

EXHIBIT 2

Computing platform

From Wikipedia, the free encyclopedia

A **computing platform** is, in the most general sense, whatever a pre-existing piece of computer software or code object is designed to run within, obeying its constraints, and making use of its facilities.

The term *computing platform* can refer to different abstraction levels, including a certain hardware architecture, an operating system (OS), and runtime libraries.^[1] In total it can be said to be the stage on which computer programs can run.

Binary executables have to be compiled for a specific hardware platform, since different central processor units have different machine codes. In addition, operating systems and runtime libraries allow re-use of code and provide abstraction layers which allow the same high-level source code to run on differently configured hardware. For example, there are many kinds of data storage device, and any individual computer can have a different configuration of storage devices; but the application is able to call a generic *save* or *write* function provided by the OS and runtime libraries, which then handle the details themselves. A platform can be seen both as a constraint on the application development process – the application is written *for* such-and-such a platform – and an assistance to the development process, in that they provide low-level functionality ready-made.

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Components

Platforms may also include:

- Hardware alone, in the case of small embedded systems. Embedded systems can access hardware directly, without an OS; this is referred to as running on "bare metal".

- A browser in the case of web-based software. The browser itself runs on a hardware+OS platform, but this is not relevant to software running within the browser.^[2]
- An application, such as a spreadsheet or word processor, which hosts software written in an application-specific scripting language, such as an Excel macro. This can be extended to writing fully-fledged applications with the Microsoft Office suite as a platform.^[3]
- Software frameworks that provide ready-made functionality.
- Cloud computing and Platform as a Service. Extending the idea of a software framework, these allow application developers to build software out of components that are hosted not by the developer, but by the provider, with internet communication linking them together.^[4] The social networking sites Twitter and facebook are also considered development platforms.^{[5][6]}
- A virtual machine (VM) such as the Java virtual machine.^[7] or .NET CLR. Applications are compiled into a format similar to machine code, known as bytecode, which is then executed by the VM.
- A virtualized version of a complete system, including virtualized hardware, OS, software and storage. These allow, for instance, a typical Windows program to run on what is physically a Mac.

Some architectures have multiple layers, with each layer acting as a platform to the one above it. In general, a component only has to be adapted to the layer immediately beneath it. For instance, a Java program has to be written to use the Java virtual machine (JVM) and associated libraries as a platform, but does not have to be adapted to run for the Windows, Linux or Macintosh OS platforms. However, the JVM, the layer beneath the application, does have to be built separately for each OS.^[8]

Operating system examples

- AmigaOS, AmigaOS 4
- FreeBSD, NetBSD, OpenBSD
- Linux
- Microsoft Windows
- OpenVMS
- OS X (Mac OS)
- OS/2
- Solaris
- Tru64 UNIX
- VM
- QNX

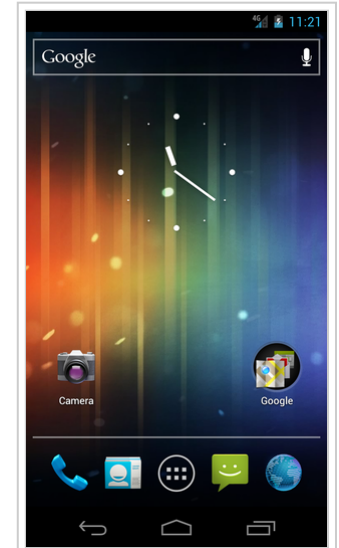
Mobile

- Android
- Bada
- BlackBerry OS
- Firefox OS

- iOS
- Embedded Linux
- Palm OS
- Symbian
- Tizen
- WebOS
- Windows Mobile
- Windows Phone

Software frameworks

- Binary Runtime Environment for Wireless (BREW)
- Cocoa
- Cocoa Touch
- Common Language Infrastructure (CLI)
 - Mono
 - .NET Framework
 - Silverlight
- Flash
 - AIR
- Java platform
 - Java ME
 - Java SE
 - Java EE
 - JavaFX
 - JavaFX Mobile
- LiveCode
- Microsoft XNA
- Mozilla Prism, XUL and XULRunner
- Open Web Platform
- Oracle Database
- Qt
- SAP NetWeaver
- Shockwave
- Smartface
- Universal Windows Platform
 - Windows Runtime
- Vexi



Android, a popular mobile operating system

Hardware examples

Ordered roughly, from more common types to less common types:

- Commodity computing platforms
 - Wintel, that is, Intel x86 or compatible personal computer hardware with Windows operating system
 - Macintosh, custom Apple Computer hardware and Mac OS operating system, now migrated to x86
 - Newton devices running the Newton OS, also from Apple
 - ARM architecture used in mobile devices
 - Gumstix or Raspberry Pi full function miniature computers with Linux
 - x86 with Unix-like systems such as BSD variants
 - CP/M computers based on the S-100 bus, maybe the earliest microcomputer platform
- Video game consoles, any variety
 - 3DO Interactive Multiplayer, that was licensed to manufacturers
 - Apple Pippin, a Multimedia player platform for video game console development
- RISC processor based machines running Unix variants
 - SPARC architecture computers running Solaris or illumos operating systems
 - DEC Alpha cluster running OpenVMS or Tru64 UNIX
- Midrange computers with their custom operating systems, such as IBM OS/400
- Mainframe computers with their custom operating systems, such as IBM z/OS
- Supercomputer architectures

Software examples

[9]

1 Windows 7 20.04%

2 iOS 9 19.47%

3 Android Lollipop 14.05%

4 Android 4.0 12.59%

5 Windows 10 8.52%

6 Windows 8.1 5.02%

7 Mac OS X 4.19%

8 iOS 8 3.76%

9 Windows XP 2.36%

10 Linux 1.76%

First party software

Software is considered **first party** if it is originated by the platform vendor. Software from other vendors is considered Third party.

See also

- Cross-platform
- Platform virtualization
- Third platform

References

1. Free Online Dictionary of Computing
2. Information Week (<http://www.informationweek.com/applications/google-redefines-browser-as-platform/d/d-id/1105162>)
3. Microsoft (<http://msdn.microsoft.com/en-us/library/bb906062.aspx>)
4. Interoute (<http://www.interoute.com/what-paas>)
5. Twitter (<https://dev.twitter.com/>)
6. Facebook (<https://www.facebook.com/notes/2207512130>)
7. Oracle (<http://www.oracle.com/technetwork/topics/newtojava/intro-139083.html>)
8. Stack Overflow (<https://stackoverflow.com/questions/17101796/platform-independence-in-javas-byte-code>)
9. <https://www.w3counter.com/globalstats.php> Top Ten Platforms in March 2016

External links

- Ryan Sarver: What is a platform? (<http://sarver.org/2013/09/26/what-is-a-platform/>)

Retrieved from "https://en.wikipedia.org/w/index.php?title=Computing_platform&oldid=735741694"

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Wikidata has a property, ***P400***, for platform (see uses)

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