

Biography of a Software Engineer — Ken Thompson

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1 Introduction

Kenneth Lane Thompson, also known as Ken Thompson, was born on the 4th of February 1943 in New Orleans, Louisiana, U.S. During Thompson's childhood, he was always fascinated with logic and electronics. Thompson got his first exposure with programming during his junior semester year in lab classes where they had a G15 computer. Thompson created scaling programs on the G15 computer which was written in assembly.[8]

Thompson attended the University of California, Berkeley, graduating with a Bachelor of Science in 1965 and a Master's degree in Electrical Engineering and Computer Science in 1966. Following this, Thompson was then hired at Bell Laboratories. It was here where many of his well known accomplishments were created, notably Unix, along with Dennis Ritchie, the B programming language and the UTF-8 character encoding. Thompson retired from Bell Laboratories on the 1st of December, 2000.[1] From 2006 onwards, Thompson works at Google as a distinguished engineer.

2 Unix Operating System

One of Thompson's greatest contributions to computer science was the creation of the Unix operating system along with Dennis Ritchie. Unix is a group of multitasking, multi-user computer operating systems that was developed by Ken Thompson, Dennis Ritchie and others at the Bell Laboratories research center.

The first version of Unix was born out of Thompson's need to test out his new disk scheduling algorithm's throughput. In order to complete this test, he required three programs: an editor, an assembler and a kernel. The combination of these three programs, then, was what created the first version of Unix.[5] The initial versions of the Unix operating system were written using assembly language. However in 1973, the C language became sufficiently mature and Unix was rewritten in C.[7]

The popularity of Unix rose between the academic circles. Flavours of the Unix operating system were created, most notably the BSD (Berkley Standard Distribution) version of Unix. Many extensions to Unix have been made in this flavor of Unix. The BSD version of Unix added the TCP/IP protocol support in 1983[3] which gave birth to the world wide web Bill Joy's vi editor was also made. At this time AT&T were also developing the commercial flavor of Unix called System III, and later System V. Many other commercial companies created their own flavours of Unix such as Sun's Solaris and Apple Unix which was a BSD based Unix operating system.

2.1 Impact

The Unix operating system without a doubt had a big impact on modern day computing and software engineering. Unix has provided a strong basis for the Linux kernel. Many Linux and "Unix-like" based operating systems power many devices nowadays such as Android, servers, supercomputers, and mainframes. Most of the internet today is powered by Linux.

The use of a high level language to write an operating system was unheard of at the time during the creation of Unix. The Unix C rewrite revolutionized operating systems as it allowed for portability i.e. operating systems were no longer bound to specific hardware.

The development of Unix led to the creation of the GNU (GNU's not Unix) project led by Richard Stallman. The creation of the GNU project also spawned the creation of the Free Software Foundation which provides awareness about the Free Software Movement. It is also the creator of the popular GPL (GNU General Public License), a license used in many software projects.

3 Programming Languages

3.1 B

Thompson has worked on the B programming language during the early versions of the Unix operating system. Thompson used TMG (TransMoGrifier), created by Robert M. McClure, to create the compiler for B. Thompson attempted to implement a Fortran compiler using TMG, however due to hardware limitations, many features of the language were stripped and instead B was created as a result.[5]

3.1.1 Impact

B is the direct predecessor of C. Dennis Ritchie created C by improving and extending the functionality of the B programming language, most notably introducing the types system. C is one of the most influential and powerful languages ever created. C is still in wide use today especially for systems programming such as operating systems and databases programming. C influenced many languages such as Go, C++, JavaScript, Java and many more.

3.2 Go

Go is a compiled and statically typed language created by Google and developed by Ken Thompson, Robert Griesemer and Rob Pike. Go was created to be an alternative to C++ and Java and is used to solve many distributed and large scale problems at Google.

3.2.1 Impact

Go is currently one of the fastest growing programming languages. It is the 12th most used programming language according to the 2020 Stack Overflow Developer Survey.[2]

Some examples of influential technology created in Go are:

- Docker allows for the ease of deployment through the use of Docker containers. Docker has many advantages, the main one being portability. If the application deployed successfully on a developer machine, it will also deploy successfully on the host machine. Other advantages include security and isolation. Since the containers are completely isolated, no Docker container can access other Docker container processes.
- Kubernetes is container orchestration software created by Google. It allows for the management, deployment and scaling of containers. Kubernetes can be used in conjunction with Docker to allow ease of management of the deployment of multiple Docker containers, to allow for automated redundancy, load balancing and provisioning of containers.

4 UTF-8 Character Encoding

Thompson along with Rob Pike created the first implementation of the UTF-8 encoding scheme for the Plan 9 operating system in 1992.[6] This encoding scheme is backwards-compatible with ASCII.

4.1 Impact

As of 2020, the UTF-8 character encoding scheme is the most used encoding scheme for websites. Over 95.8% of websites use this encoding.[4] This encoding scheme is the reason why we are able to see websites with multiple languages on the same webpage.

5 Conclusion

It is evident from the above arguments that Ken Thompson is a key software engineer. He has many substantial contributions to the world of software engineering and has forever changed computing as we know it.

References

- [1] Ken thompson: A brief introduction. <http://www.linfo.org/thompson.html>, 2006.
- [2] 2020 developer survey. <https://insights.stackoverflow.com/survey/2020>, 2020.
- [3] History and timeline. http://www.unix.org/what_is_unix/history_timeline.html, 2020.
- [4] Usage of character encodings broken down by ranking. https://w3techs.com/technologies/cross/character_encoding/ranking, 2020.
- [5] Vintage Computer Federation. Vcf east 2019 – brian kernighan interviews ken thompson. https://www.youtube.com/watch?v=EY6q5dv_B-o&t=1553s, 2019.
- [6] Rob Pike and Ken Thompson. Hello world or.
- [7] Dennis M Ritchie. The evolution of the unix time-sharing system. In *Symposium on Language Design and Programming Methodology*, pages 25–35. Springer, 1979.
- [8] Peter Seibel. *Coders at work: Reflections on the craft of programming*. Apress, 2009.