PLANNING ASSUMPTION

June 26, 2002

Linux Has Gone Mainstream: Are You Up to It?

Stacey Quandt and Bob Zimmerman

Giga Position

Linux matters because it has contributed to a multi-billion dollar market based on hardware and software revenues. The Linux market opportunity is broad, with Linux capable of running on everything from a mainframe to mobile devices. Companies in widely dispersed industries such as financial services, insurance, life sciences, telecommunications, oil and gas and retail have deployed Linux systems. Due to the interest in a migration from Unix to Linux and the economics of Linux on **Intel** architecture, Linux has become the dominant "Unix" on x86-based systems, and it is No. 2 after Windows based on new operating system server shipments. If the rapid pace of Linux scalability and performance improvements continues and the reduction of IT spending costs remain a key focus for users, Giga estimates within three to four years there is high probability Linux will overtake Windows to become the leading operating system on new server shipments.

The price/performance benefits of Linux/Intel are placing pressure on the Unix market and it continues to take market share away from the Windows and Unix markets as a replacement with Apache for Web server front ends and Samba for file/print servers. Linux is also gaining interest as a platform to support application servers and e-mail consolidation and transactional desktops. There is even increasing, albeit small, interest in the office productivity Linux desktop. There are systemic and adaptive challenges for an office productivity Linux desktop to gain significant market share against **Microsoft**. It will be important to measure the success of commercial Linux desktop implementations by users such as Merrill Lynch and HSBC before coming to conclusions about an end to Microsoft's near ubiquity on the desktop. The handheld market for Linux is still in its infancy.

Proof/Notes

Linux has grown from a graduate student's project to a major force driving application growth. Based on server revenues, Linux distribution providers accounted for a $1.5 billion market in 2000; a $2.5 billion market in 2002 and will grow to a $15 billion market by 2007. Today, there are more than 20 million Linux users worldwide, with Linux representing 30 percent of the Web server market. The use of Linux by companies and organizations such as Amazon.com, Google, Hughes Network Services, Dresdner Kleinwort Benson, Dreamworks, Telia, FAA, Merrill Lynch, UBS Warburg and L.L.Bean influence the growth of the Linux server market.

Forces Driving Linux Acceptance

Linux is achieving greater mindshare and market share due to six key attributes:

1. Flexibility
2. Open standards
3. Distributed development and collaboration
4. Price/performance
5. Lack of license fees
6. Lack of vendor lock-in

Flexibility is important for the freedom to choose among multiple Linux distribution providers and not be dependent on a single vendor for operating system (OS) code integrity. At the same time, various system vendors such as **IBM**, **Dell**, **Hewlett-Packard**, **NEC**, **SGI** and **Fujitsu** support Linux on Intel-based server platforms. With broad support for Linux across the entire IBM and HP server portfolios, Linux has become a pervasive platform alternative.

Linux supports open standards such as TCP/IP, Kerberos, Secure Shell, IPv6, etc., while providing vendor independence since no one company controls it. Compliance to open standards has made it straightforward to port applications from Unix or even Windows. At the same time, standards have made Linux a technically attractive base for embedded systems such as personal digital assistants (PDAs) and storage appliances.

Linux is an open source operating system and benefits from the distributed development and collaboration of the Linux and open source communities. Many key kernel developers are employed by a number of Linux distribution providers and system vendors. For example, Linus Torvalds (**Transmeta**), Alan Cox and Stephen Tweedie (**Red Hat**), Andrea Arcangeli (**SuSE**), Ted Ts'o(IBM), Rik Van Riel and Marcelo Tosatti (**Conectiva**) and David Mosberger (HP) work with many other developers on the maintenance and continued advancement of the Linux kernel.

The price/performance of Linux on Intel and the absence of license fees contribute to lower initial acquisition costs and return on investment. First of all, the basic kernel is free and may be downloaded from multiple sites on the Internet. Most enterprises, however, choose to obtain Linux from one of the distribution providers — the price advantage here is that one copy, complete with user extensions and documentation, may be propagated across every system in the enterprise. Contrast this with the server serial licensing practice of every proprietary OS available.

Since all Linux distributions, with the exception of **Caldera**, do not charge per seat license fees, it is possible to deploy Linux across any number of servers, workstations and desktops. Although the initial acquisition of a Linux distribution is only a small part of an overall infrastructure investment, it is the absence of license fees which is an competitive advantage against Microsoft.

Lack of vendor lock-in means there are no forced software upgrades. There are efforts toward application portability across various Linux distributions with the Linux standards base and the emergence of UnitedLinux, a consortia of Linux distribution providers to create a single enterprise-class Linux solution. While the Unix vendors all claim to support Linux, they continue their respective development of AIX (IBM), HP-UX (HP) and Solaris (**Sun Microsystems**). The Unix vendors will add the APIs necessary to address missing Linux interfaces to support Linux applications on Unix. One caveat, given the breadth of the Linux opportunity, is that the major system houses may find the market too enticing to ignore; they may fold Linux into their proprietary Unix implementations and try to use their market strength to force the current Linux distribution providers out of the market.

The driving factors of Linux growth include Linux clusters, distributed enterprise, edge services, workload and server consolidation and embedded devices. In particular, Linux has become a mainstream operating system because it enables workload and server consolidation, which means moving workloads from either underutilized servers and consolidating them on a single server such as the mainframe or consolidating these workloads on Intel-based IU and 2U servers or server blade architectures. The Unix market continues to consolidate with the majority of migrations and new departmental and workgroup deployments going to Linux. The economics of Linux on IA-32 bit systems — given the cost and frailty of Windows, blades as well as Linux virtualization alternatives on mainframes and PowerPC — are gaining traction among IT managers. Leading vendors will increasingly emphasize their virtualization capabilities to support Linux on logical partitions and dedicated blades.

Enterprises with distributed sites and/or remote locations benefit from the stability and remote management

characteristics of Linux. Service and telecommunications providers have deployed Linux for Web serving, DNS and FTP serving. Although still in its infancy, telecommunications manufacturers are beginning to consider Linux on Intel as an alternative to a proprietary operating system. The promise of a carrier-grade Linux solution will enable migration from proprietary operating systems to Linux at the expense of proprietary solutions with this becoming a critical factor by mid to late 2003.

The high-volume opportunity for Linux is among application developers that can use Linux on Intel as a platform for application development and small and midsize businesses that want to minimize the higher licensing costs of proprietary systems and Web-enabled middleware. Linux as an application development environment will grow due to IBM's support for the Eclipse framework (www.eclipse.org). As IBM and its partners port their Web development tools to the Eclipse framework, developers will be able to use the Eclipse workbench directly on Linux. This will lead to the use of Linux as an application development environment and hence drive IBM's agenda to create more Linux applications, as well as the development and deployment of Web Services on Linux.

Some ISVs are certified for specific Linux distributions but some are not, so it is important to select a Linux distribution carefully. Most importantly, not all applications are certified for Red Hat Linux Advanced Server, which offers workload and scalability benefits over its competitors. The enterprise Linux opportunity will be led by Red Hat, UnitedLinux and Sun Linux. However, since Linux lacks the scalability, reliability, serviceability and manageability of high-end Unix, companies need to have realistic expectations about what Linux can achieve today.

Deploying Linux requires users to understand their needs due to the variety of workloads, hardware platforms and form factors (e.g., server, desktop, embedded device) Linux supports. Linux is a volume platform on IA-32 systems, on emerging IA-64 and is the No. 2 operating system platform after Microsoft Windows. The end-user benefits of using Linux are low initial acquisition costs, price/performance and greater flexibility in choosing among IA-32 and IA-64 hardware providers. However, as Linux matures, the quaint expression "Linux is Linux is Linux" fades, with some Linux distribution providers partnering with system vendors and ISVs to provide optimization in the user space surrounding the kernel for specific applications such as database, systems management, e-commerce, enterprise resource planning (ERP) and customer relationship management (CRM). This will result in the gap widening between mainstream and midrange Linux providers with only a limited few capable of enterprise-class support and the rest providing only core functionality for entry-level, workgroup and departmental Internet infrastructure.

Linux is, to a large degree, hardware independent, which means it runs on just about every microprocessor architecture, including x86, IA-64, MIPS, SPARC, PowerPC, PA-RISC, SuperH, StrongARM, etc. Linux first gained a foothold on entry-level systems, but this is changing. Midrange Linux deployments are becoming more common. The scalability requirements of database, enterprise resource planning (ERP) and commercial custom application workloads combined with the performance enhancements of Red Hat Linux Advanced server, means the development of UnitedLinux will drive the adoption of eight-way IA-32 architectures and beyond.

Linux clusters represent a significant segment of the Linux server market in the context of high performance technical computing, load leveling and high availability. The automotive industry uses Linux clusters for crash analysis. Bioinformatics and life science researchers use Linux clusters to discover the secrets of protein folding, drug discovery and aspects of genetic research. The financial services industry deploys Linux clusters for risk and portfolio analysis. The oil and gas industry uses Linux clusters for seismic analysis and exploration.

In specialized applications, Linux has become an integral part of the entertainment industry, adopted by the digital filmmakers to render animation. Linux is also embedded in devices ranging from PDAs to network attached storage (NAS) appliances. The common characteristic here is that *Linux per se* is invisible — the business function is the critical measure. Linux has proven to be a cost-effective component of the solution.

Surprisingly, the weakest segment for Linux is the desktop. This will continue to be a nascent market in North America, which accounts for 5 percent of the market due to the market dominance of Microsoft Office and the underlying Windows operating system. The promise of significant Linux desktop growth will be in Asia Pacific, Latin America and Europe due in large part to political agendas favoring open source software and financial pressures to reduce the costs of IT infrastructure. **MandrakeSoft**, Red Hat and SuSE are the leading Linux distributions providers for the Linux desktop segment.

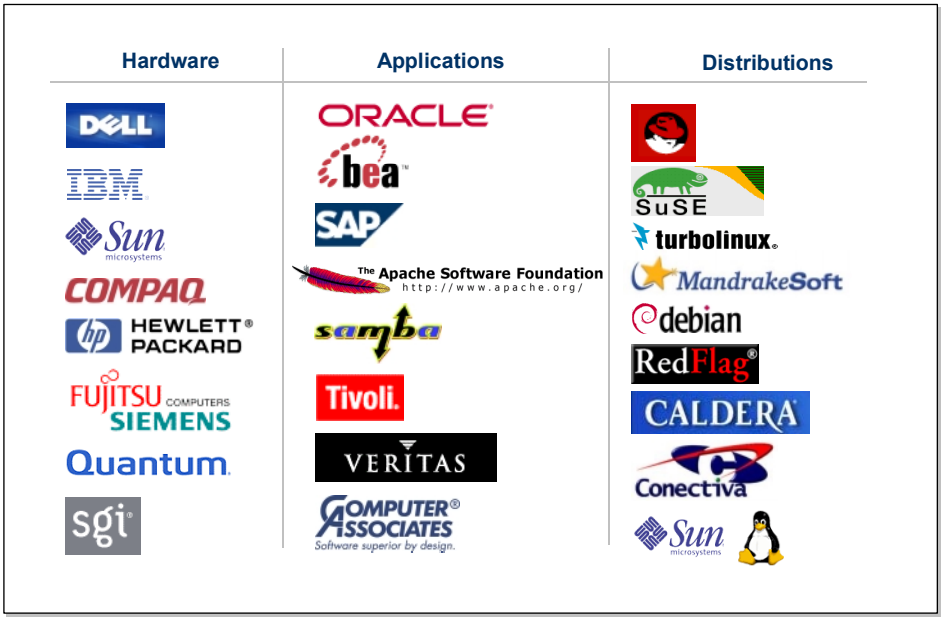
The Range of Linux

Linux is available for and supported on a wide range of servers from the major system houses; even Sun has a formal strategy for Linux on low-end systems. The major database and application suites support Linux, some seeing a new opportunity such as **VERITAS** and **Oracle**, to address specific client demands. Linux distribution providers generate only a fraction of their income from the sale of the documentation that is part of a Linux distribution package. The major source of revenue for Linux distribution provider sis derived through support services and functional enhancements in the user space. Red Hat, one of the few publicly held vendors, has profitably focused on the North American market, while several of the privately held companies have told Giga they are approaching profitability by addressing specific market segments. Linux is a tier-one platform for ISVs and there are more than 2,800 applications that run on Linux. To be fair, it is worth comparing this against the 20,000 applications supported by Solaris. However, in reality there is a much smaller set of Solaris applications, what Sun commonly refers to as the "bear hug" 20, that truly matter to enterprise customers.

There are even subtleties within specific geographic market segments as the distribution providers try to establish brand identities. For example, SuSE dominates in German-speaking countries and has a close partnership with **SAP**, while MandrakeSoft targets France and **Turbolinux** has created a strong brand identity in the Asian market because it focuses on double-byte character sets. Conectiva, based in Brazil, focuses primarily on supporting Portuguese and Spanish users.

The decision to select Linux more often starts with a targeted application and this leads to a choice of system vendors. Despite the relative breadth and depth of a number of system vendors, no one has it all and there are strengths of each OEM. IBM's architecture strength is support for Linux virtualization across its entire server product line. Users seeking price sensitivity should look toward Dell. Users with custom applications or who are in the telecommunications market should consider HP and users specifically focused on edge-of-network services should evaluate Sun. Users who want to leverage an integrated solution stack consisting of WebSphere, DB2 and Tivoli should consider IBM. Although Figure 2 makes it appear that you could choose any hardware, application and distribution vendor to base your business application on, this is not always true. Carefully check all of the compatibility and operational items before settling on a configuration.

Figure 2: Linux Infrastructure

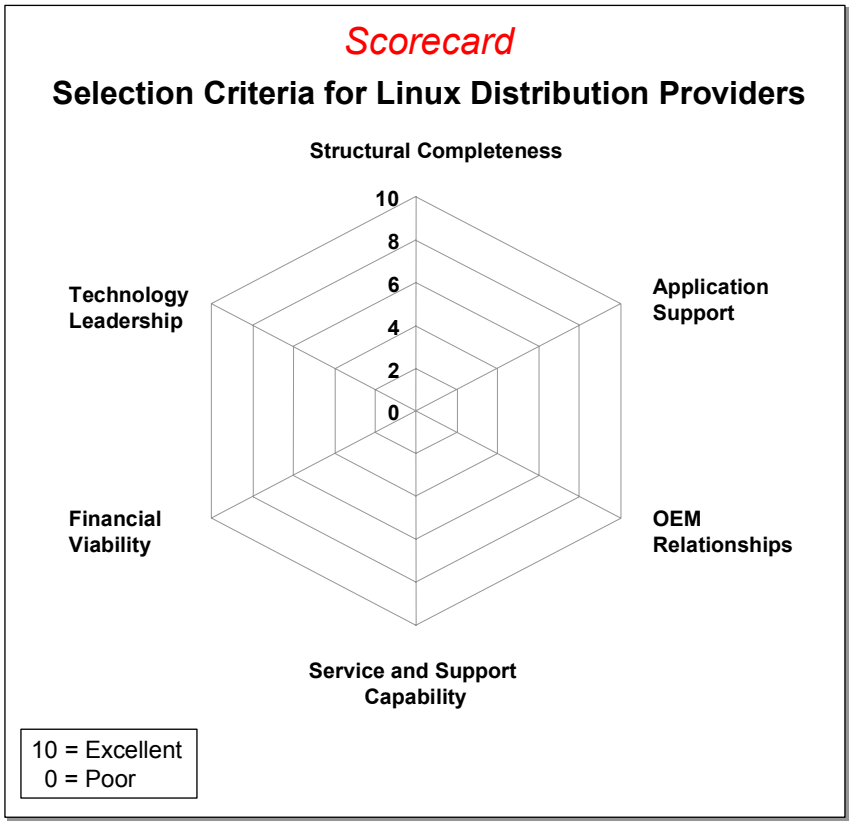


Source: Giga Information Group

Choosing a Linux Distribution Partner

To assess how well the distribution providers meet your requirements, base your comparison of the leading Linux distributions on the following criteria (see Planning Assumption, Market Overview Linux Distribution Providers — The Server Segment, Stacey Quandt).

- Branding — Ability to deliver on the value promise
- OEM relationships —Partnership agreements that cover service and support or integrate applications
- Structural completeness — Breadth of specific features and functionality
- Application support — Open source and commercial third-party ISV applications
- Service and support capabilities — Installation and service and support programs
- Financial viability — Ability to demonstrate that revenue will sustain the company
- Regional market segmentation — Evaluate the market strength and long-term viability of a Linux distribution based on geographical dynamics
- Recognized technical leadership — Research and development (R&D) capabilities and ability to work in partnership with key ISVs and system vendors to augment Linux functionality



Source: Giga Information Group Figure 3

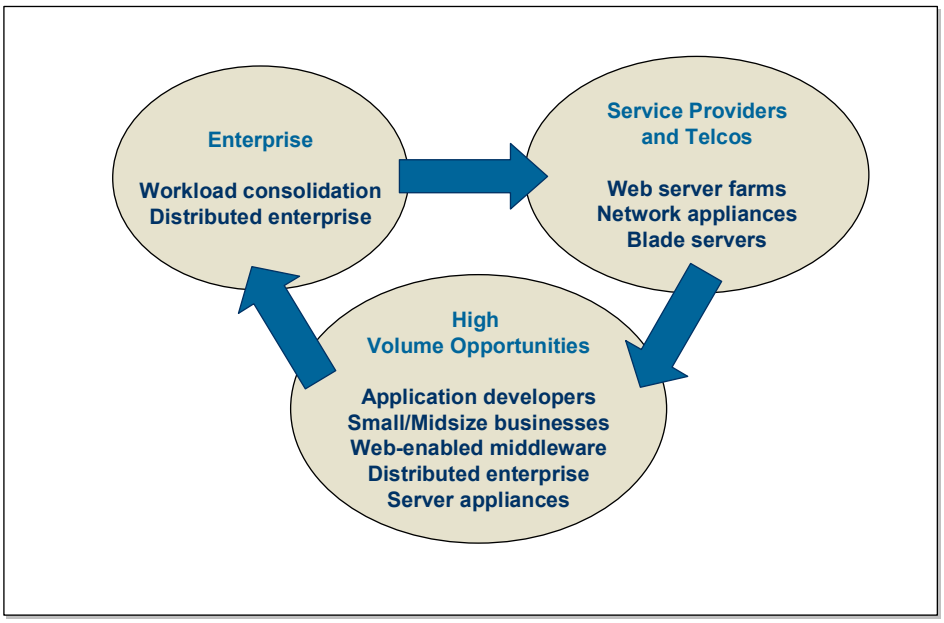
Discussions with Giga clients indicate that the primary criteria for Linux distribution providers is:

- Service and support
- Application support
- OEM relationships
- Financial viability

However, the order tends to vary depending upon customer needs. This means you will have to determine application by application what the decisive factors are for you. Keep in mind that not all distributions are equivalent to one another. For example, while there are hundreds of Linux distribution providers that target the server, only a handful — MandrakeSoft, Red Hat, SuSE and Turbolinux — support the Itanium Processor Family.

Linux growth, to a large extent, feeds on the success of Linux-based application solutions. Companies may initially choose Linux as a base platform for price or application-specific reasons, but they expand its use because it exceeds business expectations. The Linux distributors and opportunistic ISVs have now enabled other applications, databases and business suites, which has the leveraging effect of expanding the high-volume opportunities and restarting the cycle (see Figure 4).

Figure 4: Strategic Linux Plays



Source: Giga Information Group

Alternative View

Although Linux has been an engine of growth for Internet infrastructure (i.e., Web serving, DNS, file/print, and FTP), serving the installed base of enterprise-class midrange Linux systems is just now ramping up. For this to continue, and for Linux to overtake Unix and Windows within the next three years based on new OS server shipments, it will need to overcome the inertia of users that remain unconvinced that Linux is an enterprise-class operating system or who simply need to maintain legacy infrastructure based on application requirements. If Linux cannot overcome these obstacles, then its market growth opportunity will decrease.

Findings

Linux is becoming a core element in both workload consolidation and support for the distributed enterprise. There are highly visible applications in the telco and Web Services industries, which are being address both by Linux-based appliances and blade servers. These applications in turn are spurring developers to move down the technology chain to Intel-based solutions for the midsize enterprise, which in feeds back into the consolidation and distributed support model for the large enterprise.

Given the increasing interest in Linux to reduce IT spending costs there is a possibility that over the next three to four years that it could exceed the market share of Microsoft based on new OS server shipments. However, whether it is number one or two in new OS shipments the implications for both end users and Microsoft are the same.

Recommendations

When exploring new application solutions it is important that enterprises:

- Pay attention to Linux — it is an important element in every aspect of enterprise computing
- Understand application and scalability requirements — this should be a critical path item in any

product selection matrix

- Match OEMs and ISVs to requirements
- Realize there is no one-stop shopping — every business challenge has its own twists, and there is no universal "best" solution

Selecting a Linux distribution provider is a non-trivial task and requires users to look at the technical merits of a Linux distribution and also include the existence of ISV and OEM partnerships in their assessment. While the core functionality and structural completeness of a Linux distribution is paramount, the selection of a Linux distribution provider should also include an examination of financial viability.

Organizations that deploy Linux should customize Giga's evaluation criteria for a Linux distribution provider to address their special circumstances. Since priorities may vary based on the rank in importance of each attribute, choose a distribution closely aligned with business objectives.

References

Related Giga Research

Market Overview Linux Distribution Providers — The Server Segment, Stacey Quandt

The Promise of Portability Where Unix Failed — Linux Standard Base Advances to 1.0, Stacey Quandt

Market Overview 2002: Storage Management Software, Bob Zimmerman

IdeaBytes

Common Mistakes in Linux Infrastructure Selection and Deployment, Stacey Quandt

Unix-to-Linux Migration — An Easy Journey, Richard Fichera

Unbreakable Linux Shifts Focus From Performance to Availability, Stacey Quandt

Red Hat Linux Kernel Enhancements Address Oracle Database Requirements, Stacey Quandt

UnitedLinux Has the Means, Motive and Opportunity to Become a Standard Linux Distribution for the Enterprise, Stacey Quandt

From GigaWorld US 2002: Polls Point to Increased Linux and Microsoft OS Use, Richard Fichera

IBM Targets SuSE for eServer Integrated Platform for E-Business, Stacey Quandt

Red Hat Advanced Server Narrows the Gap Between the Unix and Linux Midrange, Stacey Quandt

German Federal Parliament to Support Linux and Windows, Stacey Quandt

Open Source Development Lab Support for Carrier-Grade Linux is Visionary, Stacey Quandt

Sun Seeks Reinvention With Strategy of Linux on x86 and SPARC, Stacey Quandt

IT Trends 2002: Linux, Stacey Quandt

IT Trends 2002, Midyear Update: Linux, Stacey Quandt

Linux Really Is Different: Backup and Recovery Procedures Online, Bob Zimmerman

Linux on IBM pSeries 690: Virtualization Alternative for Systems Deployment, Stacey Quandt

Networked-Attached Storage Closes in on Direct Attached Storage, Bob Zimmerman

Hewlett-Packard and Compaq Merge — The Linux Impact, Stacey Quandt

Hewlett-Packard Offers Secure Linux, Stacey Quandt

Red Hat Linux 7.2 for Compaq Alpha Yields Only Short-Term Benefits, Stacey Quandt