



May 2019, IPT Course
Java Web Development

World Wide Web

Trayan Iliev

tiliev@iproduct.org

<http://iproduct.org>

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About me



Trayan Iliev

- CEO of IPT – Intellectual Products & Technologies
- Oracle® certified programmer 15+ Y
- end-to-end reactive fullstack apps with Java, ES6/7, TypeScript, Angular, React and Vue.js
- 12+ years IT trainer
- Voxxed Days, jPrime, jProfessionals, BGOUG, BGJUG, DEV.BG speaker
- Organizer RoboLearn hackathons and IoT enthusiast (<http://robolearn.org>)

Internet (1)

- Internet – history and development:

- ARPANet – 1968

- Development of a suit of protocols for global host addressing and routing – **TCP/IP** – 1973 г.

- Divided to ARPANet and MILNET, **Domain Name System (DNS)** – 1983 г.

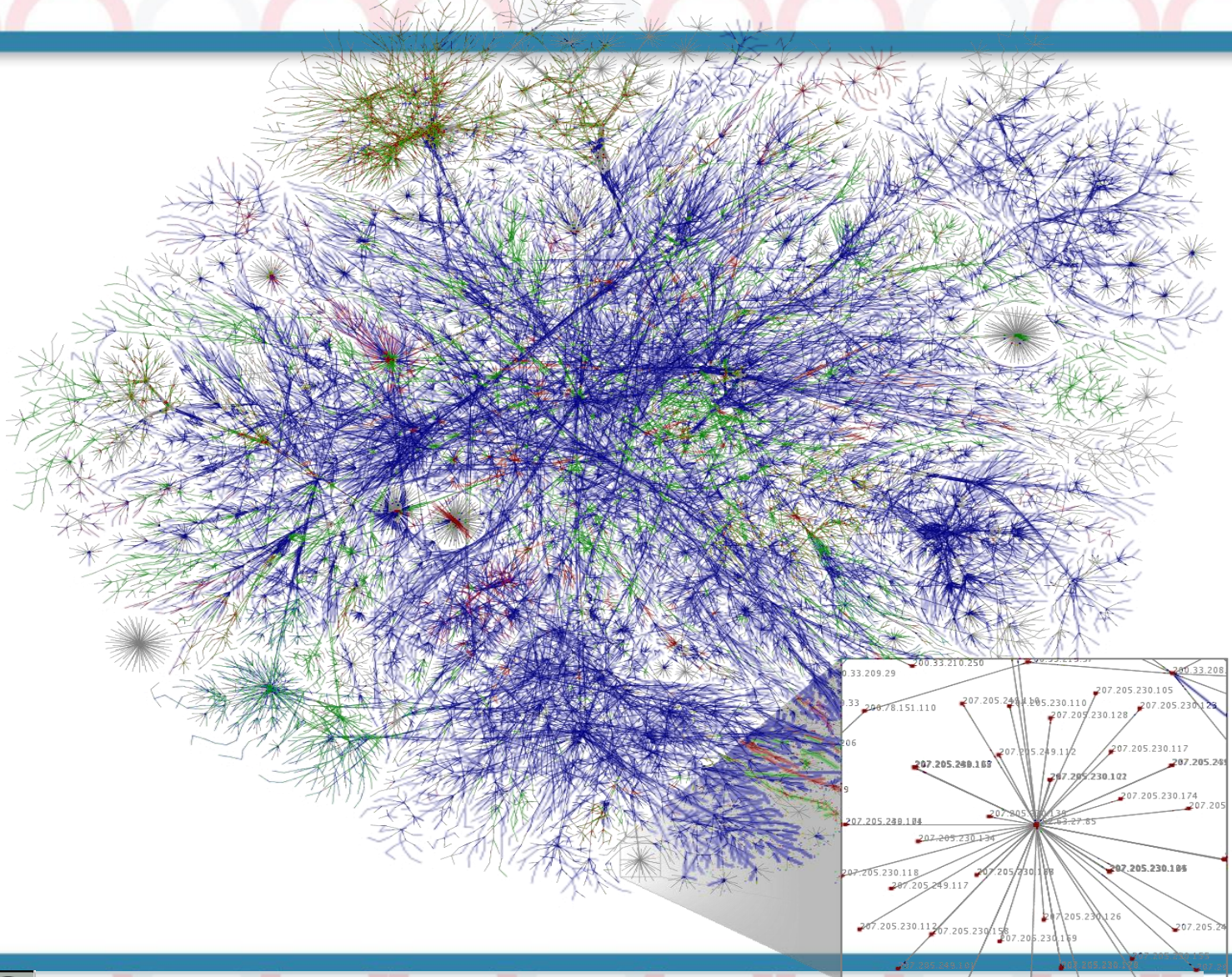
- NSFNET, high-speed T1 communication lines (1.544 Mbps) – 1986 г.

- Internet Society – 1992 г.

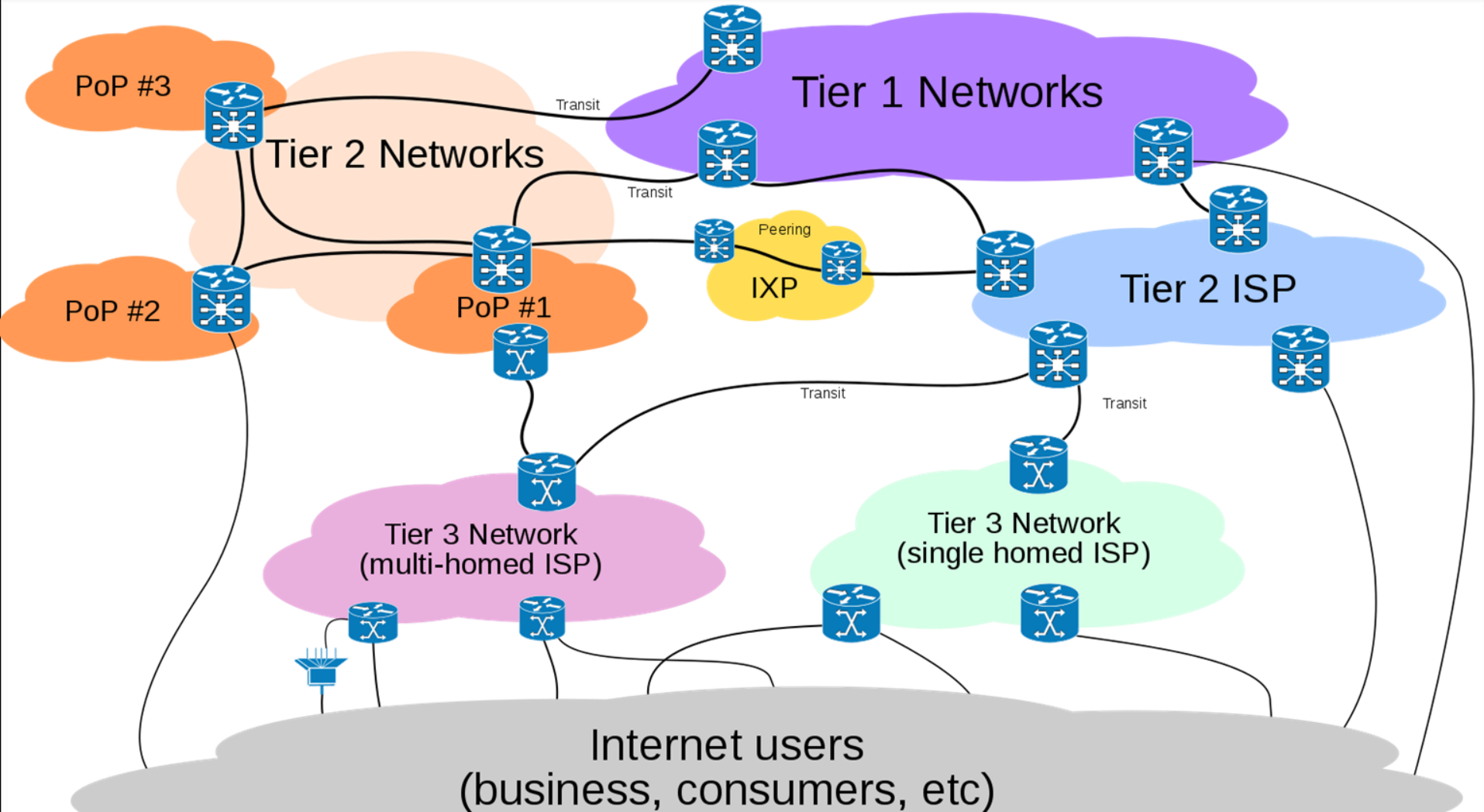
Internet (2)

- Internet Society:
 - Internet Architecture Board (IAB)
 - Internet Engineering Task Force (IETF)
 - Internet Research Task Force (IRTF)
 - Request for Comments (RFC)
- Challenge for you: find what is the purpose of RFC 1118
- Internet Corporation for Assigned Names and Numbers (ICANN)
- Perspectives – cloud computing, SaaS, PaaS, IaaS

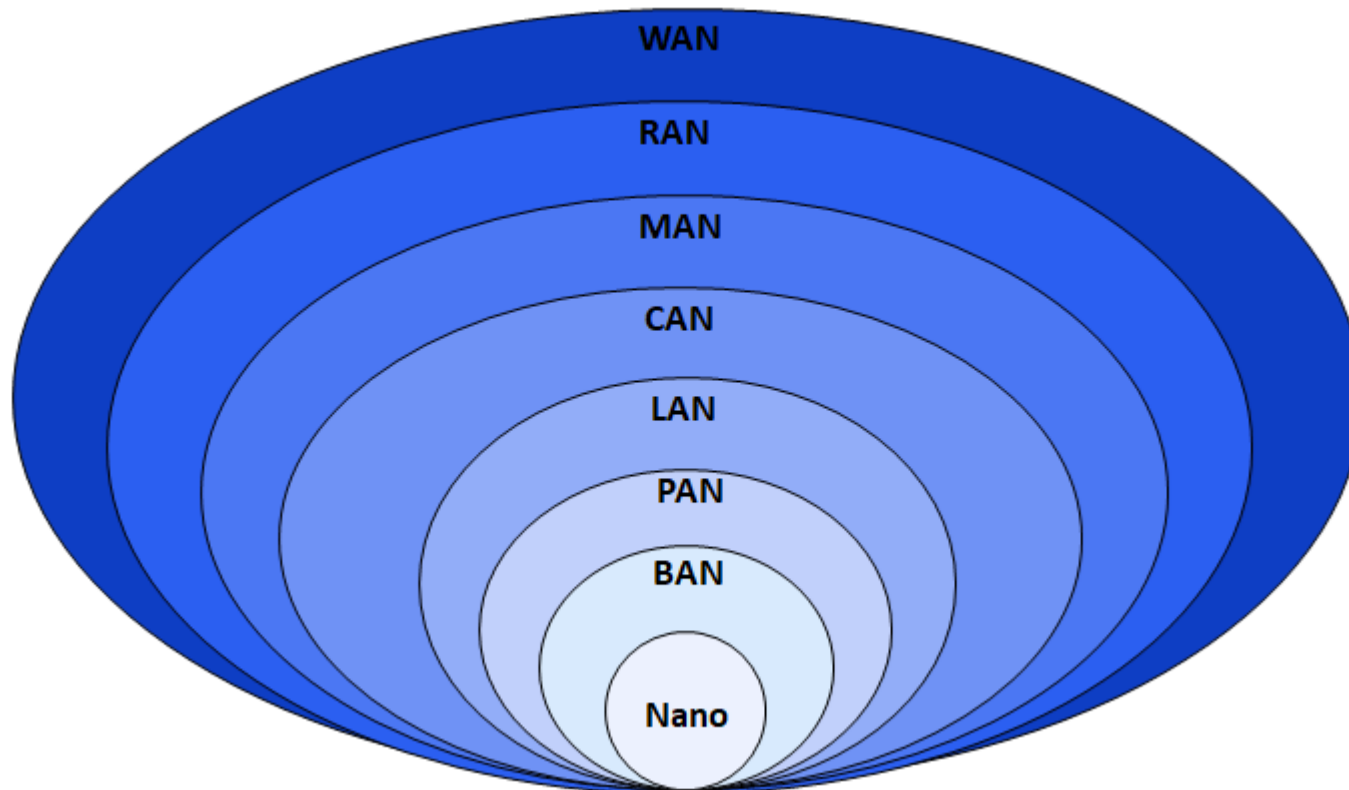
Internet Routes Partial Visualization (2005)



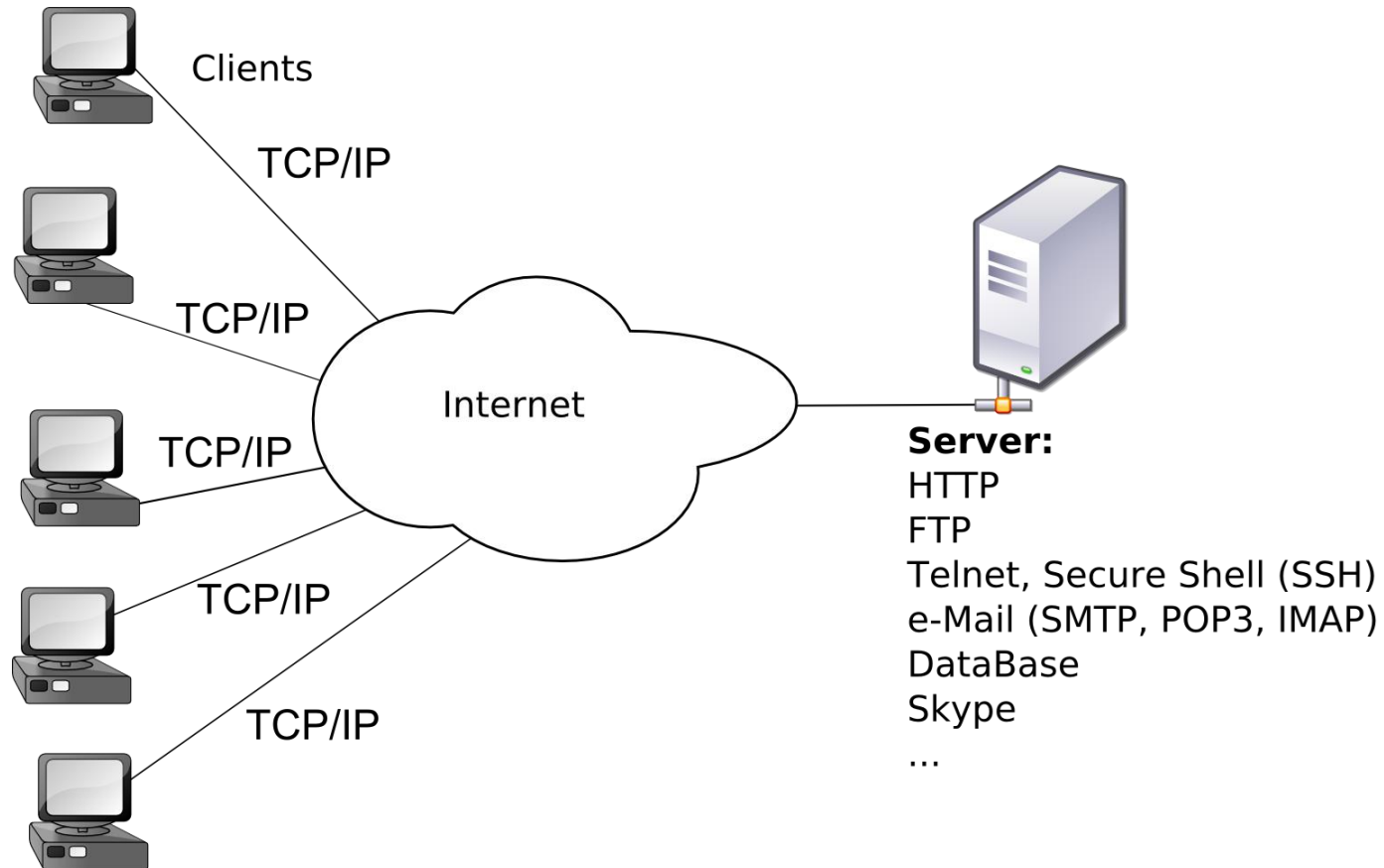
Internet Multi-Tiered Architecture



Types of Networks (by Skope)



Client-Server Architecture



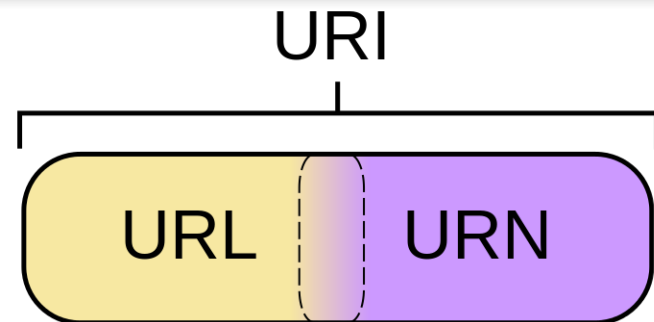
Types of Servers

- Email server
- Web server – e.g. Apache HTTPD
- Domain Name System (DNS) Server
- Database server
- File Server – e.g. FTP, SSH, or NFS
- Application Server – serving different types of web applications and services (XML, REST)



URLs, IP Addresses, and Ports

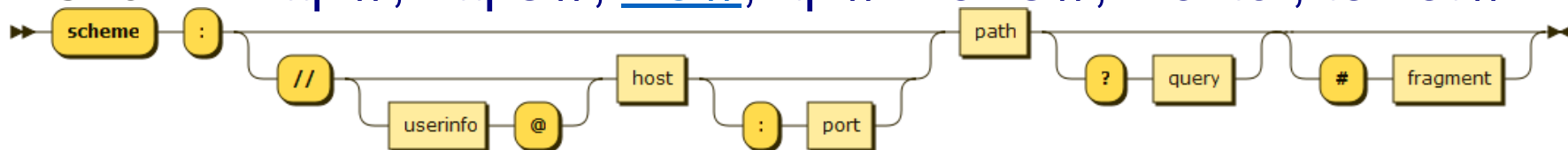
- Uniform Resource Identifier - URI:
 - Uniform Resource Locator – URL
 - Uniform Resource Name – URN



- Формат:

`scheme://domain:port/path?query_string#fragment_id`

- Схеми: `http://`, `https://`, `file://`, `ftp://`, `news://`, `mailto:`, `telnet://`



- Пример:

`http://en.wikipedia.org/wiki/Uniform_resource_locator#History`

URL Structure (1)

Each URL can include following elements (ordered):

- **schema (protocol) type** – defines how the resource will be accessed – e.g.: http, https, file, ftp, news, mailto, telnet, etc. (HOW?)
- **://**
- **host name (Network computer)** – can be domain or IP address, defines the server computer (host) where the resource is deployed (WHERE?)
- **:port number (незадължителен)** – defines the service on that host (e.g. Web server is on port 80 by default)
- **full path to the resource on the server** – for example:
/wiki/Uniform_resource_locator (WHAT?)

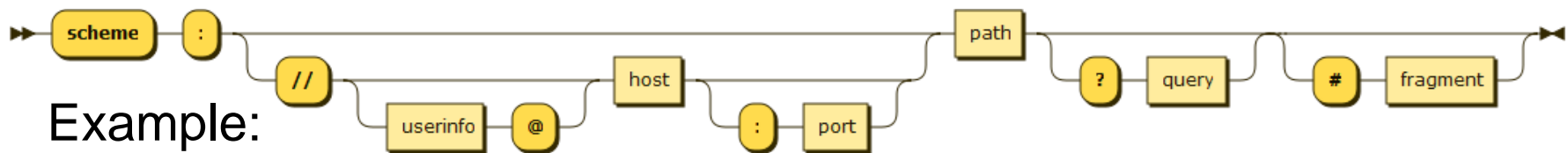
URL Structure (2)

URLs pointing to **dynamic resources** (CGI scripts, Java Servlet / JSP, ASP, PHP, etc.) often include:

- **?**list of request query parameters (query string) – e.g.:
?courseId=1211&role=student
- **#**fragment identifier – defines the fragment (part) of the resource we want to access, used by asynchronous javascript page loading (AJAX) applications to encode the local page state – e.g. **#view=fitb&nameddest=Chapter3**

The whole syntax is:

scheme://domain:port/path?query_string#fragment_id



Example:

http://en.wikipedia.org/wiki/Uniform_resource_locator#History

Relative URI/URLs (URI References)

- URLs can be **absolute** (by fully specifying how to access the resource) and **relative** (defining only the differences from the currently accessed resource URL)
- Examples for relative URLs:
(http://en.wikipedia.org/wiki/Uniform_resource_identifier):
- [//example.org/scheme-relative/URI/with/absolute/path/to/resource.txt](#)
- [/relative/URI/with/absolute/path/to/resource.txt](#)
- [relative/path/to/resource.txt](#)
- [../.../resource.txt](#)
- [./resource.txt#frag01](#)
- [resource.txt](#)
- [#frag01](#)

IP Version 4 Addresses

An IPv4 address (dotted-decimal notation)

172 . 16 . 254 . 1



10101100.00010000.11111110.00000001

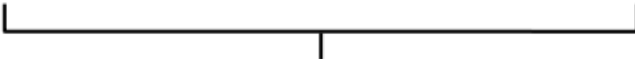
One byte=Eight bits




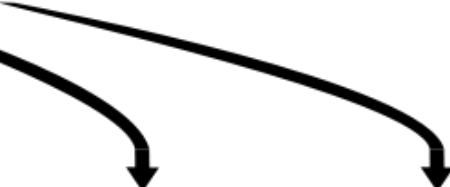
Thirty-two bits (4 x 8), or 4 bytes

IP Version 6 Addresses

An IPv6 address (in hexadecimal)

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

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

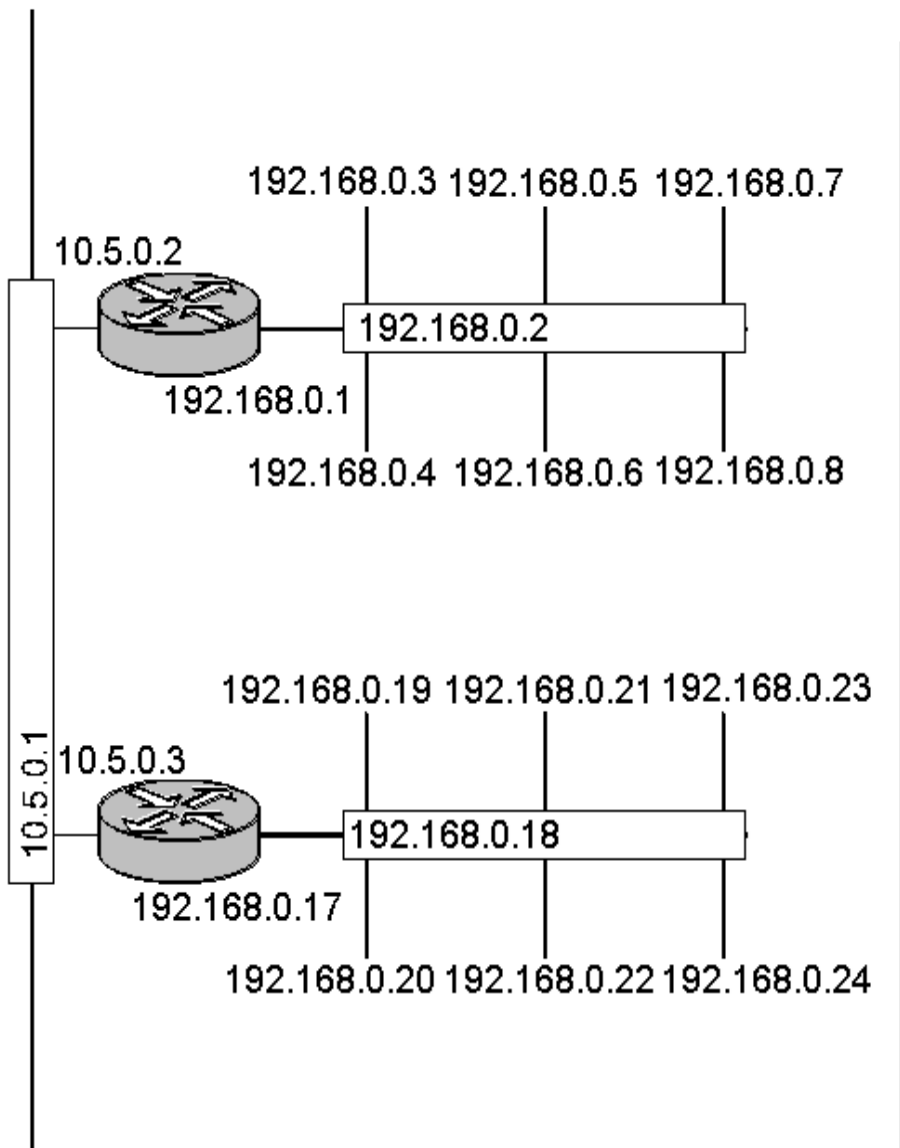
   

10000000000001:0000110110111000:1010110000010000:1111111000000001:
0000000000000000:0000000000000000:0000000000000000:0000000000000000

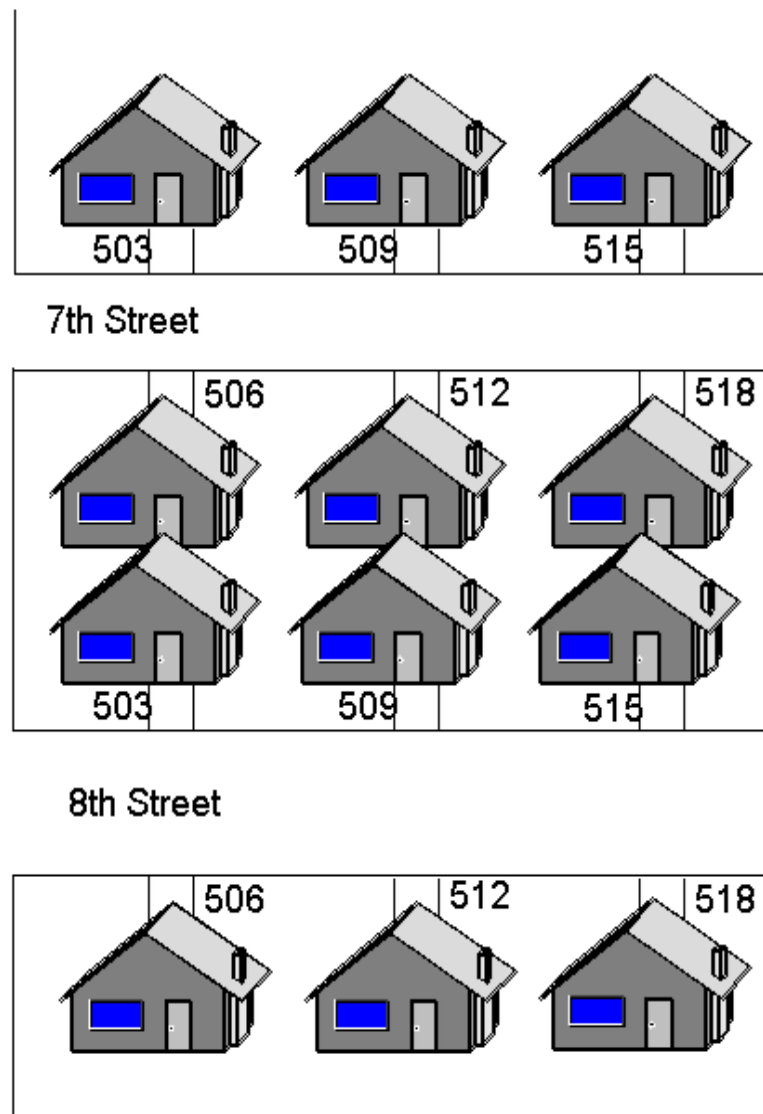
Well Known Ports – TCP and UDP

...

67/UDP	Bootstrap Protocol (BOOTP) Server; also used by Dynamic Host Configuration Protocol (DHCP)	Official
68/UDP	Bootstrap Protocol (BOOTP) Client; also used by Dynamic Host Configuration Protocol (DHCP)	Official
69/UDP	Trivial File Transfer Protocol (TFTP)	Official
70/TCP	Gopher protocol	Official
79/TCP	Finger protocol	Official
80/TCP	Hypertext Transfer Protocol (HTTP)	Official
81/TCP	Torpark—Onion routing	Unofficial
82/UDP	Torpark—Control	Unofficial
83/TCP	MIT ML Device	Official
88/TCP	Kerberos—authentication system	Official

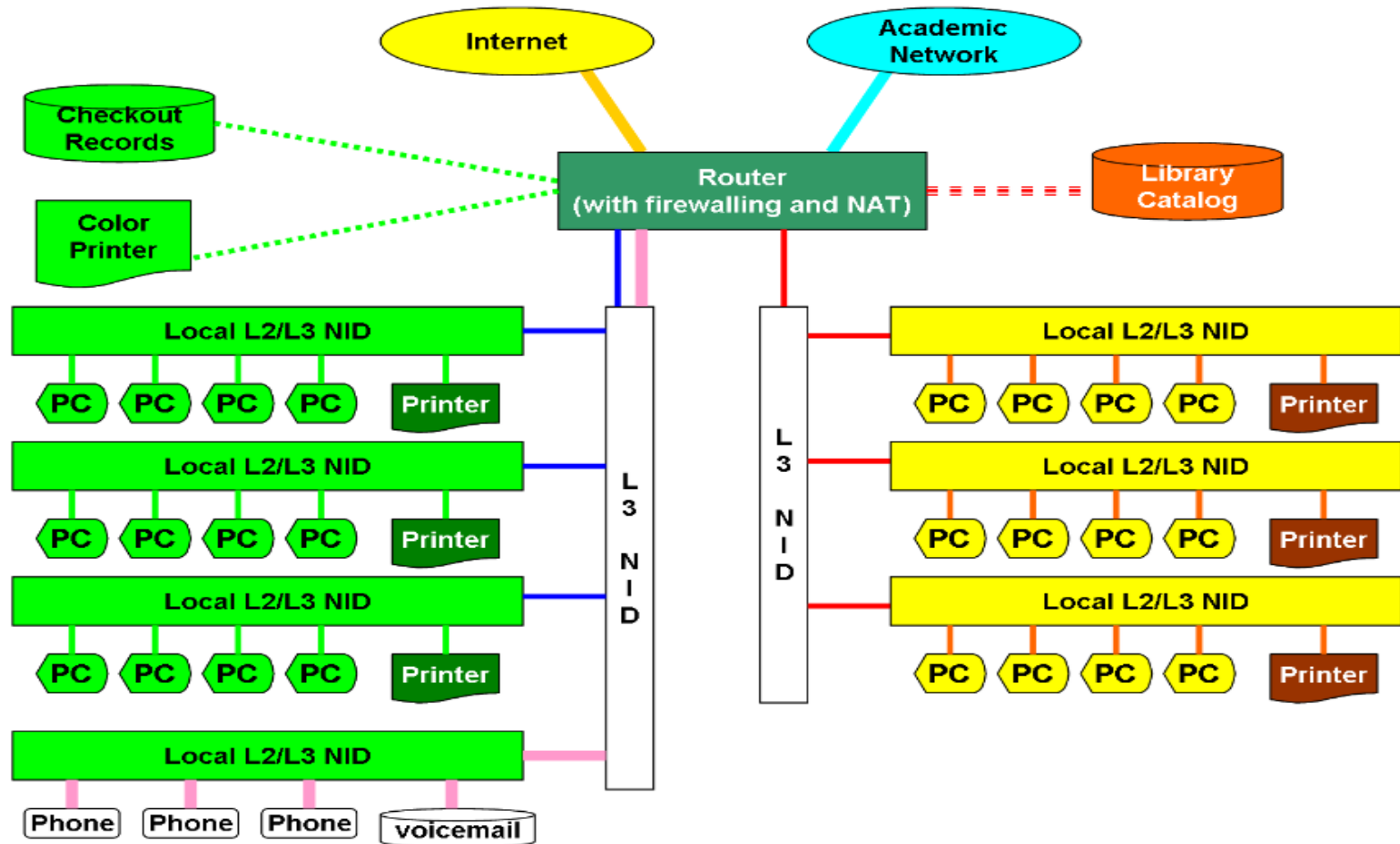


Network



Neighborhood

Network Topology (Wikipedia)



OSI Model

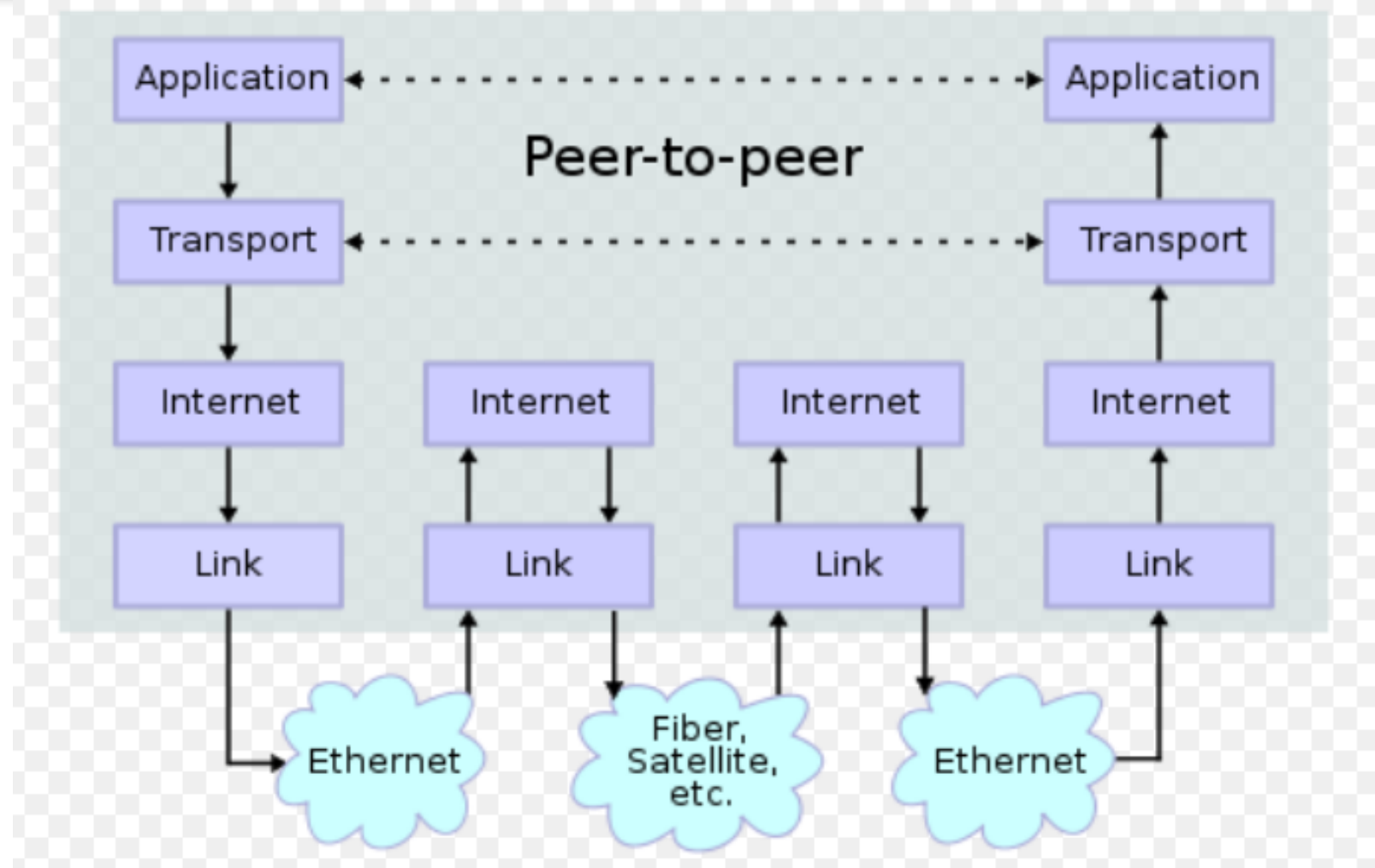
- OSI = Open Systems Interconnect Basic Reference

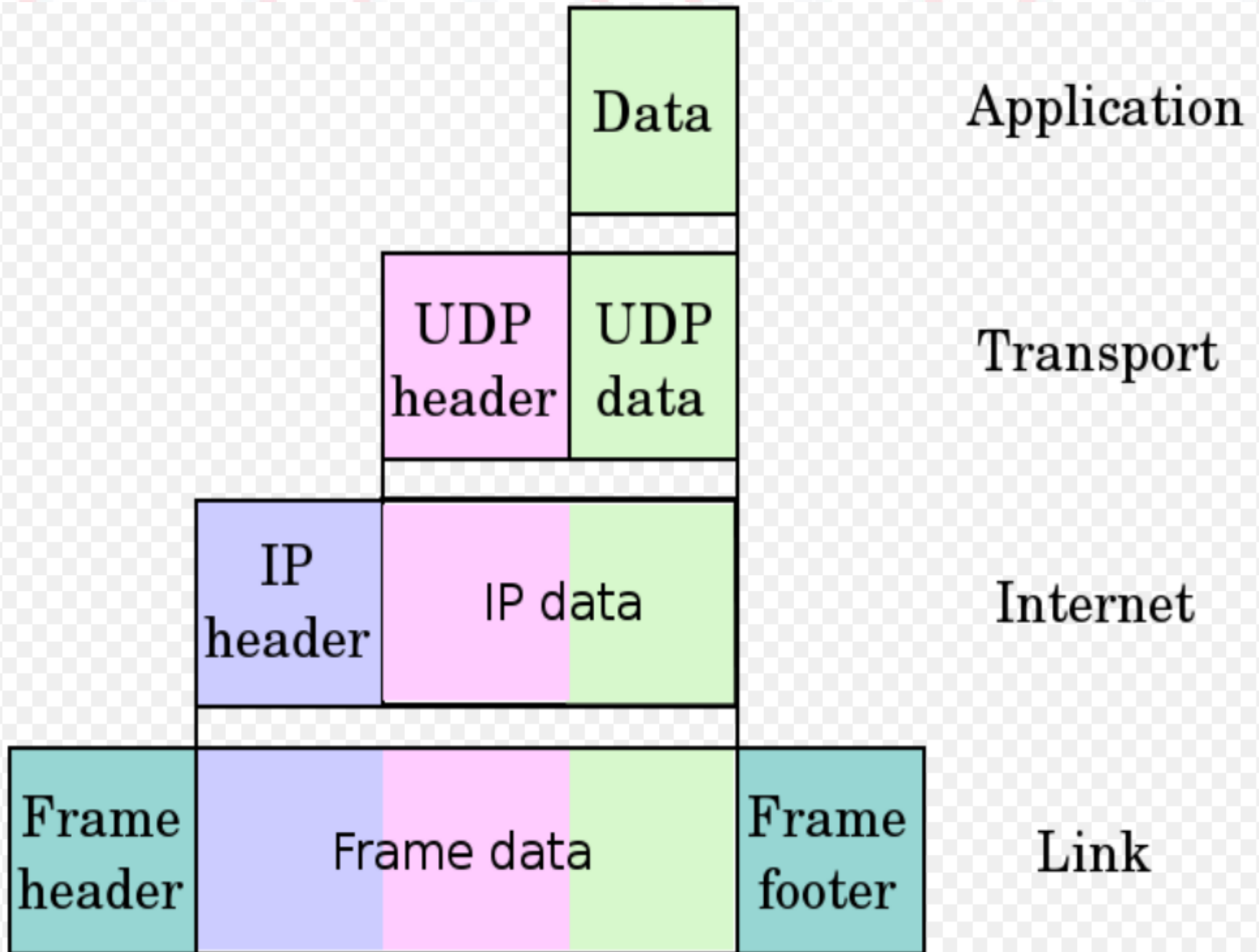
OSI модел

Application	Приложен слой	layer 7
Presentation	Представителен слой	layer 6
Session	Сесиен слой	layer 5
Transport	Транспортен слой	layer 4
Network	Мрежови слой	layer 3
DataLink	Канален слой	layer 2
Physical	Физически слой	layer 1

OSI Model			
	Data unit	Layer	Function
Host layers	Data	7. Application	Network process to application
		6. Presentation	Data representation and encryption
		5. Session	Interhost communication
	Segment	4. Transport	End-to-end connections and reliability
Media layers	Packet	3. Network	Path determination and logical addressing
	Frame	2. Data Link	Physical addressing
	Bit	1. Physical	Media, signal and binary transmission

TCP/IP Protocol Stack (Wikipedia)

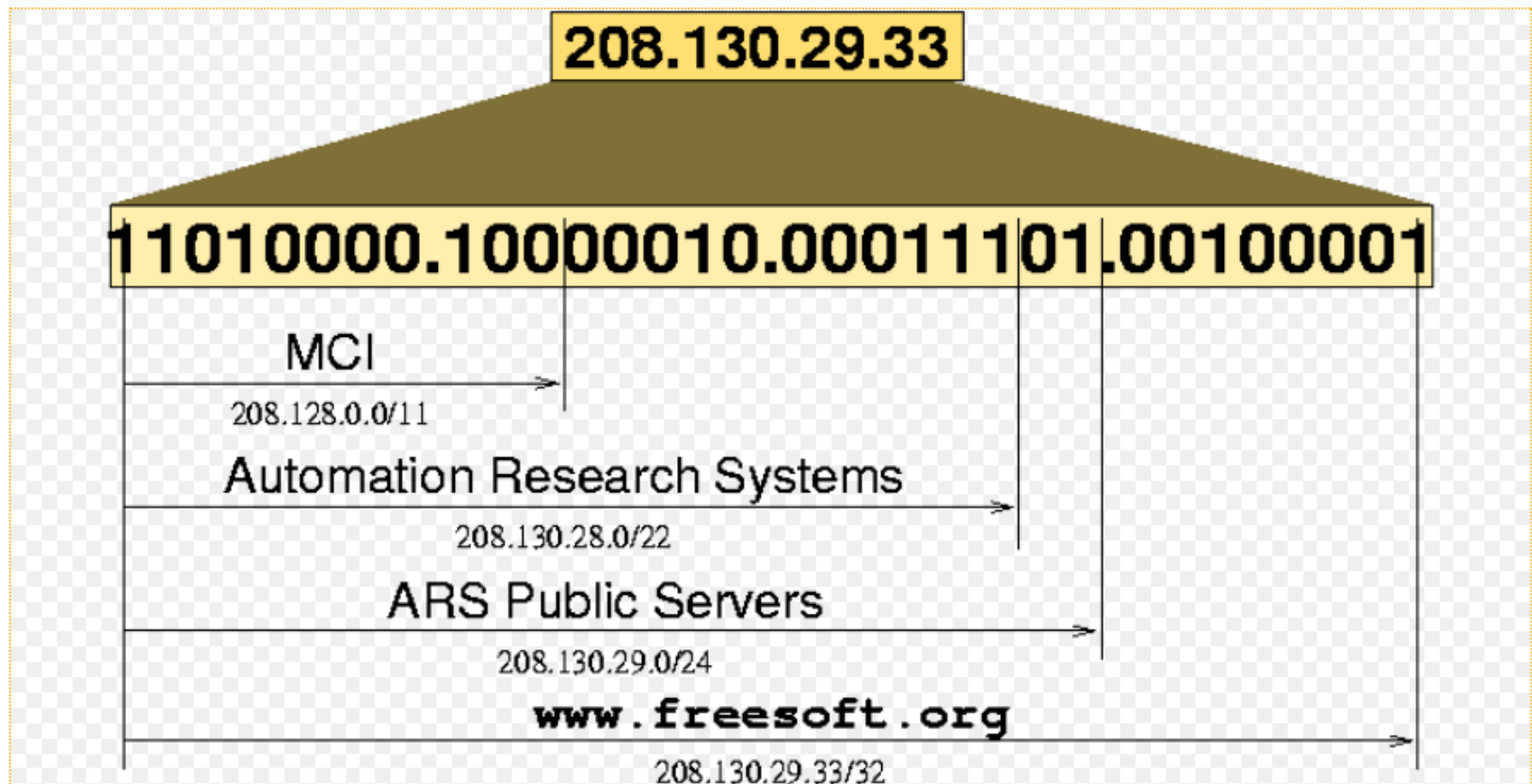




IPv4 – Address Classes (Wikipedia)

Class	Leading Bits	Size of <i>Network Number</i> Bit field	Size of <i>Rest</i> Bit field	Number of Networks	Hosts per Network
Class A	0	8	24	128	16,777,214
Class B	10	16	16	16,384	65,534
Class C	110	24	8	2,097,152	254
Class D (multicast)	1110	not defined	not defined	not defined	not defined
Class E (reserved)	1111	not defined	not defined	not defined	not defined

Classless Inter-Domain Routing (CIDR)



Transfer Control Protocol – TCP

- Reliable data transfer

+	0 - 3	4 - 9	10 - 15	16 - 31
0	Порт на източника			Порт на получателя
32	Номер по ред			
64	Сегментен номер			
96	Дължина на заглавието (хедъра)	Запазен	Кодови (за синхронизация)	Големина на рамката
128	Сума за проверка			Указател за спешност
160	Опции и пълнеж			
192	Данни			

User Datagram Protocol – UDP

- UDP fast, but not reliable out of the box

+	Битове от 0 - 15	Битове 16 - 31
0	Изходен Порт	Порт на дестинацията
32	Дължина	Контролна сума
64	Данни	

Well Known Ports – TCP и UDP

...

7/TCP,UDP Echo Official

...

20/TCP FTP - data Official

21/TCP FTP—control (command) Official

22/TCP,UDP Secure Shell (SSH)—used for secure logins, file transfers
(scp, sftp) and port forwarding Official

23/TCP Telnet protocol—unencrypted text communications Official

25/TCP Simple Mail Transfer Protocol (SMTP)—used for e-mail
routing between mail servers Official

...

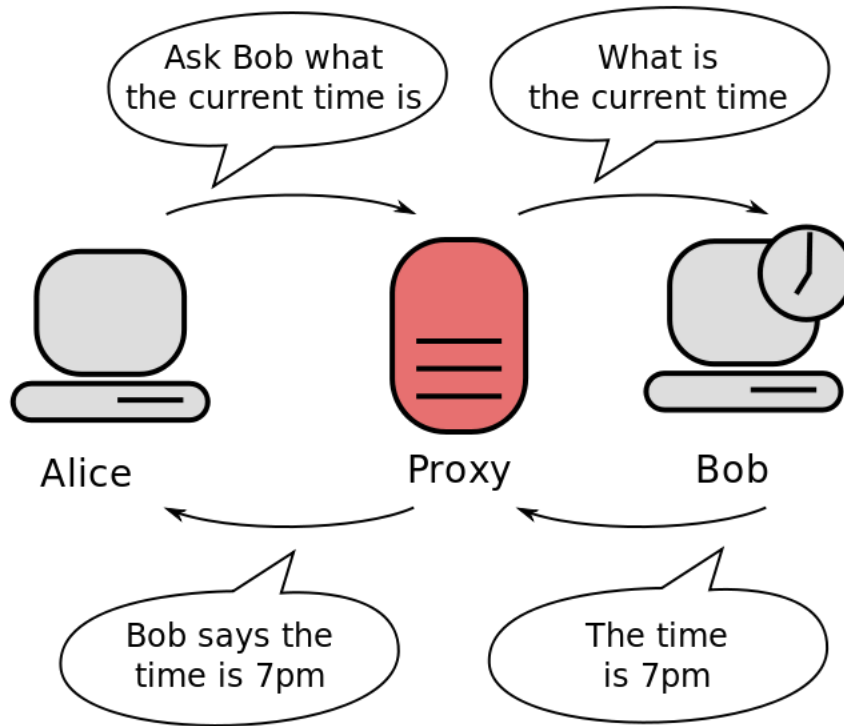
80/TCP Hypertext Transfer Protocol (HTTP) Official

...

88/TCP Kerberos—authentication system Official

...

Web Proxy



World Wide Web (WWW) Service

- World Wide Web (WWW) or W3 is a system of mutually connected hypertext documents (resources), accessible using the Internet
- Today World Wide Web is one of the main Internet services to the extent that the two terms are often used as synonyms



The NeXT computer used by Tim Berners-Lee in CERN. The label says: „The machine is a server. DO NOT POWER DOWN!!“

Источник: Wikipedia, Автор: Aavindraa, Лиценз: Creative Commons Attribution-Share Alike 3.0 Unported, Адрес: http://en.wikipedia.org/wiki/File:First_Web_Server.jpg

World Wide Web (WWW) – Main Concepts

- The idea for **World Wide Web** is suggested by Tim Berners-Lee in 1989 in CERN.
- Documents in **World Wide Web**, called **web pages**, may contain *text, images, video, and other multimedia components*, and the connections between them are specified using *hyperlinks*.
- Web Sites** include multiple connected *web pages* for a specific purpose
- They are **deployed** on a **Web Server** and are accessed using **Web Client** (*web browser – IE, Mozilla, Chrome*), using a protocol called: **Hypertext Transfer Protocol (HTTP)**

Thank's for Your Attention!



Trayan Iliev

CEO of IPT – Intellectual Products
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<http://robolearn.org/>

<https://github.com/iproduct>

<https://twitter.com/trayaniliev>

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