# Introducing the Unix System

# An Advanced Introduction to Unix/C Programming



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**Dennis Ritchie** – Created the C programming language and Unix operating system at Bell Labs.

**Ken Thompson** – With Dennis, designed and implemented the first Unix operating system. Invented B language and co-developed the Google's Go language.

Linus Torvalds – Creator and lead developer of the Linux kernel and Git.

Richard Stallman –Launched free software GNU Project and wrote GNU General Public License.

**Brian Kernigham** – Developed the first Unix operating system with Ken, co-authored first C programming language, but he did not design the C language.

### Unix

- Unix is a multi-user, multi-tasking operating system.
- Development started in 1969 at AT&T Bell Labs.
- Unix was announced outside of Bell Labs in 1973.
- Written by Ken Thompson, Dennis Ritchie, Brian Kernigham, Douglas Mcllroy, Joe Ossanna, and others at Bell Labs.



Photo: Ken Thompson (sitting) and Dennis Ritchie working on a Digital PDP 11.

# Digital Equipment Corporation PDP-11/20 thru PDP-11/94

- Released 1970
- Very Popular Minicomputer
- 16-bit architecture
- ~8 Megahertz CPU
- 600,000 units sold
- One of the first systems to run Unix.



### **Unix Derivatives**

- As Unix became more popular, different versions of Unix were written over the years, such as:
  - System V Unix from AT&T
  - BSD from University of California, Berkeley
  - SunOS/Solaris from Sun Microsystems
  - HP-UX from Hewlett Packard
  - AIX from IBM
  - Xenix from Microsoft
  - SCO from Santa Cruz Operation
     (AT&T sold the Unix license to Novell, who sold license to SCO.)

### Open Source Unix Derivatives

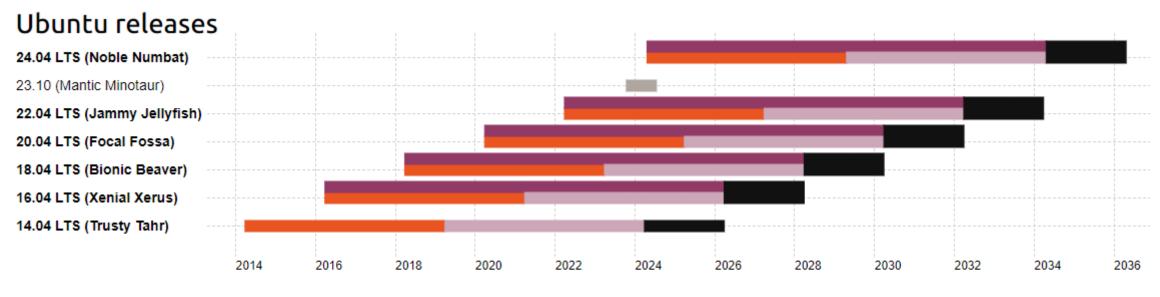
- In 1991, Linus Torvalds released an open-source Unix-like operating system which is freely available to anyone to use, copy, and modify.
- Linux is not proprietary software. Users do not need to pay for a license to use.
- "Free Software" is defined by:
  - Free access to all source code.
  - Free to run the program as you wish for any purpose.
  - Free to study how the program works and change it.
  - Free to distribute and redistribute copies of your modified versions.

### **Linux Distributions**

- Today, free Linux distributions include:
  - Ubuntu 24.04 (LTS) x64 (Ubuntu means "I am because we are.")
  - FreeBSD 14.2
  - Fedora Linux 40
  - Debian Bookworm (Combination of Debra Lynn & Ian Murdock)
  - Rocky Linux 9.4
  - Actually there are hundreds of different Linux distributions available today.
- Commercial Distributions
  - Red Hat Enterprise Linux
  - SUSE Linux Enterprise Server

### Noble Numbat

Noble Numbat is Ubuntu's latest Long Term Support version (LTS).



- LTS standard security maintenance for Ubuntu Main
- Expanded Security Maintenance (extra 5 years)
- LTS Expanded Security Maintenance (ESM) for Ubuntu Universe (initial 5 years)
- Interim release standard security maintenance (9 months)
- Legacy support (years 11 and 12)
  - Hardware and maintenance updates
  - Interim release Standard Support
  - Extended Security Maintenance (ESM)

#### 1969 1969 Unnamed PDP-7 operating system Open source 1971 to 1973 1971 to 1973 Mixed/shared source Version 1 to 4 Unix 1974 to 1975 1974 to 1975 Closed source PWB/Unix Version 5 to 6 1978 1978 1.0 to 2.0 1969-1979 1979 Version 7 Unix/32V 1980 1980 3.0 to 4.1 Xenix 1.0 to 2.3 1981 System III 1981 2023 1982 1982 Xenix 3.0 BSD 4.2 1983 SunOS 1 to 1.1 1983 System V R1 to R2 1984 1984 SCO Xenix Unix-like systems 1985 1985 Version 8 SCO Xenix System V R3 AIX 1.0 V/286 BSD 4.3 1986 1986 SunOS 1.2 to 3.0 SCO Xenix V/386 Unix 1987 1987 9 and 10 (last versions 1988 BSD 4.3 Tahoe System V R4 1988 2.0 to 3.0 SCO Xenix Bell Labs) 1989 1989 BSD Net/1 V/386 BSD 4.3 1990 1990 BSD Net/2 1991 1991 Linux 0.0.1 To 0.9 SunOS Minix 1.x 386BSD NexTSTEP 1992 OpenSTEP 1992 1.0 to 4.2 0.8 to 1.0 BSD SCO UNIX 3.2.4 1993 UnixWare 1993 4.4-Lite 6 to 11.10 1.x to 2.x 1994 FreeBSD 1994 Lite Release 2 (System V R4.2) 1.0 to 2.2x 1995 1995 OpenBSD 1.0 to 2.2 OpenServer 1.1 to 1.2 5.0 to 5.04 1996 1996 Solaris 2.1 to 9 1997 1997 NetBSD 1.3 FreeBSD 3.0 to 3.2 1998 1998 3.0 to 7.3 1999 Mac OS X Server 1999 Minix 2.x Linux 2.0 to 6.x 2000 OpenServer 2000 3.3 to 4.x 5.0.5 to 5.0.7 2001 to 2002 2001 to 2002 2003 UnixWare 7.x 2003 OpenBSD 2.3 to 7.2 2004 2004 (System V R5) Mac OS X,

NetBSD 1.4 to 9.x

2005 to 2007

2008 to 2009

2010

2011 to 2018

2019 to 2023

3.1.0 to 3.4.0

OS X,

macOS

10.x to 13.x

1.2.1 to 22)

FreeBSD

5.0 to 13.x

DragonFly BSD 1.0 to 6.4 HP-UX

11i v1 to 11i v3

OpenSolaris & derivatives

(Illumos, etc.)

Solaris 10

Solaris 11.0 to 11.4

OpenServer

2005 to 2007

2008 to 2009

2010

2011 to 2018

2019 to 2023

## Operating System Market Share 2023

Category	Source	Date	Linux	UNIX and Unix-like (not incl. Linux)	Windows	In-house	Other
Desktop, laptop	StatCounter Global Stats <sup>[265]</sup>	June 2023	Linux kernel family 7.23%: ChromeOS 4.15% (in the US up to 8.0%) plus traditional "Linux" 3.08%	21.38% (macOS)	68.15% (all versions)		3.24%
Embedded <sup>[e]</sup>	EE Times <sup>[266]</sup>	Mar 2019	38.42% (embedded Linux, Ubuntu, Android, other)	2.82% (QNX, LynxOS)	10.73% (Windows 10, Windows Embedded Compact)	10.73%	37.30%
Mainframe	Gartner <sup>[256]</sup>	Dec 2008	28% (SLES, RHEL)			72% (z/OS) <sup>[f]</sup>	
Server (web)	W3Techs <sup>[267]</sup>	Sep 2021	Likely 77.4% (39.8% confirmed) <sup>[g]</sup> (Ubuntu, CentOS, Debian, Gentoo, RHEL,) <sup>[268]</sup>	Less than 1% is confirmed to be UNIX or Unix-like and non-Linux. The top operating systems in order are: 0.3% BSD (97.8% of which is FreeBSD),[269] <0.1% Darwin,[270] <0.1% HP-UX,[271] <0.1% Solaris,[272] and <0.1% Minix.[273][9]	22.7% (Windows Server 2019, WS2016, WS2012) Microsoft's own webserver runs 6.6% of websites.[274]		
Smartphone, tablet	StatCounter Global Stats <sup>[275]</sup>	Apr 2020	70.80% (Android, KaiOS)	28.79% (iOS)	0.07%		0.34%
Supercomputer	TOP500 <sup>[276]</sup>	Nov 2019	100% (Custom)				

## Web Operating Systems (w3tech.com)

### **Operating Systems**

Most popular operating systems

		change since
© W3Techs.com	usage	1 June 2024
1. Unix	85.6%	+0.6%
2. Windows	14.7%	-0.6%

percentages of sites

Fastest growing operating systems since 1 June 2024

© W3Techs.com	sites
1. Unix	108.6
2. AlmaLinux	1.7
3. CloudLinux	0.2
daily increase of numb	er of sites er million

Find more details in the operating system surveys

### What does this mean?

### 85.6% of all websites use Unix as their operating system.

If you're interviewing with web-based companies, like FAANG, there's a 86% chance knowing Unix will benefit you!

If you're interviewing to develop apps on an iPhone, Android, or any tablet, there's a 99.66% chance knowing Unix will benefit you!

FAANG – Facebook, Amazon, Apple, Netflix, and Google ... You can add Tesla to this list too.

## Unix/Linux Are Written in C & Assembly

• Unix and Linux operating systems are written in the C programming language and assembly language.

## Web Programming Languages (w3tech.com)

#### Server-side Programming Languages

#### Most popular server-side programming languages

© W3Techs.com	usage	change since 1 June 2024
1. PHP	76.1%	-0.1%
2. ASP.NET	5.9%	-0.2%
3. Ruby	5.9%	
4. Java	4.9%	+0.1%
5. JavaScript	3.5%	+0.1%

percentages of sites

#### Fastest growing server-side programming languages since 1 June 2024

© W3Techs.com	sites
1. Scala	22.7
2. JavaScript	20.0
3. Ruby	11.5
daily increase of number	er of sites er million

#### Client-side Programming Languages

#### Most popular client-side programming languages

© W3Techs.com	usage	change since 1 June 2024
1. JavaScript	98.9%	
2. Flash	1.1%	
3. Java	0.1%	
		percentages of sites

#### Fastest growing client-side programming languages since 1 June 2024

© W3Techs.com	sites
1. JavaScript	13.4
2. Java	0.3
daily increase of number	er of sites er millior

# The C Programming Language – July 2025

In 2025, C is the third most popular programming language used on over 9.65% of all software projects.

9.65%

Add C++, C#, Objective-C, Swift, PHP, and other C and C++ related languages and C-based languages have more than 25.6% share worldwide.

25.6%

TIOB  ( the software quality co	SE ompany)		<u>Products</u> ~ Qualit	y Models ~ Market	Schedule a demo
Jul 2025	Jul 2024	Change	Programming Language	Ratings	Change
1	1		TICS Feet Python	26.98%	+10.85%
2	2		C++	9.80%	-0.53%
3	3		<b>G</b> c	9.65%	+0.16%
4	4		<u>4</u> , Java	8.76%	+0.17%
5	5		C#	4.87%	-1.85%
6	6		<b>JS</b> JavaScript	3.36%	-0.43%
7	7		<b>≪©</b> Go	2.04%	-0.14%
8	8		VB Visual Basic	1.94%	-0.13%
9	24	*	Ada Ada	1.77%	+0.99%
10	11	^	Delphi/Object Pascal	1.77%	-0.12%
11	30	*	Perl	1.76%	+1.10%
12	9	•	<b>F</b> Fortran	1.67%	-0.38%
13	10	•	SQL SQL	1.39%	-0.65%
14	16	^	php PHP	1.28%	+0.14%
15	22	*	R R	1.25%	+0.42%

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January 2025

# The C Programming Language – July 2024

In 2022, C is the third most popular programming language used on over 9.48% of all software projects.

9.5%

Add C++, C#, Objective-C, Swift, PHP, and other C and C++ related languages and C-based languages have more than 29% share worldwide.

29%

	Jul 2024	Jul 2023	Change	Programming Language		Ratings	Change
	1	1			Python	16.12%	+2.70%
	2	3	^	<b>G</b>	C++	10.34%	-0.46%
	3	2	•	9	С	9.48%	-2.08%
	4	4		<b>(</b> )	Java	8.59%	-1.91%
	5	5		<b>©</b>	C#	6.72%	-0.15%
	6	6		JS	JavaScript	3.79%	+0.68%
	7	13	*	-GO	Go	2.19%	+1.12%
	8	7	•	VB	Visual Basic	2.08%	-0.82%
	9	11	^	B	Fortran	2.05%	+0.80%
	10	8	•	SQL	SQL	2.04%	+0.57%
	11	15	*	<b>(3)</b>	Delphi/Object Pascal	1.89%	+0.91%
	12	10	•	<b></b>	MATLAB	1.34%	+0.08%
	13	17	*	<b>®</b>	Rust	1.18%	+0.29%
	14	16	^		Ruby	1.16%	+0.25%
	15	12	•		Scratch	1.15%	+0.08%
1	16	9	*	php	PHP	1.15%	-0.27%
-	17	18	^	<u> </u>	Swift	1.13%	+0.25%
	18	14	*	ASM	Assembly language	1.11%	+0.10%
	19	20	^	***	COBOL	1.08%	+0.21%
	20	26	*	•	Kotlin	1.05%	+0.35%

Source: https://www.tiobe.com/tiobe-index/

# **Historical Rankings**

### **Very Long Term History**

To see the bigger picture, please find below the positions of the top 10 programming languages of many years back. Please note that these are *average* positions for a period of 12 months.

Programming Language	2023	2018	2013	2008	2003	1998	1993	1988
Python	1	4	8	7	12	24	18	-
С	2	2	1	2	2	1	1	1
Java	3	1	2	1	1	16	-	-
C++	4	3	4	4	3	2	2	5
C#	5	5	5	8	9	-	-	-
Visual Basic	6	17	-	-	-	-	-	-
JavaScript	7	7	11	9	8	21	-	-
SQL	8	251	-	-	7	-	-	-
PHP	9	8	6	5	6	-	-	-
Assembly language	10	12	-	-	-	-	-	-
Fortran	19	30	27	21	13	8	3	16
Objective-C	22	16	3	41	55	-	-	-
Ada	26	28	21	19	16	14	5	3
Lisp	29	31	12	17	14	9	6	2
(Visual) Basic	-	-	7	3	5	3	8	6