

Introduction to Computer Science

Exercise 1

1. Computer Science Terms

Assign the following terms to the five topics **operating system**, **hardware**, **software**, and **network**, or **web**. A term may belong to several topics. Where possible, give a brief explanation of the term.

Term	Topic (Explanation)
Authentication	SW, W: Authentication is the act of proving an assertion, the process of verifying a person or thing's identity. It might involve validating personal identity documents, verifying the authenticity of a website with a digital certificate, determining the age of an artifact by carbon dating, or ensuring that a product or document is not counterfeit.
Authorization	SW, W: Authorization is the function of specifying access rights/privileges to resources, which is related to information security and computer security in general and to access control. In particular, it means the definition of an access policy.
Architecture (Hardware)	Hardware architecture refers to the identification of a system's physical components and their interrelationships.
Architecture (Software)	Software architecture refers to the fundamental structures of a software system and the discipline of creating such structures and systems. The architecture of a system describes its major components, their relationships (structures), and how they interact with each other.
ASCII / UTF	W: American Standard Code for Information Interchange , is a character encoding standard for electronic communication. ASCII codes represent text in computers, telecommunications equipment, and other devices. Many modern character-encoding schemes like UTF are based on ASCII. UTF (Unicode Transformation Format). The Unicode Standard covers (almost) all the characters and symbols of all languages.
Asynchronous	SW: Asynchrony refers to the occurrence of events independent of the main program flow. Asynchronous procedure call is a method to run procedures concurrently. Asynchronous communication is the relay of information with a time lag.
Big Data	SW: Big data is a field that treats ways to analyze, systematically extract information from data sets that are too large or too complex to be dealt with by traditional software. Big data deals with unstructured, semi-structured, or structured data, used for predictive analytics, or user behavior analytics.
BIOS (Basic Input / Output System)	BIOS is the firmware used to perform hardware initialization during the booting process (power-on startup), and to provide runtime services for the operating system.

Bot	<p>W: An Internet bot is an application that runs automated tasks over the Internet. Bots perform tasks that are simple and repetitive, like web crawling, in which an automated script fetches, analyzes and files information from web servers.</p> <p>A chatbot simulates human conversation by responding to certain phrases with programmed responses.</p>
Browser	<p>A web browser is a software application for accessing information on the World Wide Web. When a user requests a web page from a particular website (URL), the web browser retrieves the website content from a web server and displays the (HTML) page on the user's device.</p>
CI/CD continuous integration, continuous delivery, continuous deployment	<p>SW: CI/CD is a method to simplify the delivery of software applications to customers by using automation in the different stages of the application development (the integration, delivery, and deployment stages).</p> <p>CI/CD uses ongoing automation and continuous monitoring throughout the lifecycle of the applications, from integration and testing phases to delivery and deployment (the so-called CI/CD pipeline).</p>
Cookie	<p>W: An HTTP cookie is a small piece of data stored on the user's computer by the web browser while browsing a website. Cookies were designed to be a reliable mechanism for websites to remember stateful information (such as items added in the shopping cart in an online store) or to record the user's browsing activity.</p> <p>Tracking cookies, and especially third-party tracking cookies, are commonly used to compile long-term records of individuals' browsing histories.</p>
Dead Lock	<p>SW: A deadlock is a state in which each member of a group is waiting for another member, including itself, to release a lock of a resource. Deadlock is a common problem in multiprocessing systems, parallel computing, and distributed systems, where software and hardware locks are used to share resources and implement process synchronization.</p>
DHCP	<p>NW: The Dynamic Host Configuration Protocol (DHCP) is a network management protocol used on Internet Protocol (IP) networks, whereby a DHCP server dynamically assigns an IP address to each device on the network, so they can communicate with other IP networks.</p>
DNS Server	<p>The Domain Name System (DNS) is a naming system for computers, services, or other resources connected to the Internet or a private network. It translates domain names (e.g., bfh.ch) to the numerical IP addresses needed for locating and identifying computer services and devices (a <i>phone book</i> for IP addresses).</p>
Device Driver	<p>OS: A device driver is a computer program that controls a particular type of device that is attached to a computer. A driver provides a software interface to hardware devices, enabling operating systems and other computer programs to access hardware functions without needing to know precise details about the hardware being used.</p>
Docker Container	<p>Docker is an open-source project for automating the deployment of apps as mobile, standalone containers that can run in the cloud or locally.</p> <p>Docker containers are a kind of light version of virtual machines.</p> <p>However, Docker Containers only virtualize the operating system. Based on the running host operating system, other Linux distributions are run in parallel. The containers are isolated from each other.</p>
Ethernet	<p>NW: Ethernet is a (family of) computer networking technologies commonly used in local area networks. It has been the most widely used method of linking computers together in LANs.</p>
FIFO	<p>SW: FIFO (first in, first out) is a method for organizing the manipulation of a data structure where the oldest (first) entry, or 'head' of the queue, is processed first.</p>
Filesystem	<p>OS: A file system controls how data is stored and retrieved. There are different kinds of file systems, each with a different structure and logic.</p>

Firewall	NW: A firewall is a network security system that monitors, and controls incoming and outgoing network traffic based on predetermined security rules. A firewall typically establishes a barrier between a trusted network and an untrusted network, such as the Internet.
Framework/Library	A framework provides a standard way to build and deploy applications. It is a universal software environment to facilitate the development of software applications. (E.g., Web-Frameworks for the development of Web Applications). A software library is a collection of files, programs, ... It can be referenced and then used in the programming code to achieve more functionality for the application (e.g., math libraries for scientific calculations).
HTML	Hypertext Markup Language (HTML) is the standard markup language for documents designed to be displayed in a web browser. It can be assisted by technologies such as Cascading Style Sheets (CSS) and scripting languages such as JavaScript. HTML is the basis of the World Wide Web is used by Web browsers.
HTTP	Hypertext Transfer Protocol: HTTP is the set of rules for transferring files over the web. As soon as a user opens their web browser, they are indirectly using HTTP. HTTP runs on top of the TCP/IP suite which forms the foundation of the internet. Through HTTP, resources are exchanged between client devices and servers over the internet. Client devices send requests to servers for the resources needed to load a web page; the servers send responses back to the client to fulfill the requests.
Interface	A User Interface is the means by which a user interacts with a machine. An interface is a boundary across which separate components of a computer system exchange information. The exchange can be between different software, hardware, peripheral devices, or humans.
Interrupt	OS: An interrupt is a reaction of the processor to an event that needs (immediate) attention (e.g. user input). He alerts the processor and serves as a request for the processor to interrupt the currently executing code, so that the event can be processed immediately.
IP address / MAC address	NW: An Internet Protocol address is a unique identification number given to every device that is connected to the internet. It represents the unique location on which the device is connected to the internet, allowing devices all over the world to communicate with each other. A MAC address (Media Access Control address) is a unique number that identifies the actual device that is connected to the internet or network. The MAC address is fixed, i.e. it does not change when a device is connected to the internet from different locations.
LAN	A local area network (LAN) is a computer network that interconnects computers within a limited area such as a residence, school, laboratory, university campus or office building. A wide area network (WAN) not only covers a larger geographic distance, but also generally involves leased external circuits.
Memory (RAM)	Random-access memory is a form of computer memory that can be read and changed in any order, typically used to store working data and machine code. RAM is normally associated with volatile types of memory, where stored information is lost if power is removed.
Multithreading / Multitasking	Multithreading is the simultaneous processing of multiple execution strands within a single process or task. In contrast to multitasking, in which several independent programs are run from each other virtually-simultaneously, the threads of an application program are not isolated from each other and share common resources.
Path	A path is the general form of the name of a file or a directory and specifies a unique location in a file system. Path are essential in the construction of Uniform Resource Locators (URLs). Files or resources can be represented by either absolute or relative paths.

Protocol (TCP/IP)	TCP/IP is the communication protocol used in the Internet and similar computer networks. TCP stands for Transmission Control Protocol, IP for Internet Protocol. TCP provides reliable, ordered, and error-checked delivery of a stream of bytes between applications running on hosts communicating via an IP network.
Process	A process is an instance of a computer program that is being executed by a computer system that can run several applications or programs concurrently. A computer program itself a passive collection of instructions, while a process is the actual execution of those instructions.
Public Key Cryptosystem	Public-key cryptography is a cryptographic system that uses pairs of keys: a public key, which may be distributed, and private keys, which are known only to the owner. The generation of such keys depends on cryptographic algorithms based on mathematical problems to produce one-way functions. Security requires to keep the private key private; the public key can be openly distributed without compromising security. Public key algorithms are the base of most modern cryptosystems.
Router	A router is a networking device that forwards data packets between computer networks. Routers perform the traffic directing functions on the Internet.
Scheduler (Process scheduling)	The process scheduling is the activity of the process manager that handles the removal of the running process from the CPU and the selection of another process based on a particular strategy. Process scheduling is an essential part of a multitasking operating system. Such operating systems allow more than one process to be loaded into the executable memory at a time and the loaded processes shares the CPU using time multiplexing.
Share	Network or device sharing is a feature that allows resources to be shared over a network, like files, documents, folders, media, etc. These are made accessible to other users/computers over a network.
Shortcut	<ol style="list-style-type: none"> 1. A shortcut is an abbreviated form of a keyboard shortcut. (Ctrl-C) 2. A shortcut is a pointer (link) to a file on your hard drive. This pointer can point to a program, a file, or a folder. The shortcut is a small file that takes very little space because it only has information about the location of the original file.
Software Design	Software design is the process of defining the overall structure and interaction of the application code so that the resulting functionality will satisfy the users requirements. In the process, we start with an initial design and refine it as necessary. The overall design should be well thought out and reviewed before the coding starts. Software design includes a description of the overall software architecture as well as hardware, databases, and third-party frameworks to be used. This is the big picture of what is running where and how all the parts will interact.
Software Specification	A software requirements specification (SRS) is a description of a software system to be developed. It specifies functional and non-functional requirements, and it may include a set of use cases that describe user interactions that the software must provide to the user for perfect interaction. An SRS establishes the basis for an agreement between customers and contractors or suppliers on how the software product should function.
Source Code	Source code is the set of instructions and statements written by a programmer using a computer programming language. This code is later translated into machine language by a compiler.
Timeout	A parameter related to an event designed to occur at the end of a predefined elapsed time. A specified period of time that will be allowed to elapse in a system before a different event will start or take place.

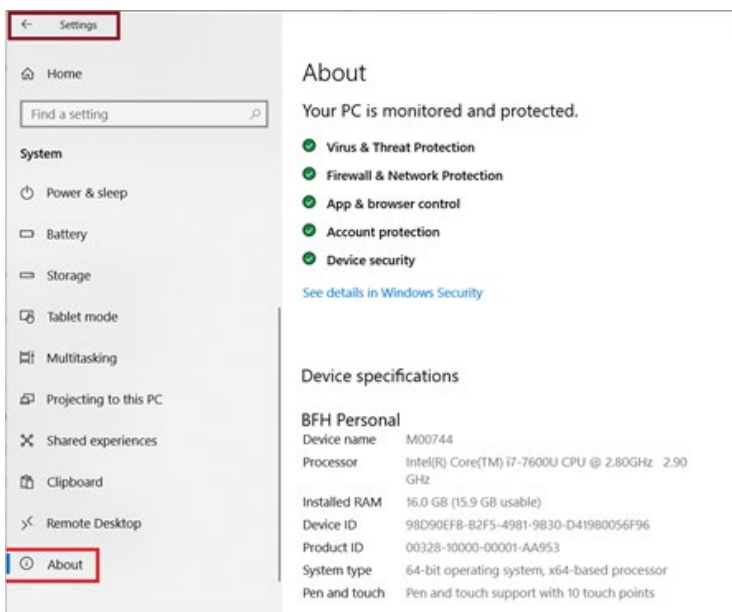
Thread (Thread-safe)	<p>A Thread is a lightweight flow of execution of code, taking lesser resources than a process. He has its own program counter, system register, and a stack which contains the execution history.</p> <p>A thread shares with its peer threads information like code segment, data segment and open files. When one thread alters a memory item, all other threads see are affected. Threads are also called lightweight processes.</p> <p>Thread-safe code manipulates the shared data structures or resources in a manner that makes sure that all threads behave properly and fulfill their design specifications without unintended (faulty) interaction.</p>
Trojan	<p>A Trojan horse (or simply trojan) is any malware which misleads users of its true intent. The term is derived from the Ancient Greek story of the deceptive Trojan Horse.</p> <p>Trojans are generally spread by some form of social engineering, for example where a user is duped into executing an email attachment disguised to appear not suspicious, or by clicking on some fake advertisement on social media.</p>
UNIX, Linux	<p>UNIX is a family of multitasking and multiuser computer operating systems. UNIX is very popular among the scientific, engineering and academic due to its most appreciating features like great inbuilt security, flexibility, portability, network capabilities etc.</p> <p>Linux is an open source, UNIX like operation system.</p>
UML	<p>Unified Modeling Language provides a standard way to visualize the design of a software system. Although many software engineers don't use clean UML, software is usually designed with diagrams similar to UML.</p>
URL	<p>A Uniform Resource Locator is a reference to a web resource that specifies its location on a computer network and a mechanism for retrieving it. URLs occur most commonly to reference web pages (http) but are also used for file transfer (ftp), email (mailto), database access (JDBC), and many other applications.</p>
Virus, Worm	<p>A virus is a type of malware program that, when executed, replicates itself by modifying other computer programs and inserting its own code. When this replication succeeds, the affected areas are then said to be "infected" with a computer virus.</p> <p>A computer worm is a malware computer program that replicates itself to rapidly spread to all other computers connected to the network.</p>
Virtual Server	<p>A virtual server is defined as a virtual machine (VM) created by a special software on a physical server. A virtual server shares the resources of a physical server with other virtual servers. Also known as the Virtual Private Server (VPS), the virtual machine provides users with the same server functions as a dedicated server.</p>
Virtual Memory	<p>Virtual memory (also virtual storage) is a memory management technique that provides an abstraction of the storage resources available. It creates the illusion to users of a large memory. The benefits of virtual memory include freeing applications from having to manage a shared memory space, increased security due to memory isolation, and being able to conceptually use more memory than might be physically available, using the technique of paging.</p>
VPN	<p>A virtual private network (VPN) extends a private network across a public network and enables users to send and receive data across shared or public networks as if their computing devices were directly connected to the private network. Applications running across a VPN can so benefit from the functionality, security, and management of the private network.</p>
XML	<p>Extensible Markup Language (XML) is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable. The goals of XML emphasize simplicity, generality, and usability across the Internet. XML is a text-based data format with strong support via Unicode for different human languages. XML is used for the representation of text documents as well as arbitrary data structures.</p>

2. Your work equipment

Find out the following from your computer (laptop, notebook):

- What is your computers name, (not the login name)?
- What kind of operating system do you have? Which version?
- How much memory does your computer have?
- What is the screen resolution of your computer?
- How many processors does your computer have?
- How fast are your processors (clock rate)?
- How many tasks are running on your computer at this moment? Which ones?
- How much memory do they occupy?

Settings → About



Advanced display settings

Display information



Display 1: Connected to Intel(R) HD Graphics 620

Desktop resolution	1920 × 1080
Active signal resolution	1920 × 1080
Refresh rate (Hz)	120 Hz
Bit depth	8-bit
Color format	RGB
Color space	Standard dynamic range (SDR)

Which tasks are started at startup time:

Name	Publisher	Status	Startup impact
AcroTray	Adobe Systems Inc.	Enabled	High
Adobe GC Invoker Utility	Adobe Systems, Incorpo...	Enabled	Medium
Adobe Updater Startup Utility	Adobe Systems Incorpo...	Enabled	Medium
Cisco AnyConnect User Inter...	Cisco Systems, Inc.	Enabled	High
Cortana	Microsoft Corporation	Disabled	None
DisplayLinkUI Sys-Tray Appli...	DisplayLink Corp.	Enabled	Low
Intel® Graphics Command C...	INTEL CORP	Disabled	None
KeePass	Dominik Reichl	Enabled	Not measured
Microsoft OneDrive	Microsoft Corporation	Enabled	High
Microsoft Teams	Microsoft Corporation	Enabled	High
OctoSAM Inventory Scanner	Octosoft AG	Enabled	Medium
Skype for Business	Microsoft Corporation	Disabled	None
Windows Security notificatio...	Microsoft Corporation	Enabled	Low