CS330 course note

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Contents

1 Component of PC

1.1 intro

1. Social engineering
   is when hacker use their knowedge of psychology to trick people into divulging confidential infomation

2. Hardware Components

   - Processor: CPU
     where symbols, characters and numbers are manipulated
   - Main Memory
     where data and program instructions are stored temporarily during processing
     e.g. registers, cache, ram
   - Secondary storage
     Store data and programs even when computer is turned off
     e.g. flash drives, SSD, HDD, CD, DVD
   - Input devices
     Covert data and instructions from the outside world into electronic form
     e.g. keyboard, mouse
   - Output Devices
     convert electronic data produced by computer into a form understood by human or the outside world
     e.g. printer, speaker, monitor
   - Communication Devices
     Provide connections between the computer and communications networks
     e.g. WIFI, bluetooth

3. Capacity
   small b is bit for single binary digit
   Big B is Byte(8 bits), there are 2^8 possible values
   dealing with data storage, use mutiples of 1024
   dealing with frequencies, use mutiples of 1000

   - KB = 1024 bytes
   - MB = 1024^2 bytes
   - GB = 1024^3 bytes
   - TB = 1024^4 bytes
   - Kb's or Kbps = 1024 bits/s
   - Mb/s or Mbps = 1024^2 bits/s
   - Gb/s or Gbps = 1024^3 bits/s

1.2 Processor

1. Processor
   64 bit have backwards compatibility: still works for older program

   - Build for efficiency
     used for small product, do not need a fan, try to minimize the number of transistors they use
   - Build for speed
     used for large product like laptops, desktops and require large battery
     need a fan to keep cool
     they have lots of transistors

2. Processor Operations

   - Arithmetic and logic
   - comparisons
   - Accessing data
   - Flow control

3. Components of Processor

   - Program Counter(PC):
     holdes the address of the current/next instruction
   - Instruction Register(IR):
     holds the instrustion that is being executed
   - Arithmetic logic Unit(ALU):
     performance arithmetic and logic operations
   - Registers:
     a small amount of temporary storage, usually a source or destination for the data
   - Control Unit:
     reads the instruction in the instruction register and turns on and off the other components of the processor to execute the instruction
   - Cache
     stores recently used data and instructions

4. Processing power
   clock speed
   Mhz: 1 million clock tick per s, or Ghz: 1 billion clock ticks per second

   - millisecond: ms : $\frac{1}{10^3}$s
   - microseconds: us: $\frac{1}{10^6}$s
   - nanoseconds: ns: $\frac{1}{10^9}$s
   - picoseconds: ns: $\frac{1}{10^{12}}$s

5. Main Memory Hierarchy

Type	Speed	Capacity
Register	0.2 ns	100B - 300 B
caches	1-10 ns	10KB - 10 MB
RAM	100 ns	4GB - 400GB
SSD	10 us	256GB - 1TB
hard drive	10ms	8TB - 12 TB
network storage		
off-site storage		

1.3 Secondary Storage

1. Secondary Storage

   - Hard drive
   - Flash drive
   - Optical drive

   Not directly access able by the processor
   Slow than main memory, cheaper than main memory and non-volatile
   must copied into main memory before do action

2. How Secondary Storage works

   - Platter
     Aset of disks stacked on top of each others, with smooth magnetic coating on both side
     RPM: rotation per minute
   - Actuator arm
     move across the disk to read/write
     change the orientation of the magnetic field

3. Parameters of Hard Drives Basics

   - Mean Time Between Failures (MTBF) around 100000 hours
     bathtub curve
     more likely to fail initially due to manufacturer error
     more likely to fail later due to wearing out
   - Annualized Failure Rate(AFR)
     - 0.7-0.8% for enterprise drives (what UW buys)
     - 1.25-1.89% for consumer drives
       1.89% means on average roughly $(1.0 - 0.0189)^4 \times 100\% = 92\%$

     Have over 100000 hard drives Tracks failures and make datat public

4. SSD
    - Pros
        - 10x faster access data
        - last longer
        - has no moving parts
    - Cons
        - More expensive
        - Can wear out snnoer than hard disk when writing a lot of data
        - data can fade
5. Hybird drives
   combine small SSD with larger HD to create more space and faster speed
6. Optical Drives Basics
   Similar to hard drive
   use a laser than actuator arm
   slower and have less capacity than hard drive, inexpensive and durable
   less common as cloud and streaming are more popular

7. Assesing Performance

    - Price per gigabyte
      Best: hard drive
    - Capacity
      Best: hard drive
    - Bandwidth(speed)
      Best: SSD
    - Durability
      Best: DVD/SSD

2 About PC

2.1 Type of PC

1. Specialty Computers
    - Mainframs
        - Reliability
        - ability to hot swap
        - ability to suppoert many users
    - Supercomputers
        - Fast floating point computations
        - Main use: calculation and simulation
        - use order of 100000 of cores
    - Microcontrollers
        - Main Characteristic: simple processors with ram and I/O abilities
        - used in embedded systems

2. Evolution of IT
   (a) mainframe/minocomputer
      - Very expensive
      - One centralized system
   (b) Personal computers
      - Used by one person
      - cost $4000
      - do simple programmings
   (c) Client/Server
      - 2 machine: clients(very cheap) servers(more expensice)
      - Client: requests and user services
      - servers: runs an application and provides it to others
   (d) Enterprise computing
      - Link together different networks and applications
      - use internet to create
   (e) Cloud and mobile computing
      - is an extension of client/server but rather than a server have a shared pool of resources
      - like a cluster of computer, software, storage
3. Peer-to-peer (P2P)
   every machine in the network consumes and provides services at the asme time

2.2 Drivers of Technology

1. Moore's law
    - The number of transistors that can fit on a chip doubles every 18 months
    - Trend has been true since 1959, but slow down since 2010-2013
2. Law of Mass Digital Storage
    - Amount of digital information is roughly doubling every year
    - Since 1990, rate become 65% year
    - Hard disk drive capacity groeing exponentially
3. Metcalfe's law
    - The value of a net work grows exponentially as a function of the number of network members
4. Declining communication Costs
    - Communication costst have been declining
5. Creation of Standards
    - The creation of technology standards allows competition, increase interoperability and reduces costs

2.3 Infrastructure Components

1. Computer Hardware Platforms
    - Client machines: desktops, laptops....
    - Server machines
      could be single mainfarme or large number of rack servers or blade servers
2. Operating System Platforms
    - OS managers a computer's hardware and software resources
    - For laptops and desktops
        - 88.6 % of PCs ran Windows
        - 9.4 % ran macOS
        - 1.5 % run linux
    - For smartphones
        - 71.3 % run Android
        - 28.3 % run IOS
    - For servers
        - 69.7 % run Unix or linux
        - 30.3 % run windows
3. Enterprise Applications
   Computer programs used by organizations that integrate business applications and services across the many different departments
4. Data Management System and store
   Role: organize and store the company's data
   Use Redundant Array of Independent Disk(RAID0 to impore hard disk performance
    - improve in reliability, availability, performance, capacity
    - RAID 0: DIsk striping
      Split the file into differnet part and store in different disk
      * number of disk speed
      Decrease Reliability
    - RAID 1: Disk Mirroring
      Store same data on two or more disks
      Improve Realiability, Read Performance
      Decrease Capacity
    - Parity (2-6)
      Help Detect error

5. Network Platforms
   Components:

   - hub
     Data received by the hub is send to all connected devices
   - Bridge
     only one input and one output, looks like destination and decides whether to forward it across the bridge or not
   - switch
     has many ports, decide which port sent it out to
   - router
     like switch but connectes different networks together

   Use Network Interfacing Card(NIC)
   Network Operating System (NOS)

6. Telecom Platforms
   Include telephone and cell phone services

7. Internet Platforms

   - Sinternet Service Provider
     Provides the link from your home or company network to the rest of the internet
   - Web Development
     Simple website use HTML and JS and static
   - Web hosting
     need a server, domain name and web server

8. Service Platform
   A collection of services that enable the infomation system of function

2.4 Contemporary H/W Trends

1. Mobile Digital Platform
   internet access happens via highly protable devices: smartphone

2. Consumerization of IT and BYOD
   BYOD = bring Your own device (to work)
   allow employee to bring own device
   and allow use software services

3. Grid computing
   processor are idel most of the time, so simulate sa super computer by organizing the computational power of a network of PC
   Can be remote, different OS
   Broke task into smaller independent tasks (parallelized)
   Only benefit task can be paralleized

4. Virtualization
   Creation of a virtual rather actual version of something-¿¿¿ make something look like something
   In computer a computer looks like

   - Application
     interact with hardware with OS
   - Operation system
   - Hardware
     managed by OS

   To virtualization

   - This is a fake Linux on Windos
     - Linux app
     - Linux OS
     - Virtual Hardware
   - Operation system
     Wndows
   - Hardware

   Benefit: better resource management, test software on variety virtual configurations

5. Cloud Computing
   Leasing as a service(hardware or programing tools) from another company that is accessed over the internet

   - pros
     - Cost: less expense way to cover peak demad
     - Convinient: use as needed
     - Flexible: not tied to a fixed number of computers of types of OS
   - Cons
     - Privacy: less control
     - Liability: might went down
     - Legal: must comply with canadian privacy laws
     - Loss of control

6. Green Computing
   Design and use of computer system in a way the minimizes their impact on the environment

   - Reduce power consumption
   - Reduce use of standby power
   - Reuse: make parts avilable to repair older PCs
   - Recycle e-waste

   Sanitizing a device
   Different for HD and SSD

7. Autonomic Computing
   industry-wide effort to develop systems that are capable of self-management

8. Future Hardware Technology

   (a) Nanotechnology

   - Definition
     using nanostructures to build devices
   - ideas
     a trasistor is about 14 nanometes wide
     minimum 5 nanometers
   - Quantum Computing
     use quantum property of a group of electrons to represent data
     n eletrons have over 2^n different states

2.5 Contemproary S/W trends

1. Open-Source Software(OSS) $\neq$ Free software
    - Different stardards
        - Free software Foundation(1985): derived software must have the same freedoms
        - Open Source Initiative: make OSS more commerical
    - Many popular OSS are developed and maintained by worldwide network
      may make product they don't support open source
      or fund an open source challenger
    - pros
        - lower cost
        - more security, less bugs
        - flexibility
        - transparency
        - not reliant on single person
    - cons: less likely to
        - easy to use
        - meet customer needs
        - fit your particular hardware
        - have support
2. HTML
   use for website
    - hypertext = text contain links
    - markup language = a way to anotation and presenting text
3. Web services and SOA
    - XML
      provice a format for program to exchange informations
    - SOA
      service-oriented architexture
      cost effective way to adopt to new techs
4. Software Outsourcing
   create software outside of the company

2.6 Management Issues

1. Dealing with change
   fimrs need to be able to grow
   scalability: ability to expand to serve a larger number of user

2. Management and Governace
   Who is responsible for IT:
   each department has own IT group
   one overall IT group for who company
   mix of both

3. Infrastructure Investment:

   - Total cost of ownership (TCO)
     the acquisition cost for hardware and software represent 20 % of TCO
     can break into
     - Capital expenditure: fixed, one-time cost
     - Operational expenditure: ongoing expenses

     2 type of cost
     - Direct IT cost: cost would pay explicity
     - indirect IT cost: cost due to lost productivity
   - Manangement
     the more a computer is managed, the less size of thhe indirect costs
   - Compttitive forces model
     - Demand of services
     - Business strategy
     - IT trategy
     - IT assessment
     - Computitor's services
     - Competitor's IT investments

3 DataBases

3.1 ideas

1. Flat files

   - Pros
     simple to create
     all data in one place
     good for one person processing a small amount of data
   - Cons
     lack of security
     lack of concurrent access
     lack of data integrity
     lack of sacality
     program-data dependence
     lack of custom formats

2. Database Management System

   - integrity
   - data independence
   - sharing and high availablity
   - have standard software packages

3. Common type of databases

   - Hierarachy model: like a tree
   - Network model: as a network
   - Relational model: as a table
   - Object-oriented model: as a object

3.2 Relational Databases

1. Structure
    - entities
      row in a table
    - Attributes or field
      a column of the table, information of entity
      Domain: set of allowed values
    - Record
      collection of attributes
2. Keys
    - Parmary keys
      a unique attribute
    - Composite
      two or more attributes that are combined unique
    - canadiate
      more than two key that are unique(each unique individualy)
    - Foreign keys
      an attribute in a table that is primary key in another table
3. Schema Architecture
    - External Schema (logical view)
      displayed to a particular user
    - Conceptual Schema (global view)
      can see the entire database
    - Physical Schema (physical view)
      can see how dat is physically stored and organized
4. SQL operation
    - Select
      finds the row that match a certain attributes
    - join
      adds relevaant columns from another table
    - Project
      display the data with only those columns

3.3 Types of Databases

1. Hierarchical Database
   tree captures the relationship among the data
   a parent have many children
2. Network database
   child can have multiple parents
3. OO database
   like a OOP program
   - Inheritance (jicheng)
     a children have the attributes of a parent
   - Polymorphism(duotai)
     a children and it's parent can use the same function
   - Limitation of relational Databasese
     - Multimedia
       graphs are hard to store
     - Arrays of data
     - Unstructured text
       like email...
     - Hierarchical data
       maps

3.4 Database Design

1. Good design
    - Correctness
    - Completness
    - Minimum redundancy
2. Steps
    - Identify the entities and the relationship between them
      use a ER diagram to do it
    - Convert the ER diagram into table
    - Fine-tune your design
      apply normalization to remove redundancy
3. ER diagram
    - Rectangle are entities
    - diamonds are relationships
    - oval are attributes
      underline→ primary keys
    - Relationships
        - 1:1
          one entity have only one attributes
        - 1:N
          one entity have many this type of attributes
        - N:M
          many entity can have many this type of attributes
    - Relationships connection
        - single line
          not every entity participate
        - double line
          every entity participate

4. Map ER to table

   - Entity from ER is represented a table
   - Relationships are one of
     - Foreign keys
     - own table
   - 1;1 relationships
     place the primary key from one entity and any attributes of that relationship into the other entity's table
     should include : own attributes, other's primary key, attributes for relationship
   - 1:N relationships
     place primary key from the "1" side into "N" 's table
     N should include: own attributes, 1's parmary key
   - N: m relationship
     create a new table with composite key
     new table: primary key from both entites, own attributes
   - Boyce-Codd Normal Form
     every attribute fro an entity only
   - Functional Dependency $A \rightarrow (B, C)$
     A determines the value of B and C
     B, C depend on A

3.5 Beyond

1. Data Warehouse
   A decision support database that is maintained separately from otganization's operational database
   used to find relationships between datas

2. Data Marts
   departmental subsets that focus a selected subjects

3. Online Analytical Processing
   suports multidimensional data analysis

4 Networking

4.1 Overview

1. Definition
   A coumputer network is two or more computers connected together so that they can share resources

2. Components

   - Network Interface Card
     allowed computer to connect to netork
   - Network Operation system
     routes and manages communications on the network and coordinates network resourecs
   - Connection medium
     eg. wire, cable, radio waves
   - Dedicated servers
     e.g. file server, email server, databse
   - Hubs, bridges and switches
     connect machines on the same network and forward data from one to another
   - Rounters
     connect two or more different networks
   - Firewall
     hardware or software put between the internal network

3. Switching

   - Circuit Switching
     create connection using wires
     like telephones
   - Packet Switching
     Data is broken down to 1KB size
     sent it from source to destination

4. Topologies
   Start, ring, bus
   start most popular, others are rare

5. Geographical Scale

    - NFC - near field communication
      up to 4 cm : apple pay and google pay
    - PAN - personal area network
      up to 10cm: Bluetooth
    - LAN - local area network
      within a small building: Wi-Fi
    - WAN - wide area network
      internet

6. Internet Protocal Suite
   is a set of rules governing how data is exchanged in a network
   including Transmission Control Protocol(TCP), Internet Protocol(IP)
   each computer have unique IP

7. Different Layer

    - Application Layer
      Defines protocol forapplicationes to exhanges data
    - Transport Layer
      set up and manages the connection
    - Internet Layer
      address and routes a packet throught the network
    - Network Interface Layer
      Transporting a bit in the network medium

8. Physical Tansmission Media

    - Twisted pair
    - Coaxial cable
    - Fiber optic cable
    - Wirrless transmission

   Bandwidth : the number of bits that can transmitted per second
   Latency: how long it takes to reeive the first byte of data

9. Wireless communication

    - Bluetooth
      for PAN, 10 metres or less
    - Wifi
      for WLAN
    - Wimax
      secure remote wireless access for longer distances (up to 50 kilometres)

- Generation Cellular Networks
  1G voice only, 2G text, 3G-5G internet access
  3G = 1-2mb/s, 4G = 4-200Mb/s, 5G 1Gb/s
- Cell towers
  35km

10. WWW
    - HyperText transfer Protocol (HTTP)
      strucutres the communication between the web browser
    - Hypertext Markup Language (HTML)
      is the file type that a browser understands
    - Uniform resoure locator (URL)
      webpage's address
11. IP addresses
    every device have one when connected to internet
    with a domain name is the english like name
12. Voice Over IP
    is a way of making telephone calls using the internet
13. VPN virtual private network
    provide ability to work remotely and scurely access files
14. Radio Frequency Identification (RFID)
    passive cost a few pennies, don't need battrry
    active: cost a few dollars, need a battery, can be red from over 100 feet away

5 Management Information System

1. Key definition
   - Data: raw facts
   - Infromation: Data shaped into a form that is meaningful, to human
   - Information technology
     all hardware and software that a firm needs to use inorder to achieve its business obejctives
   - Information System IS:
     A set of interrelated component that connect, process, store and dsitribute information to support decision making and control
2. Demension of an information System
   - Technical
     like processor, memory ...
   - Organization(next topic)
     different group in a firm have different information needs
     rules are embedding in the information system
   - Management
     make decision, furmulate action plans
3. Mission of MIS
   To improve the performance of people
   have automate data gathering, to convert business data into information with business intelligence
   Business Interlligence: is IT to help user make better business decisions
4. Stargic objectives of an IS
   - Create or main a competitive advantage
     - Oberational excellence, improved efficiency
     - Help develop new products
     - Understand customer and suppliers
     - Improved decision making
     - Survival
   - Adapt to internal or external change
     focused on the future, incremental improvement is guarantedd to make you obsolete
     Creative Destruction
   - Cost/Benefit Analysis
     Need complementary assets: assets required to derive value from a primary investment

5. Contemporary Approaches: from IS to mIS

   - Technical Approaches
     - Computer Science: methods of computation, storage and access
     - Operation Research: optimizing selected parameteres such as transportations costs, inverntory levels
     - Management Science: Models for decision making and manafaement practices
   - Behaviour Approaches
     - Sociology: How IS affect individuals
     - Economics: production of digital goods, dynamics of digital martes
     - Psychology: how humans decision makers use formal information
   - Sociotechnical Approach
     optimal organizational performance is achieved by jointly optimizing both the social and technical systems
     consider both

6 Business Processes and Types of Information Systems

1. Business Processes
   Are the collection of activities required to produce a product or service
   how they might be improved by using information technology
   use IS to automated BP

2. Business function
   each business is a collection of business functions

   - Manufacturing and production
     producing and delivering products and services
   - sales and marketing
     selling the organization's products and services
   - Finance and accounting
     Managing the organization's financial assets and records
   - Human resources
     attracting, developing and maintaining the organaization's labour force

3. Type of IS

   (a) Sales and Market

   - Which business process can be automated
     ordering process, order fulfillment...
   - What data can be gather
     individual order: what, when, where
     customer data: name, contact info, purchases, return
   - WHat info can help improve business
     purchase habits, promotion stategy
     Terminology: called Customer relationship management(CRM)

   (b) Manufacturing and production

   - Which business processes can be automated?
     making of individual parts, assembling testing, stocking/shelving
   - what data can be gather?
     inventory of parts, products
   - What imformation can help improve business?
     efficiency of the production process
     Called Supply Chain mangement(SCM)

(c) Finance and accounting

- Which business processes can be automated?
  Everything with money
- what data can be gather?
  inventory, pruchase order, AP, sales order, billing, AR
- What imformation can help improve business?
  cash flow, financial status ...
  Called Accounting information System(AIS)

(d) HUman resources

- Which business processes can be automated?
  automatic deposits, tax forms, pay slips
- what data can be gather?
  recuriting, hiring and reassignment, payroll, time, attendance...
- What imformation can help improve business?
  high employee turnover in a certain area
  Human resources management System(HRMS) or HUman resources information System(HRIS)

4. Types of Management

- Senior Management
  is concerned with long range
  use ESS
- Middle Management
  concered with implementing the plans of the senior management
  use DSS, MIS
- Operational Management
  concerned with monitoring the day-to-day activities
  use TPS

5. IS for different management

   - TPS
     Automates the business process, record stuff for day-to-day stuff
   - MIS
     provides routine repots on department's current performance to middle management
     reports contain same information of each time they produced
   - DSS
     Supports ad-hoc(non-routine, the first time this question has been asked and this information has been created)
     create sattistical model
   - ESS
     supports ad-hoc, decision requiring judgment, evaluation, and insight by senior management
     provide view for entire company, sepcialized version of DSS
   - Enterprise Resource Planning (ERP)
     Integrates many of the existing IS into a big system
     make report to all level

7 Organizatios and IS

1. Feature of organization
   Behavioural View: rights and obligations apply to everyone, whereas privilieges and responsibilities depend on your role
   - Rountines and Business Processes
     organizations become very efficient over time because they develop rountines
   - Organization Politics
     people with different background will struggle for limited company resources
   - Organizational Culture:
     unquestioned assumptions that organizations make about their goals and products
   - Organizational Enviornment
     government, competitors, customers, financial institutions
   - Organizational Structure
     different organizational sturctures would have different IS
   - Other organiztional features
     democratic/authoritarian leadership
2. Impact of IS on organizations
   - reduce transactional cost
     cost associated with an organization buying a product or service
   - reduce agency costs
     cost of managing employees
   - IT flattens organizations
     management more efficient
   - IT innovations cause resistance
     the organizational structure
3. Porter's Competitive Forces Model
   - Competitors
   - New market entrants
   - subsitute products
   - customers
   - suppliers
   - government

4. Competitive strategies
    - decrease costs, increase quality
    - differentiate products, enable new products
    - focus on market niche
    - develop strong ties with suppliers and customers
5. Business value chain model
   find where IS are particularly useful
    - Primary activities: directly related to create product or service
      automated warehouse, computer control manufacturing
    - Support activities: make primary possible
      electronic schuduling and messaging system...

8 Social, Ethical, and Legal Issues

1. Technology trends
    - Storage costs decresing
      jcheaper to store lots of info about people
    - Computing power increases
      more dependence on computers
    - Big data techniques
      can develop profiles of people and make prediction
    - Growth of internet
      easy to access or buy personal data
    - Growth of mobile phone usage
      location may be tracked witout user knowledge
2. IMplications
    - Personal information(PI) right and obligations
    - Digital property right and obligations
    - Data and system quality
    - Accountability, liablility and control
    - Quality of life
3. Key legal terms
    - Responsibility
      accepting the potential cost, dutires
    - Accountability
      provide mechanism to identify who is responsible
    - Liability
      laws exist that permit individuals to recover damages
    - Due process
      laws are well known and understood, can appeal to a higher authority

4. Ethical Principles

    - Golden Rule
      Do unto others as you would have them do unto you
    - Kant's categorical imperative
      if an action is not right for everyone to take, then it is not right for anyone
    - Descartes rules of change
      if an action cannot be taken repeatedly, then it is not right to be taken at all time
    - Utilitarian Principle
      take the action that achieves the higher or greatest value of all concrened
    - Risk aversion principle
      take actions that do not have a high cost of failure

5. PI in canada
   Personal Information Protection and Electronic Documents Act(PIPEDA) include

    - demographics
      age, income, ethnic origin, religion, martital status
    - internet
      email, content of email, IP
    - physical
      age, height, weight....
    - financial
      purchases, spending habits, banking information....

   Treatment of PI

    - Accountability: appoint someone to be resposible
    - Consent: inform you purpose of collecting that info
    - Limiting use: only use of the purpose you claim
    - Safeguards: you PI must be protected
    - Individual access: you have right to access your PI
    - Identifying purposes: reason for collecting PI
    - limiting collection: only gather information that is necessary
    - Accuracy: should keep your info accurate
    - Openness: privacy policy should be easy to find and understand
    - Resoueces: you should provided with a complaint procedure

6. Terms of service
   is the name we give to the document you consent to when you use
7. WWW challenges to privacy
   - Cookies
     a website store a unique bit of data(like an account number) on your device
     like primary key for database
   - Third party cookies
     companies like facebook, google, amazon, track your activity across many websites
   - Web beacons
     website can tell if you viewed a certain item
   - spyware
     that gather information about user without user's knowledge
   - Internation mobile (station) equipment identity(IMEI)
     each smartphone has a unique one, tracks that device and can be used to blacklist a phone in case of theft
   - Browser fingerprinting
     each pc/phone has many seeting and hardware specs
     the combination make a pc/phone unique
8. Stratigies of protect PI
   - Use 2 browser
     one for dat-to-dat access
     one for more private access
   - use a old computer for private access
   - Use a public computer
9. Interllectual property (IP)
   is intangible property created by individuals or corporation
   - Trade secret
     is intellectuall work or product belonging to a business
     confers economic advantage, and reasonable attempts have been made to keep it secret
   - Copyright
     copyright protects original literary.....
   - Patent
     grants the owner an exclusive monopoly on the ideas behind an invention between 17 and 20s
     key: originality(you crated it), novelty(new idea), invention(useful, solve a problem)

9 Security

1. Secure Communication terms
   - encryption: rendern message unreadable
   - decryption: retrieve the original message
   - strength: number of possible key
   - symmetric key encryption: the same key is used for both en and de
   - Brute force search: try every possible key
   - Computationally secure: it will take attacker a very long time to solve
   - Hash function is a function that map input of anysize onto an output of a fixed size
   - Key distribution Problem
     use public key encryption to solve it
2. Public key encryption
   for symmetric key encryption, you have a single key
   public key encryption use 2 key: public key and private key, and are mathematically related which must be used in pair
3. Digital signature
   goal: show that message came from the sender rather than an imposter
4. Certificates
   The certificate has the digital signature of a known certificate Authority (CA)
   https is based on using this
   contain information about sender and public key
5. Secure Browsing steps
   - Amazon create 2 key,
   - send public key to CA, get certificates, contain info about amazon and public key
   - show certificate to pat's browser
   - browser check certificate by CA's public key, browser get public key from certificate
   - also generate a symmetric key and encrypts using Amazon's public key and send back to amazon, only amazon can decrpt it (by it's private key)
   - now use symmetric key to communicate

6. Terms

   - tapping: eavesdropping on telephone lines
   - sniffing: eavesdropping on computer network
   - Radiation: intercept signial without damaging the wire
   - web scraping

7. Classes of Threats

   - Malware: malicious software
     software designed to cause damage to a pc
   - Computer virus
     software that attaches to other program or data in order to be executed
   - worm
     similar to viruese but run on their own
   - Trojan horse
     a software that appears to be good, but does something bad behind the scenes
   - Phishing
     an eamil or text message that pretends to come from a trusted authority
     ask for confidential information
   - Denial of Service Attack(DOS):
     many computer overwhelm a website requesting service
   - Sniffing
     eavesdropping on network communication
   - Spam
     junk email
   - Botnet
     a collection of PC that used together for common purpose
   - Ransomware
     software that threatens user's information unless a ransom is paid

8. Computer Scurity
   policies: password must have two special charcters
   procedures: eg. how to get access to eduroam
   technical measures: two factor authentication

9. Security Service
    - Authentication: make sure the other party is the one we want
    - Access Control: prevention of unauthorized use of resource
    - Data confidentiality: protect data from unauthorized disclosure
    - Data Integrity: assurance the data get is what they send
    - Availability: assurance service is available when needed
    - Non-repudiation: keep the message between partys
10. Wireless Security
    - Bandwidth
    - Security
    - Authentication
11. Security and control framework
    - Risk Assessment: Determine level of different risk to the firm
    - Security Policy:
      identitfies main seutiry risks, acceptable security goals, mechanisms to achiveve these goals
    - Acceptable Use Policy(AUP)
      state the acceptable uses and users's info
    - Disaster Recovery Planning
      get IT running after disruption: back up system/file
    - Business Continuity Planning
      get business up and running after disaster
    - Security Auditing: check current secutiy and control framework

10 Managing Knowledge

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