Linux vs. Windows

Total Cost of Ownership Comparison

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

Cybersource

Executive Summary

In late 2001, Cybersource undertook a study into the differences in licence costs between Linux and Open Source software on the one hand, and Microsoft's operating systems and applications on the other. That research is available in a whitepaper linked to here:
http://www.cyber.com.au/cyber/about/linux_vs_windows_pricing_comparison.pdf

We received much feedback from readers seeking a determination of the Total Cost of Ownership (TCO) figures, rather than just the initial licence costs. While it is difficult to qualitatively analyse all of the total-cost-of-ownership factors at play, it is possible to produce a reasonable first-pass quantitative estimate for the instantiation and operation of a network and computer workstation infrastructure for a small-to-medium organisation, to highlight the TCO differences between these two competing platforms.

To that end, we have modeled an organisation with 250 computer-using staff, an appropriate number of workstations, servers, with 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 ran the model with two options: firstly, using pre-existing hardware and secondly, purchasing brand new hardware and network infrastructure explicitly for establishing this organisation's computer systems. We also simulated the IT expenses over a 3 year period, mimicking the operational life-span of most corporate computer systems, and amortising the purchase and installation costs over that period of time.

Throughout this whitepaper, we will be presenting the raw data as well as the explicative methedologies 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 single organisation is likely to operate with the exact parameters presented here, and we therefore recommend the use of the document as a guide only. 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.

The final results are summarized in the table below.

	Microsoft Solution (TCO Over 3 Years)	Linux/Open Source Solution (TCO Over 3 Years)	Savings Achieved by Using Linux (Over 3 Years)	Percentage Saved (Over 3 Years)
Existing Hardware & Infrastructure is used	$733,973	$482,580	**$251,393**	34.26%
New Hardware & Infrastructure is purchased	$1,042,110	$790,717	**$251,393**	24.69%

All prices are in US$ for ease of conversion to your currency, and correct as of 2002-04-19

Disclaimer:
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Hardware, Platforms

In our model 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 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 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 $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 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 calculated based on any per-seat and per-machine licence costs as garnered from information provided by the operating system vendors themselves. Much of this information will be drawn from our previous whitepaper on software licence costs: *Linux vs. Windows Pricing Comparison*. Rather than include this research *in toto*, we will provide you with the briefing results, and commend you to the full *Pricing Comparison* document for the details.

Applications, Salaries

Office Productivity Applications

As with users in other organisations, ours 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 productivity suite (co-developed by Sun Microsystems) along with the Mozilla web browser (co-developed by Netscape, an AOL company) for viewing web-pages and email. The full details of these applications are provided in the following pages and in our licence costs source document, *Linux vs. Windows Pricing Comparison.*

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 a handful of (often technical or specialist staff) who require and utilise specific technical applications, for such needs as desktop publishing, 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 likely 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 fulfill 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 will be specified, and applied to both competing solutions.

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 couple of pages we will outline the core software components of our two competing platform technologies: Microsoft Windows and associated server software and applications, and Linux/Open Source and associated server software and applications. Much of this material has been provided in our previous research document: *Linux vs. Windows Pricing Comparison* (available from: http://www.cyber.com.au/cyber/about/linux_vs_windows_pricing_comparison.pdf)

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. 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.

Windows Platform Solution

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

	Price	Supplier	Comments
Norton Antivirus 2002	$49.95	Symantec	
Microsoft Internet Information Server 5 (Web Server)	Free	Microsoft	Bundled with Microsoft NT and 2000 server.
Microsoft Windows 2000 Advanced Server	$3,999.00	Microsoft	Comes with 25 Client Access Licenses (CALs). AdditionalCALs are $67 each.
Microsoft Commerce Server	$12,999.00	Microsoft	This is a per processor license. Product includes SQL Server.
Microsoft ISA Standard Server 2000	$1,499.00	Microsoft	This is a per processor license. Product includes firewall and proxy server software.
Microsoft SQL Server	$4,999.00	Microsoft	This is a per processor license.
Microsoft Exchange Server 2000	$1,299.00	Microsoft	Comes with 5 Client Access Licenses (CALs). AdditionalCALs are $67 each.
Windows XP Professional Full version	$299 (per user)	Microsoft	
Microsoft Visual Studio 6.0	$1,079.00	Microsoft	
Microsoft Office Standard	$479 (per user)	Microsoft	

All prices are in US$ for ease of conversion to your currency, and correct as of 2002-04-19

Linux Platform Solution

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

	Price	Comments
Red Hat 7.2 or Mandrake 8.1 or SuSE 7.3 Official Boxed Sets	$59.95 $55.00 $79.95	Linux Distributions, suitable for workstations or servers.
Apache (Web server)	Included with Linux distributions or free download.	An efficient and extensible web server, used on 59% of web servers on the Internet.
Squid (Proxy server)	Included with Linux distributions or free download.	A high-performance web-cache proxy server.
PostgreSQL (Database)	Included with Linux distributions or free download.	PostgreSQL is a robust, next-generation, Object-Relational DBMS.
Iptables (Firewall)	Included with Linux distributions or free download.	A powerful Linux packet filter control utility, that acts as a firewall within the Netileter framework.
Sendmail or Postfix (Mail server)	Included with Linux distributions or free download.	Sendmail is a powerful and flexible mail server with 80% of the Internet mail server market. Postfix is a fast and secure mail server.
KDevelop (IDE)	Included with Linux distributions or free download.	A feature rich Integrated Development Environment that supports C and C++.
GIMP (Graphics)	Included with Linux distributions or free download.	The GNU Image Manipulation Program, for photo retouching
OpenOffice (Productivity Suite)	Included with Linux distributions or free download.	A full-featured, Microsoft Office-compatible productivity suite that runs on Linux, Solaris and Windows.
The Exchange Project (e-Commerce System)	Available from http://theexchangeproject.org.	A feature-packed online shop with maintenance made easy with a friendly GUI Administration Tool.

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.

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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 mimick 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
- 3 x Developer Workstations
- 2 x Graphics/Design Workstations
- 1 x Mail Server
- 5 x File/Print Server

- 1 x Proxy/Firewall Server
- 1 x Intranet & SQL Server
- 1 x E-Business Server
  (incl. SQL & Webserver)

	Windows	Linux
HARDWARE		
Workstation	$232,300.00	$232,300.00
Server	$25,837.00	$25,837.00
Network Infrastructure	$25,900.00	$25,900.00
TOTAL Hardware Costs	$284,037.00	$284,037.00
SOFTWARE		
Platform Software	$56,121.00	$79.95
Office Productivity Applicati	$222,397.50	$0.00
Specific Technical Applicati	$4,455.00	$0.00
Total Software Costs	$282,973.50	$79.95
OPERATING COSTS		
Staff Salaries	$345,000.00	$376,500.00
Internet Connectivity	$36,000.00	$36,000.00
Consultancy Fees	$45,000.00	$45,000.00
Miscellaneous	$25,000.00	$25,000.00
TOTAL Operating Costs	$451,000.00	$482,500.00
TOTAL COSTS	$1,018,010.50	$766,616.95
LINUX SAVINGS		$251,393.55
% Total Cost		24.69%

All prices are in US$ for ease of conversion to your currency, and correct as of 2002-04-19

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 mimick the operational life-span of most corporate computer systems, and amortise the purchase and installation costs over that period of time.

	Windows	Linux
SOFTWARE		
Platform Software	$56,121.00	$79.95
Office Productivity Applications	$222,397.50	$0.00
Specific Technical Applications	$4,455.00	$0.00
TOTAL Software Costs	$282,973.50	$79.95
OPERATING COSTS		
Staff Salaries	$345,000.00	$376,500.00
Internet Connectivity	$36,000.00	$36,000.00
Consultancy Fees	$45,000.00	$45,000.00
Miscellaneous	$25,000.00	$25,000.00
TOTAL Operating Costs	$451,000.00	$482,500.00
TOTAL COSTS	$733,973.50	$482,579.95
LINUX SAVINGS		$251,393.55
%Total Cost		34.25%

All prices are in US$ for ease of conversion to your currency, and correct as of 2002-04-19

Software Licence Costs

The following information is taken from our *Linux vs Windows Pricing* Comparison.Prices are suuplied 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 requirments include:

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

Microsoft Solution Software Cost

Norton Antivirus 2002	250 copies	$12,487.50
MS Internet Information Server	2 copies	$0.00
MS Windows 2000 Advanced Server	9 copies	$35,991.00
MS Commerce Server	1 copy	$12,333.00
MS ISA Standard Server 2000	1 copy	$1,499.00
MS SQL Server 2000	1 copy	$4,999.00
MS Exchange Standard Server 2000	1 copy	$1,299.00
Windows XP Professional	250 copies	$74,750.00
MS Visual Studio 6.0	3 copies	$3,237.00
MS Office Standard	250 copies	$119,750.00
Adobe Photoshop 6	2 copies	$1218.00
Additional Client Access Licenses	230 licenses	$15,410.00
Total		**$282,973.50**

Linux Solution Software Cost

Linux Distribution (eg SuSE 7.3)	only 1 copy necessary	**$79.95**
Apache (Web server)	provided with distribution	**$0.00**
Squid (Proxy server)	provided with distribution	**$0.00**
PostgreSQL (Database)	provided with distribution	**$0.00**
iptables (Firewall)	provided with distribution	**$0.00**
Sendmail / Postfix (Mail servers)	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**
The Exchange Project (e-Commerce system)	only 1 copy necessary (free download)	**$0.00**
Total		**$79.95**

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Hardware Specification and Costs

1 x Mail Server

IBM xSeries 220, Part Number: 86464AX

- Processor: Pentium III 1.26 Ghz w/ 512KB Processor cache
- Memory: 256 MB PC133 ECC SDRAM RDIMM
- Maximum memory: 4096 MB
- Storage: IBM 36.4 GB 10K-rpm Ultra160 SCSI Hot-Swap SL HDD (Part Number 06P5755) driven by Integrated Dual-Channel Ultra160 SCSI Controller.
- Maximum storage: 660 GB (Hot-swappable)
- Optical Drive: 48X-20X CD-ROM
- Ethernet: Integrated Ethernet 10/100 Mbps
- Power: 385W Power Supply and Smart-UPS 1000.
- Peripherals: IBM Keyboard and Mouse.
- Operating System: Costs removed from published price to provide a OS-neutral figure

Total cost: $2,373.00

1 x Proxy / Firewall Server

As above, with 10/100 EtherLink Server Adapter by 3Com (with CD) (part number 09N9901)

Total cost : $2,458.00

5 x File / Print Servers:

As mail server, with

- an extra 256MB RAM (bringing total to 512MB),
- second 36.4GB Harddrive and
- 10/100 EtherLink Server Adapter by 3Com (with CD) (part number 09N9901).

Total Cost: $3,252.00 x 5 = $16,260.00

1 x Intranet and SQL Server

Specification as per mail server.

$2,370.00

E-business server

Specification as per mail server.

$2,373.00

Therefore, total cost of server hardware = $25,837

245 x Standard Workstations

IBM NetVista A22p 2292

- Processor type: Pentium 4 1600 Mhz w/ 256 KB
- Memory: 128 MB PC133 SDRAM
- Monitor: G78 17inch (16 inch Viewable) Monitor (Part Number 66274AN)
- Hard drive: 40GB Ultra ATA/100 Hard Drive
- Floppy Disk Drive.
- Optical device: 48X-20X CD-ROM Drive
- Graphics: NVIDIA AGP 4X with 16 MB SDRAM Video Memory
- Audio: SoundMAX with SPX and IBM Speakers.
- Ethernet: Intel PRO/100 Ethernet w/Wake on LAN
- Modem: IBM PCI V.90 Modem, 56K
- IBM Mouse & Keyboard.

Total cost = $928.00.00 x 245 = $227,360

Developer Workstations

As above, with 256MB of RAM.

Total cost =$988.00 x 3 = $2,964

Graphic Designer Workstations

As per developer workstations.

Total cost = $988.00 x 2 = $1,976

Therefore, total cost of workstations = $232,300

All prices are in US$ for ease of conversion to your currency, and correct as of 2002-04-19

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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

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 juinior help-desk support staffer. Ancillary or specialist technical services will be provided by external consultants

Windows Platform Permanent Staff

Salary for Senior Systems Admin	@ $55,000 per-annum for 3 years = $165,000
Salary for Mid-level Systems Admin	@ $35,000 per-annum for 3 years = $105,000
Salary for Junior Support Officer	@ $25,000 per-annum for 3 years = $75,000

Total Cost of Windows Platform Permanent Staff = $345,000

Linux Platform Permanent Staff

Salary for Senior Systems Admin	@ $60,000 per-annum for 3 years = $180,000
Salary for Mid-level Systems Admin	@ $38,500 per-annum for 3 years = $115,500
Salary for Junior Support Officer	@ $27,000 per-annum for 3 years = $81,000

Total Cost of Linux Platform Permanent Staff = $376,000

Specialist Consultancy Services

Most organisations need specialist IT consultancy services and for our example organisation, we will allocate the same set cost to both the Windows and Linux models to cover this service provision.

Total Cost of Specialist Consultancy Services = $25,000

All prices are in US$ for ease of conversion to your currency, and correct as of 2002-04-19

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.

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.

Where possible, we have also tried to research volume licensing and other such licensing agreements. If there was little clear information and pricing detail on vendor's web-sites, we did not include that information in our calculations.

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 currently being modified and replaced, so the long term validity of a licensing scheme such as volume licensing is unknown.

Appendix 2

Software Pricing Resources

Norton Antivirus 2002
http://www.symantecstore.com/dr/v2/

MS Windows 2000 Advanced Server
http://www.microsoft.com/windows2000/advancedserver/howtobuy/pricing/default.asp

MS Commerce Server
http://www.microsoft.com/commerceserver/howtobuy/pricing/default.asp

MS ISA Standard Server 2000
http://www.microsoft.com/isaserver/howtobuy/pricing/default.asp

MS SQL Server 2000
http://www.microsoft.com/sql/howtobuy/pricing/default.asp

MS Exchange Standard Server 2000
http://www.microsoft.com/exchange/howtobuy/pricing/default.asp

Windows XP Professional
http://www.microsoft.com/windowsxp/pro/howtobuy/pricingretail.asp

MS Visual Studio 6.0
http://msdn.microsoft.com/vstudio/prodinfo/purchase/pricing.asp

MiS Office Standard
http://www.microsoft.com/office/howtobuy/pricing.htm

Adobe Photoshop 6
http://www.adobe.com/store/products/photoshop.html

Mandrake 8.1
http://www.mandrakestore.com/en/storemdkinc-8.1.php

Red Hat 7.2
http://www.redhat.com/software/linux/7-2_standard.html

SuSE 7.3
http://shop.suse.com

NB: All links were working and correct as of 2001-11-19

Appendix 3

Hardware and Services Pricing Resources

IBM Workstations and Servers
http://www.ibm.com/businesscenter

To access server and workstation specifications, simply click on 'Products', then either 'desktops' or 'servers'. To verify our calculations, select either the 'Universal Servers -> xSeries 220' server or the 'NetVista A Series -> NetVista A22p' workstation and select 'Customize'. Modify the specifications to match the ones listed in this document, and select 'View configuration and buy' to see final price.

Internet Service Provider Costs
http://www.netspace.net.au/products/adsl/business/plans.shtml

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 2002-04-26

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

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.cnet.com/news/0-1003-200-4979275.html) figures tracking it's growth over the past few years, is the fastest growing operating system platform in the industry. It now accounts for around 27% of all server installs, second only to Windows.

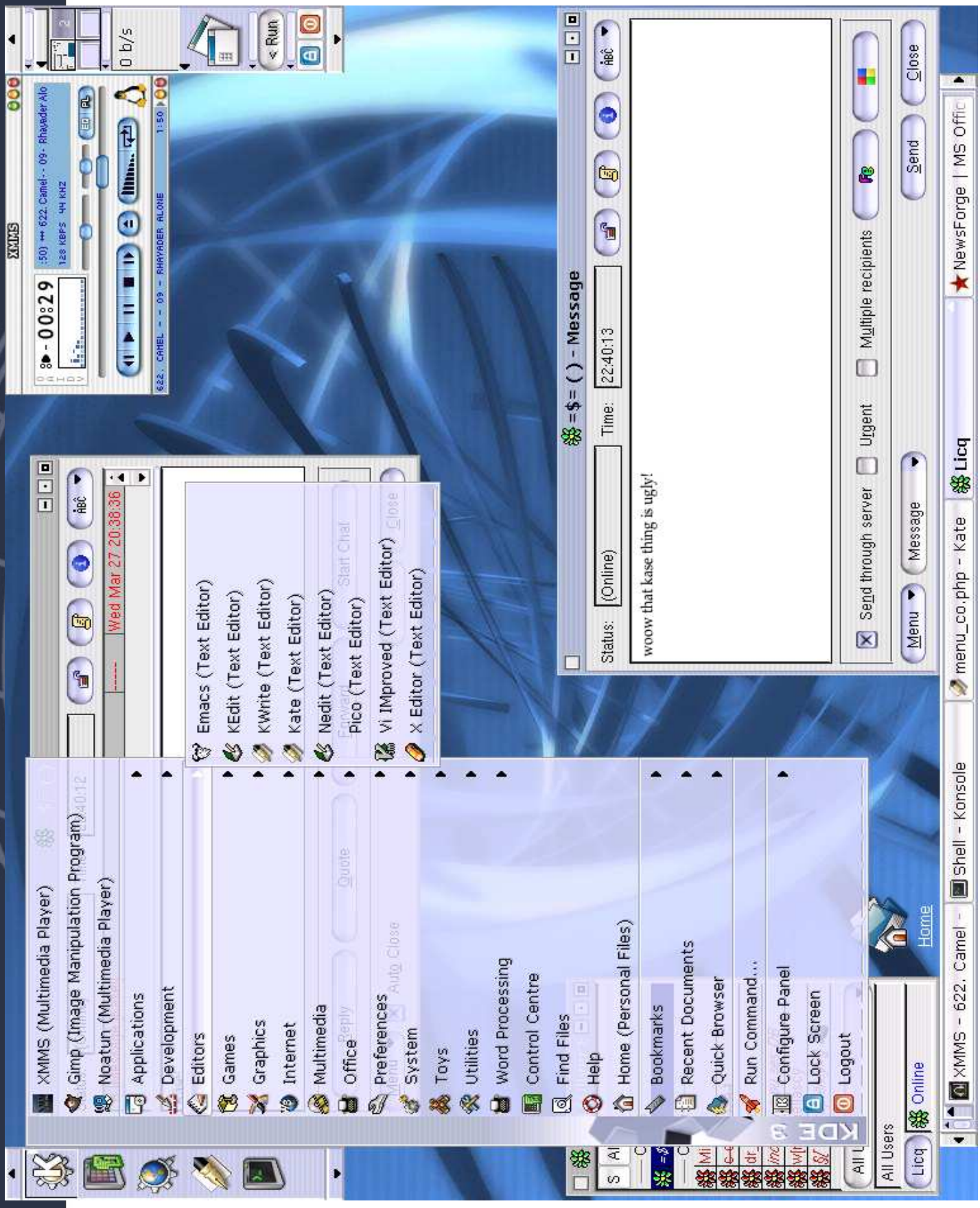
Open Source is a term used to indicate the development and licensing model under which Linux, and many thousands of other platform, productivity and business software are now being produced. In short, the advantages of this style of development are reduced costs of software acquisition (in most instances, 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.

As most people reading this document will likely have used or know about Windows, there's little reason to include specific information on that platform. As Linux is less well known, we have included the following few page by way of quick introduction to the Linux computer system desktop.

Appendix 5

A Linux Desktop Screenshot



Screenshot used is from http://www.kde.org/ website. It's showing a desktop environment of a typical Linux desktop for workstation users. Many Windows users will be familiar with most of the menus icons and launch bar items found on current Linux systems