

Glossary

- ABI** *Association for Computing Machinery* A computer programming interface provided by libraries, for example. This interface promises to the developers a certain behaviour, including the alignment of data types and calling conventions. See also: API 229, 232
- ACL** *Access Control List* A list of permissions, commonly attached to a network or file resources. An defines e.g. what privileges are granted to the object or what sort of network traffic may be allowed. 46, 117, 214
- ACM** *Association for Computing Machinery* A learned society for computing, governing Special Interest Groups, publishing academic journals and sponsoring numerous conferences. 24
- AFP** *Apple Filing Protocol* A network file system / protocol used predominantly by Apple's Mac OS versions (both "Classic" and OS X). Sometimes also referred to as "Apple Share". 79
- AFS** *Andrew File System* A distributed network file system developed at Carnegie Mellon University with certain distinguishing features over other network file systems, including authentication via Kerberos, access control lists and, to some degree, location independence. 80, 108
- API** *Application Programming Interface* A specification describing the interfaces of a given software component. This specification is sufficiently high-level so as to allow the developer of software using this API to not care about *how*, the interface is implemented. See also: ABI 32, 84, 85, 106, 109, 110, 116, 118, 150, 220, 242, 254
- AWS** *Amazon Web Services* Amazon.com's cloud computing platform. 242

- BBS** *Bulletin Board System* The electronic version of a traditional bulleting board and the predecessor of Usenet and, conceptually, today's Internet "forums". 36
- BIND** *Berkeley Internet Name Domain* The most widely used DNS software, included in various Unix flavors since 4.3BSD. 36
- BIOS** *Basic Input/Output System* The basic firmware found on IBM compatible computers, loaded from read-only memory at system startup and in charge of initializing some of the hardware components before handing control over to the boot loader. 93–96, 130, 134, 147
- BSD** *Berkeley Software Distribution* Commonly refers to a number of UNIX derivatives based on software distributed by the Computer Systems Research Group of the University of California at Berkeley. Open Source versions include NetBSD, FreeBSD and OpenBSD. 30, 37
- CHS** *Cylinder-Head-Sector* An early scheme used to address individual sectors (or blocks) on a hard drive by identifying their location on the disk via the given cylinder (or track), the disk's read-write heads and finally the individual sector. 94, 95
- CIFS** *Common Internet File System* An application layer network protocol used predominantly by Microsoft Windows systems as a network file system and to communicate with other devices, such as shared printers. Frequently named *SMB/CIFS*, as it was derived from SMB. 79, 108
- CLI** *Command Line Interface* A human-computer interface primarily relying on text-based input whereby the user types commands into a terminal or console interface. The CLI is valued by System Administrators as being widely more efficient and flexible than most graphical interfaces. See also: GUI 48
- CPU** *Central Processing Unit* The actual circuitry (e.g. a microprocessor chip) of a computer performing the arithmetic and logical operations within a computer, possibly comprising multiple computing components or "cores" and nowadays even extending to virtual CPUs. 44
- CSNET** *Computer Science Network* An early network connecting computer science departments at academic and research institutions. 36

- CSRG** *Computer Systems Research Group* A research group at the University of California, Berkeley, funded by the Defense Advanced Research Projects Agency to enhance the Unix operating system. 30–32
- CVS** *Concurrent Versions System* The at one point perhaps most popular open source client-server version control system. (Yes, *CVS* is a *VCS*. One thing we cannot complain about is a lack of acronyms.) In recent years, CVS has lost popularity to the Subversion VCS and newer distributed revision control systems such as Git. 193
- DARPA** *Defense Advanced Research Projects Agency* Originally known as “ARPA”, this agency of the United States Department of Defense is probably best known for the development of what ultimately became the Internet. 32
- DAS** *Direct Attached Storage* A storage system in which the disk devices are attached directly, i.e. without any network component, to the server. See also: NAS, SAN 76–78, 80, 81, 86, 89, 106, 118, 120
- DNS** *Domain Name System* A hierarchical, distributed system to map hostnames to IP addresses (amongst other things). 36
- DRAM** *Dynamic Random Access Memory* A volatile type of computer storage used for most computers’ and laptops’ main memory. 87
- DSL** *Domain Specific Language* A language developed for a very specific purpose, such as the configuration of a given piece of software or the representation of information within a certain data model. 196, 199, 202, 223
- EBS** *Elastic Block Store* Amazon’s block-level cloud storage service. See also: S3 85
- EC2** *Elastic Compute Cloud* Part of Amazon’s Web Services, EC2 allows a user to deploy virtual machines or “compute instances” on demand. vii, 12
- FCP** *Fibre Channel Protocol* A high-speed network protocol primarily used to connect components in a Storage Area Networks. FCP allows for a number of different topologies, most notably connections in a switched fabric. 83

- FFS** *Fast File System* See: UFS 32, 107, 112
- GCC** *GNU Compiler Collection* A suite of tools comprising a compiler *chain* provided by the GNU project. Originally referring to the GNU C Compiler, the tools provided include support for many different languages, including C++, Objective-C, Fortran, Java, Ada, and Go. The C compiler, invoked via the `gcc(1)` command, is the de-facto standard and is shipped with most Unix flavors. See also: GNU 229
- GNU** *GNU's Not Unix* The GNU project was founded to provide free software and aimed to provide a full operating system. After having adopted the Linux kernel, GNU/Linux become commonly referred to just as “Linux”, much to the chagrin of many GNU proponents. The contributions of the GNU project, however, should not be underestimated. See also: GPL v, 49, 136, 159
- GPL** *GNU General Public License* A widely used free software license originally written by Richard Stallman for the GNU Project. The license aims to guarantee availability of the source code for the licensed software as well as any derived works. 37, 49
- GUI** *Graphical User Interface* A human-computer interface primarily relying on interactions with the user through e.g. a mouse or other pointing device, icons, and other visual cues. See also / contrast with: CLI 48
- HBA** *Host Bus Adapter* A hardware connector, such as a PCI, PCI-X, or PCIe card, connecting, for example, a storage medium to a host system. 88, 89, 127, 134
- HDD** *Hard Disk Drive* A data storage device using magnetic storage, frequently rotating platters allowing for random access via a magnetic read-write head. See also: SDD 87
- HTTP** *Hyper Text Transfer Protocol* The ubiquitous application-layer protocol underlying the World Wide Web, allowing for distributed documents to be linked. 36
- IaaS** *Infrastructure as a Service* A concept in cloud computing whereby infrastructure components are deployed and delivered on demand, frequently by use of virtualization. 84, 145

- IANA** *Internet Assigned Numbers Authority* An organization responsible for the global coordination of the DNS Root (i.e., maintenance of the DNS root zones), IP addressing (i.e., overseeing global IP address allocation to the regional Internet registries), and other Internet Protocol resources. See also: ICANN 24
- ICANN** *Internet Corporation for Assigned Names and Numbers* A non-profit corporation overseeing Internet-related tasks, such as the operation of the IANA. 24
- IEEE** *Institute of Electrical and Electronics Engineers* A non-profit professional organization for the advancement of technological innovation. Publishes countless journals, leads the creation of many standards etc. Some overlap between the IEEE Computer Society and the ACM. 24, 35
- IETF** *Internet Engineering Task Force* An open, volunteer-based organization responsible for the development and creation of Internet standards. See also: ISOC 24
- IoT** *Internet of Things* A term describing the internetworking of devices, especially consumer products, previously typically not expected to be connected to the internet. Such devices are frequently referred to as “smart” devices, despite their tendency to be poorly secured and with questionable functionality deriving from their ability to connect to – and be reached from – the public internet. 29
- IP** *Internet Protocol* The fundamental protocol underlying the Internet, routing datagrams across networks. Together with the Internet Protocol, the suite is commonly referred to as *TCP/IP*. See also: TCP, UDP 108
- IPC** *Interprocess Communication* Methods for exchanging data between related or unrelated processes on one or more systems. 43
- ISOC** *Internet Society* An international non-profit organization providing guidance and direction to Internet related standards and policy. Parent organization of the IETF, but contains additionally a strong focus on education. 24
- ITIL** *Information Technology Infrastructure Library* A set of practices underlying the first international standard for IT Service Management,

ISO/IEC 20000. *ITIL* covers a series of publications focusing on Service Strategy, Service Design, Service Transition, Service Operation, and Continual Service Improvement. 217, 218

JBOD *Just a Bunch Of Disks* A term describing a simple storage configuration where individual disks are made available in the operating system as separate logical units accessed via separate mount points. 97

JSON *JavaScript Object Notation* An open standard to describe data objects using key-value pairs. Despite its name, the data format is language independent, and libraries to process and generate JSON exist for virtually all common programming languages. 263

LBA *Logical Block Addressing* A scheme used to address individual sectors (or blocks) on a hard drive by iterating over them. 95

LDAP *Lightweight Directory Access Protocol* A common protocol for accessing directory services, such as username lookups, user groupings, password storage, and other such data. Defined in RFC4511. 182, 183, 188, 192, 197, 208

LISA *The USENIX Special Interest Group for Sysadmins* A non-profit organization established to serve the System Administration community. See also: LOPSA. 6, 8, 9, 12

LOPSA *League of Professional System Administrators* A non-profit organization established to advance the profession and practice of System Administration. See also: LISA. 12, 23

LUN *Logical Unit Number* A numerical identifier for a distinct storage unit or volume in a Storage Area Network. 82

LVM *Logical Volume Manager* A tool or technique to allocate and manage storage space across multiple block-storage devices and to present them to the OS as a virtual block device, possibly increasing storage capacity or performance. 77, 80, 97–100, 106, 119

MBR *Master Boot Record* A special boot sector found on the primary boot device, allowing the system to access the file system and transfer control to a second-stage bootloader. 93–95, 130, 148

- MILNET** *Military Network* The part of the ARPANET designated for unclassified communications of the US Department of Defense. 36
- Multics** *Multiplexed Information and Computing Service* A time-sharing operating system initially developed in the 1960s in collaboration amongst MIT, General Electric, and Bell Labs. See also: Unics 29
- NAS** *Network Attached Storage* A storage model in which disk devices are made available over the network by a file server to remote clients. The file server is running an operating system and maintains the file system on the storage media; client access the data over the network using specific network file system protocols. See also: DAS, SAN 78, 80, 108
- NFS** *Network File System* A distributed network file system developed by Sun Microsystems. NFS has become the de-facto standard in distributed file systems in the Unix world and is supported by virtually all NAS solutions. 32, 79, 108, 148
- NSFNET** *National Science Foundation Network* A network supporting the initiatives of the National Science Foundation and initially connecting a small number of supercomputing, later on developed into a major part of the Internet backbone. 36
- NSI** *NASA Science Internet* A multiprotocol wide area network, combining a DECnet and a TCP/IP based network (the Space Physics Analysis Network or SPAN and the NASA Science Network or NSN, respectively). 36
- PATA** *Parallel Advanced Technology Attachment* An interface standard for connecting storage devices to a host system. Initially named *ATA*, it was renamed *PATA* to avoid confusion with *SATA*. Also frequently referred to as *IDE*. 88
- PCI** *Peripheral Component Interconnect* A computer expansion bus used to attach a hardware device such as an HBA to a computer. There are different standards (PCI, PCI Express, PCI-X) providing different speeds and features. Not to be confused with *PCI DSS*. 89, 100
- PCI DSS** *Payment Card Industry Data Security Standard* The information security standard describing the requirements a merchant needs to meet in order to accept credit cards. 61, 217

- POLA** *Principle of Least Astonishment* A concept of predictability in software tools, following which any invocation should not lead to any surprises by the user. 264
- POSIX** *Portable Operating System Interface* A family of IEEE standards defining the common API and (command-line) interfaces, primarily used by the Unix family of operating systems. 34
- POST** *Power-On Self Test* A number of simple routines intended to ensure that the hardware is not obviously faulty, run by most server systems immediately after the system is powered on and before the boot loader is run. 130
- PXE** *Preboot eXecution Environment* A combination of protocols that allow a computer to determine its network information and boot media dynamically so as to allow for bootstrapping the system over the network. This process is also known as *pxebooting*. 147
- RAID** *Redundant Array of Independent Disks* A storage technology that allows multiple disks to be combined into a single data container upon which a file system can be created. Different schemas allow for increased data redundancy or I/O performance at the cost of decreased capacity. 75, 77, 80, 98, 99
- REST** *REpresentational State Transfer* A software architecture granting distributed access to an object model. As the name suggests, the focus is on relaying a given object's current *state* See also: SOAP 84
- RFC** *Request For Comments* Publications outlining Internet related technologies, research, protocols etc. Some of the RFCs may become actual *standards*; many of them are de-facto standards. 24, 67
- S3** *Simple Storage Service* Amazon's object-level cloud storage service. See also: EBS 85, 109
- SAN** *Storage Area Network* A network providing access to disk devices on the block level. The storage is made accessible to remote clients on a block level; clients can then create a file system on top of these storage blocks. See also: DAS, NAS 78, 81, 86, 97

SATA *Serial Advanced Technology Attachment* An interface standard for connecting storage devices to a host system using high-speed serial cables. See also: PATA 88, 89

SCM *Source Control Management* The task of maintaining changes to a computer system's runtime configuration without manual intervention. SCM systems are able to install software, update existing or create new files, or run commands across large numbers of servers. Some systems include support for non-traditional host systems, including networking equipment. Examples of popular SCM systems are: CFengine, Chef, Puppet. 192

SCM *Source Control Management* The task of tracking changes during software development. Often referred to as *revision control*, performed by a *Version Control System*, (VCS). Examples include CVS, Subversion, Perforce and Git. To avoid confusion with Software Configuration Management, we will use the acronym VCS when referring to source control management. 193

SCSI *Small Computer System Interface* A set of standards for physically connecting and transferring data between computers and peripheral devices. Interfaces for using SCSI are numbersome and range from so-called "Fast SCSI" (parallel) to Fibre Channel. See also: iSCSI 20, 83, 88

SDD *Solid State Drive* A storage device using non-volatile Flash memory to store data. See also: HDD 87

SLA *Service Level Agreement* An agreement between service consumers and providers, outlining the expectations the users of the service may pose and that the provider is obligated to meet. Examples include maximum turnaround time until an issue is resolved, maximum downtime of a service or minimum throughput or bandwidth etc. 61

SMB *Server Message Block* See CIFS. 79, 108

SMTP *Simple Mail Transfer Protocol* An application-level protocol used to exchange electronic messages, or email, amongst mail servers. 36

- SNMP** *Simple Network Monitoring Protocol* The industry standard protocol used for monitoring network devices, computer, printers and all sorts of other systems. 73
- SOAP** *Simple Object Access Protocol* A protocol used by many web services to exchange structured information over HTTP using XML. See also: REST 84
- SPOF** *Single Point of Failure* A common term describing a crucial system component without which nothing works. Note that *people* can easily become a Single Point of Failure if they retain exclusive knowledge about the system infrastructure or the internal details of a given program. 183, 194
- SRE** *Site Reliability Engineering* A term describing the merging of software engineering with traditional “operations” or system administration, in many ways similar to the term “DevOps”. The term is believed to originate at Google. 4, 24
- SSL** *Secure Sockets Layer* The predecessor to TLS, initially developed by Netscape. To this day, TLS and SSL are used interchangeably, even though TLS has superseded SSL. 87
- TCO** *Total Cost of Ownership* In software engineering, the total cost of ownership provides an estimate of what it takes to build or run a system. This includes the initial development or purchase cost as well as the ongoing cost (both monetary as well as in human resources) to maintain, update, patch and debug the software. 255
- TCP** *Transmission Control Protocol* One of the fundamental protocols underlying the Internet, routing datagrams across networks. Together with the Internet Protocol, the suite is commonly referred to as *TCP/IP*. TCP provides for reliable, connection-oriented connections between e.g. a server and a client. See also: IP, UDP 80
- TLS** *Transport Layer Security* A protocol to allow for encryption of network traffic on the application layer, currently defined in RFC5246. TLS was initially based on SSL, with which it is frequently used interchangeably. 87, 120

- TOFU** *Trust on First Use* In secure communications, it may be difficult or impossible to verify the identify of a remote party prior to e.g. establishing a connection. After an initial communication, a trust identifier may be exchanged, which the client might store locally and then report any possible mismatches on subsequent connections. This act of initially accepting the token without explicit verification is then referred to as *Trust on First Use*. A common example might be a user accepting the ssh hostkey fingerprint of a host they have not previously connected to. 180
- UEFI** *Unified Extensible Firmware Interface* A specification defining the interactions between an Operating System and lower-level firmware. See also: BIOS 130
- UFS** *Unix File System* A widely adopted file system across different Unix versions, implementing boot blocks, superblocks, cylinder groups, inodes and data blocks. Also called the Berkeley Fast File System (FFS). 32, 71, 107, 112
- Unics** *Uniplexed Information and Computing Service* The original name of the UNIX operating system, a pun on “Multics”. 29
- VCS** *Version Control System* A component of software and configuration management, allowing for the tracking of revisions made to a given set of files. See also: CVS, SCM 193
- VFS** *Virtual File System* An abstraction layer providing applications with a consistent interface to different underlying file systems. Initially developed by Sun Microsystems. The term `vnode` indicates this heritage. 32
- WAN** *Wide Area Network* A computer network spanning wide-ranging regions, possibly connecting different Local Area Networks, designed to overcome physical proximity requirements. See also: LAN 83
- XML** *eXtensible Markup Language* A markup language based on free, open standards that is frequently used in web services or by system tools to describe complex configuration attributes of a service. 263

Appendix A

Image Attributions

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