#1447: Applications Development for Linux/IPF®

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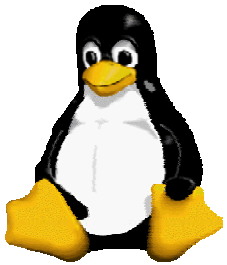
Itanium Linux Marketing Manager

HP WORLD 2003
Solutions and Technology Conference & Expo

Linux is Linux
develop once, deploy often!



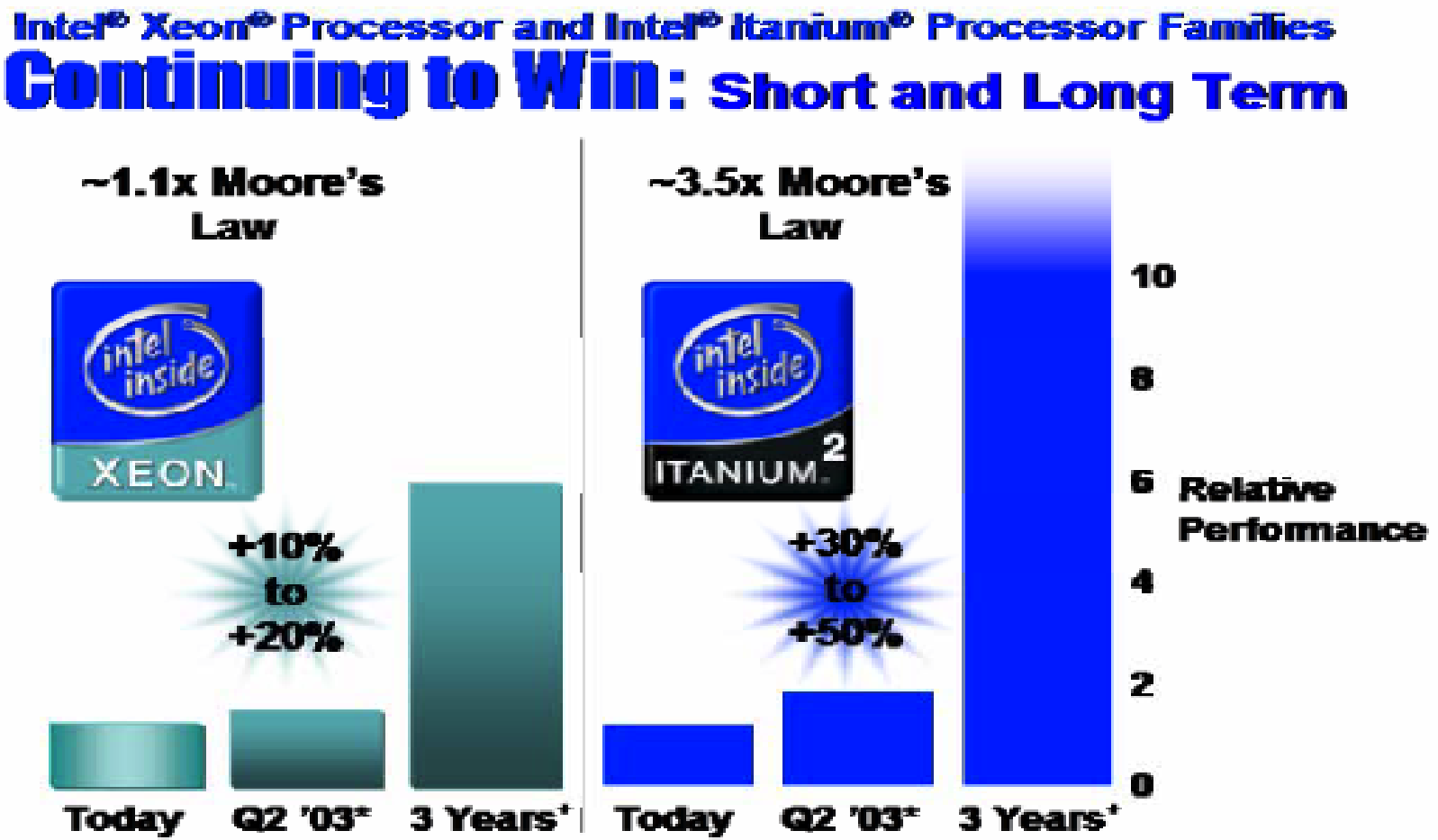
some workloads run best on IPF

some workloads run best on IA32

What is the benefit of 64-bits?

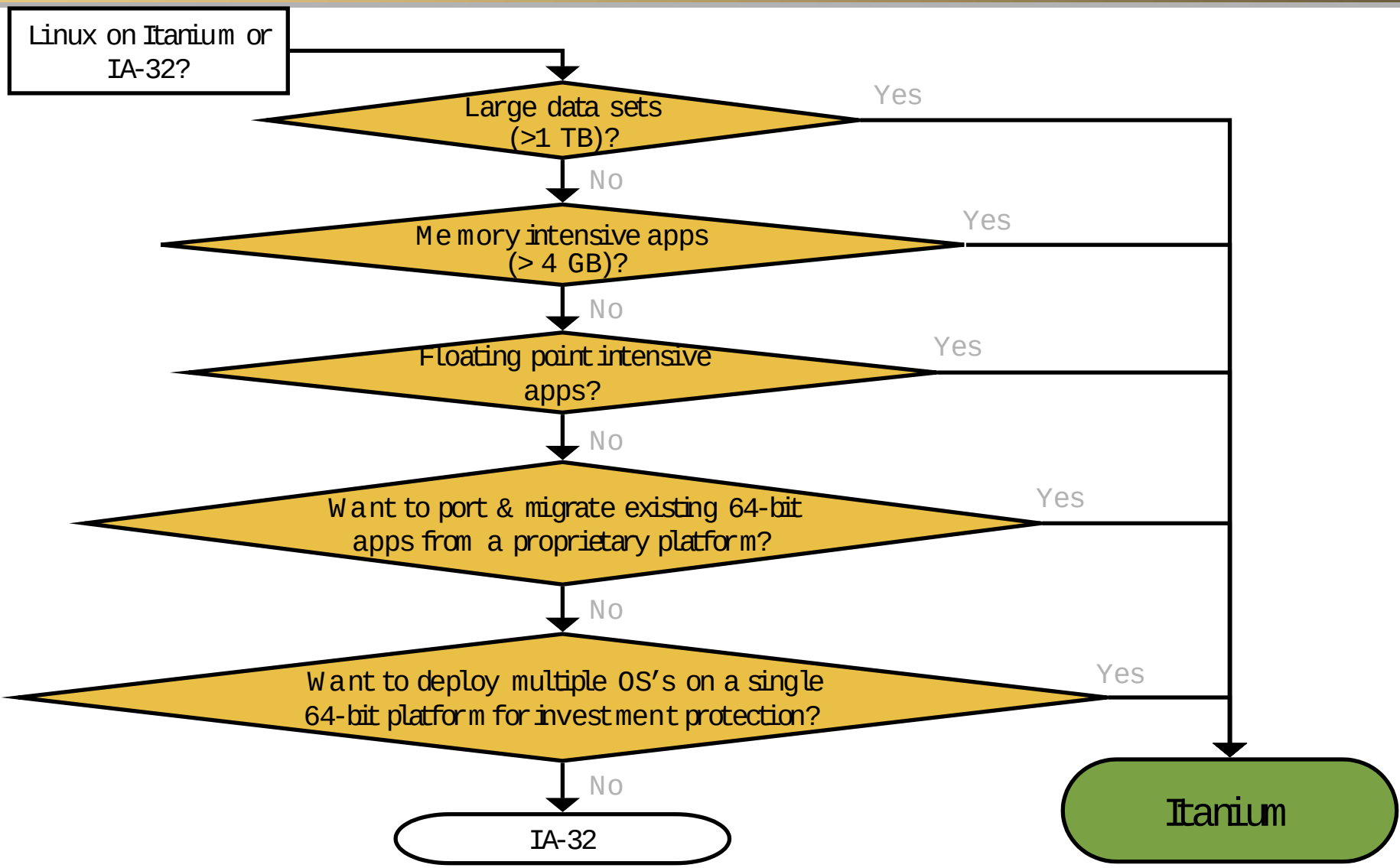
- Big Numbers
- Big Memory
- Wide data

Intel® Spring Analyst Meeting



When to deploy Linux on Itanium?

Some Positioning Guidelines



Market Opportunities & Committed ISVs

Workloads	Needs	Key ISVs Committed
High-Performance Technical Computing scientific research life & materials sciences oil & gas government & defense computer-aided engineering	Heavy use of floating-point operations Large data sets 64-bit computing with high memory bandwidth and low latency means faster calculations, more in-depth data analysis, and more vivid, precise modeling and simulation – all for quicker time-to-breakthroughs	Adina, MSC.Software, Accelrys, Earth Decision Sciences, Metacomp Technologies, Mecalog, Platform Computing, Linux NetworX, Scyld, Scali, Cluster File Systems, …
Large Database Applications data warehousing & data mining online analytical processing (OLAP) memory-intensive, mid-level DBs	Load entire databases into memory for faster data access, faster throughput, and faster time-to-discovery	Oracle9*i*, Sybase Adaptive Server Enterprise, IBM DB2 and Informix, TeraText Solutions, …
Enterprise Resource Planning (*Limited*)	Large data sets can be processed in memory for faster response times and support for more users	SAP mySAP
Application Development organizations porting & migrating their in-house applications ISVs moving to Linux on Itanium	Developers need a complete 64-bit computing and data environment to move to Linux from proprietary 64-bit UNIX environments, while also providing the opportunity to re-architect source code to optimize performance	Many open source development tools, Intel Compiler 7.0, Rational Software, BEA JRockit, Etnus, Pallas, Tibco Software, …
Financial Services financial and economic modeling	Floating-point performance for Monte Carlo simulations means faster time-to-solutions and a competitive edge	Primarily in-house applications

Linux roadmap for Itanium® 2 – based systems

Intel® Itanium® 2 Processor Platform Release

- **HP Enablement Kit for Linux** – installation and configuration tools for HP Itanium2 – based systems

- **MSC.Linux** – performance - tuned distribution for compute clusters running high performance computing workloads

- **Debian** – available in the open source community for advanced users

- **Red Hat Advanced Workstation**

- **Red Hat Advanced Server**

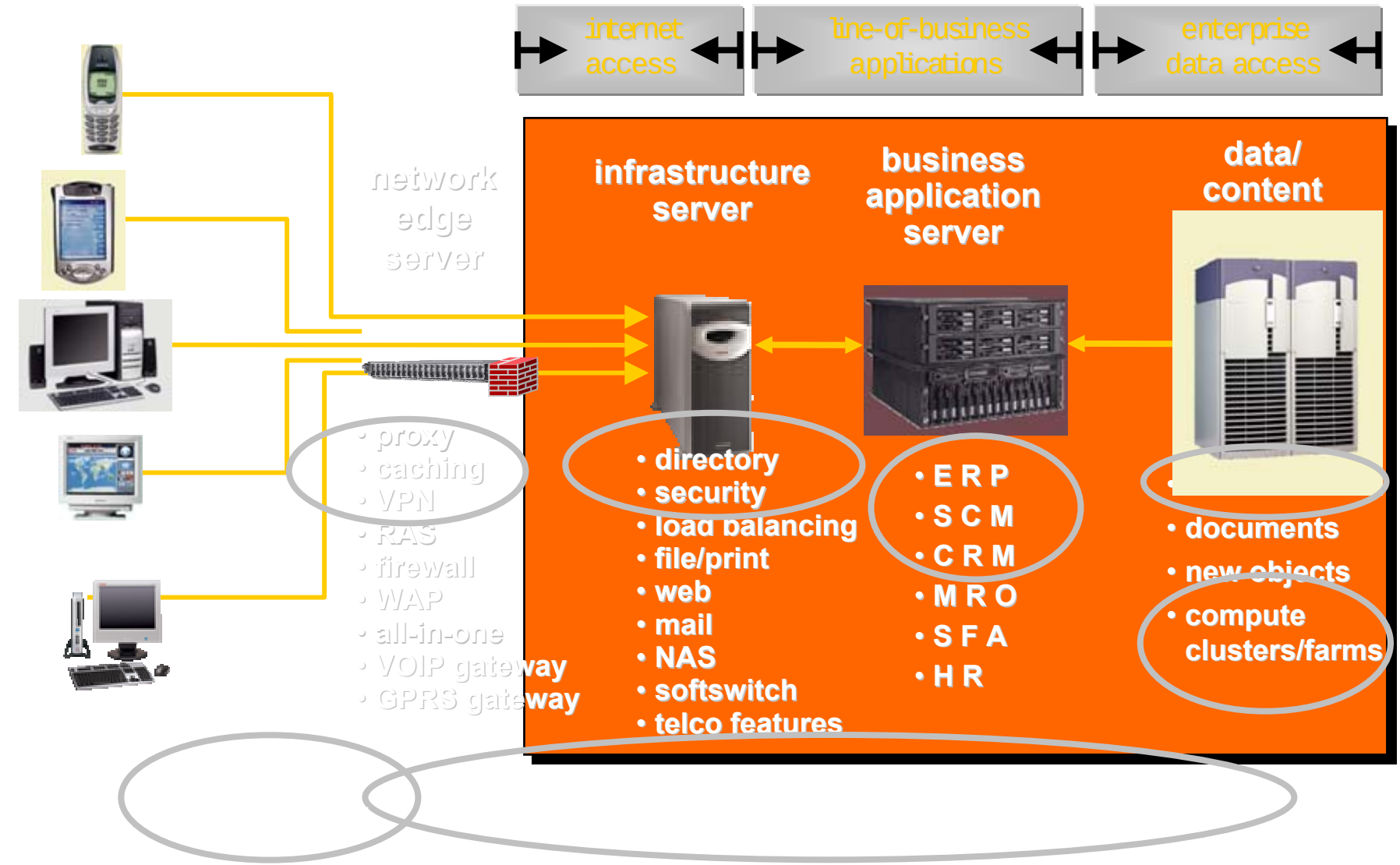
- **SuSe** – a UnitedLinux–based distribution

Q3 CY 2002 — **Q4 CY 2002** — **Q1 CY 2003**

Itanium is a trademark or registered trademark of Intel Corporation or its subsidiaries in the United States and other countries.

Linux solution workloads

- where Linux products and solutions are making significant in-roads -



How do you choose between open source and commercial tools?

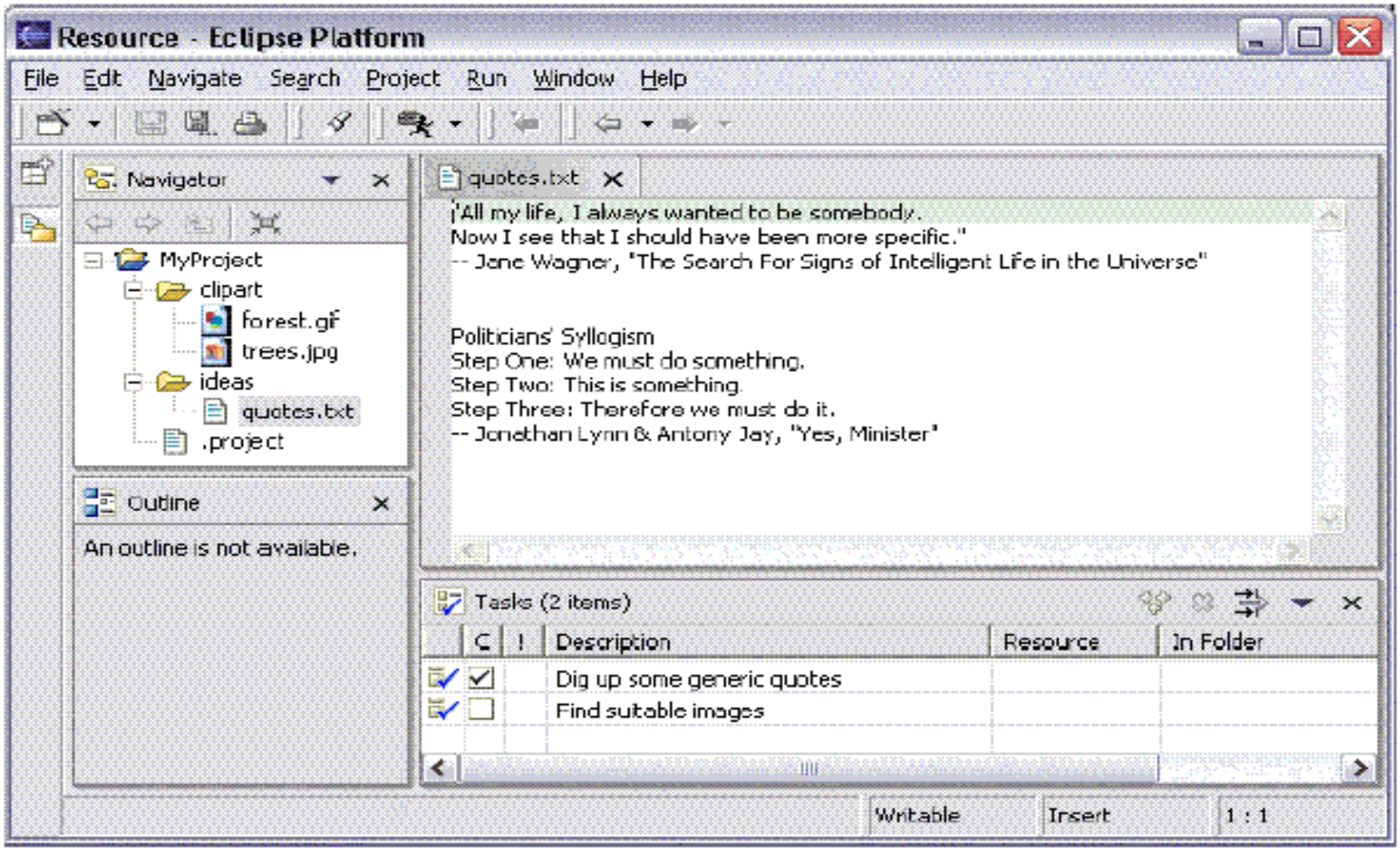
- try the "free" tools early and often
- look for support for any tool you pick
- go with tools that you're familiar with or have good recommendations
- you'll likely end up with a mix of commercial and open source tools

"free" can be cheaper and better than proprietary, but not always!

Linux ISV Commercial Solutions

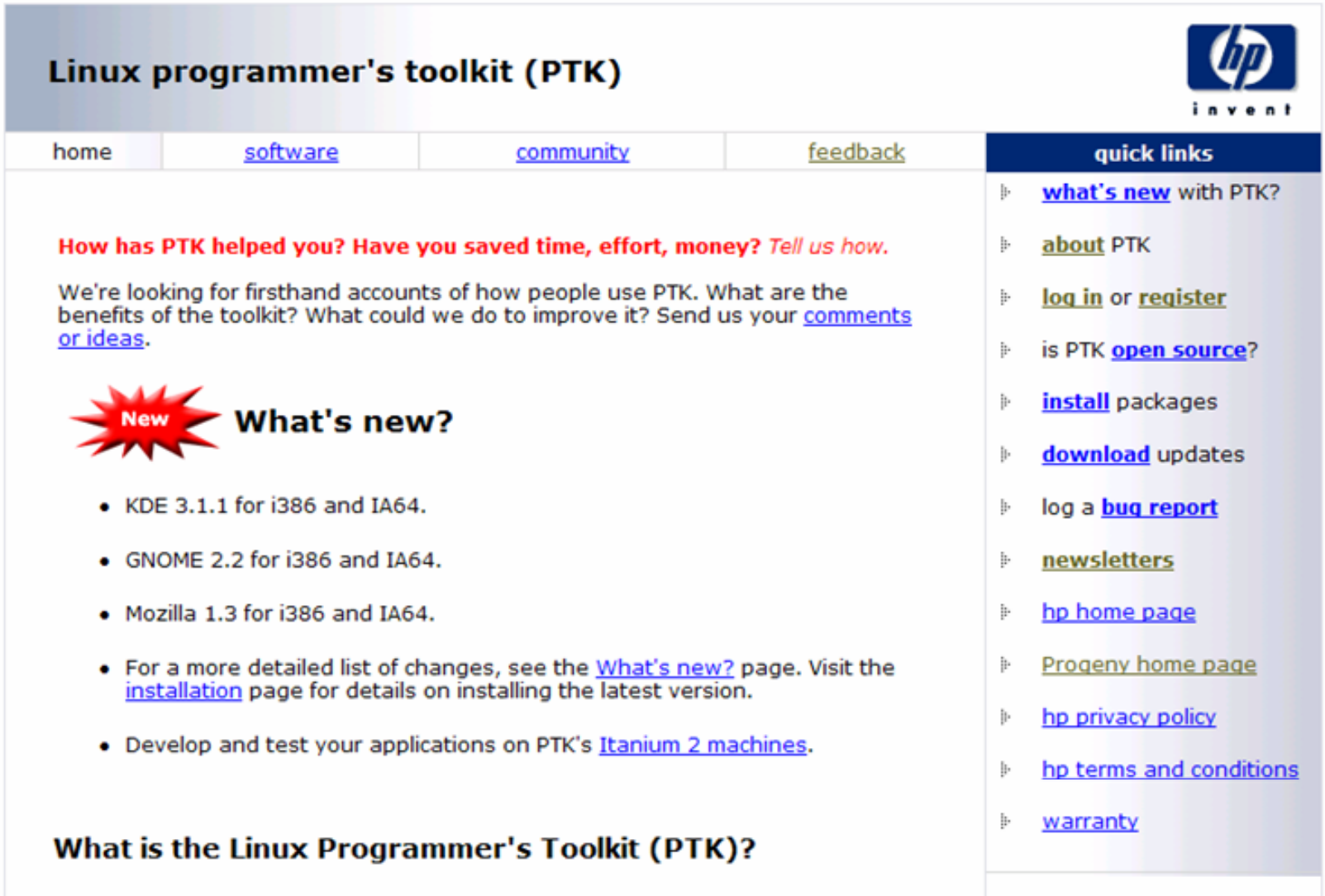
1Q03	2Q03	3Q03	4Q03	1Q04
Apache Software Foundation http://www.apache.org/	Borland Enterprise Server suite; J-builder	SAP R/3 V4.6D+	trema	IBM Websphere
Globetrotter	Microquill - SmartHeap	J-Boss	i-flex i-flex solutions ltd. FLEXCUBE	ca Computer Associates
Intel inside ITANIUM Development tools	IBM DB2	Sendmail	Unicenter enterprise; Brightstore	INTEC TELECOM SYSTEMS Inter-mediatE
Macro media	ORACLE Oracle 9*i* Oracle Application Server			
zeus Web Server June '02	VMWare		Reuters	TREMA Finance KIT/Ware
RSA SECURITY	bea Weblogic Server; J-rocket	IBM Tivoli	SYBASE IQ	Microquill
	Times10			Veritas
	Legato	Etnus - Totalview		
	TIBCO			

Introduction to Eclipse



http://ptk.progeny.com

(over 1936 packages for ia64)



Linux programmer's toolkit (PTK)

invent

home | software | community | feedback

How has PTK helped you? Have you saved time, effort, money? *Tell us how.*

We're looking for firsthand accounts of how people use PTK. What are the benefits of the toolkit? What could we do to improve it? Send us your comments or ideas.

New **What's new?**

- KDE 3.1.1 for i386 and IA64.
- GNOME 2.2 for i386 and IA64.
- Mozilla 1.3 for i386 and IA64.
- For a more detailed list of changes, see the What's new? page. Visit the installation page for details on installing the latest version.
- Develop and test your applications on PTK's Itanium 2 machines.

What is the Linux Programmer's Toolkit (PTK)?

quick links

- what's new with PTK?
- about PTK
- log in or register
- is PTK open source?
- install packages
- download updates
- log a bug report
- newsletters
- hp home page
- Progeny home page
- hp privacy policy
- hp terms and conditions
- warranty

Why Linux?

- lowe[illegible]wnership:
  - -runs[illegible]y standard Inte[illegible]ctures: IA-32[illegible]tanium
  - -ma[illegible] pla[illegible]m read[illegible]a[illegible]d[illegible]asing
  - d[illegible]ta[illegible]r[illegible]n[illegible]t
  - [illegible]n[illegible]T[illegible]tp
  - [illegible]l[illegible]ta[illegible],
  - flexibilit[illegible]us[illegible]iz[illegible]S
  - lever[illegible]e[illegible]OS[illegible]v[illegible]n[illegible]e[illegible]rc[illegible]ent
  - l[illegible]s[illegible]ti[illegible]ec[illegible]L[illegible]ng[illegible]or[illegible]tu
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  - te[illegible]
  - -Accor[illegible]g IDC Decreased [illegible]f 45-82%

Scale Out

Why Scale-Out US$ 2.7M/32CPU = $86,000/CPU

IBM.	IBM eServer pSeries 690 Turbo Model 7040-681	TPC-C Rev. 5.1

Description	Part No.	Source	Unit Price	Qty	Ext Price	Maint Price
Server Hardware						
IBM eServer pSeries 690 (CD, cables, clock card)	7040-681	1	13,394	1	13,394	20,760
128MB (4x32) L3 Cache, 600MHz	4199	1	25,000	4	100,000	0
64GB H-Memory (inward facing)	4488	1	172,000	4	688,000	0
64GB H-Memory (outward facing)	4489	1	172,000	4	688,000	0
1.7GHz 8-way Processor MCM	5246	1	350,000	4	1,400,000	372,000
Std CEC Fan Pwr cbl grp, BPC(F&R) to Std CEC Fans-	6161	1	400	1	400	0
Std CEC Service Proc Y-Cbl, BPC(F&R) to Std CEC Sf	6162	1	200	1	200	0
St						0
Pc						0
Ad						0
Ca						0
Se						0
Re						0
Ba						0
Att						0
Me						0
I/O						0
SC						0
RK						0
18.						0
10/100 Mbps Ethernet adapter II	4962	1	275	10	2,750	0
Cable Grp, 4xUPIC/2xRIO, BPM(IO#1 thru#4) to B&C	6121	1	1600	1	1,600	0
I/O Drwr DC/DC Converter assembly, (DCA)	6172	1	4000	8	32,000	0
Power Cable, B&C to Media Drawer	6179	1	300	1	300	0
Ultra SCSI SE Adapter	6206	1	395	1	395	0
Advanced SerialRAID Adapter	6230	1	3000	30	90,000	0
32 MB Fast_Write Cache option card	6235	1	575	2	1,150	0
B&C Planar, 10 PCI Slots, 2x integrated SCSI	6563	1	8,000	8	64,000	0
Ultra3 SCSI 4-Pack	6564	1	500	16	8,000	0
Rack	7040-61R	1	5,500	1	5,500	3,960
Front Door, 24W, 2M, and back door	6070	1	3750	1	3,750	0
Bulk Power Regulator (BPR)	6186	1	4000	4	16,000	0
Bulk Power Controller (BPC), 4 Fans + 3 DCAs	6187	1	1900	2	3,800	0
Bulk Power Distribution (BPD), 10 DCAs	6188	1	3500	4	14,000	0
Line Cord, 60A, 14', IEC309 Plug, Chargeable	8678	1	1000	2	2,000	0
Regatta-H Bulk Power Module (2x BPA, EPO PNL)	8690	1	5000	1	5,000	0
System Console, serial attach, cabel 6M	7316	1	4,400	1	4,400	0
Display, White P76/P77 Color Monitor, keyboard	3627	1	675	1	675	0
				Subtotal	**3,265,184**	**413,040**

64GB H-Memory (inward facing) 4488 1 172,000 4 688,000
64GB H-Memory (outward facing) 4489 1 172,000 4 688,000
1.7GHz 8-way Processor MCM 5246 1 350,000 4 1,400,000

Why Scale Out? $2.1M/32 = $65,600/CPU

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NEC	NEC Express5800/1320Xc C/S with Express5800/120Re-2				TPC-C REV 5.1 Report Date: 04/23/03		
Description	Part Number	Third Party Brand	Third Party Pricing	Unit Price	Qty	Extended Price	3-yr Mnt. Price
Server Hardware							
Express5800/1320Xc system	850200023	NEC	1	2,126,090	1	2,126,090	1,158,910
Base Original 32	Included	NEC	1	-	1	-	-
Cell Card Original	Included	NEC	1	-	8	-	-
CPU(1.5GHz/6MB)	Included	NEC	1	-	32	-	-
Memory(8GB)	Included	NEC	1	-	64	-	-
Base PCI Box	Included	NEC	1	-	3	-	-
Core PCI Box(Windows Model)	Included	NEC	1	-	1	-	-
PCI Cable(2.5m)	Included	NEC	1	-	6	-	-
PCI Cable(3.0m)	Included	NEC	1	-	2	-	-
Expansion Cabinet	Included	NEC	1	-	1	-	-
18GB 10K rpm HDD	Included	NEC	1	-	1	-	-
Gbit Ether NIC	Included	NEC	1	-	1	-	-
Mouse/Keyboard	Included	NEC	1	-	1	-	-
SCSI HBA with VHDCI cables	Included	NEC	1	-	1	-	-
Windows Server 2003, Datacenter Edition	Included	NEC	1	-	1	-	-
NEC Express5800/120Re-2 (for System Maintenance)							
Base System with 1 x Xeon Processor 1.8GHz/512KB	850162001	NEC	1	2,859	1	2,859	-
1 x Xeon Processor 1.8GHz/512KB BTO Option,	062-02163-000	NEC	1	399	1	399	-
1GB(2 x 512MB) DDR200 SDRAM memory,	062-02168-000	NEC	1	599	1	599	-
1 x 18.2GB 10K rpm Ultra160 HDD,	062-02011-000	NEC	1	329	1	329	-
CD-ROM, 2 x On-board LAN, KB/MS	Included	NEC	1	-	1	-	-
3 years of warranty service to 4-hour response, 7x24	WG-0000-1095-7244	NEC	1	1,399	1	-	1,399
NEC AccuSync50 (15" monitor)	AS50	NEC	3	120	2	239	-
36GB 10K rpm SCSI HDD (+2 spares)	DK32DJ-36MC	HITACHI	3	239	3	717	
FC HBA QLA2340 (+2 spares)	QLA2340-CK	QLogic	3	1,329	15	19,940	-
FC Adapter QLA2350 (+2 spares)	QLA2350	QLogic	4	2,095	11	23,045	-
FC Cable 10M LC-LC (+2 spares)	062-02304-000	NEC	1	200	11	2,200	-
					Subtotal	2,176,417	1,160,309
Server Software							
SQL Server2000 Ent. Edition(64-bit) ,Processor License	810-00560	Microsoft	2	16,541	32	529,312	5,850
					Subtotal	529,312	5,850

Here is Why

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Rx2600 2 * Itanium® II CPU - $<8K/CPU

close window

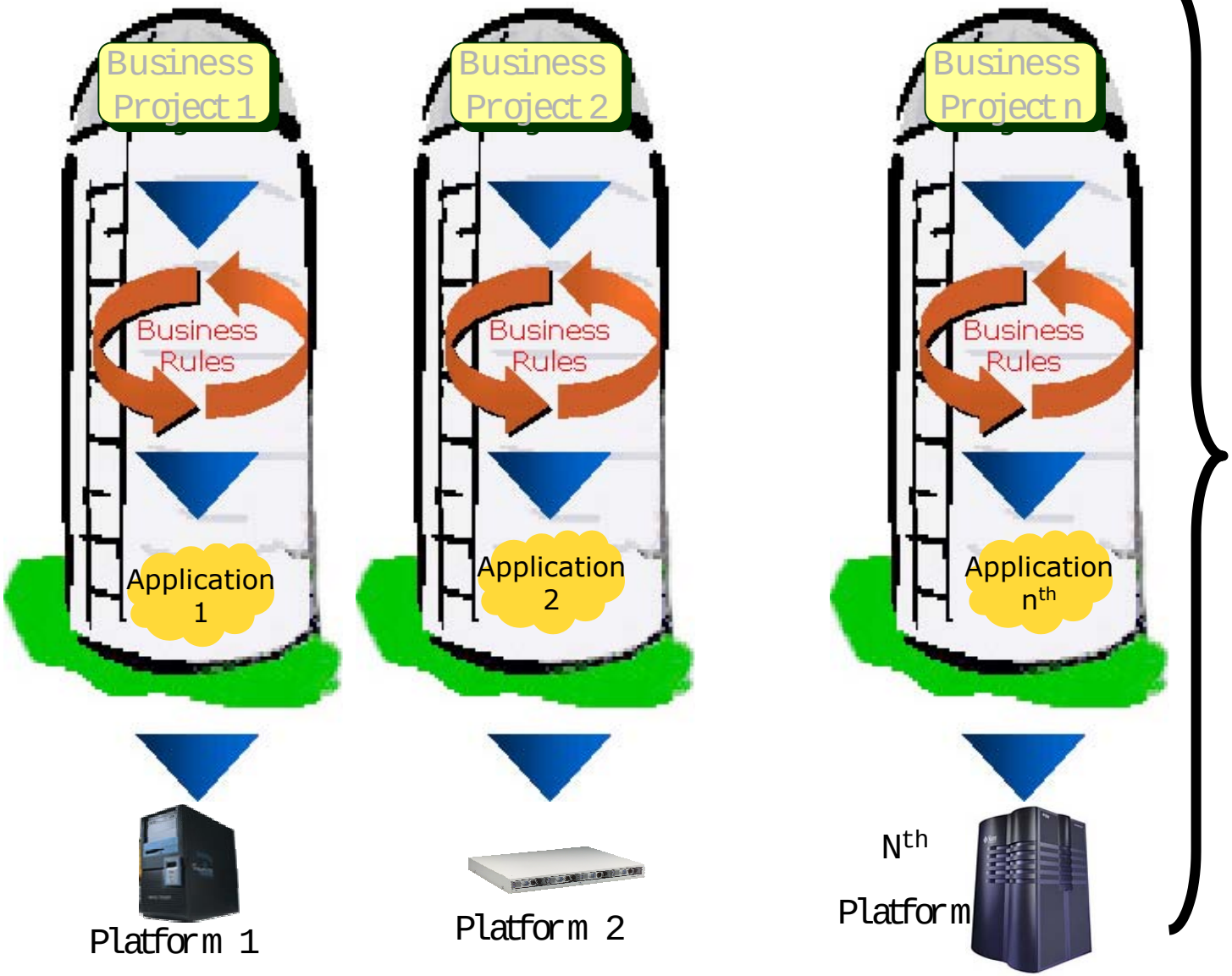
But Can You Pull a Plow with 1000 Chickens?

Can you Service 20,000 Clients on a $1,200 Machine?

- 1Ghz, 2GB RAM, GigE NIC = $1,200
- 1Ghz/20,000 Clients = 50K instruction cycles/Client
- 2GB/20,000 = 100K Bytes/client
- 50Kbits/sec/client
- Yup, can do it. $.08/client

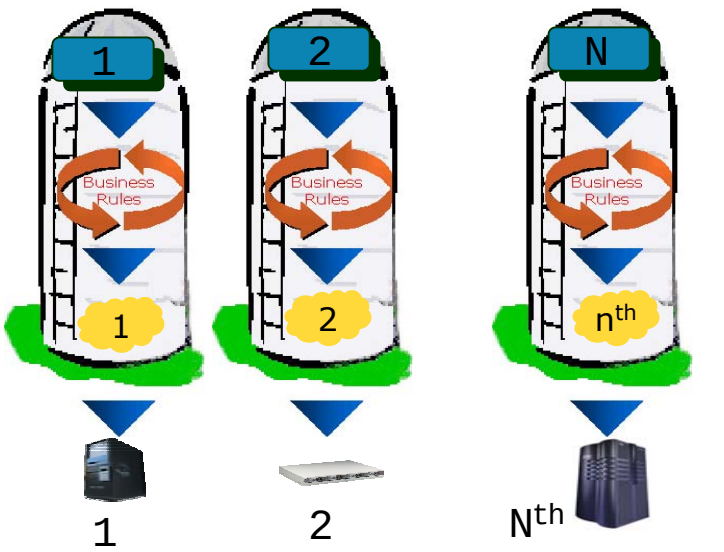
- Actually 10K clients is very doable
  www.kegel.com/c10k.html

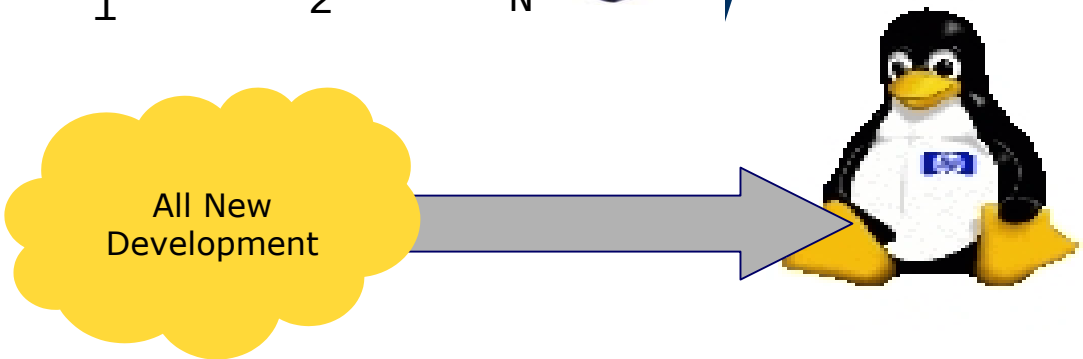
IT purchases are driven by urgent, time-to-market business opportunities that result in an inefficient and unmanageable IT infrastructure



- Data and process sharing problems
- Multiple OSs
- Multiple RDBMS
- Multiple Skill sets
- EOL risks
- Cross-platform support issues
- Inefficient data center utilization
- Costly business continuity
- Upgrade challenges

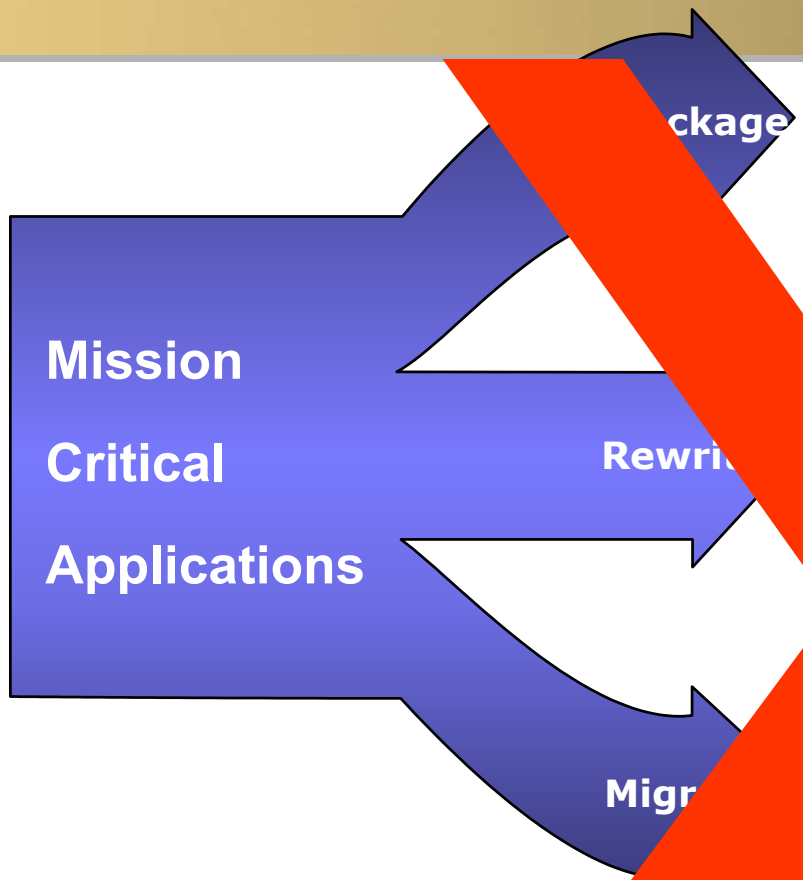
Moving to industry standard components in the enterprise presents an opportunity to create additional IT efficiencies while improving service levels





- Industry standard technology
- Consolidated skill base
- Minimal EOL risk
- Increased service levels and maintainability
- Efficient supply chain
- Low risk, fast upgrades
- Price / Performance
- Strategic HW Platform WITH A CHOICE (Linux, HPUX, Windows)

Application Options



Lose competitive advantage
- long time to
- loss of bus
knowled

time consuming

1. Retain competitive advantage created through years of developing and refining business rules and processes
2. inimal risk and impact to current iness rules/processes
3. in speed of business on
4. In ly system interfaces

E BEST OPTION

Web Services is a Great Place to Start

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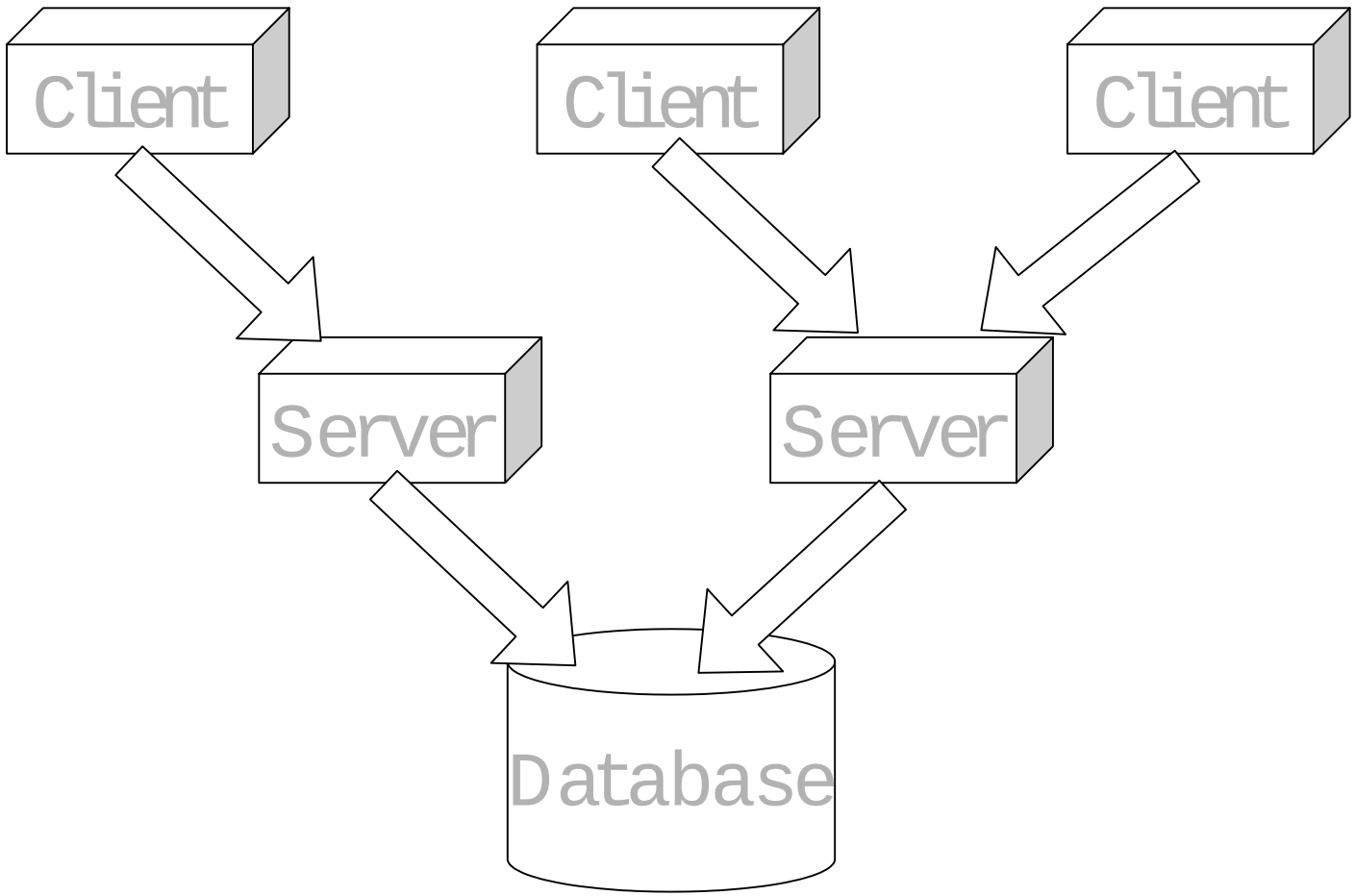
What BEA is Seeing

- Market migration is real
- Linux now owns 13.7% of the $50.9 billion server market and is expected to increase its share to 25.2% in 2006
- BEA interviewed 700+ organizations on their use of application servers and the majority of enterprise customers are seriously evaluating ways to lower costs
  - Over 40% of these accounts were specifically evaluating Intel/Linux to replace vendor specific platforms
  - Financial services, telco, and government are leading the way
- Large, SMP servers are being being replaced with a variety of configurations
  - Clusters of single-cpu Intel boxes
  - Multi-cpu Intel boxes (most common option)
  - Blade servers are an important part of the evaluation

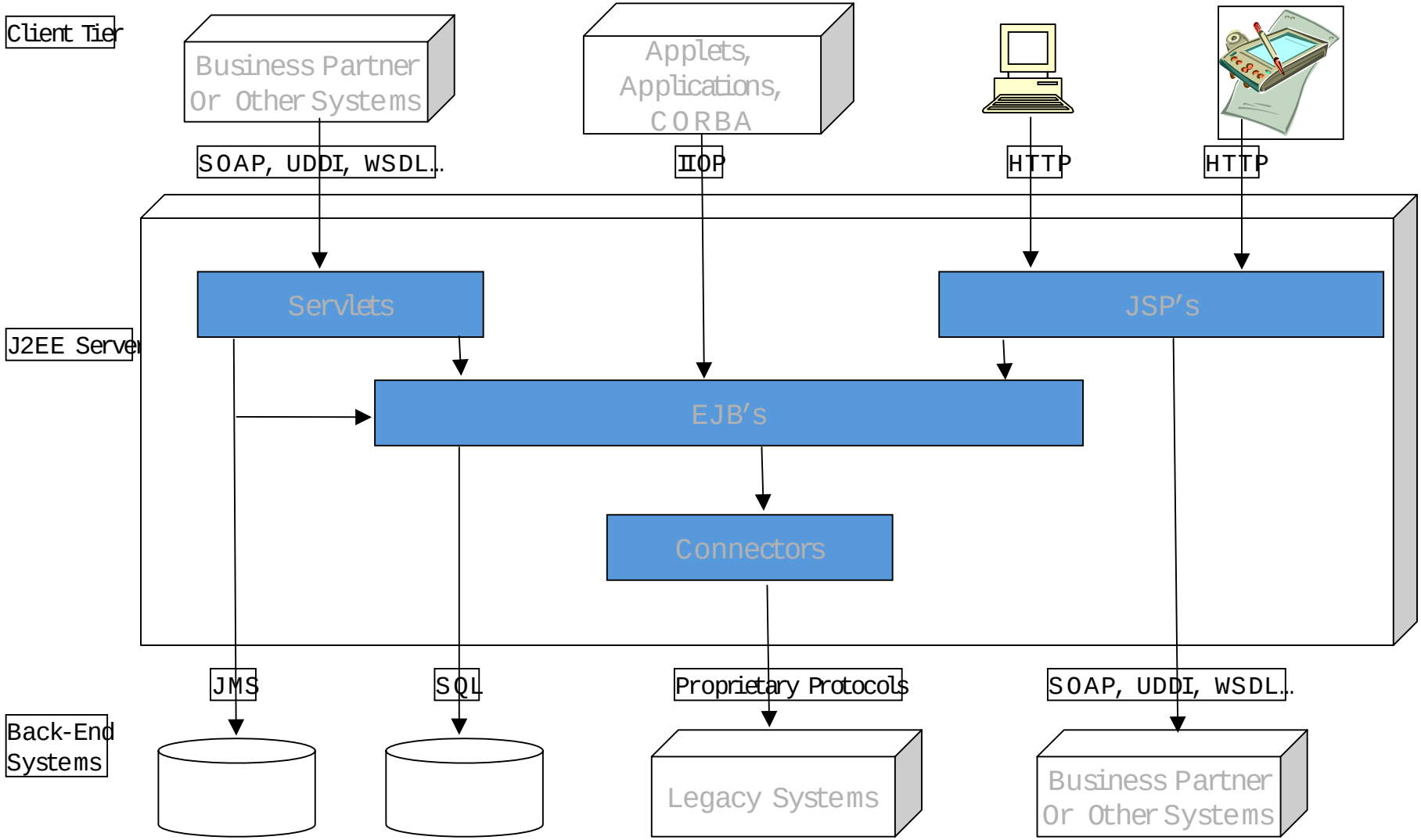
Typical Business Application



What Else Do We Need

- Remote method invocation
- Load balancing
- Transparent fail-over
- Back-end integration (persistent data and legacy systems)
- Transactions – ACID
  - atomicity, consistency, isolation and durability
- Clustering – replicated state
- Dynamic redeployment
- Clean shutdown
- Log and Audit
- Manageability
- Threading
- Messaging infrastructure
- Object life cycle – create and destroy
- Resource pooling – sockets and objects
- Security
- Caching
- What did I miss?

Generic J2EE Deployment



What is Available on Itanium® Linux?

- Lots of development tools
- Scale out can offer huge savings
- Typical 64-bit (Database, analytics, computation)
- Rearchitecting can have great payback, learn J2EE
- Much can be done for free~!

Compilers & libraries

- **gcc**
  http://gcc.gnu.org/
  "GCC development is a part of the GNU Project, aiming to improve the compiler used in the GNU system including the GNU/Linux variant. The GCC development effort uses an open development environment and supports many other platforms in order to foster a world-class optimizing compiler, to attract a larger team of developers, to ensure that GCC and the GNU system work on multiple architectures and diverse environments, and to more thoroughly test and extend the features of GCC."

- **DotGNU Portable.NET**
  http://www.southern-storm.com.au/portable_net.html
  "A suite of free software tools to build and execute .NET applications, including a C# compiler, assembler, disassembler, and runtime engine. The initial target platform is GNU/Linux, with other platforms to follow in the future. DotGNU Portable.NET is part of the DotGNU project."

- **Mono**
  http://www.go-mono.com
  “An open source implementation of the .NET Development Framework”
- **GNU Smalltalk**
  http://www.gnu.org/software/smalltalk/smalltalk.html
  "GNU Smalltalk is a free implementation of the Smalltalk-80 language that runs on most versions on Unix and, in general, everywhere you can find a POSIX-compliance library."

- **GNU C Library**
  http://www.gnu.org/software/libc/
  "The GNU C library is used as the C library in the GNU system and most newer systems with the Linux kernel."

Programming tools

- **GDB**
  http://sources.redhat.com/gdb/
  "The GNU Project debugger, allows you to see what is going on 'inside' another program while it executes -- or what another program was doing at the moment it crashed."

- **GVD: The GNU Visual Debugger**
  http://libre.act-europe.fr/gvd/
  "GVD, the GNU Visual Debugger, is an extensible graphical debugger licensed under the GNU General Public License and written in Ada using GNAT and the GtkAda graphical toolkit."

- **GNU Binutils**
  http://sources.redhat.com/binutils/
  "The GNU Binutils are a collection of binary tools. The main ones are "ld", the GNU linker, and "as", the GNU assembler."

- **Code-Forge IDE**
  http://www.codeforge.com/
  "CodeForge is an integrated development environment for Unix. Providing full project management and complete edit/compile/debug cycle support. With its clear and intuitive user interface development will become easier and more efficient."

- **Borland Kylix**
  http://www.borland.com/products/downloads/download_kylix.html
  Borland Kylix 3 Open Edition delivers an integrated ANSI/ISO C++ and Delphi language solution for building powerful open-source applications for Linux, licensed under the GNU General Public License. Use visual design tools and the power of component-based development with FreeCLX component framework to rapidly build high-performance applications.

Programming tools

- **Anjuta**
  http://anjuta.sourceforge.net/
  "Anjuta is a versatile Integrated Development Environment (IDE) for C and C++ on GNU/Linux. It has been written for GTK/GNOME and features a number of advanced programming facilities. These include project management, application wizards, an on-board interactive debugger, and a powerful source editor with source browsing and syntax highlighting."

- **FOX**
  http://www.fox-toolkit.org/
  "FOX is a C++ based Toolkit for developing Graphical User Interfaces easily and effectively. It offers a wide, and growing, collection of Controls, and provides state of the art facilities such as drag and drop, selection, as well as OpenGL widgets for 3D graphical manipulation. FOX also implements icons, images, and user-convenience features such as status line help, and tooltips."

- **^txt2regex$**
  http://txt2regex.sourceforge.net/
  "^txt2regex$ is a Regular Expression "wizard", all written with bash2 builtins, that converts human sentences to RegExs. with a simple interface, you just answer to questions and build your own RegEx for a large variety of programs, like awk, ed, emacs, grep, perl, php, procmail, python, sed and vim. there are more than 20 supported programs."
  ManEdit
  http://wolfpack.twu.net/ManEdit/
  "ManEdit is a UNIX manual page editor and viewer, it is designed specifically for the editing of the UNIX manual page format using an integrated XML interface."

Programming tools

- **Flawfinder**
  http://www.dwheeler.com/flawfinder/
  "Flawfinder is a program that examines source code and reports possible security weaknesses ("flaws") sorted by risk level. It's very useful for quickly finding and removing at least some potential security problems before a program is widely released to the public."

- **CheckInstall**
  http://checkinstall.izto.org/
  "checkinstall will keep track of every file modified by an installation, making it easy to uninstall the software if desired."

- **motor**
  http://konst.org.ua/motor/
  "Motor is a text-mode-based programming environment for Linux. It consists of a powerful editor with syntax highlight feature, project manager, makefile generator, gcc and gdb front-end, etc. Deep CVS integration is also provided."

- **C++Test 2.1**
  http://www.parasoft.com/
  "C++Test is a unit testing tool that automatically tests C and C++ classes, functions, or components without requiring developers to write a single test case, harness, or stub. With the click of a button, C++Test automatically performs static analysis of code using industry-wide coding standards, tests code construction (white-box testing), tests code functionality (black-box testing), and maintains code integrity (regression testing)."

Scripting languages and 4GLs

- **Perl**
  http://www.perl.org/
  "Perl started on Unix systems as a system administration tool." See http://www.perl.org/press/fast_facts.html for a collection of fast facts.

- **perltidy**
  http://perltidy.sourceforge.net/
  "Perltidy is a Perl script which indents and reformats Perl scripts to make them easier to read. If you write Perl scripts, or spend much time reading them, you will probably find it useful."

- **Prima**
  http://www.prima.eu.org/
  "Prima is an extensible Perl toolkit for multi-platform GUI development. Platforms supported include Linux, Windows NT/9x/2K, OS/2 and UNIX/X11 workstations."

- **Python**
  http://www.python.org/
  "Python is an interpreted, interactive, object-oriented programming language. It is often compared to Tcl, Perl, Scheme or Java. Python combines remarkable power with very clear syntax. It has modules, classes, exceptions, very high level dynamic data types, and dynamic typing."

- **Ruby**
  http://www.ruby-lang.org/
  "Ruby is the interpreted scripting language for quick and easy object-oriented programming. It has many features to process text files and to do system management tasks (as in Perl). It is simple, straight-forward, extensible, and portable. Ruby has simple syntax, partially inspired by Eiffel and Ada. Ruby has exception handling features, like Java or Python, to make it easy to handle errors."

Scripting languages and 4GLs

- **PHP**
  http://www.php.net/
  "PHP is a widely-used general-purpose scripting language that is especially suited for Web development and can be embedded into HTML."

- **PHPMyEdit**
  http://phpmyedit.sourceforge.net/
  "PHPMyEdit is a code generator to write an editor for you automatically. You may never need to hand-code a table editor again."

- **phpGroupWare**
  http://www.phpgroupware.org/
  "phpGroupWare is a multi-user web-based groupware suite written in PHP. It also provides an API for developing additional applications. This program is currently in the beta stages, and is intended for developers."

- **Tcl/Tk**
  http://tcl.activestate.com/
  "Tcl is a very simple programming language. If you have programmed before, you can learn enough to write interesting Tcl programs within a few hours."

- **guile**
  http://www.gnu.org/software/guile/
  "Guile is a library designed to help programmers create flexible applications. Using guile in an application allows programmers to write plug-ins, or modules (there are many names, but the concept is essentially the same) and users to use them to have an application fit their needs."

- **VDKBuilder**
  http://sourceforge.net/projects/vdkbuilder/
  "VDKBuilder is a rapid application development tool based on VDK, a C++ wrapper of the Gtk+ widget set library. It helps programmer in constructing GUI interfaces, editing, compiling, linking and debugging within an integrated environment."

Scripting languages and 4GLs

- libbond
  http://bond.treshna.com/
  "BOND is a powerful rapid application development 5th generation language for creating data aware database applications. It's purpose is to minimize the need for coding and maximise platform independence; this tool can dramatically reduce software development life cycles."

- slang
  http://space.mit.edu/~davis/slang/
  "S-Lang is a multi-platform programmer's library designed to allow a developer to create robust multi-platform software. It provides facilities required by interactive applications such as display/screen management, keyboard input, keymaps, and so on."

- Database design
  DbDesigner
  http://dbdesigner.sourceforge.net/
  "DbDesigner allows you to construct your DB in an intuitive and easy to use environment, where you have a visual representation of the tables and relations contained in your project."

- TOra
  http://www.globecom.se/tora/
  A toolkit for Oracle.

Graphical user interface libraries

- **KDE Studio**
  http://www.thekompany.com/products/ksg/
  "KDE Studio is a full-fledged IDE for the development of sophisticated C++ KDE applications -- including the many utility features you expect from a modern development environment, such as code completion, dynamic syntax highlighting and popup function parameter lookup. Debugging is simplified by tight integration with kdbg in the IDE."

- **KDevelop**
  http://fara.cs.uni-potsdam.de/~smeier/www/
  "Kdevelop is an easy to use C/C++ IDE (Integrated Development Enviroment) for Unix. It is publicly available under the GPL and supports KDE/Qt, GNOME, plain C and C++ projects.

- **Qt**
  http://www.trolltech.com/products/qt/
  "Qt is a C++ toolkit for application development. It lets application developers target all major operating systems with a single application source code. Qt provides a platform-independent API to all central platform functionality: GUI, database access, networking, file handling, etc."

- **PyQt**
  http://www.riverbankcomputing.co.uk/pyqt/
  "PyQt is a set of Python bindings for the Qt toolkit. The bindings are implemented as a set of Python modules: qt, qtcanvas, qtgl, qtnetwork, qtsql, qttable and qtxml, and contains 300 classes and more than 5,750 functions and methods."

- **QtEZ**
  http://www.ibl.sk/qtez
  "QtEZ is development environment for X11 and Qt2 QtEZ is a GUI application builder that uses the Qt Toolkit. It can also be used to create applications utilizing the KDE libraries and widgets. QtEZ allows a programmer to create an application using visual techniques, run the application from within QtEZ for testing purposes, and then dump the project to Source Code."

Graphical user interface libraries

- **PyGTK**
  http://www.daa.com.au/~james/pygtk/
  "PyGTK is a set of bindings for the GTK widget set. It provides an object oriented interface that is slightly higher level than the C one. It automatically does all the type casting and reference counting that you would have to do normally with the C API. I have also written GNOME bindings."

- **GTK+**
  http://www.gtk.org/
  "GTK+ is a multi-platform toolkit for creating graphical user interfaces. Offering a complete set of widgets, GTK+ is suitable for projects ranging from small one-off projects to complete application suites. GTK+ is free software and part of the GNU Project."

- **gtkmm**
  http://gtkmm.sourceforge.net/
  "gtkmm (previously known as Gtk--) is the official C++ interface for the popular GUI library GTK+. Highlights include typesafe callbacks, widgets extensible via inheritance and a comprehensive set of widget classes that can be freely combined to quickly create complex user interfaces."

- **GtkExtra**
  http://gtkextra.sourceforge.net/
  "GtkExtra is a useful set of widgets for creating GUI's for the X Window System using GTK+. You can use it complementary to GTK+ and it is written in C."

- **ParaGUI**
  http://www.paragui.org/
  "ParaGUI is a cross-platform high-level application framework and GUI (graphical user interface) library. It can be compiled on various platforms (Linux, Win32, BeOS, MacOS) ParaGUI's cross-platform nature is completely based on the Simple DirectMedia Layer (SDL)."

Graphical user interface libraries

- **FLTK**
  http://www.fltk.org/
  "FLTK (pronounced "fulltick") is a LGPL'd C++ graphical user interface toolkit for X (UNIX), MacOS, and Microsoft Windows, and supports 3D graphics with OpenGL. FLTK is designed to be small and modular enough to be statically linked."

- **OpenMotif**
  http://www.opengroup.org/openmotif/
  "Open Motif, is a source code version of Motif."
  More LinuxWorld stories about application-development tools.
- **Lesstif**
  http://www.lesstif.org/
  "LessTif is the Hungry Programmers' version of OSF/Motif. It aims to be source compatible meaning that the same source code should compile with both and work exactly the same! LessTif is "free software": it is licensed under the GNU Library General Public License (LGPL)."

- **XForms**
  http://world.std.com/~xforms/
  "XForms is a GUI toolkit based on Xlib for X Window System. It features a rich set of objects, such as buttons, scrollbars, and menus etc. integrated into an easy and efficient object/event callback execution model that allows fast and easy construction of X-applications. In addition, the library is extensible and new objects can easily be created and added to the library."

- **WebGUI**
  http://www.plainblack.com/webgui
  "WebGUI is a content management platform built to allow average business users to build and maintain complex web sites. It is modular, pluggable, and platform independent. It was designed to allow the people who create the content, to manage it online, rather than content management taking up the time of the busy IT staff."

- **R**
  http://www.r-project.org/
  "R is `GNU S' - a language and environment for statistical computing and graphics. R is similar to the award-winning S system, which was developed at Bell Laboratories."

Bug tracking, CVS & change management

- **Bugzero**
  http://www.websina.com/bugzero/
  "A web-based bug tracking and change management system written in Java servlet and database technologies."

- **Request Tracker**
  http://www.bestpractical.com/
  "RT is an industrial-grade ticketing system. It lets a group of people intelligently and efficiently manage requests submitted by a community of users. RT is used by systems administrators, customer support staffs, NOCs, developers and even marketing departments at over a thousand sites around the world."

- **TUTOS**
  http://www.tutos.org/
  "TUTOS is a tool to manage the the organizational needs of small groups, teams, departments. To do this it provides some web-based tools, including a calendar for users and groups, Groups / Teams, address manager for people, companies and departments, bug tracking system, product/project repository, mailboxes, timetracking on projects, installations and bugs, Invoices, Watchlists. Support for teams that are distributed over different timezones, color schemes, fine grained permission handling, change history."

- **Mantis**
  http://mantisbt.sourceforge.net/
  "Mantis is a web-based bugtracking system. It is in active development and is considered beta. It is written in the PHP scripting language and requires the MySQL database and a webserver."

- **PhpBugTracker**
  http://phpbt.sourceforge.net/
  "phpBugTracker is meant to be a replacement for Bugzilla. It's not quite there yet, but we're working on it. (Its) design goals are, simplicity in use and installation, use templates to achieve presentation independence, use a database abstraction layer to achieve database independence."

Bug tracking, CVS & change management

- **A.C.E. All-purpose Collaboration Engine**
  http://www.ace-solution.com/
  "A.C.E. is a fully downloadable PHP source web based project management and intranet tool that enables you to fully manage projects and leverage internal and external talents. Our highly organized source code will allow you to modify the software to better suit your needs."

- **Bugzilla**
  http://www.bugzilla.org/
  "Bugzilla is very adaptable to various situations. Known uses currently include IT support queues, Systems Administration deployment management, chip design and development problem tracking (both pre-and-post fabrication), and software and hardware bug tracking for luminaries such as Red Hat, Loki software, Linux-Mandrake, and VA Systems."

- **GNATS**
  http://www.gnu.org/software/gnats/
  "GNU GNATS is a set of tools for tracking bugs reported by users to a central site. It allows problem report management and communication with users via various means. GNATS stores all the information about problem reports in its databases and provides tools for querying, editing, and maintenance of the databases."

- **Alma**
  http://www.memoire.com/guillaume-desnoix/alma/
  "Alma is a software with the following functionality: Reads several sources; Helps to design for object-oriented modeling; Modifies the structure and the code; Outputs new sources, documentation, and diagrams. It is designed for object-oriented modelization (definition of classes and relations) and for migrating (help to convert) code written in old languages to newer ones."

- **Aegis**
  http://aegis.sourceforge.net/
  "Aegis is a transaction-based software configuration management system. It provides a framework within which a team of developers may work on many changes to a program independently, and Aegis coordinates integrating these changes back into the master source of the program, with as little disruption as possible."

JAVA

- **Blackdown Java 2 Standard Edition for Linux**
  http://www.blackdown.org/java-linux/java2-status/
  "The Blackdown project is a world-wide community of volunteer developers dedicated to the professional development of the Java platform for Linux."

- **Java SQL Admin Tool**
  http://www.trash.net/~ffischer/admin/index.html
  "A Java-based Admin-Tool for SQL-Databases via JDBC."

- **Java Development Environment for Emacs**
  http://sunsite.auc.dk/jde/
  "The Java Development Environment for Emacs is a software package that interfaces Emacs to command-line Java development tools (for example, JavaSoft's JDK). The JDEE supports both Emacs (Unix and Windows versions) and XEmacs."

- **Java checkstyle Tool**
  http://checkstyle.sourceforge.net/
  "Checkstyle is a development tool to help programmers write Java code that adheres to a coding standard. It automates the process of checking Java code to spare humans of this boring (but important) task. This makes it ideal for projects that want to enforce a coding standard."

- **ccl**
  http://www.kclee.com/clemens/java/ccl/
  "ccl is a general purpose, reusable Java library that provides a Basic GUI/Swing application framework and utility classes, additional string methods, vector methods, file methods, debug and assertion support, and test framework."

- **Sniffer version 1.0**
  http://www.softgineering.com/Sniffer.html
  "This Sniffer package allows a high level programmer to sniff IP packets arriving at, and leaving their computer. A queue of IP packets is sent to the Java or C++ program and the programmer can analyse each packet in sequence. The programmer can optionally filter the queue of IP packets by specifying the IP addresses, protocols and port numbers for which packets are queued."

- **Packet-Utils version 1.0**
  http://www.softgineering.com/Packet-Utils.html
  " Packet-Utils takes the Sniffer library to the next level. Packet-Utils is a networking utility library that give C++ and Java programmers access to all incoming and outging packets through user friendly network classes. Packet-Utils allows the programmer to drop/allow packets, effectively creating a firewall. IP packets of any protocol, including user-defined, can be sent along the network, effectively creating a VPN."

Web server tools

- **Web Performance Trainer**
  http://www.webperformanceinc.com/
  "Web Performance Trainer is a personal trainer for your web site, helping you find performance bottlenecks, increase performance, or do capacity planning."

- **Linux Test Project**
  http://ltp.sourceforge.net/
  "The Linux Test Project is a joint project with SGI, IBM, OSDL, and Bull with a goal to deliver test suites to the open source community that validate the reliability, robustness, and stability of Linux. The Linux Test Project is a collection of tools for testing the Linux kernel and related features."

- **PureLoad**
  http://www.ming.se/products/pureload/
  "PureLoad is a load testing tool that simulates hundreds of users executing requests against server based applications. PureLoad reports quality and performance problems as well as detailed statistics gathered during a load test."

- **Hammerhead**
  http://hammerhead.sourceforge.net/
  "Hammerhead 2 is a stress testing tool designed to test out your web server and web site. It can initiate multiple connections from IP aliases and simulated numerous (256+) users at any given time. The rate at which Hammerhead 2 attempts to pound your site is fully configurable, there are numerous other options for trying to create problems with a web site."

Web server tools

- **Apache Toolbox**
  http://www.apachetoolbox.com/
  "Apache Toolbox provides a means to easily compile Apache with SSL, PHP (v4 or v3), MySQL, APC, and 63 other third-party modules."

- **iConductor Apache Server Module**
  http://www.i-conductor.com/
  "With iConductor, you can develop and host all your Internet applications on your Apache server. Whether you need to create complex sales and accounting systems, or simply access external data, the iConductor Server Module makes it possible for you to leverage the power of your existing information assets."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