

BTSF

Key concepts of Internet use — Diego RIVERO

Contract number 2017 96 05 – New Food Investigation Techniques –
Phase II - *Course 2a: E-Commerce of food standard*

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BTSF Course objectives: Key concepts

- Some general guidelines for investigation
- What's the Internet?
- Some concepts:
- Networking - TCP/IP
- Internet - How it's governed
- IP address
- DNS (Domain Name System)
- URL (Uniform Resource Locator)
- World Wide Web (www) vs Internet





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Course objectives



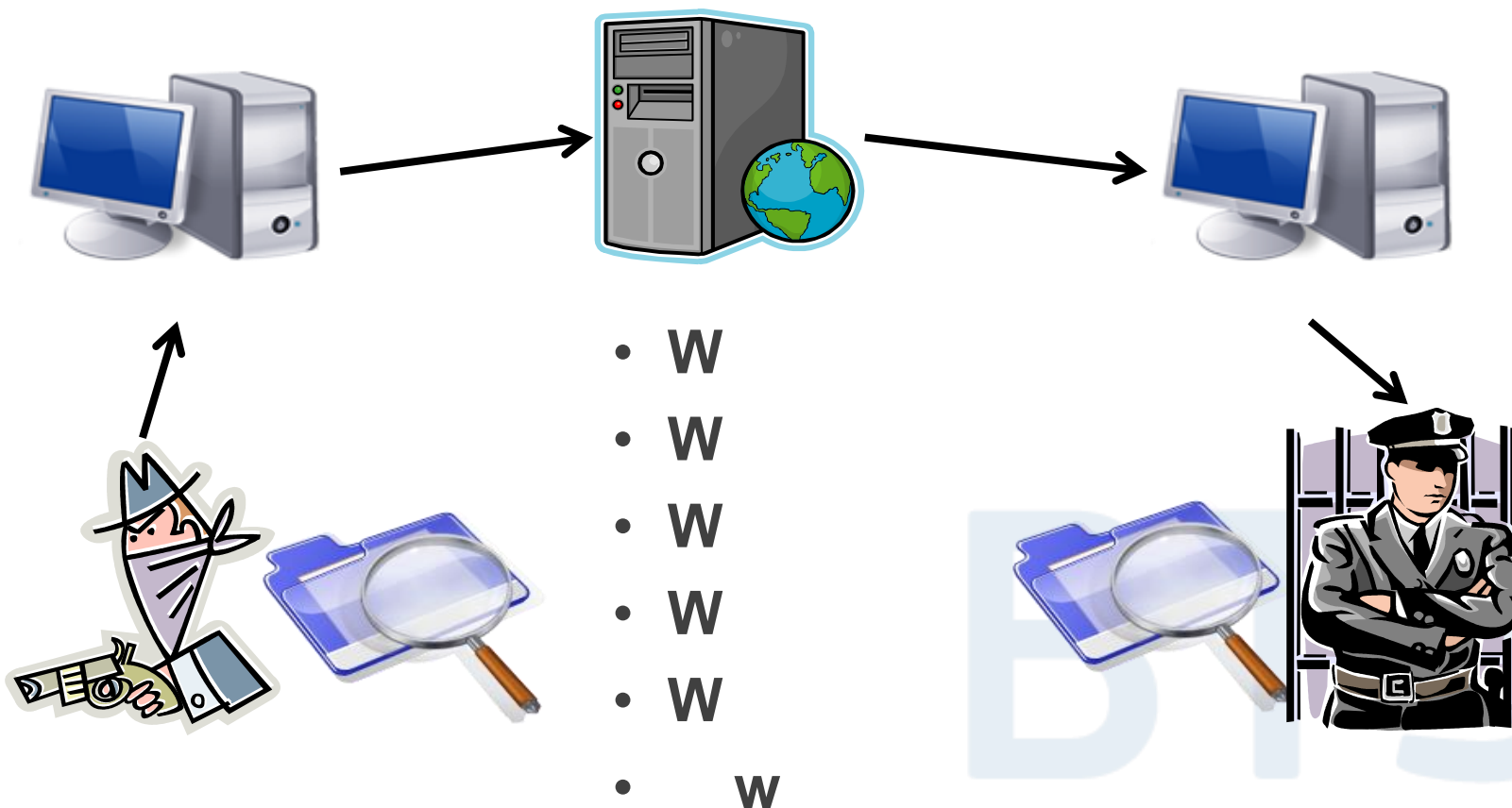
What do you expect from the course?

What experience and training have you on internet investigations?

BTSF Course objectives

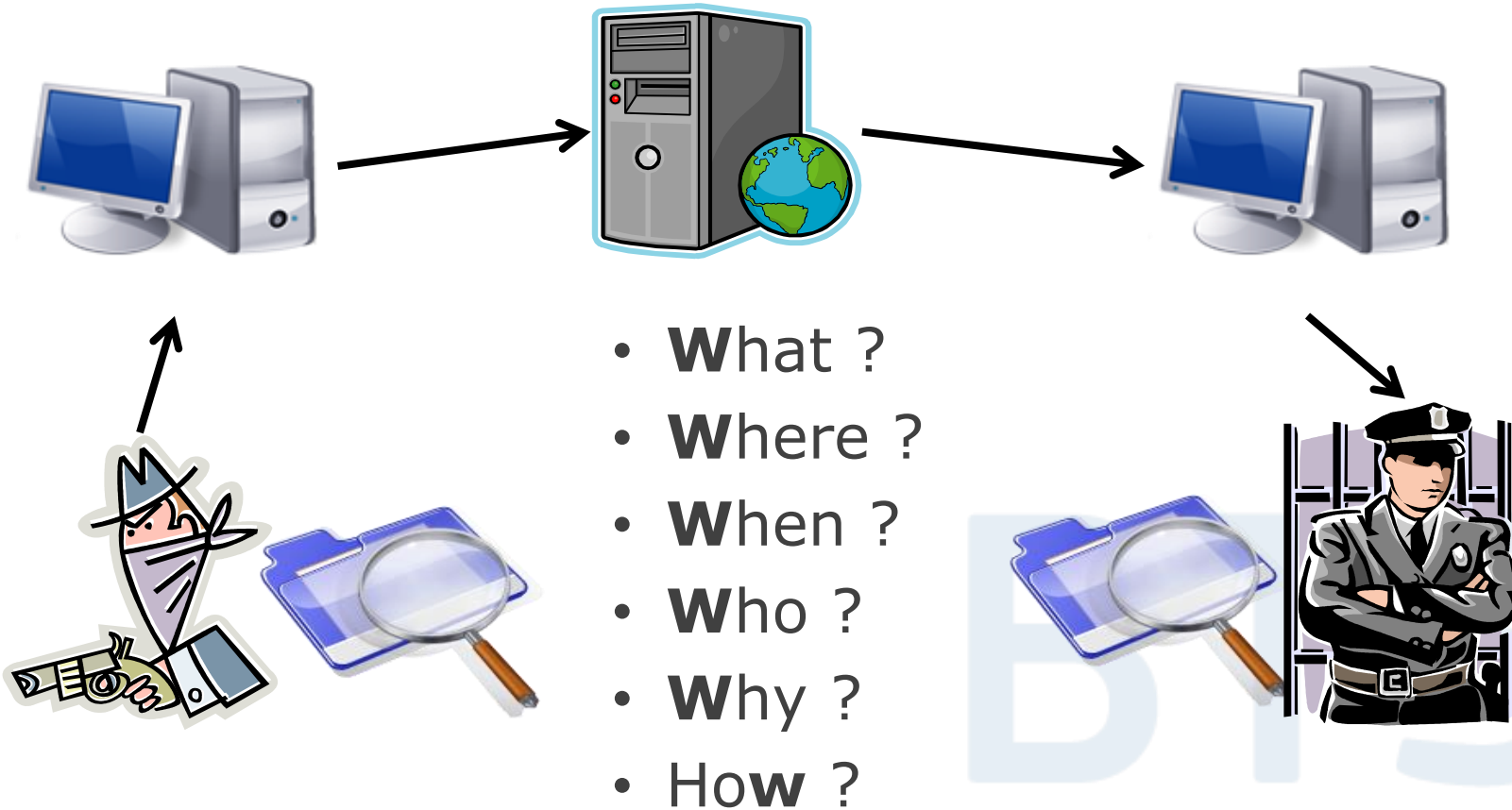
Internet TCP/IP
PC IP address protocol
router whois
proxy domain
ISP www
DNS URL HTML
HTTPS

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Just like any other investigation

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(but online)

BTSF Some general guidelines

- Planning and scope
- Investigation & evidence gathering
- Enforcement



BTSF Some general guidelines



Planning and scope

- 1. Select the sector/activities/irregularities to be analysed;
- 2. Share the knowledge and analysis criteria, and distribute tasks among the team members that will participate in the investigation;

BTSF Some general guidelines

Planning and scope

3. Identify and study the specific regulation on that sector/type of activity. Seeking of expert advice may be required (internal or external);
4. Get a general overview of online shops in order to choose the most relevant or representative ones of the sector/type of activity;



BTSF Some general guidelines

Investigation & evidence gathering

5. Analyse thoroughly the target websites, register the detected irregularities and collect evidence;

6. Create a summary report or record about the investigation and the key findings;



BTSF Some general guidelines



Enforcement

7. Initiate the enforcement procedure;
8. Carry out the corresponding enforcement actions following the corresponding authority's protocol and/or contact the competent body;
9. Follow-up the open cases.

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What is the Internet?

List of videos which summarise how the Internet was created and how it works:

<https://www.youtube.com/watch?v=Dxcc6ycZ73M&list=PLzdnOPI1iJNfMRZm5DDxco3UdsFegvuB7>

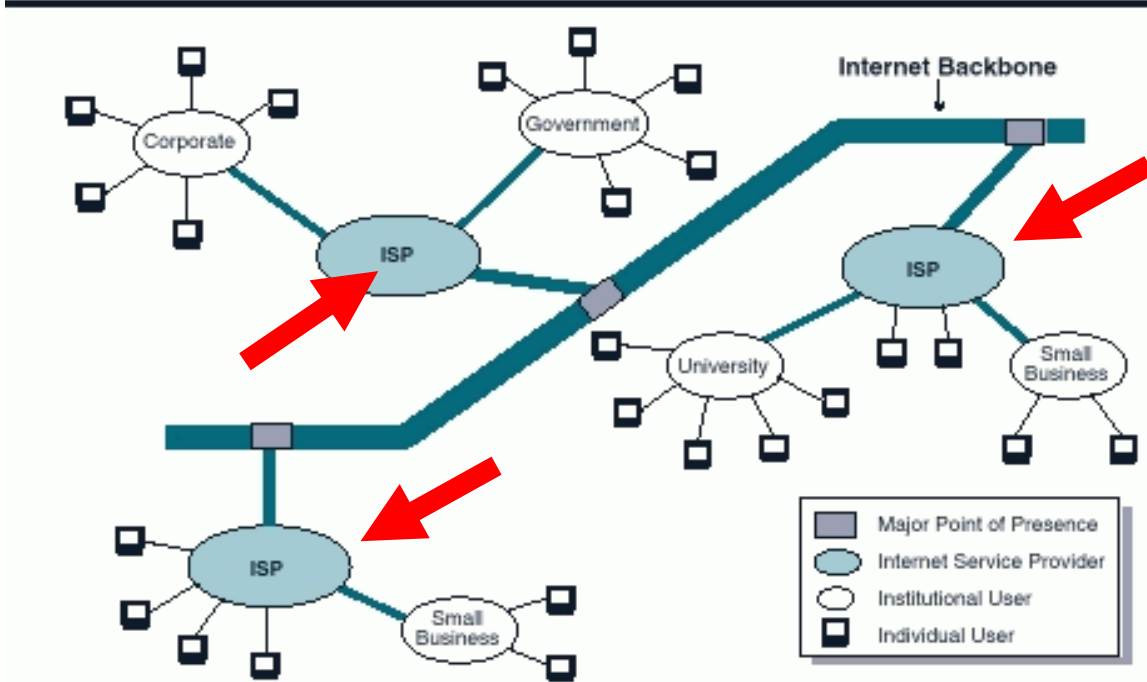
Map of submarine cable worldwide:

<https://www.submarinecablemap.com>

BTSF What is the Internet?

You can think Internet **like** a wire that interconnects computer networks...
.....**BUT**

Structure of the Internet



LAN – Local Area Network

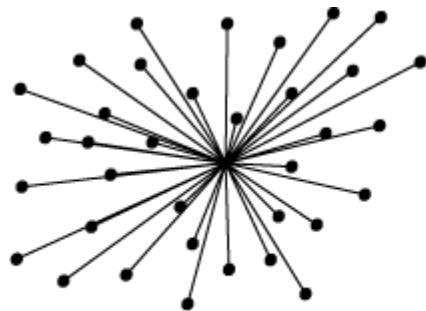
WAN – Wide Area Network

Internet – Worldwide WAN that connects local WANs and LANs

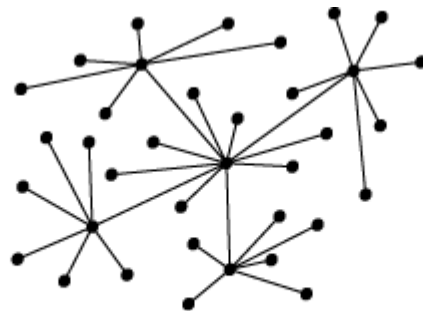
BTSF What is the Internet?

You can think Internet **like** a wire that interconnects computer networks...

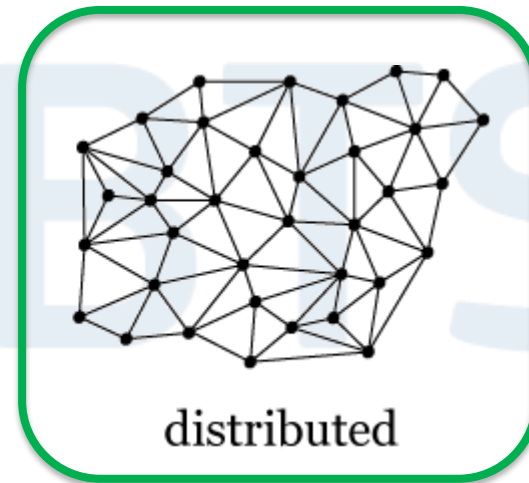
... it is not really a wire. It was designed as a **distributed network** which move pieces of data (packets) all over the world following certain rules (e.g. TCP/IP protocol).



centralised



decentralised



distributed

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What is the Internet?

- The main role of the network is to move data between two specific computers.

For such communication we require:

- The **addresses** of the origin and destination.
- A safe method of moving data in the form of signals.
- A set of rules so the communication is understandable (**protocols**)

Remember this for
later

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Important concepts about Internet...

- The Internet operates without a central governing body. However there are some standards worldwide admitted.
- The [Internet Engineering Task Force](#) (IETF), a non-profit organization, main activity is technical underpinning and standardization of the core protocols ([IPv4](#) and [IPv6](#)).
- To maintain interoperability, the principal [name spaces](#) of the Internet are administered by the [Internet Corporation for Assigned Names and Numbers](#) (ICANN).

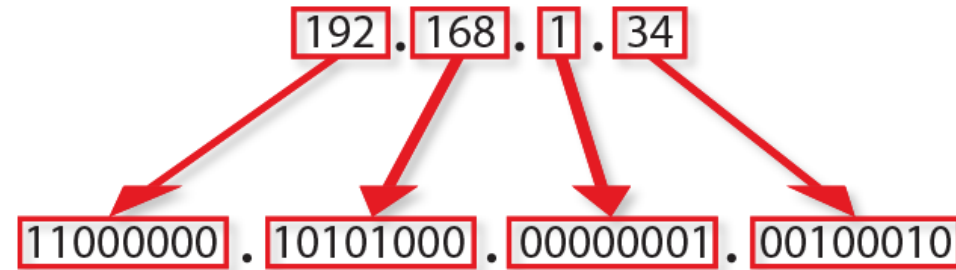
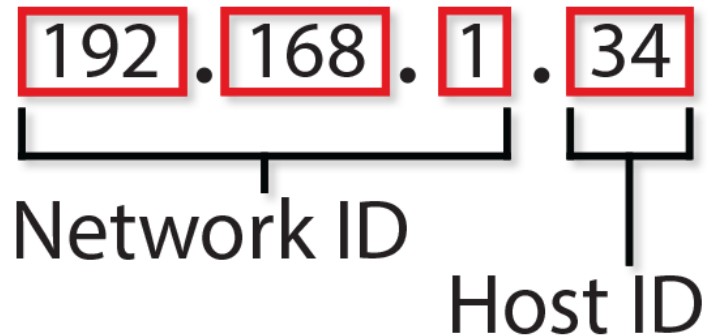
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We all need an address

- The IP address (Internet Protocol address)
 - Numerical label assigned to every device that identifies it in the network
 - Simply a way of connecting devices
 - Any format of data can be exchanged
 - Every device must have a unique ID/address (in the network it is connected)

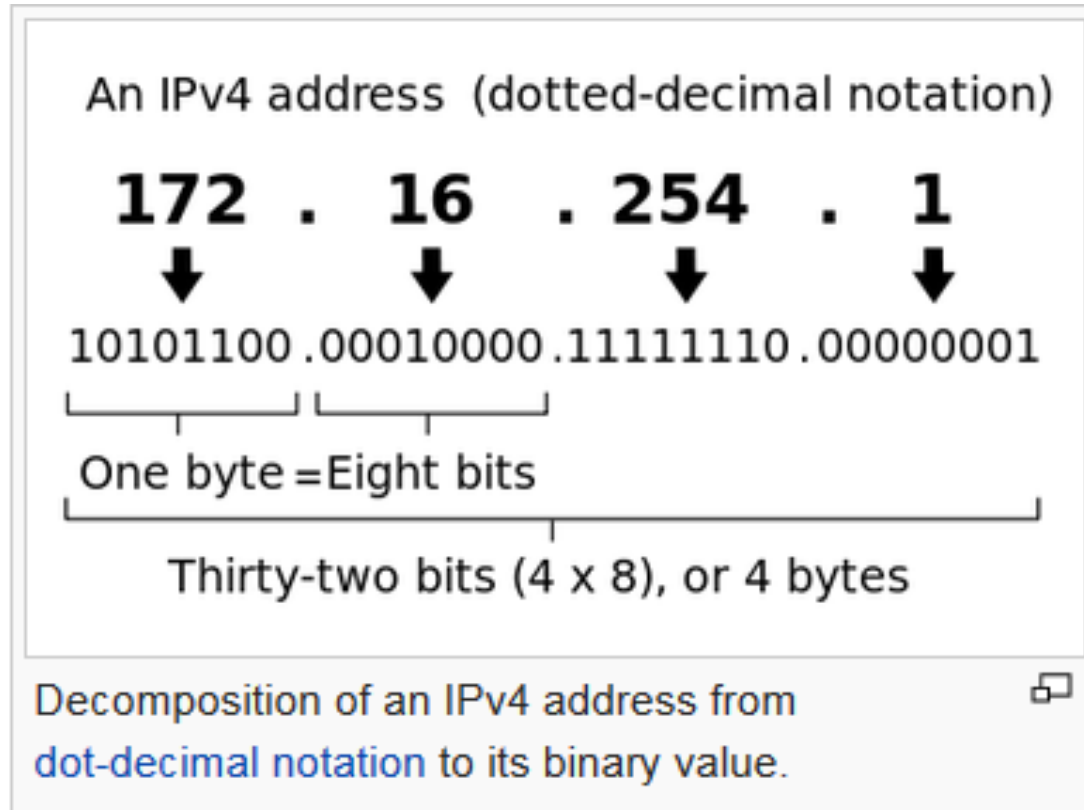
BTSF We all need an address

- IP address - Two principal information:
 - the specific network on which the device is located
 - the specific device on that network.



<https://www.howtogeek.com/341307/how-do-ip-addresses-work/>

BTSF The internet is big!



- There are two versions of IP addresses: v4 & v6
- IPv4 – 32 bit number
- (4,294,967,296 (2^{32}) possible unique addresses)
 - 4 numbers, range from 0-255
 - Each number represents 8 bits
 - (octet)
- In Feb-2011 all IPv4 addresses were used up

BTSF What supports IPv4



BTSF The internet is big!

- IPv6 – 128 bit number
 - (2^{128} (approx. 3.4×10^{38}) possible unique addresses)
 - The intent of the new design was not to provide just a sufficient quantity of addresses, but also redesign routing in the Internet by more efficient aggregation of subnetwork routing prefixes

- 8 groups of four hexadecimal digits (16 bits (2 octets)) separated by colons
- Example:

An IPv6 address (in hexadecimal)

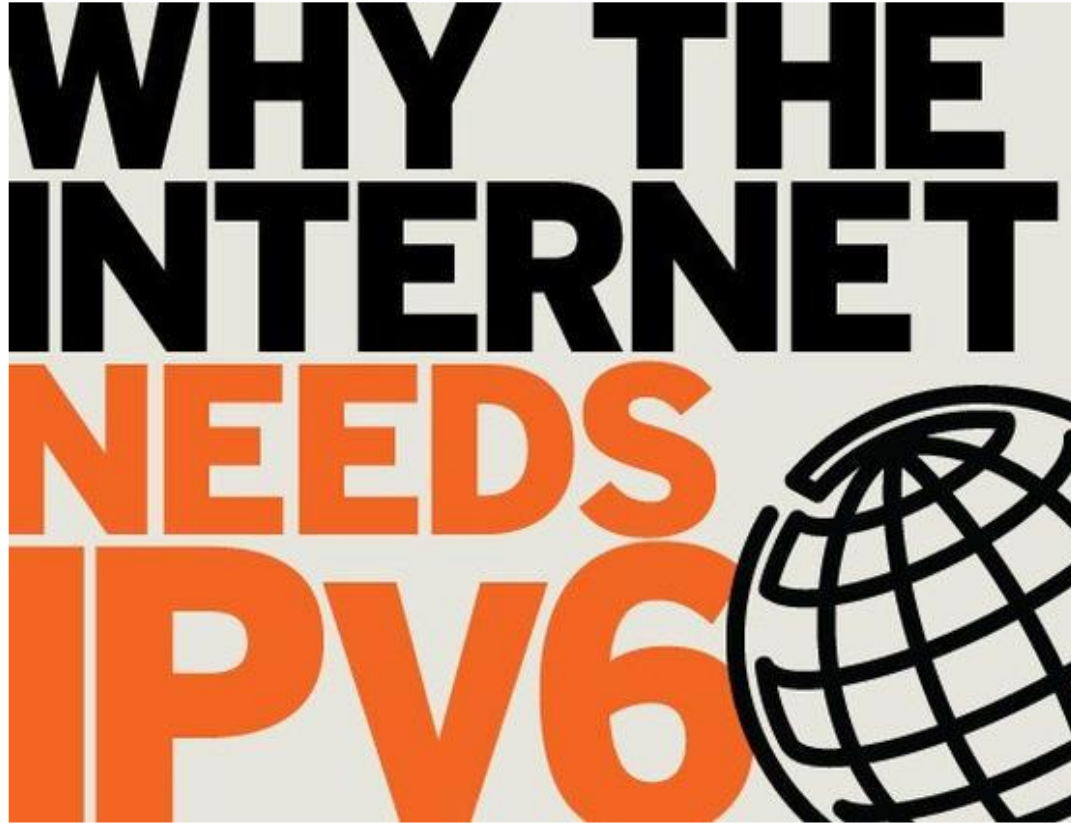
2001:0DB8:AC10:FE01:0000:0000:0000:0000

↓ ↓ ↓ ↓

2001:0DB8:AC10:FE01:: Zeroes can be omitted

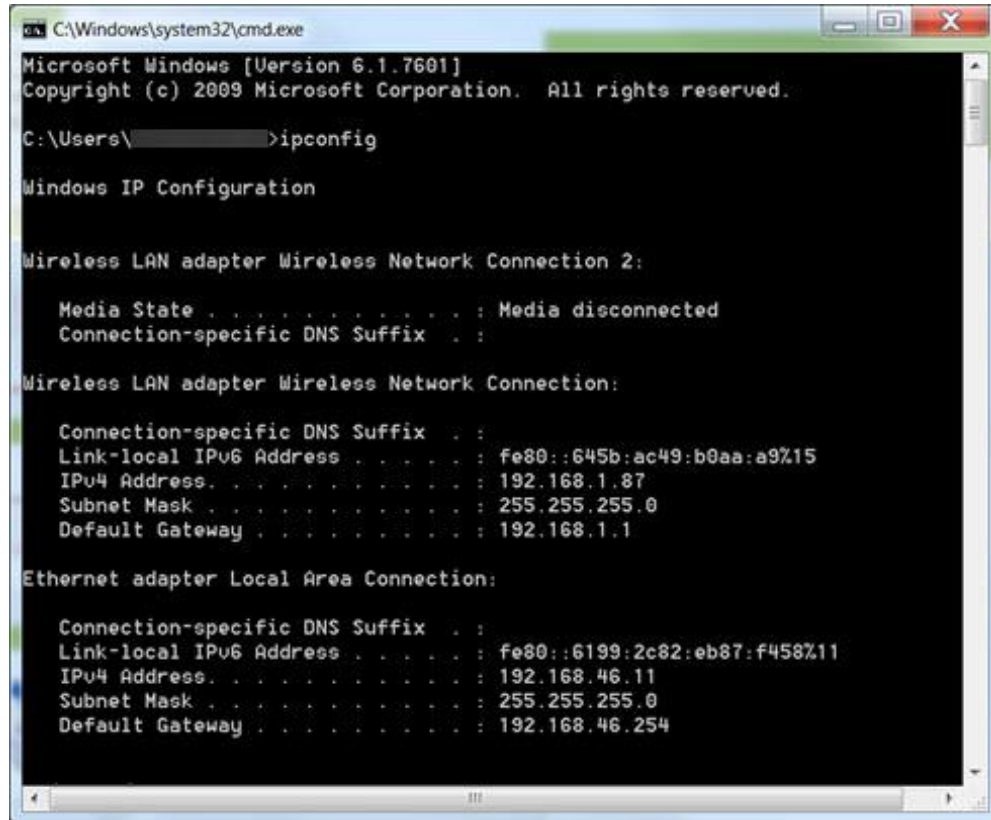
0010000000000001:0000110110111000:1010110000010000:1111111000000001:
0000000000000000:0000000000000000:0000000000000000:0000000000000000

BTSF What supports IPv6



- Internet
- VoIP
- IP – TV
- Wireless Mobile Technology
- Internet Broadcasting
- Internet of Things

BTSF A little exercise: our IP address



```
C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\>ipconfig

Windows IP Configuration

Wireless LAN adapter Wireless Network Connection 2:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Wireless LAN adapter Wireless Network Connection:

    Connection-specific DNS Suffix  . :
    Link-local IPv6 Address . . . . . : fe80::645b:ac49:b0aa:a9%15
    IPv4 Address. . . . . : 192.168.1.87
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.1.1

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . :
    Link-local IPv6 Address . . . . . : fe80::6199:2c82:eb87:f458%11
    IPv4 Address. . . . . : 192.168.46.11
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.46.254
```

On Windows:

Click on “start” and then “run” (old versions of Windows)

Type ‘cmd’

Type ‘ipconfig’

INTERNAL !!

BTSF A little exercise: our IP address

```
inet6 ::1 prefixlen 128
inet6 fe80::1%lo0 prefixlen 64 scopeid 0x1
inet 127.0.0.1 netmask 0xff000000
inet6 fe80::fa1e:dfff:feea:d544%en1 prefixlen 64 scopeid 0x5
inet 192.168.0.100 netmask 0xfffff00 broadcast 192.168.0.255
```

- On Mac:
- Launch the Terminal located in /Applications/Utilities/
- Type 'ifconfig'

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BTSF A little exercise: our IP address

That was my IP address of my network but..

And what is my “external” IP address, the one seen by other devices connected to the Internet?

- The IP of my device in the network?
- The IP of my router?
- The IP of my proxy?

Let's ask... a search engine?

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Where do IP address's come from?

- All devices **online** have an IP address
- Some are **static** (assigned by an administrator), some are **dynamic** (assigned by a server DHCP or software)
- **ISPs** (Internet Service Providers) have blocks of addresses which they generally allocate on a dynamic basis
- ISPs keep **logs** that can be useful... but difficult to get them (collect like evidence)

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IP address sounds simple but...

- Every device needs an IP address but there are much more devices than IP addresses available, so... how does it work?
- Most devices use same IP address in private (their own networks) that are translated into public IP address when connecting to Internet.
- As most devices don't need to have a permanent connection to others through Internet, we use intermediate devices that connect rest of devices to Internet (such as routers or proxy servers).

BTSF IP address sounds simple but...

Routers, Gateways, Proxies...

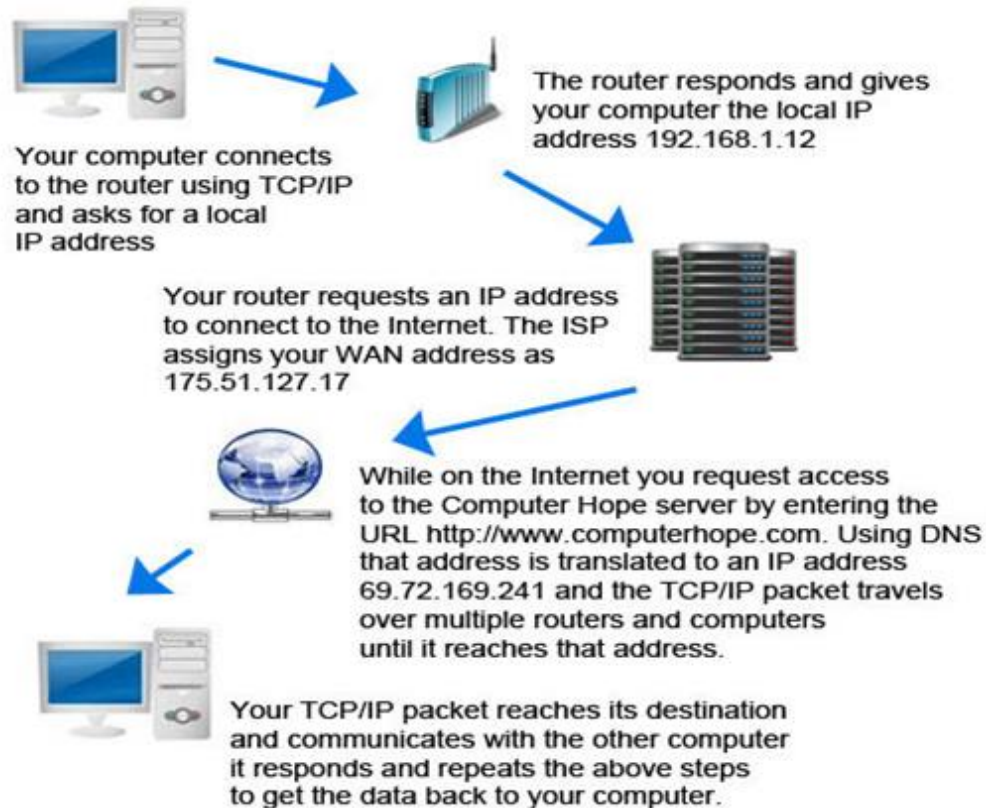
- They have public IP addresses (constant) to connect with other servers or gateways and they translate our private's IP addresses into a public one that can be used out of our network without collision with other private IP addresses.
- Have you understood anything? I hope so... but we are going to clarify concepts...

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IP address sounds simple but...

- Really, ISPs assure us that the devices connected to our internal network (company or home), are going to be capable to connect to Internet.
- ISPs manage a range of public IP addresses, assigned to them by IANA, that distribute into their clients. And ISPs servers manage connection with other ISPs networks and so on...
- But this range of IP addresses is limited...

BTSF Example



- Our ISP router/switch translates our private/internal IP address into a public of the IP addresses range they manage.
- In most of the cases, there is **no direct association of an exact physical geographical address or the computer associated with an IP address** that an end-user can do.

BTSF A little exercise: others IP address

On Windows:

- Click on “start” and then “run”
- Type ‘cmd’
- Type ‘ping’
<computername>

```
C:\>ping wikipedia.com

Pinging wikipedia.com [91.198.174.192] with 32 bytes of data:
Reply from 91.198.174.192: bytes=32 time=48ms TTL=53
Reply from 91.198.174.192: bytes=32 time=43ms TTL=53
Reply from 91.198.174.192: bytes=32 time=43ms TTL=53
Reply from 91.198.174.192: bytes=32 time=47ms TTL=53

Ping statistics for 91.198.174.192:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 43ms, Maximum = 48ms, Average = 45ms
```

Many online tools which might also help:

- Flagfox (<https://iplookup.flagfox.net>)
- Centralops

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BTSF Practice Case

01

Look for the info available about your public IP

02

Look for and compare the IP address of the site you chose with the command “ping”

03

Collect the following information of website *www.vitamaze.eu*

- IP Address
- Town/Country IP server located
- Name & address of ISP that hosts website

BTSF Internet domains Domain Name System (DNS)

- Web users can't remember IP addresses

54.230.61.220 vs www.amazon.de

- Servers have databases (domain name system, DNS) that match a web domain to an IP address, making the link in a fraction of a second.
- By providing a worldwide, distributed directory service, the DNS is an essential component of the functionality of the Internet.

BTSF Internet domains

Domain Name System (DNS)

- However, the domain names have several parts...

Example: `www.amazon.de`

- `www` = third level domain (subdomain)
- `amazon` = second level domain
- `.de` = top level domain (TLD)
- ... and not all the DNS servers have the information of all the domains.
- The DNS servers ask to each others to build the path so the connection reach the destination.

<https://www.youtube.com/watch?v=2ZUxoi7YNgs>

BTSF Internet domains

- **ICANN** (www.icann.org) together with other affiliates bodies such as IANA (www.iana.org) coordinates the assignment of unique identifiers for use on the Internet (such as domain names or (IP) addresses).
- **ICANN** delegates in regional/national bodies the administration of domain names, normally supported by agents (private companies that offer the domain registry service).

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- Different bodies/agents for different top-level domains, including generic TLDs (gTLD) such as .com, and country-code TLDs (ccTLD) such as .sk.
- A relatively new range of generic TLDs was introduced:

.africa .christmas .lol .soy
.bar .doctor .gift .organic .онлайн
.移动

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Internet domains Uniform Resource Locator (URL)

Example: <http://www.amazon.de>

- www = third level domain (subdomain)
- amazon = second level domain
- .de = top level domain (TLD)

The country top level domain (ccTLD) .de

- ... what does it mean?

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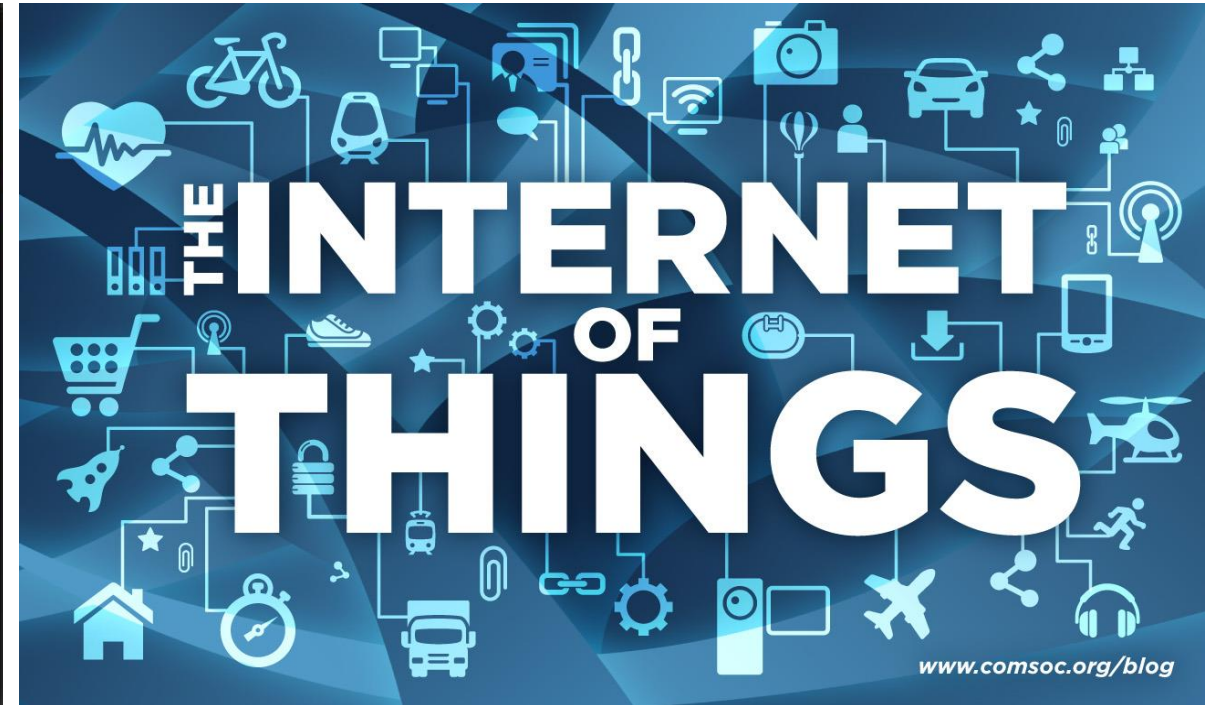
Internet domains Uniform Resource Locator (URL)

- The elements used in the web are called resources (e.g. webpages, images, videos).
- A URL is a reference to a web resource that specifies its location on a computer network and a mechanism for retrieving it
- A typical URL could have the form <https://www.example.com/index.html>
 - a protocol (http, https)
 - a hostname (www.example.com)
 - a file name (index.html)

BTSF The World Wide Web is NOT the Internet



BTSF The World Wide Web is NOT the Internet



BTSF But Internet is much more...





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Recap

- **Internet** is a worldwide wide area network that interconnects computer networks.
- Over the Internet work [several services](#) like: www, ftp, email, private networks, etc.

Some of them less accessible than others.

- **Protocols** set the rules for communication make data run on the networks. Each protocol has its function (tcp, ip, http, ftp, smtp)

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Recap

- **IP address:** host and network identification and location addressing.
 - Static IP addressing is for one customer on one IP address.
 - Dynamic IP addressing assigns a different IP address each time the ISP customer logs on to their computer.
 - There is no method of associating an exact physical geographical address or the computer associated with an IP address that an end-user can do.





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Recap

- Humans cannot remember easily IP addresses, **domain names** are used instead.
- **DNS** (the “phone book” of the Internet) translates human-friendly computer hostnames into IP addresses. Essential component of the functionality of the Internet.
- **URL** is a reference to a web resource that specifies its location on a computer network and a mechanism for retrieving it.
- **Internet** is more than the **World Wide Web**.

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Thank you

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