

Why Free and Open Source Software ?

One of the aims of the CCC program is to provide you with the tools and understanding to help you to be self-sufficient with your computer.

We hope to provide you with the ability to help others in your community, today, tomorrow and for the future.

This means that we have to choose an OS and software that is

- Free to start with
- Will remain free

Which means that for **you** the software will be

- Free to change and
- Free to share

This obviously rules out software we have to pay for. But what about free software?

In this section we talk about what 'free' means when we talk about software... the difference between 'Free as in beer' and 'Free as in speech'.

Free as in Beer

Some companies give you software for free. If you own an Apple computer, Apple will give you a new version of OSX. Adobe lets you download Adobe Flash player.

This is given as a gift, like a free beer, no need to pay for it.

However, it is given to you with a **license** attached. If you've used a computer, you have seen software licenses.

Usually a wall of text we scroll past immediately to click on 'I agree' when we are on the web or installing software.

These licenses usually say things like:

```
You are allowed to use this software for free on one computer but;  
you are but not allowed to modify the software, share the software  
and we and have total control over upgrades, functionality. We can  
restrict or take it away from you at any time, for any reason,  
and we might make you pay for future upgrades..... but we might not.
```

Despite the strong language, it may be that companies don't actually even read their own licenses or try to enforce them.

Such *restrictive* licenses are common, and have become the normal way of doing business in the world of computers since the 1970s, but there is an alternate way to look at software.....

Free as in Speech

By the middle of the 1980s the Free Software Foundation was established by [Richard Stallman](#) to help ensure that software users have four freedoms.

- Freedom 0: The freedom to run the program for any purpose.¹⁾
- Freedom 1: The freedom to study how the program works, and change it to make it do what you wish.
- Freedom 2: The freedom to redistribute and make copies so you can help your neighbour.
- Freedom 3: The freedom to improve the program, and release your improvements

(and modified versions in general) to the public, so that the whole community benefits.

Freedoms one, two and three require access to **source code**. Which we will deal with shortly.

To enforce these freedoms, software is licensed as Free and Open Source Software (FOSS).

There are many FOSS licenses used and once software is released under such a *permissive* license, then 'the cat is out of the bag'.

Depending on the software's popularity there may be hundreds or thousands of people working on a program, using, adapting, giving it away or even selling it.

What does using FOSS for CCC mean in practice?

For a start we can freely offer FOSS resources for download on our wiki, or offer direct links to downloads.

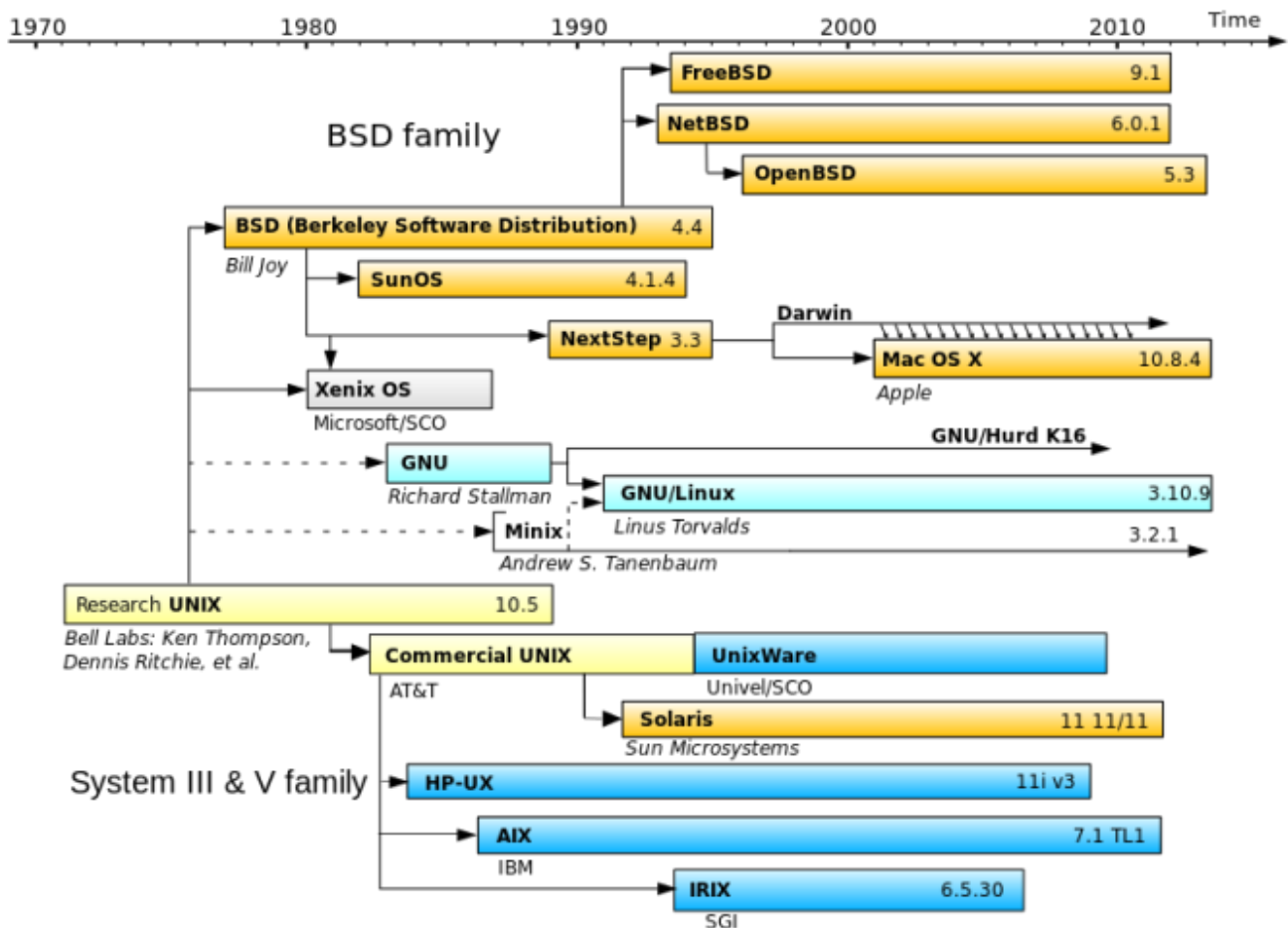
In remote workshops, we can create a local store of software with over 30,000 packages and make them freely available to download, then leave it all behind in the community.

It also means we can use the world's most popular operating system.

Introducing Linux..

[Linux](#) (also known as [GNU](#)/linux) is part of the Unix family of operating systems.

Here is the Unix 'family tree' for reference. Can you see where Linux, and OSX come from?



"Unix timeline.en" by Guillem, Wereon, Hotmocha (copied from old version's history)Christoph S. (redrew the image with Inkscape) - Original image: Image:Unix.png. Licensed under Public Domain via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:Unix_timeline.en.svg#/media/File:Unix_timeline.en.svg

Linux Kernel + GNU =Linux

The word Linux originally referred to the **Linux kernel**. A **kernel** is the central part of an Operating System.

Linux was created by [Linus Torvalds](#) in 1991 and has grown to 14,000 contributors by 2015.

It manages the basic tasks of the computer, directing programs access to the CPU, managing memory, internal devices and peripherals.

To be a complete OS, a kernel needs to be combine with tools for users create, manage and use their computers.

GNU

Fortunately the [GNU](#) project contained all the software required to make up a functional operating system. GNU stands for *GNU's Not Unix* and is a project to replace all the functionality of Unix with FOSS software, led by [Richard Stallman](#).

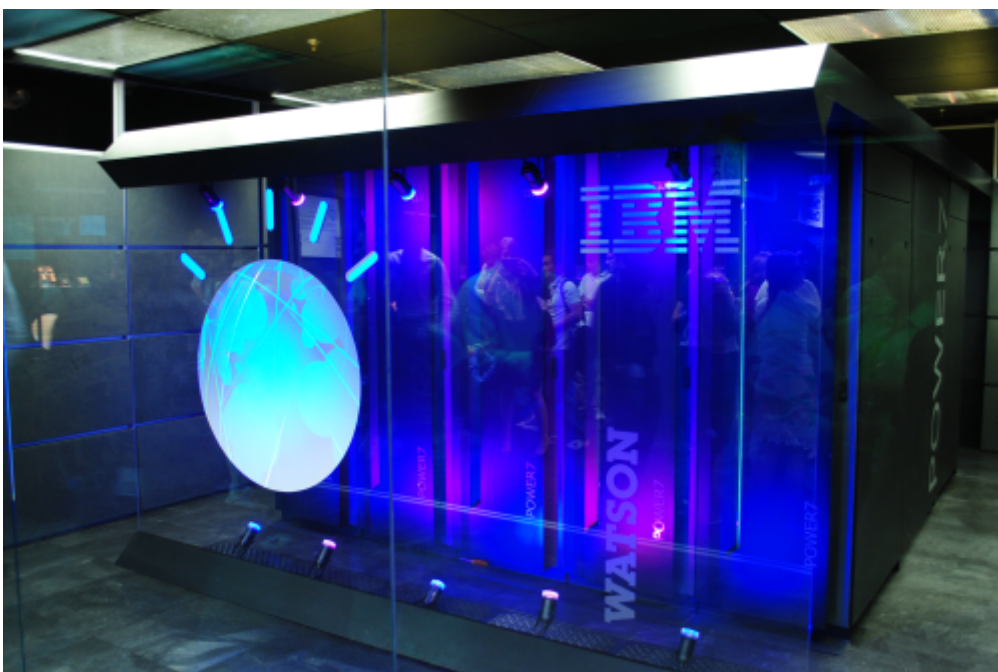
The merging of these two projects resulted in the potential to have totally FOSS operation system. So where is Linux used?

The most powerful computer in the world [Tianhe-2](#) used a version of Linux



By 001326 - Own work, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=45399546>

This is Watson, a computer that beat the world's top [jeopardy](#) players in 2011. Watson ran on the SUSE Linux Enterprise Server 11 operating system.



"IBM Watson" by Clockready - Own work. Licensed under CC BY-SA 3.0 via Wikimedia Commons -

http://commons.wikimedia.org/wiki/File:IBM_Watson.PNG#/media/File:IBM_Watson.PNG

This is a raspberry pi, a tiny credit-card sized computer, that is usually run on a version of Debian Linux, called Rasberian.



We have installed a version of Linux on the wifi router we use to create our local wireless network.

Android is Linux

Linux is also inside the Android operating system, the most commonly used mobile operating system in the world.

There are now over one billion Android devices activated, across hundreds of different phones, tablets and other portable devices.

So we've covered the 'free' part of our operating systems, which brings us to the question: *What is Open Source?*

Source Code - Open and Closed

What is Source?

Before we can compare closed source with open source, we need to know what source code is.

[source code](#) is the instructions for a computer program contained in a simple text document.

Source code is written or *coded* in a programming language. So, someone who writes computer programs is a programmer writing code.

Programmers are also called developers or hackers. Hacking in this case means putting something together to solve a problem, not 'hacking' into a computer system like in movies or on TV.

Using the Source

For a computer to run a program, the source code has to be compiled into binary machine code by a [compiler](#). This file is executable - in this case execute just means can be read, understood and acted on by the computer.

Here is a example of source code. in this case its a simple program in the C programming language that shows on the screen “Hello, World”

```
#include <stdio.h>

int main(void)
{
    printf("Hello, world!\n");
    return 0;
}
```

Despite the strange symbols, if you know how the C language is written, this program is **human readable**.

Once this code is run through a compiler, we get a binary executable file - which is **machine readable**.

But with the right tools (like a HEX editor) we can still open the file and edit it.

Here is the binary for our “Hello World!” program.


```

Terminal - ccc@ccc-server: ~/helloworld
File Edit View Terminal Tabs Help
[ 3E8/ 216E ] [helloworld]
3E8 0c 20 00 48 85 c0 74 05 e8 3b 00 00 00 48 83 c4 08 c3 00 00 00 00 00 00 . .H..t.;...H.....
400 ff 35 02 0c 20 00 ff 25 04 0c 20 00 0f 1f 40 00 ff 25 02 0c 20 00 68 00 .5...%...@.%...h.
418 00 00 00 e9 e0 ff ff ff ff 25 fa 0b 20 00 68 01 00 00 00 e9 d0 ff ff ff .%...h.....l.I..^H.
430 ff 25 f2 0b 20 00 68 02 00 00 00 e9 c0 ff ff ff 31 ed 49 89 d1 5e 48 89 .H...PTI....@H..P.@H..
448 e2 48 83 e4 f0 50 54 49 c7 c0 c0 05 40 00 48 c7 c1 50 05 40 00 48 c7 c7 .@.....f..D...G..UH-
460 2d 05 40 00 e8 b7 ff ff ff f4 66 0f 1f 44 00 00 b8 47 10 60 00 55 48 2d @..H...H..w.]...H..t
478 40 10 60 00 48 83 f8 0e 48 89 e5 77 02 5d c3 b8 00 00 00 00 48 85 c0 74 .].@..'......@..H..
490 f4 5d bf 40 10 60 00 ff e0 0f 1f 80 00 00 00 00 b8 40 10 60 00 55 48 2d @..H...H..H..H..?H..H..
4A8 40 10 60 00 48 c1 f8 03 48 89 e5 48 89 c2 48 c1 ea 3f 48 01 d0 48 d1 f8 u.].....H..t.]H...@..
4C0 75 02 5d c3 ba 00 00 00 00 48 85 d2 74 f4 5d 48 89 c6 bf 40 10 60 00 ff .....=Y...u.UH...~
4D8 e2 0f 1f 80 00 00 00 00 80 3d 59 0b 20 00 00 75 11 55 48 89 e5 e8 7e ff .].F.....@H.=...
4F0 ff ff 5d c6 05 46 06 20 00 01 f3 c3 0f 1f 40 00 48 83 3d 18 09 20 00 00 t.....H..t.U..'.H....]
508 74 1e b8 00 00 00 00 48 85 c0 74 14 55 bf 20 0e 60 00 48 89 e5 ff d0 5d .{.....s.....UH.....@...
520 e9 7b ff ff ff 0f 1f 00 e9 73 ff ff ff 55 48 89 e5 bf d4 05 40 00 b8 00 .....].f.....@...
538 00 00 00 e8 d0 fe ff ff 5d c3 66 2e 0f 1f 84 00 00 00 00 0f 1f 40 00 .....].f.....@...
550 41 57 41 89 ff 41 56 49 89 f6 41 55 49 89 d5 41 54 4c 8d 25 a8 08 20 00 AWA...AVI...AUI...ATL.%...
568 55 48 8d 2d a8 08 20 00 53 4c 29 e5 31 db 48 c1 fd 03 48 83 ec 08 e8 5d UH... .SL).1.H...H....]
580 fe ff ff 48 85 ed 74 1e 0f 1f 84 00 00 00 00 00 4c 89 ea 4c 89 f6 44 89 ...H..t.....L..L..D.
598 ff 41 ff 14 dc 48 83 c3 01 48 39 eb 75 ea 48 83 c4 08 5b 5d 41 5c 41 5d .A..H...H9.u.H...[]A\A\
5B0 41 ff 41 5f c3 66 6e 2e 0f 1f 84 00 00 00 00 00 f3 c3 00 00 48 83 ec 08 A^A_ff.....@H..H...
5C8 48 83 c4 08 c3 00 00 00 01 00 02 00 48 65 6c 6c 6f 2c 20 57 6f 72 6c 64 H.....Hello, World
5E0 21 2f 6e 00 01 1b 03 3b 30 00 00 00 05 00 00 00 1c fe ff ff 7c 00 00 00 !/n....;0.....|...
5F8 5c fe ff ff 4c 00 00 00 49 ff ff ff a4 00 00 00 6c ff ff ff c4 00 00 00 \...L...I.....l.....
610 dc ff ff ff 0c 01 00 00 14 00 00 00 00 00 00 00 01 7a 52 00 01 78 10 01 .....zR..x...
628 1b 0c 07 08 90 01 07 10 14 00 00 00 1c 00 00 00 08 fe ff ff 2a 00 00 00 .....*...
640 00 00 00 00 00 00 00 00 14 00 00 00 00 00 00 00 01 7a 52 00 01 78 10 01 .....zR..x...
658 1b 0c 07 08 90 01 00 00 24 00 00 00 1c 00 00 00 98 fd ff ff 40 00 00 00 .....$.....@...
670 00 0e 10 46 0e 18 4a 0f 0b 77 08 80 00 3f 1a 3b 2a 33 24 22 00 00 00 00 ...F..J..w...?;*3$"...
688 1c 00 00 00 44 00 00 00 9d fe ff ff 15 00 00 00 00 41 0e 10 86 02 43 0d .....D.....A....C.
6A0 06 50 0c 07 08 00 00 00 44 00 00 00 64 00 00 00 a0 fe ff ff 65 00 00 00 .P....D...d.....e...
6B8 00 42 0e 10 8f 02 45 0e 18 8e 03 45 0e 20 8d 04 45 0e 28 8c 05 48 0e 30 .B....E....E...E.(..H.0
6D0 06 06 48 0e 38 83 07 4d 0e 40 6c 0e 38 41 0e 30 41 0e 28 42 0e 20 42 0e .H.8..M.@l.8A.0A.(B..B.
6E8 18 42 0e 10 42 0e 08 00 14 00 00 00 ac 00 00 00 c8 fe ff ff 02 00 00 00 .B..B.....
700 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
718 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
730 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
748 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
760 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
778 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
790 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
7A8 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
iGoto 2Search 3Next 4Prev 5HexCal 6 7 8 9Undo 0Quit

```

Close Source

Closed Source software means only the owners of the program have access to the source code. It is then distributed as a binary executable.

An example of extremely popular closed sourced software is Adobe Photoshop. It is so popular that saying a heavily modified picture is 'photoshopped' or just 'shopped' has become a normal phrase.

This is great when the software runs well, is updated when needed to fix [bugs](#) and patch security flaws.

However, when a closed source program is not updated after a serious security flaw is discovered, many thousands or even millions of computers may be left vulnerable.

Users have no option but to wait for the owners of the software to find a fix the software, and hope to be informed when they are vulnerable.

Open Source

Dokuwiki (the software we are using for this wiki) is open source, and developed publicly, and freely [available](#) on the internet. Anyone is able to grab the source code and run it, modify it or redistribute

it.

Below is an example of the **open source** code for this wiki, which is written in a language called [php](#).

```
// define all DokuWiki globals here (needed within test requests but also helps to keep track)
global $ACT, $INPUT, $QUERY, $ID, $REV, $DATE_AT, $IDX,
$DATE, $RANGE, $HIGH, $TEXT, $PRE, $SUF, $SUM, $INFO, $JSINFO;
if(isset($_SERVER['HTTP_X_DOKUWIKI_DO'])) {
$ACT = trim(strtolower($_SERVER['HTTP_X_DOKUWIKI_DO']));
} elseif(!empty($_REQUEST['idx'])) {
$ACT = 'index';
} elseif(isset($_REQUEST['do'])) {
$ACT = $_REQUEST['do'];
} else {
$ACT = 'show';
}
```

How did we get hold of the source code for this wiki? In this case all we did was look in the dokuwiki source found [here](#) pick bit of code at random and throw it in our wiki.

So, finding the source for FOSS software is easy. but to do the same thing with closed source program is usually difficult or impossible. Either you purchase or are given access to the code. Any other method may break all manner of licenses and laws.

1)

Yes - it starts at zero - because computers count from zero...