

LINUX VS WINDOWS

It's not enough to just be better – you have to know why you're better.

If you're reading this, then the chances are that you're already pretty fond of Linux. However, it's always good to stop and look around every once in a while to take stock of the situation, and ask yourself: is Linux still the best choice for me? We think that the answer's a resounding yes, and this month we're reminding ourselves just why we use Linux.

The more we looked at it, the more we realised that there wasn't just one reason we use Linux. It's better in loads of different ways – too many to cover fully in one article, but we've done our best.

“The more we looked at it, the more we realised that there wasn't just one reason we use Linux.”

The list looks very different today than it would have done a couple of years ago. Some things are just as great as they've always been (like package management and the shell interface), but others have got a lot better recently.

Obviously, everyone will rate each area differently. For some of you, freedom will be the most important reason; for others, it'll be security or flexibility. If you're a gamer, programmer, office worker or sysadmin, you'll have different priorities, but we've looked at areas that we think are important to everyone. Read on and remember exactly why Linux is the best OS around.

Online

The internet is a scary place... unless you're a Linux user.

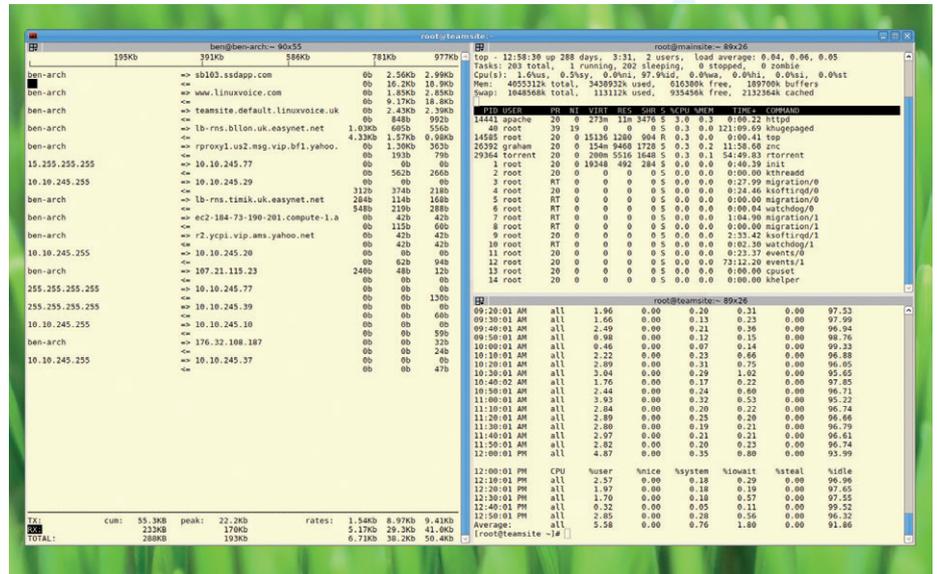
Let's be honest, the internet is built on Linux and open source. Even if you happen to be using Windows and Internet Explorer, if you're browsing the web, then really, you're using Linux. The majority of the servers generating the content are running Linux, and your Windows machine is just an input device.

It isn't a coincidence that Linux runs the back-end of most of the internet. The modern web wasn't created by big companies, but by little companies that dreamed big. At least two of the biggest companies in the world today (Google and Facebook) were started in college dorms less than two decades ago. Small companies like these need flexibility and cost effectiveness, and that just doesn't come from large companies with complex software licences.

The bureaucracy of proprietary solutions means that they just can't keep up with the level of innovation in Linux. Whether it's featureful filesystems, advanced virtualisation or containers, open source OSes have led the way since the web became popular. This innovation has allowed companies building their servers on Linux far more flexibility in how they deploy, and in the internet age, flexibility in your IT is a commercial advantage.

Client side

Now it's true that there are a select few things that you can only do online if you happen to be using a closed source desktop – Adobe's Air and Active X spring to mind – but these are getting fewer in number each year. Recently, the Pipelight plugin has enabled Linux users to interact with sites



Three shells running on three different computers spread out across the UK. Beat that, Windows.

requiring Microsoft's Silverlight. With the advent of HTML 5 though, more and more sites are pushing rich content through open standards rather than through proprietary add-ons.

It's not just about what you can access, there's also the issue of what can access you. The web is a dangerous place, or so some people tell say. The truth is that we've been using Linux for so long that we've forgotten all about internet-based malware. Drive-by downloads, infected adverts and others attacks simply don't bother us, not because we use antivirus software, but because we use Linux. So far, at least this operating system has proved to be far more resilient against attacks than Windows.

There have been a few scares around internet security on Linux recently

(Heartbleed and Shellshock spring to mind), but these were patched quickly, and neither one has had a significant effect on web users, since they primarily targeted servers. We shouldn't worry too much.

More than the web

The internet isn't all about browsing the web though. There are myriad methods for two computers to communicate, including FTP, SSH, SCP and RSync. Almost all of these protocols interact seamlessly with Linux.

Of course, most of these protocols work with Windows too, but they're often wrapped in ineffective GUIs, or you have to download them from a website without being able to verify their origins (see next page). Only on Linux and other Unix systems do you have full access to a wide range of power users network tools out of the box.

There is no perfect OS for the internet. Linux is more powerful and more secure, while there are still a few sites that require Windows or OS X to run. However, when everything is balanced out, we're far happier running on Linux.

Tails

Some of the biggest benefits of Linux come from its flexibility, and few things show this as well as Tails, the live distro designed to help people securely and anonymously access the internet.

It's free as in zero cost. While this is always nice, it's actually an important aspect here. If tails were built on some commercial software (like Windows), it'd be a security hole, as a payment almost always creates a record. Especially if it's done over the internet using a credit card (Bitcoin could help alleviate this, but it's still not widely used). This would enable credit card companies to track who had access to the anonymising software, and this

could be used to de-anonymise it. The zero-cost access also means that it can be shared freely, copied and handed out without any restrictions.

Of course, Tails isn't only great because it's free, it's also great because it delivers what it promises (a secure anonymous operating system). While it's not impossible to do that with commercial OSes, it is quite hard to do. The internals are locked off to the extent that even making a live bootable CD is difficult, let alone customising it so as to make it anonymous. Even if they were no backdoors or spyware compromising your system you could never verify it – which is why free software wins.

TOP 3 REASONS LINUX IS BETTER FOR USE ONLINE

- 1 Servers
- 2 Security
- 3 Flexibility



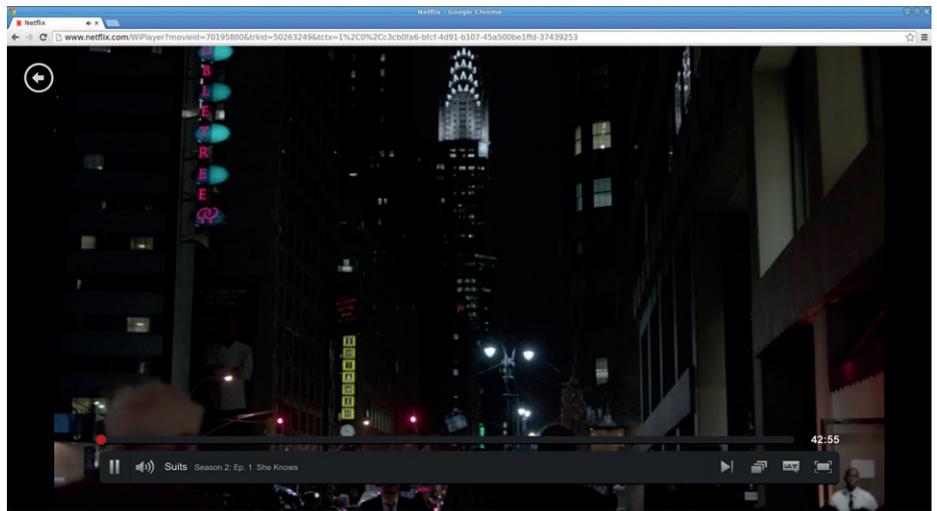
Desktop

You should feel comfortable in your computing environment.



We're sure that there's someone who likes how Windows 8 looks, but we haven't found them. Ultimately, the problem with the Windows desktop isn't that you may like or dislike how a particular version of Windows looks, but that you're stuck with the desktop environment that Microsoft thinks you should use. Some people like traditional desktop environments with a taskbar along the bottom and a menu in the lower-left corner, while other people like tiled window managers. Some people have embraced Gnome Shell and Unity, while others think they're an aberration of all that is good in this world. It doesn't really matter what you like – what matters is that it should be up to you to decide what desktop environment you like, not some multinational corporation that's primarily interested in profit.

It's not just looks that makes the Linux desktop better than Windows though. There's one thing that always shocks us about Redmond's OS: the complete lack of package management. If you want new software, you have to download it from a website and install it by hand. Of course, this means there's also no centralised update system: the software you download may or may not have a mechanism to stay up to date. Even if it does, it will be out of sync



Netflix now works natively on Linux using HTML 5 video. That's one less reason to dual boot.

with the other updates on your system, so you (as the user) are being constantly asked to download yet more software. And this is without mentioning all the intrusive browser toolbars and other ad- (and spy-) ware that can come bundled in these updates.

Some progress

It would be remiss of us not to mention that the situation in Windows is improving. With Windows 8, Microsoft introduced an app store. This is a centralised place that users

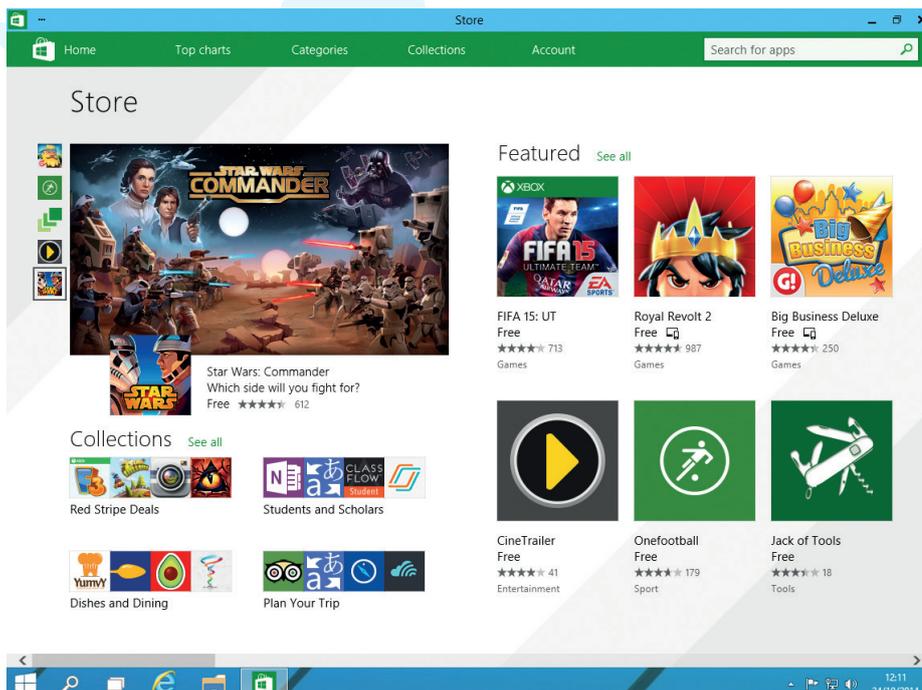
can go to to download quality software and be sure of its origin. Or, at least, that's what it should be. In reality, Microsoft's management of the store has meant that few software vendors have decided to use it. As a simple example, we searched for office software. There are many good pieces of office software available for Windows, from the open source suites (*Libre* and *OpenOffice*), to closed source suites (*Kingsoft* and *Softmaker Office*) to smaller products. The results of the search were (as ordered by the store)

- One Note (Microsoft's note taking application).
- Office Depot (A map showing the location of Office Depot stores).
- Office Evolution (A table showing which applications have been in which version of MS Office).
- Office 365 Garage Series (A list of videos for Office 365).
- Office Academy (A tool to help you use MS Office).

The list goes on in much the same fashion. There's almost nothing useful, and almost everything is a simple wrapper around online content. None of the useful office software we mentioned before is available on this app store.

Compare this to the list we got when we put the same search term into Ubutu 14.04:

- Zoho Webservices Presentation.
- Zoho Webservices Spreadsheet.
- Zoho Webservices Wordprocessor.
- Extra Office applications (a menu for



The Windows store does have some good games, but otherwise it seems woefully barren.

Ubuntu Studio).

- Office Worker (a game).
- LibreOffice Base.

The list goes on to show the rest of the *LibreOffice* suite and other useful software. Admittedly, this list isn't the order we'd ideally put Linux office software in. What's more, the Ubuntu store is built on top of a package manager. The two pieces of software are often confused, but they ultimately serve different purposes. A software store (or software centre) is a place a company can publish software, usually accompanied by details about the software, screenshots and user reviews. A package manager, on the other hand, is a system for installing packages and keeping them up to date.

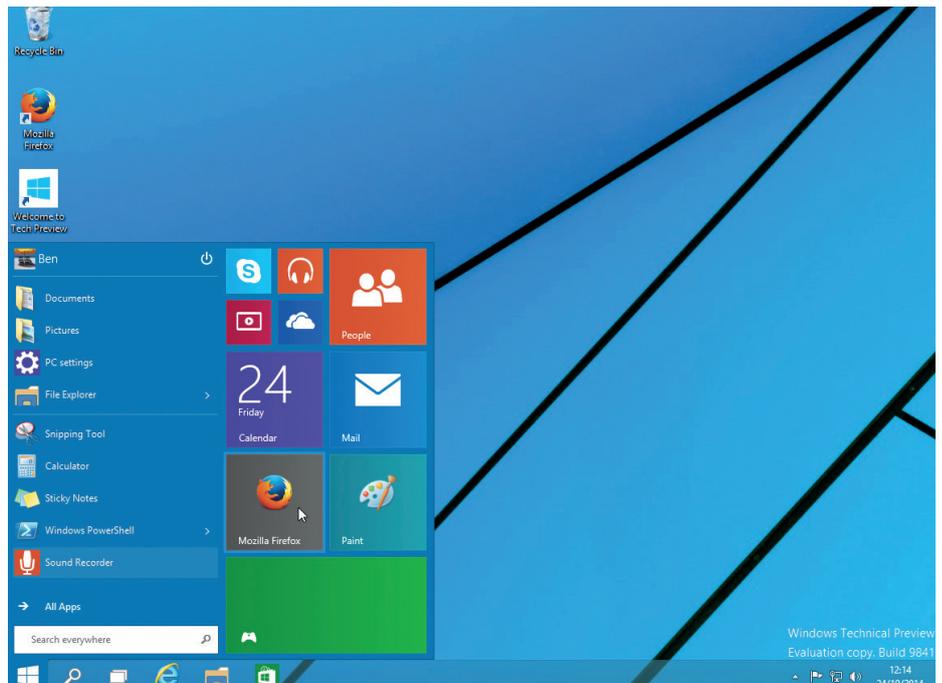
Microsoft has promised a package manager for Windows 10. However, it won't have the power of a Linux package manager. In fact, it will be little more than a command line wrapper around **install** files, and so won't really make the situation much better.

Gaming

Just a few years ago, if you'd dared to suggest that Linux was a good gaming platform, you'd have been laughed at. Now, industry leaders such as Gabe Newell are claiming this very thing. To understand why, you have to look a little at the history.

Traditionally, gaming has been done on two distinct types of machines: consoles and multi-purpose computers. Consoles are stripped down computers with everything not necessary for games removed. However over time, the hardware differences between games consoles and general purpose computers got smaller.

When Microsoft released the first Xbox console in 2001, it was really just a PC in a different box with a different interface. By releasing a games console, Microsoft became a games publisher. This put the



Windows 10 brings some sanity back to the Windows desktop after the clusterfail that was Windows 8, but users still only have one desktop environment to choose from.

company that created the OS in direct competition with many companies that created software for the OS. However, this wasn't the only factor pushing games towards Linux.

As games consoles were changing, so too were regular computers. PCs became the dominant platform, and PCs are more hackable than the computer that came before them. You could replace the CPU, motherboard, storage, or just about anything else in a PC with parts from a wide range of manufacturers. You could even build your own from parts.

DIY ethos

This hackability was something that PC gamers took to heart. Some people relentlessly pursued ever-higher frame rates

using more and more advanced hardware. Others built weird and wonderful machines out of old PCs with just enough muscle to run modern games. Even games started to become more customisable, with some publishers actively encouraging players to create new levels and artwork. However, on top of this was always Windows, and this has become more and more locked down with each version. Ultimately, with a community that was used to ever-increasing hackability and an OS that was becoming ever more restrictive, something had to give.

The final tipping point came in 2012 when Valve released its Steam games distribution platform for Linux. Since then, Valve has been encouraging games makers to release their titles for Linux.

Linux is a natural choice for PC gaming. It's the only OS that fully supports the hackable philosophy of PC gaming. The number of games available has exploded in the last couple of years with three new major sources of games (Steam, GOG and Humble Store), as well as the faithful stores that have been selling Linux games for years (such as Desura).

Hardware support

Unfortunately, there are some manufacturers that only support Windows. There are even some that actively hamper development of Linux drivers by people in the community who want to create open source drivers. The situation is getting better, but it's far from perfect.

However, this doesn't mean that Windows has better drivers than Linux. The situation is a little complex, and there are a few things you need to consider. Most Linux drivers are part of the main kernel project. This means that they're automatically available without the user having to download anything additional. It also means that they're subject to quality checks, and are updated

by kernel developers when changes are needed to ensure they work with the latest kernel.

Hardware drivers on Windows, however, are developed entirely by the hardware manufacturer, and usually included on a disk that comes with that hardware. On the one hand, this is convenient, but on the other hand, it means that the hardware manufacturer can force you to install all sorts of weird software just to use the hardware. The manufacturer may also not update drivers for older hardware for newer versions of Windows, meaning that you can get stuck with either a computer you can't upgrade or hardware you can't use – both problems that just don't arise with Linux.

TOP 3 REASONS LINUX IS BETTER ON THE DESKTOP

- 1 Flexibility
- 2 Games
- 3 Hardware



Power users

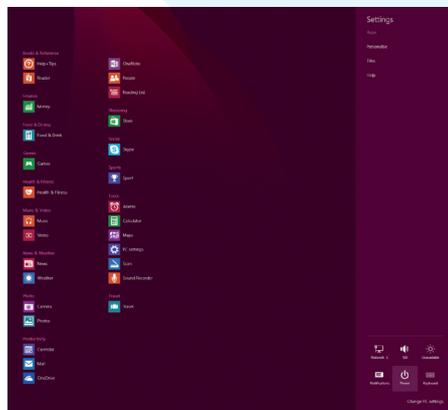
There's only one operating system for those who like a little power.

Microsoft is as ubiquitous as x86 processors. It could even be argued that it owes its success and dominance to their existence, going all the way back to 1981 when Microsoft's PC-DOS and MS-DOS were sold for use on IBM PCs and non-IBM (yet still compatible) PC clones. And while those very early machines used Intel 8088 CPUs, they were closely related and quickly supplanted by the 8086 as the market exploded, creating the foundations for what is Microsoft and the PC market today.

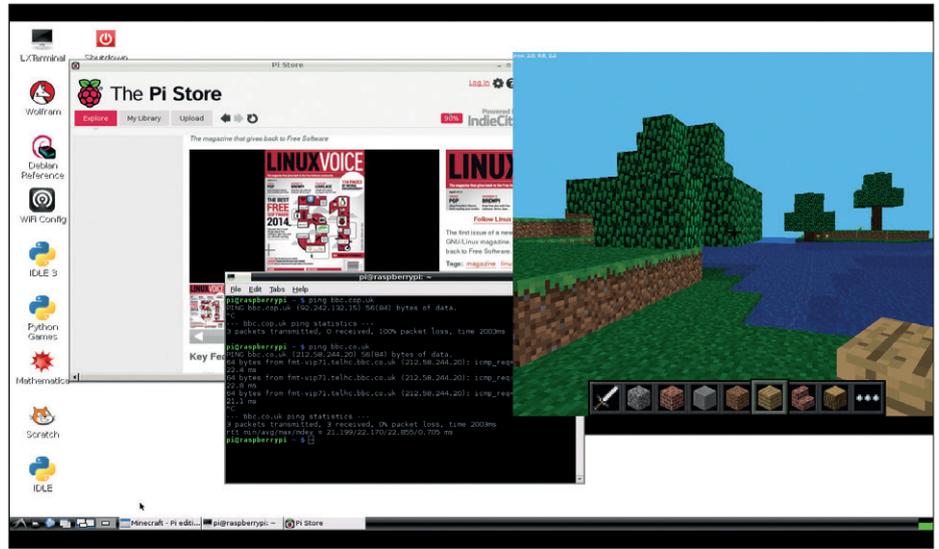
When you look at it this way, it's not surprising that Microsoft hasn't embraced other architectures, and the much anticipated ARM version of Windows 8 has done little to change this. Windows RT, as it is known, looks and feels like Windows 8 but its transformation to ARM has more to do with providing something for the tablet market, rather than new territory for Windows developers; Windows RT is fundamentally the Windows 8 experience running on slower hardware, which misses the point behind Linux's incredible success on other platforms.

“From toasters to robots, games consoles to weaponry and space stations, Linux is everywhere.”

Linux has never had any kind of problem running on non-x86 hardware, and we're sure that's because it's open source. When anyone can use this source code, almost



If you think Gnome has shutdown problems, look at Windows 8. Move the mouse somewhere then click on 'Settings' – only then will you find the fabled shutdown button.



Linux works on all kinds of hardware, which means the skills you learn on the desktop are incredibly transferrable – here's Raspbian running on an ARM-based Raspberry Pi, for example.

anyone will try and get it running on almost anything – from toasters to robots, games consoles to weaponry, space stations to sous-vides, Linux is everywhere. Debian has official ports for ARM, MIPS, PowerPC, IBM's S/390 servers and Sun SPARC, while

substantial projects that have taken a piece of consumer hardware and subverted its Linux kernel into a much more open and ambitious project. If a piece of hardware is using Linux, you've got a far better chance of being able to get access to its innards – whether that's unlocking frequencies in a commercial oscilloscope (a Rigol DS1052E hack), adding web access to a digital video recorder, or just putting XBMC on your favourite ARM-based mini-PC.

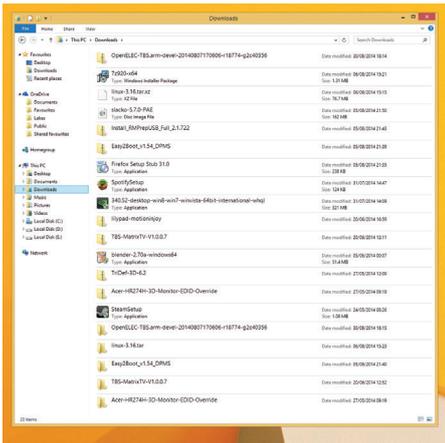
the unofficial ports still include code for processors such as the venerable Motorola 68000, for instance. But it's the ARM ports that have perhaps had the biggest impact, because the ARM 'System On A Chip' packaging has transformed the embedded market – a complete Linux PC that fits into a tiny low-powered space, whether that's Android on smartphones and tablets or Raspbian running on a Raspberry Pi.

Regardless of the architecture, if you're using GNU/Linux, you're using the same underlying operating system. That means you can use many of the same skills you learnt for playing media on your desktop to create a media streaming device that attaches to your television. Or the same skills you used to install OwnCloud on a virtual private server. This also expands to development and the ease with which you can hack your own software and hardware. Linux is unparalleled for this. There are many

Development

Writing code isn't for everyone. But software development is not only vital for native development, it's also vital if a platform is to succeed as a working environment for cross-platform development. Visual Studio and Microsoft's associated toolkits actually provide a world-class development environment just as vital to many businesses and corporations as *Microsoft Word*. The use of .Net and DirectX have created industries in their own right.

But over the last decade, open source toolkits and development models have transformed the industry. It's not just about open source compilers, or the GNU toolkit, or that you can even code on a Raspberry Pi. It's about creating a shared resource – something that you couldn't have done with Microsoft's development environment 15 years ago. Open APIs are the backbone of the internet, whether that's Google probing



The *Windows Explorer* file manager can also be replaced, but because most users don't bother, your options are limited.

your emails for advertising potential, or for the latest responsive web frameworks.

Linux is at the heart of this. It's the native environment for web site creation, and with IDEs like Eclipse, the native environment for many kinds of cross-platform development too. And what's more important is that with many computing curriculums changing to focus more on programming and hacking your own hardware, the combination of Linux and something like the Raspberry Pi is unbeatable. It's the best kind of lock-in, because we're getting the next generation of coders exposed to open source and Linux, and once you've experienced that freedom, it's very difficult to move to a development environment that offers less.

The command line is still simply the easiest way to perform many kinds of tasks. But in its attempt to distance itself from the old DOS days, and to emphasise the point-and-clickiness of Windows, the DOS prompt became a 90s relic. After being in development for a couple of years, this



PowerShell is a great addition to Windows. But it's not a replacement for the Unix mentality of *Bash*.

OpenWrt

OpenWrt is one of the best known custom firmware replacements for commercial hardware (and even the Raspberry Pi), as it replaces the default operating systems for many standard routers. This is a vital job, not only because it adds a layer of trust that only open source audited code can provide, it also adds features often restricted to far more costly devices. There's an SSH server, for example, which is very handy when it's built into your router, as it enables you to create simple VPN tunnels to your network, and there are many other packages that can be installed, much like you can with a regular Linux distribution. But even in a commercial setting, OpenWrt is used to replace enterprise-grade hardware costing £1,000s, even if it's just to use the traffic shaping features of the new firmware. And all of this is thanks to Linux being open source and because Linksys had to release its own firmware when it was built upon the original GPL code.



OpenWrt started life on Linksys' original WRT54G (the later WRT54GL show here), and used the GPL code released by Linksys [image: CC BY-SA Vidarlo ENWP]

This couldn't have happened any other way, and it's not even the only time this happened with wireless routers. Another custom firmware, dd-wrt, is also available for certain Linksys models and offers a very similar feature set, and there are even more choices for other hardware platforms/routers.

finally changed with Windows 7 when the 'Power Shell' became an integrated part of the update. *PowerShell* is a much closer approximation of the Linux command line, and has succeeded in becoming an essential too for Windows sysadmins. There's even an update for Windows 10, in the form of keyboard shortcuts. But it's still a vastly different beast to the Linux/Unix shell.

It's about choice...

Most importantly, with Linux you have a choice. *Bash* is installed by the majority of distributions, but every user is free to change their default command environment, or change whenever they want, as each shell does things differently. *PowerShell* could or should be another one of those options, because it's actually good at some very Windows/Microsoft specific tasks. It's excellent at piping output and keeping the

context of the data you're working with. It works brilliantly with Microsoft's object models and is a highly useful extension to the latest version of Windows.

But it's not a Unix shell. For example, tools such as *Emacs* or *Vim* were designed to maximise the Unix-alike environment they were running in, and it's the same for the vast majority of tools you can run from any command line. You can still perform any task on your computer from the command line, regardless of the GUI environment you might have installed. *PowerShell* isn't trying to compete with that functionality, which means Windows is still missing out.

Which brings us to another point. With Linux, you're never forced to upgrade, or have an application force an upgrade, or be left with files that don't load into anything you can't afford to buy. And many proprietary formats change from one version of an application to another, meaning you'll need the same version of *Photoshop*, or the same version of *Word*, to get the same data when you share a file. This just doesn't happen with open source because the emphasis is always on open standards and interoperability – it's why, for example, *LibreOffice* supports many more formats that *Microsoft Office*.

TOP 3 REASONS FOR POWER USERS

- 1 Hackability
- 2 The degree of control
- 3 Choice



Interoperability

Can't we all just get along...

Microsoft Windows is and always has been widely used in business. And this isn't likely to change. Many companies, especially older ones, have a long history with the software, its capabilities and its licensing. And companies don't like change any more than the users do, especially when Microsoft does create rather good business software. Ignoring the usability and graphical overhauls, Windows is a perfectly good operating system when you need to get things done, and ignoring the cost, there's a good reason its business-focused applications are the backbone of its business. They're industry standards because they work well.

But there is a change coming, and it's one we think Microsoft is going to find increasingly difficult to attack. As the desktop becomes less important, and users now have more than one device, more than one machine, and more of one way of working, issues besides functionality and performance become more relevant. In particular, open computing and data standards are finally being recognised as being important, after decades where proprietary formats have ruled in local government, health and education. In the UK, for example, government documentation in its static form has to be provided as PDF/A, which is an open format that can be read by lots of different

“After decades, open computing and data standards are finally being recognised as important.”

kinds of software. In Switzerland, the open source community has just crowdfunded approximately €8,000 to pay for *LibreOffice* developers to add digital signatures to PDF/A documents. This is a requirement for PDF documents to be legally binding, and is another great step towards making digital documentation and facilities available to as many people as possible (the campaign is still accepting money until the end of the year: <http://wilhelmtux.ch/?MID=11&PID=93>).

Of course, none of this has anything to do with Linux specifically, but by using Linux you are ensuring this interoperability



The Free Software Foundation is running a campaign to highlight the free alternatives to Adobe's default PDF reader and icons – that's why we're supporting their use on LinuxVoice.com.

and openness remains relevant. By getting other people to use Linux, you're keeping this forward open momentum going. It's the same reason Microsoft fought so hard, and succeeded, to ratify its own Office Open XML format, despite an open format (ODF) already existing. It needed its own formats in place in order to control the way people shared documents created and edited with

its own software, regardless of whether that meant the format was open or not. And of course, it was always going to be in Microsoft's best interests to do so. There's nothing wrong with that – it's the best possible way of safeguarding its business interests. But when open standards make all of our lives easier, Microsoft's stance isn't always going to be in our best interests.

To fork or not to fork

Another more tangible advantage that Linux has is the power to fork the operating system. Forking refers to the act of taking the source code, copying it under the terms

of an open source licence, and continuing to develop – usually with a different emphasis, or maintainer, or community. The ability to do this is enshrined within open source, and it's completely different to the closed and proprietary development model of companies like Microsoft and Apple. To the greatest extent, they view their code and their software as their intellectual property, and increasingly, they're not selling us an application, they're selling us the licence to use their property for a period of time.

Forking has resulted in lots of duplicity and choice, which isn't always a good thing. But it means that if users don't like the way Ubuntu is going, they can create a fixed version of Ubuntu. It will either thrive or fail depending on whether other users agree, and that's why we have distributions like Mint. It also safeguards the software – *LibreOffice* is a fork of *OpenOffice.org*, created when the future of the original project was unclear. X.org, the display system used by most installations, is a fork of XFree86, from a time when development had stalled and other operating systems were advancing quicker than Linux.

It's a completely different kind of development, and one we think results in simply better software. It's also an attitude

that rails against the burgeoning patent war of the big software creators, along with the constant battle to keep software patents out of Europe.

Which neatly leads us on to education. We're going to argue that skills learnt on Linux are more transferable, and that's why it's important that educators use Linux or open source software. If you learn how to create digitally signed PDFs with *LibreOffice*, for instance, you can now use *LibreOffice* on many different types of platform and from many different types of computer.

Education, education, education.

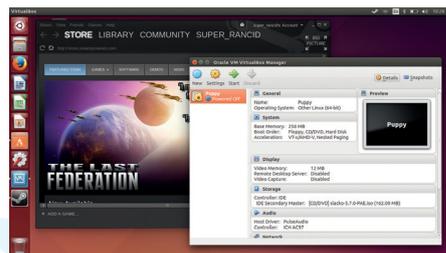
But this also works at a lower level. Many educational authorities are changing their computing curriculums to reflect the way we now use computing and to hopefully emphasise the need for computing science. This September in the UK, for example, marked the start of a new curriculum that throws out much of the style curriculum. Or in the words of the UK's Education Secretary at the beginning of the year, "ICT used to focus purely on computer literacy – teaching pupils, over and over again, how to word-process, how to work a spreadsheet, how to use programs already creaking into obsolescence; about as much use as teaching children to send a telex or travel in a zeppelin."

He then explained how he wanted it to change, "Our new curriculum teaches children computer science, information technology and digital literacy: teaching

Convergence

Both Microsoft and Apple are trying hard to make their users an integral part of their services, and part of this strategy is convergence – multiple devices acting as one, like being able to use *Word* on both your tablet and your desktop. Or your tablet becoming your desktop. There are Linux projects and distributions promising to do the same, with Ubuntu's imminent phone being perhaps the best example. But another aspect to convergence is the shared data services for your device, whether that's for the documents that you edit, the photos you take or the applications you purchase.

As with everything else, Linux differs because you have a choice. You may choose to run *OwnCloud* on a server somewhere and manage your own shared files and devices – there are *OwnCloud* apps that run on both Android and iOS devices, so this works even with mixed hardware. Or you can even choose to use the



Ubuntu has re-used many of the same ideas in its desktop, netbook and smartphone versions.

same services provided by Microsoft and Apple. The great thing is that your operating system won't be held hostage to this choice, and neither should your data. And you also get to choose where and when you use these services, whether that's on your own hacked tablet, or BusyBox running on a NAS device, or a router with a custom firmware. And we think that's the best definition of convergence.

them how to code, and how to create their own programs; not just how to work a computer, but how a computer works and how to make it work for you."

Tomorrow belongs to us

There's only one operating system we can think of that teaches "how a computer works and how to make it work for you," and that's Linux. Better though, is that these skills won't lock you into Linux. They'll give you a lifetime of perspective whenever you use technology, whether that's a cash dispenser or the latest Macbook Pro. This is

likely to be why the Raspberry Pi has been such a success, and why it uses Linux as the default operating system. It doesn't matter that it's Linux, just that it enables you to do whatever you need to achieve a specific educational goal.

TOP 3 REASONS LINUX WINS AT INTEROPERABILITY

- 1 Standards compliance
- 2 Education
- 3 Convergence



TWELVE REASONS WHY LINUX WINS

You knew it was a forgone conclusion.

After all that, it feels like we've only scratched the surface. What's also interesting is how things have changed. Ten years ago we may have started a comparison like this as a feature-by-feature comparison of the two operating systems, as if the desktop was the only way one operating system could ever come to dominate over another – or win, as we'd have put it at the time. Many of us still use Windows, and it still does a great job in the millions upon millions of places it's installed and used. It's a huge accomplishment and a testament to the skills of the corporation behind it.

But side-by-side comparisons are no longer relevant. We hate using the word, but

our comparison has become more 'heuristic' for a good reason; technology is now shaping almost every aspect of our lives and it's no longer about one company or operating system. It's about your data, control, freedom and choice, and these are ideas that don't align with our old way of thinking.

They're also ideas that we feel strongly about, which naturally leaves us with only one choice of operating system. We know we're preaching to the choir when we say Linux wins in so many different ways, but it's important to remember why, and just why GNU, Linux and Free Software are getting stronger and more relevant with each passing decade.

TOP 3 REASONS LINUX IS BETTER FOR . . .



USE ONLINE

- 1 Servers
- 2 Security
- 3 Flexibility



USE WITH LINUX

- 1 Flexibility
- 2 Games
- 3 Hardware



POWER USERS

- 1 Hackability
- 2 The degree of control
- 3 Choice



INTEROPERABILITY

- 1 Standards compliance
- 2 Education
- 3 Convergence