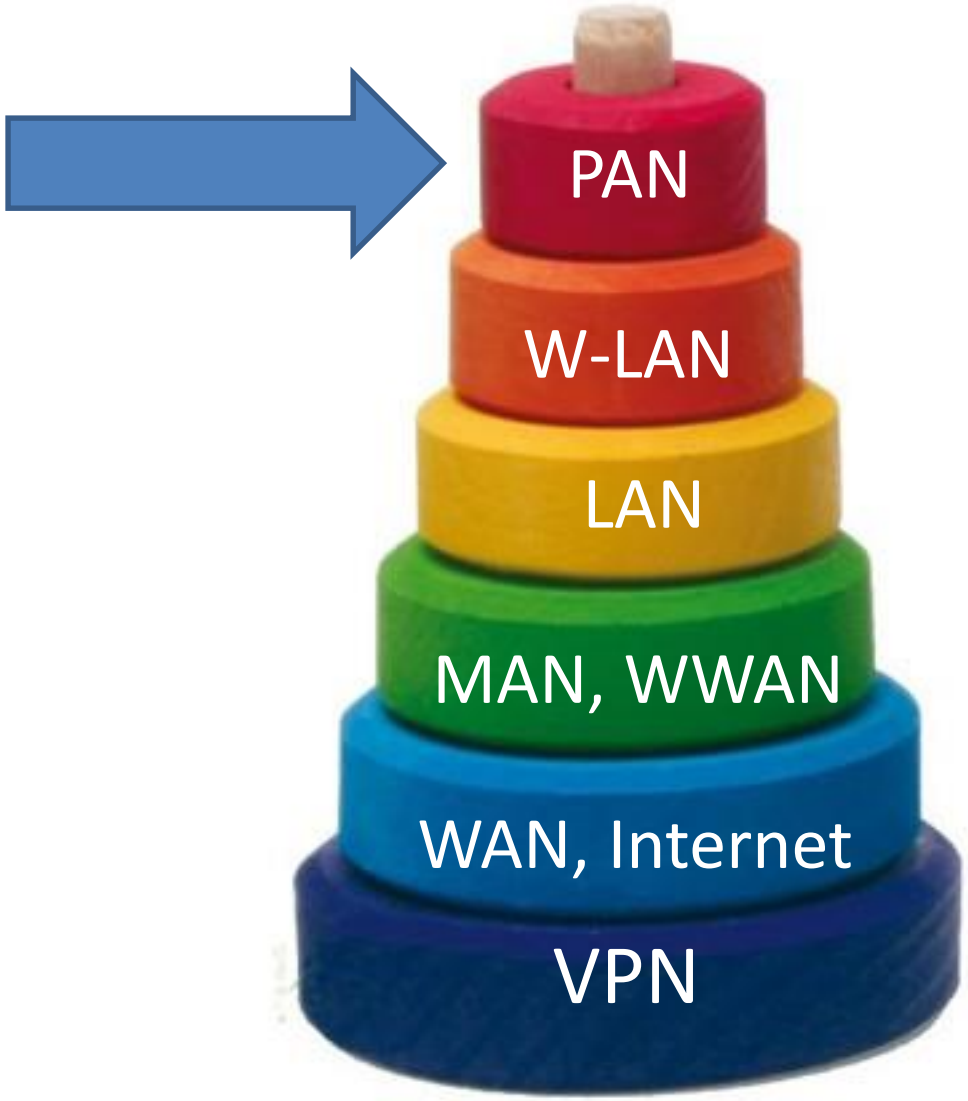
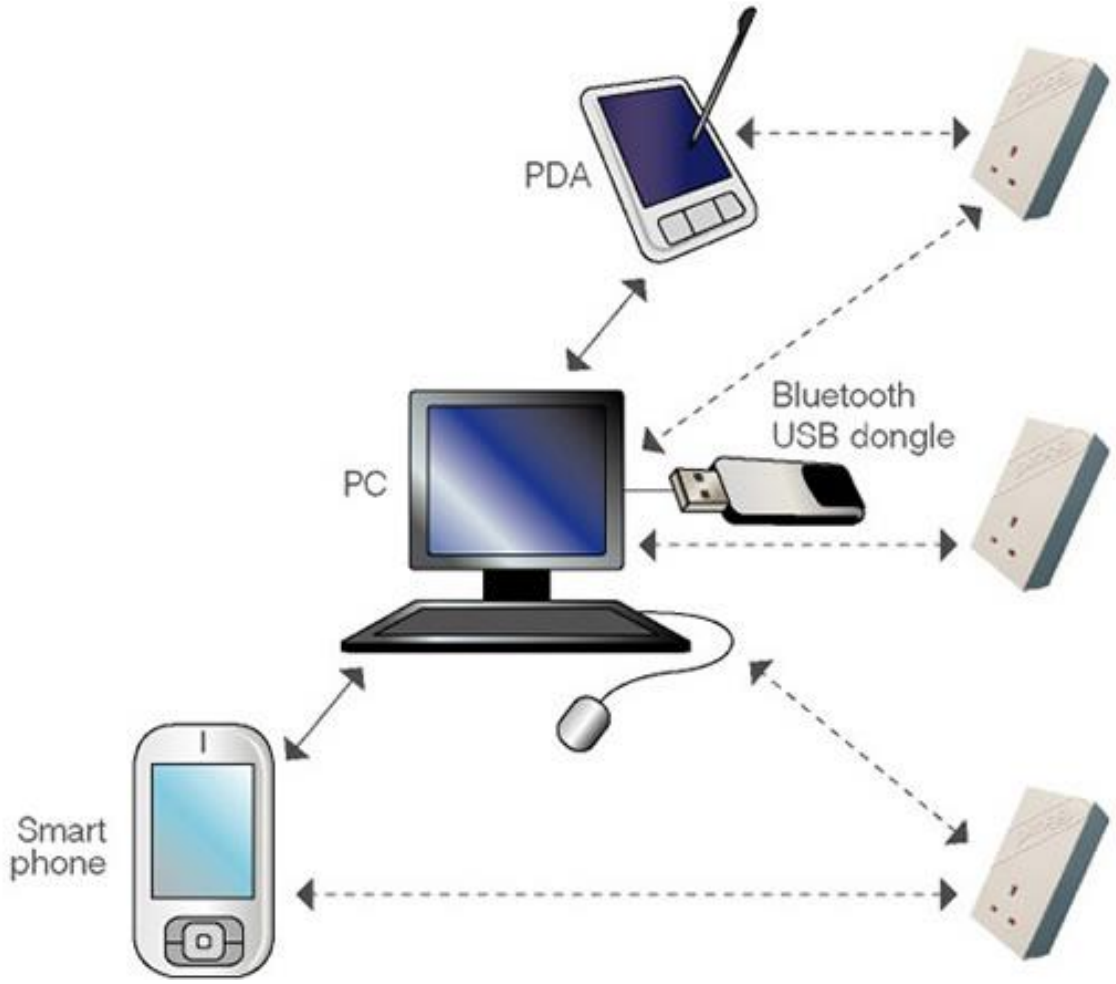
“AN”s and “Nets”

Network Sizes

First Size!



PAN – Personal Area Network

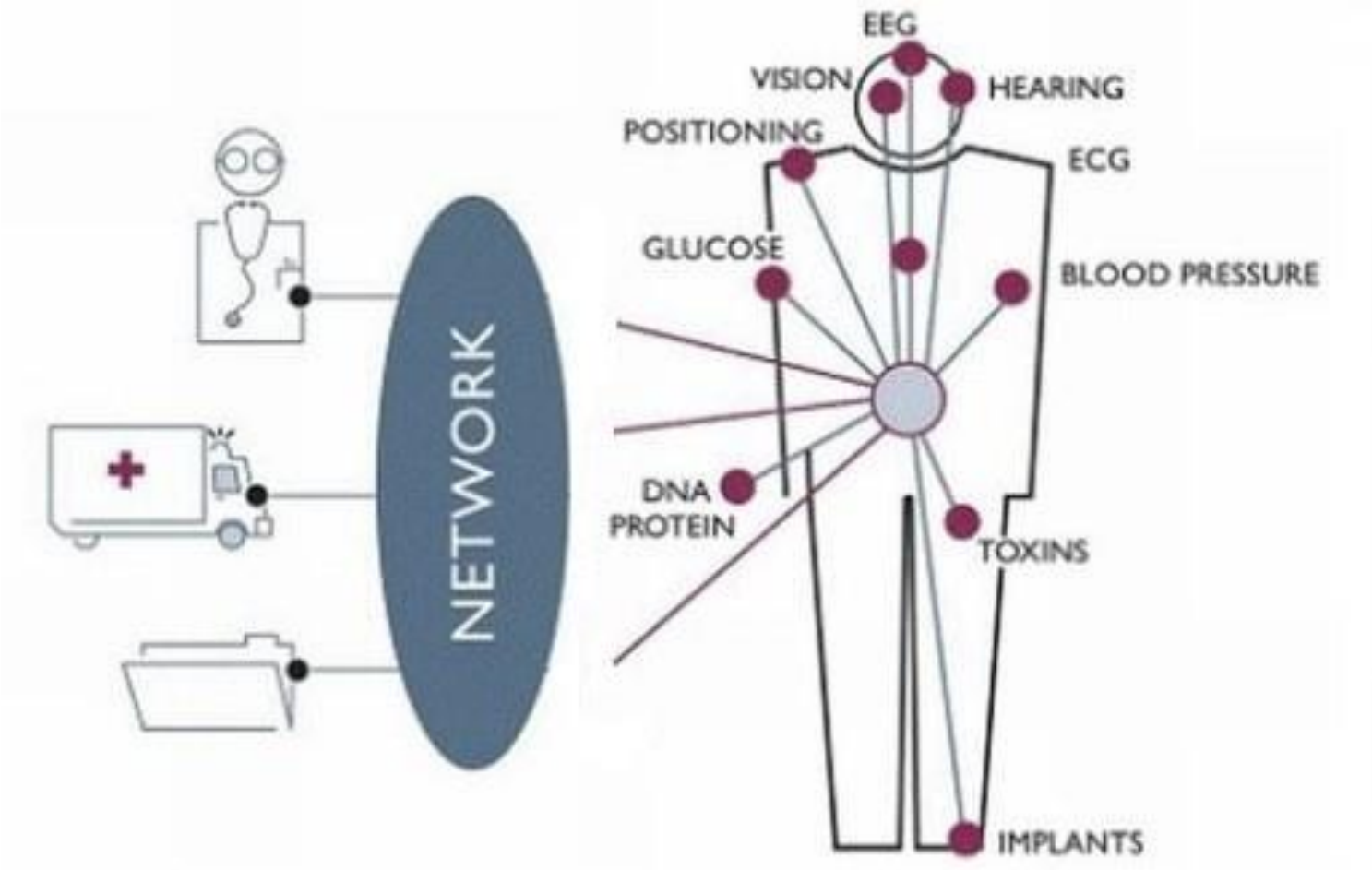


A PAN Application

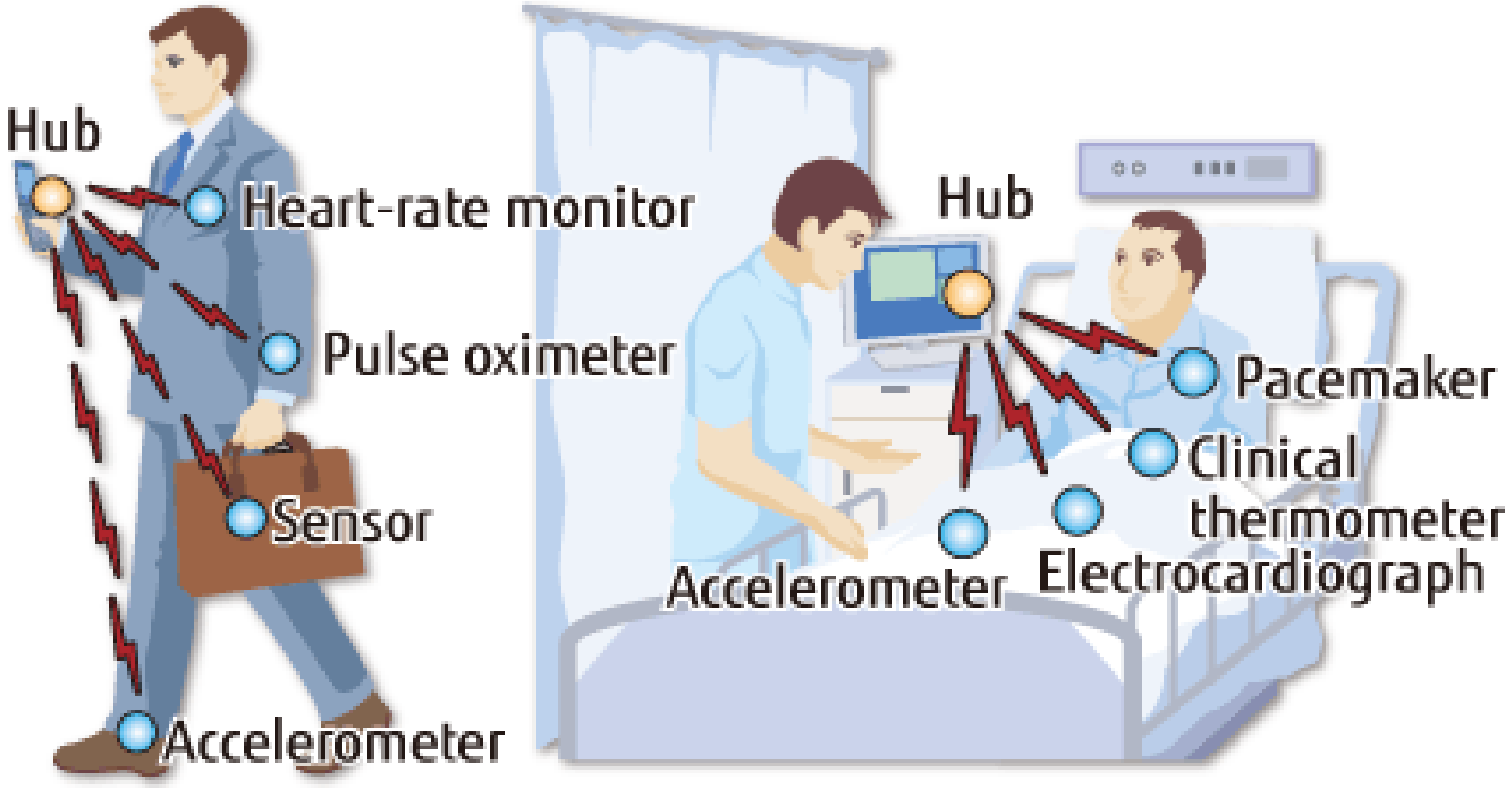
Another PAN application

Another PAN application

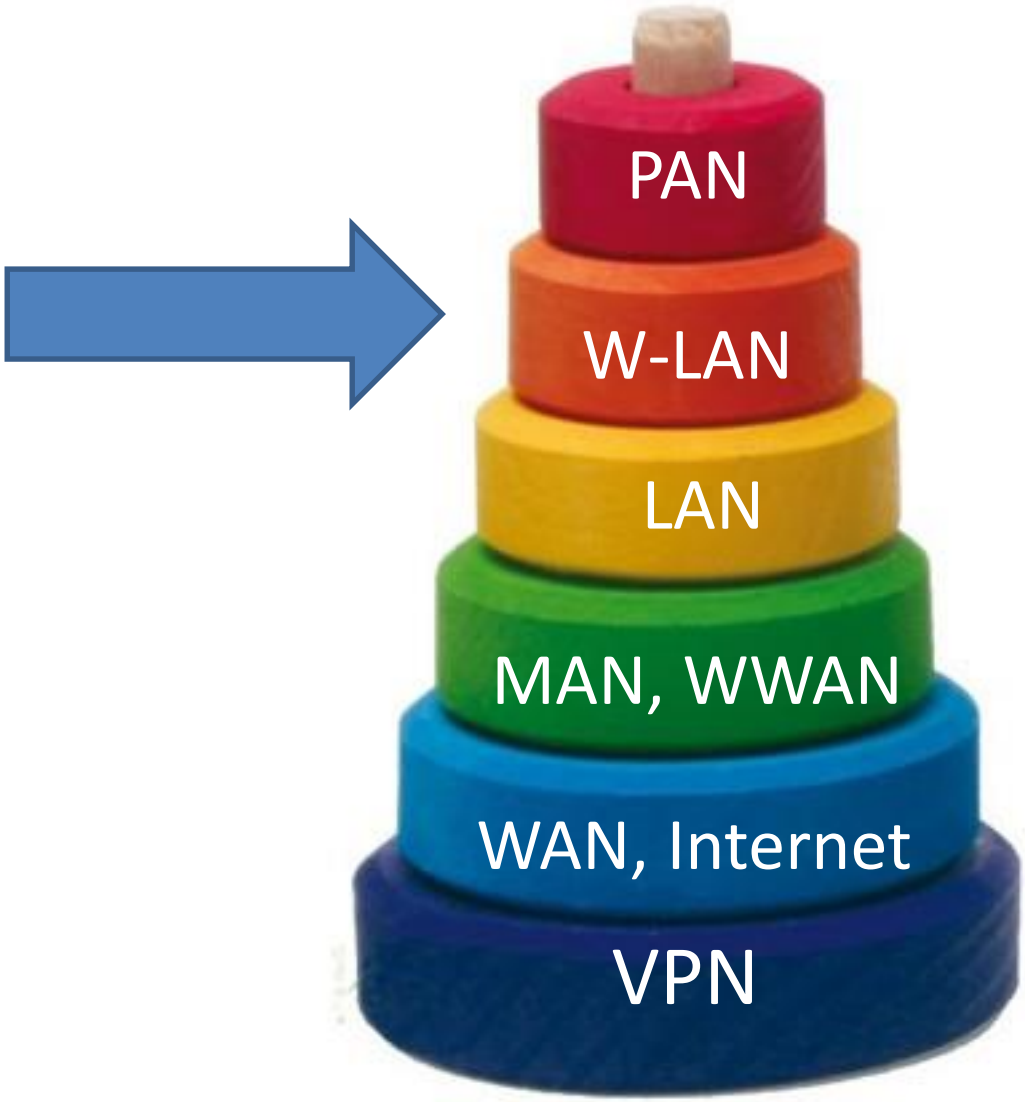
A new developing PAN is a “Body Area Network” for medical devices.



More on Body Area Networks.....

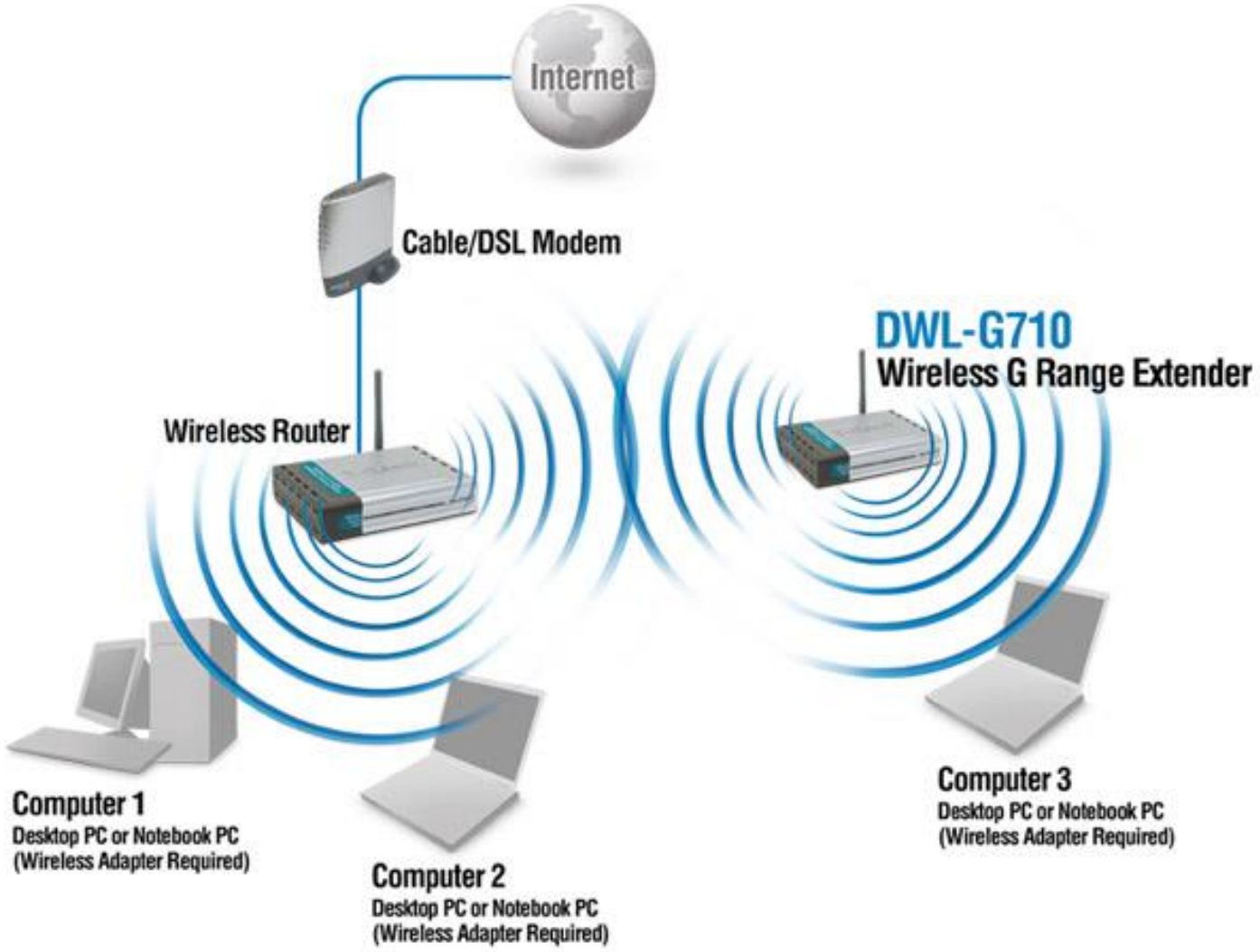


Next Size!



There are also Wireless LANs or W-Lans

W-LANs have routers that are attached to cables.



Home Network aka W-LAN


STARBUCKS
COFFEE
FREE Wi-Fi


Mount Everest
8850 m
Wi Fi
ZONE
7900 m
4
3
7300 m
6400 m
2
5920 m
1

FREE No WiFi ZONE

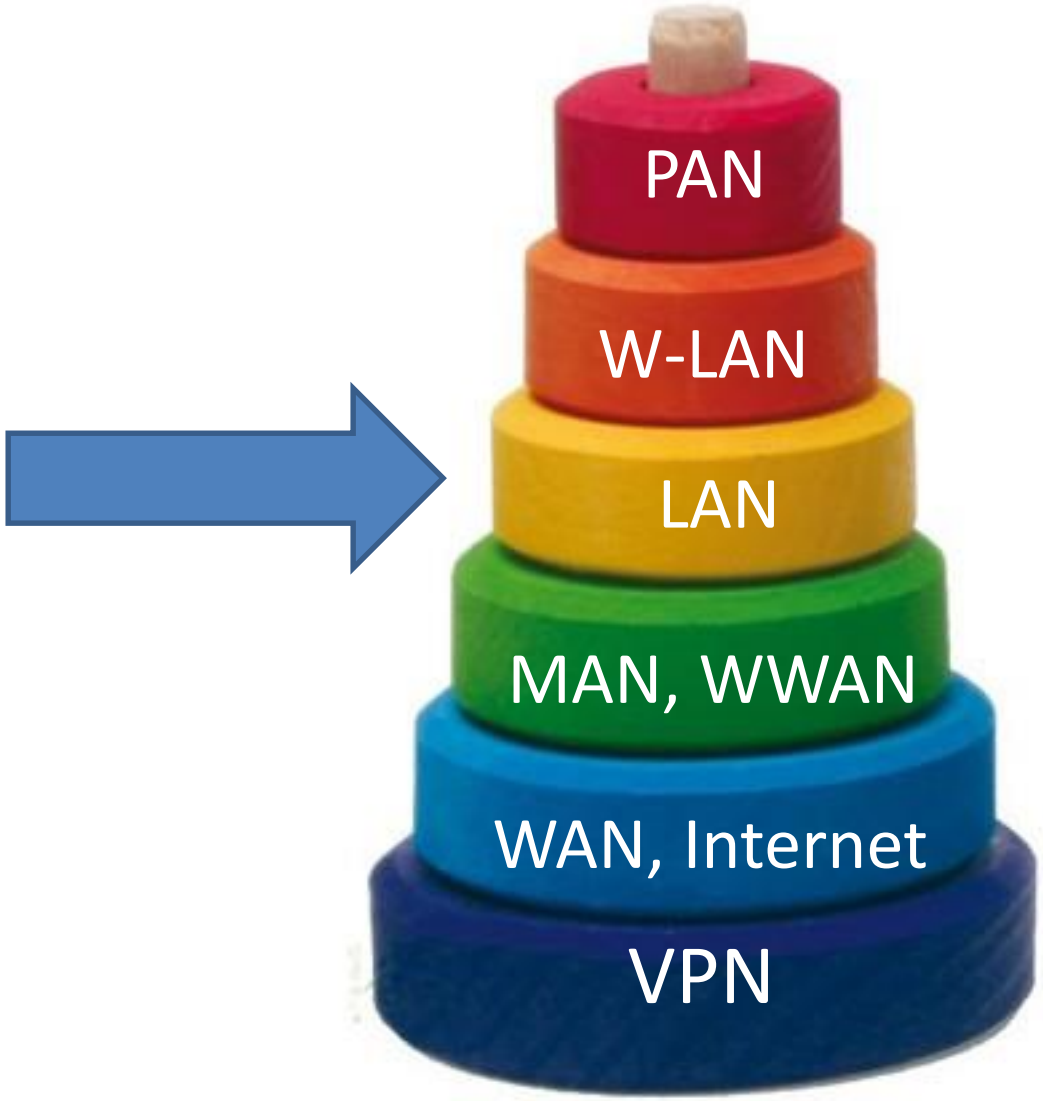
Have a break, have a KitKat

The world is becoming one big WiFi zone. It's available in bars, restaurants, trains, airports, supermarkets.. There's even WiFi on Mount Everest. Result? People are constantly online. Time for a break.

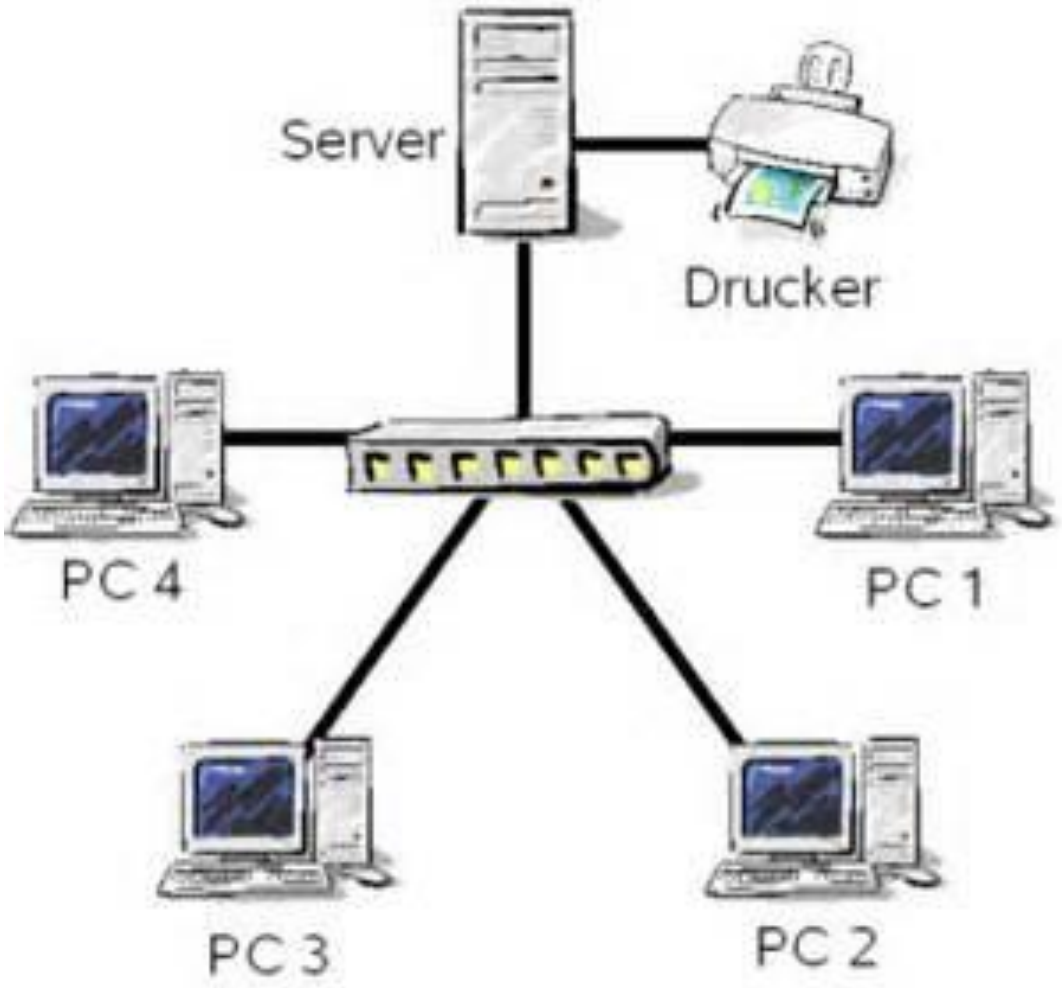
So we created a Free No-WiFi Zone. In a radius of 5 meters, we blocked all signals so people could escape e-mails, updates, tags or likes. Instead, they could enjoy a good old newspaper or a hardcover book. Some even had a real conversation. Whilst eating a Kit Kat of course.

Have a break, have a KitKat

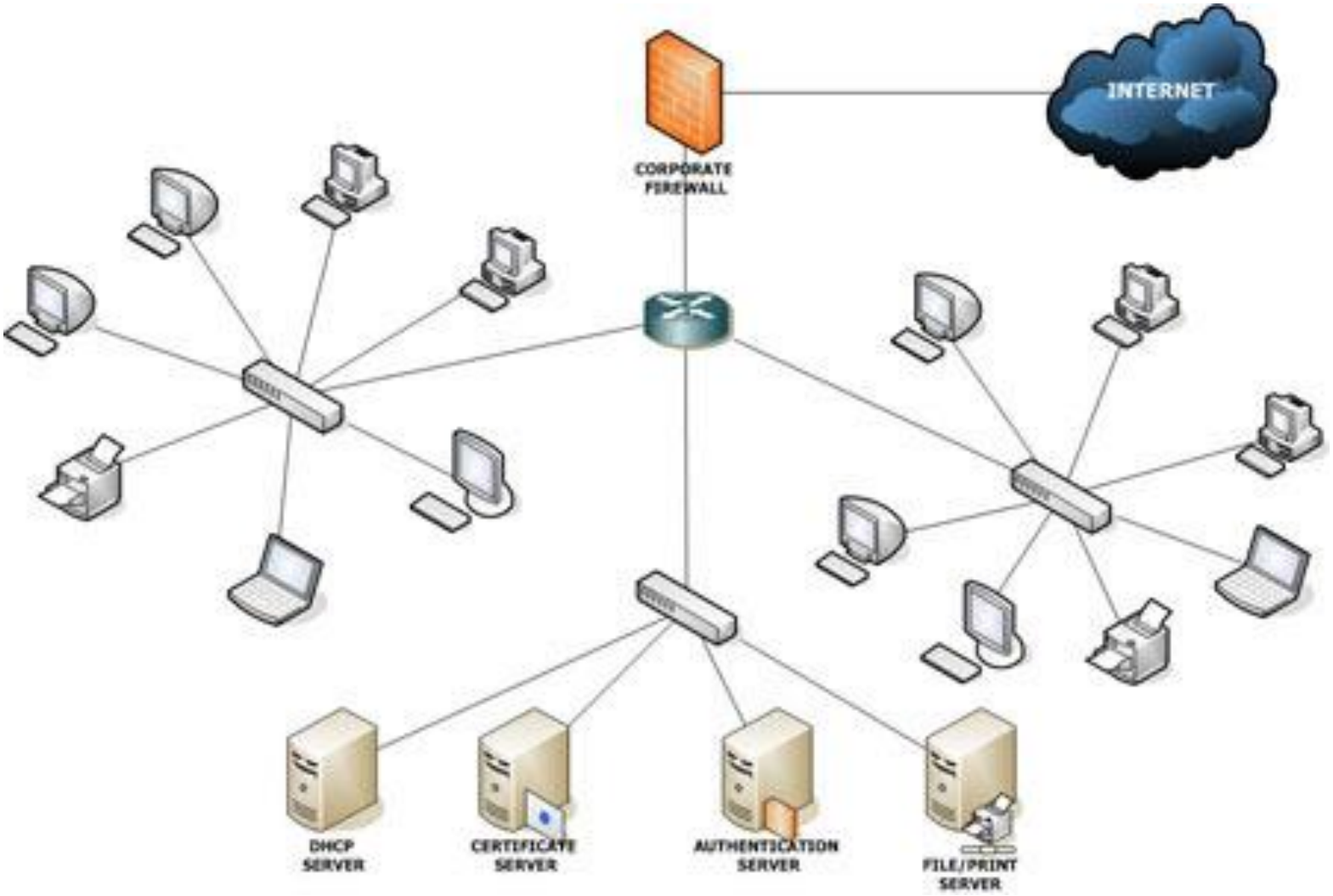
Next Size!



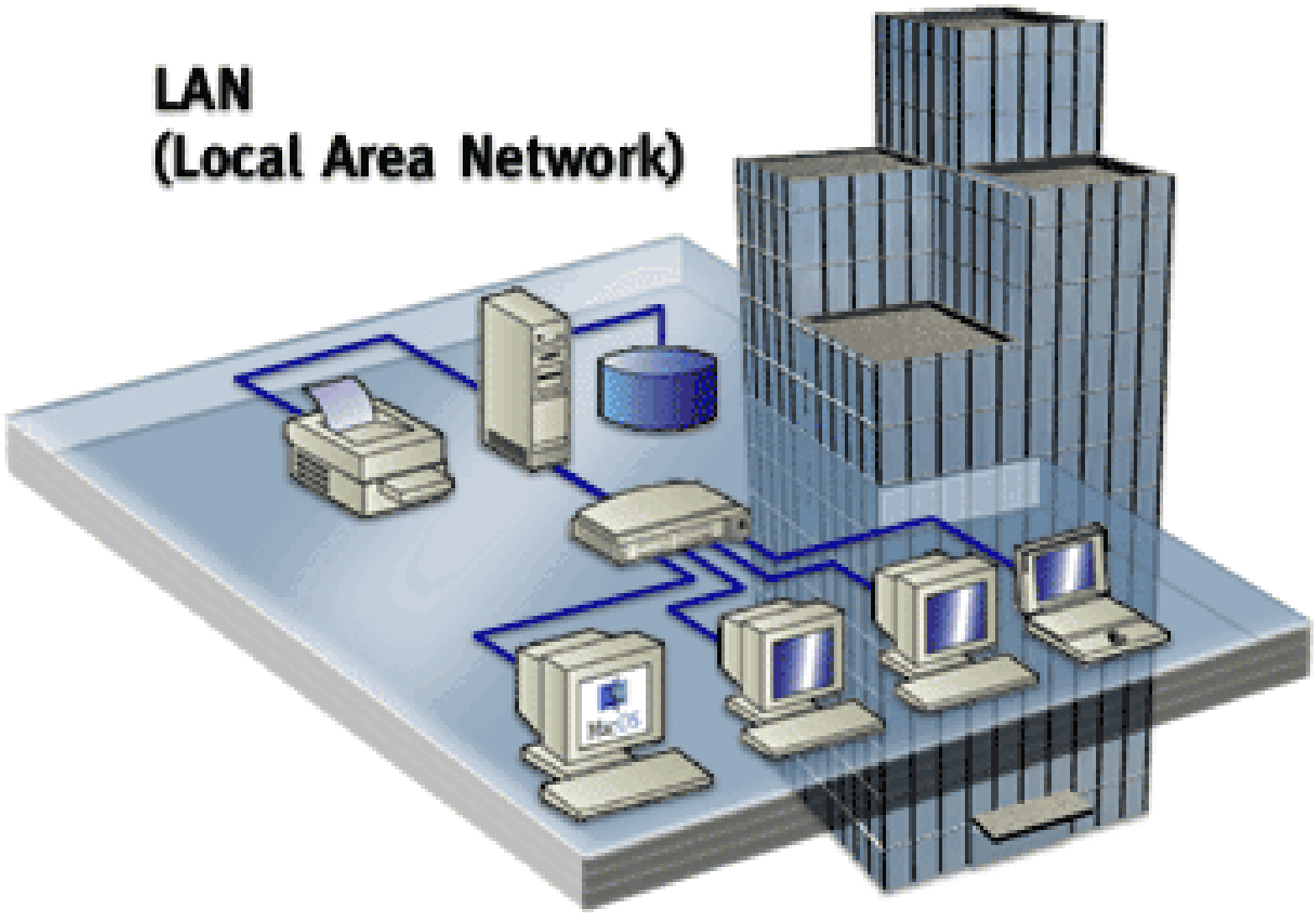
LAN or Ethernet or Small Network



LAN or Ethernet or Small Network



LAN
(Local Area Network)



Router

Server

Router

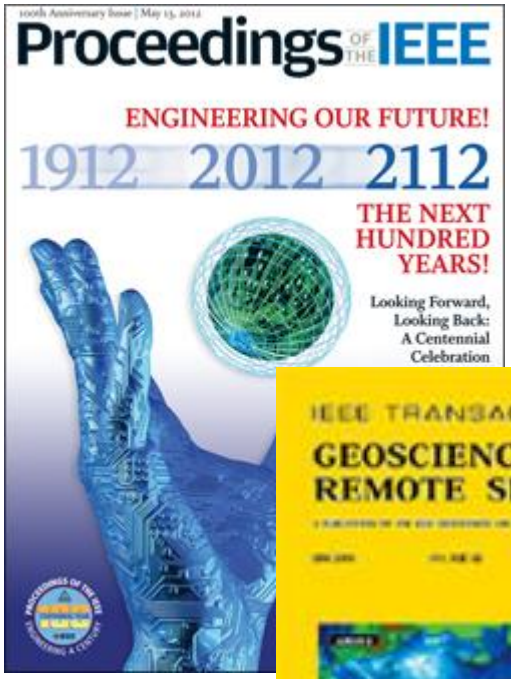
Switch

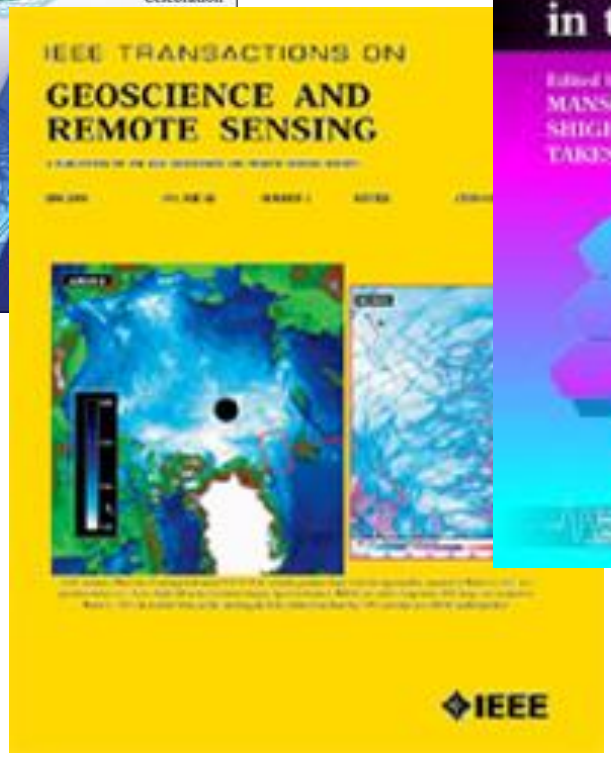
Hub

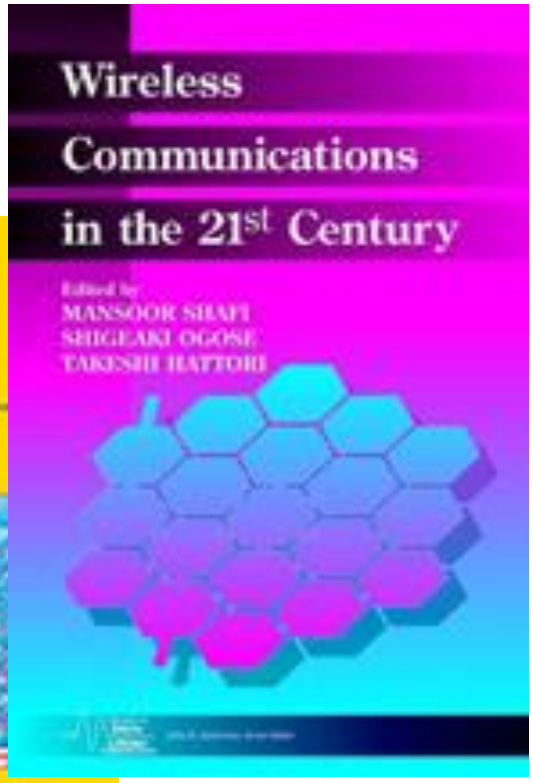

IEEE

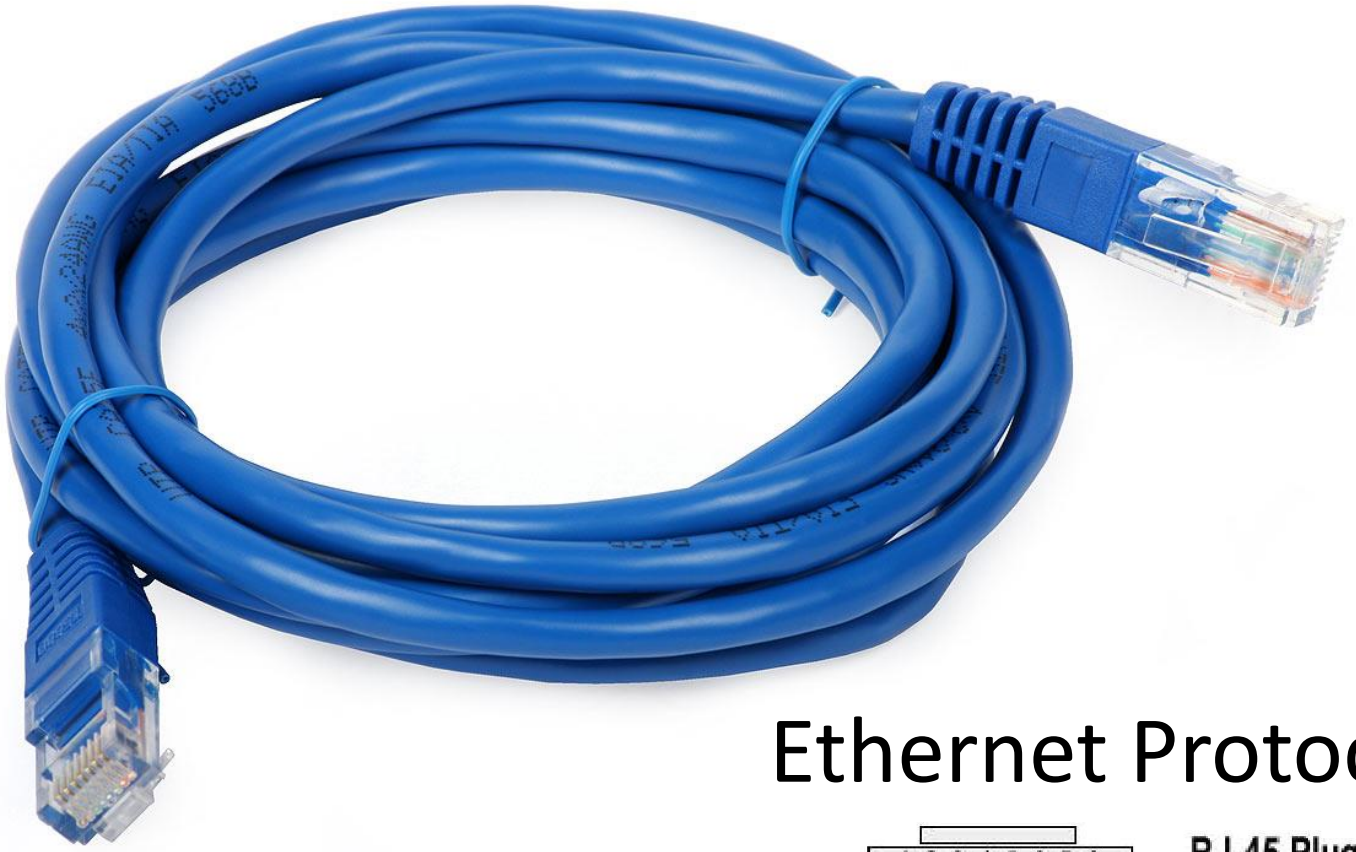
The IEEE corporate office is on the 17th floor of 3 Park Avenue in New York City

It was formed in 1963 by the merger of the Institute of Radio Engineers (IRE, founded 1912) and the American Institute of Electrical Engineers (AIEE, founded 1884).


100th Anniversary Issue | May 13, 2012
Proceedings OF THE IEEE
ENGINEERING OUR FUTURE!
1912 2012 2112
THE NEXT HUNDRED YEARS!
Looking Forward, Looking Back: A Centennial Celebration

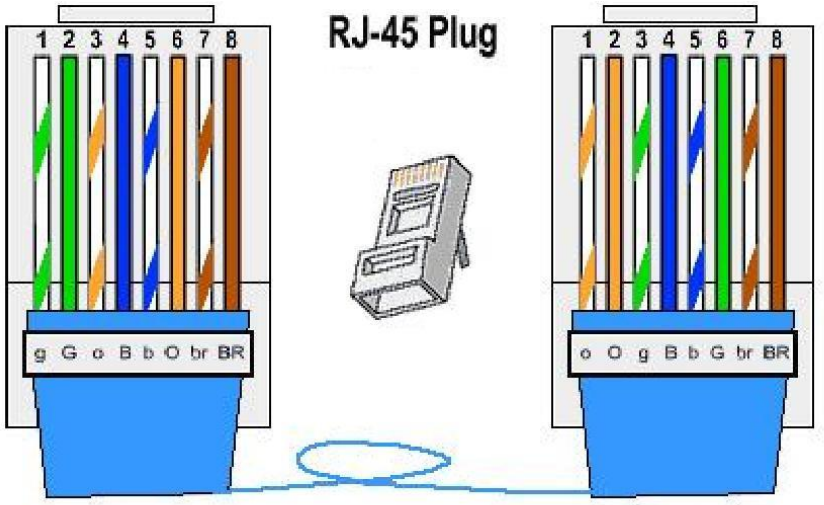

IEEE TRANSACTIONS ON
GEOSCIENCE AND REMOTE SENSING
IEEE


Wireless Communications in the 21st Century
Edited by
MANSOOR SHAFI
SHIGEAKI OGOSE
TAKESHI HATTORI



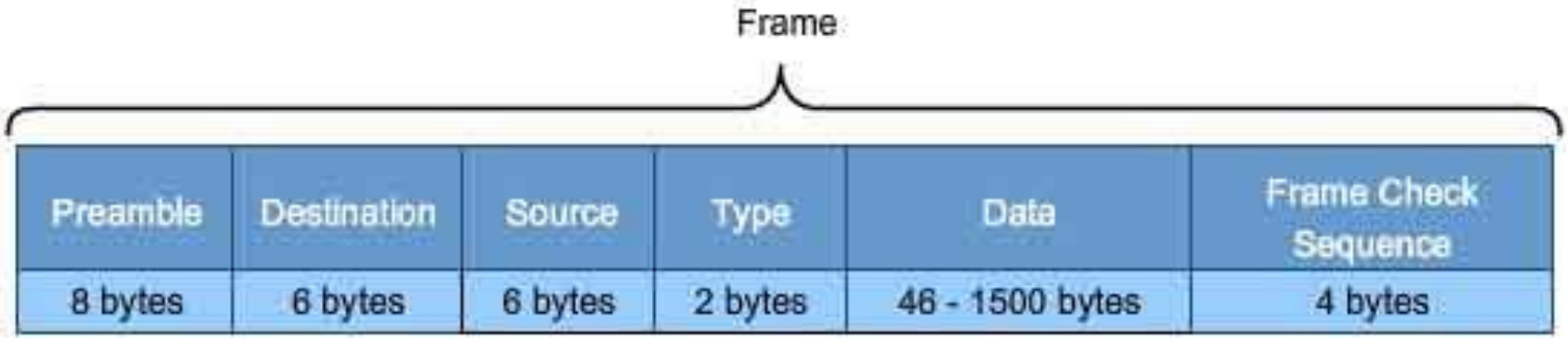
Ethernet Protocol 802.3

Ethernet Cable – the colours and wire types are part of the protocol laid out by IEEE



Ethernet Protocol

A Common Data Link Layer Protocol for LANs



Preamble - used for synchronization; also contains a delimiter to mark the end of the timing information.

Destination Address - 48 bit MAC address for the destination node.

Source Address - 48 bit MAC address for the source node.

Type - value to indicate which upper layer protocol will receive the data after the Ethernet process is complete.

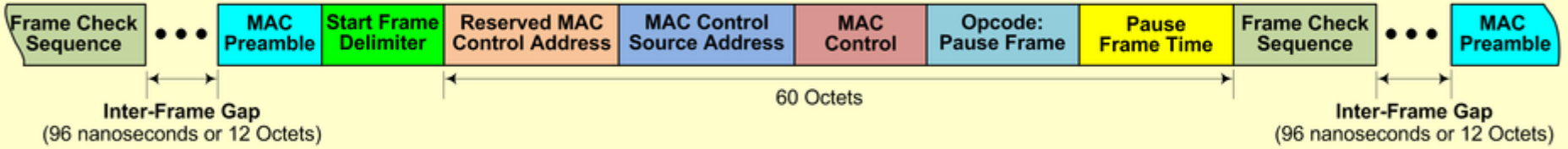
Data or payload - this is the PDU, typically an IPv4 packet, that is to be transported over the media.

Frame Check Sequence (FCS) - A value used to check for damaged frames.

Ethernet Flow Control: Pause Frame (IEEE 802.3x)

Gigabit Ethernet frame flow control mechanism.

Gigabit Ethernet MAC Control Pause Frame Structure



Gigabit Ethernet Pause Frame Component Size

Frame Component		Component Size
MAC Preamble		7 Octets of: **10101010**
Start Frame Delimiter		1 Octet of: **10101011**
Reserved MAC Control Address (Globally - Assigned Multicast Destination Address)		6 Octets: **01:80:C2:00:00:01**
MAC Control Source Address		6 Octets: **00:00:00:00:00:00**
MAC Control Type		2 Octets: **0x8808**
MAC Opcode:	**Pause Frame**	2 Octets: **0x0001**
Pause Frame Time	**Pause Time**	2 Octets
	Padding	42 Octets of: **0x00**
	Total:	46 Octets
Frame Check Sequence (CRC)		4 Octets
Inter-Frame Gap • • •		12 Octets (96 nanoseconds)
Total Physical Frame Size:		**84 Octets**

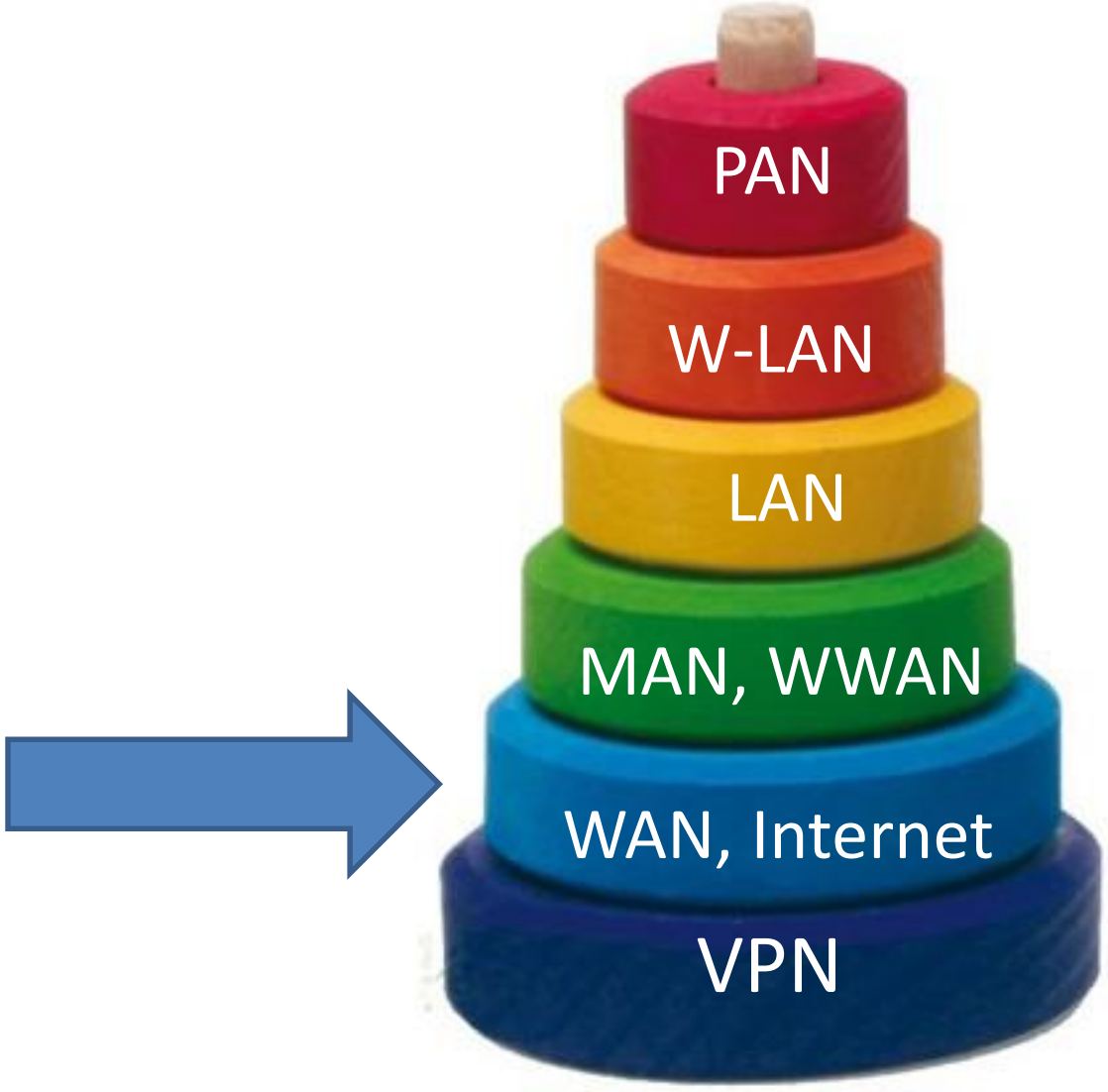
Ethernet Pause Frame Calculations

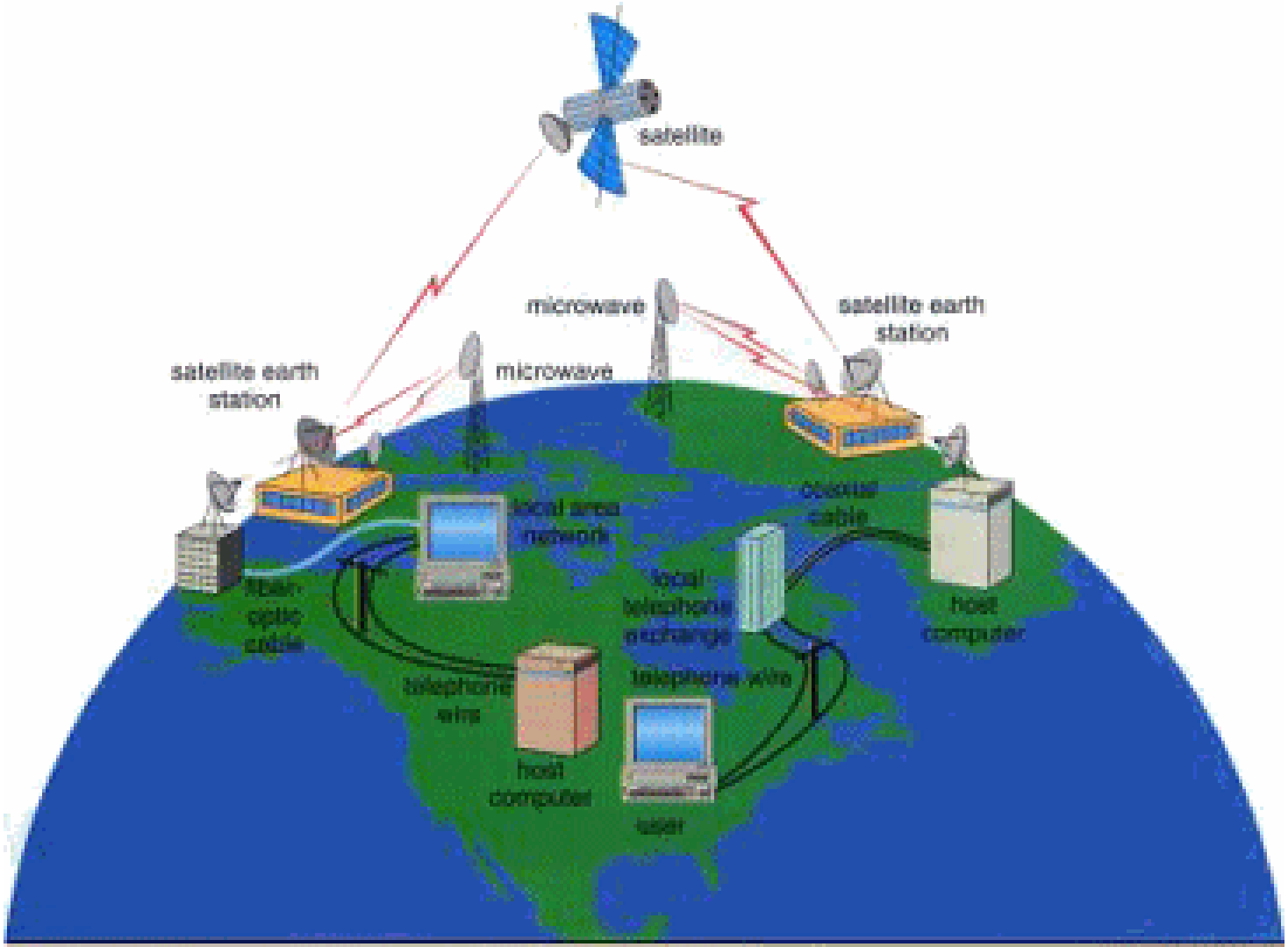
Maximum Transmit Pause Times

Rate Term	Value
Fast Ethernet Bit Time	10 nanoseconds (.00000001 seconds)
Gigabit Ethernet Bit Time	1 nanosecond (.000000001 seconds)
10 Gigabit Ethernet Bit Time	.1 nanoseconds (.0000000001 seconds)
Pause Quantum	512 Bit Times For Ethernet Type
Fast Ethernet: Pause Time: 0xFFFF (65536)	(.00000001 secs) * (65536) * (512 Bit Times) = **335.5 msec**
Gigabit Ethernet: Pause Time: 0xFFFF (65536)	(.000000001 secs) * (65536) * (512 Bit Times) = **33.55 msec**
10 Gigabit Ethernet: Pause Time: 0xFFFF (65536)	(.0000000001 secs) * (65536) * (512 Bit Times) = **3.355 msec**

*** **Note 1:** Light moves '29.979 mm (1.1803 US inches) ' in .1 nanoseconds.

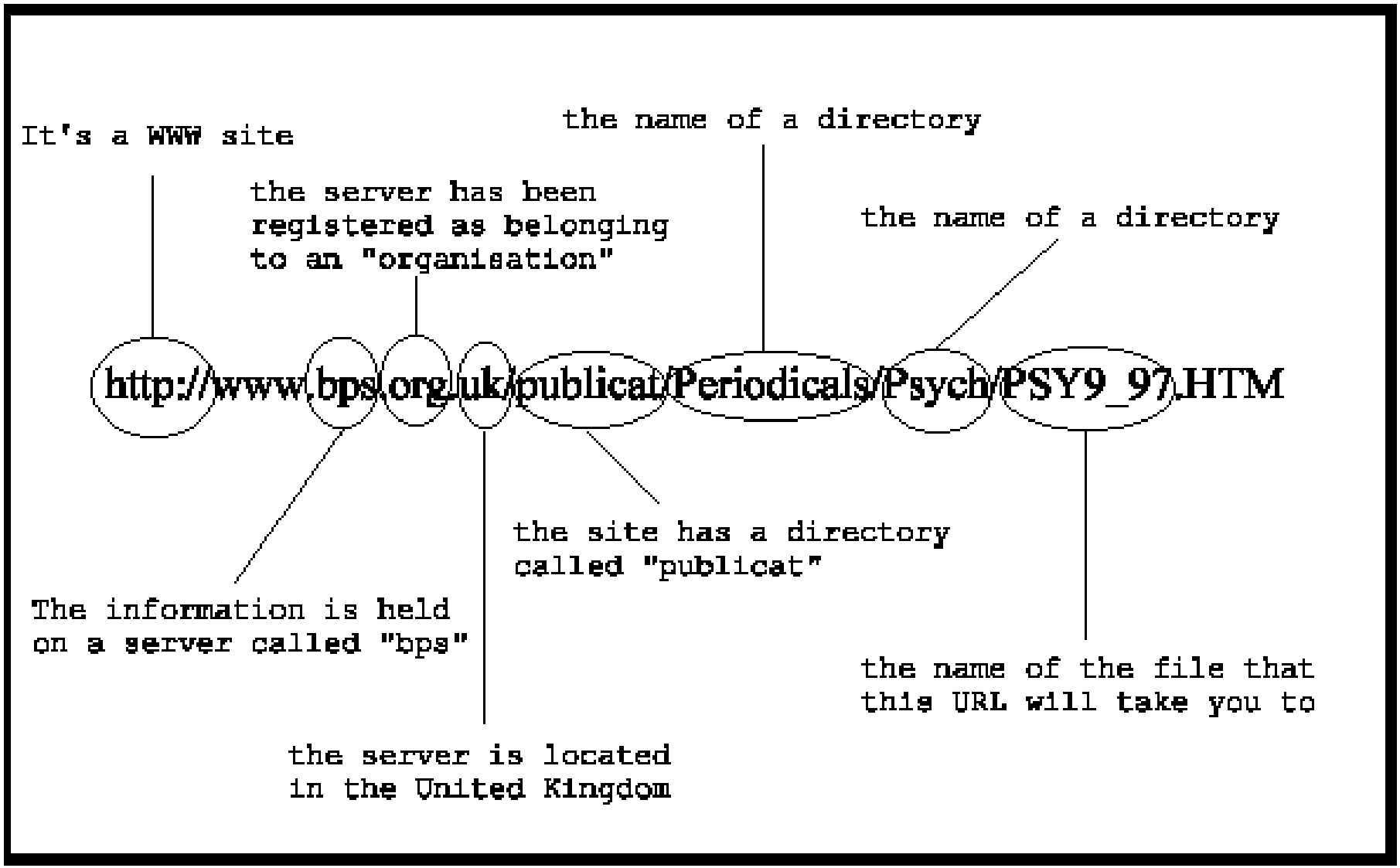
Next Size!



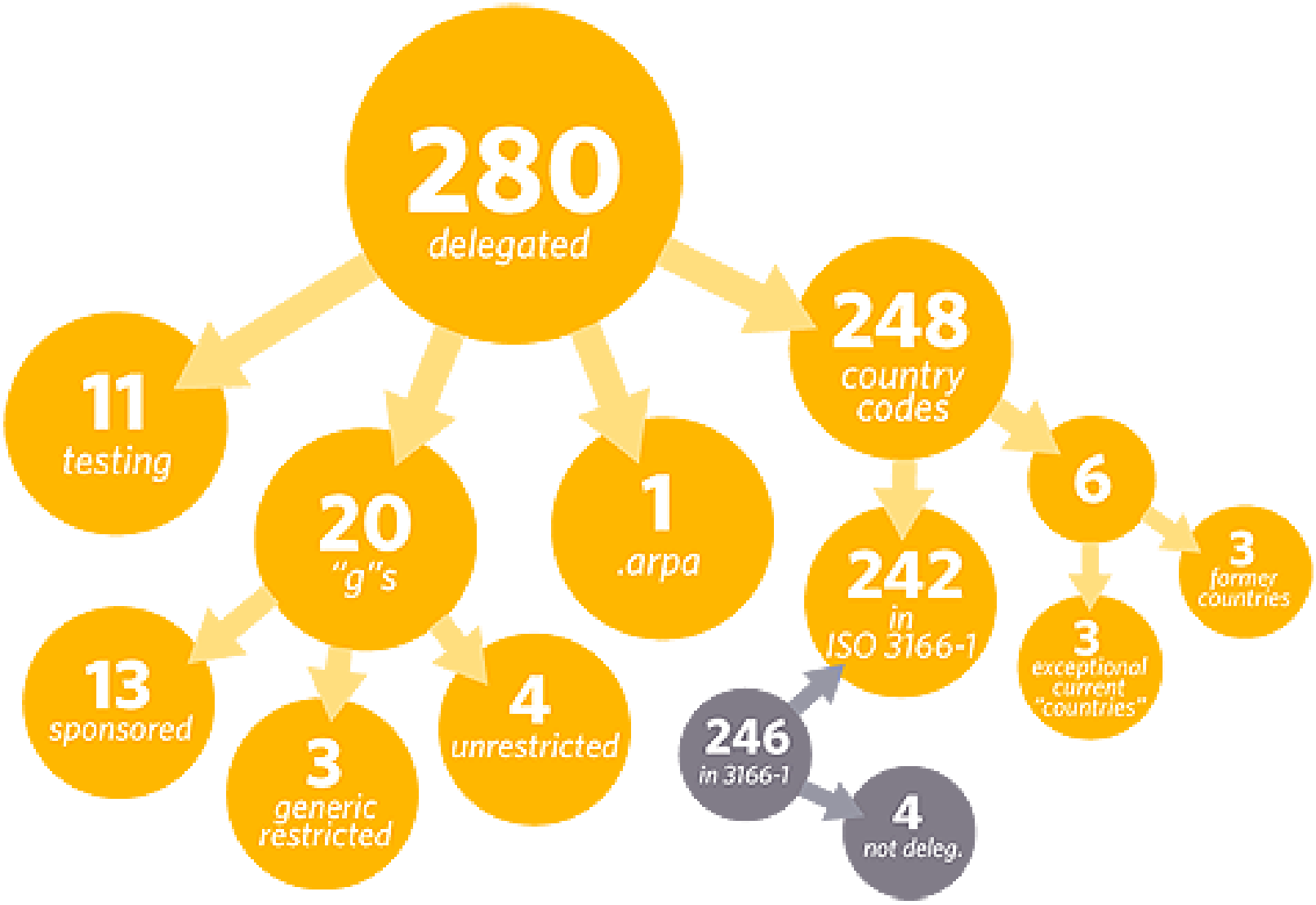

satellite
microwave
satellite earth station
satellite earth station
microwave
local area network
coaxial cable
fiber-optic cable
local telephone exchange
host computer
telephone wire
telephone wire
host computer
user


ICANN

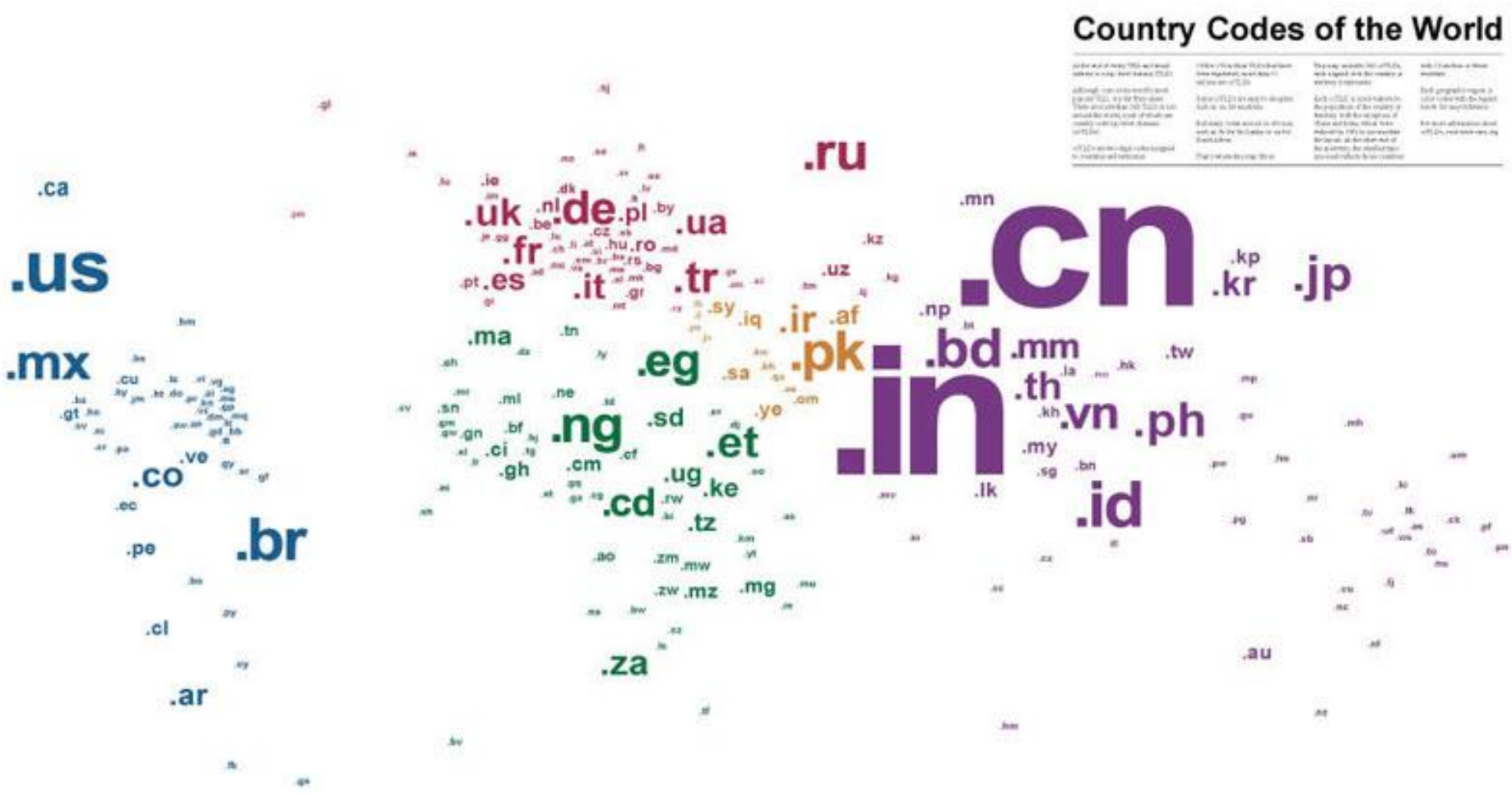

The Internet Corporation for Assigned Names and Numbers is a nonprofit private organization headquartered in the Playa Vista section of Los Angeles, California, United States, that was created on September 18, 1998.


It's a WWW site
the server has been registered as belonging to an "organisation"
the name of a directory
the name of a directory
http://www.bps.org.uk/publicat/Periodicals/Psych/PSY9_97.HTM
The information is held on a server called "bps"
the site has a directory called "publicat"
the server is located in the United Kingdom
the name of the file that this URL will take you to

There are 280 of these top-level domains, 248 are country codes.



This is an interesting graphic, the world is re-drawn with country domain names.

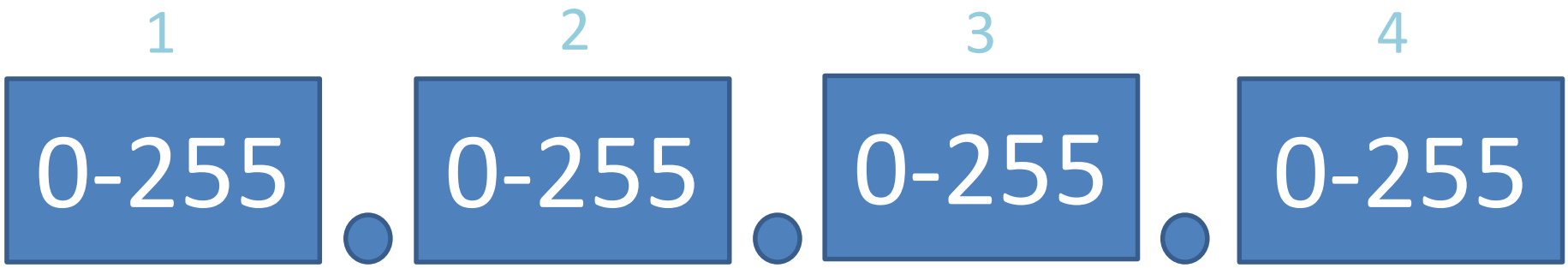



Internet Society & Internet
Engineering Task Force

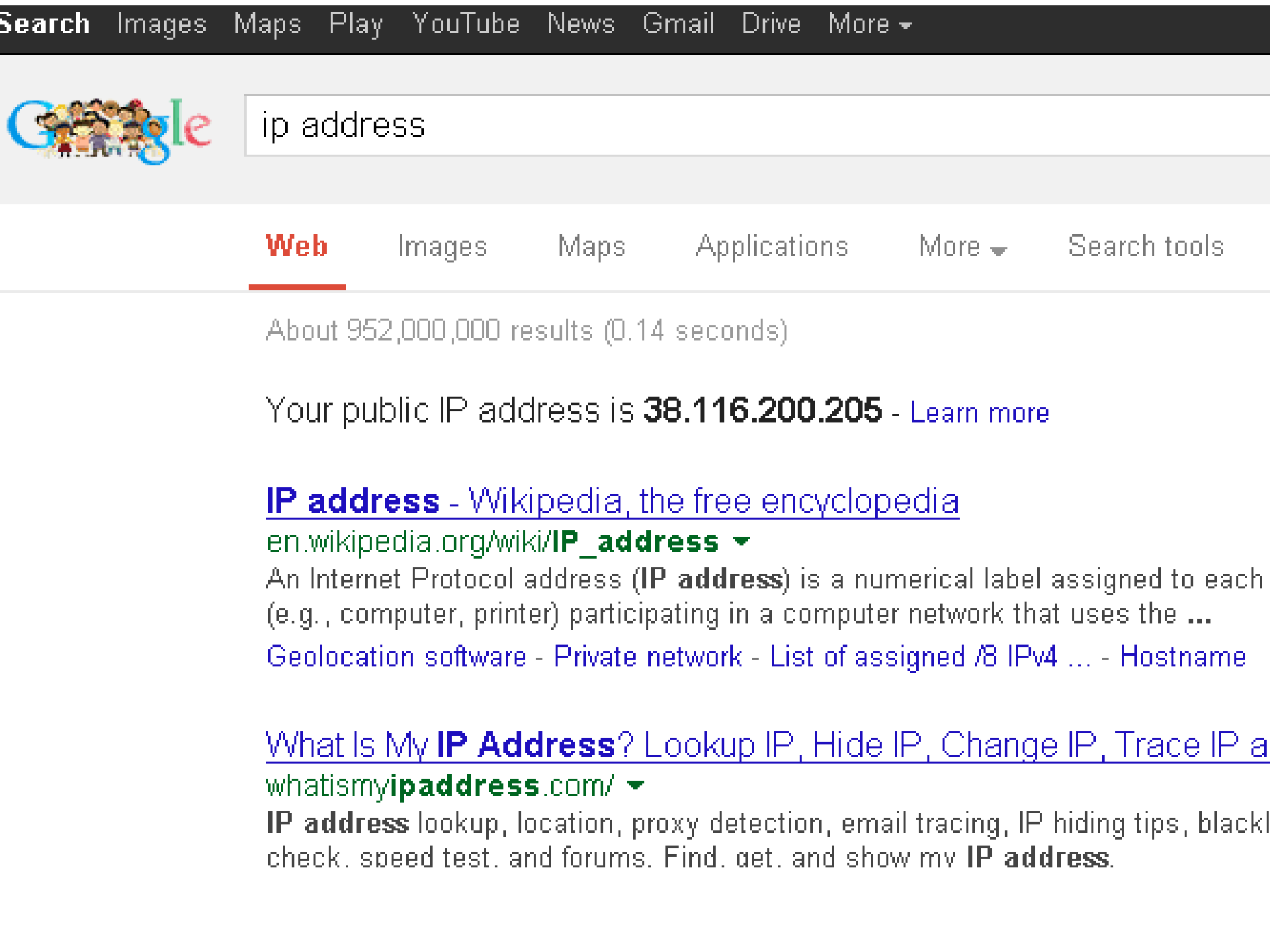
What is an IP address?

- A unique number assigned to a computer on the internet
- 38.116.202.26
- 32 bits number OR 4 blocks of 8 bits OR 4 bytes.
- Each byte separated by a dot. Each byte goes from 0 to 255
- Only 4 billion addresses in this system

An IP address is four numbers, each between 0 and 255, separated by dots.



For example, my current IP address is 67.21.154.155


Search Images Maps Play YouTube News Gmail Drive More
ip address
Web Images Maps Applications More Search tools
About 952,000,000 results (0.14 seconds)
Your public IP address is 38.116.200.205 - Learn more
IP address - Wikipedia, the free encyclopedia
en.wikipedia.org/wiki/IP_address
An Internet Protocol address (IP address) is a numerical label assigned to each
(e.g., computer, printer) participating in a computer network that uses the ...
Geolocation software - Private network - List of assigned /8 IPv4 ... - Hostname
What Is My IP Address? Lookup IP, Hide IP, Change IP, Trace IP a
whatismyipaddress.com/
IP address lookup, location, proxy detection, email tracing, IP hiding tips, blackl
check. speed test. and forums. Find. get. and show my IP address.

Problems with IPv4

- Decimal: 38.116.202.26
- Binary: 11101110 00010001 10011111 00000100
- Each of the four numbers uses eight bits of storage, and so can represent any of the 256 numbers in the range between zero (binary 00000000) and 255 (binary 11111111).
- Therefore, there are more than 4 billion possible different IP addresses in all: 4,294,967,296 = 256 * 256 * 256 * 256

Network Sizes Summary

Name	Other Names	Protocol	Size
PAN Personal Area Network	Bluetooth		Tiny, 1-2 m
WLAN Wireless Local Area Network	Wi-fi	IEEE 802.11	Small, room sized
LAN Local Area Network	Intranet	IEEE 802.3	Building sized
WAN Wide Area Network	Internet, WWW Cell Network NASA's Deep Space Network	HTTP, HTTPS, IP	Huge. Country or Planet Sized

Networks Sizes & Addresses

2.8 C

Size & Meaning	Other Names	Protocols (Rules)	Size
	Bluetooth		Tiny, 1-2 m
	Wi-fi	IEEE 802.11	Small, room sized or house sized.
	Intranet, Ethernet	IEEE 802.3	Large Building sized
	• Internet, WWW • Cell Network • NASA's Deep Space Network • USA military network (also, Russia & China have one)	HTTP, HTTPS, IP	Huge. Country or Planet sized

Pieces of a packet

- Header Contains
  - Destination IP address (who it is to)
  - Origin IP address (who it is from)
  - The packet number
  - Error checking information
- Data Contains
  - The piece of the giant file that you are receiving
  - OR the message for the server about what you want.

What is an IP address?

- A unique number assigned to a computer on the internet
- 38.116.202.26
- Each byte separated by a dot. Each byte goes from ___ to ___
- Only _____ addresses in this system