



Kunnskap for en bedre verden

Teknostart Day 1

How does the Internet work?

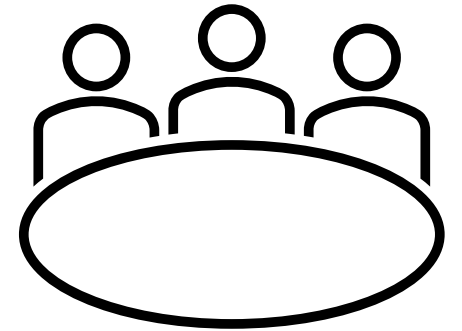
Innsjekk

Hva?

- Uformell, ved starten av dagen
- Mulighet til å dele noe med de andre i gruppen om hvordan du har det (feks. jeg er litt nervøs, spent på dagen, trøtt, ...)

Hvordan?

- Si gjerne også hvem du er, hvor du kommer fra
- Fortell kort noe om hvordan du har det? Hvordan har starten på dagen vært?
- 2-3 min. per person



Utsjekk

Hva?

- Uformell kort avslutning etter dagens siste arbeidsøkt

Hvordan?

- Si kort noe om hvordan du har opplevd dagen
- Feks. hva synes du var interessant / gøy / kjedelig? Evt. hva skal du gjøre etterpå?
- 2-3 min. per person

Hvorfor?

- Bli kjent med de andre i gruppen / klassen
 - Bidrar til åpenhet og til at gruppemedlemmene kan få forståelse for hva de andre tenker / opplever, ...
 - Gir en mulighet til å ta vare på hverandre
 - Viktig for samarbeidet at man også blir litt kjent, har fokus på det sosiale
-
- Innsjekk/utsjekk hver dag denne uken ;)

Overview

Next semesters
TTM4200, TTM4180, ...

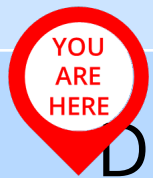
**Go
Deeper**

Weeks 35-37
Networking

Weeks 39-41
Ethical Hacking

Weeks 43-46
IoT

**Apply
Knowledge in
Context**



Days 1, 2
The Internet,
Encryption

Days 3, 4
Net. Reliability,
HTML

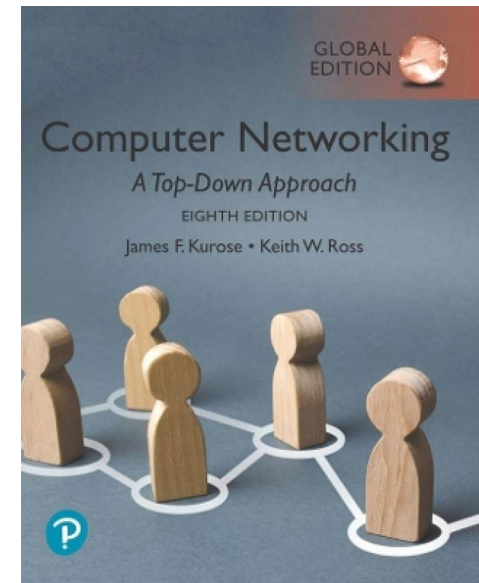
Week 34
Linux CLI

**Build
Foundation**

Book Recommendation

Used in several units of TTM4175 and multiple courses

Title: Computer Networking: A Top-Down Approach
Author: James F. Kurose, Keith W. Ross
Publisher: Pearson
Date: 2021
Edition: 8th edition, Global edition.



Goals for Today



Get a broad sense of how the Internet works

Internet structure and components
Addressing and address resolution
Protocols and packets
See and use some basic tools



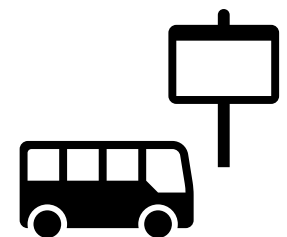
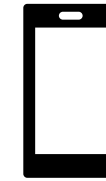
Use case: what happens when we access a web page?

Everything is Internet-Connected

- Smart devices at home
- Phone and apps
- Communication platforms
- Public infrastructure

- ➔ Large impact of outages
- ➔ Attractive targets

- ➔ Understand to build and improve robust systems

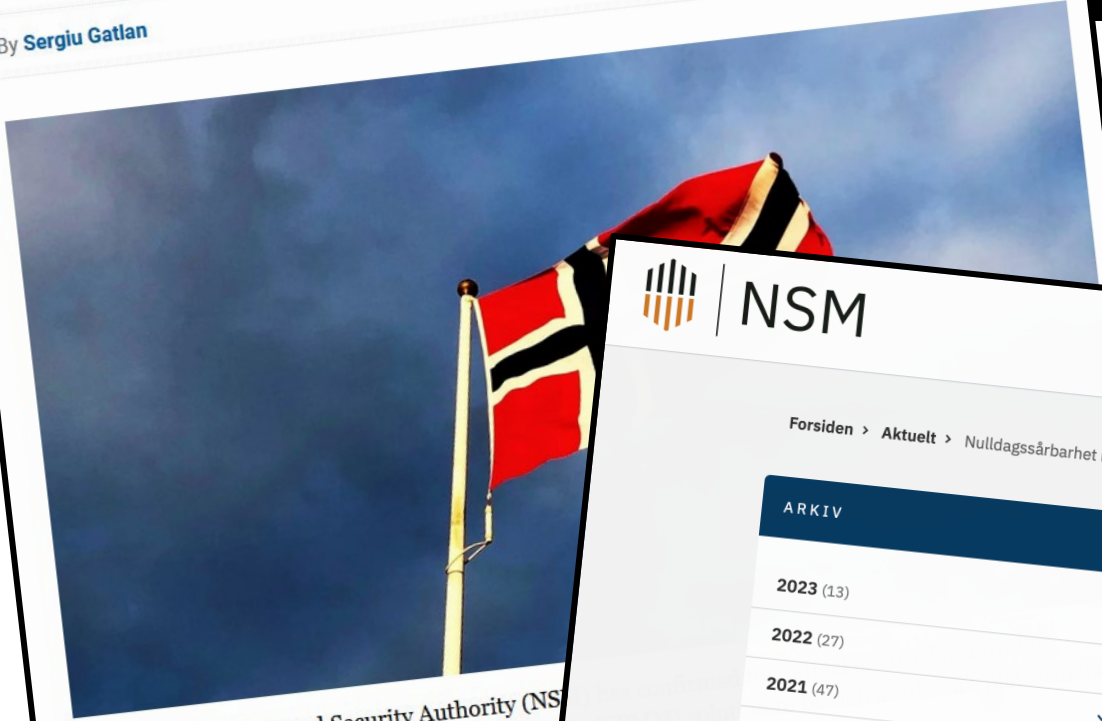


net-C

Home > News > Security > Norway says Ivanti zero-day was used to hack govt IT systems

Norway says Ivanti zero-day was used to hack govt IT systems

By Sergiu Gatlan



The Norwegian National Security Authority (NSA) has announced a vulnerability in Ivanti's Endpoint Manager MobileIron Core used by 12 ministries in the country.

The New York Times

Gone in Minutes, Out for Hours: Outage Shakes Facebook

When apps used by billions of people worldwide blinked out, lives were disrupted, businesses were cut off from customers and some Facebook employees were locked out.

ENGLISH AKTUELT LEDIGE STILLINGER KONTAKT VARSLE NSM OM HENDELSER

Forsiden > Aktuelt > Nulldagssårbarhet i Ivanti Endpoint Manager (MobileIron Core)

Nulldagssårbarhet i Ivanti Endpoint Manager (MobileIron Core)

Publisert: 24.07.2023

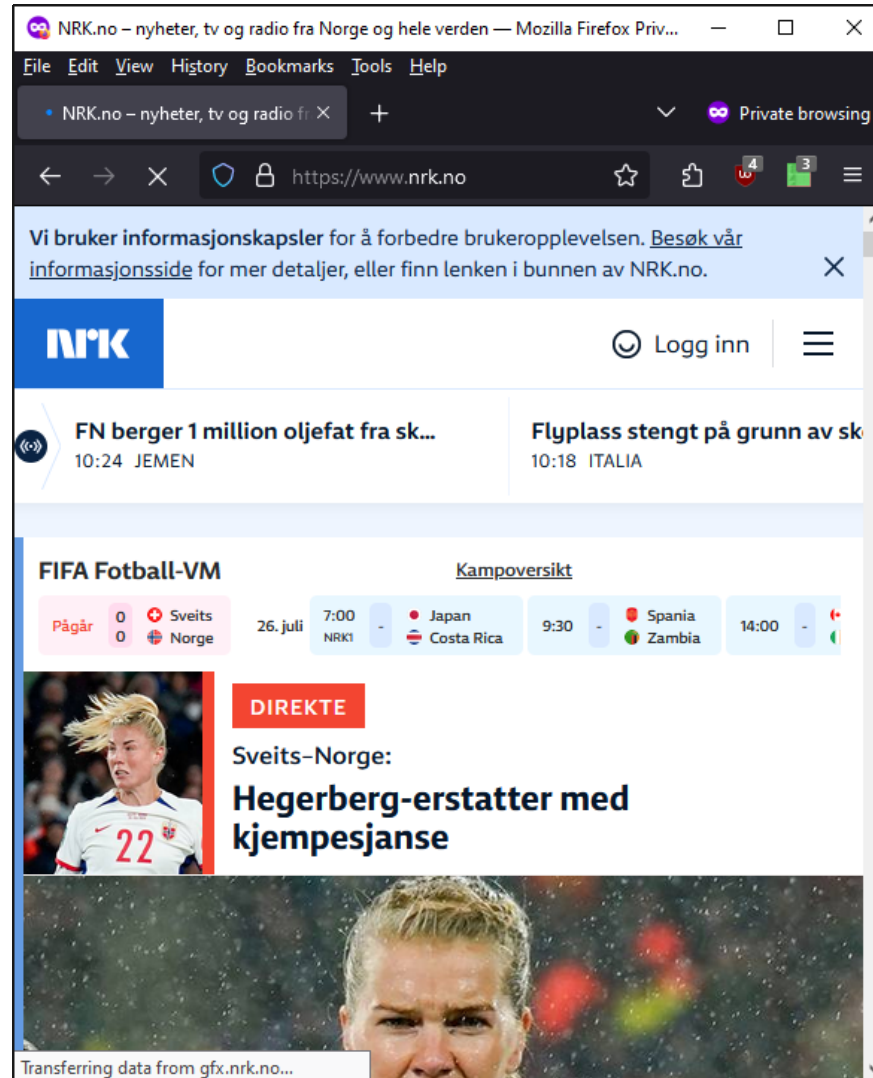
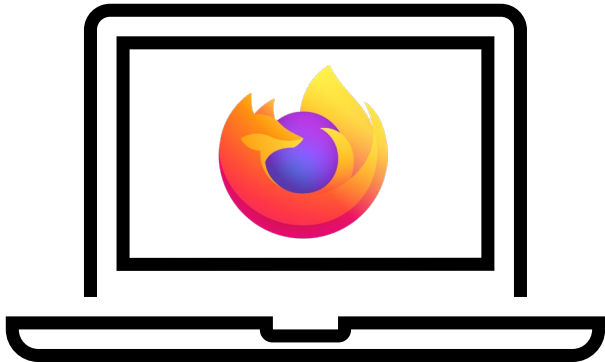
Oppdatert: 25.07.2023

På pressemøtet mandag 24. juli 2023 informerte Nasjonal sikkerhetsmyndighet og Departementenes sikkerhets- og serviceorganisasjon (DSS) om at det var en nulldagssårbarhet som ble benyttet til å utføre dataangrepet mot Departementenes sikkerhets- og serviceorganisasjon (DSS).

ARKIV
2023 (13)
2022 (27)
2021 (47)
2020 (38)
2019 (15)
2018 (14)

- ➔ Attractive targets
- ➔ Understand to build and improve robust systems

Let's Visit a Website

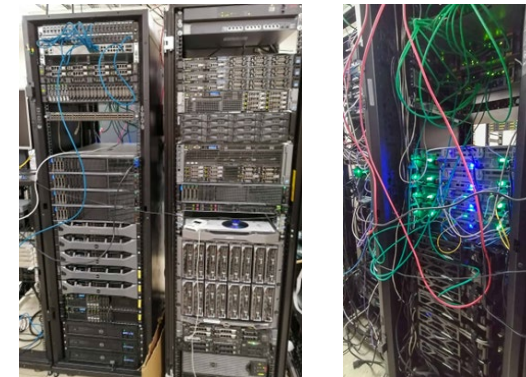
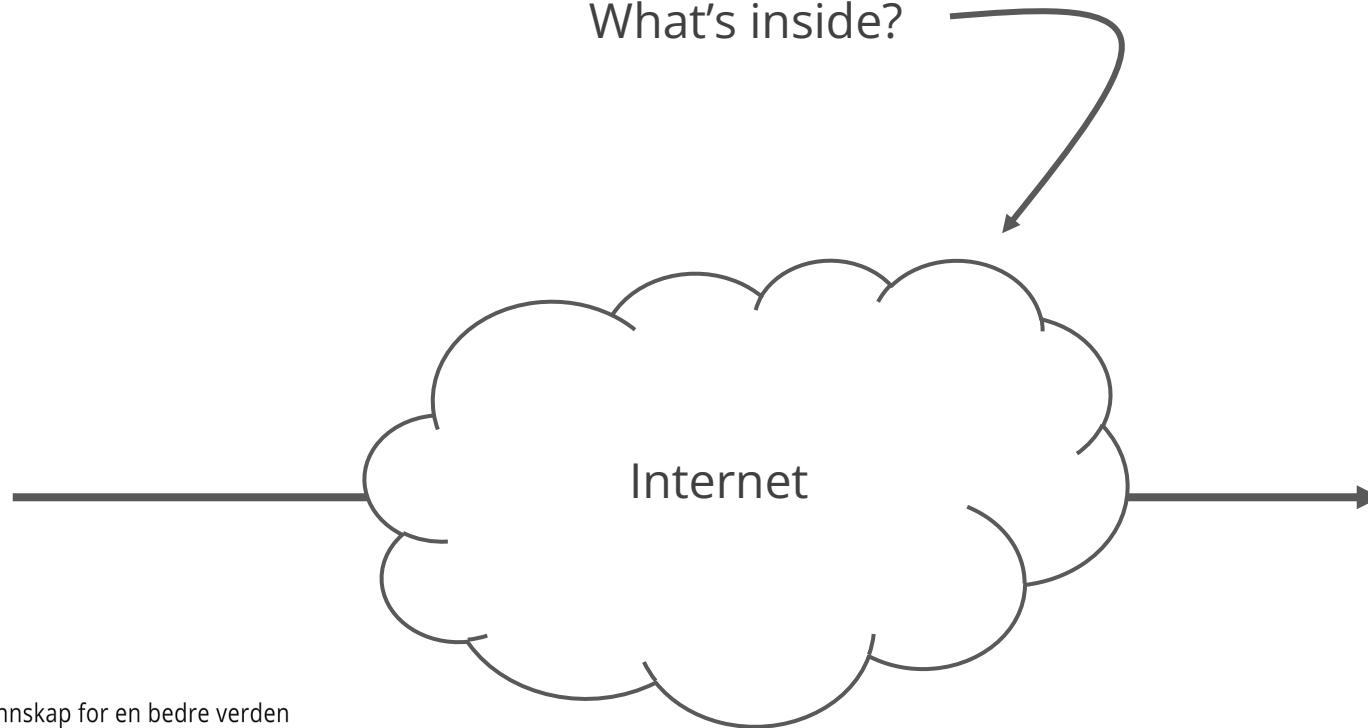
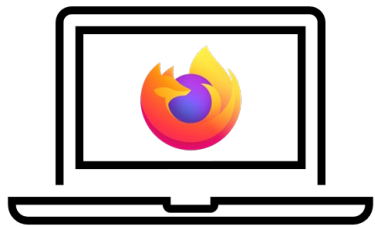


- Open a new tab
- Type in address
- Press enter
- Page appears

A lot of things happen behind the scenes here!

High-Level View

What's inside?

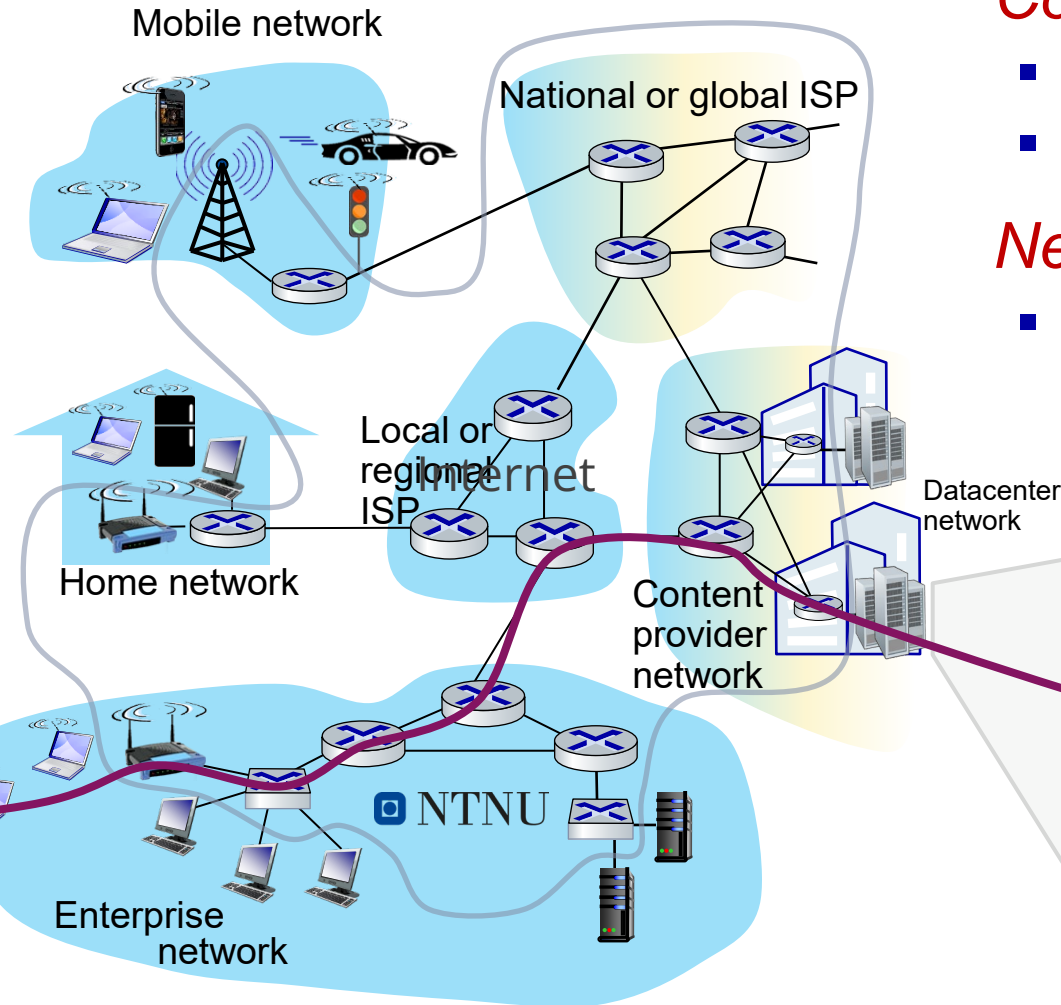


Internet Structure and Components

Billions of connected computing *devices*

- *Hosts* = end systems
- Running *network apps*

Packet switches and routers forward packets (= chunks of data)

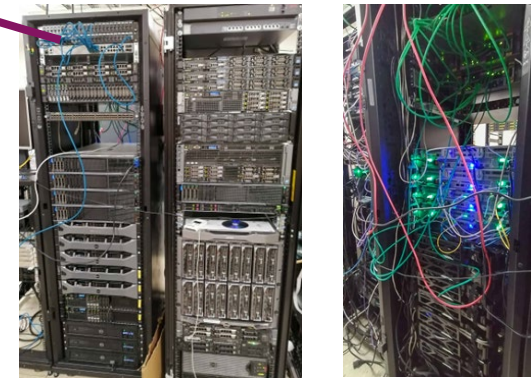


Communication links

- Fiber, copper, radio, satellite
- Transmission rate: *bandwidth*

Networks

- Collection of devices, routers, links: managed by an organization

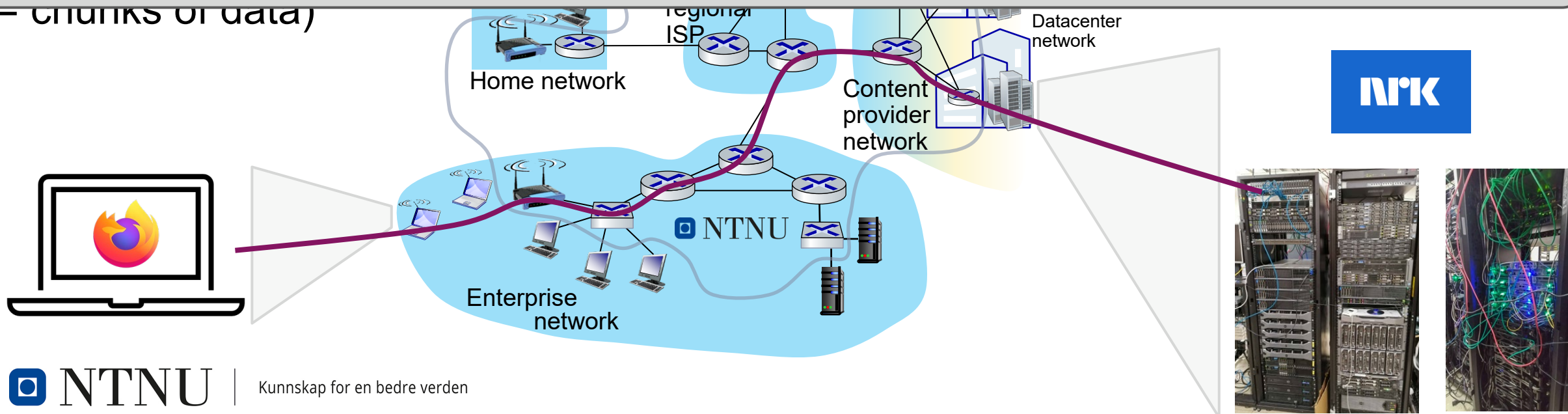


Internet Structure and Components

The Internet is a network of networks with many different devices, applications, and stakeholders

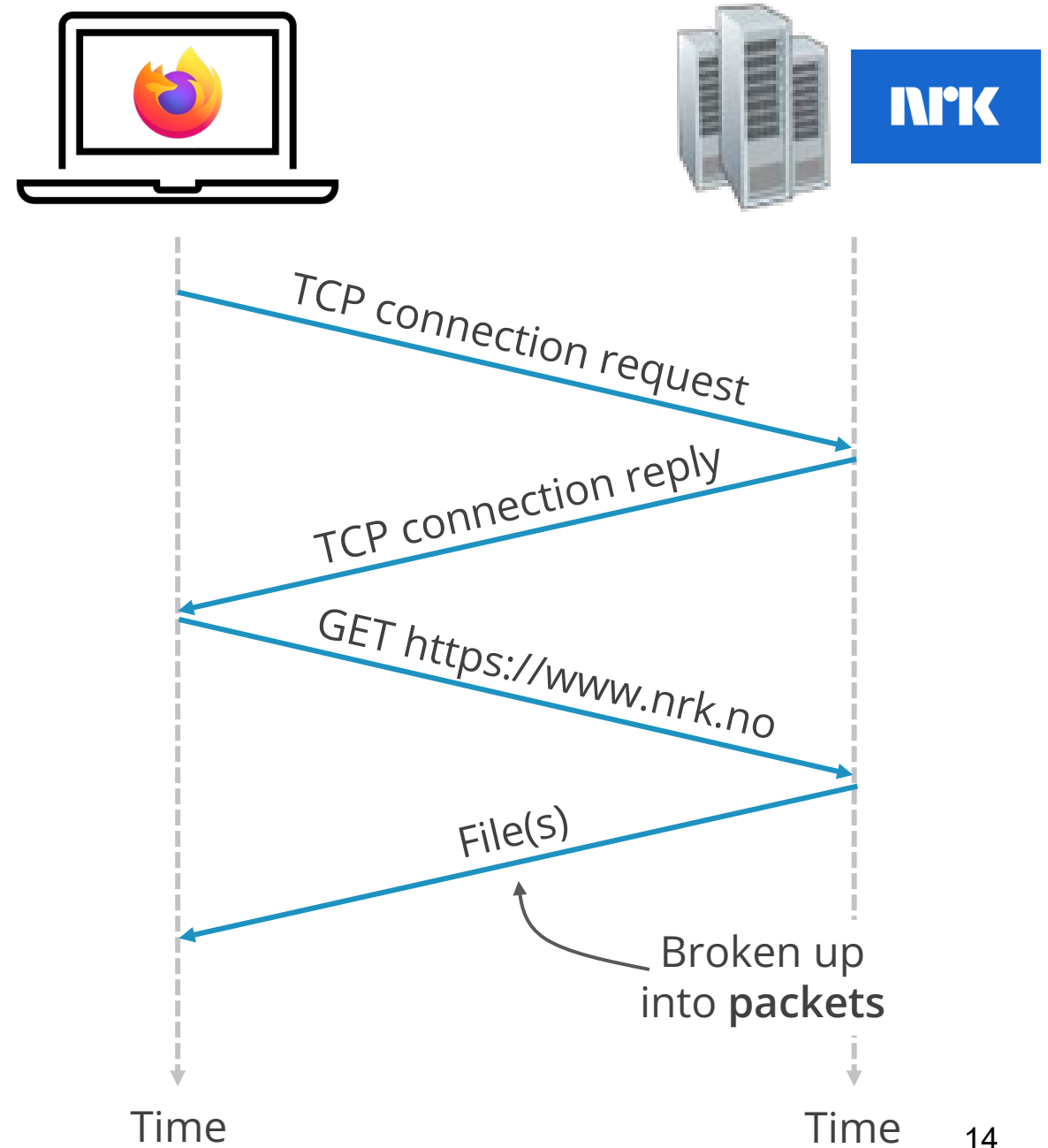
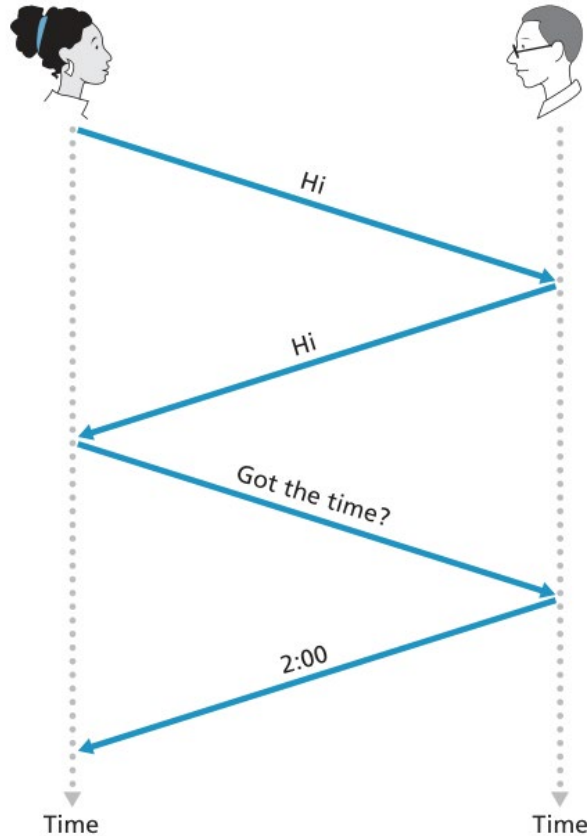
- ➔ How to exchange data in such diverse contexts?
 - Protocols
 - Addressing schemes

(= chunks of data)



Protocols

- Rules and format of information exchange



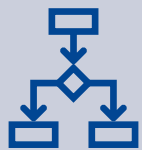
Internet Protocol (IP) Addressing



What is an IP address?



What does an IP address look like?



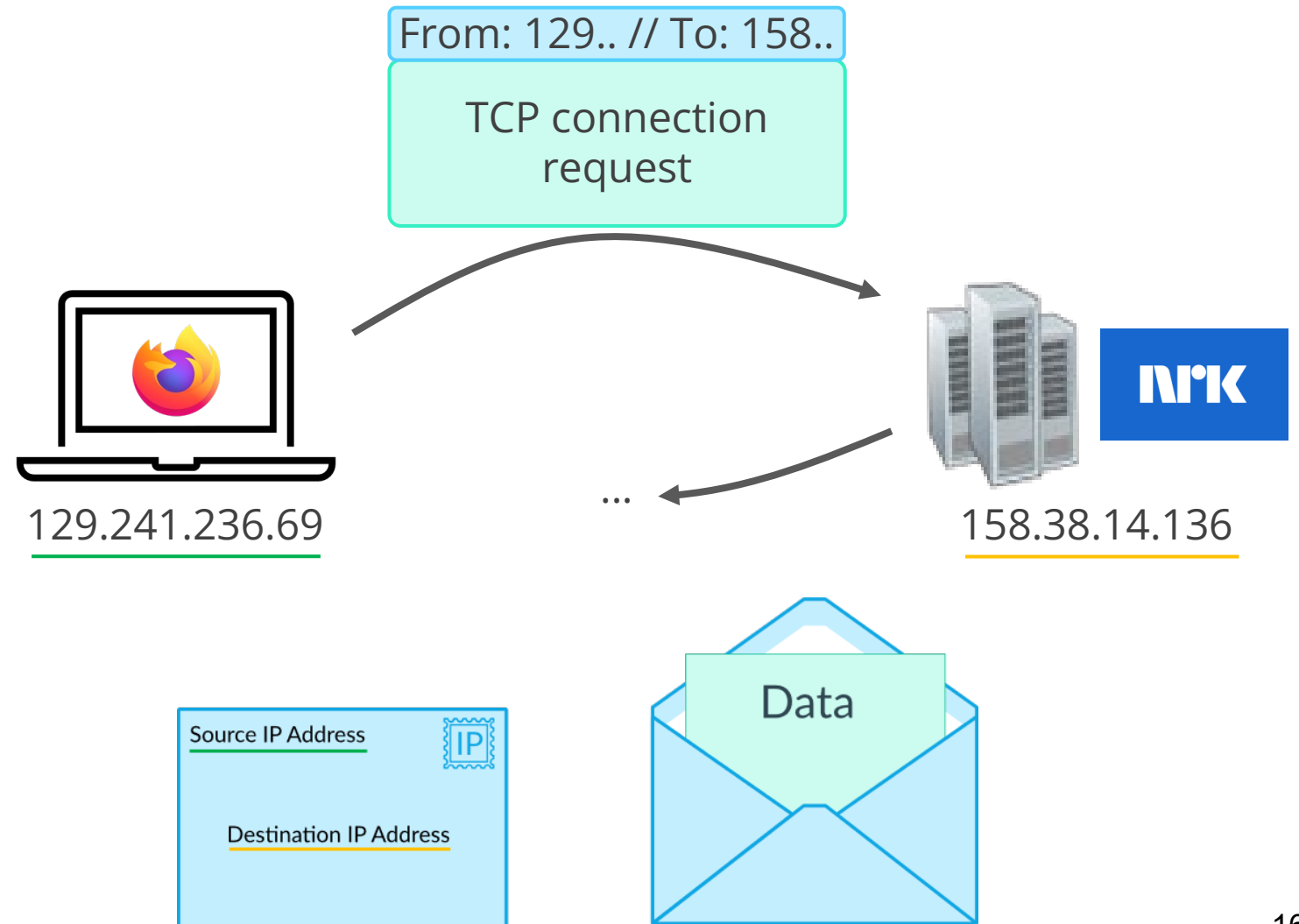
What types of IP addresses are there?

Your turn!



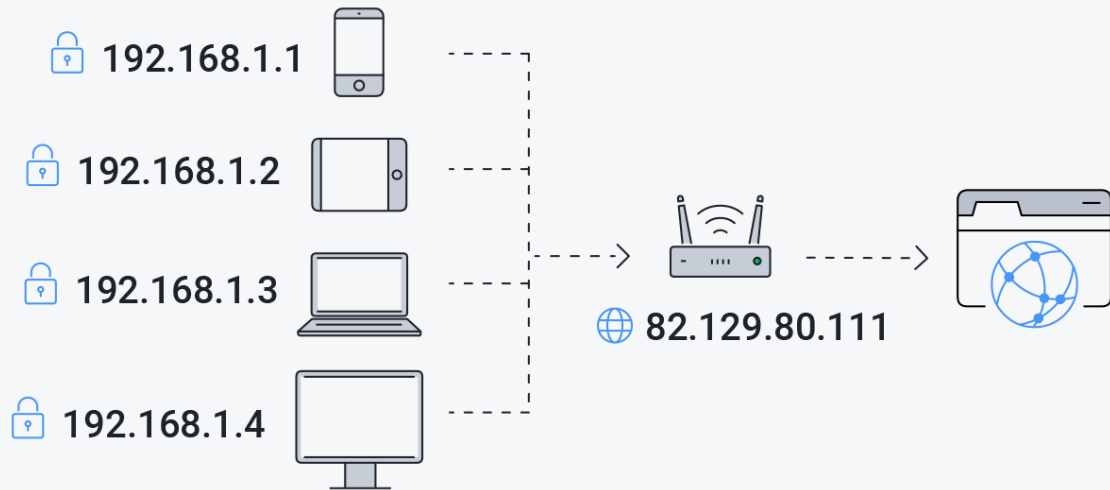
Internet Protocol (IP) Addressing

- Each Internet-facing device has a **globally unique** IP address



IP Address Types

Private (local) vs Public IP Addresses



IPv4 vs IPv6 Addresses

- v4: 32 bits in 4 blocks of 8 bits
 - Example: 158.38.14.136
 - ~4.3 billion unique addresses
- v6: 128 in 8 blocks of 16 bits
 - Example: fe80:0000:0000:0000:0215:5dff:feeb:5381
 - $\sim 3.4 \cdot 10^{38}$ unique addresses

IPv4 Address Structure

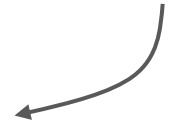
- 32 bits, four octets of 8 bits = 1 Byte each

158 . 38 . 14 . 136

$$(1 \cdot 2^7 + 0 \cdot 2^6 + 0 \cdot 2^5 + 1 \cdot 2^4 + 1 \cdot 2^3 + 1 \cdot 2^2 + 1 \cdot 2^1 + 0 \cdot 2^0 = 158)$$

- Range 0.0.0.0 – 255.255.255.255

More details on
binary ↔ decimal
conversion in week 35

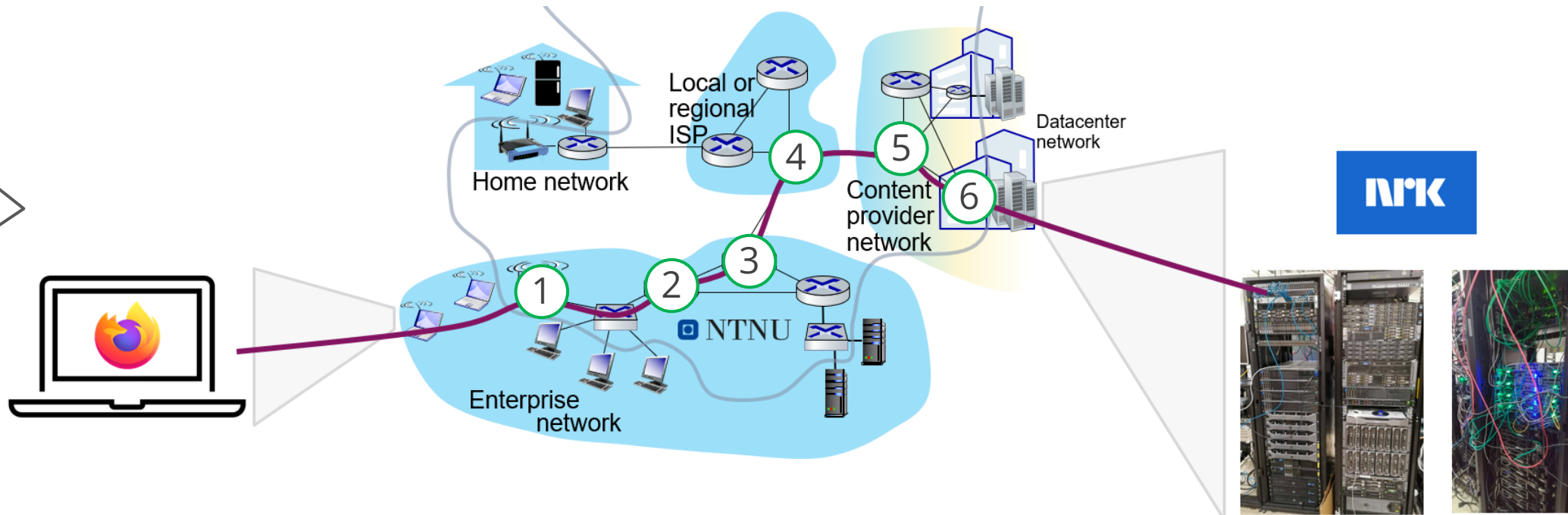


Traceroute

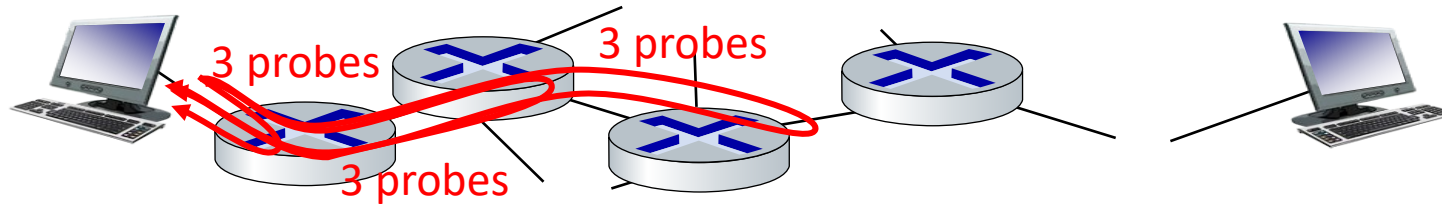
- Find out what way packets take to a destination
- Try it out!
 - On your machine: `tracert nrk.no`
 - Online: <https://s.ntnu.no/traceroute-map>

[> [how to open a terminal](#)]

How does it work?



Traceroute



IPv4 Address Structure

- 32 bits, four octets of 8 bits = 1 Byte each

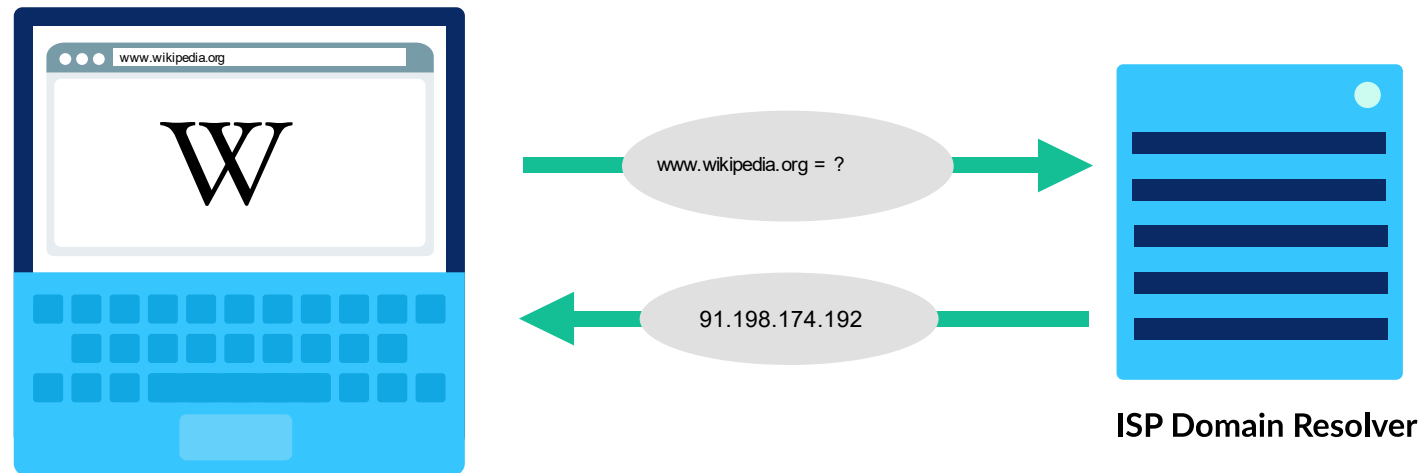
158 . 38 . 14 . 136
10011110 . 00100110 . 00001110 . 10001000

$$(1 \cdot 2^7 + 0 \cdot 2^6 + 0 \cdot 2^5 + 1 \cdot 2^4 + 1 \cdot 2^3 + 1 \cdot 2^2 + 1 \cdot 2^1 + 0 \cdot 2^0 = 158)$$

- Range 0.0.0.0 – 255.255.255.255
- **But:** how do we know where <https://www.nrk.no> is at?
 - ➔ Address resolution using the **Domain Name System (DNS)**

Domain Name System (DNS)

- Maps between easier-to-remember names and IPs
- **Distributed** database with trillions of daily requests
 - Performance, scalability, and security challenges!



Hands-on – IP and DNS

- Checking one's own IP address
 - Private: `ipconfig / ip / ifconfig`
 - Public: <https://www.showmyip.com/>
- Resolving IP address of a remote target
 - Operating system tools: `host, dig, nslookup`
 - Online tools: <https://www.nslookup.io/>

Hands-on – IP and DNS



Find your private IP address and compare with your team members / other teams. Do you notice a pattern?



Find your public IP address and do the same



When using your local DNS tools, which name server is used? Who owns it?



Try different DNS servers at nslookup.io – do you notice something when comparing the results for large services like netflix.com?

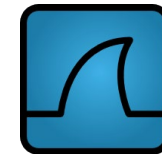


Demo: WiFi Access Point

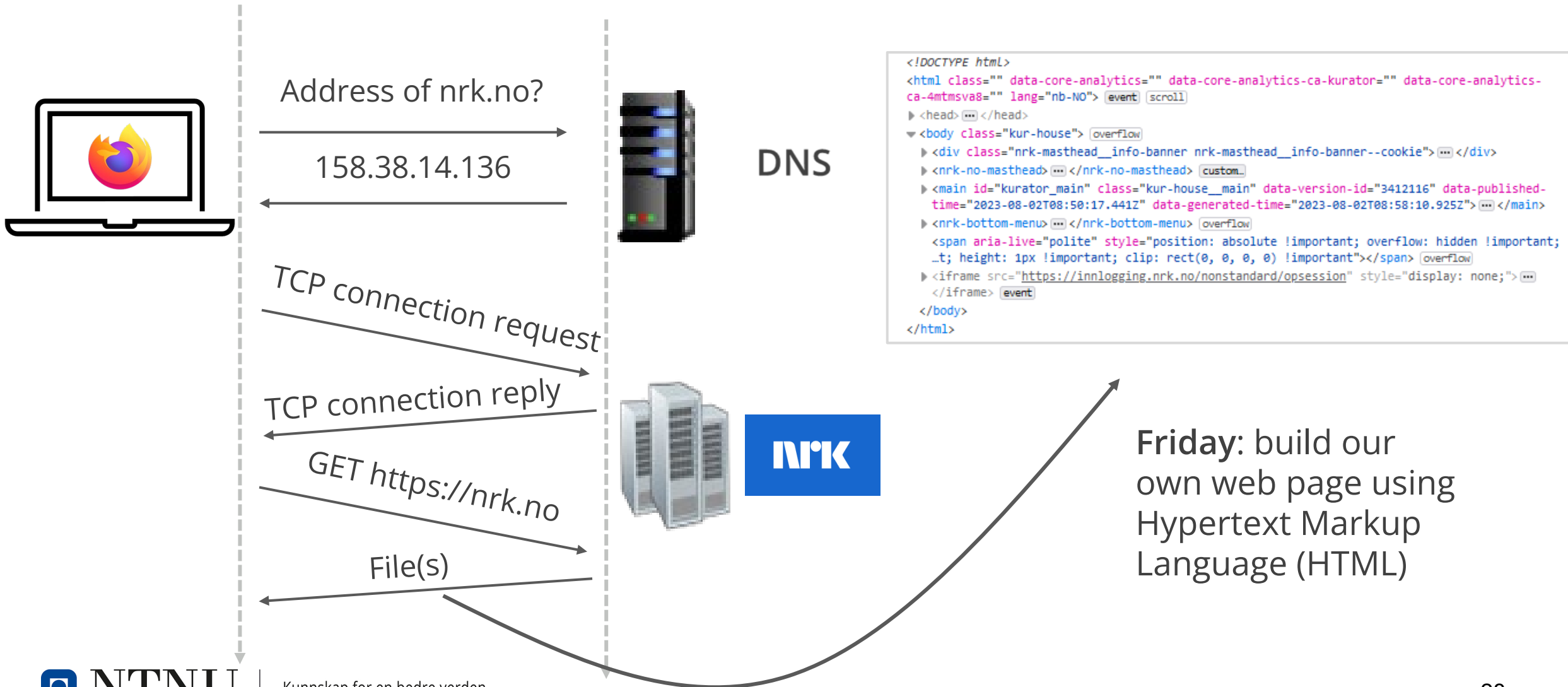
- Connect to network teknostart-wifi, password: teknostart23



- Provides IP address, DNS, Internet access
- Can monitor / redirect / alter / block traffic
- Inspection of traffic using Wireshark → Week 35



Summary and Outlook



Friday: build our own web page using Hypertext Markup Language (HTML)