Internet

LBF/VAA011 Medicalbiophysics, biometrics and computer technology

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Computer network

- **Computer network** - set of computer connected together
- main goal – share resources
- computers = nodes
- connection – wired or wireless
- **Internet** – global system, internet protocol (IP) network
- **IP address** – numerical label
- functions of IP address:
  - identification
  - addressing

IP address

- **IP v. 4**
  - 32-bit number
  - dot-decimal notation e.g. 172.250.0.1
  - only 2^{32} nodes
  - dividing to two parts – network number position (subnet mask) and host identifier
- **IP v. 6**
  - most recent version (standard since July 2017)
  - 128-bit number
  - 2^{128} possible addresses
  - eight groups of four hexadecimal digits
  - 2001:0db8:0000:0042:0000:8a2e:0370:7334

Domain name system (DNS)

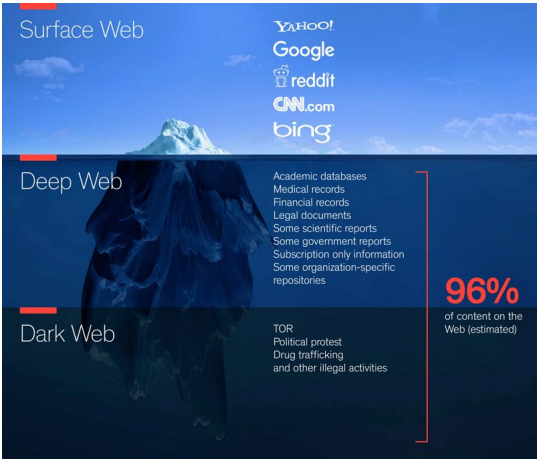
- hierarchical decentralized naming system
- IP address $\rightarrow$ domain name
- domain name – `www.upol.cz`
- domain names – consists one or more labels divided by dot
- top-level domain
- hierarchy – from right to left
- **domain name**
  - top-level domains – managed by Internet corporation for assigned names and numbers
  - 1543 top-level domains (April 2018)
  - several groups of top-level domains
  - generic top-level domains (edu, com, net, gov, org, ...)
  - country code top-level domains (cz, fr, uk, us, ...)
  - infrastructure top-level domains
  - second level domains are managed by its top-level domain

Exercise

1. Find your IP address
2. Find your network mask
3. Find your DNS gate

use cmd `ipconfig /all`
or
`https://www.whatismyip.com/`

Internet



Is dark web illegal?

Searching internet

- billions of websites
- **searching engine**
- `http://www.google.com`
- `http://www.yahoo.com`
- `http://www.seznam.cz`
- `http://www.bing.com`
- Encyclopedia – `http://en.wikipedia.org`

Searching Google

- when typing – Google suggestions
- Google is not case sensitive
- Google spell checker – Dog breads → dog breeds

Google – quick answers

- weather – “weather” or “weather Olomouc”
- dictionary – “define medicine”
- calculations – “1+1”
- unit conversion – “3 USD to EUR”
- sports – “Sigma Olomouc”
- quick facts – “Bart Simpson”

Google – advanced searching

@	search social media
#	search hastags
-	exclude word from search
" "	search for an exact match
*	search wildcards or unknown words
..	search within a range of numbers
or	combine search
site:	search for a specific site
related:	search for related sites
info:	get details about site
and	combine search

Exercise

- You want to purchase a DVD player
- you only want to spend between 40€ – 50€
- you do not want buy it on amazon

What would you type into the Google search box?

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What would you type into the Google search box?

buy dvd player 40€..50€ -amazon

Electronic information resources

- **http://ezdroje.upol.cz**
- informations used in science and research
- exclusively limited for academic needs
- outside of faculty you may need VPN (how to: `http://wiki.upol.cz`)
- **ScienceDirect** – more than 2500 peer-reviewed journals (Elsevier, Academic press, . . .)
- **MEDLINE** – medical database

Exercise

Use ScienceDirect and Medline and find out how many results you obtain for searching ULTRASOUND

1. when you use it as key word
2. in title
3. restricted for year 2016

Internet security

- branch of computer security
- possible threats:
  - malware
  - spyware
  - adware
  - phishing
  - comuter virus
  - computer worm
  - etc.
- focus on prevention, real time protection

Malware

- general term
- short for malicious software
- goals:
  - disrupt computer operations
  - gather sensitive informations
  - gain access to private computer systems
- types of malware:
  - spyware
  - adware
  - phishing
  - Trojan horse
  - worms, viruses
- spreading:
  - running infected e-mail attachment
  - infected websites
  - program downloaded from internet

Spyware

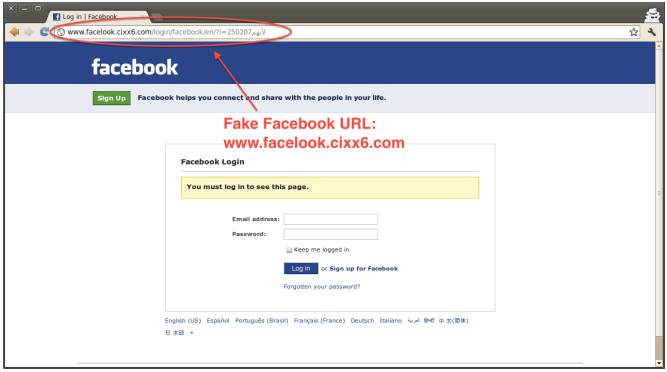
- gather information about person or organisation (without their knowledge)
- informations – browser history, personal informations like credit card informations
- **Keyloger** – records the keys struck on keyboard

Adware

- advertising-supported software
- generate online advertisements
-
- usually is not dangerous
- hidden in free softwares, browser plugins

Phishing

- fraudulent attempt to obtain sensitive informations
- carried out by e-mails, instant messaging
- directs to fake websites (look and feel like legitimate site)
- difference – url of website



Computer viruses

- can execute, replicate itself
- affected areas – "infected" with computer virus
- spreading:
  - e-mail – opening attachment
  - infected websites
  - connecting infected external storage
- modify or delete key functions
- copy, delete or encrypt data
- infecting other resources

Trojan horse

- malicious software, look like a legitimate software
- they do not spread themselves, they carry other virus files
- steal users informations
- download malicious content onto infected system

Computer worm

- infects vulnerable computers in network
- they usually propagates to other computers without any user interaction
- they replicate themselves – eat up lot of system resources
- they do not need host files or programs to spread

Spam

- unsolicited (undesirable) electronic message
- usually advertisements
- e-mail, instant messaging, web search engine spam, ...

Rootkit

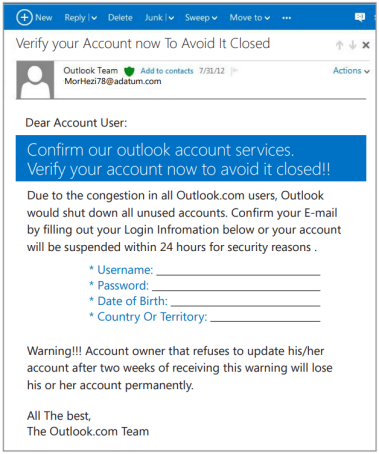
- software to get to the root of the computer
- gain admin access to computer
- phishing, social engineering attack

Ransomware

- threats to delete or deny access to data
- commands ransom
- very common
- carried out using a Trojan horses or computer worms

Exercise

This was a fraudulent phishing message from “Microsoft” to an Outlook user. Give at least two warning signs that it’s a hoax


New Reply Delete Junk Sweep Move to

Verify your Account now To Avoid It Closed

Outlook Team Add to contacts 7/31/12
MorHezi78@adatum.com
Actions

Dear Account User:

Confirm our outlook account services.
Verify your account now to avoid it closed!!

Due to the congestion in all Outlook.com users, Outlook would shut down all unused accounts. Confirm your E-mail by filling out your Login Infromation below or your account will be suspended within 24 hours for security reasons .

* Username: _____
* Password: _____
* Date of Birth: _____
* Country Or Territory: _____

Warning!!! Account owner that refuses to update his/her account after two weeks of receiving this warning will lose his or her account permanently.

All The best,
The Outlook.com Team

Protecting

- Use antivirus software
- Use firewall
- Keep your software up to date
- Back up your computer
- Use strong passwords
- Do not click on links within e-mails
- Minimize downloads
- Do not visit porn pages
- Think before you share anything
- Be aware of those around you
- Do not always trust what you see online
- Be cautious where you are on public wireless network
- Deleted data are not actually deleted

Antivirus software

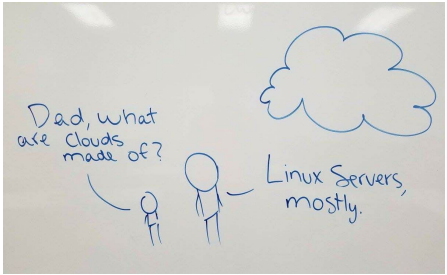
- software – prevent, detect and remove malware
- background process, which scanning devices
- basic functions:
  - scaning directories or specific files for known malicious patterns indicating of malicious software
  - scheduled scans
  - scanning in any time
  - remove malicious software
- free of paid license

Exercise

Choose any antivirus software
on web find which functions this software offers
find the price and if it has free licence

Backup

- archive files on other place
- restore data after loss event
- purpose:
  - recover data after their lost
  - recover data from earlier time
- Where we can store our data?
  - Storage media – USB, optical storages, hard disk
  - Network attached storages – NAS
  - Online backup storages (Cloud storages) – Dropbox, Onedrive



Exercise

Find 5 **cloud data storages** find out their

- name
- free capacity
- price for more space

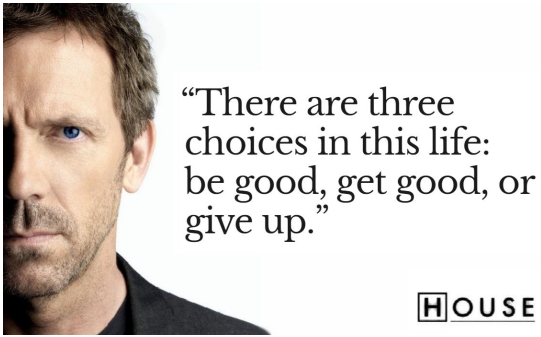
Find 3 **backup softwares** find out their name and price

Password

- word or string used for authentication
- poor passwords – easy to guess
- strong password – difficult to remember
- recommendation:
  - use strong password
  - use different passwords for different websites
  - do not share your password
  - do not write it down
- most common passwords:
  - the name of the pet or relative
  - anniversary date or birth date
  - birth place
  - name of favourite holiday
  - sports team
  - the word "password" or other common phrase such as "iloveyou"

Create secure password

- use **reminder sentence** for your unique password
- number word change for numbers
- take first letters of each word
- some word can be changed into symbols – "or" $\rightarrow$ "+"
- ta3citl:bggg+gu
- use **personal formula** – start with some root
- add number – root42
- capitalize one letter – rOot42
- this stay same for all your passwords
- for each web adapt root – facebook add F at the beginning



Store your passwords

- generate random strong password
- password management app
- they offer:
  - storing password
  - generating passwords
  - automatically fills in passwords
- Examples: "KeePass", "Sticky Password", "LastPass"
- **LastPass**:
  - `http://www.lastpass.com`
  - all passwords are stored on web
  - access via single password

Exercise

Create strong password you can remember
test its strong on web page
`http://www.passwordmeter.com`
test your current passwords

Password cracking

- **Brute force** – try all possible passwords
- common computer can try 588 234 passwords per second
- four digit pin code – 10^4 combinations, all possibilities $0.07s$
- average time is $0.035s$
- 8 character long lowercase password – 26^8 – in average 2 days (on supercomputer $1.8s$)
- upper + lower case – 52^8 – 1.4 years
- upper + lower case + number – 62 chars – 5.8 years
- upper + lower case + number + special symbols – approx 80 chars – 45 years (on supercomputer 4 days)
- 10 character long password – 3 years on supercomputer