

# An Overview of Samba Serving for Windows



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## **1. Intended Audience**

This document assumes a degree of technical knowledge and, as such, is not for a general audience.

The document starts with a brief overview of servers, what they do and how they are often implemented. This provides context for the subsequent sections concerning the Samba server product.



## 2. Introduction

GNU/Linux, or 'Linux' as we shall call it, is one alternative operating system to Microsoft's Windows product.

Linux is developed co-operatively by an informal collection of commercial and non-commercial organisations and individuals. The software itself is free. There is a growing number of commercial Linux support organisations who sell services around the basic free software elements. Linux is a very high quality operating system.

You may have heard about Linux becoming increasingly popular as a desktop operating system, but you may not know that it is already a mature server operating system. For example, Linux plus Apache web server runs 58% of web servers<sup>3</sup>.

The Samba software suite running on Linux provides many of the features of a Windows server and, indeed, for some services it can act as a drop-in replacement.



### 3. What Does A Server Do?

Most organisations will have appreciated the benefits of a networked server for sharing files and printers with other people.

Some, typically the smaller organisations and those who are cash starved, use Microsoft's 'desktop', 'workstation' or 'client' operating systems such as Windows 2000 Pro and XP Pro as servers. Larger organisations are more accustomed to using Windows Server operating systems, such as Windows NT 4 Server, Windows 2000 Server, Windows Server 2003 with Service Pack 2 and Windows Server 2003 R2.

The client versions of Windows, Windows 2000 Pro and Windows XP Pro can only act as makeshift servers, they cannot offer the full feature set and performance tuning of a dedicated server operating system.

When we talk of Samba in comparison with a server, we are comparing it with the server variants of Microsoft Windows.

Some general features of a server:

- Files and printers can be shared amongst everyone no matter which computer they're using and where they are in the networked environment – a shared drive will appear just like any other drive in the person's computer and a printer as though it is directly connected.
- User accounts and groups can be defined once on the server rather than on every client computer.
- Restrictions can be placed on individuals and on groups so that, for example, only people in the accounts department can see the accounts.
- Administration is made more efficient. It is focused at one point and can be more easily automated. For example, with all data in one place rather than spread around each client computer it is easy to make sure data is backed up and the backup procedure can be more readily automated. Server operating systems are more likely to include the tools, or far better tools, for enabling server features and for automating them.

Some of these features can be coaxed out of client versions of Windows to some extent - for example, they have very limiting restrictions on the number of simultaneous users that can use them<sup>4</sup>. Others require dedicated server software such as can be provided by Windows Server versions and by Linux with Samba.

The extent to which server functionality can be made use of may not have been very greatly explored in many organisations. Today, almost everyone understands how their work can be helped by simple file sharing, but how you can actually do that with the various software applications to hand that may not be so well understood?

A Windows 'domain' offers additional features that can greatly streamline the management of the various and interconnected aspects of a larger computing system with, say, 10 users, a couple of different groups amongst them and a couple of printers.

Where cost is a consideration, Windows Server licences are considerably more expensive than the desktop versions of Windows, even for charities through the CTX Programme<sup>5</sup>,

and they also require Client Access Licences (CALs) - an additional fee based upon the number of client users or computers connecting to the server. In contrast, most Linux distributions have no such licencing costs.

**Table 1 - Server Functionality Provided by Client and Server Versions of Windows**

Windows Edition	Orientation	Can Share Files?	Can Share Printers?	Can Provide A Domain?	Maximum Number Of Simultaneous Connections
Windows 95	Client	√	√	×	100, can be changed <sup>6</sup>
Windows 98	Client	√	√	×	100, can be changed
Windows Me	Client	√	√	×	100, can be changed
Windows XP Home	Client	√	√	×	5
Windows Vista Home Basic	Client	√	√	×	5
Windows NT4 Workstation	Client	√	√	×	10
Windows 2000 Pro	Client	√	√	×	10
Windows XP Pro	Client	√	√	×	10
Windows Vista Home Premium	Client	√	√	×	10
Windows Vista Business	Client	√	√	×	10
Windows Vista Ultimate	Client	√	√	×	10
Windows NT4 Server	Server	√	√	√	5. Can be increased by buying more CALs.
Windows 2000 Server	Server	√	√	√	5. Can be increased by buying more CALs.
Windows Server 2003	Server	√	√	√	5. Can be increased by buying more CALs.
Windows Server 2003 R2	Server	√	√	√	5. Can be increased by buying more CALs.

**Table 2 - Capabilities of Various Client Versions of Windows**

Client versions of Windows	Can Use Shared Files?	Can Use Shared Printers?	Can Join A Domain?
Windows 95	√	√	×
Windows 98	√	√	×
Windows Me	√	√	×
Windows XP Home	√	√	×
Windows Vista Home Basic	?	√	×
Windows Vista Home Premium	?	√	×
Windows NT4 Workstation	√	√	√
Windows 2000 Pro	√	√	√
Windows XP Pro	√	√	√
Windows Vista Business	√	√	√
Windows Vista Ultimate	√	√	√

## 4. Windows Shared Folders

Folders on a server are often shared so that documents in the folders are available to everyone within an organisation as though they were on their own computer. These are known as Windows shares.

Access to Windows shares can be restricted to specific individuals or groups if required. System managers can define specific, finely grained restrictions to groups and/or individuals.

Through the use of Windows shares, some software applications can offer collaborative features that are often unused:

- Email. Larger organisations would instead want to run a dedicated mail server.
- Address books
- Calendar
- Database. Larger organisations would instead want to use dedicated database server software.

### 4.1 Running Programs From Windows Shares

Programs can be run from Windows shares, on the face of it meaning you only have one copy of the program to maintain. However, depending on the particular software you want to use, it may prove to be impractical to do this.

Many programs will work this way; some won't; others can be made to but it is laborious to do so<sup>7</sup>. It takes trial and error to work this out and even then you will likely have a mixed environment that won't afford you the advantages possible from having all software installed on a Windows share. Nevertheless there may be individual software that's still worth running this way so it is worth knowing it can be done.

There are many tools to automate the installation of software to workstations (where the applications won't have any trouble running other than possibly requiring elevated permissions). This is a lot easier than the effort needed to get difficult applications to run from the server or having a mix of both approaches.

### 4.2 Permissions

Permissions are the individual/ group usage restrictions associated with a Windows share.

Permissions are used to define which people can access a share and what they can do with it. You need to carefully decide on the permissions of each specific share, so that they reflect the way your organisation works. This is not just a decision for the computer support personnel but should involve management. For example, though it seems entirely normal for a file created by one person to be editable others, you may need to specifically define whether or not any/ some/ all others can remove it. Sets of permissions can get very complex very quickly.

## 5. Windows Shared Printers

Printers can be shared by Windows in a similar way to folders.

Windows users will expect to be able to connect to a shared printer using a variety of intuitive methods and to have the printer driver install automatically to their machine.

There are more manual processes that can be used by someone with more computing skills to connect to a shared printer, but it is the 'point and print' method that the majority of users will expect to be available if they are to connect to printers themselves.

## 6. The Windows Domain

A server can be set up to control a Windows domain and bring even more of the administration into the realm of the server.

The most important difference with other Windows sharing options is that user accounts are created on the server rather than on workstations. When users turn on their computers they enter their user name and password and these are checked against the server.

This has various benefits:

- Administration is more efficient and efficiency is compounded the more users you have to deal with when setting up the system and when changing it
- Users can 'roam' or 'hot desk'
- If a workstation breaks then the time to get a new one onto a user's desk is reduced
- With users 'logging in' through the server there are more aspects of system administration that can be automated
- Use of the system can be restricted to certain times of the day or days of the week
- Software can be installed automatically on a workstation when a user logs in, using programs such as WPKG<sup>8</sup>
- Users' Windows settings are additionally stored on the server, further increasing the centralisation of everything and allowing for a more thorough backup

A Windows domain is more complicated to set up and administer than Windows shared disks and printers and so requires an increase in the expertise of your IT personnel. However the advantages are such that it is likely worth the effort if you have more than a few people using the system.

User accounts in the Windows domain default to having restricted permissions. This is excellent in terms of system security and most software is written to work this way in conformance with Microsoft's best practice guidance. However many of the larger proprietary programs intended to be used by a small trusted group of specialists, such as Adobe Photoshop or Intuit QuickBooks, require more sophisticated permissions management. Similar issues can arise with sharing access to USB scanners, for example.

## 7. The Samba Server

Samba can act as a server for many versions of Windows, offering file and printer sharing and Windows NT 4 style domains. It will not facilitate the more modern 'Active Directory realm' though it can join one. This should be sufficient for small to medium sized organisations who don't need the management facilities provided by Active Directory - most organisations will not.

Samba acts as a drop-in replacement for Windows servers if it is doing such things as offering shared folders and sharing printers. Only if you require Active Directory will it lack in features. The new system should work faster than a comparable Windows server.

## 7.1 Samba & Clients Using Windows

Windows 2000 with Service Pack 4 and Windows XP with Service Pack 2 are the ideal versions of Windows to be using with Samba.

At this point in time the preferred version would be Windows XP with Service Pack 2. Windows 2000 with Service Pack 4 is fine, and for some reasons even better, but at this point in time it is too near its end of life so security updates won't be available for long enough.

Windows Vista is supported but because it was so recently released there are many compatibility fixes currently being made to the Samba suite. As a consequence you are advised not to use Windows Vista and Samba without first checking if Samba supports what you need from it.

It goes without saying that there is a lot to be gained in terms of stability of your system and reducing maintenance time if you standardise on one specific version of Windows across all workstations.

## 7.2 Samba & Clients Using Mac OS X

Perhaps you have a designer or volunteer who comes in with their computer which has Mac OS X?

Usefully, Mac OS X uses Samba itself to integrate with Windows machines so it too can access Samba's shared folders, printers and join a domain.

Because the precise level of compatibility depends on the version of Samba included in OS X, and because this is constantly being improved, you should use OS X version 10.3 or higher, but preferably the very latest version available from Apple (as of this writing that is version 10.4.9).

It also helps Mac OS X users if you have the latest version of Samba on your server but this is not always possible when Linux distribution releases only happen every couple of years.

**Table 4 – Samba Versions in Mac OS X**

Mac OS X Version	Included Samba Version	How Much of Samba is Included?
10.0.x	2.0.x	Just smbclient
10.1.x	?	Just smbclient
10.2.x Jaguar <sup>9</sup>	2.2..x	The Samba suite
10.3.x Panther <sup>10</sup>	3.0.x	The Samba suite
10.4.x Tiger <sup>11</sup>	3.0.x	The Samba suite

## 7.3 Samba & Clients Using Linux

If you have any client computers running Linux then they should be able to integrate with the Samba system<sup>12</sup>, accessing shared folders, shared printers and joining a domain.

## 8. Printing

Some of the advantages of printing through a server are print job accounting and redundancy whereby if two printers are attached and one breaks the print job will continue from the other printer.

### 8.1 Printers and Print Drivers

Not all printers are supported, you can check specific printer models on the OpenPrinting web site<sup>13</sup>.

It's recommended that you use PostScript laser printers because you can get the driver from their manufacturer in a form that will work no matter the operating system you're using.

Other than PostScript printers, most brand new printer models won't have a suitable available driver. However you may find a driver for an older model of the same kind of printer works fine but doesn't take advantage of new features in the more recent model.

Some Linux distributions will install printer drivers for popular printers by default, others will need them installing by hand.

### 8.2 Checking Printer Consumable levels

The following makes of printer are supported by Samba to some extent:

- Hewlett Packard provide graphical interface tools<sup>14</sup> for many of their printers<sup>15</sup>
- Recent Hewlett Packard laser printers with recent network cards<sup>16</sup> provide excellent levels of information on consumables through their web interface
- Epson inkjet printers have command-line programs for checking<sup>17</sup> ink levels, printing test patterns and changing and cleaning ink cartridges; one of these can be plugged into the CUPS web interface.

Note; Sometimes there are ways to work around difficulties. Some printers, for example Epson inkjets, allow you to change ink and clean heads from the printer's front panel.

Tip: Using Hewlett Packard laser printers with JetDirect network cards ensures you have a combination of a high quality printer and the best Linux compatibility.

### 8.3 Print queues

Software called CUPS (Common UNIX Printing System) is used to set up a printer. Samba does the job of sharing the CUPS printer to Windows. It is possible to enable Windows users to see the printer and connect to it in the automatic way they will be used to.

The CUPS print queue needs to be set up. This can be done using the command-line or web browser-based tools that come with CUPS, or using any of the several graphical desktop environments available.

Setting up the Windows printer driver for point and print style automatic installation on Windows clients is somewhat tricky. It can be done, but will likely require the attention of someone with specific skills in this area. There are, however, various methods to work around this.

- The printer driver can be installed by hand on the Windows client. This adds an extra step for an administrator but preserves the ease of use for the user.
- Windows can print direct to the CUPS print queue rather than via Samba. This adds two extra steps for an administrator and leaves the system without the finishing of the efficient point and print system.

After this, any of the usual Samba tools can be used to share the CUPS printer.

Printing preferences can be manipulated using the usual tools on the Windows clients, as can removing jobs from the print queue.

Smaller organisations may find that the most cost effective approach is using a printer with a network interface and having each client machine print directly to it. For them the benefits of a print server per se may not be worth the effort of setting it up.

There is useful information on working with printers at the Samba web site<sup>18</sup>.

## 9. Samba Administration Tools

In Linux you can do everything from the command-line and this is usually the best practice recommendation for a Linux server. But this is an unremitting, inhospitable environment for non-technical people.

To be reasonable to people other than experienced Linux system administrators, and for organisations without the money to employ such people, it is entirely sensible to want to use a graphical interface for administration.

Fortunately there are various graphical interfaces available, ranging from a web browser-based one which would be accessed from any Windows client to the fully fledged and more intuitive 'desktop environments' KDE and GNOME which resemble Windows and are used from the server console.

An important benefit of the graphical user interface is that it gives the ability to feel one's way around the whole system using an intuitive tool, not just around Samba. Support people without Linux expertise who are charged with supporting the whole system have a better chance of managing with this.

Web browser-based interfaces can be included with barely any increase in system resources. On the other hand, the KDE and GNOME environments will increase utilisation of system resources. If the computer is very old, e.g. a Pentium III era computer, then the KDE and GNOME environments will drastically affect performance. In contrast, if the computer is more modern then it is unlikely to slow to any great extent, though it still will to some degree - including more system memory can mitigate this. Tables 5 and 6 below summarise these points and more.

**Table 5 - Software Administration Environments**

Environment	Description	Pros	Cons
<b>Command-line</b>	Commands are typed into a terminal, like MS-DOS	Technically superior. Everything available.	Requires expertise. Cryptic / terse.
<b>Web browser-based</b>	You use it through the web browser. You can use a mouse.	Reasonably familiar for non-technical people. Technically fine, gives best balance of command-line and graphical and preserves the command-line set up	
<b>GNOME</b>	Fully fledged graphical user interface. You can use a mouse.	Familiar for non-technical people. Intuitive so many more people able to administer	Server is less stable, though not appreciably. Requires more powerful hardware – won't run on very old equipment.
<b>KDE</b>	Fully fledged graphical user interface. You can use a mouse.	Familiar for non-technical people. Intuitive so many more people able to administer	Server less stable, though not appreciably. Requires more powerful hardware – won't run on very old equipment.

**Table 6 - Samba Administration Software**

ENVIRONMENT	Software	Description	Can set up Shared Files?	Can Share CUPS Printers?	Can set up a Domain?	Limited to Specific Distributions?	Stage Of Development?
<b>Command-line</b>	Samba	Part of Samba itself	√	√	√	No	Mature
<b>Web browser-based</b>	Webmin	Covers more than just Samba	√	√	√	No	Mature
<b>Web browser-based</b>	SWAT	Part of Samba itself; terse	√	√	√	No	Mature
<b>GNOME</b>	GNOME	Part of GNOME itself	√		×	No	Mature
<b>GNOME</b>	GSAMBAD <sup>19</sup>	Possibly no less cryptic than SWAT	√	√	√	No	Early
<b>GNOME</b>	Redhat-config-samba		√	√	?	Red Hat, Fedora	?
<b>KDE</b>	KDE	Part of KDE itself	√	√	√	No	Mature

The command-line tools that come with Samba and CUPS can be used to set up the full range of Samba features. CUPS includes a web browser-based tool for setting up printers. The web browser-based Webmin tool, available for all distributions, can be used to set up

the full range of Samba features.

The tools that come with GNOME by default are able to set up shared files and printers, not domains. The only tool available that can be added to GNOME is GSAMBAD which can set up shared files, printers and a domain, but it is at an early stage of development so possibly not something you should rely on.

The tools that come with KDE by default are able to set up shared folders, share CUPS printers and domains.

KDE and GNOME both include tools for setting up CUPS printers.

There are other options available but they're not considered mature enough to be recommended<sup>20</sup>.

Some degree of administration of a domain can be performed using Windows' own command-line and graphical interface tools<sup>21</sup>, but they are limited to managing users and groups, and shared files and printers. They cannot be used to add shared folders, printers and domains. See "Managing Samba: Remote GUI tools" by John H. Terpstra<sup>22</sup>.

## 10. Support

With the reduced licencing costs possible with most Linux distributions, you should expect most of your IT costs to be spent on labour. You may have various people providing computer support - in-house skilled or unskilled people, outside skilled people or some combination of types.

Whatever you think you have, before committing to change you should check that your support provider has appropriate expertise in both Linux/ Unix and Windows because you will be running a mixed environment.

Any in-house support people are going to benefit from training. The level of expertise they will require will depend on the server features they have to set up and the numbers of people they support. It should be possible with any of the common Linux distributions for a semi-skilled support person to install a Linux distribution and set up a Samba server with only a little training. If such people are to set up a domain then a Linux distribution should be chosen with such support in the graphical user interface.

Fundamentally, someone needs to understand the operating system. Having tools to help less skilled administrators is fine up to a point, but when something goes wrong someone will need to understand the operating system's internals. Perhaps you have someone you can call in for just these situations? Alternatively, you could choose a Linux distribution from a supplier that also provides telephone support? Finally, and precisely because the software development methodology and culture of the free software movement tallies well with co-operative ethics, you may find that some working in the voluntary and community sector are ready and willing to learn these new skills and so help you out.

Linux support is also available for all distributions via less formal channels provided by the communities of people that use each distribution. While these channels are open to in-house support people, if they are not used to this form of support then they may find it takes some getting used to.

If you use outside support people, then they're likely already comfortable using these informal channels. This means that looking for distributions with commercial support arrangements may not be necessary, which could save you a fixed cost?

Commercial support provision varies widely in scope and level of help. You should shop

around to find the best fit to your needs.

## 11. Server Hardware

You can set up a Samba server on very old and fairly recent hardware, but not necessarily the most recent...

### 11.1 Linux Hardware Support

Linux hardware support for old hardware is exhaustive.

Very modern server hardware can pose a problem because of a lack of drivers for new equipment for a period of time after the new hardware is released. As a consequence of this 'lag factor', you are advised not to purchase a server with very newly released hardware and to research the compatibility of any server's components with your particular distribution before buying<sup>23</sup>.

### 11.2 Recommended Hardware

An old machine that might otherwise be thrown away as it is too old for a desktop system could be perfectly adequate for sharing files to 10 people, administered with a command-line or web browser-based interface. But then again, as you're centralising resources, will you be safer using more modern hardware that is less likely to breakdown through simple 'old age'?

More hardware resources will be required the more people you share to at any one time or the more features you expect from it such as full Samba print serving and a domain.

If you want a full graphical user interface to configure by, then you will need drastically more hardware resources but only up to a point. Once you have the option of a vaguely modern computer then it will be fine with GNOME and KDE, especially if you add extra memory.

If you have very modern hardware then the additional resources required to run KDE or GNOME will be of negligible impact.

It's worth bearing in mind that dedicated servers come with dedicated server hardware tuned to being used by multiple users - unlike desktop computers that are tuned for use by only one person at any one time. If you can afford it, it is worth getting a dedicated server.

A good compromise is a very high quality five year old server from a reseller specialising in ex-corporate second-user stock – try e-Bay or search locally. They will still be of exceptional quality and what cost £1000's five years ago you can expect to get now for £100's.

Alternatively there are low-end servers available new at reasonable costs from big name suppliers such as Dell.

New distribution upgrades won't be particularly demanding of increased hardware capability, which usually leaves you to upgrade as and when you are required to by growing demands upon the server in terms of space, numbers of users or features such as a domain.

This flexibility in the hardware that a Samba server will run on allows organisations with little money to start small and work their way up as need/ resources demand/ allow.

## 12. Useful Publications

- Using Samba, Third Edition By Gerald Carter, Jay Ts, Robert Eckstein; O'Reilly<sup>24</sup>
- Learning Red Hat Enterprise Linux & Fedora By Bill McCarty; O'Reilly<sup>25</sup>
- Linux Network Administrator's Guide, Third Edition By Tony Bautts, Terry Dawson, Gregor N. Purdy; O'Reilly<sup>26</sup>
- Book of Webmin ...or How I Learned to Stop Worrying and Love Unix By Joe Cooper; No Starch Press<sup>27</sup>
- Samba 3 By Example by John H. Terpstra; published online<sup>28</sup>

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1 <http://www.gnu.org/licenses/gpl.txt>

2 <http://creativecommons.org/licenses/by-sa/3.0/>

3 Netcraft March 2007 Web Server Survey

([http://news.netcraft.com/archives/2007/02/23/march\\_2007\\_web\\_server\\_survey.html](http://news.netcraft.com/archives/2007/02/23/march_2007_web_server_survey.html))

4 'Inbound connections limit in Windows' - <http://support.microsoft.com/?kbid=122920>

5 <http://www.ctxchange.org>

6 <http://support.microsoft.com/kb/q158474/>

7 Those larger software applications that aren't intended to be used in this way, such as Adobe Photoshop and Dreamweaver, might install system files outside of their program directory, in Windows system directories. This can be worked around with some effort by putting the particular system files in each workstations' Windows system directories. Software applications that are small, or those intended to work in a multi-user environment (such as those with a Unix heritage, e.g. The GIMP) usually work.

8 <http://wpkg.org/>

9 Mac OS X 10.2 (Jaguar) Cross-Platform Report - <http://www.macwindows.com/jaguar.html>

10 Mac OS X 10.3 (Panther) Cross-Platform Report - <http://www.macwindows.com/panther.html>

11 Mac OS X 10.4 (Tiger) Cross-Platform Reports - <http://www.macwindows.com/tiger.html>

12 Linux clients require Samba and winbind in order to join a Windows domain

13 [www.linuxprinting.org/foomatic.html](http://www.linuxprinting.org/foomatic.html)

14 HP Linux Imaging and Printing (HPLIP) <http://hplip.sourceforge.net/>

15 For printers supported by hpijs and hplip see [http://hplip.sourceforge.net/supported\\_devices/index.html](http://hplip.sourceforge.net/supported_devices/index.html);

For printers supported by hpoj see <http://hpoj.sourceforge.net/suplist.shtml>

16 For instance HP LaserJet 4000 series printers with a minimum of a JetDirect 610N card

17 mtink and escputil; mtink can potentially be connected with the CUPS web interface

18 Chapter 22 – CUPS Printing Support (<http://www.samba.org/samba/docs/man/Samba-HOWTO-Collection/CUPS-printing.html#id2645046>)

19 [www.gadmintools.org](http://www.gadmintools.org)

20 Ubuntu-Config-Samba (<http://socgguisambaconf.wordpress.com/>)

21 The NT4 Domain User Manager, the NT4 Domain Server Manager (both potentially downloadable from Microsoft) and the Windows 2000/XP Professional MMC Computer Management Console (included with the operating system)

22 [http://searchenterpriseunix.techtarget.com/tip/0,289483,sid39\\_gci1159865,00.html](http://searchenterpriseunix.techtarget.com/tip/0,289483,sid39_gci1159865,00.html)

23 For SUSE (<http://en.opensuse.org/Hardware>); for Red Hat

(<https://hardware.redhat.com/hwcert/index.cgi>); and for multiple distributions the 'Linux Hardware Compatibility Lists & Linux Drivers' (<http://www.linux-drivers.org/>).

24 <http://www.oreilly.com/catalog/samba3/>; ISBN 9780596007690

25 <http://www.oreilly.com/catalog/learnredhatentlnx/>; ISBN 9780596005894

26 <http://www.oreilly.com/catalog/linag3/>; ISBN 9780596005481

27 <http://www.oreilly.com/catalog/1886411921/>; ISBN 9781886411920

28 <http://samba.org/samba/docs/man/Samba-Guide/>