I'm not a bot

Hello there, future tech wizards! ? Welcome to our exciting journey into the world of Unix and Linux commands. I'm thrilled to be your guide as we explore these powerful tools that form the backbone of modern computing. Don't worry if you're new to this – we'll start from the very basics and work our way up. So, grab a cup of coffee ☕ (or tea, if that's your thing), and let's dive in! Files and Directories Let's start with the building blocks of any operating system: files and directories. Think of these as the digital equivalent of your physical file cabinet. Listing Files and Directories The ls command is your go-to for seeing what's in your current directory. It's like opening a drawer in your file cabinet. ls This will show you a basic list of files and directories. But wait, there's more! Let's add some superpowers to our command: ls -l This gives you a long format listing, showing permissions, owner, size, and modification date. It's like getting a detailed report on each item in your drawer. ls -a This shows all files, including hidden ones (those starting with a dot). It's like finding the secret compartment in your drawer! Navigating Directories Now, let's learn how to move around. The cd command is your digital compass. cd Documents This moves you into the Documents directory. It's like walking into a room in your digital house. cd .. This moves you up one level. Think of it as going back to the hallway from a room. cd ~ This takes you to your home directory. It's like teleporting back to your bedroom, no matter where you are in the house! Creating and Removing Directories Let's learn how to create new rooms in our digital house: mkdir NewFolder This creates a new directory called NewFolder. It's like building a new room! To remove a directory, we use: rmdir EmptyFolder But be careful! This only works for empty directories. It's like trying to demolish a room – you need to clear it out first! Manipulating Data Now that we know how to navigate, let's learn how to work with the actual files. Copying Files The cp command is your digital photocopier. cp source.txt destination.txt This creates a copy of source.txt and names it destination.txt. It's like making a photocopy of a document and giving it a new name. Moving and Renaming Files The mv command is your digital mover. mv oldname.txt newname.txt This renames the file. It's like using a label maker to change the name on a folder. mv file.txt /home/user/Documents/ This moves the file to a new location. It's like picking up a file and walking it to a different room. Removing Files To delete a file, we use: rm unwanted.txt This deletes the file. But be careful! Unlike your computer's recycle bin, this is permanent. It's like shredding a document directly into a shredder – no going back! Compressed Files Sometimes, we need to make our files smaller for easy transport or storage. Think of it like vacuum-sealing your winter clothes to save space. Compressing Files The gzip command is your digital vacuum sealer: gzip largefile.txt This compresses the file and adds a .gz extension. Your largefile.txt becomes largefile.txt.gz. Decompressing Files To "unseal" our compressed file, we use: gunzip largefile.txt.gz This brings your file back to its original, uncompressed state. Getting Information Knowledge is power, and Unix/Linux provides many commands to get information about your system and files. Viewing File Contents The cat command is like a quick peek inside a file: cat myfile.txt This displays the entire contents of the file. It's like dumping out all the contents of a folder onto your desk. For larger files, less is more... well, less overwhelming: less largefile.txt This lets you scroll through the file page by page. It's like flipping through a book instead of seeing all pages at once. Checking Disk Usage The du command tells you how much space your files and directories are using: du -h /home/user The -h option makes the output "human-readable" with units like K, M, and G. It's like having a smart scale for your digital stuff! Network Communication In our interconnected world, network commands are crucial. They're like the postal service of the digital realm. Checking Network Connectivity The ping command is like shouting "Marco!" and waiting for "Polo!": ping google.com This sends a small packet of data to google.com and waits for a response. It's a great way to check if you're connected to the internet. Downloading Files The wget command is your digital delivery service: wget This downloads the file from the specified URL. It's like ordering something online and having it delivered right to your digital doorstep. Messages between Users Unix/Linux systems are often used by multiple users simultaneously. Here's how you can communicate with them. Sending Messages The write command lets you send a message to another user: write username This lets you type your message and press Ctrl+D to send. It's like passing a note to a classmate. Broadcasting Messages The wall command is used to send a message to all logged-in users: wall This broadcasts your message to everyone. It's like making an announcement over a PA system. Programming Utilities For those venturing into coding, Unix/Linux provides some handy tools. Compiling Programs The gcc command is used to compile C programs: gcc myprogram.c -o myprogram This compiles myprogram.c and creates an executable named myprogram. It's like translating your recipe (code) into a meal (program). Running Scripts The chmod command can make a script executable: chmod +x myscript.sh This gives the script execute permissions. It's like giving your script a special "run me" badge. Running Commands Finally, let's look at some miscellaneous but incredibly useful commands. Checking Command History The history command shows you a list of commands you've run: history It's like having a personal secretary who keeps track of everything you've done! Finding Files The find command is your digital bloodhound: find /home/user -name "*.txt" This searches for all .txt files in the /home/user directory and its subdirectories. It's like having a super-powered search function for your entire digital house! Here's a table summarizing some of the key commands we've discussed: Command Description Example ls List directory contents ls -l Change directory cd Documents mkdir Make directory mkdir NewFolder cp Copy files cp source.txt destination.txt mv Move/rename files mv old.txt new.txt rm Remove files rm unwanted.txt gzip Compress files gzip largefile.txt View file contents cat myfile.txt ping Check network connectivity ping google.com wget Download files wget Compile C programs gcc program.c -o program Search for files find Search for files find /home -name "*.txt" And there you have it, folks! We've journeyed through the landscape of essential Unix/Linux commands. Remember, practice makes perfect, so don't be afraid to open up your terminal and start experimenting. Happy commanding! Credits: Image by storyset In today's diverse computing environments, a strong operating system (OS) foundation is needed to drive business continuity and scalability. UNIX®, an open standard owned and managed by The Open Group, is an enabler of key technologies and delivers reduced total cost of ownership, increased IT agility, stability, and interoperability in hetero¬geneous environments enabling business and market innovation across the globe. This OS has an interesting history while showcasing a robust modern market momentum. Download the UNIX Overview Brief today. UNIX: An Innovative History The history of computing would not be complete without the vision of Ken Thompson and Dennis Ritchie. Both men couldn't have anticipated the impact of their contribution to the IT industry in 1969. Thompson, Ritchie, and others at Bell Labs created a collaborative programming environment that would promote what is now commonly called "open development". The success of the UNIX approach led to a large number of "look-alike" operating systems, often divergent in compatibility and interoperability. To address this, vendors and users joined together in the 1980s to create the POSIX® standard and later the Single UNIX Specification. Formal UNIX certification started in 1995, with all the major UNIX vendors certifying their products. Most recently, a Linux® distribution has become UNIX certified continuing the trend and value of basing operating systems on the UNIX standard. Download the UNIX Evolution Infographic to get more history on UNIX. UNIX: Driving Innovation Today The UNIX OS plays a big role in the current market landscape and is an enabler of technologies such as cloud computing, security, virtualization, mobility, and more. It has a proven track record of adoption by Global 100 and Fortune 100 companies. The UNIX OS is a strong choice for verticals such as telecommunications, manufacturing, pharmaceuticals, financial services, government, healthcare, defense, and more. For these end-user enterprises, procuring certified UNIX systems and software ensures the highest level of availability, scalability, and maintainability for those who want to focus on their business with confidence and peace of mind without the worry of disrupting their environments. Single UNIX Specification- "The Standard" The Single UNIX Specification is the standard in which the core interfaces of a UNIX OS are measured. The UNIX standard includes a rich feature set, and its core volumes are simultaneously the IEEE Portable Operating System Interface (POSIX) standard and the ISO/IEC 9945 standard. The specification encompasses the base operating system environment, networking services, windowing services, and internationalization aspects and programming languages. The latest version of the certification standard is UNIX V7, aligned with the Single UNIX Specification Version 4, 2018 Edition. Read or download the Single UNIX Specification here. UNIX Open Standards Development The Open Group Governing Board UNIX Systems Work Group sets the strategy and influences the direction for the evolution of the Single UNIX Specification. The Work Group is comprised of The Open Group Platinum Members, all industry leaders each with a representative on The Open Group Governing Board. A few examples of UNIX based operating systems are IBM® AIX®, HPE™ HP-UX®, Oracle® Solaris®, and Inspur® K/UX. Certification of Conformance to the Standard The Open Group grants licenses through the UNIX Certification Program. Suppliers are granted a license to use the UNIX trademark in connection with a product when: The product has demonstrated passing the applicable certification test suites. The supplier has formally agreed to the terms of the Certification Program. An Open Brand Certificate is issued for each Registered Product that has been certified against the standard. An entry is made in the Directory of Registered Products, which can be found on The Open Group website at www.opengroup.org/openbrand/register. Read details on the UNIX certification. C:\>npm install myoftware CLI thanks for: Command Line Interface Command Line Interpreter Command Line Input CLI is a command line program that accepts text input to execute operating system functions. In the 1960s, using only computer terminals, this was the only way to interact with computers. In the 1970s an 1980s, command line input was commonly used by Unix systems and PC systems like MS-DOS and Apple DOS. Today, with graphical user interfaces (GUI), most users never use command-line interfaces (CLI). However, CLI is still used by software developers and system administrators to configure computers, install software, and access features that are not available in the graphical interface. Examples The software package manager npm can be used with this command: C:\Users\myuser>cd .. C:\Users\cd .. C:\> Use CLI commands with great attention!!! Wrong use can easily delete files or destroy your computer system completely. Basic Linux CLI Commands CommandDescription ls List the directory (folder) system. cd pathnameChange directory (folder) in the file system. cd ..Move one level up (one folder) in the file system. cpCopy a file to another folder. mvMove a file to another folder. mkdirCreates a new directory (folder). rmdirRemove a directory (folder). clearClears the CLI window. exitCloses the CLI window. man commandShows the manual for a given command. Basic Windows CLI Commands CommandDescription dirList the directory (folder) system. cd pathnameChange directory (folder) in the file system. cd ..Move one level up (one folder) in the file system. copyCopy a file to another folder. moveMove a file to another folder. type filenameType a file. md or mdCreates a new directory (folder). rmdir or rdRemoves a directory (folder). clsClears the CLI window. exitCloses the CLI window. help commandShows the manual for a given command. DOS Commands Help You can display all available commands with the help command: C:\Users\myuser>help ASSOC Displays or modifies file extension associations. ATTRIB Displays or changes file attributes. BREAK Sets or clears extended CTRL+C checking. BCDEDIT Sets properties in boot database to control boot loading. CACLS Displays or modifies access control lists (ACLs) of files. CALL Calls one batch program from another. CD Displays the name of or changes the current directory. CHKDSK Checks a disk and displays a status report. CHKNTFS Displays or modifies the checking of disk at boot time. CLS Clears the screen. CMD Starts a new instance of the Windows command interpreter. COLOR Sets the default console foreground and background colors. COMP Compares the contents of two files or sets of files. COMPACT Displays or alters the compression of files on NTFS partitions. CONVERT Converts FAT volumes to NTFS. You cannot convert the current drive. COPY Copies one or more files to another location. DATE Displays or sets the date. DEL Deletes one or more files. DIR Displays a list of files and subdirectories in a directory. DISKPARTDisplays or configures Disk Partition properties. DOSKEY Edits command lines, recalls Windows commands, and creates macros. DRIVERQUERY Displays current device driver status and properties. ECHO Displays messages, or turns command echoing on or off. ENDLOCALEnds localization of environment changes in a batch file. ERASE Deletes one or more files. EXIT Quits the CMD.EXE program (command interpreter). FC Compares two files or sets of files, and displays the differences between them. FIND Searches for a text string in a file or files. FINDSTR Searches for strings in files. FOR Runs a specified command for each file in a set of files. FORMAT Formats a disk for use with Windows. FSUTIL Displays or configures the file system properties. FTYPE Displays or modifies file types used in file extension associations. GOTO Directs the Windows command interpreter to a labeled line in a batch program. GPRESULTDisplays Group Policy information for machine or user. GRAFTABLEnables Windows to display an extended character set in graphics mode. HELP Provides Help information for Windows commands. ICACLS Display, modify, backup, or restore ACLs for files and directories. IF Performs conditional processing in batch programs. LABEL Creates, changes, or deletes the volume label of a disk. MD Creates a directory. MKDIR Creates a directory. MKLINK Creates Symbolic Links and Hard Links. MODE Configures a system device. MORE Displays output one screen at a time. MOVE Moves one or more files from one directory to another directory. OPENFILES Displays files opened by remote users for a file share. PATH Displays or sets a search path for executable files. PAUSE Suspends processing of a batch file and displays a message. POPD Restores the previous value of the current directory saved by PUSHD. PRINT Prints a text file. PROMPT Changes the command prompt. PUSHD Saves the current directory then changes it. RD Removes a directory. RECOVER Recovers readable information from a bad or defective disk. REM Records comments (remarks) in batch files or CONFIG.SYS. REN Renames a file or files. RENAME Renames a file or files. REPLACE Replaces files. RMDIR Removes a directory. ROBOCOPYAdvanced utility to copy files and directory trees. SET Displays, sets, or removes Windows environment variables. SETLOCALBegins localization of environment changes in a batch file. SC Displays or configures services (background processes). SCHTASKSSchedules commands and programs to run on a computer. SHIFT Shifts the position of replaceable parameters in batch files. SHUTDOWNAllows proper local or remote shutdown of machine. SORT Sorts input. START Starts a separate window to run a specified program or command. SUBST Associates a path with a drive letter. SYSTEMINFO Displays machine specific properties and configuration. TASKLISTDisplays all currently running tasks including services. TASKKILLKill or stop a running process or application. TIME Displays or sets the system time. TITLE Sets the window title for a CMD.EXE session. TREE Graphically displays the directory structure of a drive or path. TYPE Displays the contents of a text file. VER Displays the Windows version. VERIFY Tells Windows whether to verify that your files are written correctly to a disk. VOL Displays a disk volume label and serial number. XCOPY Copies files and directory trees. WMIC Displays WMI information inside interactive command shell. Command Help For more information on a specific command, type help + command-name C:\Users\myuser>help dir Displays a list of files and subdirectories in a directory. DATE [/T | date] Type DATE without parameters to display the current date setting and a prompt for a new one. Press ENTER to keep the same date. If Command Extensions are enabled the DATE command supports the /T switch which tells the command to just output the current date, without prompting for a new date. A shell is a text-based interface that lets you talk to your computer. There are different types of shells, but bash (Bourne Again SHell) is the most popular because it's powerful and easy to use. Types of Shells: Bourne Shell (sh): The original Unix shell, developed by Stephen Bourne. C Shell (csh): Known for its C-like syntax, popular for interactive use. Korn Shell (ksh): Combines features of sh and csh, offering advanced scripting capabilities. Bash (Bourne Again SHell): An improved version of sh, with additional features like command history and tab completion. Why Use Bash? It is widely available on Unix/Linux systems, making scripts portable. Supports powerful scripting features, including loops, conditionals, and functions. Provides command history and tab completion for ease of use. Can be integrated with other Unix/Linux tools for automation. Learning by Examples In this tutorial, we will show you Bash commands like this: bash --version GNU bash, version 5.2.21(1)-release (x86_64-pc-linux-gnu) Copyright (C) 2022 Free Software Foundation, Inc. License GPLv3+: GNU GPL version 3 or later This is free software; you are free to change and redistribute it. There is NO WARRANTY, to the extent permitted by law. For new users, using the terminal can seem a bit complicated. Don't worry! We will keep it really simple, and learning this way gives you a good grasp of how Bash works. In the code above, you can see commands (input) and output. Lines like this are commands we input: bash --version GNU bash, version 5.2.21(1)-release (x86_64-pc-linux-gnu) Copyright (C) 2022 Free Software Foundation, Inc. License GPLv3+: GNU GPL version 3 or later This is free software; you are free to change and redistribute it. There is NO WARRANTY, to the extent permitted by law. In general, lines with $ in front of it is input. These are the commands you can put in your terminal. Bash Services Many chapters in this tutorial end with an exercise where you can check your level of knowledge. See all Bash Exercises Learn by taking a quiz! The quiz will give you a signal of how much you know about Bash. Start Bash Quiz Track Your Progress View your completed tutorials, exercises, and quizzes Keep an eye on your progress and daily streaks Set goals and create learning paths Create your own personal website Sign Up For Free Note: This is an optional feature. You can study at W3Schools without creating an account. Linux is one of the most widely used open-source operating systems. It's fast, secure, stable, and powers everything from smartphones and servers to cloud platforms and IoT devices. Linux is especially popular among developers, system administrators, and DevOps professionals.Linux is:A Unix-like OS used in servers, cloud infrastructure, supercomputers, personal computers and embedded systems.Reliable and secure, making it ideal for web hosting, networking, and automation.Preferred in DevOps, where it's used for scripting, configuration, containerization (Docker), and CI/CD pipelines.Open-source and customizable, giving users full control over their systems and workflows.This Linux tutorial is designed for both beginners and experienced professionals. It covers everything from basic commands and file management to advanced topics like file permissions and shell scripting. 1. Understanding Linux BasicsIn this section, we will cover the basics of Linux operating system, how it works, and how it's different from Unix. We'll learn about the concept of Linux distributions (distros), why they exist, and how to choose the right one based on your needs—whether you're a beginner, developer, or system admin. Installing LinuxBefore getting started with Linux, we need to set it up on your system. Here are two common ways to do this:1. Linux CommandsLinux commands are instructions entered in the terminal to perform tasks such as navigating directories, managing files, monitoring system performance, and installing software. Here are the most commonly used Linux commands along with a complete list:25 Basic Linux Commands For Beginners Complete Linux Commands3. Linux File SystemThe Linux file system organizes data in a hierarchical structure, starting from the root ("/"). It defines how files and directories are stored, accessed, and managed, ensuring efficient system navigation and resource organization. In this section, we'll explore its key components including the directory structure, file types, absolute and relative paths, and mount points. 4. File Management in LinuxFile management in Linux is all about creating, viewing, editing, moving, copying, and deleting files and directories using both command line and graphical tools. In this section, we'll cover essential file management commands like ls, cd, cp, mv, rm, and touch, along with concepts like file paths, wildcards, and hidden files. Package Management in LinuxPackage management is a crucial aspect of Linux systems involves installing, updating, and removing software using package managers like apt, yum, or dnf. It simplifies handling software dependencies and ensures systems stay updated and secure. 5. File Permissions in LinuxFile Permissions in Linux. Package Management Managing users and groups in Linux involves creating, modifying, and controlling user accounts, assigning permissions, and organizing users into groups for efficient access control and system security.7. Linux NetworkingLinux networking covers everything from configuring IP addresses and managing network interfaces to setting up firewalls, monitoring traffic, and enabling communication between devices and servers.Linux Firewall8. Shell ScriptingShell scripting is writing a series of commands in a script file to automate tasks in a Linux or Unix shell. It simplifies repetitive tasks like file management, system monitoring, and process automation, using languages like Bash or other shell environments.Creating and Running Shell ScriptsVariables in Shell ScriptingBash ScriptingAdvanced Topics in Shell ScriptingMaking Your Own Linux Shell in C30+ Common Linux Shell Script ExamplesS. System AdministrationSystem administration in Linux involves managing and maintaining Linux systems, including tasks like user management, file permissions, software installation, network configuration, and monitoring system performance. It ensures the system operates smoothly and securely.Monitoring System UnderstandThe Linux file system structure.10. Interview QuestionsHere's the step-by-step approach to learn and master Linux efficiently and effectively:Understand Linux Basics. Start by learning what Linux is, its distributions (distros), and its core components like the kernel, shell, and file system.Install a Linux Distro: Choose a beginner-friendly distribution like Ubuntu or Fedora and set it up on your system (dual boot or virtual machine).Learn Basic Commands: Familiarize yourself with essential commands like ls, cd, pwd, cp, mv, rm, and mkdir. Practice navigating directories and managing files.Explore the File System: Understand the Linux file structure, including /home, /var, /etc, and /usr. Learn how permissions work using chmod, chown, and ls -l.Work with Text Editors: Get comfortable with terminal-based editors like Vim or Nano for creating and editing files.Understand File Permissions & Ownership: Learn how package managers like apt (Debian-based) or yum/dnf (Red Hat-based) work.Shell Scripting: Start writing basic shell scripts to automate repetitive tasks and understand how shell scripting integrates with Linux commands.Manage Processes and Services: Use commands like ps, top, and kill to manage processes and explore system services using systemctl.Networking in Linux: Understand networking basics like IP configuration (ifconfig or ip), checking connectivity (ping), and managing firewall settings (ufw or iptables).Learn Advanced Tools: Explore tools like grep, awk, sed, and cron for text processing and task scheduling.Work on Real Projects: Set up a web server using Apache or Nginx, configure SSH for remote access, or create a simple home automation script.Stay Updated: Regularly practice and stay updated with the latest Linux features, commands, and best practices by joining Linux forums and following tutorials.By following this structured approach, you'll gain both the foundational knowledge and practical skills needed to use and manage Linux systems effectively.Linux CertificationsEarning a Linux certification validates your expertise in Linux administration, troubleshooting, and system management, opening doors to career opportunities in IT and networking. Certification Experience Details Post-Certification Opportunities CompTIA Linux+12 months hands-on experience with Linux servers recommended.Covers system management, security, scripting, and troubleshooting.$369 (exam only) Qualifies for roles like Linux Administrator, Network Administrator, and Technical Support Specialist. Red Hat Certified System Administrator (RHCSA)Prior experience or training in Linux system administration beneficial.Focuses on installation, configuration, and management of RHEL systems.$400 per exam; two exams required Opens opportunities as a Red Hat System Administrator, with an average salary of $130,000.Linux Professional Institute Certification (LPIC-1)Basic experience with Linux systems advantageous.Validates ability to perform maintenance tasks, work at the command line, and install & configure a computer running Linux.$200 per exam; two exams required Entry-level positions in Linux system administration.Linux Foundation Certified System Administrator (LFCS)Practical experience with Linux systems beneficial.Emphasizes command line administration and implementation.$10,475 per exam Opportunities as an Oracle Linux System Administrator.Why Pursue a Linux Certification?Validates technical skills and increases job prospects.Enhances credibility for roles like Linux Administrator, DevOps, and cloud computing.Provides in-depth knowledge for efficient Linux management.Career & Jobs in Linux 2025Linux skills are in high demand, offering high-paying job roles across various industries. Here are some commonly requested job opportunities available for professionals with Linux expertise, along with their average salaries.CareerAverage Salary (INR) Per AnnumAverage Salary (USD) Per AnnumLinux System Administrator₹400,000 – ₹1,000,000$50,000 – $90,000DevOps Engineer₹800,000 – ₹2,000,000$80,000 – $140,000Cloud Engineer₹900,000 – ₹2,400,000$90,000 – $150,000Security Analyst₹700,000 – ₹1,800,000$75,000 – $130,000Network Engineer₹500,000 – ₹1,200,000$60,000 – $100,000Linux Kernel Developer₹1,000,000 – ₹2,500,000$100,000 – $160,000Technical Support Engineer₹300,000 – ₹800,000$40,000 – $70,000Automation Engineer₹500,000 – ₹1,200,000$55,000 – $100,000Embedded Systems Engineer₹700,000 – ₹1,500,000$70,000 – $120,000Database Administrator₹600,000 – ₹1,500,000$60,000 – $125,000As a Career in Linux These are some popular companies that use Linux in their workflow:CompanyDescriptionGoogleLinux forms the backbone of Google's servers, powering its search engine, cloud services, and data centers.AmazonAmazon Web Services (AWS) relies heavily on Linux for scalability, flexibility, and security in its cloud infrastructure.FacebookUses Linux for its servers to handle massive data processing and ensure efficient social media operations.NASAEmploys Linux for high-performance computing (HPC) and space research projects.TwitterRelies on Linux to power its servers and maintain seamless platform performance for millions of users.IBMA major supporter of Linux, IBM integrates it into its hardware solutions and enterprise systems.NetflixUses Linux to run its cloud-based services, ensuring uninterrupted streaming services worldwide.TeslaTesla's in-car systems, Autopilot, and backend infrastructure are powered by Linux for reliability and performance.WikipediaWikipedia operates on Linux servers to manage its vast knowledge base and serve millions of daily users.AirbnbUtilizes Linux for its servers to handle booking systems, data processing, and backend services. Linux, often associated with being a complex operating system primarily used by developers, may not necessarily fit that description entirely. While it can initially appear challenging for beginners, once you traverse through the beginning's phase and get hold of different commands in controlling your PC, coupled with their clean user interface, can make it hard to switch back to older operating systems. If you're a developer, you can likely relate to the advantages and appeal of Linux.To support developers and beginners alike, we have created a comprehensive LinuxUnix command line cheat sheet. This cheat sheet covers all the basic and advanced commands, including file and directory commands, file permission commands, file compression and archiving, process management, system information, networking, and more. Along with proper examples and descriptions. In addition to that we provide all the most used Linux Shortcut which includes Bash shortcuts, Nano shortcuts, VI & Vim Shortcuts Commands. It provides a solid foundation on Linux OS commands, as well as insights into practical applications.By the end of this cheat sheet, you will have a basic understanding of Linux/Unix Commands and how it makes development easy for developers.Linux Commands Cheat SheetWhat is Linux?Linux is an open-source operating system (OS). An operating system is a software that directly manages a system's hardware and resources, like CPU, memory, and storage. OS acts as a GUI through which user can communicate with the computer. The OS sits between applications and hardware and makes the connections between all of your software and the physical resources that do the work. Basic Linux Commands with ExamplesIn this Linux cheat sheet, we will cover the most important Linux commands, from the basics to the advanced. We will also provide some tips on how to practice and learn Linux commands. This cheat sheet is useful for Beginners and Experienced professionals.1. File and Directory Operations CommandsFile and Directory operations are fundamental in working with the operating system. Here are some commonly used File and Directory Operations CommandsCommandDescriptionOptionsExamplesList files and directories.ls -l long format listing.-l: Long format listing.ls-l displays files and directories with detailed information.ls -a shows all files and directories, including-lh displays file sizes in a human-readable format.cdChange directory. cd /path/to/directorychanges the current directory to the specified path.pwdPrint current working directory. pwd displays the current working directory.mkdirCreate a new directory.mkdir new_directory.rmRemove directories recursively.-r: Recursive deletion.-f: Remove directories recursively.-f: Force removal without confirmation.cpCopy files and directories.-r: Copy directories recursively.cp -r directory destination copies the directory "directory" and its contents to the specified destination.cp file.txt destination copies the file "file.txt" to the specified destination.mvMove/rename files and directories.mv file.txt new_name renames the file "file.txt" to "new_name.txt".mv file.txt directory moves the file "file.txt" to the specified directory.touchCreate an empty file or update file timestamps. touch file.txt creates an empty file named "file.txt".catView the contents of a file. cat file.txt displays the contents of the file "file.txt".head Display the first few lines of a file. -n: Specify the number of lines to display.head file.txt shows the first 10 lines of the file "file.txt".-n: Specify the number of lines to display.head -n 5 file.txt displays the first 5 lines of the file "file.txt".tailDisplay the last few lines of a file.-n: Specify the number of lines to display.tail file.txt shows the last 10 lines of the file "file.txt".-n: Specify the number of lines to display.tail -n 5 file.txt displays the last 5 lines of the file "file.txt".lnCreate links between files.-s: Create symbolic (soft) links.ln -s source_file link_name creates a symbolic link named "link_name" pointing to "source_file".2. File Permission CommandsFile permissions in Linux and Unix systems control access to files and directories. There are three basic permissions: read, write, and execute. Each permission can be granted or denied to three different categories of users: the owner of the file, the members of the file's group, and everyone else.Here are some file permission commands:Command DescriptionExamplechmodChange file permissions.-u: User/owner permissions.-g: Group permissions.-o: Other permissions.+: Add permissions.-: Remove permissions.=: Set permissions explicitly.chmod u+rwx file.txt grants read, write, and execute permissions to the file owner.chownChange file ownership.user file.txt changes the owner of "file.txt" to the specified user.chgrpChange group ownership. chgrp group file.txt changes the group ownership of "file.txt" to the specified group.umaskSet default file permissions. umask 022 sets the default file permissions to read and write for the owner, and read-only for group and others.3. File Compression and Archiving CommandsArchiving CommandsHere are some commonly used File Compression and Archiving Commands in Linux.CommandsDescriptionOptionsExamplesCreate an archive file.-c: Create a new archive.-x: Extract files from an archive.-v: Verbose mode.-z: Compress the archive with gzip.-j: Compress the archive with bzip2.tar -czvf archive.tar.gz files/ creates a compressed tar archive named "archive.tar.gz" containing the files in the "files/" directory.gzipCompress files.gzip file.txt compresses the file "file.txt" and renames it as "file.txt.gz".zipCreate compressed zip archives.-r: Recursively include directories.zip archive.zip file.txt zip archive.zip file1.txt file2.txt create a zip archive named "archive.zip" containing "file1.txt" and "file2.txt".4. Process Management CommandsIn Linux, process management commands allow you to monitor and control running processes on the system. Here are some commonly used process management commands:CommandsDescriptionOptionsExamplesDisplay running processes.-aux: Show all processes.ps aux shows all running processes with detailed information. topMonitor system processes in real-time. top displays a dynamic view of system processes and their resource usage.killTerminate a process.-9: Forcefully kill a process.kill PID terminates the process with the specified process ID.pkillTerminate processes based on their name. pkill process_name terminates all processes with the specified name.grepPrint lines matching a pattern.-i: Ignore case-insensitive matches.-v: Invert the match, displaying non-matching lines.-r or -R: Recursively search directories for matching patterns.grep 'pattern' file.txt searches for the pattern 'pattern' in the file "file.txt".-i: Print only the names of files containing matches.-n: Display line numbers alongside matching lines.-w: Match whole words only, rather than partial matches.-c: Count the number of matching lines instead of displaying them.-l: Specify multiple patterns to be matched.grep -i "hello" file.txtgrep -v "pattern" file.txtgrep -r "keyword" file.txtgrep -n "pattern" file.txtIn these examples are extracting our desired output from filename (file.txt)5. System Information CommandsIn Linux, there are several commands available to gather system information. Here are some commonly used system information commands:sudCommandDescriptionOptionsExamplesunamePrint system information.-a: all system information.uname -a displays all system information.whoamiDisplay current username. whoami shows the current username.dfShow disk space usage.-h: Human-readable sizes.df -h displays disk space usage in a human-readable format.du: Estimate file and directory space usage.-h: Human-readable sizes.du -h displays disk usage in a human-readable format.free: Display free and used memory.-h: Human-readable sizes.free -h displays memory usage in a human-readable format.uptimeShow system uptime. uptime shows the current system uptime.lscpuDisplay CPU information. lscpu provides detailed CPU information.lspciList PCI devices. lspci lists all connected USB devices. 6. Networking CommandsIn Linux, there are several networking commands available to manage and troubleshoot network connections. Here are some commonly used networking commands:CommandDescriptionOptionsExamplespingSend network interface information. ifconfig displays the details of all network interfaces.pingSend ICMP echo requests to a host.ping google.com sends ICMP echo requests to "google.com" to check connectivity.netstatDisplay network connections and statistics.netstat -tuln displays network connections and listening TCP and UDP connections.sshSecurely connect to a remote server.ssh user@hostname initiates an SSH connection to the specified hostname.scpSecurely copy files between hosts.scp file.txt user@hostname:/path/to/destination securely copies "file.txt" to the specified remote host.wgetDownload files from the web.wget download file.txt downloads a file from the web.curlTransfer data to or from a server.curl retrieves the content of a webpage from the specified URL.7. IO Redirection CommandsIn Linux, IO (Input/Output) redirection commands are used to redirect the standard input, output, and error streams of commands and processes. Here are some commonly used IO redirection commands:CommandDescriptionOptionsExamples> Redirect output to a file.command > file.txt redirects the output of a command to the file "file.txt".file.cmd 2> fileError output of a command is redirected to file.cmd 2>&1stderr is redirected to the same place as stdout.cmd1 /dev/null Discards the stdout of cmd by sending it to the null device.cmd &> fileEvery output of cmd is redirected to file.cmd 1>&2stdout is redirected to the same place as stderr.cmd >> fileAppends the stdout of cmd to file.8. Environment Variable CommandsIn Linux, environment variables are used to store configuration settings, system information, and other variables that can be accessed by processes and shell scripts. Here are some commonly used environment variable commands:CommandDescriptionOptionsExamplesecho $VARIABLE_NAMEDisplays the value of a specific environment variable.envLists all environment variables currently set in the system.unset VARIABLE_NAMEUnsets or removes an environment variable.export -pShows a list of all currently exported environment variables.env VAR1=value COMMANDSets the value of an environment variable for a specific command.printenvDisplays the values of all environment variables. It can also be used to display the value of a specific environment variable.currently logged in.sudo adduser usernameCreate a new user account on the system with the specified username.SpecifyDisplay information about all the users currently logged into the system, including their usernames, login time, and terminal.idle time, and login from.sudo userdel -r usernameDelete the specified user account, preventing the user from logging in.u - usernameSwitch to another user account with the user's specified group. The user is added to the specified group.sudo usermod -a -G GROUPNAME USERNAME Add an existing user to the specified group. The user is added to the group without removing them from their current groups.10. Shortcuts CommandsThere are many shortcuts commands in Linux that can help you be more productive. Here are a few of the most common ones:10.1: Bash Shortcuts CommandsNavigationDescriptionHistoryDescriptionCtrl + AMove to the beginning of the line.Ctrl + RSearch command history (reverse search).Ctrl + E Move to the end of the line.Ctrl + KCut/delete from the cursor position to the end of the line.Ctrl + GEscape from history search mode.Ctrl + BMove back one characterCtrl + YPaste the last cut text.Ctrl + NGo to the next command in history.Alt + BMove back one wordCtrl + LClear the screen.Ctrl + CTerminate the current command.Alt + FMove forward one word.   10.2: Nano Shortcuts CommandsFile OperationsDescriptionNavigationEditingDescriptionSearch andReplaceDescriptionCtrl + O Save the file.Ctrl + YScroll up one page.Ctrl + KCut/delete from the cursor position to the end of the line.Ctrl + WSearch for a string in the text.Ctrl + X Exit Nano (prompt to save if modified).Ctrl + VScroll down one page.Ctrl + U Paste the cut/deleted text.Ctrl + \Replace a string in the text.Ctrl + RRead a file into the current buffer.Alt + \Go to a specific line number.Ctrl + 6Mark a block of text for copying or cutting.Alt + RReplace the last search.Ctrl + JJustify the current paragraph.Alt + \Go to the beginning of the current line.Alt + 6Copy the marked block of text. 10.3: VI Shortcuts CommandsCommandDescriptionChange the current word. Deletes from the cursor position to the end of the current word and switches to insert mode.ddDelete the current line.xDelete the character under the cursor.Enter insert mode. Overwrites characters starting from the cursor position until you press the Escape key.oInsert a new line below the current line and switch to insert mode.uUndo the last change.sSubstitute the character under the cursor and switch to insert mode.dwDelete the word from the cursor position to the end of the word.DDelete from the cursor position to the end of the line.4dwDelete the next four words from the cursor position.AInsert at the end of the current line.SDelete the current line and insert a new line above it.rReplace the character under the cursor with a new character entered from the keyboard.iSwitch to insert mode.DSwitch to insert mode at the end of the current line.3ddDelete the current line and the two lines below it.ESCExit from insert or command-line mode and return to command mode.URestore the current line to its original state before any changes were made.~Switch the case of the character under the cursor.CbDelete from the cursor position to the end of the line and switch to insert mode.10.4: Vim Shortcuts CommandsNormal ModeDescriptionInsert ModeDescriptionCommand ModeDescriptionModeDescriptionNormal ModeInsert mode at the end of the current line.wSave the file.GMove to the last line of the file.esc Exit insert mode and return to command mode.wqSave changes and exit.Vim.pPaste the copied or deleted text.pPaste the copied or deleted text below the cursor line.:s/old/new/gReplace all occurrences of "old" with "new" in the file. uUndo the last change.:set nuor:set numberDisplay line numbers.Ctrl + RRedo the last undo.   ConclusionIn conclusion, Linux is a widely used operating system for development, and as a developer, you should have knowledge of basic Linux commands. In this Cheat Sheet, we covered all commands like creating directories, file compression and archiving, process management, system information, networking and more. In addition to that, this Linux Cheat Sheet is organized and categorized, making it easy for developers to quickly find the commands they need for specific use cases. By utilizing this resource, developers can enhance their productivity and efficiency in working with Linux, leading to smoother and more successful development projects.PS. Don't miss our other Python cheat sheet for data science that covers Scikit learn, Bokeh, Pandas and Python basics. Welcome, aspiring programmers! As an experienced computer science teacher, I'm thrilled to guide you through the fascinating world of Unix and Linux. Don't worry if you're new to programming – we'll start from the basics and build our way up. Let's embark on this exciting journey together! 1. What is Unix? Unix is an operating system that was developed in the 1960s and has since become the foundation for many modern operating systems, including Linux. It's known for its stability, flexibility, and powerful command-line interface. 1.1 Unix Architecture Unix follows a layered architecture, consisting of: The kernel (core of the system) The shell (interface between user and kernel) Utilities and applications Think of Unix like a three-layer cake: the kernel is the base, the shell is the frosting, and the utilities are the delicious toppings! 2. Getting Started with Unix/Linux 2.1 The Command Line Interface (CLI) Unix/Linux systems primarily use a command-line interface. Don't be intimidated - it's like learning a new language, and soon you'll be fluent! To start, open your terminal. You'll see something like this: username@hostname:~$ This is your command prompt. Let's break down what it means: username: Your current username hostname: The name of your computer ~: Represents your home directory $: Indicates you're a regular user (# for root) 2.2 Basic Commands Let's start with some simple commands: Command Description Example pwd Print Working Directory pwd ls List files and directories ls -l cd Change Directory cd Documents Downloads Music Pictures & mkdir MyProject cd MyProject touch hello.txt nano hello.txt mkdir Make Directory mkdir MyProject cd cd Documents cmoves you to a different location, and touch creates a new file. 3. File Management 3.1 Creating and Editing Files Let's create a simple text file using the nano editor: $ nano hello.txt This opens the nano editor. Type some text, then press Ctrl+X, then Y, then Enter to save and exit. 3.2 Displaying File Content To view the content of your file: $ cat hello.txt This is my first file. The cat command displays the entire file content. 3.3 Copying, Moving, and Deleting Files Here's a quick reference table: Command Description Example cp Copy files cp hello.txt copy.txt mv Move or rename files mv hello.txt newfile.txt Remove files or directories rm hello.txt Let's try it: $ cp hello.txt backup.txt $ ls hello.txt backup.txt $ mv backup.txt greetings.txt $ ls hello.txt greetings.txt $ rm greetings.txt $ ls hello.txt Remember, the rm command is permanent – there's no recycle bin in the command line! 4. Directory Management 4.1 Navigating Directories We've already seen cd for changing directories. Here are some navigation tips: cd .. takes you up one directory cd ~ takes you to your home directory cd / takes you to the root directory 4.2 Creating and Removing Directories We've seen mkdir for creating directories. To remove one, use rmdir: $ mkdir TestDir $ ls TestDir MyProject $ rmdir TestDir $ ls MyProject rmdir only works on empty directories. To remove non-empty directories, you'd use rm -r, but be careful with this powerful command! 5. File Permissions Unix/Linux systems have a robust permissions system. Each file and directory has permissions for the owner, group, and others. 5.1 Understanding Permissions Use ls -l to see detailed file information, including permissions: $ ls -l -rw-r--r-- 1 username username 35 Jun 15 10:30 greetings.txt The permissions are represented by -rw-r--r--. The first character denotes the file type (- for regular file, d for directory) The next three characters represent the owner's permissions (rw-) The next three represent the group's permissions (r--) The last three represent others' permissions (r--) Here Each set of three permissions represents read (r), write (w), and execute (x) permissions. 5.2 Changing Permissions Use the chmod command to change permissions. It uses a numbering system: 4 for read (r), 2 for write (w), and 1 for execute (x). $ chmod 644 greetings.txt $ ls -l greetings.txt -rw-r--r-- 1 username username 35 Jun 15 10:30 greetings.txt Here, 644 means read and write for the owner (6), and read-only for the group (4) and others (4). In binary it means read-only for group and write for the owner (4 (100 in binary) means read-only for group and others). 6 (110 in binary) means read and write for the owner. 5.2 Additional Configurations You've taken your first steps into the world of Unix/Linux. We've covered the basics of navigating the file system, managing files and directories, and understanding permissions. Remember, practice makes perfect – the more you use these commands, the more comfortable you'll become. In our next lessons, we'll dive deeper into more advanced topics like shell scripting, process management, and network utilities. Until then, keep exploring and don't be afraid to experiment in your Linux playground! Credits: Image by storyset Family of computer operating systems Operating system UnixUnix System III running on a PDP-11 simulatorDeveloperKen Thompson, Dennis Ritchie, Brian Kernighan, Douglas McIlroy, and Joe Ossanna at Bell LabsWritten inC and assemblylanguageOS familyUnixSource modelHistorically proprietary software, while some Unix projects (including BSD family and illumos) are open-source and historical Unix source code is archived.Initial releaseDevelopment started in 1969first manual published internally in November 1971 (1971-11)[1]Announced outside Bell Labs in October 1973 (1973-10)[2]Available inEnglishKernel typeVaries; monolithic, microkernel, hybridInfluenced byCTSS,[3] MulticsDefault userCommand line interface and Graphical (Wayland and X Window System; Android SurfaceFlinger; macOS Quartz)LicenseVaries; some versions proprietary, others are free/libre or open-source softwareOfficial websitewww.opengroup.org/unix Internet history timeline Early research and development: 1960-1964: RAND networking concepts developed 1962-1964: ARPA networking ideas 1965: NPL network concepts conceived 1966: Merit Network founded 1967: ARPANET planning begins 1967: Symposium on Operating Systems Principles 1969: NPL followed by the ARPANET carry their first packets 1970 (1970): Network Information Center (NIC) 1971 (1971): Tymnet switched-circuit network 1972 (1972): Merit Network's packet-switched network operational 1972 (1972): Internet Assigned Numbers Authority (IANA) established 1973 (1973): CYCLADES network demonstrated 1973 (1973): PARC Universal Packet development begins 1974 (1974): Transmission Control Program specification published 1975 (1975): Telenet commercial packet-switched network 1976 (1976): X.25 protocol approved and deployed on public data networks 1978 (1978): Minitel introduced 1979 (1979): Internet Activities Board (IAB) 1980 (1980): USENET news using UUCP 1981 (1981): BITNET established Merging the networks and creating the Internet: 1981 (1981): Computer Science Network (CSNET) 1982 (1982): TCP/IP protocol suite formalized 1982 (1982): Simple Mail Transfer Protocol (SMTP) 1983 (1983): Domain Name System (DNS) 1983 (1983): MILNET split off from ARPANET 1984 (1984): OSI Reference Model released 1985 (1985): First .COM domain name registered 1986 (1986): NSFNET with 56 kbit/s links 1986 (1986): Internet Engineering Task Force (IETF) 1987 (1987): UUNET founded 1988 (1988): NSFNET upgraded to 1.5 Mbit/s (T1) 1988 (1988): Morris worm 1988 (1988): Complete Internet protocol suite 1988 (1988): Border Gateway Protocol (BGP) 1989 (1989): PSINet founded, allows commercial traffic 1989 (1989): Federal Internet Exchanges (FIX East|FIXes) 1990 (1990): GOSIP (without TCP/IP) 1990 (1990): ARPANET decommissioned 1990 (1990): Advanced Network and Services (ANS) 1990 (1990): UUNETAlternet allows commercial traffic 1990 (1990): Archie search engine 1991 (1991): Wide area information server (WAIS) 1991 (1991): Gopher 1991 (1991): Commercial Internet eXchange (CIX) 1991 (1991): ANS CO+RE allows commercial traffic 1991 (1991): World Wide Web (WWW) 1992 (1992): NSFNET upgraded to 45 Mbit/s (T3) 1992 (1992): Internet Society (ISOC) established 1993 (1993): Classless Inter-Domain Routing (CIDR) 1993 (1993): InterNIC established 1993 (1993): AOL added USENET access 1993 (1993): Mosaic web browser released 1994 (1994): Full text web search engines 1994 (1994): North American Directory Operators' Group (NANOG) established Commercialization, privatization, broader access leads to the modern Internet: 1995 (1995): New Internet architecture with commercial ISPs connected at NAPs 1995 (1995): NSFNET decommissioned 1995 (1995): GOSIP updated to allow TCP/IP 1995 (1995): very high-speed Backbone Network Service (vBNS) 1995 (1995): IPv6 proposed 1996 (1996): AOL changes pricing model from hourly to monthly 1998 (1998): Internet Corporation for Assigned Names and Numbers (ICANN) 1999 (1999): IEEE 802.11b wireless networking 1999 (1999): Internet2/Abilene Network 1999 (1999): vBNS+ allows broader access 2000 (2000): Dot-com bubble bursts 2001 (2001): New top-level domain names activated 2003 (2003): National LambdaRail founded 2003 (2003): UN World Summit on the Information Society (WSIS) phase I 2004 (2004): UN Working Group on Internet Governance (WGIG) 2005 (2005): UN WSIS phase II 2006 (2006): First meeting of the Internet Governance Forum 2010 (2010): First internationalized country code top-level domain names registered 2012 (2012): ICANN begins accepting applications for new generic top-level domain names 2013 (2013): Montevideo Statement on the Future of Internet Cooperation 2014 (2014): NetMundial International Internet statement proposal 2016 (2016): ICANN contract with U.S. Dept. of Commerce ends, IANA oversight passes to the global Internet community on October 1st Examples of Internet services: 1989 (1989): AOL dial-up service provider, email, instant messaging, and web browser 1990 (1990): IMDb Internet movie database 1994 (1994): Yahoo! web directory 1995 (1995): Amazon online retailer 1995 (1995): eBay online auction and shopping 1995 (1995): Craigslist classified advertisements 1995 (1995): AltaVista search engine 1996 (1996): Outlook (formerly Hotmail) free web-based email 1997 (1997): Babel Fish automatic translation 1998 (1998): Google Search 1998 (1998): Yahoo Groups (formerly Yahoo! Clubs) 1998 (1998): PayPal Internet payment system 1998 (1998): Rotten Tomatoes review aggregator 1999 (1999): 2ch Anonymous textboard 1999 (1999): i-mode mobile internet service 1999 (1999): Napster peer-to-peer file sharing 2000 (2000): Baidu search engine 2001 (2001): 2channel Anonymous imageboard 2001 (2001): BitTorrent peer-to-peer file sharing 2001 (2001): Wikipedia, the free encyclopedia 2003 (2003): LinkedIn business networking 2003 (2003): Myspace social networking site 2003 (2003): Skype Internet voice calls 2003 (2003): iTunes Store 2003 (2003): 4chan Anonymous imageboard 2003 (2003): The Pirate Bay, torrent file host 2004 (2004): Facebook social networking site 2004 (2004): Podcast media file series 2004 (2004): Flickr image hosting 2005 (2005): YouTube video sharing 2005 (2005): Reddit link voting 2005 (2005): Google Earth virtual globe 2006 (2006): Twitter microblogging 2007 (2007): WikiLeaks anonymous news and information leaks 2007 (2007): Google Street View 2007 (2007): Kindle, e-reader and virtual bookshop 2008 (2008): Amazon Elastic Compute Cloud (EC2) 2008 (2008): Dropbox cloud-based file hosting 2008 (2008): Encyclopedia of Life, a collaborative encyclopedia intended to document all living species 2008 (2008): Spotify, a DRM-based music streaming service 2009 (2009): Google Docs, Web-based word processor, spreadsheet, presentation, form, and data storage service 2009 (2009): Kickstarter, a threshold pledge system 2009 (2009): Bing search engine 2009 (2009): Google Wave, massive open online course 2010 (2010): TikTok, video sharing and social networking Unix (/ˈjuːnɪks/; YOO-niks; trademarked as UNIX) is a family of multitasking, multi-user computer operating systems that derive from the original AT&T Unix, whose development started in 1969[4] at the Bell Labs research center by Ken Thompson, Dennis Ritchie, and others.[4] Initially intended for use inside the Bell System, AT&T licensed Unix to outside parties in the late 1970s, leading to a variety of both academic and commercial Unix variants from vendors including University of California, Berkeley (BSD), Microsoft (Xenix), Sun Microsystems (SunOS/Solaris), HP/HPE (HP-UX), and IBM (AIX). The early versions of Unix—which are retrospectively referred to as "Research Unix"—ran on computers such as the PDP-11 and VAX; Unix was commonly used on minicomputers and large mainframes from the 1970s. It distinguished itself from its predecessors as the first portable operating system: almost the entire operating system is written in the C programming language (in 1973), which allows Unix to operate on numerous platforms.[6] Unix systems are characterized by a modular design that is sometimes called the "Unix philosophy". According to this philosophy, the operating system should provide a set of simple tools, each of which performs a limited, well-defined function.[7] A unified and inode-based filesystem and an inter-process communication mechanism known as "pipes" serve as the main means of communication,[7] and a shell scripting and command language (the Unix shell) is used to combine the tools to perform complex workflows. Unix distinguishes itself from its predecessors as the first portable operating system: almost the entire operating system is written in the C programming language, thereby allowing Unix to reach numerous platforms. Unix was originally meant to be a convenient platform for programmers developing software to be run on it and on other systems, rather than for non-programmers.[8] The system grew larger as the operating system started spreading in academic circles, and as users added their own tools to the system and shared them with colleagues.[9] At first, Unix was not designed to be portable[10] or for multi-tasking.[11] Later, Unix gradually gained portability, multi-tasking and multi-user capabilities in a time-sharing configuration. Unix systems are characterized by various concepts: the use of plain text for storing data; a hierarchical file system; treating devices and certain types of inter-process communication (IPC) as files; and the use of a large number of software tools, small programs that can be strung together through a command-line interpreter using pipes, as opposed to using a single monolithic program that includes all of the same functionality. These concepts are collectively known as the "Unix philosophy". Brian Kernighan and Rob Pike summarize this in The Unix Programming Environment as "the idea that the power of a system comes more from the relationships among programs than from the programs themselves".[12] By the early 1980s, users began seeing Unix as a potential universal operating system, suitable for computers of all sizes.[19][20] The Unix environment and the client-server program model were essential elements in the development of the Internet and the reshaping of computing as centered in networks rather than in individual computers. Both Unix and the C programming language were developed by AT&T and distributed to government and academic institutions, which led to both being ported to a wider variety of machine families than any other operating system. The Unix operating system consists of many libraries and utilities along with the master control program, the kernel. The kernel provides services to start and stop programs, handles the file system and other common "low-level" tasks that most programs share, and schedules access to avoid conflicts when programs try to access the same resource or device simultaneously. To mediate such access, the kernel has special rights, reflected in the distinction of kernel space from user space, the latter being a lower-priority realm where most application programs operate. Main article: History of Unix The origins of Unix date back to the mid-1960s when the Massachusetts Institute of Technology, Bell Labs, and General Electric were developing Multics, a time-sharing operating system for the GE-645 mainframe computer.[21] Multics featured several innovations, but also presented severe problems. Frustrated by the size and complexity of Multics, but not by its goals, individual researchers at Bell Labs started withdrawing from the project. The last to leave were Ken Thompson, Dennis Ritchie, Douglas McIlroy, and Joe Ossanna,[17] who decided to reimplement their experiences in a new project of smaller scale. This new operating system was initially without organizational backing, and also without a name. The new operating system was a single-tasking system.[21] In 1970, the group coined the name Unix for Unplexed Information and Computing Service as a pun on Multics, which stood for Multiplexed Information and Computer Services. Dennis Ritchie,[17] Doug McIlroy,[14] and Peter G. Neumann[23] also credit Kernighan. The operating system was originally written in assembly language, but in 1973, Version 4 Unix was rewritten in C. Ken Thompson faced multiple challenges attempting the kernel port due to the evolving state of C, which lacked key features like structures at the time.[17][24] Version 4 Unix, however, still lacked many potentially important features that were not suitable for porting. The first port to another platform was made five years later (1977) at the University of Wollongong onto the Interdata 7/32,[25] followed by a Bell Labs port of Version 7 to the Interdata 8/32 during 1977 and 1978.[26] Bell Labs produced several versions of Unix that are collectively referred to as Research Unix. In 1975, the first source license for UNIX was sold to Donald B. Gillies at the University of Illinois Urbana–Champaign (UIUC) Department of Computer Science.[27] During the late 1970s and early 1980s, the influence of Unix in academic circles led to large-scale adoption of Unix (BSD and System V) by commercial startups, which in turn led to Unix fragmenting into multiple, similar — but often slightly and mutually incompatible — systems including DYNIX, HP-UX, SunOS/Solaris, AIX, and Xenix. In the late 1980s, AT&T Unix System Laboratories and Sun Microsystems developed System V Release 4 (SVR4), which was subsequently adopted by many commercial Unix vendors. In the 1990s, Unix and Unix-like systems grew in popularity and became the operating system of choice for over 90% of the world's top 500 fastest supercomputers,[28] as BSD and Linux distributions were developed through collaboration by a worldwide network of programmers. In 2000, Apple released Darwin, also a Unix system, which became the core of the Mac OS X operating system, later renamed macOS.[29] Unix operating systems are widely used in modern servers, workstations, and mobile devices.[30] The Common Desktop Environment (CDE), part of the COSE initiative in the late 1980s, an open operating system standardization effort now known as POSIX provided a common desktop environment, Common Desktop Environment (CDE). In March 1993, a separate but very similar effort was begun by industry consortium, the Common Open Software Environment (COSE) initiative, which eventually became the Single UNIX Specification (SUS) administered by The Open Group. Starting in 1998, the Open Group and IEEE started the Austin Group, to provide a common definition of POSIX and the Single UNIX Specification, which, by 2008, had become the Open Group Base Specification. In 1999, in an effort towards compatibility, several Unix system vendors agreed on SVR4's Executable and Linkable Format (ELF) as the standard for binary and object code files. The common format allows substantial binary compatibility among different Unix systems operating on the same CPU architecture. The Filesystem Hierarchy Standard was created to provide a reference directory layout for Unix-like operating systems; it has mainly been used in Linux. See also: List of Unix commands Unix is also often referred to as a "self-contained" operating system, because it has additional citations for verification. Please help improve this article by adding citations to reliable sources in this section. Unsourced material may be challenged and removed.Find sources: "Unix" – news · newspapers · books · scholar · JSTOR (October 2023) (Learn how and when to remove this message) The Unix system is composed of several components that were originally packaged together. By including the development environment, libraries, documents and the portable, modifiable source code for all of these components, in addition to the kernel of an operating system, Unix was a self-contained software system. This was one of the key reasons it emerged as an important teaching

and learning tool and has had a broad influence. See § Impact, below. The inclusion of these components did not make the system large – the original V7 Unix distribution, consisting of copies of all of the compiled binaries plus all of the source code and documentation occupied less than 10 MB and arrived on a single nine-track magnetic tape, earning its reputation as a portable system.[31] The printed documentation, typeset from the online sources, was contained in two volumes. The names and filesystem locations of the Unix components have changed substantially across the history of the system. Nonetheless, the V7 implementation has the canonical early structure: Kernel – source code in /usr/sys, composed of several sub-components: conf – configuration and machine-dependent parts, including boot code dev – device drivers for control of hardware (and some pseudo-hardware) sys – operating system "kernel", handling memory management, process scheduling, system calls, etc. h – header files, defining key structures within the system and important system-specific invariables Development environment – early versions of Unix contained a development environment sufficient to recreate the entire system from source code: ed – text editor, for creating source code files cc – C language compiler (first appeared in V3 Unix) as – machine-language assembler for the machine ld – linker, for combining object files lib – object-code libraries (installed in /lib or /usr/lib). like, the system library with C run-time support, was the primary library, but there have always been additional libraries for things such as mathematical functions (libm) or database access. V7 Unix introduced the first version of the modern "Standard I/O" library stdio as part of the system library. Later implementations increased the number of libraries significantly. make – build manager (introduced in PWB/UNIX), for effectively automating the build process include – header files for software development, defining standard interfaces and system invariants Other languages – V7 Unix contained a Fortran-77 compiler, a programmable arbitrary-precision calculator (bc, dc), and the awk scripting language; later versions and implementations contain many other language compilers and toolsets. Early BSD releases included Pascal tools, and many modern Unix systems also include the GNU Compiler Collection as well as or instead of a proprietary compiler system. Other tools – including an object-code archive manager (ar), symbol-table lister (nm), compiler-development toolkits (e.g. lex & yacc), and debugging tools. Commands – Unix makes little distinction between commands (user-level programs) for system operation and maintenance (e.g. cron), commands of general utility (e.g. grep), and more general-purpose applications such as the text formatting and typesetting package. Nonetheless, some major categories are: sh – the "shell" programmable command-line interpreter, the primary user interface on Unix before window systems appeared, and even afterward (within a "command window"). Utilities – the core toolkit of the Unix command set, including cp, ls, grep, find and many others. Subcategories include: System utilities – administrative tools such as mkfs, fsck, and many others. User utilities – environment management tools such as passwd, kill, and others. Document formatting – Unix systems were used from the outset for document preparation and typesetting systems, and included many related programs such as nroff, troff, tbl, eqn, refer, and pic. Some modern Unix systems also include packages such as TeX and Ghostscript. Graphics – the plot subsystem provided facilities for producing simple vector plots in a device-independent format, with device-specific interpreters to display such files. Modern Unix systems also generally include X11 as a standard windowing system and GUI, and many support OpenGL. Communications – early Unix systems contained no inter-system communication, but did include the inter-user communication programs mail and write. V7 introduced the early inter-system communication system UUCP, and systems beginning with BSD release 4.1c included TCP/IP utilities. Documentation – Unix was one of the first operating systems to include all of its documentation online in machine-readable form.[32] The documentation included: man – manual pages for each command, library component, system call, header file, etc. doc – longer documents detailing major subsystems, such as the C language and troff See also: Unix-like Ken Thompson and Dennis Ritchie, principal developers of Research Unix Photo from USENIX 1984, including Dennis Ritchie (center) The Unix system had a significant impact on other operating systems. It achieved its reputation by its interactivity, by providing the software at a nominal fee for educational use, by running on inexpensive hardware, and by being easy to adapt and move to different machines. Unix was originally written in assembly language, but was soon rewritten in C, a high-level programming language.[33] Although this followed the lead of CTSS, Multics and Burroughs MCP, it was Unix that popularized the idea. Unix had a drastically simplified file model compared to many contemporary operating systems: treating all kinds of files as simple byte arrays. The file system hierarchy contained machine services and devices (such as printers, terminals, or disk drives), providing a uniform interface, but at the expense of occasionally requiring additional mechanisms such as ioctl and mode flags to access features of the hardware that did not fit the simple "stream of bytes" model. The Plan 9 operating system took this model even further and eliminated the need for additional mechanisms. Unix also popularized the hierarchical file system with arbitrarily nested subdirectories, originally introduced by Multics. Other common operating systems of the era had ways to divide a storage device into multiple directories or sections, but they had a fixed number of levels, often only one level. Several major proprietary operating systems eventually added recursive subdirectory capabilities also patterned after Multics. DEC's RSX-11M's "group, user" hierarchy evolved into OpenVMS directories, CP/M's volumes evolved into MS-DOS 2.0+ subdirectories, and HP's MPE group.account hierarchy and IBM's SSP and OS/400 library systems were folded into broader POSIX file systems. Making the command interpreter an ordinary user-level program, with additional commands provided as separate programs, was another Multics innovation popularized by Unix. The Unix shell used the same language for interactive commands as for scripting (shell scripts – there was no separate job control language like IBM's JCL). Since the shell and OS commands were "just another program", the user could choose (or even write) their own shell. New commands could be added without changing the shell itself. Unix's innovative command-line syntax for creating modular chains of producer-consumer processes (pipelines) made a powerfully productive programming paradigm (coroutines) widely available. Many later command-line interpreters have been inspired by the Unix shell. A fundamental simplifying assumption of Unix was its focus on newline-delimited text for nearly all file formats. There were no "binary" editors in the original version of Unix – the entire system was configured using textual shell command scripts. The common denominator in the I/O system was the byte – unlike "record-based" file systems. The focus on text for representing nearly everything made Unix pipes especially useful and encouraged the development of simple, general tools that could easily be combined to perform more complicated ad hoc tasks. The focus on text and bytes made the system far more scalable and portable than others. Over time, text-based applications have also proven popular in application areas, such as printing languages (PostScript, ODF), and at the application layer of the Internet protocols, e.g., FTP, SMTP, HTTP, SOAP, and SIP. Unix popularized a syntax for regular expressions that found widespread use. The Unix programming interface became the basis for a widely implemented operating system interface standard (POSIX, see above). The C programming language soon spread beyond Unix, and is now ubiquitous in systems and applications programming. Early Unix developers were important in bringing the concepts of modularity and reusability into software engineering practice, spawning a "software tools" movement. Over time, the leading developers of Unix (and programs that ran on it) established a set of cultural norms for developing software, norms which became as important and influential as the technology of Unix itself; this has been termed the Unix philosophy. The TCP/IP networking protocols were quickly implemented on the Unix versions widely used on relatively inexpensive computers, which contributed to the Internet explosion of worldwide, real-time connectivity and formed the basis for implementations on many other platforms. The Unix policy of extensive on-line documentation and (for many years) ready access to all system source code raised programmer expectations, and contributed to the launch of the free software movement in 1983. See also: Operating system § Unix and Unix-like operating systems Console screenshots of Debian (top, a popular Linux distribution) and FreeBSD (bottom, a popular Unix-like operating system) In 1983, Richard Stallman announced the GNU (short for "GNU's Not Unix") project, an ambitious effort to create a free software Unix-like system—"free" in the sense that everyone who received a copy would be free to use, study, modify, and redistribute it. The GNU project's own kernel development project, GNU Hurd, had not yet produced a working kernel, but in 1991 Linus Torvalds released the Linux kernel as free software under the GNU General Public License. In addition to their use in the GNU operating system, many GNU packages – such as the GNU Compiler Collection (and the rest of the GNU toolchain), the GNU C library and the GNU Core Utilities – have gone on to play central roles in other free Unix systems as well. Linux distributions, consisting of the Linux kernel and large collections of compatible software have become popular both with individual users and in business. Popular distributions include Red Hat Enterprise Linux, Fedora, SUSE Linux Enterprise, openSUSE, Debian, Ubuntu, Linux Mint, Slackware Linux, Arch Linux and Gentoo.[34] A free derivative of BSD Unix, 386BSD, was released in 1992 and led to the NetBSD and FreeBSD projects. With the 1994 settlement of a lawsuit brought against the University of California and Berkeley Software Design Inc. (USL v. BSDi) by Unix Systems Laboratories, it was clarified that Berkeley had the right to distribute BSD Unix for free if it so desired. Since then, BSD Unix has been developed in several different product branches, including OpenBSD and DragonFly BSD. Because of the modular design of the Unix model, sharing components is relatively common; most of all Unix and Unix-like systems include at least some BSD code, while some include GNU utilities in their distributions. Linux and BSD Unix are increasingly filling market needs traditionally served by proprietary Unix operating systems, as new markets such as the consumer desktop, mobile devices and embedded devices. In a 1999 interview, Dennis Ritchie voiced his opinion that Linux and BSD Unix operating systems are a continuation of the basis of the Unix design and are derivatives of Unix.[35] I think the Linux phenomenon is quite delightful, because it draws so strongly on the basis that Unix provided. Linux seems to be among the healthiest of the direct Unix derivatives, though there are also the various BSD systems as well as the more official offerings from the workstation and mainframe manufacturers. In the same interview, he states that he views both Linux and Unix as "the continuation of ideas that were started by Ken and me and many others, many years ago".[35] OpenSolaris was the free software counterpart to Solaris developed by Sun Microsystems, which included a CDDL-licensed kernel and a primarily GNU userland. However, Oracle discontinued the project upon their acquisition of Sun, which prompted a group of former Sun employees and members of the OpenSolaris community to fork OpenSolaris into the illumos kernel. As of 2014, illumos remains the only active, open-source Unix* derivative. In May 1975, RFC 681 described the development of Network Unix by the Center for Advanced Computation at the University of Illinois Urbana-Champaign.[36] The Unix system was said to "present several interesting capabilities as an ARPANET mini-host". At the time, Unix required a license from Bell Telephone Laboratories that cost US$20,000 for non-university institutions, while universities could obtain a license for a nominal fee of $150. It was noted that Bell was "open to suggestions" for an ARPANET-wide license. The RFC specifically mentions that Unix "offers powerful local processing facilities in terms of user programs, several compilers, an editor based on QED, a versatile document preparation system, and an efficient file system featuring sophisticated access control, mountable and de-mountable volumes, and a unified treatment of peripherals as special files." The latter permitted the Network Control Program (NCP) to be integrated within the Unix file system, treating network connections as special files that could be accessed through standard Unix I/O calls, with included the added benefit of closing all connections on program exit, should the user neglect to do so. In order "to minimize the amount of code added to the basic Unix kernel", much of the NCP code ran in a swappable user process, running only when needed.[36] See also: List of Unix systems Promotional license plate by Digital Equipment Corporation. Actual license plate is used by Jon Hall. HP 9000 workstation running HP-UX, a certified Unix operating system AT&T originally did not allow licensees to use the Unix name; this Microsoft called its variant Xenix, for example.[37] In October 1988, they allowed licensees to use the UNIX trademark for systems based on System V. When System V source at the time, transferred the trademarks of Unix to the X/Open Company (now The Open Group),[39] and in 1995 sold the related business operations to Santa Cruz Operation (SCO).[40][41] Whether Novell also sold the copyrights to the actual software was the subject of a federal lawsuit in 2006, SCO v. Novell, which Novell won. The case was appealed, but on August 30, 2011, the United States Court of Appeals for the Tenth Circuit affirmed the trial decisions, closing the case.[42] Unix vendor SCO Group Inc. accused Novell of slander of title. The present owner of the trademark UNIX is The Open Group, an industry standards consortium. Only systems fully compliant with and certified to the Single UNIX Specification qualify as "UNIX" (others are called "Unix-like"). By decree of The Open Group, the term "UNIX" refers more to a class of operating systems than to a specific implementation of an operating system; those operating systems which meet The Open Group's Single UNIX Specification should be able to bear the UNIX 98 or UNIX 03 trademarks today, after the operating system's vendor pays a substantial certification fee and annual trademark royalties to The Open Group.[43] Systems that have been licensed to use the UNIX trademark include AIX,[44] EulerOS,[45] HP-UX,[46] Inspur K-UX,[47] IRIX,[48] macOS,[49] Solaris,[50] Tru64 UNIX (formerly "Digital UNIX", or OSF/1),[51] and z/OS.[52] Notably, EulerOS and Inspur K-UX are Linux distributions certified as UNIX 03 compliant.[53][54] Sometimes a representation like Un*x, *NIX, or *N?X is used to indicate all operating systems similar to Unix. This comes from the use of the asterisk (*) and the question mark characters as wildcard indicators in many utilities. This notation is also used to describe other Unix-like systems that have not met the requirements for UNIX branding from the Open Group. The Open Group requests that UNIX always be used as an adjective followed by a generic term such as system to help avoid the creation of a genericized trademark. Unix was the original formatting,[disputed – discuss] but the usage of UNIX remains widespread because it was once typeset in small caps (Unix). According to Dennis Ritchie, when presenting the original Unix paper to the third Operating Systems Symposium of the American Association for Computing Machinery (ACM), "we had a new typesetter and troff had just been invented and we were intoxicated by being able to produce small caps".[55] Many of the operating system's predecessors and contemporaries used all-uppercase lettering, so many people wrote the name in upper case due to force of habit. It is not an acronym.[56] Trademark names can be registered by different entities in different countries and trademark laws in some countries allow the same trademark name to be controlled by two different entities if each entity uses the trademark in different categories. The result is that Unix has been used as a brand name for various products including bookshelves, ink pens, bottled glue, diapers, hair driers and food containers.[57] Several plural forms of Unix are used casually to refer to multiple brands of Unix and Unix-like systems. Most common is the conventional Unixes, but Unices, treating Unix as a Latin noun of the third declension, is also popular. The pseudo-Anglo-Saxon plural form Unixen is not common, although occasionally seen. Sun Microsystems, developer of the Solaris variant, has asserted that the term Unix is itself plural, referencing its many implementations.[58] Comparison of operating systems Plan 9 from Bell Labs Timeline of operating systems Unix time Market share of operating systems Year 2038 problem ^ a b c McIlroy, M. D. (1987). A Research Unix reader: annotated excerpts from the Programmer's Manual, 1971–1986 (PDF) (Technical report). CSTR. Bell Labs. 139. 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A History of UNIX before Berkeley: UNIX Evolution: 1975-1984 BYTE Magazine, September 1986: UNIX and the MC68000 – a software perspective on the MC68000 CPU architecture and UNIX compatibility Retrieved from "2 Anonymous imageboard website Homepage on May 3, 2023Type of siteImageboardAvailable inEnglishCountry of originUnited StatesOwnerHiroyuki Nishimura (since 2015)Created byChristopher PooleServicesChan PassURL4chan.orgAdvertisingYesCommercialYesRegistrationNone (except for staff)LaunchedOctober 1, 2003 (21 years ago) (2003-10-01)[1]Current statusActiveWritten inPHP 4chan is an anonymous English-language imageboard website. Launched by Christopher "moot" Poole in October 2003, the site hosts boards dedicated to a wide variety of topics, from video games and television to literature, cooking, weapons, music, history, technology, anime, physical fitness, politics, and sports, among others. Registration is not available, except for staff, and users typically post anonymously.[2] As of 2022[update], 4chan receives more than 22 million unique monthly visitors, of whom approximately half are from the United States.[3][4] 4chan was created as an unofficial English-language counterpart to the Japanese imageboard Futaba Channel, also known as 2chan, and its first boards were originally used for posting images and discussing manga and anime. It is generally considered the first American internet subculture.[5] 4chan has been described as a hub of Internet subculture, its community being influential in the formation and popularization of prominent Internet memes, such as lolcats, Rickrolling, rage comics, wojaks, Pepe the Frog, as well as hacktivist and political movements, such as Anonymous and the alt-right. 4chan has often been the subject of media attention as a source of controversies, including the coordination of pranks and harassment against websites and Internet users, and the posting of illegal and offensive content as a result of its lax censorship and moderation policies. In 2008, The Guardian summarized the 4chan community as "lunatic, juvenile [...] brilliant, ridiculous and alarming".[6][7] As of August 2022[update], the site's homepage lists 75 imageboards and one Flash animation board. Most boards have their own set of rules and are dedicated to a specific topic, including anime and manga, video games, music, literature, fitness, politics, and sports, among others. Uniquely, the "Random" board—also known as /b/—enforces few rules.[8] Akin to the Internet's most trafficked imageboard, according to the Los Angeles Times.[9] 4chan's Alexa rank was 853 in March 2022,[10] though it has been as high as 56.[11] It is provided to its users free of charge and consumes a large amount of bandwidth; as a result, its financing has often been problematic. Poole acknowledged that donations alone could not keep the site online, and turned to advertising to help make ends meet.[12] However, the explicit content featured on 4chan has deterred businesses who do not want to be associated with the site's content.[13] In January 2009, Poole signed a new deal with an advertising company; in February 2009, he was $20,000 in debt, and the site was continuing to lose money.[14] The 4chan servers were moved from Texas to California in August 2008, which upgraded the maximum bandwidth throughput of 4chan from 100 Mbit/s to 1 Gbit/s.[15] Unlike most web forums, 4chan does not have a registration system, allowing users to post anonymously.[16][17] Posting is ephemeral, as threads receiving recent replies are "bumped" to the top of their respective board and old threads are deleted as new ones are created.[2] Any nickname may be used when posting, even one that has been previously adopted, such as "Anonymous" or "moot".[18] In place of registration, 4chan has provided tripcodes as an optional form of authenticating a poster's identity.[19] As making a post without filling in the "Name" field causes posts to be attributed to "Anonymous", general understanding on 4chan holds that Anonymous is not a single person but a collective (hive) of users.[20] Moderators generally post without a name even when performing roles as moderators. A "capcode" may be used to attribute the post to "Anonymous ## Mod", although moderators often post without the capcode.[21] In a 2011 interview on Nico Nico Douga, Poole explained that there are approximately 20 volunteer moderators active on 4chan.[note 1] 4chan also has a junior moderation team, called "janitors", who may delete posts or images and suggest that the normal moderation team ban a user, but cannot post with a capcode. Revealing oneself as a janitor is grounds for immediate dismissal.[22] Gianluca Stringhini, an associate professor at Boston University College of Engineering, said in August 2024, "The only moderation on the platform appears to be for clearly illegal content, such as video or pornography. Everything else remains untouched."[23] 4chan has been the target of occasional denial of service attacks. For instance, on December 28, 2010, 4chan and other websites went down due to such an attack, following which Poole said on his blog, "We now join the ranks of MasterCard, Visa, PayPal, et al. – an exclusive club!"[24] The site was launched as 4chan.net on October 1, 2003, by Christopher Poole, a then-15-year-old student from New York City using the online handle "moot".[25] Poole had intended for the site to be a place for English-language users to discuss anime and manga. Awful's subforum "Anime Death Tentacle Rape Whorehouse" (ADTRW), where many users were familiar with the Japanese imageboard format and Futaba Channel ("2chan.net"),[16] When creating 4chan, Poole obtained Futaba Channel's open source code and translated the Japanese text into English using AltaVista's Babel Fish online translation service.[26] After the site's creation, Poole invited users from the ADTRW subforum, many of whom were dissatisfied with the site's moderation, to visit 4chan, which he advertised as an English-language counterpart to Futaba Channel and a place for Western fans to discuss anime and manga.[7][27][28] At its founding, the site only hosted one board: /b/ (Anime/Random).[note 1] Before the end of 2003, several new anime-related boards were added, including /h/ (Hentai), /c/ (Anime/Cute), /d/ (Hentai/Alternative), /w/ (Wallpapers/Anime), /y/ (Yaoi), and /a/ (Anime). In the early days of the website, Poole hosted meetings from 2003 to 2008 in various locations to promote it, such as Otakon.[30] that 4chan-related memes. Additionally, a lolicon board was created at /l/ (Lolikon),[31] but was disabled following the posting of real-life child pornography and ultimately deleted in December 2004, after threats of legal action.[32][33] In February 2004, Poole announced that he lacked the funds to pay for the month's server bill, but was able to continue operations after receiving a swarm of donations from users.[34] In June 2004, 4chan experienced six weeks of downtime due to PayPal suspending 4chan's donations service and complaints about the site's content.[35] Following 4chan's return, several non-anime related boards were introduced, including /k/ (Weapons), /o/ (Auto), and /v/ (Video Games).[36] In 2008, nine new boards were created, including the sports board at /sp/, the fashion board at /fa/ and the "Japan/General" (the name later changed to "Otaku Culture") board at /jp/.[37] By this point, 4chan's culture had altered, moving away from the "early, more childish," humour, as evident by the Rules of Chanology; trolling underwent a so-called "golden age" that took aim at American corporate media.[38][39] In January 2011, Poole announced the deletion of the /r9k/ ("ROBOT9000") and /new/ (News) boards, saying that /new/ had become devoted to racist discussions, and /r9k/ no longer served its original purpose of being a test implementation of xkcd's ROBOT9000 script.[40] During the same year, the /soc/ board was created in an effort to reduce the number of socialization threads on /b/. /r9k/ was restored on October 23, 2011, along with /hc/ ("Hardcore", previously deleted), /pol/ (a rebranding of /new/ and the new /diy/ board, in addition to an apology by Poole where he recalls how he criticized the deletion of Encyclopedia Dramatica and realized that he had done the same to others.[citation needed] In 2010, 4chan had implemented reCAPTCHA in an effort to thwart spam following an influx of pornographic images.[41] In 2012, 4chan made the transition to utilizing Cloudflare following a series of DDoS attacks. The 4chan homepage was rewritten in valid HTML5/CSS3 in May 2012 in an effort to improve client-side performance.[15] On September 28, 2012, 4chan introduced a "4chan pass"[41] that, when purchased, "allows users to bypass typing a reCAPTCHA verification when posting and reporting posts on the 4chan image boards"; the money raised from the passes go towards supporting the site.[42] Hiroyuki Nishimura, the owner of 4chan since 2015 On January 21, 2015, 4chan stepped down as the site's administrator, citing stress from controversies such as Gamergate as the reason for his departure.[43][44][45] On September 21, 2015, Poole announced that Hiroyuki Nishimura had purchased from him the ownership rights to 4chan, without disclosing the terms of the acquisition.[28][46][47] Nishimura was the former administrator of the Japanese imageboard 2channel, which he founded in 1999 and 2014, the website forming the basis for anonymous posting culture which influenced later websites such as Futaba Channel and 4chan.[48] Nishimura lost 2channel's domain after it was taken down was the "Chicken jockey!" quote, taken from A Minecraft Movie.[63] In the days following the attacks, 4chan and Nishimura's official Twitter accounts released statements confirming that they would work to fix security vulnerabilities and return at a later date, though its temporary unavailability, some users took to the site's Downdetector page, using its comment section as a temporary replacement for the website.[69] Main article: Christopher Poole Christopher Poole concealed his real-life identity until it was revealed on July 9, 2008, in The Wall Street Journal. Prior to that, he had used the alias "moot".[25] In April 2009, an open Internet poll conducted by Time magazine named Poole as the world's most influential person of 2008.[70] The results were questioned even before the poll completed, as automated voting programs and manual ballot stuffing were used to influence the vote.[71][72][73] 4chan's interference with the vote seemed increasingly likely when it was found that reading the first letter of the first 21 candidates in the poll spelled out a phrase containing two 4chan memes: "mARBLECAKE. ALSO, THE GAME."[74] On September 12, 2009, Poole gave a talk regarding 4chan's reputation at the Paradox Symposium in Vienna, Austria, which was part of the ParaFlows 09 festival, themed Urban Hacking. In this talk, Poole mainly attributed this both to the anonymous system and to the lack of data retention on the site ("The site has no memory.").[75][76] In April 2010, Poole testified in the United States of America v. David Kernell as a government witness,[77] explaining the terminology used on 4chan to the prosecutor, ranging from "OP" to "lurker", as well as the nature of the data given to the FBI as part of the search warrant, including how users can be uniquely identified from site audit logs.[78] Board Name NSFW Year created /3/ 3DCG No 2005 /a/ Anime & Manga No 2003 /aco/ Adult Cartoons Yes 2015 /adv/ Advice No 2010 /an/ Animals & Nature No 2006 /asp/ Alternative Sports No 2013 /b/ Random Yes 2003 /bant/ International/Random Yes 2017 /biz/ Business & Finance No 2014 /c/ Anime/Cute No 2003 /cgl/ Cosplay & EGL No 2006 /ck/ Cooking No 2006 /cm/ Cute/Male No 2006 /co/ Comics & Cartoons No 2007 /d/ Hentai/Alternative Yes 2005 /diy/ Do It Yourself No 2011 /e/ Ecchi Yes 2005 /fa/ Fashion No 2008 /fit/ Fitness No 2008 /g/ Technology No 2007 /gd/ Graphic Design No 2013 /gif/ Adult GIF Yes 2005 /h/ Hentai Yes 2005 /his/ History & Humanities No 2015 /hm/ Handsome Men Yes 2006 /hr/ High Resolution Yes 2005 /i/ Oekaki No 2005 /ic/ Artwork/Critique No 2005 /int/ International No 2011 /jp/ Otaku Culture No 2008 /k/ Weapons No 2004 /lgbt/ LGBT No 2013 /lit/ Literature No 2010 /m/ Mecha No 2004 /mlp/ Pony No 2012 /mu/ Music No 2006 /n/ Transportation No 2006 /news/ Current News No 2015 /o/ Auto No 2004 /out/ Outdoors No 2013 /p/ Photography No 2005 /po/ Papercraft & Origami No 2006 /pol/ Politically Incorrect Yes 2011 Professional Wrestling No 2021 /qa/ Question & Answer No 2015 /qst/ Quests No 2016 /r/ Request Yes 2004 /r9k/ ROBOT9001 Yes 2008 /s/ Sexy Beautiful Women Yes 2003 /s4s/ Shit 4chan Says Yes 2013 /sci/ Science & Math No 2010 /sp/ Sports No 2006 /t/ Torrents Yes 2003 /tg/ Traditional Games No 2007 /toy/ Toys No 2008 /trash/ Off-Topic No 2015 /trv/ Travel No 2008 /tv/ Television & Film No 2006 /u/ Yuri Yes 2004 /v/ Video Games No 2004 /vg/ Video Game Generals No 2012 /vip/ Very Important Posts No 2016 /vm/ Video Games/Multiplayer No 2020 /vmg/ Video Games/Mobile No 2020 /vp/ Pokémon No 2010 /vr/ Retro Games No 2013 /vrpg/ Video Games/RPG No 2020 /vst/ Video Games/Strategy No 2020 /vt/ Virtual YouTubers No 2021 /w/ Anime/Wallpapers No 2005 /wg/ Wallpapers/General No 2005 /wsg/ Worksafe Requests No 2015 /wsr/ Worksafe Requests No 2015 /x/ Paranormal No 2008 /xs/ Extreme Sports No 2021 /y/ Yaoi Yes 2004 /vg/ "Random" board. It was the first board created, and has been described as 4chan's most popular board, accounting for 30% of site traffic in 2009.[79][80][2] Gawker's Nick Douglas summarized /b/ as a board where "people try to shock, entertain, and coax free porn from each other."[6] /b/ has a "no rules" policy, except for bans on certain illegal content, such as child pornography, invasion of other websites (posting floods of disruptive content), and under-18 viewing, all of which are inherited from site-wide rules. The "no invasions" rule was added in late 2006, after /b/ users spent most of that summer "invading" Habbo Hotel. The "no rules" policy also applies to actions of administrators and moderators, which means that users may be banned at any time, for any reason, including for no reason at all.[81] Due partially to its anonymous nature, board moderation is not always successful—indeed, the site's anti-child pornography policy rule is a subject of contention. As of 2018, 4chan's rules allow for the removal of... (cut off) content, such as child pornography, invasions of other websites, and under-18 viewing, all of which are inherited from the site-wide rules.[82] The humor of /b/'s many users, who refer to themselves as "/b/tards",[82][83] is often incomprehensible to newcomers and outsiders, and is characterized by intricate inside jokes and dark comedy.[83] Users refer often to each other, and much of the outside world, as fags.[11] They are often referred to by outsiders as trolls, who regularly act to disrupt the site. The word "troll" and "newfag" for a new user. ... Attributes characterized as adolescent, crude,[87][11] and spiteful,[6] with one publication writing that their "bad behavior is encouraged by the site's total anonymity and the absence of an archive".[2][85] Douglas cited Encyclopedia Dramatica's definition of /b/ as "the asshole of the Internets [sic]".[6] Mattathias Schwartz of The New York Times likened /b/ to "a high-school bathroom stall, or an obscene telephone party line",[82] while Baltimore City Paper wrote that "in the high school of the Internet, /b/ is the kid with a collection of butterfly knives and a locker full of porn."[11] Wired describes /b/ as "notorious".[83] Each post is assigned a post number. Certain post numbers are sought after, with such numbers being referred to as "GET" them. A "GET" occurs when a post's number ends in a special number, such as 12345678, 22222222, or every millionth post.[86] A sign of /b/'s nihilistic and surreal brand of humor, as well as its self-image. A commonly cited example is Dubs Guy/Check 'Em, which features a picture of a man with seven digit post number ending in all 7s.[88] Along with the board's content, particularly /co/ and /b/.[88] Along with the board's content, many users on /mlp/ reject this label, preferring self-deprecating terms like horsefuckers or ponyfags.[90] Notable events include a 2013 Q&A with Friendship Is Magic creator Lauren Faust[91] and the board's temporary merger with /po/ on April 1, 2017, creating "/mlpol/".[92] Despite the original series ending in 2019, /mlp/ continues to maintain an active community. The board is the subject of academic research regarding musicality and online identity, particularly in a 2017 ethnographic study published in the journal Sexualities that examined how users construct collective identity around their interest in the show and its characters.[90] Main article: /mu/ The board, /mu/, is dedicated to the discussion of music artists, albums, genres, and instruments.[93] Described as "4chan's best kept secret" and a "surprisingly artistic side of 4chan", /mu/ is used by users to share their musical interests with similar minds and discover "great musicians".[94] The board has gained notoriety for earnestly focusing upon and promoting challenging and otherwise obscure music.[96][97] Some common genres discussed on /mu/ include shoegaze,[98] experimental hip hop,[95] witch house,[94][99] IDM,[100] midwest emo,[101] vaporwave,[102] and K-pop.[94] There is a significant overlap between users of /mu/ and music site Rate Your Music.[103] The board's culture has inspired several music communities and meme pages on social media that emulate /mu/'s posting style.[104] Publications such as Pitchfork and Entertainment Weekly noted the board played a significant role in popularizing various music artists, such as Death Grips,[105][106] Neutral Milk Hotel,[107] Car Seat Headrest,[108] and Have a Nice Life.[109][110][111] Prominent music community site Anthony Fantano began his career on /mu/ and developed a significant following there.[112] Some members on /mu/ formed a community and communicated via peer-to-peer feedback, as well as find inspiration from the board.[113] In particular, Zeal & Ardor said their sound, which mixes black metal with spirituals, came from suggestions by two users.[113] Andrew W.K. did a Q&A with the board's users in 2011, causing the site, Ice Zeal & Ardor and Conrad Tao, united to promote the video.[114][115] The 4chan community has repeatedly attempted to crowdsource original music. In 2012 about their then-upcoming albums The Money Store and No Love Deep Web.[116] A rendition of "Royals" by Lorde appeared on /mu/ in 2012 before its official release, although she denied over writing on the board.[116] Singer Lauren Mayberry shared on Twitter in 2015 a link to a thread on /mu/ about her band's song "Leave a Trace" to showcase what online misogyny looks like.[117] An alleged unreleased Radiohead song, titled "Putting Ketchup in the Fridge" and "How Do You Like Me Now," which was first purchased by several users who GET'd the first purchase, though the authenticity of this recording was highly disputed.[118][119] The board has been criticized for its lax moderation, which has led to unsafe content being shared on the site. Notable examples include the works of Duster,[120] D>E>A>S>T>H>S>T>A>L>I by Panchiko,[121] and All Lights Fucked on the Hairy Amp Drooling by Godspeed You! Black Emperor.[122] This was described by NPR as resembling "a nationally-obsessed with the articulation of a near-dead language, rather than a community concerned with the articulation of a near-dead language".[120] The board has attracted further attention for various projects to find the "lost album" by Panchiko, which was first discovered on /mu/ in 2016, named Dead.[123] A role-playing game based on Neutral Milk Hotel's In the Aeroplane Over the Sea, designed with help from the board's users, received coverage from Polygon[124] and Pitchfork.[125] Main article: /pol/ (Politically Incorrect) A sticker thread on its front page states that the board's intended purpose is "discussion of news, world events, political issues, and other related topics."[126] /pol/ was created in October 2011 as a rebranding of 4chan's news board, /new/,[127][128] which was deleted that January for a high volume of racist discussion.[40][127] Although there had previously been a strong left-libertarian contingent to 4chan activists, there was a gradual rightward turn to 4chan's politics board in the early-mid 2010s, with the fundamentalist approach to free speech combined with political persuasion that would be described with a new term, the alt-right.[130] Media sources have characterized /pol/ as predominantly racist and sexist, with many of its posts taking an explicitly neo-Nazi bent.[131][13][133][134] The site's far-reaching culture of vitriolic and discriminatory content is "most closely associated" with /pol/, although only it features predominantly Alt-Right beliefs. /pol/, like other boards, has been prominent in the dissemination of memes, in cases, featuring coordination to disguise Alt-Right sentiments.[4][57] /pol/ "increasingly became synonymous with 4chan as a whole".[135] The Southern Poverty Law Center regards /pol/'s rhetorical style as widely influential upon the supremacist websites such as The Daily Stormer, the Stormer's editor, Andrew Anglin, noncurrent.[132] /pol/ was where screenshots of Trayvon Martin's hacked social media accounts were initially posted.[136][137] The board's users have started antifeminist, homophobic, transphobic, and anti-Arab Twitter campaigns.[133][138][139][140] Many /pol/ users favored Donald Trump during his 2016 United States presidential campaign. Both Trump and his son, Donald Trump Jr., appeared to acknowledge the support by tweeting /pol/-associated memes. Upon his successful election, a /pol/ moderator embedded a pro-Trump video at the top of all of the board's pages.[141][142][143][44] and many /pol/ users themselves have compared the spreading of anti-Clinton information and the leaking of the DNC emails to 4chan acts of the /pol/ board's self-described role in Trump's electoral victory.[141] /pol/ became synonymous with 4chan as a whole.[135] On December 8, 2012, members of the site attacked a church of anti-Muslim origin of the "greentext" rhetorical style with center around stories of social interactions and resulting ineptness.[38][146] By 2012, personal confession stories of self-deprecating humor, depression, and attempted suicide were being told.[147] It became a common gathering spot for the controversial online incel community.[149][150] The "beta uprising" or "beta rebellion" meme, the idea of taking revenge against women, jocks and others perceived as the cause of incels' problems, was slowly building on the subsection.[151][152] The perpetrator of the 2014 Isla Vista killings, Elliot Rodger, was discussed on /r9k/ before the attack, while praising self-identified incel Elliot Rodger, the killer behind the 2014 Isla Vista killings.[153][154] He claims to have talked with each Harper-Mercer and Rodger on Reddit and 4chan and believes that he was part of a "beta uprising," also posting a message on /r9k/ about his intention the day before his attack.[155] [156] /sci/ is 4chan's science and mathematics board. On September 26, 2011, an anonymous user on /sci/ posted a question regarding the shortest possible way to watch all possible orders of episodes of a television show. Shortly after, an anonymous user responded with a mathematical proof that argued that would viewers would have to watch at least 93,884,313,611 episodes to see all possible orderings. Seven years later, professional mathematicians recognized the mathematical proof as a partial solution to a superpermutations problem that was unsolved for 25 years. Australian mathematician Greg Egan later published a proof inspired by the proof from the anonymous 4chan user, both of which are recognized as significant progress to the problem.[157] /x/ is 4chan's video games board. The board has spawned multiple Internet memes, most notably the NPC Wojak in 2016 (derived from the gaming term non-playable character to describe those who do not think for themselves or make their own conscious decisions).[158] Main article: /x/ The collaborative writing wiki-project SCP Foundation originated on /x/ in 2007. The "paranormal" board, /x/, is dedicated to discussing topics regarding unexplained phenomena, the supernatural, and non-political conspiracy theories.[159] By February 2007, it was transformed as a paranormal-themed board.[159] Many of the earliest creepypastas (Internet horror-related legends) were created on /x/.[160] The idea of the Backrooms gained popularity thanks to a thread on /x/ created on 12 May 2019, where the users asked to "post disquieting images that just feel 'off'." There the thread depicting the Backrooms was uploaded and another user commented on it with the first story about the Backrooms, claiming that one enters the Backrooms by "noclip out of reality in the wrong areas." After the post gained fame, several Internet users wrote horror stories relating to the Backrooms. Many memes were created and shared across social media, further popularizing the creepypasta.[161] American model Allison Harvard first gained notoriety in 2005 as an Internet meme on the /x/ board where she became known as Creepy Chan.[162] Known for her large eyes and peculiar interests like fascination with blood, photos posted on her blog were widely circulated on the site. She gained mainstream notoriety in 2009 and again in 2011 by appearing in America's Next Top Model. She would visit /x/ after new episodes of America's Next Top Model would air or later being well written about her and participate in the discussions.[163] The SCP Foundation, a fictional secret organization documented in the collaborative writing wiki-project of the same name, originated on /x/ in 2007, when the first SCP file, SCP-173, was posted by an anonymous user.[164] Initially a standalone wiki was created in January 2008 on the EditThis wiki hosting service to display the SCP articles. The EditThis website did not have moderators, or the ability to delete articles. Members communicated through individual article talk pages and the /x/ board.[165] As was the first /x/ story where the SCP-173 wrote and posted.[166] The board also contributed to investigating and naming the Cicada 3301 Internet puzzle.[167] "[A] significant and influential element of contemporary internet culture", 4chan is responsible for many early memes, such as Lolcats, "pool's closed", the "an hero" [sic] as a synonym for suicide, after a suicidal teen posted that message in the Myspace online memorial of seventh grader Mitchell Henderson,[168] 4chan and other websites such as the satirical Encyclopedia Dramatica, have also contributed to the development of significant amounts of leetspeak,[169] A lolcat image using the "I'm in ur..." format A lolcat is an image combining a photograph of a cat with solecistic text intended to contribute humour, widely popularized by 4chan in the form of a weekly posting dedicated to them and gained popularity from the mid-to-late 2000s.[170][171] In 2005, the installment of a word filter which changed "egg" to "duck", and thus "eggroll" to "duckroll", across all of 4chan led to a bait-and-switch meme in which users deceitfully link to a picture of a duck on wheels.[172] This was then modified into users linking to the music video for Rick Astley's 1987 song "Never Gonna Give You Up". Thus, the "rickroll" was born.[39] A link to the YouTube video of Tay Zonday's song "Chocolate Rain" was posted in /b/ on July 11, 2007, and then subsequently included by many users in their posts, becoming a very popular internet meme.[173][174][175] The portion of the song in which Zonday turns away from the microphone, with a caption stating "I move away from the mic to breathe in",[176] became an oft-repeated meme on 4chan and inspired remixes.[173][176] Fellow YouTuber Boxxy's popularity was also due in part to 4chan.[177] In his American incarnation, Pedobear is an anthropomorphic bear child predator that is often used within the community to mock contributors showing a sexual interest in children.[178] Pedobear is one of the most popular memes on non-English imageboards, and has gained recognition across Europe, appearing in offline publications.[179][180] It has been used as a symbol of pedophilia by Malt Gerald outside of Germany[181] as well.[182] See also: Anonymous (hacker group) Distributed denial-of-service attacks organized through the "Anonymous" moniker. The Baltimore City Paper[11] that he was no longer considered as a part of the Anonymous meme by The Baltimore City Paper.[11] The swarm, David George-Cosh said it has been "widely reported" that Anonymous is associated with 4chan and 711chan, as well as numerous other Internet forums.[182] Through its association with Anonymous, 4chan has become associated with Project Chanology, a worldwide protest against the Church of Scientology held by members of Anonymous. On January 15, 2008, a 4chan user posted to /b/, suggesting participants "do something big" against the Church of Scientology's website. This message resulted in the Church receiving threatening phone calls. It quickly grew into a large real-world protest. Unlike previous Anonymous attacks, this action was characterized by 4chan raids and Guy Fawkes masks. The raid drew criticism from some 4chan users who felt it would bring the site undesirable attention.[11][183] Main article: My Little Pony: Friendship Is Magic fandom The adult fandom associated with the children's animated television series My Little Pony: Friendship Is Magic began on the "Comics & Cartoons" (/co/) board of 4chan. The show was first discussed in October 2010,[183][184][185][186][187] heightened interest in the show after a critical Cartoon Brew article was shared, resulting in praise for its plot, characters, and animation style.[183] Discussion of the show extended to /b/, eventually to a point of contention. Discussion then spread forth to communities external to 4chan, including the establishment of fan websites, causing the show to reach a wider audience across the internet.[183] On July 30, 2014, an anonymous user made a reply in a thread on the board /pol/ "Politically Incorrect" of 4chan, criticizing modern art in an ironic fashion, saying: Art used to be something to cherish Now literally anything could be art This post is art—Anonymous[188] Less than an hour later the post was photographed off the screen and framed by another user who posted another reply in the thread with a photo of the framed quote. Later the user, after announcing in the thread, created an auction on eBay for the framed photograph which quickly rose to high prices, culminating in a price of $90,900.[189][190] See also: Anonymous (hacker group) 4chan raids have been conducted against other websites. A decentralized hacktivist movement that has its origins from the /b/ board. According to The Washington Post, "the site's users have managed to pull off some of the highest-profile collective actions in the history of the Internet."[193] Users of 4chan and other websites "raided" Hal Turner by launching denial-of-service attacks and prank calling his phone-in radio show during December 2006 and January 2007. The attacks caused Turner's website to go offline. This cost thousands of dollars of bandwidth bills according to Turner. In response, Turner sued 4chan, 7chan, and other websites; however, he lost his plea for an injunction and failed to receive letters from the court.[191] KTTV Fox 11 aired a report on Anonymous, calling them a group of "hackers on steroids", "domestic terrorists", and collectively an "Internet hate machine" on July 26, 2007.[195] Slashdot founder Rob Malda posted a comment made by another Slashdot user, Miang, stating that the story focused mainly on users of "4chan, 7chan and 420chan". Miang claimed that the report "seems to confuse 'Anonymous' with the /b/ board on 4chan".[196] Users of the image board set out to attack a QK uncivilized group,[197] taking a web message board for a game called Habbo Hotel.[197] On July 10, 2008, the swastika-like QK uncode character (卐) appeared at the top of the chart, though Google later removed the result.[198] Later that year, private photographs in Sarah Palin's email account (hacked by a user of 4chan) were posted on /b/. This led to the FBI and Secret Service launching an investigation into the incident shortly after its occurrence. On September 20, 2008, David Kernell, the son of Democratic Tennessee State Representative Mike Kernell,[199] gained access to Palin's email account by looking up biographical details, such as her high school and birthdate, and using Yahoo!'s account recovery for forgotten passwords.[200] He then posted screenshots from within the account to /b/ and posted the password on WikiLeaks.[197] A /b/ user then logged in and changed the password, posting a screenshot of him sending an email to a friend of Palin's informing her of the new password on the /b/ thread. However, he forgot to blank out the password in the screenshot.[197] A multitude of /b/ users were attempted to log in with the new password, and the account was frozen by Yahoo!. The incident was criticized by some /b/ users. One user commented, "seriously, /b/. We could have changed history and failed, epically."[199] The FBI and Secret Service began investigating the incident shortly after its occurrence. On September 20 it was revealed that Kernell, the son of Democratic Tennessee State Representative Mike Kernell,[200] The story focused mainly on users of "4chan, 7chan and 420chan". Miang claimed that the report "seems to confuse 'Anonymous' with the /b/ board on 4chan". The source of the story was traced back to Anonymous.[201][202] In May 2009, members of the site attacked YouTube, posting pornographic videos on the site.[203] In 2010, members of 4chan attacked YouTube again in response to the suspension of YouTube user lukeywes1234 for failing to meet the minimum age requirement of thirteen.[205] The videos uploaded by the user had gained popularity, and he was targeted wickedly known as a massive popularity increase.[206] In September 2010, in retaliation against the Bollywood film industry's hiring of Aiplex Software to launch cyberattacks against The Pirate Bay, Anonymous members, recruited through posts on 4chan, subsequently initiated their own attacks, dubbed Operation Payback, targeting the website of the Motion Picture Association of America and the Recording Industry Association of America.[207][208][209] The targeted websites usually went offline for a short period of time due to the attacks, before recovering. The website of the UK law firm ACS:Law, which was associated with an anti-piracy letter campaign, was affected by the cyber-attack.[210] In retaliation for initial attacks being called only a minor nuisance, Anonymous launched more attacks, bringing the site down yet again. After coming back up, the front page accidentally displayed a backup file of the entire website, which contained over 300 megabytes of private company emails, which were leaked to several torrents and across several sites on the Internet.[211] It was suggested that the data leak could cost the law firm up to £500,000 in fines for breaching British Data Protection Laws.[212] In January 2011, BBC News reported that the law firm announced they were to stop "chasing illegal file-sharers". Head of ACS:Law Andrew Crossley in a statement to a court suggested the letter campaign be abandoned. He said: "I have ceased my work ... I have been subject to criminal attack. My e-mails have been hacked. I have had death threats and bomb threats."[213][214] On October 18, 2006, the Department of Homeland Security warned National Football League officials in Miami, New York City, Atlanta, Seattle, Houston, Oakland, and Cleveland about a possible threat involving the simultaneous use of dirty bombs at stadiums.[215] The threat claimed that the attack would be carried out on October 22, the final day of the Muslim holy month of Ramadan.[216] Both the FBI and the Department of Homeland Security expressed doubt concerning the credibility of the threats, but warned relevant organizations as a precaution.[217] The threat turned out to be a hoax perpetrated by a grocery store clerk in Wisconsin with no terrorist ties. The FBI considered it a clearly frivolous threat and the 20-year-old was charged with fabricating a terrorist threat, and was ordered to pay $26,750 in restitution.[218][219] Hello, /b/. On September 11, 2007 at 9:11 am Central time, two pipe bombs will be detonated at Pflugerville High School. Promptly after the blast, I, along with two ther guys [sic] wearing masks, will charge the building, armed with a Bushmaster AR-15, SMG Gl: and an assortment of knives... M1 .30 Carbine, and a Benelli M4 semi auto shotgun.—The Pflugerville threat[220] Another potential threat posted on September 11, 2007, a student posted photographs of bomb bombs and another image of his holding bombs while wearing a bandana over his face, threatening to blow up his school. On September 11, 2007, 17-year-old Matthew Pflugerville helped to track him down by finding the perpetrator's father's name in the Exif data of a photograph he took, and contacted the police.[221] He was arrested shortly before the threat turned out to be a hoax; the "weapons" were toys and the threat were no threat.[227] The post was accompanied by an image of another man holding a bushmaster AR-15 with an assortment of knives he owned. Police were able to track him down and arrest him. On December 8, 2007, after apparently posting on 4chan that he was "going to shoot and kill as many people as I can until which time I am incapacitated or killed by the police",[227] The poster, accompanied by an image of another man holding a shotgun, threatened a shooting at a school near Beverly Hills.[228] While the investigation was still open, he was charged with criminal defamation for a separate incident[229] but died before the case was heard.[230] On February 4, 2009, a posting on the 4chan /b/ board[231] said there would be a school shooting at St Eskils Gymnasium in Eskilstuna, Sweden, leading 1,250 students and 50 teachers to be evacuated.[232]

[This page consists of a densely packed list of reference citations (endnotes/bibliography) continuing from the preceding pages of the article, covering sources on 4chan, 8chan, Gamergate and related topics. The citations include numerous numbered references with titles, publication names (e.g. The New York Times, The Washington Post, The Guardian, Wired, Vice, TIME, The Daily Dot, The Daily Telegraph, BBC News), authors, and archive/retrieval dates.]

VanwaTech. Speaking to The Guardian, one of DDoS-Guard's owners explained that the company had been providing their services to VanwaTech, not to 8kun directly, but that they "were not related to any political issues and don't want to be associated in any sense with customers hosting such toxic sites like QAnon/8chan".[47] Cyberattack protection services were restored to 8kun when VanwaTech began using the American company FiberHub.[47] On August 27, 2021, the U.S. House of Representatives select committee investigating the storming of the Capitol demanded records from 8kun (alongside 14 other social media companies) going back to the spring of 2020.[49] Numerous controversies related to content posted on 8chan have arisen, to the extent that participation by individuals or companies in the website can itself cause controversy. On February 25, 2019, THQ Nordic hosted an AMA (ask me anything) thread on the video games board of the website, /v/, for which it later apologized.[50] Main article: Gamergate (harassment campaign) On September 14, 2014, 8chan became entangled in the Gamergate harassment campaign after 4chan banned discussion of Gamergate,[5][20][51] whereupon 8chan became one of several hubs for Gamergate activity.[5][20][52][53] The site was little-known prior to the controversy.[54] 8chan's initial Gamergate-oriented board "/gg/" also gained attention after being compromised by members of the internet troll group Gay Nigger Association of America, forcing Gamergate activists to migrate to "/gamergate/". This replacement quickly became the site's second-most accessed board.[52] In January 2015, the site was used as a base for swatting exploits in Portland, Seattle, and Burnaby, British Columbia, most of them tied to the victims' criticism of Gamergate and 8chan's association with it.[55] the attacks were coordinated on a board on the website called "/baphomet/".[53] One of the victims of a swatting attack said that she was singled out because she had followed someone on Twitter.[56][57] On February 9, 2015, content on the "/baphomet/" subboard was wiped after personal information of Katherine Forrest, the presiding judge in the Silk Road case, had been posted there.[58] In 2019, a post threatening a mass shooting against Bethel Park High School was posted on 8chan; as a result, an 18-year-old individual was arrested and charged with one count of terroristic threats and one count of retaliation against a witness or victim.[59] Boards have been created to discuss topics such as child rape. While the sharing of illegal content is against site rules, The Daily Dot wrote that boards do exist to share sexualized images of minors in provocative poses, and that some users of those boards do post links to explicit child pornography hosted elsewhere.[5] When asked whether such boards were an inevitable result of free speech, Brennan responded: "Unfortunately, yes. I don't support the content on the boards you mentioned, but it is simply the cost of free speech and being the only active site to not impose more 'laws' than those that were passed in Washington, D.C."[5] In August 2015, 8chan was blacklisted from Google Search for what Google described as content constituting "suspected child abuse content".[7] In July 2016, U.S. presidential candidate Donald Trump tweeted an image of Hillary Clinton with a background of money and a six-pointed star which resembled the Star of David, containing the message "Most corrupt candidate ever". The image had been posted to 8chan's /pol/ board as early as June 22, over a week before Trump's team tweeted it. A watermark on the image led to a Twitter account which had published many other overtly racist and antisemitic images.[60][61][62] Main article: QAnon 8chan is the home of the discredited far-right QAnon conspiracy theory.[8][9][10] In October 2017, a 4chan user that referred to himself as "Q" started gaining attention by promoting conspiracy theories about the deep state.[63] The next month, citing security concerns, Q moved to 8chan and only posted there from then on, eventually leading to an international movement.[64] Sean Hannity has retweeted QAnon hashtags on his Twitter feed.[65][66][67] On March 14, 2018, the initial group of Q followers on Reddit were banned over their promotion of the theory.[68][69] They quickly regrouped into a new subreddit, which featured posts from Q and other anonymous posters on 8chan in a more reader-friendly format. The subreddit was banned[64] for a second time on September 12, 2018.[70] With a flood of new users on the board, Q asked one of the website's owners, Ron Watkins, to upgrade the website's servers in order to accommodate all of the board's website traffic on September 19, 2018.[71] The movement has been linked to the Pizzagate conspiracy theory. The Q movement has also been linked to the hashtags #TheGreatAwakening and #WWG1WGA,[72][73] which stands for "where we go one, we go all"; it is also sometimes linked with the phrase "Follow the White Rabbit".[74] In September 2018, the Louisiana State Police were scrutinized for using a hoax list of personal information about suspected antifa activists originally posted on 8chan's politics board. The document, dubbed "full list of antifa.docx" by police officers, actually contained the names of several thousand people who signed online petitions against then President Donald Trump. The State Police has refused to disclose the list, claiming it would "compromise" ongoing criminal investigations in which it expects arrests. A lawsuit against Louisiana State Police was filed on behalf of the record requester by Harvard lecturer and former public defender Thomas Frampton, alleging that the Police's refusal to release the list indicates that it actually believed the credibility of the hoax list and used it in investigations and litigations.[75][76][77] The perpetrators of three mass shootings, all in 2019, each used 8chan to spread their manifesto. As a result, there was increased pressure on those providing 8chan's Internet services to terminate their support,[3] which led to the services companies' withdrawal from providing CDN and domain registry, taking the website off the clearnet. Main article: Christchurch mosque shootings Prior to attacks on two mosques in Christchurch, New Zealand, on March 15, 2019, the perpetrator, Brenton Harrison Tarrant, posted links to what was ultimately a 17-minute Facebook Live video of the first attack on Al Noor Mosque and his white nationalist, neo-fascist manifesto The Great Replacement (named after the French far-right conspiracy theory of the same name by writer Renaud Camus) detailing his anti-Islamic and anti-immigration reasons for the attack. The shootings overall left 51 dead and 40 more injured.[78][79][80] Some members of 8chan re-shared it and applauded the attacks.[81] On March 20, 2019, Australian telecom companies Telstra, Optus, and Vodafone denied millions of Australians access to the websites 4chan, 8chan, Zero Hedge, and LiveLeak as a reaction to the Christchurch mosque shootings.[82] New Zealand ISPs Spark, One NZ, and 2degrees, with a near monopoly of the broadband and mobile market share in New Zealand, also followed suit in blocking 4chan, 8chan, Zero Hedge, and LiveLeak for a number of weeks following the shootings, blocking 8chan and other similar websites at a DNS level in an attempt to prevent the proliferation of widely accessible content that was classified as objectionable by the Chief Censor of New Zealand.[83] Main article: Poway synagogue shooting John T. Earnest, the perpetrator of a shooting at a synagogue in Poway, California, on April 27, 2019, and an earlier arson attack at a mosque in nearby Escondido on March 25, had posted links to his open letter and his attempted livestream on 8chan, which Earnest also named as a place of radicalization for him.[84] According to 8chan's Twitter, the shooter's post was removed nine minutes after its creation.[85] Main article: 2019 El Paso shooting Patrick Crusius, the perpetrator of a mass shooting at a Walmart store in El Paso, Texas, on August 3, 2019, allegedly posted a four-page white nationalist manifesto The Inconvenient Truth on 8chan less than an hour before the shooting began. 8chan moderators quickly removed the original post, though users continued to circulate links to this manifesto.[2][86]

Internet portalTechnology portal DLive Gab (social network) Minds (social network) Parler Voat 4chan ^ a b c Brennan, Fredrick. "FAQ". null.net. Infinitechan. Retrieved November 23, 2014.[dead link] ^ a b c Wong, Julia Carrie (August 4, 2019). "8chan: the far-right website linked to the rise in hate crimes". The Guardian. ISSN 0261-3077. Archived from the original on August 21, 2019. Retrieved August 5, 2019. ^ a b c d Roose, Kevin (August 4, 2019). "8chan Is a Megaphone for Gunmen. 'Shut the Site Down,' Says Its Creator". The New York Times. ISSN 0362-4331. Archived from the original on August 5, 2019. Retrieved August 5, 2019. ^ Mezzofiore, Gianluca; O'Sullivan, Donie (August 5, 2019). "El Paso shooting is at least the third atrocity linked to 8chan this year". CNN. Archived from the original on August 20, 2019. Retrieved August 5, 2019. ^ a b c d e f g h O'Neill, Patrick Howell (November 17, 2014). "8chan, the central hive of Gamergate, is also an active pedophile network". 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