

Comparison Between Windows and UNIX-like Operating Systems

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[Abstract] This paper centers on the differences between Windows and UNIX-like operating systems and the reason they differ in that way.

[Key words] Operating system; UNIX-like; Windows

[Introduction] Windows, as the best-known operating system for desktop computers and laptops, is familiar to the public. UNIX-like operating system, which is the operating system behind a large amount of online services, is seldom known by laymen. This paper focuses on analysing the differences between consumer-oriented Windows versions and community-maintained UNIX-like operating systems and tries to explain the reason why they differ.

1. Overview

1.1 *What is an operating system?*

According to the frontpage of the Debian project:

An operating system is the set of basic programs and utilities that make your computer run.

To be more precise, an operating system usually includes the following parts:

- Management of the system's hardware and software resources.
- Utilities that enable the user to complete basic tasks, e.g. file management.
- Interfaces for simplifying application development.

Both Windows and UNIX-like systems provide these basic functionalities.

1.2 *Basics about the two operating system families*

Microsoft Windows originated from MS-DOS in the late 1980s. Major customers of Windows have always been individual PC users. A number of servers also run Windows.

The original UNIX operating system was developed in the Bell Labs research center in the late 1960s. Since then, many UNIX derivatives came into being, which are usually called "UNIX-like" operating systems.

2. The comparison

2.0 *Before the comparison*

Because there is a vast amount of UNIX-like operating systems, each having its very own features, a comprehensive comparison is almost impossible. In order to narrow down the topic, this paper mainly focus on:

- Desktop operating systems. So differences between Windows Phone and Android is not included.
- Differences between Windows and community-maintained UNIX-like operating systems. Thus, Apple's OS X is not in our consideration.
- Comparison of workflows of a typical user. So we're not going to talk about the differences in their structures.

2.1 Market Share

Windows	UNIX-like			Other
Windows	OS X	Linux	Chrome OS	Other
85.08%	9.52%	1.55%	0.55%	3.30%
85.08%	11.62%			3.30%

Table 1. Desktop OS market share for April 2016¹

Windows	UNIX-like	
Windows	Linux	FreeBSD
1.7%	96.6%	1.7%
1.7%	98.3%	

Table 2. Internet based servers' market share for May 2015

Date	Linux	Other UNIX-like	Windows
Nov 2015	99.09%	0.91%	0.0%
Nov 2014	97.0%	2.6%	0.2%
Nov 2013	96.4%	2.4%	0.4%

Table 3. Market share on the 500 fastest Supercomputers

It would be fairly easy to notice that Windows is the overwhelming majority on desktop and laptop computers. However, this is not true for servers and supercomputers. On the contrary, Windows is almost ceased to exist on servers and supercomputers.

2.2 Application programs

Supporting a wide range of application programs is one of the major goals of an operating system. The user can barely do anything without application programs for the operating system.

Windows definitely wins in this aspect for the following reasons:

- Abundance of softwares. Due to its popularity, development of a software's Windows version is often of higher priority.
- Windows maintains a relatively stable set of application binary interfaces (ABIs), which allows old applications to run correctly on a new system.
- Higher software quality. Some community-developed applications have lower quality because the developer hold the idea that "it works for me". Most softwares for Windows don't have this issue.

However in community-maintained UNIX-like systems, most applications are free and opensource softwares, which are free to use and enable people all over the world to involve in the development of the software. Details about free and opensource softwares will be discussed later.

2.3 Workflows

Workflows often reflect the design philosophy of an operating system. It is also the key to explain the market share in section 2.1. Two examples will be given in order to illustrate the differences between workflows on Windows and UNIX-like operating systems.

2.3.1 Case 1: preparing a presentation

For a Windows user, the solution is straightforward: just use a presentation software in a office suite, such as Microsoft Powerpoint.

For a user of UNIX-like operating system, there's more choices. Using an office suite is still an option. However, more people prefer to use \TeX , which is, according to the Wikipedia, more popular in academia. When you create a document with \TeX , you just write a plain text file consisting of the content of your document and how they should be organized and formatted. It is also very popular with publishers due to its flexibility.

2.3.2 Case 2: completing a batch job

Consider the following example: you have folder which contains a lot of pictures with their file names ended with ".jpg". You want to rename them to 1.jpg, 2.jpg, 3.jpg, etc.

For a Windows user, there is no obvious solution. You have to search for a "renaming software" on the Internet or rename them manually.

However the task is rather an easy one for a UNIX user, who can have it done by writing a simple script like this:

```
j=1; for i in *.jpg; do mv $i "$j.jpg"; let "j++"; done
```

¹All the statistics are taken from the third reference article.

In fact, Windows also have a similar scripting support, but far less powerful. Most users will not use it as long as there is a alternative solution which does not involve the utilization of a command line because they are used to using a graphical user interface(GUI). Many Windows users are even unaware of the existence of such functionality.

3. Analysis

3.1 Analysis of the market share

UNIX has a longer history than Windows. Why is it unknown to most computer users? The answer is simple – UNIX is born in a laboratory, while Windows is born in a commercial company. When UNIX came into exist, there was no graphical user interfaces. At the beginning of *the epoch*² it was used in laboratories. Most UNIX users then were specialists or developers, who did not care about whether their computer had a GUI.

Windows, however, was designed to be a user-friendly operating system. It doesn't need the ability to assist a research or to host a web service, but it looks versatile from a regular user's aspect because it has everything an ordinary PC user requires.

3.2 Free and opensource software VS commercial proprietary software

Community-based UNIX-like operating systems are mainly made up of free and opensource softwares while most softwares for Windows are commercial proprietary softwares. Free softwares are free to use, modify, contribute and distribute. On the contrary, most commercial softwares must be paid before using; modification and distribution of such softwares are prohibited. Commercial softwares are often more reliable than free softwares because they are backed by a company. However a number of free softwares have comparable quality to there commercial competitors.

3.3 Design philosophy

Windows comes with a wide range of pre-installed utilities in order to meet the users' various needs. Most components of Windows have a graphical user interface to make it more user-friendly. Windows has its own software development kit, but it only allows one to develop applications for Windows.

Most UNIX-like systems only have a minimal base when they are installed. Other components must be installed separately. Many system utilities do not have graphical user interface for the purpose of simplifying batch jobs and remote management through the network. They have a mechanism to make cross-platform software development easier.

4. Conclusion

From the analysis above, we can conclude that Windows *is* designed for normal PC users and UNIX-like operating systems *are* designed for developers and servers. However, in the recent years, several organizations are striving to make user-friendly UNIX-like operating systems. No matter what they have achieved, we should choose the operating system that really meets our needs.

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²"The epoch" refers to the UNIX epoch, which is approximately the time when UNIX came into being.