Background (**Introduction**)

Smart Phone Operating Systems

With the rapid development of mobile communication technology, we embrace the arrival of a new era, the era of mobile multimedia. As a necessity for mobile communication, mobile phones have evolved from a simple “call tools” into an intelligent capable of collecting and processing personal information. Among the transformation, the operating system plays a crucial role.

An operating system (OS) is system software that manages computer hardware, software resources, and provides common services for computer programs [1]. Mobile operating systems combine features of a personal computer operating system with other features useful for mobile or handheld use, and usually including a wireless inbuilt modem and SIM tray for telephony and data connection [2]. For mobile phones, OSs have been developed to enable users to use phones in much the same way as personal computers. In following sections, Symbian OS, Android OS, Apple iOS, Windows Phone OS and Harmony OS will be discussed respectively.

Symbian OS

Symbian is a discontinued mobile operating system (OS) and computing platform designed for smartphones. Symbian was originally developed as a closed-source OS for PDAs in 1998 by the Symbian Ltd. [3]. Symbian originated from EPOC32, an operating system created by Psion in the 1990s. In June 1998. Psion Software became Symbian Ltd. Afterward, different software platforms were created for Symbian. At around early-to-mid 2000s, Symbian was difficult to develop. In mid 2007 (the year the iPhone was launched) Symbian was the leading mobile operating system, as it occupied 65 percent of the mobile market. And Symbian remained the top-selling phone operating system worldwide until late 2010. But just a year or two later, Symbian was dead and buried.

Why Symbian phased out can be attributed to three main reasons. For the first reason, the operating system is under optimized. For the second reason, the high prices of various IDEs and SDKs impeded its further development. For the third reason, the subsequent fragmentation, which means each of the manufacturers had their own IDEs and SDKs. All of these discouraged third-party developers and served to cause the native app ecosystem for Symbian not to evolve to a larger scale.

Android OS

Android is an open-source mobile OS developed by Google and launched in 2008. Android is a Linux-based OS that uses Linux 2.6, it offers a wide range of libraries that enable the app developers to build different applications. Android applications are usually written in Java programming language. From its inaugural release to today, Android has transformed visually, conceptually, and functionally — time and time again. The code names of android ranges from A to N currently, such as Aestro, Blender, Cupcake, Donut, Eclair, Froyo, Gingerbread, Honeycomb, Ice Cream Sandwitch, Jelly Bean, KitKat, Lollipop and Marshmallow. Until now, Android 12 has already been released and Android 12L is to be announced in 2022.

The Android operating system possesses many unique features, including the support for Near Field Communication (NFC), alternate keyboards, infrared transmission, No-Touch control, wireless app downloads, storage and battery swap, custom home screens and etc.

Apple iOS

Apple iOS is a closed-source code mobile phone OS developed by Apple in 2007, it is used by Apple-only products (iPhone, iPod, and iPad) [5]. The iOS architecture is based on three layers incorporated with each other. The first layer is Cocoa touch which provides basic infrastructure for applications. The second layer is the media layer which provides audio and video support. The third layer is the core OS that is responsible for core services. Since 2007, the mobile operating system has gone through some major upgrades. Ever year in the summer, Apple has reinvented the OS, adding new features and redefining what’s possible on all its iDevices.

The advantages of iOS include the following points: (1) simple interface (2) multitasking like listening to music & typing docs possible (3) efficient Battery use with less heat generation (4) Impeccable security makes phone free of malicious codes & viruses. As for the disadvantages, iOS has several drawbacks: (1) app sizes are usually too big consuming too much space (2) too simple & doesn’t support computer work as in other OS (3) does not provide NFC and radio is not in-built.

Windows Phone OS

Windows phone OS is a closed-source code mobile OS developed by Microsoft Corporation and used by multiple smart devices (personal digital assistants, smartphones, and touch devices) [5]. Windows phone OS is based on a compact version of .Net framework, which gives it an advantage in developing .Net-oriented mobile applications.

In October 2010, Microsoft officially released the first version of Windows Phone smartphone operating system, Windows Phone 7, or WP7 for short, and released hardware devices based on the platform at the end of 2010. In 2012 and 2014, Microsoft successively released Windows Phone 8 and Windows Phone 8.1. The last iteration of the Windows Phone OS — Windows Phone 10 was released in 2015, it provided t provided the new Universal Windows Platform (UWP) which allowed apps to be built for and run across all Windows 10 devices. The first Windows Phone was unlike either of the major operating systems already on the market. For instance, its home screen showcased a colorful tile pattern with information built right into the tiles [6]. Less than a decade later, however, the Windows Phone is calling it quits. In mid-December 2019, all support for Windows Phones will cease, though the devices will still be usable.

Harmony OS

HUAWEI Harmony OS is an operating system officially released by HUAWEI at the HUAWEI Developer Conference in Dongguan on August 9, 2019. In a multi-kernel design, the operating system selects suitable kernels from the abstraction layer for devices with diverse resources. The system is a distributed operating system oriented to the whole scene, creating an interconnected world, allowing one device to control others and sharing data among devices with distributed communication capabilities.

Harmony OS is well-known for its openness. As Mr. Wang, the president of Huawei Consumer BG Software Division, said “We will work with all possible partners to make Harmony ecology successful collectively. Harmony is open, and if other handset makers want to use it, they will support it.” [7]

The emergence of Harmony OS, brock the situation of the two worlds. The corresponding chip deployment in the Harmony adaptation plan is not only to adapt to Qualcomm chip platform, but also to Mediatek chip platform. Ultimately, The subsequent plan is to apply to all chip platforms. Therefore, the road of Harmony OS will be wider, and the Harmony system will be more and more perfect.

[1] <https://en.wikipedia.org/wiki/Operating_system>

[2] <https://en.wikipedia.org/wiki/Mobile_operating_system>

[3] <https://www.coursehero.com/file/17040584/Symbian/>

[4] <https://www.uswitch.com/mobiles/guides/mobile-operating-systems/>

[5] <https://zh.wikipedia.org/wiki/IOS>

[6] <https://study.com/academy/lesson/windows-phone-os-history-features-common-applications.html>

[7] <http://finance.china.com.cn/roll/20210303/5509269.shtml>