Linux *vs.* Windows

Total Cost of Ownership Comparison

An examination of the purchase and total operational costs of running an enterprise on Linux and Open Source software in comparison to Microsoft's Windows computer system platforms

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Document Build: 291

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It is recommended that enterprises considering a migration to, or implementation of, an Open Source solution undertake their own Total Cost of Ownership and Return On Investment evaluations, specific to their requirements, prior to any such implementation. This document can therefore be considered a first-pass template for such a site-specific evaluation.

Acknowledgements

Cybersource gratefully acknowledges the support of Open Source Victoria in preparing this updated version of the Linux vs. Windows TCO Comparison document.

Open Source Victoria is an industry cluster, funded by the State Government of Victoria, Australia. Open Source Victoria consists of over 80 Victorian firms and developers which provide services and technology related to Free and Open Source Software (FOSS.) Open Source Victoria offers marketing, advocacy and information referral services, and aims to raise the profile of FOSS in Victoria and work with other similar organisations across Australia. For more information visit: http://www.osv.org.au/

Table of Contents

Executive Summary

There has been significant interest in the broader business community regarding the difference in the Total Cost of Ownership (TCO) between the Linux and Open Source solutions on one side and Microsoft's proprietary Windows solutions on the other. Microsoft software is licenced to users on a fee-for-product basis, whereas most Linux and open source applications are available free of charge. There are, however, installation and support costs to consider. We will take all such costs into consideration in the models we present.

While it is difficult to qualitatively analyse all of the TCO factors at play, it is possible to produce a reasonable first-pass quantitative estimate for the instantiation and operation of a complete computer environment and network infrastructure for a small-to-medium organisation, to illuminate the TCO differences between these two competing platforms.

To that end, we have modelled an organisation with 250 computer-using staff, an appropriate number of workstations, servers, Internet connectivity, an e-business system, network cabling and hardware, standard software, and salaries for IT professionals to establish and support this infrastructure and technology. We've also added IT training for the staff along with expenditure items for ancillary IT systems and external consulting staff to assist in making it all work.

We ran the model with two options: firstly, purchasing brand new hardware and network infrastructure explicitly for establishing this organisation's computer systems; and secondly, using pre-existing hardware and infrastructure. We also simulated the IT expenses over a 3 year period, mimicking the operational life-span of many corporate computer systems, and amortising the purchase and installation costs over that period of time.

Throughout this comparison, we will be presenting the raw data as well as the explicative methodologies used in the determination of the overall costs. While we have taken care and effort to present a holistic analysis, we are mindful that no organisation is likely to operate with the exact parameters presented here, and we therefore recommend the use of the document as a guide only. Consider this document as a primer which you can use to generate an enhanced TCO model specifically tailored for your organisation, by removing those line items which don't make sense for your site and adding additional costs which are specific to your organisation.

Further, while this document makes express use of technology and services found within the IT industry, it is intended for an audience of non-IT executives within small to medium sized organisations.

What's New

We've expanded and improved this version of the TCO document in many ways, to reflect

both the altered state of the IT industry and to enhance the validity and reality of the model. We add Microsoft's Software Assurance, which didn't exist three years ago, we've increased the level of expenses for external support and we've included training expenses for the first time.

Additionally, since various industry players have begun to claim that Linux is no longer free of cost because some enterprise Linux suppliers have enacted mandatory support contract agreements, we have also added one of these suppliers into our comparison. Therefore, from this version on, we compare and contrast standard Linux, Red Hat Enterprise Linux and Microsoft platforms.

We've also expanded the number of ancillary expenses, including such items as printers etc., to better reflect business realities.

TCO: Summary of Results

The final results are summarized in the tables below. One compares the TCO difference between *Standard Linux* (namely the one that isn't acquired with a pre-paid support contract) and Microsoft's platform. The second compares Red Hat's managed *Enterprise Linux* and Microsoft's platform. Both models include costings for deployment on either a site's existing equipment or through a complete hardware refresh.

Standard Linux Solution vs. Microsoft Solution

	Microsoft Solution	*Linux Standard Solution*	*Savings Achieved by Using Open Source*	*Percentage Saved*
Existing hardware & infrastructure is used	$1,066,712	$682,090	$384,622	36%
New hardware & infrastructure is purchased	$1,366,883	$1,012,260	$345,623	26%

	Microsoft Solution	*Red Hat Enterprise Linux Solution*	*Savings Achieved by Using Open Source*	*Percentage Saved*
Existing hardware & infrastructure is used	$1,066,712	$781,279	$285,433	27%
New hardware & infrastructure is purchased	$1,366,883	$1,111,450	$255,433	19%

Linux vs Windows TCO Comparison
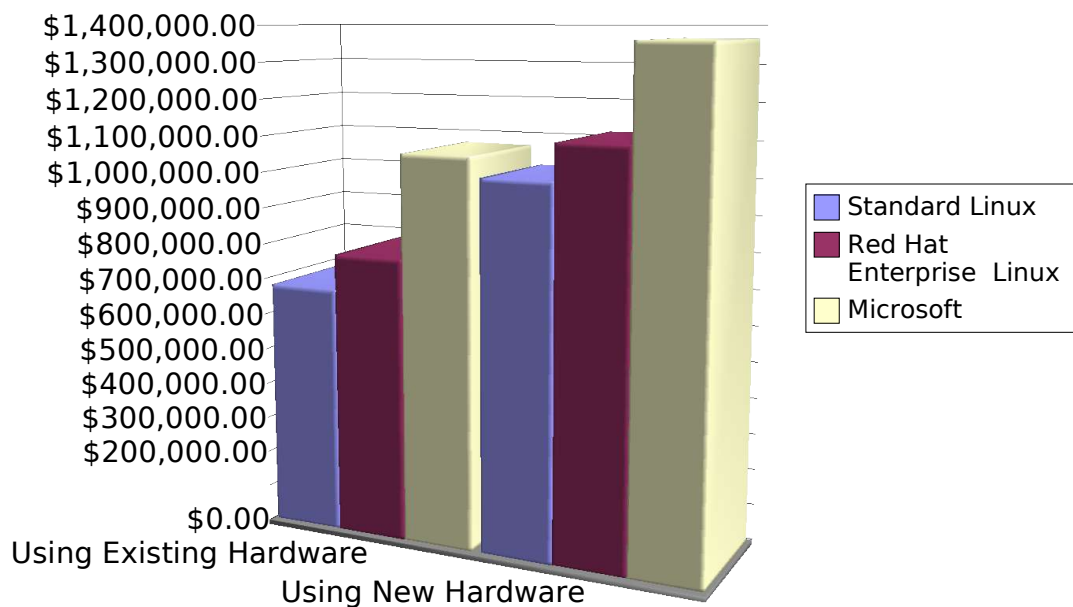
Throughout this document all prices are in US$ for ease of conversion to your currency, and correct as of 2004-09-16.

Document Build: 291

Introduction

In early 2002, Cybersource undertook a study into the differences in total cost of ownership between Linux and Open Source software on the one hand, and Microsoft's operating systems and applications on the other. Total cost of ownership is a measure of the total costs which each technology platform will incur for an organisation deploying that platform.

In late 2004, Open Source Victoria (OSV), an industry cluster promoting open standards and open source in business, government and education, requested an updated and improved version of that initial document. This is part of a documentation set that OSV is preparing to assist organisations considering the adoption of Linux and open source solutions.

This TCO comparison will be available online from now on at:

http://www.cybersource.com.au/about/linux_vs_windows_tco_comparison.pdf

This report is segmented into a number of sections Firstly, we cover the reasoning and methodology of the study itself. We also undertake a literature review, briefly examining other TCO studies which have arisen since we published our previous study.

We will also discuss research which has been undertaken recently looking into the costs of migration from Windows to Linux. Whilst this study isn't intended to provide a comparison of the costs of migration, we consider this to be a topic of broad interest, so offer what information we have found.

Additionally, we look at research which discusses the usability differences between Linux and Windows. This has bearing on calculating the costs of migration of staff from one platform to the other, as well as for calculating work efficiency differences between these two platforms.

How We've Tipped the Scales In Microsoft's Favour

Cybersource is known throughout the industry as a provider of Linux and open source solutions. There may therefore be a perceived bias towards these platforms. To counter this, we have prepared a totally transparent and open model where every single cost and assumption is documented and referenced. However, we've gone even further. We've tipped the scales markedly in Microsoft's favour. We've done this in four ways.

There exists survey research[1] by the Robert Frances Group which indicates that it takes 82% fewer resources to support Linux systems than Windows systems. If we applied these results to our model, expenses for the Linux side of the ledger would drop markedly. So we don't include them.

We have not included the costs of malware; viruses, spyware, worms, keyloggers, adware

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1   http://techupdate.zdnet.com/techupdate/stories/main/0,14179,2907876,00.html

etc. Every research point we have found suggests that this cost is essentially and predominantly a Windows platform cost, resulting in billions lost by business every year. The current list of viruses in the wild[2] includes not a single Linux virus. Additionally, Dell recently released information that up to 90% of its Windows customers suffer from spyware and other malware infestations, resulting in one of that vendor's biggest support headaches. None of these costs have been allocated to the model we use for Windows.

We have also not included the substantial costs which arise when systems need to be pre-emptively rebooted or worse, crash, resulting in unscheduled downtime. All our research indicates that Linux rarely if ever suffers such problems and open source platforms on the whole are extremely robust. In fact, none of the most robust systems tracked by research firm Netcraft UK[3] are Windows. All are open source platforms. System downtime costs can be astronomical, and if included in our model, would have resulted in further degradation of the Windows overall cost position.

Finally, because Microsoft has claimed that introducing Linux into an environment will lead to increased reliance on external consultants, we have *tripled* the amount budgeted for such requirements on both the standard Linux and Red Hat Enterprise Linux models. In reality of course, this is unnecessary.

A Note on Red Hat Enterprise Linux

Much has been made in the press that Linux and open source are now becoming commercial. This is incorrect. Linux and open source have *always been* commercial. Open source licences like the GPL are not anti-commercial, they are *anti-lockin*. Linux-vendor Red Hat's current offerings are as open source as standard Linux therefore. What you obtain when you pay for Red Hat Enterprise Linux is enterprise-grade support. It's your organisation's choice which model and which support premium you procure.

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2   *http://www.wildlist.org/WildList/RTWL.htm*

3   *http://uptime.netcraft.com/up/today/top.avg.html*

A Note on Methodology

When the first version of this TCO document was released, it was, to our knowledge, the first publicly available comparison of ownership costs between Linux/open source platforms and Microsoft's platform. The scenario policies we outlined were twofold. Firstly, to provide an even comparison, we assigned equivalent costs for all expenses unless corroborated research indicated otherwise.

Secondly, we proposed a putative organisation which could form (by extension) the basis of most any other organisation. By doing this, we provide the platform from which readers can adapt this TCO model to their own small-to-medium sized organisation. Our sample enterprise houses 250 computer using staff members. In theory, it should be possible to take this sample and halve, it, double it, quadruple it, or multiply it by 10. In other words, to scale it to your own organisation's dimensions,

There will be a point where your organisation's size will mean that a linear-interpolative approach to sizing will not necessarily work, but only you will be able to determine on where that point is, based on your understanding of your cost structures and IT requirements. When you reach that point, simply add those extra costs into this model as line items. Similarly, remove existing costs when you know that they don't apply to your situation.

What makes this particular TCO study important is that we explain, in sometimes droning detail, each and every step of our analysis. We also provide sources to every stipulated line item cost, for both Linux/open source and Microsoft Windows platforms. To our knowledge, no other TCO model sampling does this.

We hope to achieve two things by proffering this level of detail. Firstly, we want to dispel any notion that this study is in any way dubious. For each and every data point, you, the reader, are able to confirm our own research, results and conclusions. This provision marks the separation between hocus-pocus reports and science. We don't expect you to trust us. We expect you to either verify or refute our findings.

Secondly, by providing a detailed but generic model, we hope to provide you with the basis for your own TCO model. Simply take what we have provided and morph it into something which better befits your on organisation's requirements. The core, the hard work if you will, has been done already and awaits your patronage. As an organisation considering the TCO differences between Linux and Windows, you should ultimately not trust anyone's TCO study but your own. We provide you the basis for making this a reality.

Finally, if, for whatever reason, you feel that our model is lacking in any way or doesn't provide a real-world implementation of a small-medium-enterprise computing infrastructure, we want you to tell us why. Contact Cybersource directly via <info@cybersource.com.au> and speak your mind.

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Document Build: 291

Alternative Studies

Whilst Cybersource was perhaps the first to produce a TCO comparison of Linux and Windows, others have since followed. Each of these uses a different methodology. Each therefore can be considered orthogonal data points, if their methodology and raw data can be validated. It would thus be instructive to find at least two out of the group which give similar end-results. This could act as a form of confirmation for those two (or more) which offered similar such final results. Much like Science insists on the confirmation of methodology and results. We believe that at least one of the following studies confirms our study's results, thereby adding weight to the final numbers.

Robert Frances Group

The Robert Frances Group (RFG) conducted a survey to try and determine TCO comparison between Windows and Linux. Senior research analyst Chad Robinson found there were significantly lower labour costs for Linux, which allowed it to deliver a lower TCO compared to Windows.

Quoting a ZDNet article about this research:

> *In the survey, Linux admin salaries were slightly higher than Windows admins, with Linux at $71,400 per admin, and Windows at $68,500 per admin. But Linux admins took care of an average of 44 servers and Windows admins an average of 10. So the salary per processing unit was Linux, $12,010, and Windows, $52,060.[4]*

Issues

As yet, we haven't established our position on the veracity of this report's methodology and conclusions. We welcome input from readers on this matter,

IDC Windows vs Linux TCO report

In November of 2002 International Data Corporation was commissioned by Microsoft to prepare a TCO report contrasting Linux and Windows. This report, titled "Windows 2000 Versus Linux in Enterprise Computing" is available for you to download[5] and read.

Issues

Cybersource has several issues with the IDC report. For starters, links and references to raw data are not provided. We are unable to confirm or invalidate the summary results which IDC sets forth in its report.

Additionally, we noted the following comment by one of the report's authors (Dan

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4   *http://techupdate.zdnet.com/techupdate/stories/main/0,14179,2907876,00.html*

5   *http://www.microsoft.com/windows2000/docs/TCO.pdf*

Kusnetzky) in a interview published in BusinessWeek magazine of March 2003[6].

> *"One of the study's authors accuses Microsoft of stacking the deck. IDC analyst Dan Kusnetzky says the company selected scenarios that would inevitably be more costly using Linux."*

If the report had indeed been following pre-selected scenarios stipulated by Microsoft, with no references to underlying methodology and raw data, then this should be borne in mind by any readers of the report.

Yankee Group's TCO & Migration Comparison

Laura DiDio from The Yankee Group published a supposedly independent TCO analysis in April 2004 titled "Linux, UNIX and Windows TCO Report, Part 1." This report[7] was claimed to be a survey undertaken of 1,000 C-level managers in IT positions in various organisations.

The report's results were that the large majority of respondents believed that Windows still offered them better TCO.

Issues

There are a number of serious issues with this study. According to an analysis[8] done by the IT legal investigative resource Groklaw, the reports' author used online ballots and survey tools to extract information from the respondents. The approach of using online surveys has generally been discredited as an invalid tool for such research.

Secondly and more importantly, Ms. DiDio sourced her respondents from the Win2KNews mailing list operated by Sunbelt Software, a Microsoft Partner. This list and its operator cannot be judged as impartial for the purposes of providing an unbiased sampling pool.

> *"Located in Tampa Bay, Florida, Sunbelt Software is the first and one of the largest providers of "best-of-breed" Windows NT, 2000/2003 utilities, supplying the tools necessary to support a Windows NT/2000 infrastructure. Working in partnership with innovative software developers, Sunbelt Software produces leading edge utilities and provides mainframe quality technical support. Sunbelt Software Inc. is a member of the 2001 Inc. 500 list of America's fastest growing companies. . . .*
>
> *"Sunbelt is a Microsoft Gold Certified Partner interested in what Windows network administrators need to solve their NT/2000 problems.*

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6   http://www.businessweek.com/magazine/content/03_09/b3822610_tc102.htm

7   http://download.microsoft.com/download/6/b/7/6b7c5fa1-fcc9-434e-b1e6-
    5025b7f97786/YankeePart1.pdf

8   http://www.groklaw.net/article.php?story=20040324085956154

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We are constantly surveying NT/2000 administrators to determine which utilities are most in demand, and we then release best-of-breed solutions, leveraging the Internet as our primary marketing medium. Our client list contains over 90% of the Fortune 1000."

Such information must be kept in mind when reading through this report.

Soreon/Research & Markets TCO Comparison

This is perhaps the first major independent study contrasting Linux against Microsoft software. The upshot is that Linux was shown to have a lower TCO by upto 30%. What makes this study of particular importance was that data was collected from interviews conducted with 50 different enterprises. This translates into a real-world demonstration, rather than just another model.

Published by Soreon/Research and Markets the report[9] (titled "Saving Cash: A Comparison of Open Source and Proprietary Software") presents a detailed TCO calculation of Linux and open source software and Microsoft software. It offers case histories, studies into licensing costs, wage and training costs, etc.

Out of the list presented, this study is perhaps the most clearly and openly independent. The firm which produced the report expressly establishes its methodology and offers its results.

Interestingly out of all the various TCO studies presented here to provide a contrast to ours as a separate data point, this independent research closely matches our own results, thus providing some corroborative value.

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9   http://www.researchandmarkets.com/reportinfo.asp?cat_id=0&report_id=227601

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Document Build: 291

A Look at Migration Costs

One of the most common questions we were asked when the first version of this TCO study was published, concerned the costs of migration from Windows to Linux and open source. Many readers were using the Microsoft Windows platform and associated applications and had followed our TCO model to reach a conclusion that adopting Linux would indeed result in lower ongoing TCO. What they sought were answers to questions on the ease and cost of migration to Linux.

Whilst the focus of this TCO report is not to calculate the costs of migrating from Microsoft Windows to the Linux platform, we have undertaken initial research into this subject, which we will touch upon briefly here. We will also prepare a more comprehensive analysis to be published as a separate Windows to Linux Migration Cost report in the coming months.

Migrating to Open Source 90% Less than Upgrading Microsoft

To tide us over until that more comprehensive analysis is undertaken, we have found a recently released independent study by the Dutch government. In that report[10], the researchers found that migrating to an open source desktop productivity platform was *90% less expensive* than migrating to the new version of the Microsoft productivity platform. This included accounting for all the costs of migration, such as re-training, re-development of macros and add-on applications, any conversion costs for existing documents etc.

As this is only a single data point, it would be impossible to rely on the results as a template for all Microsoft-to-open source migrations. However, it is independent research, undertaken by a public sector organisation which has no vested interest in either Microsoft's nor Linux's position in this matter. This research was also based on a large scale migration, involving over 2000 desktops. Certainly within the realm of organisational size we are considering in this TCO,

There is another important point to consider when modelling your organisation's cost of upgrading to a newer version of Microsoft products versus the cost of migrating to Linux and open source. Most organisations will likely factor in the costs associated with a single upgrade-versus-migration cycle. By this we mean an organisation calculating the cost of upgrading to the next version of the Microsoft product versus migrating to Linux, rather than including the subsequent upgrades as well.

Many of the costs of upgrading to newer versions of Microsoft platforms (licences, software assurance etc.) have to be borne again and again. Most of the costs of migrating to Linux are borne once, during the initial migration. Any subsequent upgrades for that Linux platform occur with no licence costs nor software assurance costs. Therefore, to provide a more realistic appraisal and model of this scenario, you should include two or

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10 http://europa.eu.int/ida/en/document/3434/469

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three full refresh lifecycles, stretching over a period of 5-10 years. Therefore rather than an upgrade versus migration, you contrast costs of an upgrade-upgrade-upgrade versus migration-upgrade-upgrade process.

Usability Issues

Another factor which many correspondents raised on the release of the first version of this document, was the relative usability of Microsoft platforms and Linux. Our research into the topic found a study[11] undertaken by industry analysts Relevantive. According to a PC World[12] article on the study:

> *"The researchers studied how easily two groups of users could perform tasks using the different operating systems. One group consisted of 60 users between 25 and 55 with computer skills but no prior experience with Linux or Windows XP. They tested the pre-configured open source software according to various criteria, such as the ease of creating and administrating new and existing files, copying CDs, and performing some basic office tasks, such as composing a text and sending an e-mail."*

Also, the study calculated that the time difference to undertake these sets of activities between the two platforms, only differed by on 8%. Finally, the report concluded with:

> *"80 percent of the Linux users believed that they needed only one week to become as competent with the new system as with their existing (presumably Windows -- Ed) one"*

According to the report therefore, average Windows users should be in a position to display competence and equivalent comfort with Linux after perhaps a week's usage. Such factors should be costed by any firm looking to migrate across from Windows to Linux desktops.

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11 http://www.relevantive.de/Linux_e.html
12 http://www.pcworld.com/news/article/0,aid,111871,00.asp

Cybersource

Document Build: 291

Total Cost of Ownership

Hardware, Platforms

In our analysis of the costs of installing and running IT for an organisation of 250 users, we will look to include the following purchase, installation and operation cost items:

New Workstation Hardware [optional]

We will run with two separate models. The first model will involve our postulated example organisation acquiring totally new workstation hardware. For our purposes, we will seek current-generation, middle-tier workstations, from a top of the line, internationally-recognised computer firm, which supports both Microsoft and Linux[13] platforms. We will also run another costing model, where it will be assumed that no additional workstation systems are needed and that our example organisation will rely on pre-existing, *in-situ* workstations for its users.

New Server Hardware [optional]

As with the workstations, in one model, we will acquire the necessary server hardware to accomplish our business needs, and in the other model, we will use the example organisation's already-acquired server hardware. The hardware will be sized and specified for the tasks assigned to each server, including Internet connectivity and security, email, e-commerce, file and print serving and database serving. The hardware will be costed from the prices published by an internationally-recognised computer firm, which supports both Microsoft and Linux platforms. Our second model will use pre-existing servers, with no new acquisitions necessary.

New Network Infrastructure [optional]

All the user workstations and servers need to be linked via a viable network infrastructure. Rather than costing this item through specific hardware, cabling and installation costs, we will introduce a figure of US$100 per computing-unit to connect to this infrastructure. This will be required for the first model, in which we are constructing a computer network from scratch. In the second model, we will assume this infrastructure exists, and our staff can simply plug the computing nodes into it.

Platform Software

All our workstations and servers will need an *operating system* in order to be able to perform any real functions. This, like the hardware, has a cost of acquisition, installation

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13 *Vendor hardware will actually be expected to support POSIX compliant Open Source operating systems, including Linux, NetBSD and OpenBSD.*

and support. The workstation system software will provide the necessary functionality for all the example organisation's staff to login, use a current-generation Graphical User Interface to navigate to applications and provide base-level networking and access-security functionality that is IT industry best-practice of the present day. The server system software will provide all the necessary standard functionality required by most comparable-sized organisations, including file and print sharing, email, Internet connectivity and acceleration through a broadband connection, Server security (authenticated login), Internet security (perimeter firewall technology), internal knowledge management server, external e-commerce solution, as well as the pre-requisite network infrastructure and support technologies needed by this list of services; i.e. SQL database servers, Domain Name Servers, etc.

The cost of the operating system will be primarily calculated based on any per-seat and per-machine license costs as garnered from information provided by the operating system vendors themselves. Additionally, Client Access Licences, if any, will also be added.

Microsoft Software Assurance

One important new platform provision from Microsoft is called Software Assurance. Microsoft customers acquire this value-add as a way to open the door to support and upgrade facilities. Software Assurance is calculated at either 25% of the purchase cost per annum for Microsoft server products or 29% of the purchase cost per annum for Microsoft desktop products[14]. In order to comply with Microsoft's best-practice requirements for our sample organisation and to ensure the right to future upgrades, we've included Software Assurance in our model.

Red Hat Enterprise Linux

While users are able to obtain the same software for minimal or no cost, some organisations may prefer to obtain the branded enterprise support from a tier-1 Linux vendor such as Red Hat Inc. We have therefore included this option as one of the models in this updated TCO report. Red Hat provides a managed system updating service, along with various other support platforms[15]. Other Linux vendors, such Novell, also provide similar packaged Linux support solutions which can also be used in determining ownership costs.

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14 http://www.microsoft.com/licensing/programs/sa/faq.mspx
15 http://www.redhat.com/software/rhel/

Applications, Salaries

Office Productivity Applications

As with users in other organisations, our users will perform most of their daily computer-related tasks on office productivity applications. Included in this are programs like a word-processor, spreadsheet, Internet-enabled e-mail, web browsing, and related functions. Our applications need to interoperate with *de facto* industry standards, which means that they need to be able to comfortably open and save Microsoft Office file formats, use Internet communication protocol standards, as well as World-Wide Web Consortium (http://www.w3c.org) HTML and XML document standards.

For costing our Windows platform solution, we will use primarily Microsoft-produced productivity applications and cost the solution based on the prices published by the vendor. For our Linux solution, we will use the new OpenOffice.org productivity suite (co-developed by Sun Microsystems) along with the Mozilla Firefox web browser (co-developed by Netscape, an AOL company) for viewing web-pages and Thunderbird for email. The full details of these applications are provided in the following pages and from the relevant web sites (see Appendix 2 for URLs).

Line of Business Software

Almost all organisations require some custom-built, or pre-developed industry-specific line-of-business applications for purposes such as accounts, billing, customer management and payroll. As each industry uses often different and differently costed instantiations of this type of software, it is difficult to give exact prices for our example organisation. For our purposes, we will allocate a reasonable costing for the sum total of this software, to both our Linux and Microsoft platform comparisons, to produce fair and equitable results.

Specific Technical Applications

Most organisations that use computer workstations have groups, such as small numbers of technical or specialist staff, which require and utilise specific technical applications, for such needs as desktop publishing (including generation of Adobe® PDFs), computer graphics manipulation or software development. Once again, as our example organisation cannot represent all possible industries, we will include a proportionally small number of workstations, equipped with this style of software, to provide a more realistic model.

Staff Salaries

Any organisation of a comparable size to our example organisation, requires IT services, provided either by an in-house team, or outsourced to a service provider. We will cost the salaries and sundry expenses of having a team of 3 permanent staff, and include this in our analysis. The staff will comprise a senior, systems-level person, a mid-tier generalist, and a

junior support person. We will base the salary costs on numbers produced by online placement and search firm figures. The staff chosen to fill the roles will be trained and expert in either of our competing Microsoft or Linux platforms.

Installation and Configuration Costs

As we will have in-house staff trained in our platforms of choice, we will be using their expertise to design, build and configure our network, servers and workstations. The costs of doing so will be covered by their annual salaries.
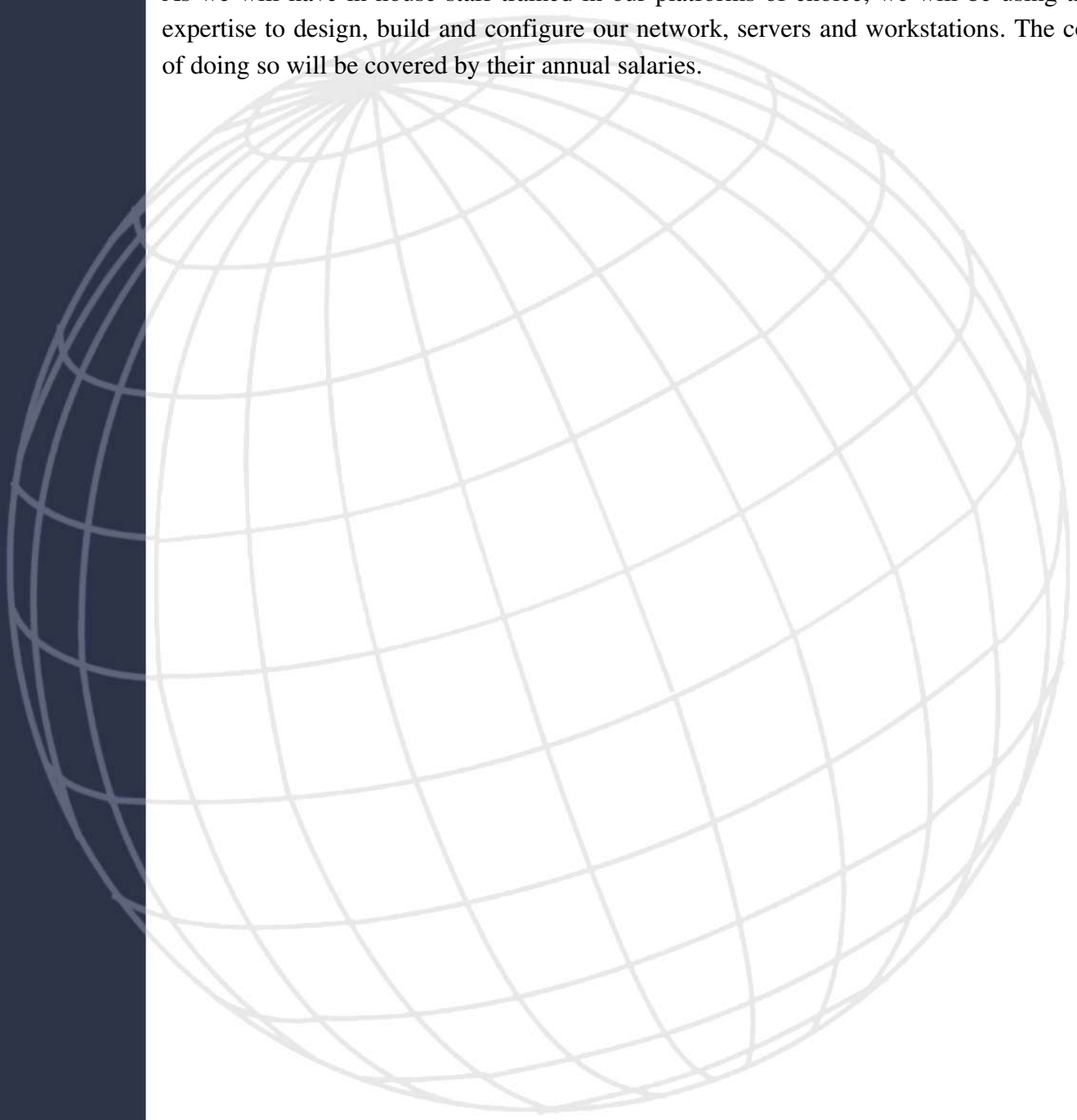
Service Charges

Internet Connectivity

The monthly Internet connectivity bill will be likely to vary greatly based on both usage and the country in which our example organisation is located. Some countries have expensive dial-up or timed local connections, others have high broadband connectivity costs. Rather than look for the lowest cost or highest cost, we will settle on an Internet service plan from a mid-tier provider, in a mid-level cost country.

Consultancy fees

As with most organisations that sustain an IT infrastructure, our example organisation will have the sporadic need to invoke industry-sector experts to fulfil requirements which fall outside the knowledge boundaries and skill-sets of the organisation's core permanent staff. It is once again difficult to provide an accurate cost for these required services, but a realistic figure of US$45,000 over the lifetime of this TCO model has been specified, and applied to the Microsoft[16] solution. We have however decided to apply a different cost structure to the Linux environment.

In the first version of this document, we received feedback along the lines that Windows platforms would be easier and less costly to acquire external support for, as they have been in widespread use for a longer period of time. Our experience disputes this, but for the purposes of responding to these requests, we have weighted external consultancy fees for Linux differently than for Windows.

For both the Standard and Enterprise Linux solutions a figure of triple the allocation (to $135,000) of the Microsoft consultancy fee will be used. In the case of the Enterprise Linux solution this will be above and beyond the consultancy and support incorporated already with the Enterprise Linux products.

Training

We will allocate US$30,000 for training for our organisation's staff over the lifetime of this TCO model. With this budget allocation, they will be trained for increased competence in either of the Microsoft Windows or Linux open source platforms by commensurate commercial training firms.

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16 **Although the Microsoft Software Assurance program includes some support, that level of support explicitly excludes support that is "more proactive and consultative in nature" - Microsoft clients requiring those services are advised by Microsoft to obtain a Premium Services support contract.**

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Document Build: 291

Miscellaneous

This category will provide a catch-all, for any and all unforeseen or forgotten budgetary allocations which duly arise in real-world IT environments.

Detailed Software Solutions

Over the next several pages we will outline the core software components of our two competing platform technologies: Microsoft® Windows and associated desktop and server software and applications, and Linux/Open Source and associated desktop and server software and applications.

By way of explanation of the purpose of the servers, the file and print servers are included to provide corporate file-sharing facilities.

The mail server is used by all users to send and receive Internet-standard e-mail.

The Intranet server is used to provide the organisation's knowledge repository, portal and groupware requirements, all back-ended by an SQL database.

The firewall provides advanced perimeter defence against Internet crackers.[17]

The proxy-server is used to provide web-cache and download acceleration functionality.

The Internet-visible e-business/e-commerce server provides the client-required communication facilities and web-publishing to satisfy our organisations web-marketing communications needs, also back-ended by a production SQL server.

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17 The firewall can be extended to incorporate advanced traffic management (traffic shaping) and more advanced security features such as the inclusion of a Virtual Private Network (VPN).

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Windows Platform Solution

For our Windows platform solution, we have selected the following operating systems, back-office technologies and office productivity tools.

Product	Price (USD)	Supplier	Comments
Symantec AntiVirus Corporate Edition	$37.90	Symantec	Price is per license when ordered in quantities of 100 to 250.
Windows Server 2003	$3,999.00	Microsoft	32-bit Enterprise, includes 25 CALs
Microsoft Internet Information Server (web server)	Free	Microsoft	Bundled with Windows 2003 Server.
Microsoft Commerce Server 2002	$19,999.00/CPU	Microsoft	Price is for enterprise edition. Requires Microsoft SQL.
Microsoft ISA 2004	$1,499.00/CPU	Microsoft	Standard edition. Enterprise edition not yet available.
Microsoft SQL Server	$19,999.00/CPU	Microsoft	Retail price for Enterprise version. Despite the price, this is actually cheaper than a server and CAL based solution.
Microsoft Exchange 2003	$3,999.00 plus $67.00/CAL	Microsoft	Requires Windows 2003 Server. Enterprise edition.
Microsoft Visual Studio .Net 2003	$2,499.00	Microsoft	Enterprise Architect version.
Windows XP Professional	$299.00 (per user)	Microsoft	
Microsoft Office Standard	$399.00	Microsoft	

Product	Price (USD)	Supplier	Comments
Microsoft Software Assurance Program for Servers	25%/year	Microsoft	25% of initial purchase price per year.
Microsoft Software Assurance Program for workstations	29%/year	Microsoft	29% of initial purchase price per year.
Photoshop CS	$649.00	Adobe	
Acrobat Standard	$299.00	Adobe	

Linux Platform Standard Solution

For our standard Linux platform solution, we have selected the following open source back-office technologies and office productivity tools.

Product	*Price (USD)*	*Comments*
Linux boxed sets (options)		Linux distributions suitable for being servers and workstations. Only one copy needed. Where possible prices have been obtained from the distributor. Alternatively, you can download many of these for free from the Internet.
Debian 3.0 (stable)	$16.99 [18]	
Fedora Core 2	$15.99 [19]	
Mandrake 10.0 Bundle	$84.90	
Slackware 10.0	$39.95	
SuSE 9.1 Professional	$89.95	
Apache (web server)	Included with Linux distributions or free download.	An efficient and extensible web server used on more than 67% of the Internet.[20]
Squid (proxy server)	Included with Linux distributions or free download.	
MySQL or PostgreSQL	Included with Linux distributions or free download.	
IPTables (firewall)	IPTables included with Linux distributions or free download.	State and packet based filtering. PF provides greater functionality (including traffic shaping).
Sendmail or Postfix (mail server)	Included with Linux distributions or free download.	
KDevelop (IDE)	Included with Linux distributions or free download.	

18 Price obtained from reseller (freesoftwarecdr.com).
19 Price obtained from reseller (freesoftwarecdr.com).
20 Figure obtained from netcraft.com.

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Document Build: 291

Product	Price (USD)	Comments
GIMP (graphics)	Included with Linux distributions or free download.	
OpenOffice (productivity suite)	Included with Linux distributions or free download.	Standard file formats include Star, Open & Microsoft Office files, plus can generate PDF files.
OSCommerce (e-commerce system)	Available from: http://oscommerce.com/	

NB: As Linux is generally taken to be immune from viruses in general, and from Windows viruses specifically, we have not added any virus-scanning software to this list.

Linux Platform Enterprise Solution

For our enterprise level Linux solution, we have selected the following open source back-office technologies and office productivity tools. The primary difference between the Enterprise Linux solution and the standard one is the incorporation of an ongoing support contract with the Linux vendor. The Red Hat Enterprise Linux solution is based on an annual subscription model and three (3) years' worth of annual subscriptions will need to be included in the cost.

Product	Price (USD)	Comments
Red Hat Enterprise Linux:		Red Hat Enterprise Linux Workstation (WS), Enterprise Server (ES) and Application Server (AS) editions available. Difference of types (basic, standard or premium) tend to reflect level of support offered by Red Hat.
RHEL WS (basic, x86)	$179.00 (per annum)	
RHEL WS (standard, x86)	$299.00 (per annum)	
RHEL ES (basic, x86)	$349.00 (per annum)	
RHEL ES (standard, x86)	$799.00 (per annum)	
RHEL AS (standard, x86)	$1,499.00 (per annum)	
RHEL AS (premium, x86)	$2,499.00 (per annum)	
SuSE Enterprise Server 9:		
2 CPU edition	$389.00	

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Document Build: 291

Product	Price (USD)	Comments
16 CPU edition	$939.00	
Apache (web server)	Included with Linux distributions or free download.	An efficient and extensible web server used on more than 67% of the Internet.
Squid (proxy server)	Included with Linux distributions or free download.	
MySQL or PostgreSQL	Included with Linux distributions or free download.	
IPTables (firewall)	IPTables included with Linux distributions or free download.	State and packet based filtering. PF provides greater functionality (including traffic shaping).
Sendmail or Postfix (mail server)	Included with Linux distributions or free download.	
KDevelop (IDE)	Included with Linux distributions or free download.	
GIMP (graphics)	Included with Linux distributions or free download.	
OpenOffice (productivity suite)	Included with Linux distributions or free download.	
OSCommerce (e-commerce system)	Available from: http://oscommerce.com/	

NB: As Linux is generally taken to be immune from viruses in general, and from Windows viruses specifically, we have not added any virus-scanning software to this list.

Scenario 1: All New Hardware

Scenario 1 incorporates the purchasing of brand new hardware and network infrastructure explicitly for fulfilling our example organisation's computer systems requirements

The scenario is based on a network of 250 users, all requiring standard office productivity solutions, email, Internet services & SQL data access as well as a small number of specialist technical/developer workstations.

Based on a 3-year period, the model aims to mimic the operational life-span of most corporate computer systems, and amortise the purchase and installation costs over that period of time. The Hardware Requirements for this Network are outlined below.

- 245 x Standard Workstations	- 1 x Proxy/Firewall Server
- 3 x Developer Workstations	- 1 x Intranet & SQL Server
- 2 x Graphics/Design Workstations	- 1 x E-Business Server
- 1 x Mail Server	(incl. SQL & Webserver)
– 5 x File/Print Server	

	Microsoft Windows	*Linux (Standard)*	*Linux (Enterprise)*
Hardware			
Workstation	$275,444.50	$275,444.50	$275,444.50
Server	$24,111.00	$24,111.00	$24,111.00
Printers	$7,615.00	$7,615.00	$7,615.00
Network Infrastructure	$25,900.00	$25,900.00	$25,900.00
TOTAL Hardware Costs	$330,170.50	$330,170.50	$330,170.50
Software			
Platform Software	$110,741.00	$89.95	$99,279.00
Office Productivity Applications	$173,146.00	$0.00	$0.00
Specific Technical Applications	$9,393.00	$0.00	$0.00
Microsoft Software Assurance	$211,432.00	N/A	N/A
TOTAL Software Costs	$504,712.00	$89.95	$99,279

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Document Build: 291

	Microsoft Windows	Linux (Standard)	Linux (Enterprise)
Operating Costs			
Staff Salaries	$444,000.00	$474,000.00	$474,000
Internet Connectivity	$18,000	$18,000	$18,000
Consultancy Fees	$45,000	$135,000	$135,000
Training	$30,000	$30,000	$30,000
Miscellaneous	$25,000	$25,000	$25,000
TOTAL Operating Costs	$532,000	$682,000	$682,000
TOTAL COSTS	$1,366,883	$1,012,260	$1,111,450
Open Source Savings		$345,623.00	$255,433.00
% of Total Cost		25.94%	18.69%

Scenario 2: Pre-Existing Hardware

Scenario 2 is based on a network of 250 users using pre-existing hardware, with all users requiring standard office productivity solutions, email, Internet services & SQL data access as well as a small number of specialist technical/developer workstations. Full staff salary costs, Internet connectivity, IT consultancy and Miscellaneous costs are also factored into the calculations.

Based on a 3 year period, the model aims to mimic the operational life-span of most corporate computer systems, and amortise the purchase and installation costs over that period of time.

	Microsoft Windows	*Linux (Standard)*	*Linux (Enterprise)*
Software			
Platform Software	$110,741	$90	$99,279
Office Productivity Applications	$173,146	$0	$0
Specific Technical Applications	$9,393	$0	$0
Microsoft Software Assurance	$211,432	$0	$0
TOTAL Software Costs	$504,712	$90	$99,279
Operating Costs			
Staff Salaries	$444,000	$474,000	$474,000
Internet Connectivity	$18,000	$18,000	$18,000
Consultancy Fees	$45,000	$135,000	$135,000
Training	$30,000	$30,000	$30,000
Miscellaneous	$25,000	$25,000	$25,000
TOTAL Operating Costs	$562,000	$682,000	$682,000
TOTAL COSTS	$1,066,712	$682,090	$781,279
Open Source Savings		$384,622	$285,433
% of Total Cost		36.06%	26.75%

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Document Build: 291

Software Licence Costs

The following information is essentially an update of the research in Cybersource's *Linux vs Windows Pricing Comparison*. Prices are supplied for all standard office productivity solutions, email, intranet and Internet services, e-commerce & SQL data access. A small number of specialist technical/developer workstations are also needed. Our requirements include:

- 245 x Standard Workstations	- 1 x Proxy/Firewall Server
- 3 x Developer Workstations	- 1 x Intranet & SQL Server
- 2 x Graphics/Design Workstations	- 1 x E-Business Server
- 1 x Mail Server	(incl. SQL & Webserver)
– 5 x File/Print Server	

Microsoft Solution Software Cost

Product License	Quantity	Price (USD)
Symantec AntiVirus Corporate Edition	250 copies	$9,475
MS Windows Server 2003	9 copies	$35,991
MS Internet Information Server	2 copies	$0
MS Commerce Server 2002	1 copy	$19,999
MS ISA Standard Server 2004	1 copy	$1,499
MS SQL Server	1 processor license	$19,999
MS Exchange Server 2003	1 copy	$3,999
MS Windows XP Professional	250 copies	$74,750
MS Visual Studio .NET Enterprise Architect 2003	3 copies	$7,497
MS Office 2003	250 copies	$99,750
Adobe Acrobat Standard	2 copies	$598
Adobe Photoshop CS	2 copies	$1,298
Additional MS Windows Server 2003 Client Access Licenses	25 licenses	$1,675

Document Build: 291

Product License	Quantity	Price (USD)
Additional MS Exchange Server 2003 Client Access Licenses	250 licenses	$16,750
Microsoft Software Assurance Program for Servers	25.00% of $99,912.00 per year for 3 years	$74,934
Microsoft Software Assurance Program for workstations	29.00% of $181,997.00 per year for 3 years	$136,498
Total:		$504,712

Linux Standard Solution Software Cost

Product License	Quantity	Price (USD)
Linux distribution (e.g. SuSE 9.1 Professional)	Only 1 copy required.	$89.95
Apache (web server)	Provided with distribution.	$0.00
Squid (proxy server)	Provided with distribution.	$0.00
MySQL or PostgreSQL (database)	Provided with distribution.	$0.00
IPTables (firewall)	Provided with distribution.	$0.00
Sendmail or Postfix (mail server)	Provided with distribution.	$0.00
KDevelop (IDE)	Provided with distribution.	$0.00
GIMP (graphics)	Provided with distribution.	$0.00
OpenOffice (productivity suite)	Provided with distribution.	$0.00
OSCommerce (e-commerce system)	Only 1 copy required (free download).	$0.00
Total:		$89.95

All prices are in US$ for ease of conversion to your currency, and correct as of 2004-09-16.

Linux Enterprise Solution Software Cost

The Red Hat Enterprise Linux solution is based on an annual subscription model.

Product License	Quantity	Price (USD)
RHEL AS (premium, x86)	1 copy[21]	$0
RHEL ES (standard, x86)	3 copies	$7,191
RHEL ES (basic, x86)	5 copies	$5,235
RHEL WS (standard, x86)	5 copies	$4,485
RH Desktop Satellite Starter Pack	1 pack	$40,500
RH Desktop Extension Pack[22]	4 packs	$42,000
Apache (web server)	Provided with distribution.	$0
Squid (proxy server)	Provided with distribution.	$0
MySQL or PostgreSQL (database)	Provided with distribution.	$0
IPTables (firewall)	Provided with distribution.	$0
Sendmail or Postfix (mail server)	Provided with distribution.	$0
KDevelop (IDE)	Provided with distribution.	$0
GIMP (graphics)	Provided with distribution.	$0
OpenOffice (productivity suite)	Provided with distribution.	$0
OSCommerce (e-commerce system)	Only 1 copy required (free download).	$0
Total:		$99,279

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21 Normally costs $2,499.00, but a copy is included with the Red Hat Desktop Satellite Starter Pack.

22 Licensing for 50 extra users

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Document Build: 291

Hardware Specification and Costs

1 x Mail Server

IBM xSeries 335, Part Number 8676G2X

- Processor: 1x(Std.) xSeries 3.2GHz 533MHz 1024KB L3 Cache Xeon

- Memory: 1024MB PC2100 CL2.5 ECC DDR SDRAM DIMM

- Maximum Memory: 8GB

- Storage: 80GB EIDE 7200rpm Hard Drive

- Maximum Storage: 200GB

- Optical Drive: CD-ROM Drive Internal 24X-10X (Variable Speed)

- Ethernet: Dual Integrated 10/100/1000 Mbps Ethernet

- Power: (1x) 411W Power Supply

- Peripherals: IBM Keyboard and Mouse

- Operating System: Costs removed from published price to provide an OS-neutral figure

Total Cost: $2,679.00

1 x Proxy / Firewall Server

Same specifications as mail server.

Total Cost: $2,679.00

5 x File / Print Servers

Same specifications as mail server.

Total Cost: $2,679.00 x 5 = $13,395.00

1 x Intranet and SQL Server

Same specifications as mail server.

Total Cost: $2,679.00

1 x E-Business Server

Same specifications as mail server.

Total Cost: $2,679.00

Therefore, total cost of Server Hardware = $24,111.00

245 x Generic Workstations

IBM ThinkCentre M Series M50 8187E8U

- Processor: Intel Pentium 4 Processor at 2.8GHz with 512KB L2 Cache and 533MHz Front Side Bus

- Memory: 512MB SDRAM

- Monitor: IBM ThinkVision L170 Monitor

- Hard Drive: 40GB EIDE 7200rpm Hard Drive

- Optical Drive: 48X Max CD-ROM Drive

- Graphics: (Std.) Intel Extreme Graphics 2

- Audio: (Std.) SoundMAX Cadenza

- Ethernet: Intel PRO/100 Gigabit Ethernet w/Wake on LAN

- IBM Keyboard and Mouse

- Cost of Operating System removed from final price

Total Cost: $1,097.10 x 245 = $268,789.50

3 x Developer Workstations

Same specifications as standard workstations, but with 1024MB of RAM and 64MB DDR NVIDIA GeForce 4 MX 440 AGP 8X ATX video card..

Total Cost: $1,331.00 x 3 = $3,993.00

2 x Standard Workstations

Same specifications as developer workstations.

Total Cost: $1,331.00 x 2 = $2,662.00

Therefore, total cost of workstation hardware = $275,444.50

1 x Multifunction Printers / Copiers / Fax / Scanners

HP Officejet 7410 "All-in-one"

- Colour thermal jet

- Scanner

- Photocopier

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- Facsimile

- network connected

<div align="right">

Total Cost: $499.00 x 1 = $499.00

</div>

4 x High performance duplex laser printer

HP Laserjet 4250dtn

- Black and white, high speed laser

- network connected

- duplex printing

<div align="right">

Total Cost: $1,779.00 x 4 = $7,116.00

Therefore, total cost of printing hardware = $7,615.00

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Document Build: 291

Salaries and Services Costs

Network Infrastructure Specification and Costs

Network Infrastructure is calculated as the cost of equipping one computer, whether it be a workstation or a server, with a connection point on a port or a switch, appropriate cabling and a wall socket, as per current industry best-practice. Research has shown this turns out to be approximately $100 per computer.

Therefore, network infrastructure is calculated as the number of computers multiplied by $100.

Total Cost of Network Infrastructure 259 x $100 = $25,900.00

Staff Salary Specifications and Costs

Staff for both our Windows platform model and our Linux/Open Source environment were sourced from online placement agency firms (such as Dice.com and Mojolin.com). We performed a search using some of the core technologies required for both platforms, and itemised three core staff members for our example organisation. We require a Senior systems administrator and co-ordinator, reporting to our example firm's executive management. We also require a mid-level generalist, and a junior help-desk support staffer. Ancillary or specialist technical services will be provided by external consultants.

Windows Platform Permanent Staff

Salary for Senior Systems Admin   @ $66,000.00 per-annum for 3 years = $198,000.00

Salary for Mid-level Systems Admin   @ $46,000.00 per-annum for 3 years = $138,000.00

Salary for Junior Support Admin   @ $36,000.00 per-annum for 3 years = $108,000.00

Total Cost of Windows Platform Permanent Staff = $444,000

Linux Platform Permanent Staff

Salary for Senior Systems Admin   @ $71,000.00 per-annum for 3 years = $213,000.00

Salary for Mid-level Systems Admin   @ $49,000.00 per-annum for 3 years = $147,000.00

Salary for Junior Support Admin   @ $38,000.00 per-annum for 3 years = $114,000.00

Total Cost of Linux Platform Permanent Staff = $474,000

Specialist Consultancy Services

Most organisations need specialist external IT consultancy services and the same applies for our example organisation. Previously we have allocated the same funds for sourcing

external consultants for both Windows and Linux, but this time we have allocated three times as much to the Linux consultancy in order to respond to feedback we received from the first version of this document.

Total Cost of Specialist Windows Consultancy Services = $45,000

Total Cost of Specialist Linux Consultancy Services = $135,000

Training

We will allocate US$30,000 for training for our organisation's staff over the lifetime of this TCO model. With this budget allocation, they will be trained for increased competence in either of the Microsoft Windows or Linux open source platforms by commensurate commercial training firms.

Total Cost of Training $30,000

Appendix 1
Pricing Research Method

Software and Hardware

To retrieve software and hardware prices, we visited the official sites for the vendors cited. We then navigated the site or used web-based cost-calculators until a price was found for the product required. Although this may have not been the cheapest price, we consider that the price on the official site would be the most authoritative price and would be truly indicative. We have provided all web addresses to these pricing web pages within this document for your reference (see also Appendix 2).

When it came to Microsoft licensing agreements, the price of the software was taken from the vendor's site and if additional user licenses were needed, their price (once again taken from the Microsoft website) was added onto the cost of the product. We also included Microsoft's pricing for Software Assurance.

Salaries, Services and Miscellaneous

For staff salaries, we researched the costs for both Linux and Windows platform staff via online staff recruitment and placement firms. For consultancy and miscellaneous costs, we chose a medium, industry-generic cost figure and applied it equally to both Linux and Windows costing models. We've also used a mid-level cost for business-grade ISP connectivity, as indicated on our chosen ISP's pricing page.

Pre-installed Operating Systems

Many organisations purchase workstations with software such as Windows XP or 2000 Professional pre-installed. As the purchase price of the operating system (Windows XP, 2000) is included in the purchase price of the workstation we have had to remove the Original Equipment Manufacture (OEM) licence costs from our calculations. As such, it is assumed that all server and workstation hardware is purchased with *no* operating system license whatsoever, and that this operating system license cost is now to be included in our calculations as a separate line-item.

A Note on Upgrading Older Windows Operating Systems

As you by now would have realised, this study makes the assumption that the model organisation in question is implementing systems and application software from scratch. Many people will likely ask if this is a realistic model for making price comparisons, as many organisations in the real-world would likely already have many older versions of Windows (95, 98) operating systems and Microsoft productivity software (Office 95, 97)

on-hand, with which to procure upgrades with. This may be true, but our mission is to present a 'greenfields' company licensing costing, where these pre-existing systems aren't available, in order to accentuate the licensing differences and thus make them amenable to study and discussion. Further, information at hand indicates that Microsoft is abandoning upgrades to current generation technologies from versions more than one iteration old, so the 'minimise cost-through upgrade' approach will cease to exist for many organisations interested in current generation software technology from Microsoft.

Finally, it is also worth mentioning that Microsoft's various licensing agreements are often being modified and replaced, so the long term validity of a licensing scheme such as volume licensing is unknown.

Appendix 2

Software Pricing Resources

Adobe

http://store.adobe.com/store/products/master.jhtml?id=catAcrobatStnd

http://store.adobe.com/store/products/master.jhtml?id=catPhotoshop

Microsoft

http://www.microsoft.com/licensing/resources/default.mspx

http://www.microsoft.com/windowsxp/pro/howtobuy/pricingretail.mspx

http://www.microsoft.com/windowsserver2003/howtobuy/licensing/pricing.mspx

http://www.microsoft.com/exchange/howtobuy/enterprise.asp

http://www.microsoft.com/office/editions/howtobuy/compare.mspx

http://www.microsoft.com/sql/howtobuy/default.asp

http://www.microsoft.com/commerceserver/howtobuy/production.asp

http://www.microsoft.com/isaserver/howtobuy/default.asp

Symantec

http://nct.symantecstore.com/0001/mup.html

http://nct.symantecstore.com/0060/632662_savcorp_wsns.html

Linux and other Free and Open Source Software

http://www.redhat.com/software/rhel/purchase/index.html

http://www.redhat.com/software/rhel/desktop/

http://www.freesoftwarecdr.com/shop/product_info.php?products_id=135

http://www.freesoftwarecdr.com/shop/product_info.php?products_id=139

http://www.freesoftwarecdr.com/shop/product_info.php?products_id=91

http://store.mandrakesoft.com/index.php

http://www.novell.com/products/linuxprofessional/pricing.html

http://www.suse.com/us/business/products/server/sles/pricing.html

http://store.slackware.com/cgi-bin/store

http://www.openbsd.com/orders.html

Appendix 3

Hardware and Services Pricing

IBM Workstations and Servers

http://www.ibm.com/products/us/

http://www-132.ibm.com/webapp/wcs/stores/servlet/ProductDisplay?productId=8666927&storeId=1&langId=-1&catalogId=-840

http://d02xms011.southbury.ibm.com/ibm_us/Pricer.jsp?cntry=840&base=8187E8U&lang=en_US&wiz%3Actrl%3A509%3A=psg_monitor_thinkvision_6734AC0_United_States

HP Printers

http://h10010.www1.hp.com/wwpc/us/en/sm/WF05a/18972-238444-410635-12019-f51-391193.html

http://h10010.www1.hp.com/wwpc/us/en/sm/WF25a/18972-236251-236263-14638-f51-412144.html

Internet Service Provider Costs

http://www.pacific.net.au/broadband/premium/

http://business.netspace.net.au

First Staff Salary Locator

http://www.dice.com/

Second Staff Salary Locator

http://www.mojolin.com/

NB: All links were working and correct as of 2004-09-23

Appendix 4

Information and References for Linux

Red Hat Linux

http://www.redhat.com

MandrakeSoft

http://www.mandrake.com

SuSE Linux

http://www.suse.com

Slackware

http://www.slackware.com

Debian

http://www.debian.org

OpenBSD

http://www.openbsd.org

While it is unlikely that Linux needs an official introduction to anyone in the Information Technology arena, we include a small section of information here on Linux and Open Source software for our readers from other industries.

Linux, like Windows XP, is an operating system. Unlike other operating systems however, it is software not written and published by any single vendor. The closest analogy we can offer by way of a conceptual overview, is that Linux and Linux development is closely mirrored by the Internet and the Internet industry.

Linux, like the Internet, had evolved in the hands of technologists over many years before the mainstream business world was made aware of its existence. Also, like the Internet, Linux is in continual development by thousands of organisations worldwide, and tens of thousands of software and systems professionals. Finally, like the Internet, Linux is not presently owned by any single organisation, or can ever be owned by any single organisation. This situation is enforced by the open source license that Linux is released

under.

Linux, according to IDC (http://news.com.com/2100-1001-253320.html?legacy=cnet) figures tracking it's growth over the past few years, is the fastest growing operating system platform in the industry. In 2001 it accounted for around 27% of all server installs, second only to Windows. IDC predict that this will increase to 29% of all servers, not just new installations, by 2008 (http://www.infoworld.com/article/04/06/17/HNidclinux_1.html, http://www.novell.com/linux/truth/index.html).

The Berkeley System Distribution (BSD), and particularly OpenBSD, may need a little more of an introduction. As the name suggests, this platform has its origin at the University of California, Berkeley campus. This version of UNIX may have had more of an uptake in the professional world, but in the early '90s its future was cast in doubt due to a legal dispute between UCLA and AT&T. While this matter was ultimately resolved in BSD's favour, the court case did keep many people and businesses from deploying the operating system. During that period Linus Torvalds created Linux.

BSD has since developed into numerous implementations, of which the most well known are NetBSD, FreeBSD, and OpenBSD. NetBSD provides the greatest support for different hardware types. FreeBSD focuses on x86 architecture and being more "userfriendly." While OpenBSD focuses on security above all else.

Open Source is a term used to indicate the development and licensing model under which Linux, BSD, and many thousands of other platform, productivity and business software are now being produced. In short, the advantages of this style of development are reduced costs of software acquisition (in most instances, the software is free of cost and requires no license fees) and of equal importance, it offers freedom to business users with respect to their rights of use of the software. More information can be found at http://www.opensource.org/ and http://www.fsf.org/.

Which leads us directly into the reason why Linux provides such a strong showing as a competitor to Microsoft Windows in terms of purchase and licensing costs: it's free. The more users you have using Linux and related technologies, the more you save.

About Cybersource

Cybersource, founded in early 1991, is the second longest running open source solutions company in the world. We have been demonstrating the better value, security and robustness of open source technologies to our clients since then. We also produce products like:

- The Safe Internet Computer: The Safest Way to Use the Internet.

- The Small Business Linux Server: the best value small business server on the market and 75% less expensive than the Microsoft alternative.

- Datasafe: Stores copies of all your documents. Easy and direct access to all past revisions.

- Cybersource Trim Client; All the advantages of a Thin Client with none of the disadvantages.

http://www.cybersource.com.au/

Phone: +61 3 9621 2377

Email: info@cybersource.com.au