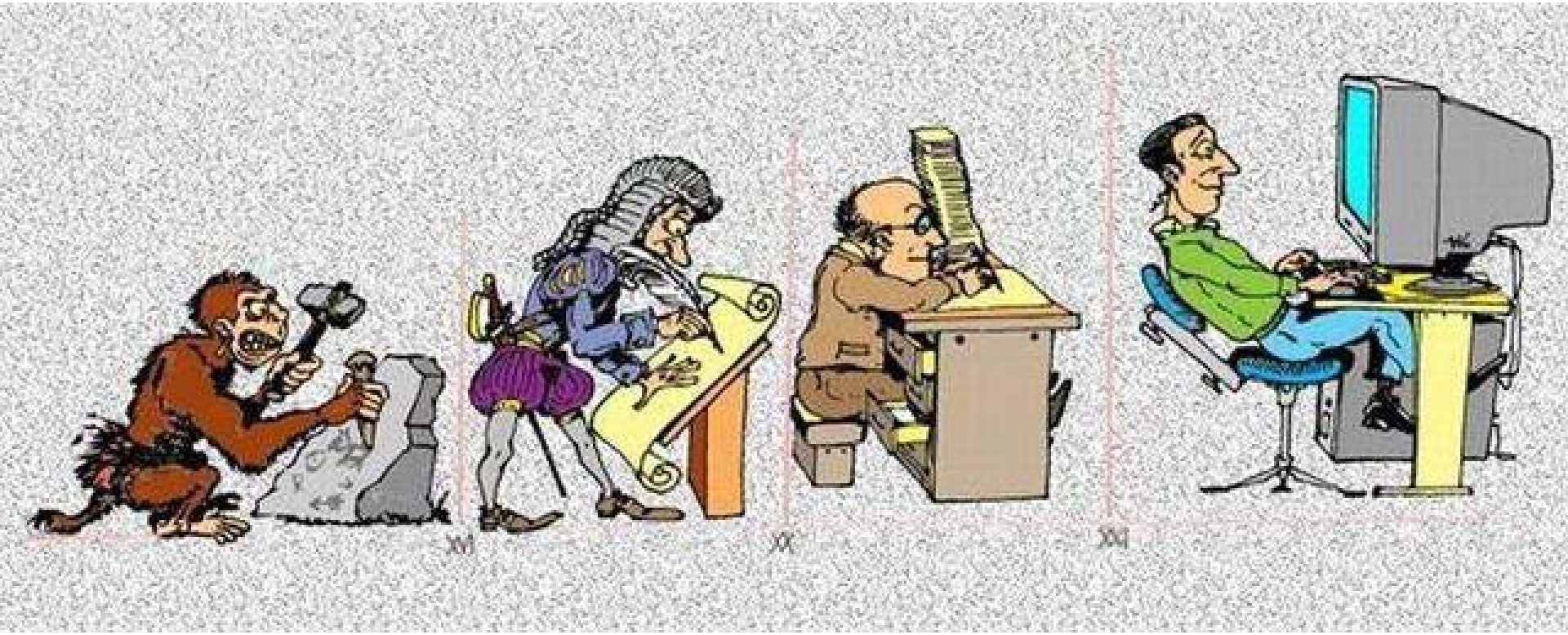
Evolution of Communication



Some things change, but the fundamentals remain the same …

EECS 3213: Communication Networks
Fall 2015

Course Web-Page: http://www.cse.yorku.ca/course/3213/
(all lecture notes will be posted on this page)

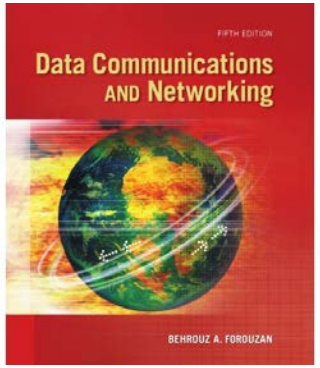
Instructor: Natalija Vlajic (vlajic@cse.yorku.ca)

Office Hours: TR 14:00 - 15:00 (LAS 2047)

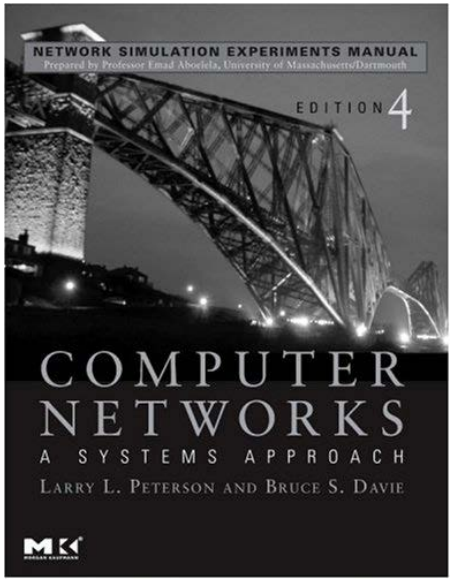
Prerequisite: General Prerequisite.

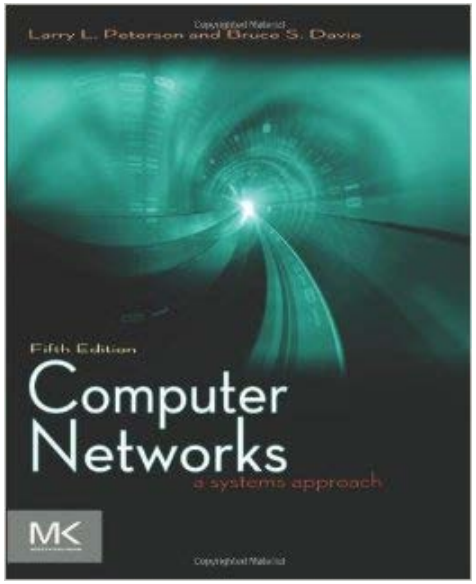
Textbook: "Communication Networks: Fundamental Concepts and Key Architectures", A. Leon-Garcia, I. Widjaja, McGraw Hill, 2004, 2nd ed.

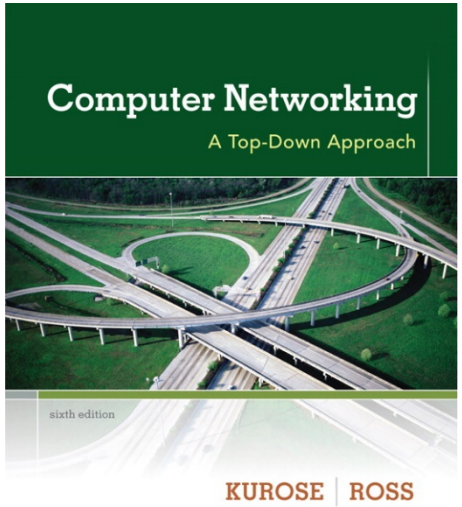
"Data Communications and Networking", B. A. Forouzan, McGraw Hill, 2012, 5th ed.

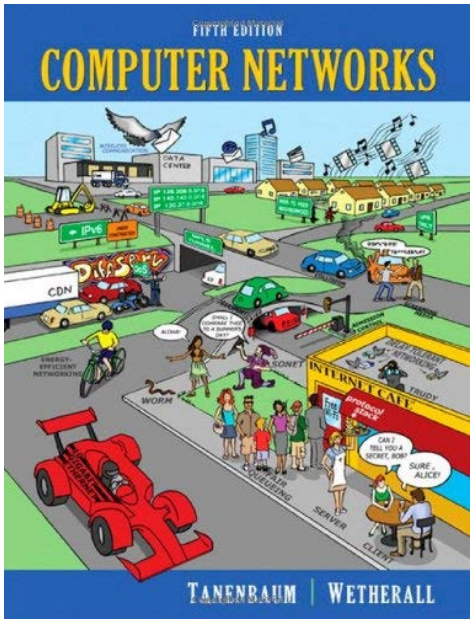


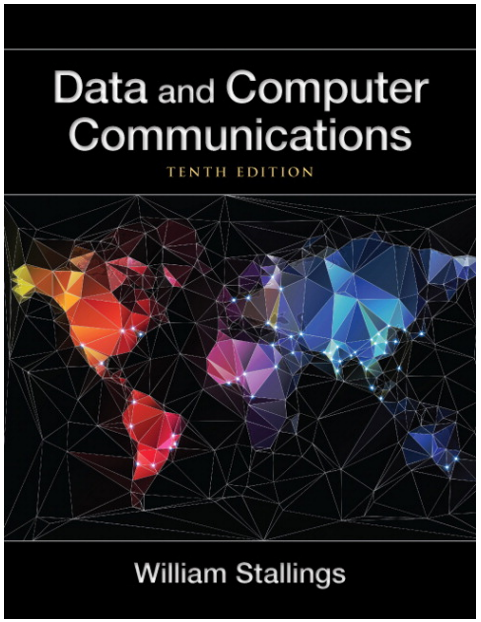
Other Material: see the course web-site











Grading Scheme:

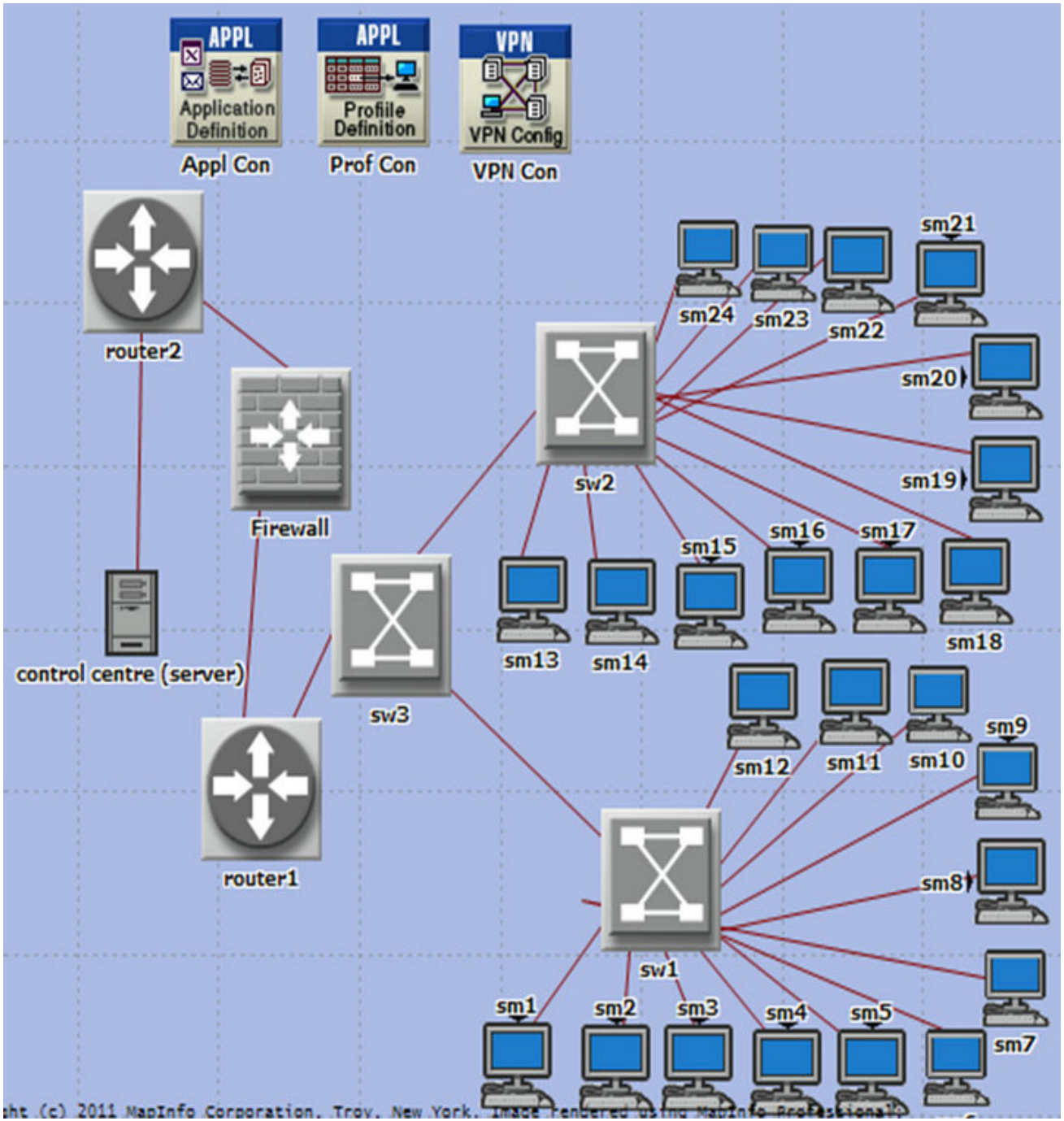
Quiz 1, 2:	2 x 6 % = 12 %
Lab Report 1, 2:	2 x 4 % = 8 %
Midterm (Oct 22):	35%
Final:	45%

Missed Quizes: Makeups of missed Quizzes will NOT be possible. Exact time of each Quiz will be announced on the course Web site, in advance.

Missed Midterm: Makeups of missed midterm exams are only possible in extremely exceptional situations, by arrangement well prior to the exam.

Lab Software: Riverbed Modeler (Academic Edition)

- formerly known as IT Guru
- free network simulation software
- 6-month renewable licence
- lab-manual will be available after reading week
- labs to take place in November


APPL
Application Definition
Appl Con
APPL
Profile Definition
Prof Con
VPN
VPN Config
VPN Con
router2
Firewall
sw2
sm21
sm24
sm23
sm22
sm20
sm19
sm16
sm17
sm15
sm18
sm13
sm14
control centre (server)
sw3
sm12
sm11
sm10
sm9
router1
sm8
sw1
sm1
sm2
sm3
sm4
sm5
sm7
ht (c) 2011 MapInfo Corporation, Troy, New York.

EECS 3213: Communication Networks

Does this course has a wrong title?

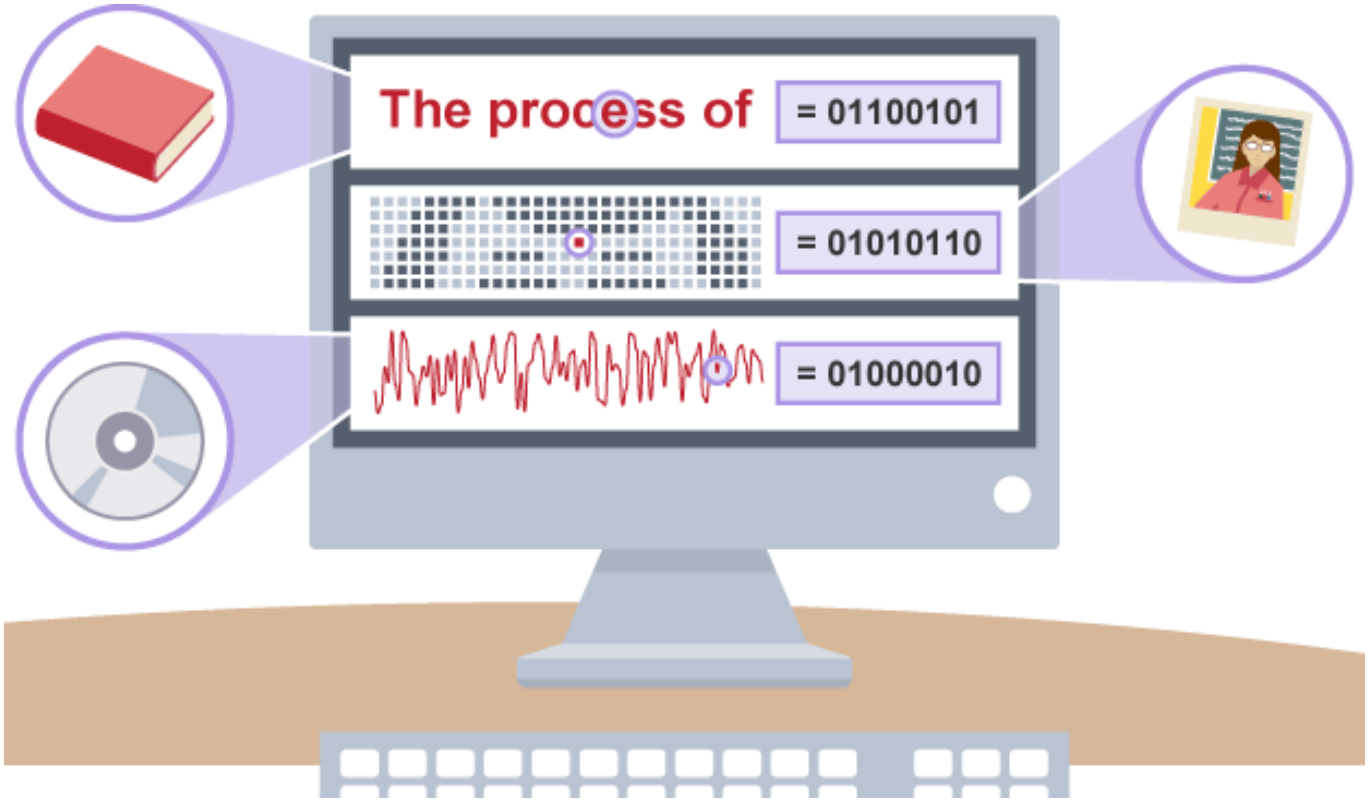
Communication is a process of transmitting or sharing *ideas*, *knowledge*, *emotions* or *thoughts*. Example of communication is saying ‘hi’ to someone.

Telecommunication is a form of *communication over a long distance*. An example of telecommunication is calling a mobile, chatting or telephone forwarding.

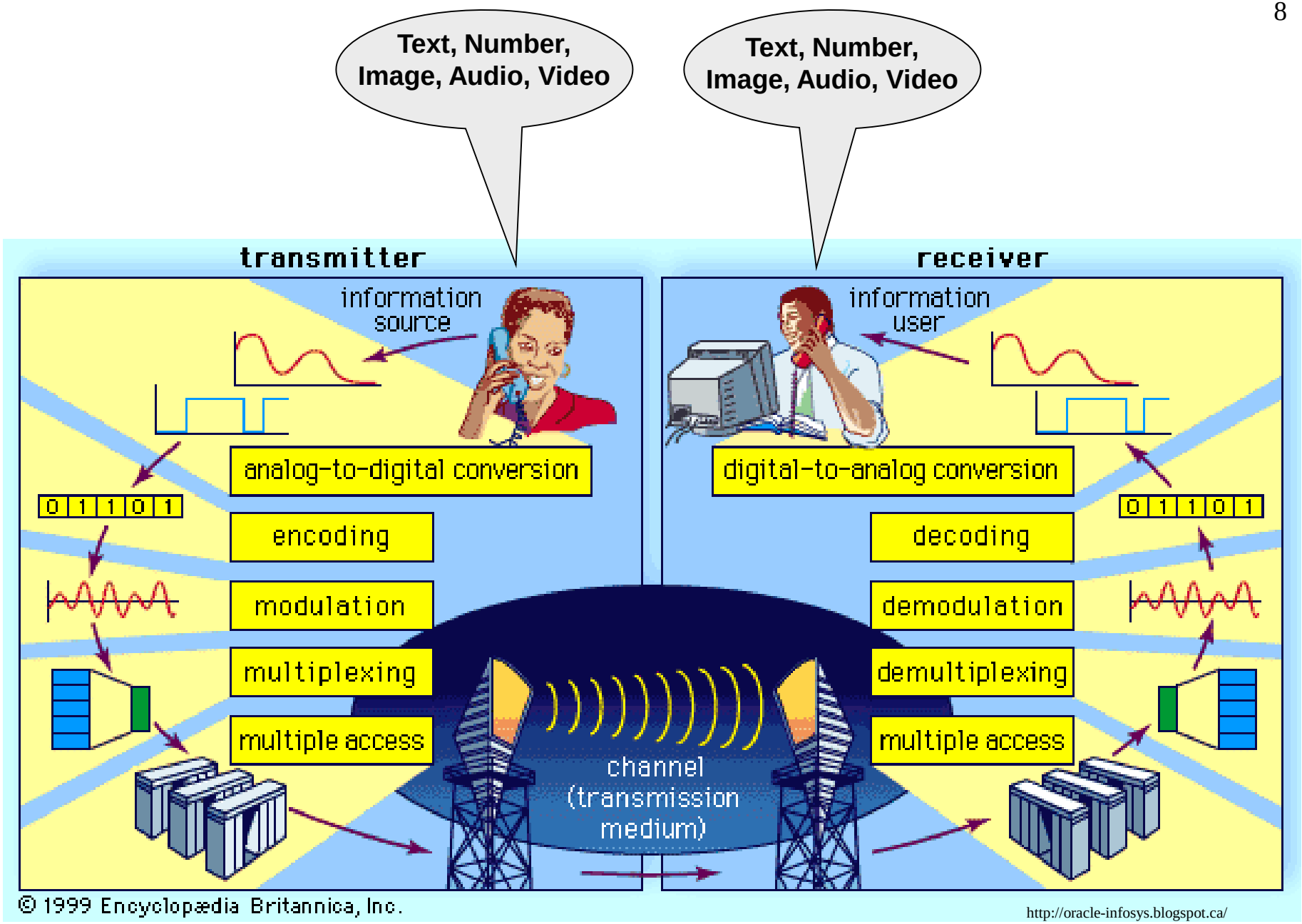
www.answers.com

Telecommunication = data communication over distance

Text, Numbers, Images, Audio, Video
(discrete vs. continuous)



http://www.bbc.co.uk/education/guides/zpfdwmn/revision/1

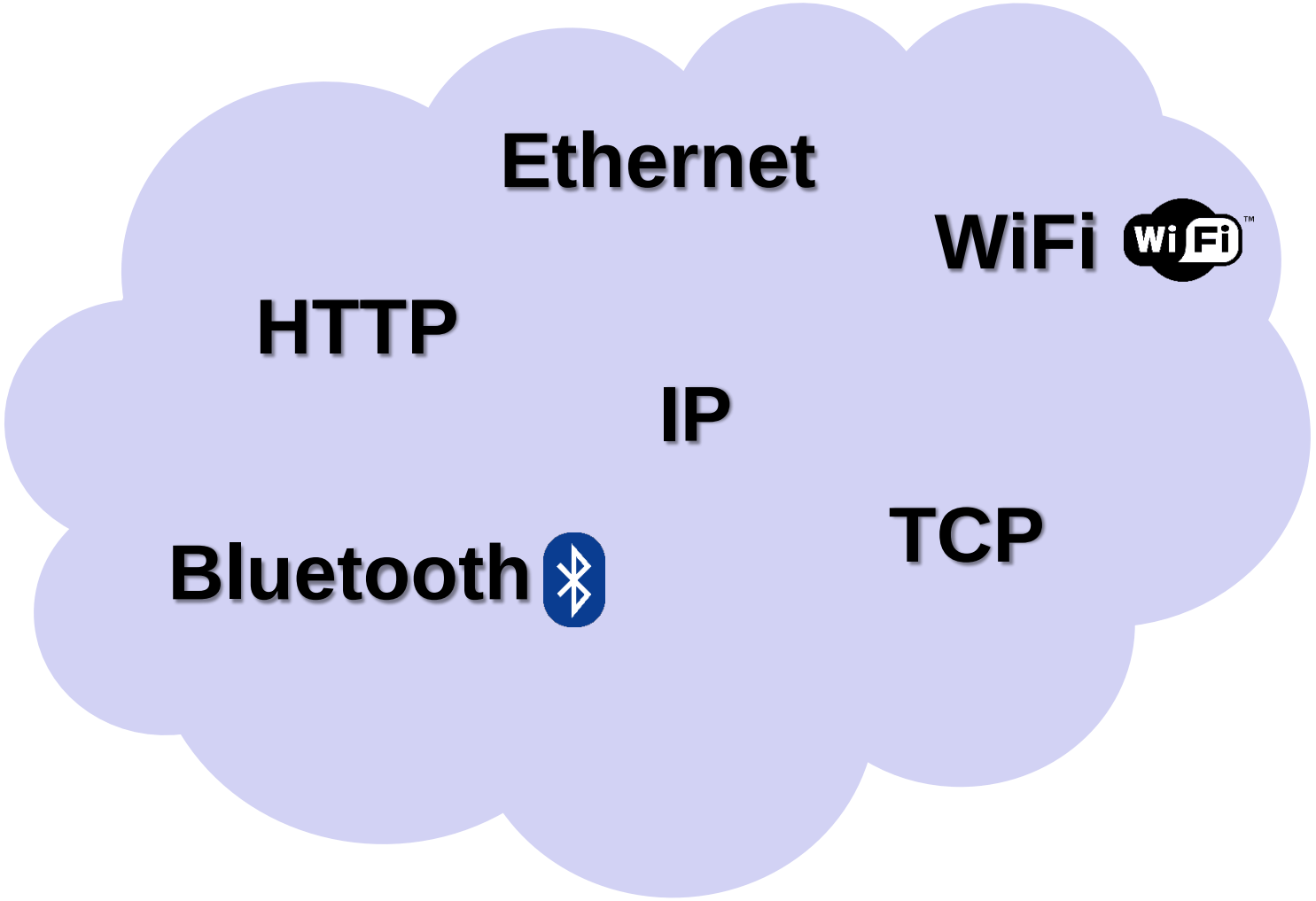

Text, Number, Image, Audio, Video
Text, Number, Image, Audio, Video
transmitter
receiver
information source
information user
analog-to-digital conversion
digital-to-analog conversion
0 1 1 0 1
encoding
decoding
modulation
demodulation
multiplexing
demultiplexing
multiple access
multiple access
channel (transmission medium)
© 1999 Encyclopædia Britannica, Inc.

Course Objective and Schedule:

The course is an introduction to communications and networking. Topics covered include:

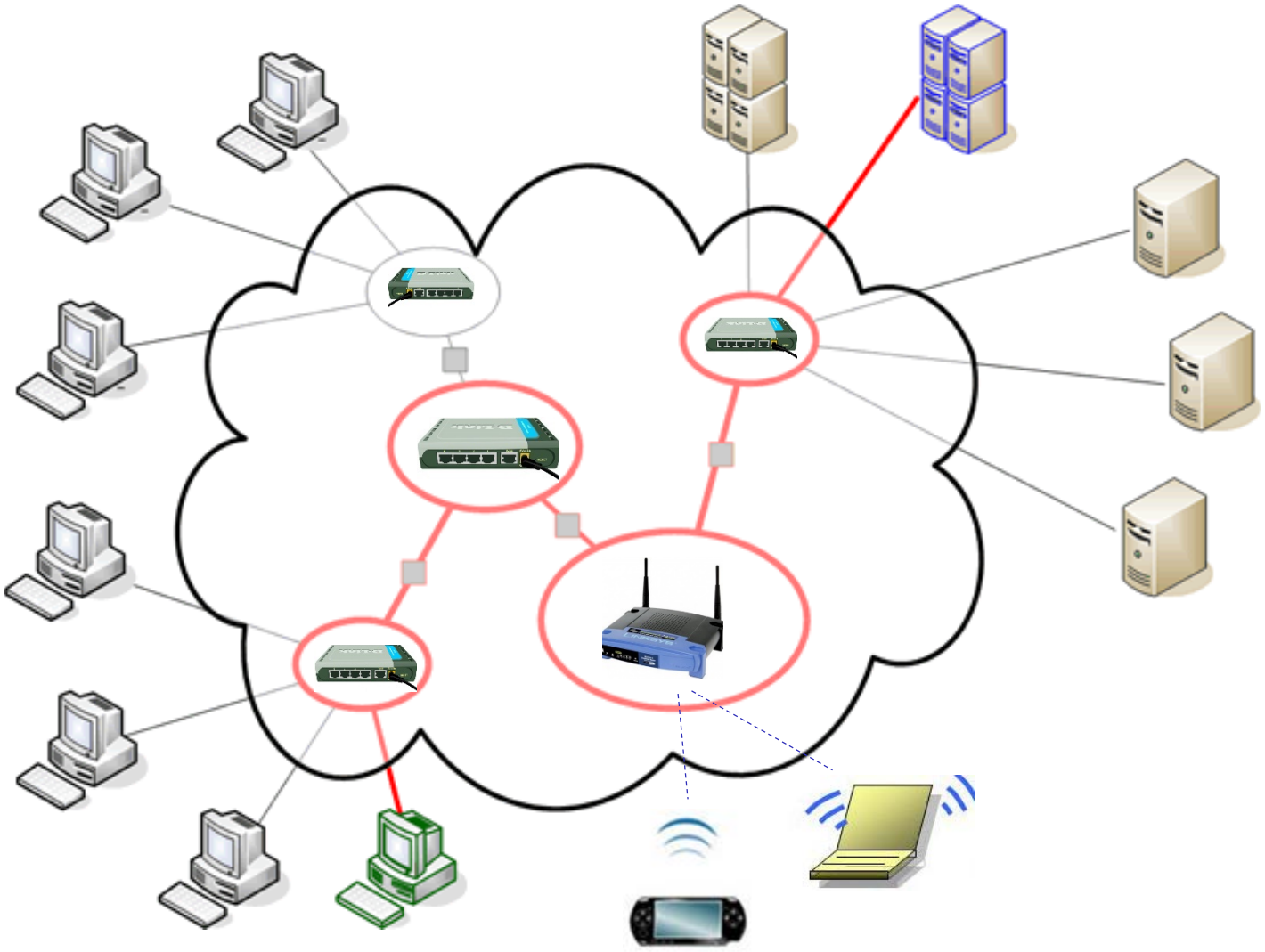
big picture	▪ Message, Circuit, Packet Switching LANs, WANs ▪ Applications and Layered Architectures
sending signals & bits over wired (or wireless) medium	▪ Time and Frequency Representations of Signals Intro to Fourier Analysis ▪ Digital vs. Analog Communications ▪ Channel Capacity, Nyquist and Shannon Theorems ▪ Line Coding (RZ, NRZ, Bipolar, Manchester) ▪ Digital Modulation (ASK, PSK, FSK) ▪ Analog Modulation (AM, FM, PM) ▪ PCM and Delta Modulation
sending packets over LANs	▪ Error Detection and Correction ▪ Flow and Error Control ▪ Medium Access Control (Aloha, CSMA, Scheduling) ▪ LAN Protocols (Ethernet, Token Ring, Wireless LANs) ▪ Connecting LANs
sending packets over Internet	▪ Network Layer ▪ IP Protocol

Big Picture

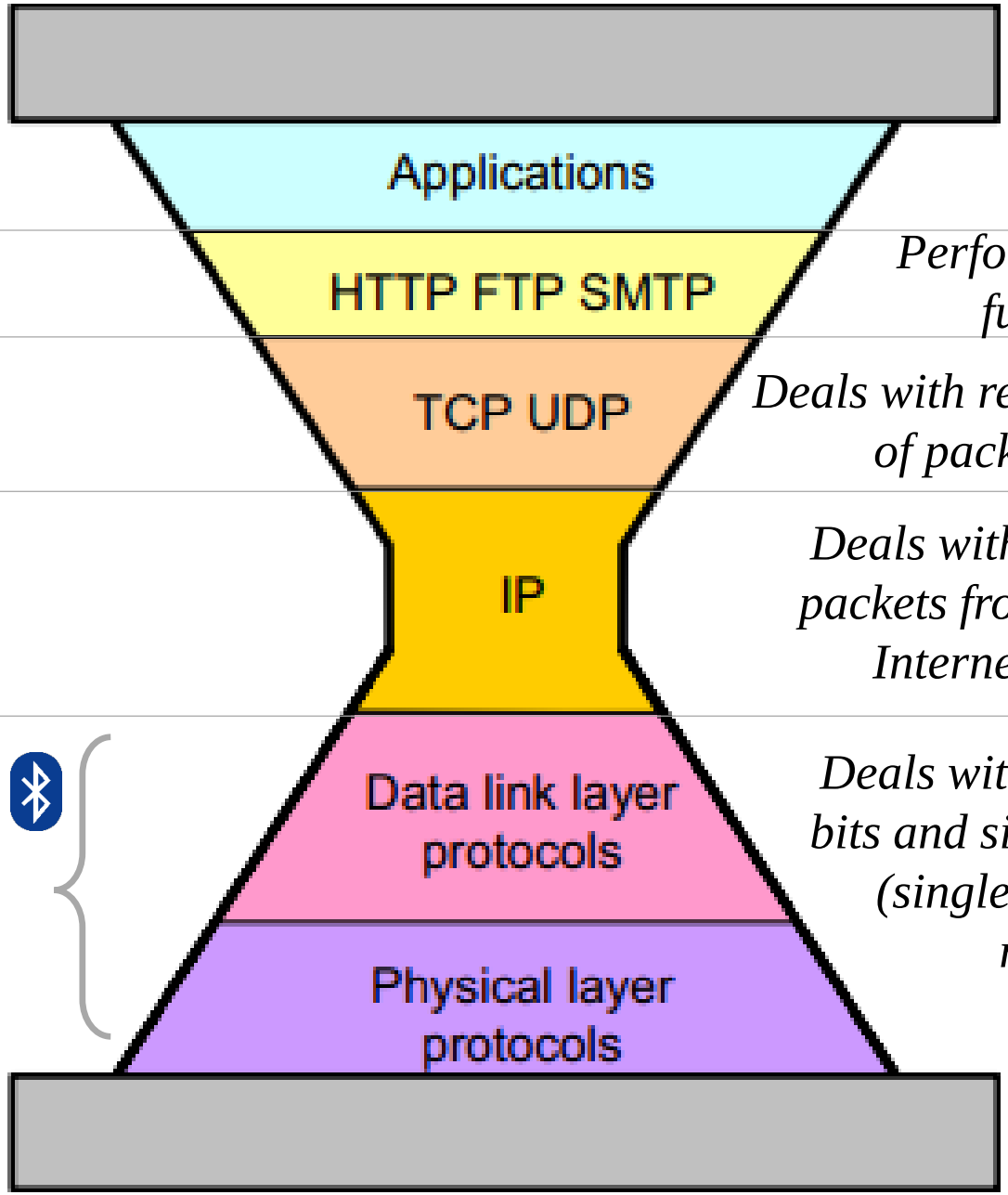


No single protocol is sufficient for communication – they each are just a ‘piece of a puzzle’ …

Puzzle: communication between two devices on two different sides of the world



Internet Hourglass Model



Performs some useful functionality.

Deals with reliable transmission of packet streams …

Deals with transmission of packets from one side of the Internet to the other.

Bluetooth

Ethernet

WiFi

Deals with transmission of bits and single packets over (single) transmission medium.

Wireless vs. Wired Comm. Networks

WiFi

Bluetooth

Mobile/Cell Phone

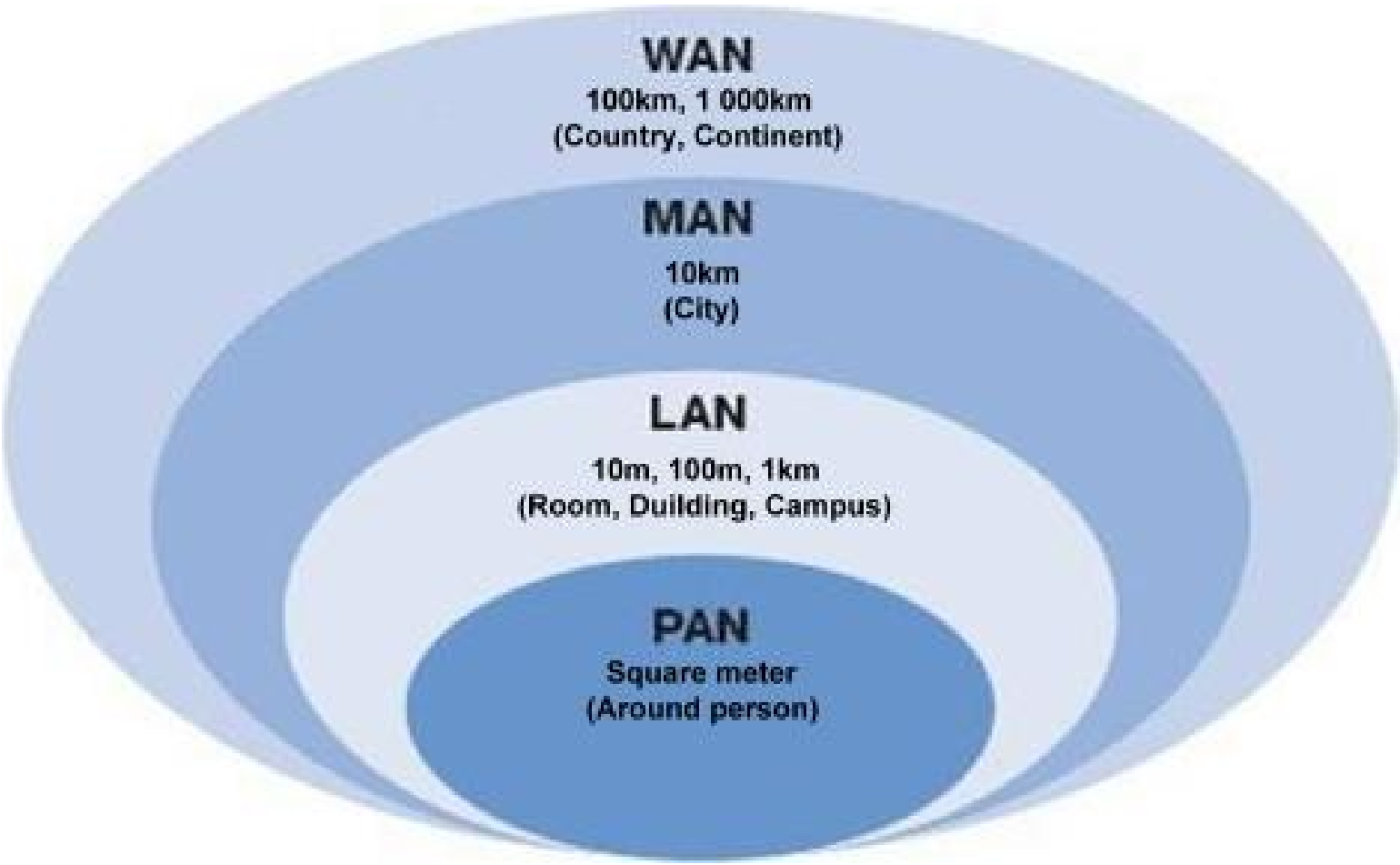
Satellite

Ethernet

Cable TV

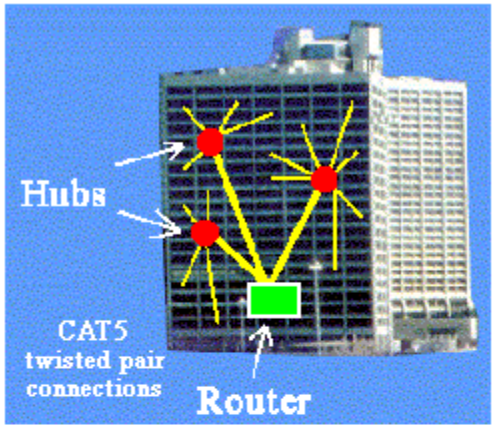
Wired Phone

Type of Networks by Scale …

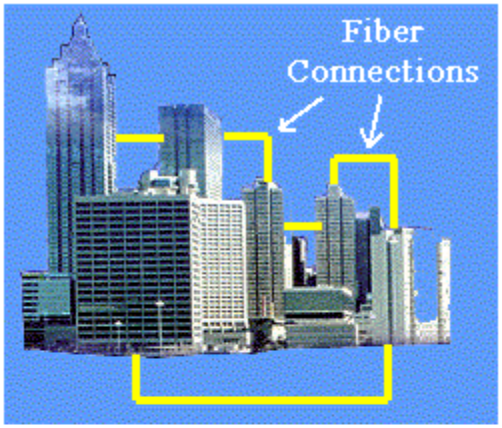


Wired LAN, MAN, WAN …

LAN interconnects hosts (computers, laptops, etc.) and spans an office or building.

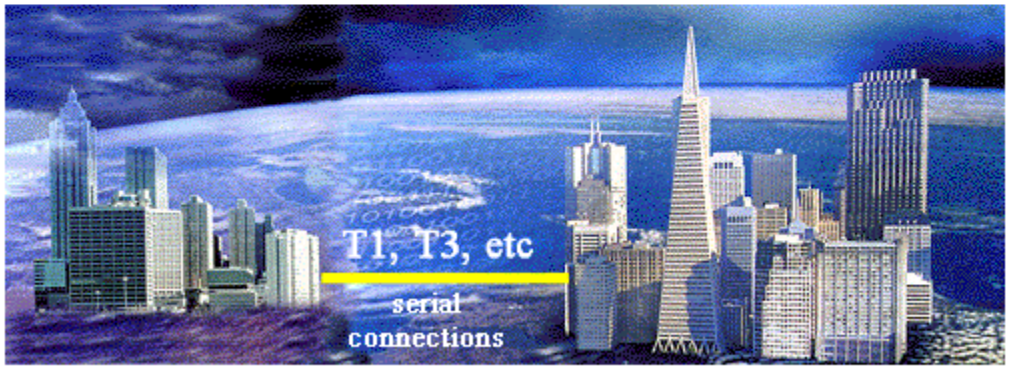


LAN



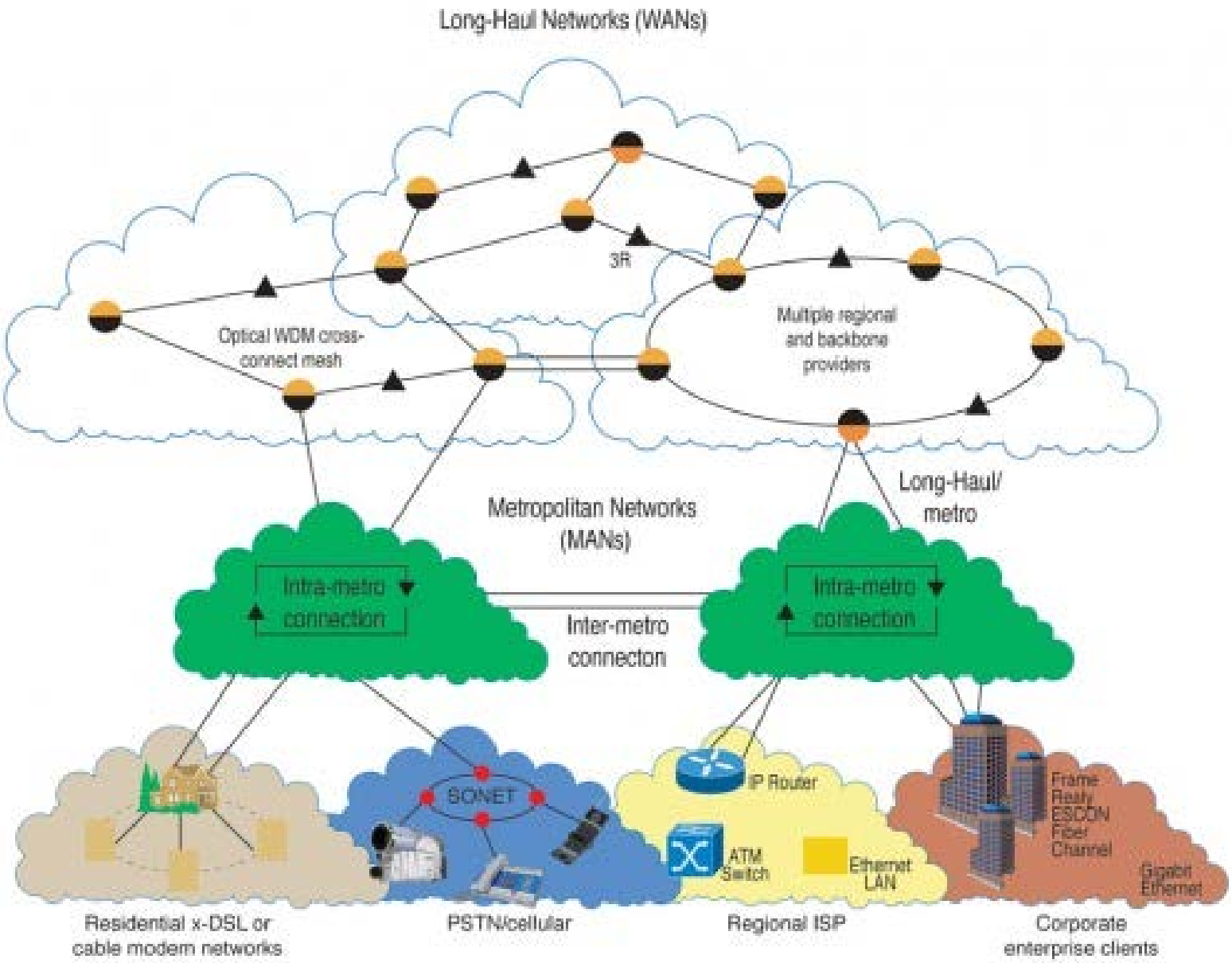
MAN

WAN interconnects connecting devices (switches, routers, etc.) and spans a town, state, country or world.



WAN

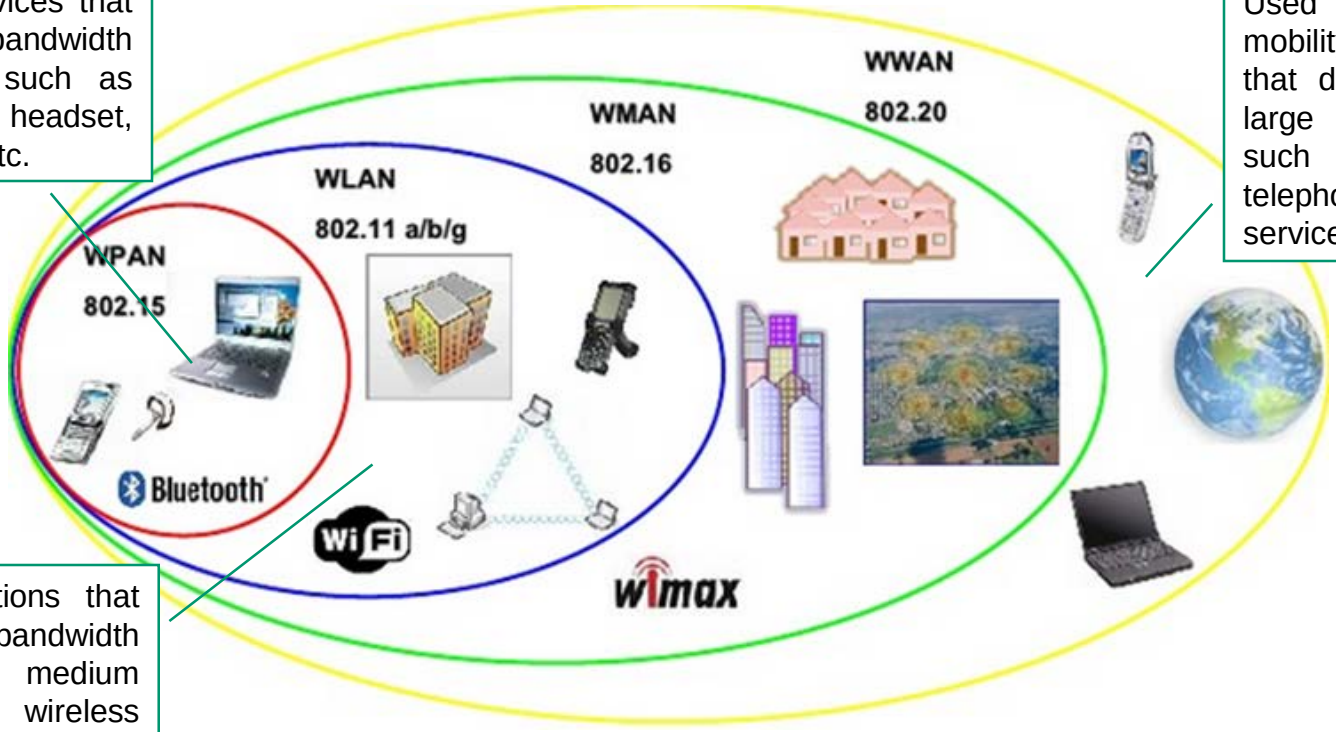
Wired LAN, MAN, WAN …



Wireless PAN, LAN, MAN, WAN …

Used for small devices that only require low bandwidth and little range, such as mobile phones headset, computer mouse, etc.

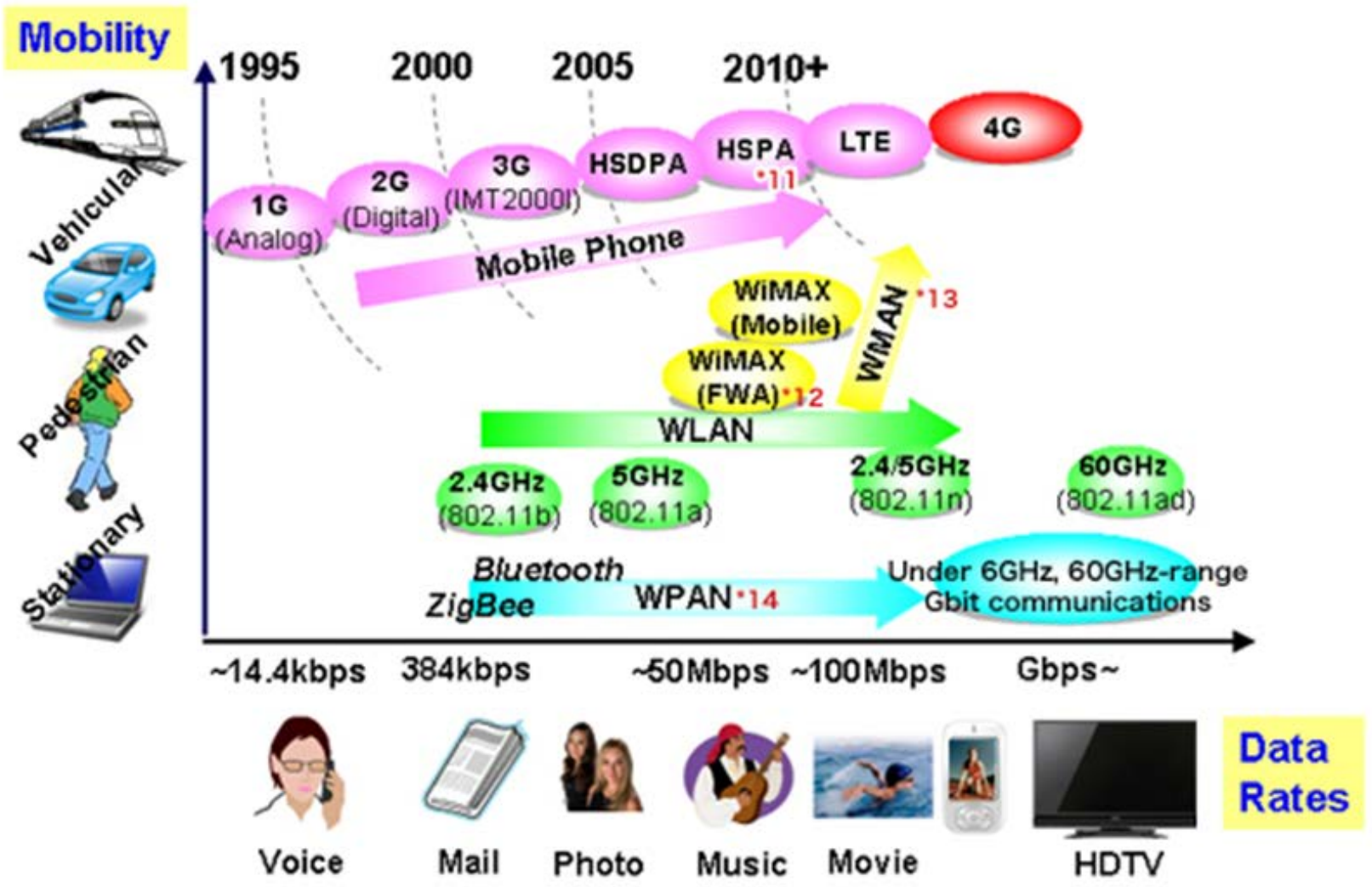
Used for high mobility applications that do not require large bandwidth, such as mobile telephone internet services.



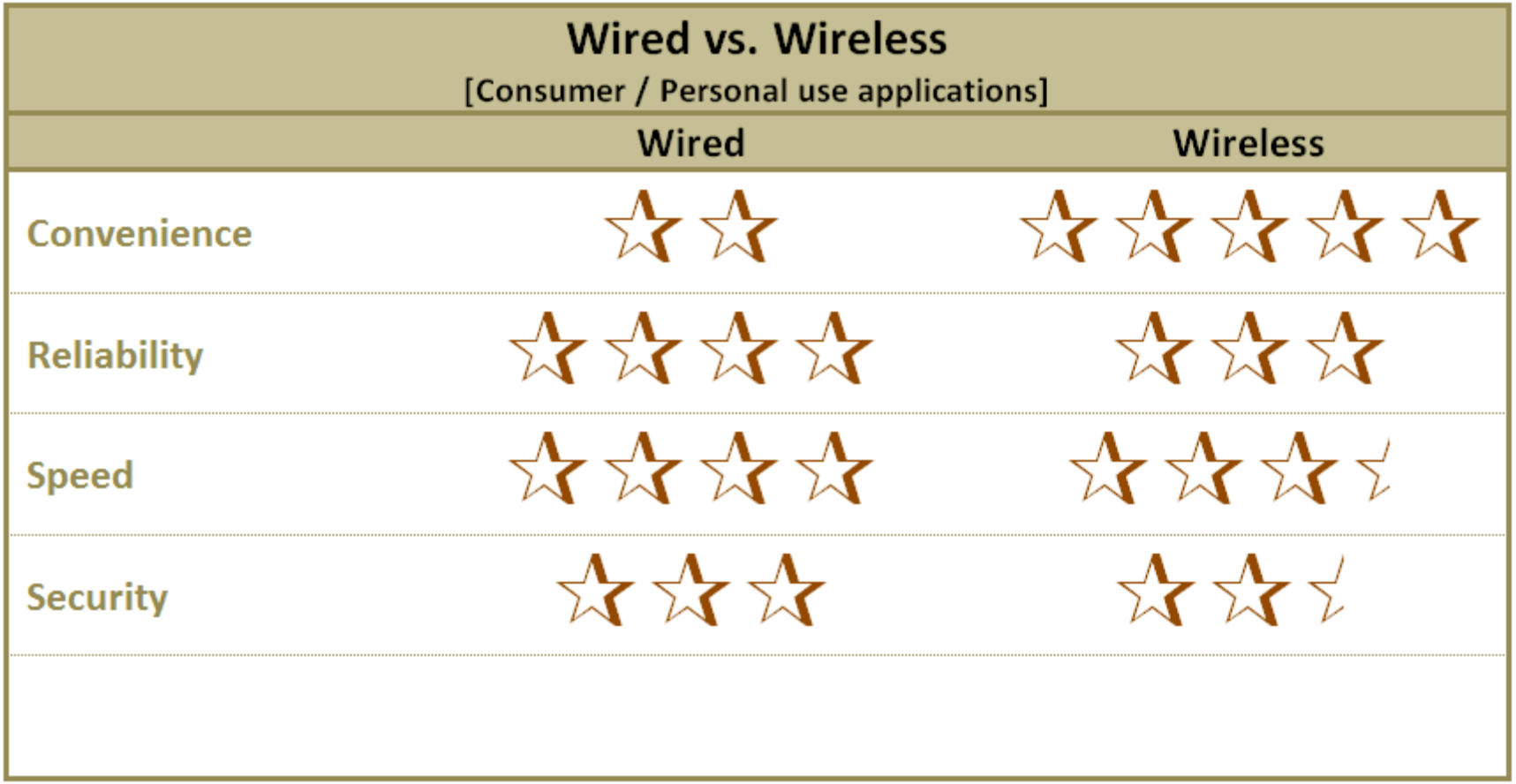
Used for applications that require high bandwidth connections at medium range, such as wireless access for laptops.

Type of Network	Technology	Device Characteristics
WPAN	Bluetooth (IEEE 802.15)	low power consumption / long life, short range, low data rate, low mobility
WLAN	WiFi (IEEE 802.11)	medium power consumption, medium range, high data rate, low mobility
WWAN	cellular (3G, 4G, …) satellite	long range, medium to high data rate, high mobility

User Mobility and Data Speed in Wireless Networks



Wired vs. Wireless Transmission: Pros and Cons



Wireless Cons
not often talked about …

Electromagnetic fields of all frequencies represent one of the most common and fastest growing environmental influences, about which anxiety and speculation are spreading. All populations are now exposed to varying degrees of EMF, and the levels will continue to increase as technology advances.

http://www.who.int/peh-emf/en/

In 2007, an independent, international collaborative of 14 scientists and public health and policy experts reviewed more than 2000 studies of health effects from EMR (the Bioinitiative project). They concluded, "*Chronic exposure to EMF is associated in some scientific studies with increased health risks that vary from impaired learning, headaches, mental confusion, skin rashes, tinnitus and disorientation to a variety of cancers, and neurological diseases like ALS and Alzheimer's*." The Bioinitiatve Report is probably the most comprehensive literature review on the subject, but some critics claim it is one-sided.

http://www.davidsuzuki.org/issues/health/science/enviro-health-policy/electromagnetic-radiation-and-fields/