can I become my own ISP?

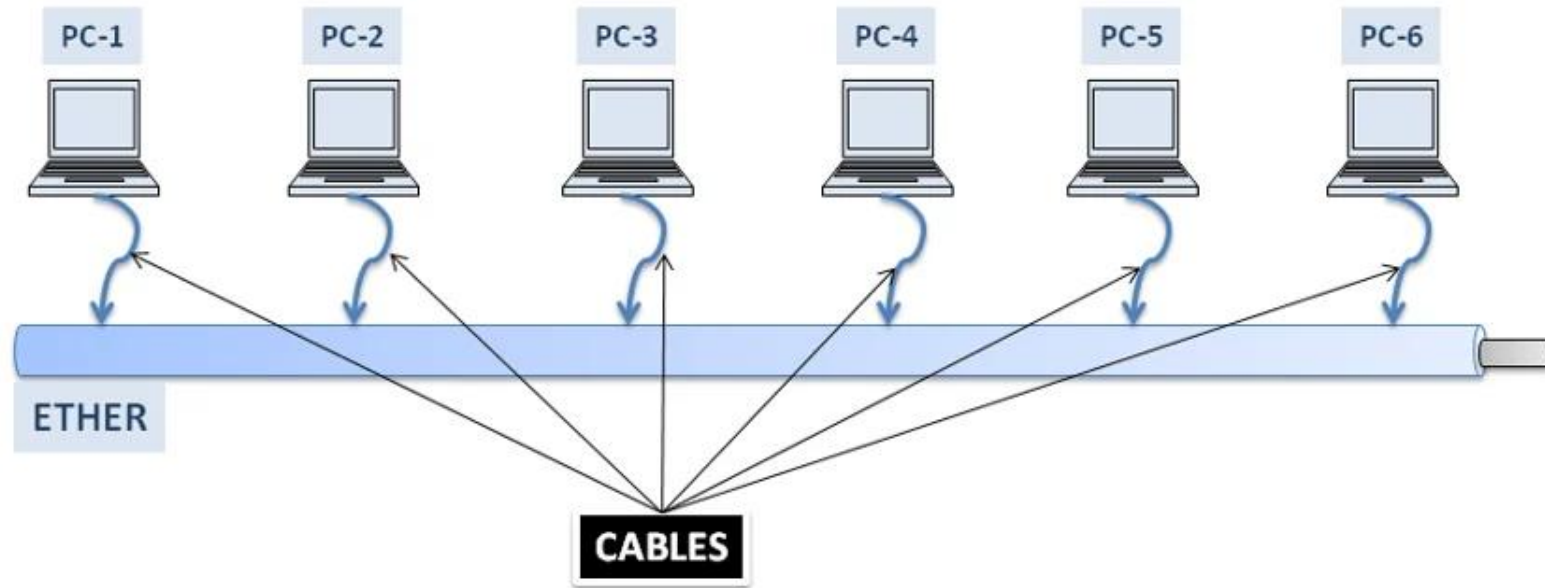


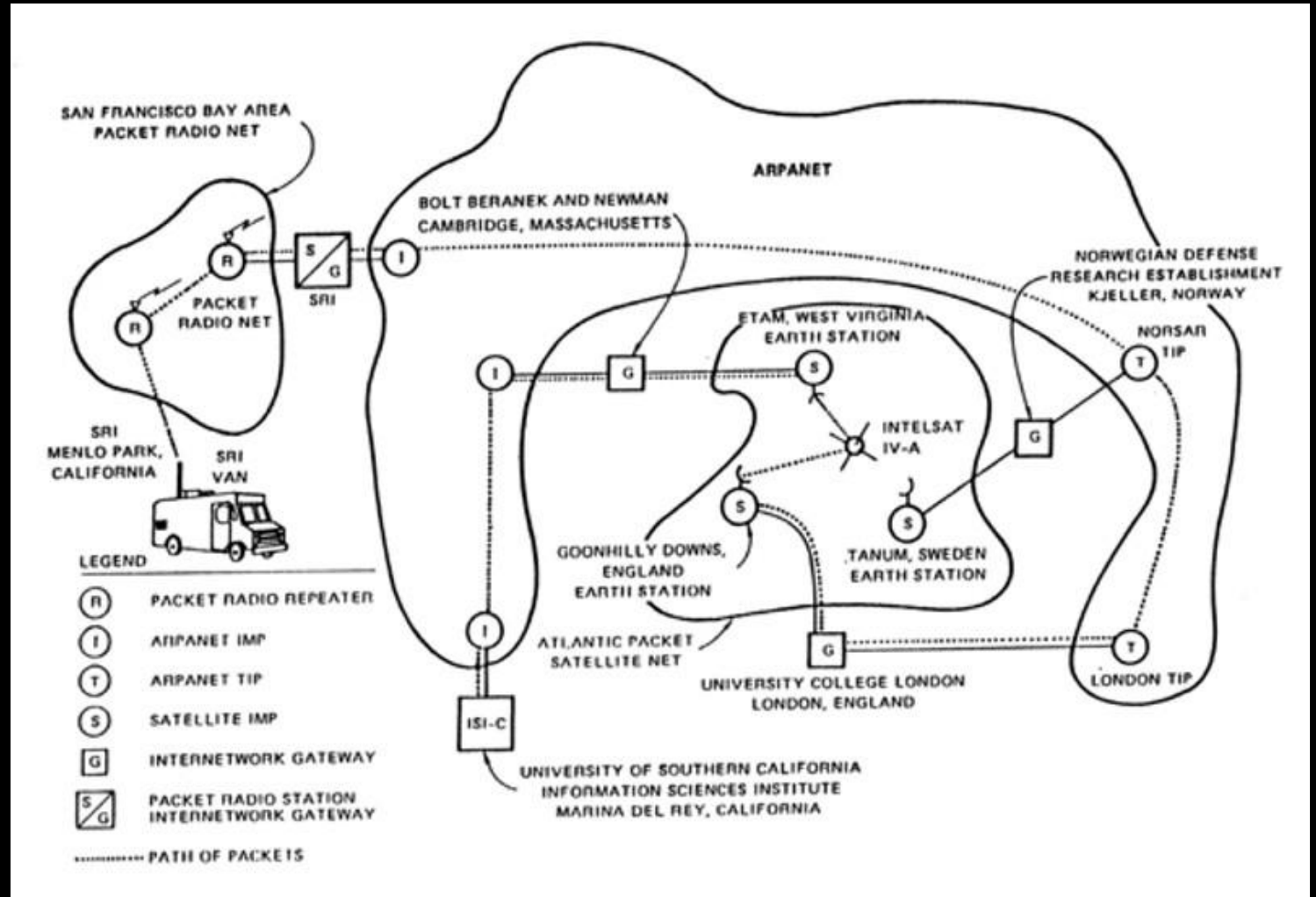
Figure 1: The Architecture of Classic Ethernet



**IDEA OF
ETHERNET**

INTERNET

EARLY DAY



LAYERED MODEL

L3

Internet Protocol

L1/2

Ethernet

Packet
Radio

Serial

...

ETHERNET VS INTERNET

ETHERNET

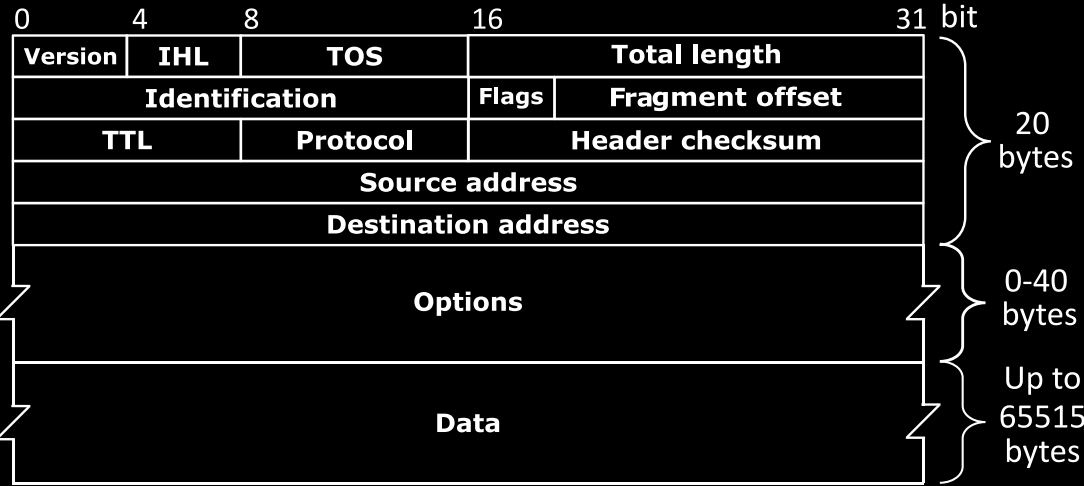
- Media dependent
- Always broadcasting, frame reach destination directly
- Use MAC address to fake the idea of unicast
- Switch as an improvement measures

INTERNET

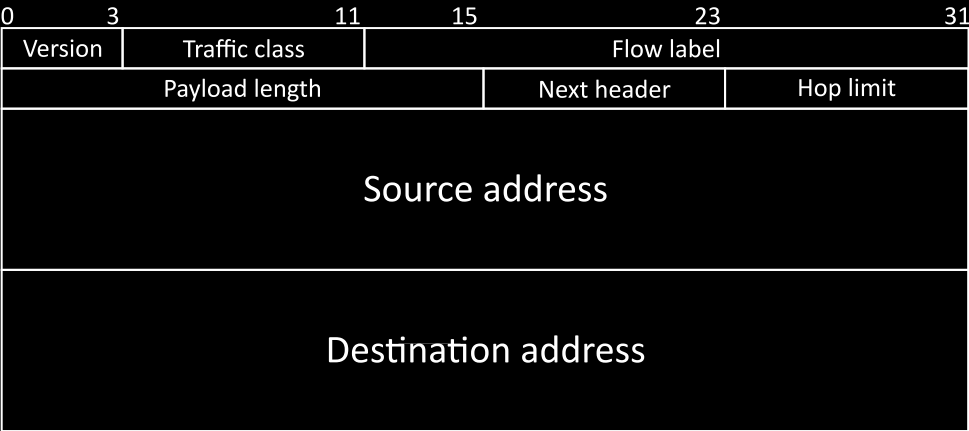
- Doesn't care about the physical media
- Allows router to forward IP packet
- Use ARP/ND to map IP destination to MAC address

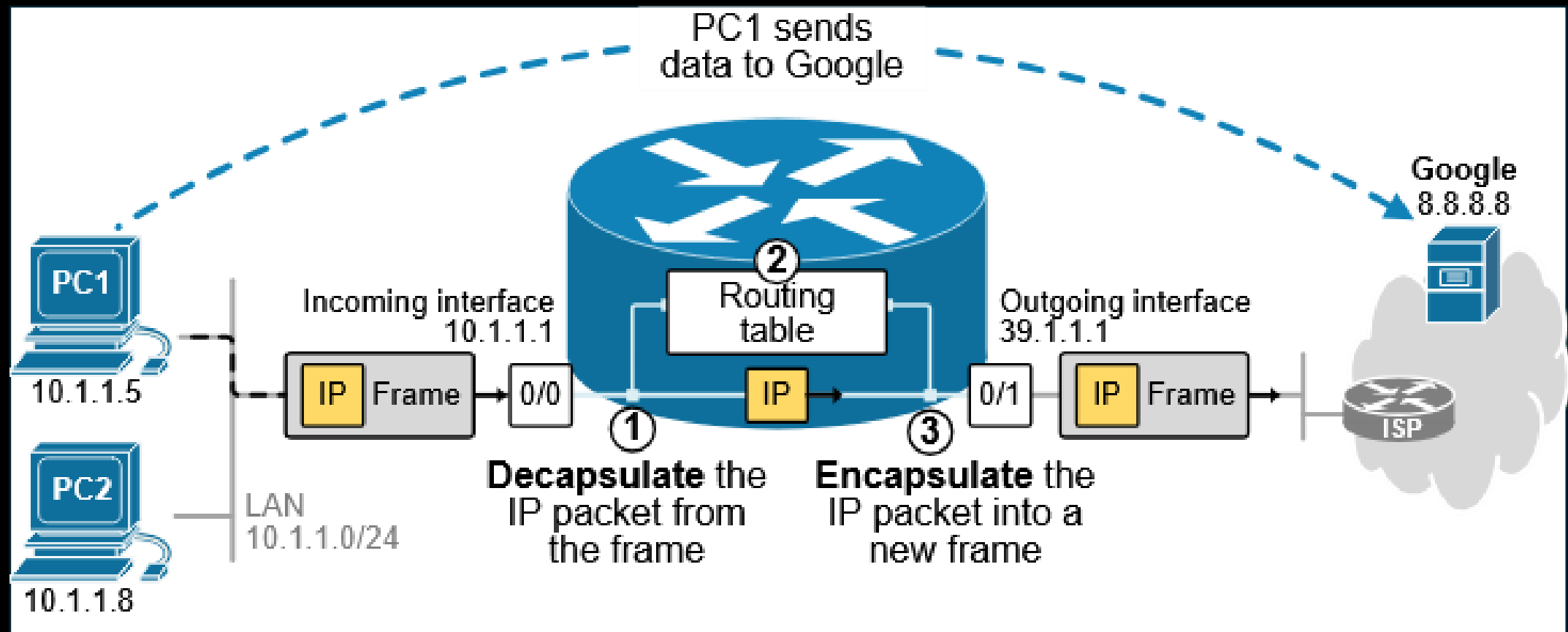
INTERNET PROTOCOL

IPv4



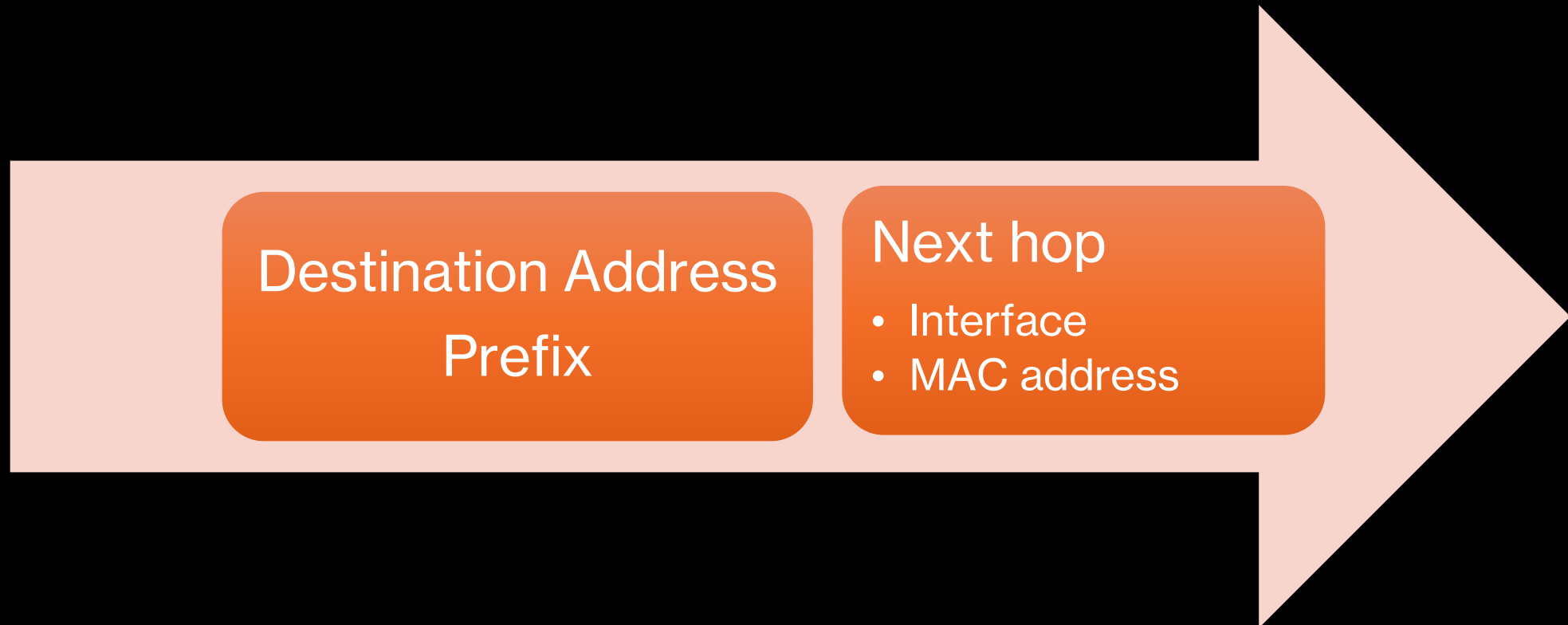
IPv6

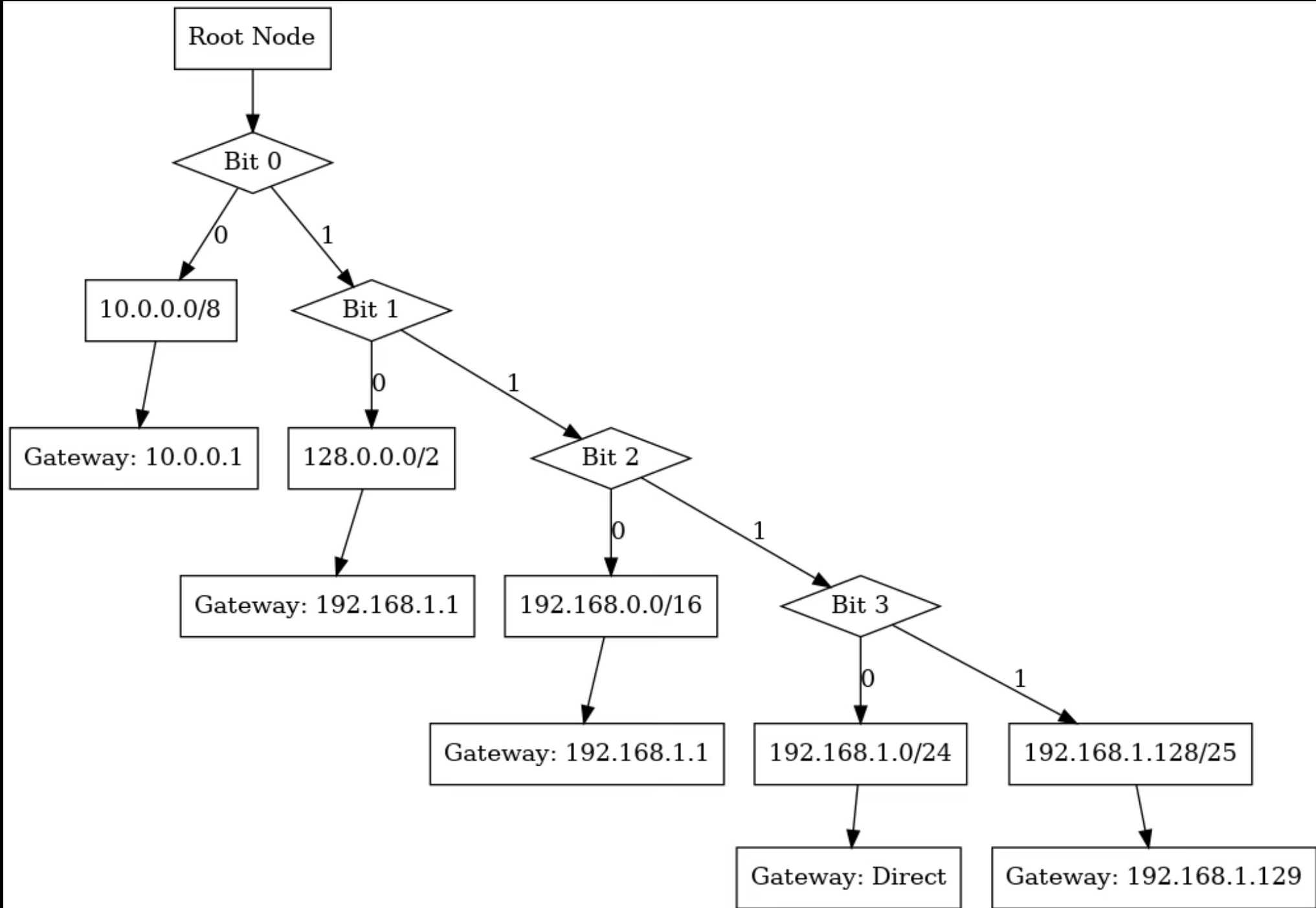




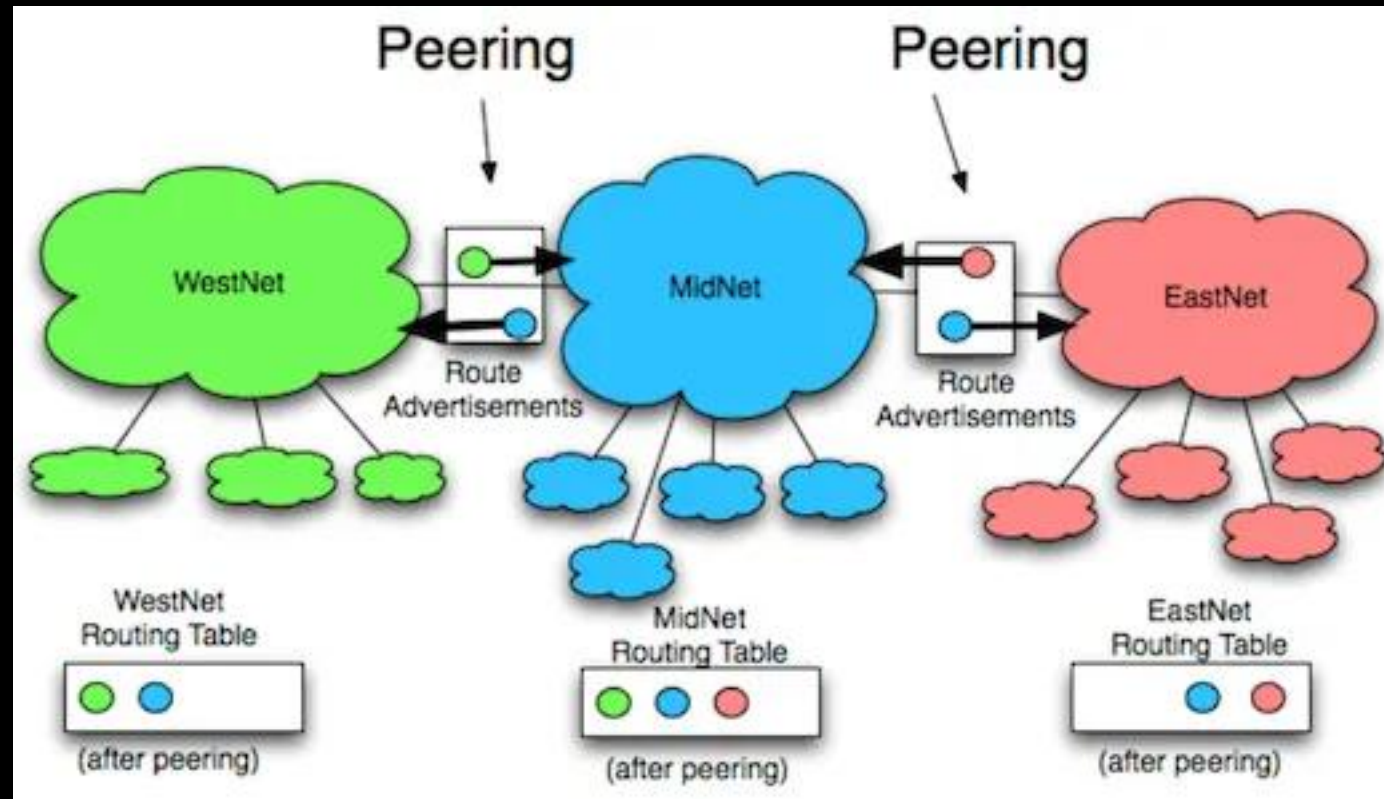
IP ROUTER

ROUTING TABLE



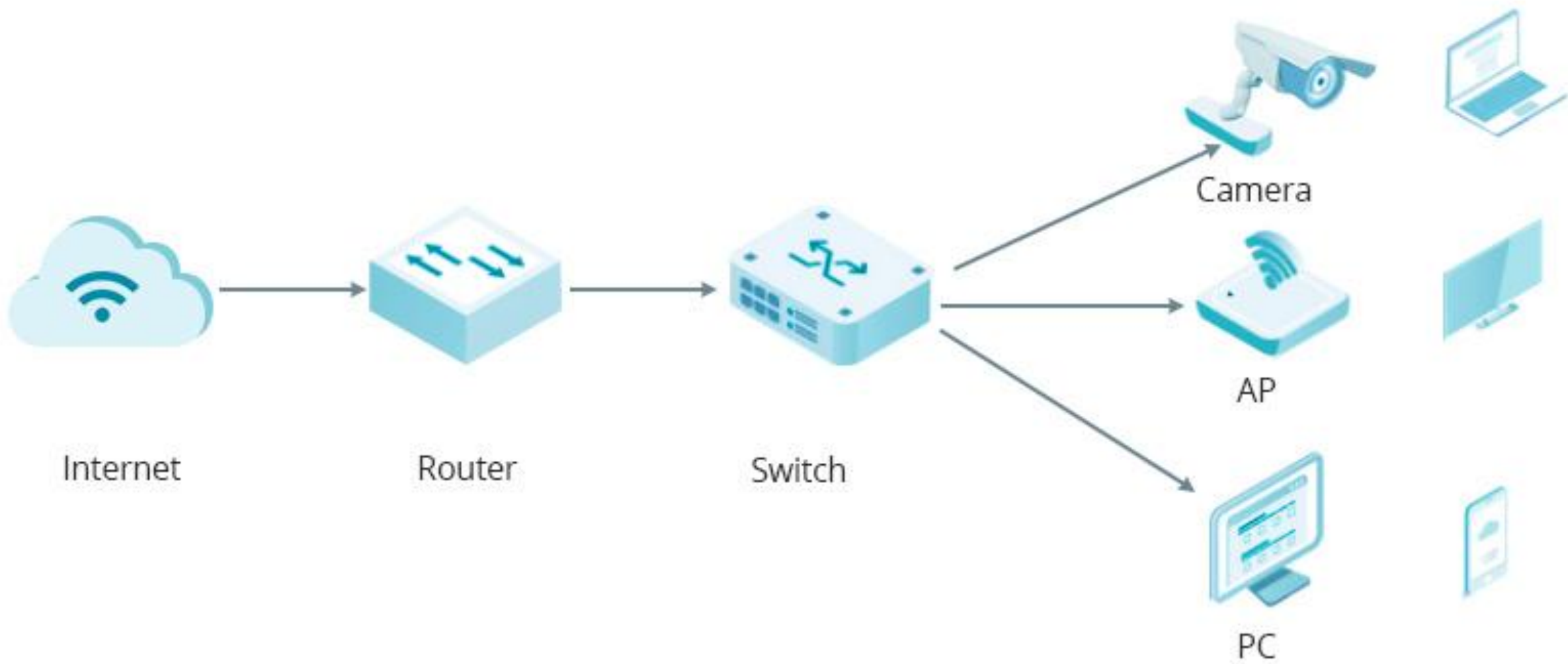


HOW TO FILL-IN ROUTE TABLE?



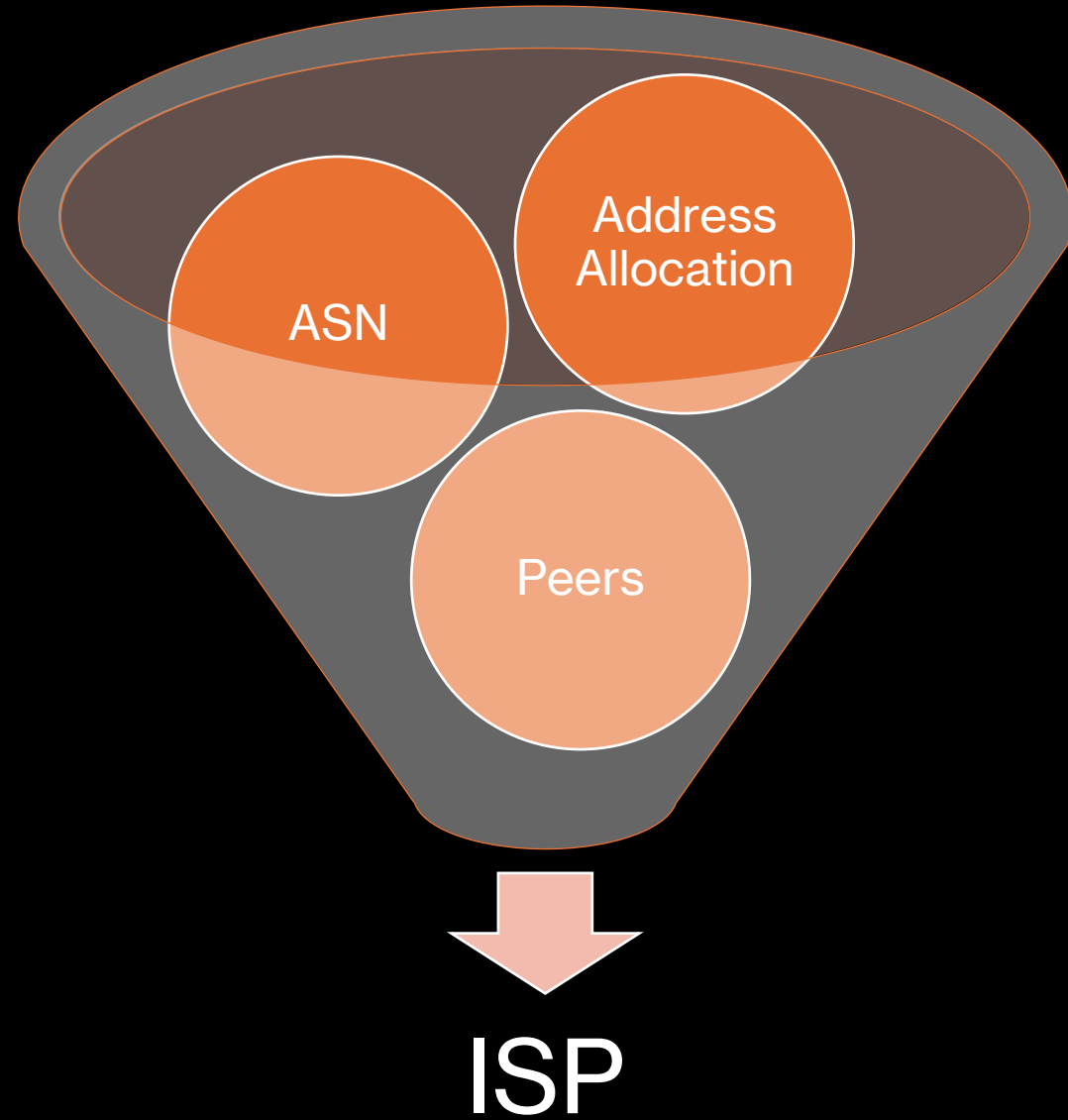
AUTONOMOUS SYSTEM AND BGP PEERING

NETWORK AT HOME



HOW TO BECOME AN ISP?

WHAT'S NEEDED?



IANA

APNIC

RIPE

ARIN

...

Member

Member

Member

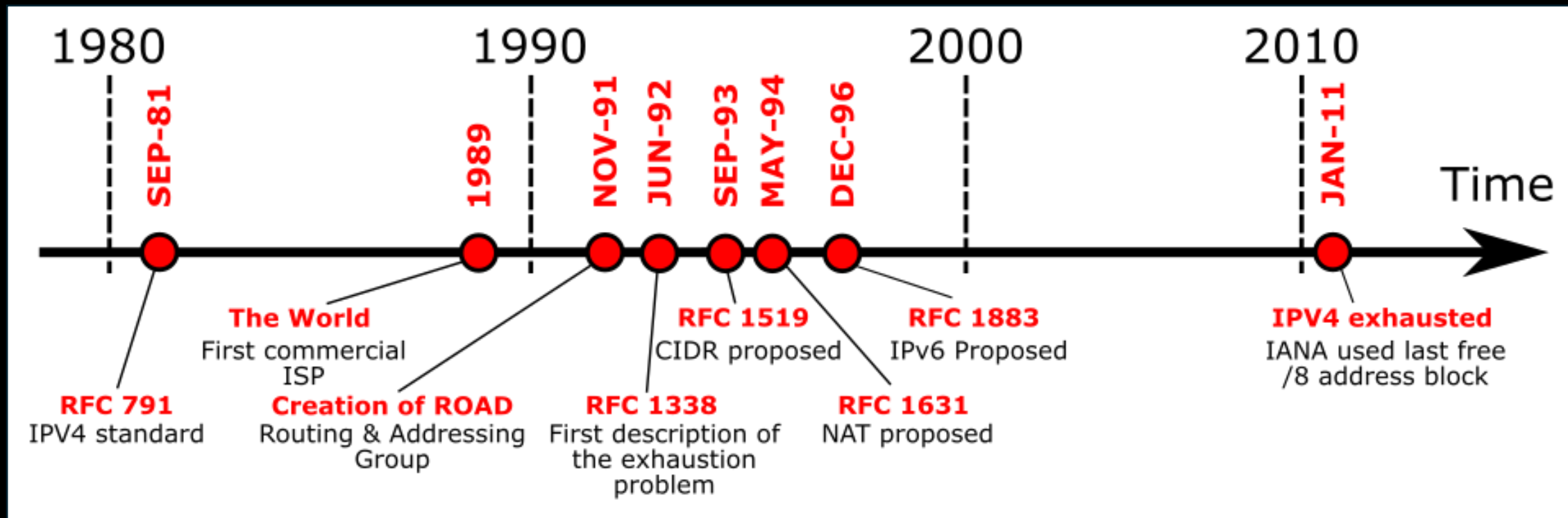
Member

Member

Member

...

WHO ALLOCATE ADDRESSES?



IPv4 USED UP

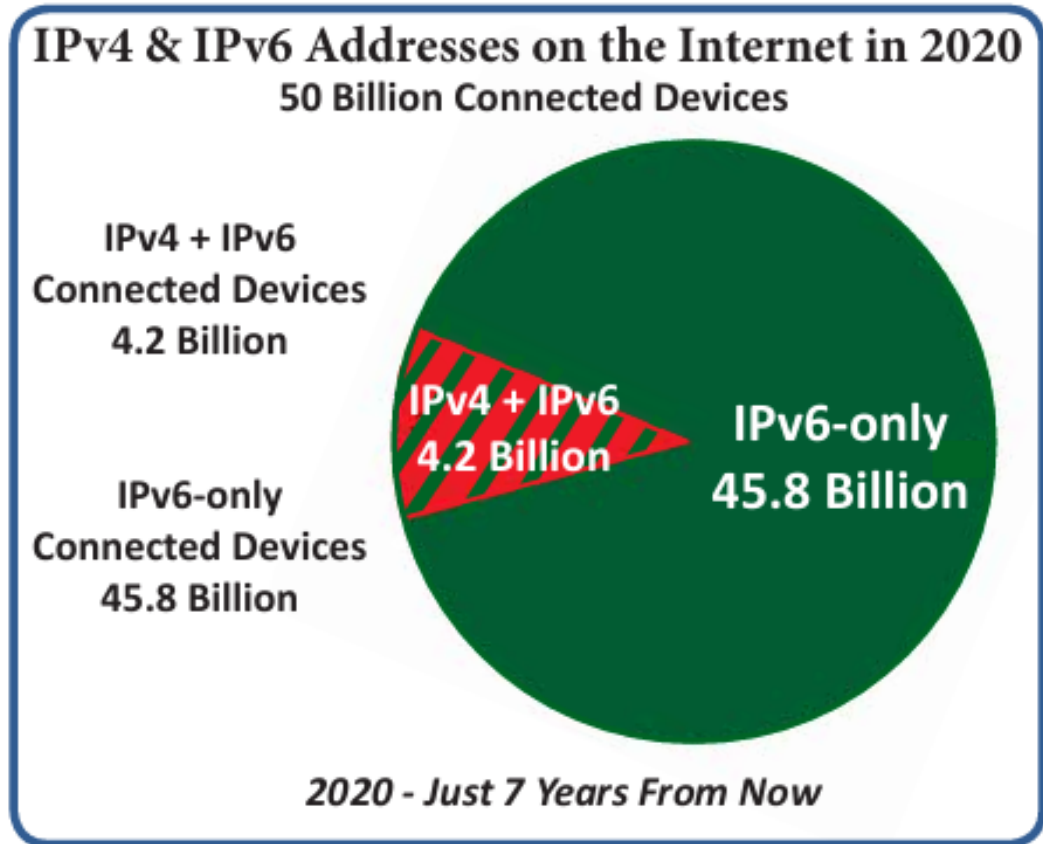
exponential rate. Based on the current rate of growth of the Internet, it is projected that 15% of users will be IPv6-only by the end of 2013, and 40% of Internet users will be IPv6-only by the end of 2014. In another study, Cisco calculated that 75% of the Internet will be using only IPv6 addresses by 2016.¹³ This is a huge part of the Internet and the percentage will only grow.

According to Government Technology Magazine, it has been predicted that by 2020 there will be 50 billion Internet-enabled devices in the world.¹⁴ Compare that with the world's total number of IPv4 addresses at just 4.2 billion. That is at least 45.8 billion additional IP addresses needed - these will all be IPv6 addresses. That is over 1,000% growth, or approximately 10 times the size of the current Internet in just 7 years. (See chart to the right.) Companies who don't take IPv6 seriously and only use IPv4 will be left isolated from many of these new IPv6 users and services.

Many companies with IPv4 services are also implementing IPv6 dual-stack. So, by the year 2020, it is expected that most all IPv4 services on the Internet will also be IPv6-enabled. This is in addition to the expected 45.8 billion connected devices with only IPv6 addresses.

IPv4 is the old Internet of the past and the present.
IPv6 is the Internet of the present and the future.

Based on its Internet monitoring, and recent increased Internet growth, Cisco revised their estimates upward and now predicts *"there will be 19 billion IPv6-capable, fixed and mobile devices in 2016, up from 1 billion in 2011."*¹⁵



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[XML](#) [JSON](#) [PLAIN TEXT](#)

Responsible organisation: [Zichao Heng](#)
Abuse contact info: wencey@outlook.com

```
inet6num:          2a0b:6340:a0::/44
netname:            DREAMRY
descr:              Dream Recovery
org:                ORG-DA836-RIPE
country:            FR
admin-c:            HZ1518-RIPE
tech-c:             HZ1518-RIPE
notify:             noc@nekomimirouter.com
notify:             noc@misaka.io
status:             ALLOCATED-BY-LIR
mnt-by:            MISAKA-MNT
mnt-by:            DREAMRY-MNT
created:            2017-07-17T09:50:07Z
last-modified:     2020-05-26T17:50:40Z
source:            RIPE
```

LOGIN TO UPDATE

Version History

RIPEstat [↗](#)

PEERING?

TUNNELING

L3

Internet Protocol

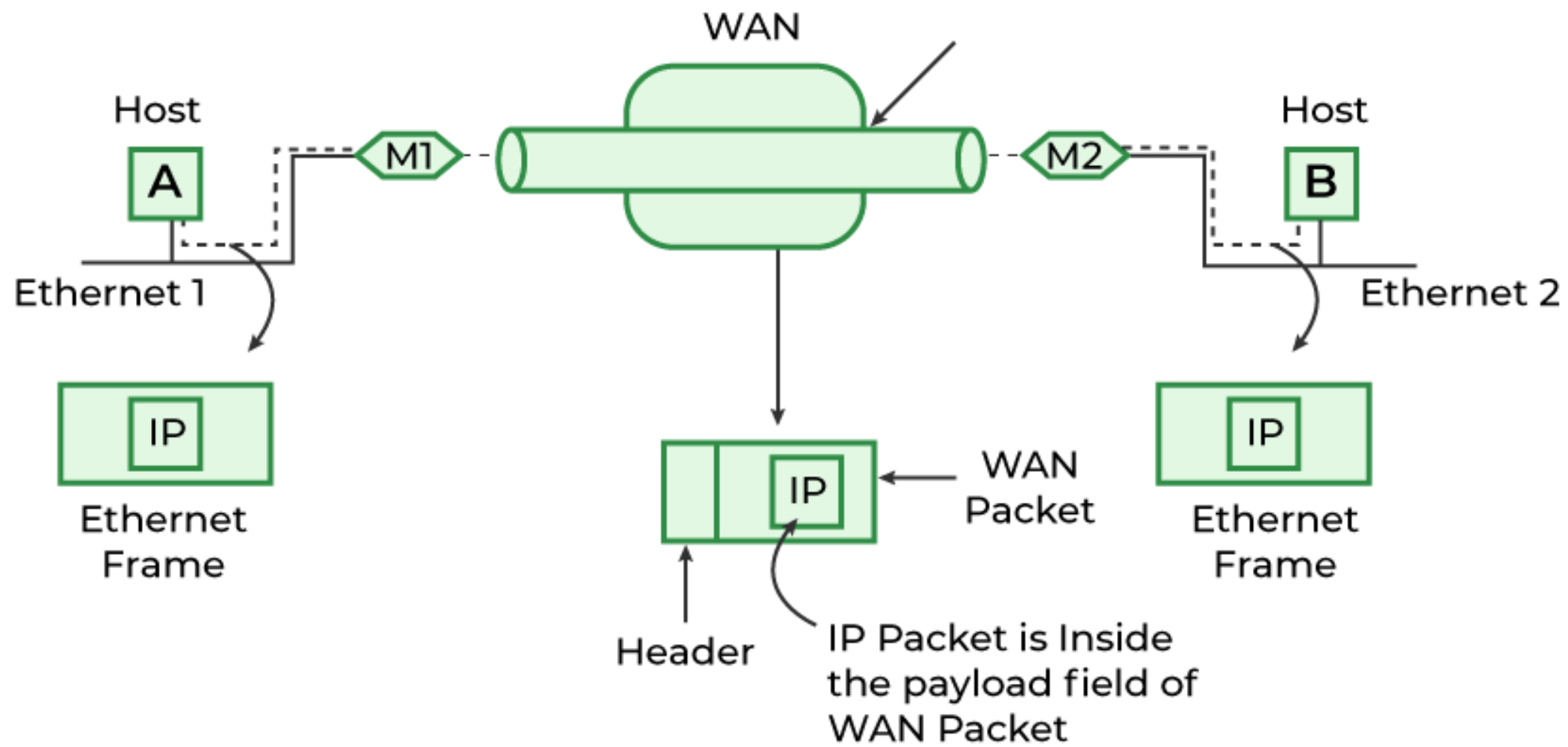
L1/2

Ethernet

Packet
Radio

Serial

Another
IP
Packet





Conceptual Overview

[Simple Network Interface](#)[Cryptokey Routing](#)[Built-in Roaming](#)[Ready for Containers](#)[Learning More](#)

About The Project

[Source Code](#)[License](#)

WIREGUARD[®]

FAST, MODERN, SECURE VPN TUNNEL

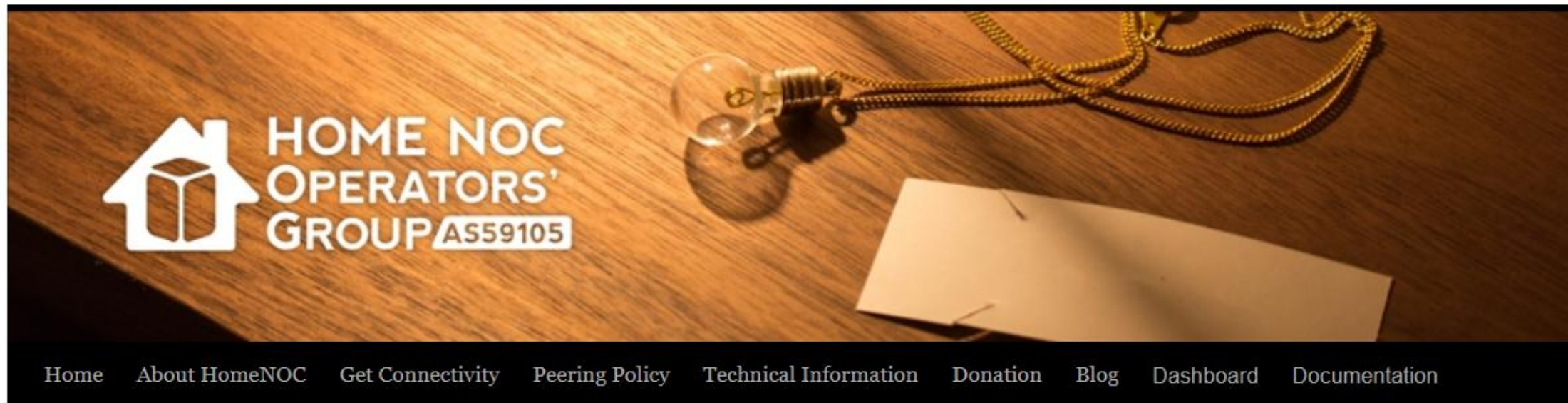
WireGuard[®] is an extremely simple yet fast and modern VPN that utilizes **state-of-the-art cryptography**. It aims to be **faster**, **simpler**, leaner, and more useful than IPsec, while avoiding the massive headache. It intends to be considerably more performant than OpenVPN. WireGuard is designed as a general purpose VPN for running on embedded interfaces and super computers alike, fit for many different circumstances. Initially released for the Linux kernel, it is now cross-platform (Windows, macOS, BSD, iOS, Android) and widely deployable. It is currently under heavy development, but already it might be regarded as the most secure, easiest to use, and simplest VPN solution in the industry.

Simple & Easy-to-use

WireGuard aims to be as easy to configure and deploy as SSH. A VPN connection is made simply by exchanging very simple public keys – exactly like exchanging SSH keys – and all the rest is transparently handled by WireGuard. It is even capable of roaming between IP addresses, just like **Mosh**. There is no need to manage connections, be concerned about state, manage daemons, or worry about what's under the hood. WireGuard presents an extremely basic yet powerful interface.

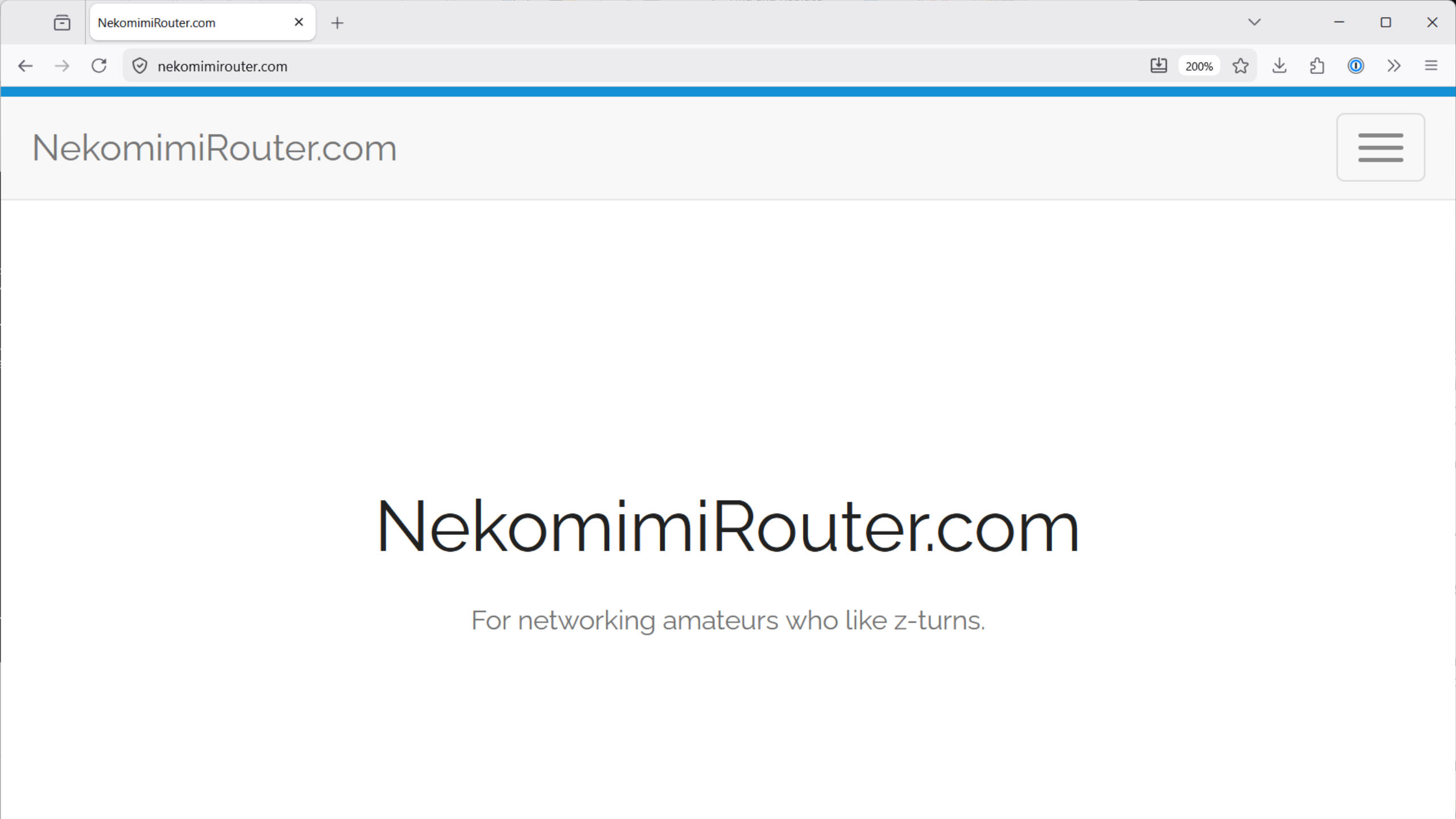


Home NOC Operators' Group

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AS59105 Home NOC Operators' Group

Today, the Internet has become one of the essential "infrastructures" in our lives. This provides limited opportunities to be involved in the core technologies of the Internet, including the design, construction, and operation of Autonomous System (AS) that connect to the Internet.



NekomimiRouter.com



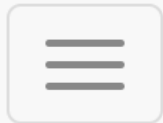
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200%



NekomimiRouter.com



NekomimiRouter.com

For networking amateurs who like z-turns.



internet routing daemon



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The BIRD Internet Routing Daemon

The **BIRD** project aims to develop a fully functional dynamic IP routing daemon primarily targeted on (but not limited to) Linux, FreeBSD and other UNIX-like systems and distributed under the [GNU General Public License](#).

5.5.2025 - Bugfix release 2.17.1

What do we support:

- Both IPv4 and IPv6
- Multiple routing tables
- BGP
- RIP
- OSPF
- BFD
- Babel
- Static routes
- IPv6 Router Advertisements
- Inter-table protocol
- Command-line interface (using the 'birdc' client; to get some help, just press '?')
- Powerful language for route filtering
- Linux, FreeBSD, NetBSD, OpenBSD ports

ROUTER CONFIG

- wg: tunnel interface
- ip2: ip addr
- sysctl: ip forwarding
- bird2: Establish BGP peer
- DHCP Server/ND
- Firewall

Table master6:

2620:129:2000::/42 unicast [Apernet 2026-07-22 from 2406:4440::1] * (100) [AS27016i]
via fe80::14:2cff:feca:620b on epair0a

2804:505c::/32 unicast [Apernet 2026-07-22 from 2406:4440::1] * (100) [AS268384i]
via fe80::14:2cff:feca:620b on epair0a

2804:385c:a200::/40 unicast [Apernet 2026-07-22 from 2406:4440::1] * (100) [AS262687i]
via fe80::14:2cff:feca:620b on epair0a

2608:12a:7425::/48 unicast [Apernet 2026-07-23 from 2406:4440::1] * (100) [AS306i]
via fe80::14:2cff:feca:620b on epair0a

2001:df3:43c0::/48 unicast [Apernet 2026-07-22 from 2406:4440::1] * (100) [AS137970i]
via fe80::14:2cff:feca:620b on epair0a

2a04:26c0::/29 unicast [Apernet 2026-07-22 from 2406:4440::1] * (100) [AS60532i]
via fe80::14:2cff:feca:620b on epair0a

2a0b:2f04::/31 unicast [Apernet 2026-07-22 from 2406:4440::1] * (100) [AS48112i]
via fe80::14:2cff:feca:620b on epair0a

2804:5a64::/34 unicast [Apernet 2026-07-22 from 2406:4440::1] * (100) [AS268770i]
via fe80::14:2cff:feca:620b on epair0a

2804:5d3c:c000::/34 unicast [Apernet 2026-07-23 from 2406:4440::1] * (100) [AS268959i]
via fe80::14:2cff:feca:620b on epair0a

2409:8729:3700::/40 unicast [Apernet 2026-07-25 from 2406:4440::1] * (100) [AS56041i]



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Welcome to the Hurricane Electric BGP Toolkit.

You are visiting from **2a0b:4340:a0:297::11** 

Announced as **2a0b:4340:a0::/48** 

Announced as **2a0b:4340:a0::/44** 

Your ISP is **AS205532** (Zichao Heng) 

BENEFIT AND PROBLEM?

- Easily roam between Wi-Fi networks without breaking TCP connection
 - Always encrypted traffic in public places
 - Easily access infra at home
-
- Higher latency
 - Browse the Internet with your real name
 - Geo-blocked



LOOKING FOR A JOB!

SOFTWARE DEVELOPER

NETWORK ENGINEER

IT ADMIN