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WHITE PAPER / LINUX AND EMAIL INFRASTRUCTURE

# Linux and Email Infrastructure: Freedom and Choice

## A business and technology perspective

December 2004

After decades of relatively little change, electronic mail, the world's most ubiquitous application, is in great need of improvement. Issues of security, reliability, performance, cost of ownership and lock-in plague most organizations today. The disruptive shift brought about by Linux and open source has created a unique opportunity to define a new generation email infrastructure that supports the demands placed on today's systems. The strengths inherent to Linux -- open, secure, reliable, cost-effective, high performance -- make it a superior platform for email infrastructure. These promising advances are causing many organizations to consider a Linux-based email infrastructure as an alternative to today's proprietary systems. This paper examines the case for choosing a Linux-based email infrastructure and offers criteria for evaluating solutions.

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# Executive Summary

Linux has created a disruptive shift in the computing ecosystem and is driving significant change both from a technology and a business perspective. Every major computing initiative is being impacted by this shift. Organizations in the process of adopting Linux infrastructure and applications will find it worthwhile to give Linux-based email infrastructure a careful look.

The advantages of Linux are well recognized by IT organizations as evidenced by the fact that it's the fastest growing server platform in the market today. An **Information Week** 2003 study surveying 274 organizations that have been using Linux for at least one year, found that the top reasons they are adopting Linux are:

#1 Total cost of ownership (TCO)

#2 Technical superiority, namely reliability and performance

#3 A hedge against vendor lock-in

Against that backdrop, the lifeline for day-to-day business communication has become electronic mail, a mature technology that is now ubiquitous and mission-critical. It is becoming increasingly apparent that we are breaking the back of the underlying email infrastructure as we attempt to extend and use it in ways never originally anticipated. The result is a plethora of technology and usability challenges that leave today's systems lacking, organizations frustrated and email administrators under pressure.

Mounting security threats. Rising cost and complexity. Lack of reliability. Proprietary, monolithic systems that are difficult to support. Concerns about technology and licensing lock-in and a lack of choice and flexibility all contribute to this frustration.

Furthermore, the leading email suppliers have created a tight coupling between their email offerings and other infrastructure components where they'd like to drive adoption. An example is the interdependence between Microsoft Exchange, Outlook, Active Directory and the Windows platform on both the desktop and server. The consequence for customers is even greater cost and complexity in managing upgrade cycles, and a lack of choice and flexibility in choosing key infrastructure components independently. Organizations as a result are complaining about a loss of control over their IT infrastructure and the sense of being locked-in.

Linux holds the key to a better solution for email infrastructure. *Offering a higher degree of freedom and flexibility than any preceding operating system, Linux's greatest strengths strike at the heart of the issues plaguing today's email infrastructure.*

Openness, security, reliability and high performance make Linux a superior platform for mission-critical email infrastructure.

The specific advantages of Linux for email infrastructure discussed in this paper:

- A reduction in the total cost of ownership (TCO) of email infrastructure.
- A secure foundation that is significantly less vulnerable to the security threats putting email systems at risk today.

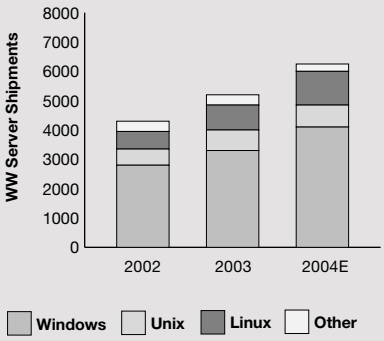
- Robustness, reliability and high performance
- Reusability of existing Linux infrastructure investments. Organizations can leverage the same tools, utilities, processes and expertise already in place.
- A hardware independent, open source platform that gives customers the flexibility to deploy email infrastructure on the hardware platform of their choice.
- Integration with the wide range of open source products (e.g. directory, security, backup and storage, instant messaging, calendaring and scheduling, collaborative applications).

The ability to change the underlying hardware platform or Linux vendor, while preserving their investment in email infrastructure affords customers a degree of flexibility not possible before. While email infrastructure on Linux holds great promise, migration requires an evolutionary approach that minimizes cost and disruption. At the server level, rich interoperability with Microsoft Exchange and other proprietary email systems is important to enabling seamless co-existence in a heterogeneous environment. This gives organizations greater flexibility in controlling the pace of migration and eliminates the risks associated with a flash cut migration. Organizations are well advised to work with suppliers that have taken a thorough and comprehensive approach to migration that includes automated tools, methodology and expertise.

Also essential to a successful transition is transparent, full-function support for the most popular email clients and desktops already deployed, in particular Microsoft Outlook and Windows. End users should experience no changes in client functionality, no data loss, and no service disruption. A Linux-based email infrastructure should support the latest innovations in end user functionality and provide anytime, anywhere access from a full range of desktops and devices. For example, end users can appreciate the desktop-grade capabilities of new generation web email clients that support open source browsers such as Mozilla and Firefox, as well as Internet Explorer. In short, a move to Linux and open systems shouldn't result in a tradeoff of important functionality users have come to know and expect.

Any organization, of any size, in any industry can extend the benefits of Linux to their email infrastructure -- lower cost and complexity, increased security and reliability and long-term flexibility and freedom. Growing recognition for the advantages that Linux-based email systems offer is evidenced by a recent survey of more than 100 CIOs, IT executives and messaging managers regarding their current and planned messaging systems. This study, conducted by **Osterman Research**, indicates that within two years (2004-2006) more than 55% of email decision makers will be using or considering Linux-based email. This paper examines the reasons behind the momentum as well as the criteria for considering migration to a Linux-based email infrastructure.

FIGURE 1




Linux is the fastest growing server segment worldwide with revenue growth of 48.9% and unit shipment growth of 38.2%. Source: IDC

Linux has become the fastest growing server platform in the market today (Figure 1). Linux server revenues topped $1B in third quarter 2004, with a year-over-year revenue growth rate of 42.6%, as reported by **IDC** in November 2004.

The advantages that Linux brings are now well recognized by IT departments. It has evolved from a developer's playground to a platform for mission-critical business applications. Organizations of all sizes and all industries have migrated portions of their IT infrastructure to Linux. These range from utility infrastructure services such as web servers, file and print servers, and internet mail servers to databases, application servers and mission-critical financial applications.

# Mission-Critical Email

Email is mission critical. Everyone understands the power, reach and value of email. A **META Group** survey of senior IT executives and business managers representing 387 corporations globally found that:

- 80% of people surveyed said they believe email is more valuable than the phone for business communication.
- 74% regarded being without email as more of a hardship than being without phone service.

With so much value accorded to email as the number-one method of business communication, *IT organizations require and should expect a more secure, reliable and scalable email infrastructure: the email equivalent of dail tone, i.e. "mail tone."* Unfortunately, this is not the state of most messaging systems. Most have evolved over the years as usage has changed and increased dramatically.

# Pain Points Today

The original design center of today's email systems has its roots in LAN-based architecture, making it difficult to meet the rigors of mission critical systems normally deployed in corporate data centers. This has exposed many weaknesses -- not the least of which are issues of TCO, security, reliability, scalabity and manageability -- causing a significant gap between reality and the "mail tone" ideal.

## HIGH TOTAL COST OF OWNERSHIP (TCO)

Organizations are increasingly aware of the already high and ever increasing costs of ownership associated with running an email environment. The cost of software represents a small fraction of TCO, where the primary contributors to high TCO are hardware and labor costs associated with supporting email. The cost of email downtime or recovery from security breaches further increases TCO.

According to the **Osterman Research** survey of more than 100 messaging executives conducted in October 2004, the median TCO for email, including hardware, software, deployment, administration and management, was $192 per user per year. The average at $741 per user per year, reflects the higher costs of larger organizations with distributed offices, more complex configurations and more servers. This data does not include the cost of downtime and lost productivity during email outages.

Some of the factors driving TCO still higher are:

- More hardware required to meet scalability requirements.
- Higher administrative costs compensating for inadequate security and reliability, and system complexity.
- Proprietary ecosystem of email specific tools and services.

## SECURITY THREATS

While rising TCO is a measurable concern with email today other issues are less quantifiable. Security breaches, spam, phishing attacks, viruses and increasing regulatory requirements like Sarbannes Oxley are imposing demands on email not originally anticipated.

Swift and prudent response to these issues is vital to an organization's security and credibility. According to the **Osterman Research** survey, organizations are investing about 20% of their total email budgets each year into anti-spam, anti-virus and other security solutions yet they continue to feel exposed.

Security concerns have fueled the deployment of Linux, as well as the recent surge in adoption of Mozilla and Firefox browsers, both of which are viewed as more secure alternatives to Windows and Internet Explorer.

## LACK OF RELIABILITY

The **Osterman Research** survey found that messaging system uptime was rated the most important email concern for an organization. Unplanned downtime, due to reliability and security issues such as server crashes, loss of connectivity, denial-of-service attacks, etc., was of primary concern. The level of monthly downtime experienced by the respondents – an average of 229 minutes (98.5% uptime) and a median of 45 minutes (99.7% uptime) was deemed unacceptable. Variance between the average and the median is due to variability in company size and environment.

A well-known contributor to unplanned downtime for both large and small organizations, are database corruptions occurring within the message store. Recovery from these corruptions can result in downtime of hours or days and lost email data. In an attempt to manage these corruptions, many organizations have adopted costly, complex and cumbersome database hygiene procedures.

## TECHNOLOGY AND LICENSING LOCK-IN

Traditionally, vendors have used proprietary technology and tightly coupled interdependencies between components as a way to raise switching costs and ensure customer retention. Because of its ubiquity, email has been used to help drive broad adoption of new platforms. This has its roots back in the 1980s when IBM and DEC used Profs and All-in-1 respectively to help fuel adoption of their hardware and software platforms.

A more current example is the interdependence between Microsoft Exchange, Outlook, Active Directory and the Windows platform on both the desktop and server. Similarly, Oracle has built its email offering around the Oracle database in the hopes of driving broader adoption and a greater dependence on its flagship product.

The result – higher cost and complexity and a lack of flexibility in choosing key infrastructure components independently. Faced with costly, perpetual upgrade cycles they must commit to years in advance, customers are increasingly questioning the necessity of these interdependencies and seeking greater choice and flexibility. All of this has culminated in an increasing sentiment that customer lock-in, not customer needs, is what drives vendor technology, licensing direction and agendas.

### LACK OF CHOICE

A mature, consolidated market dominated by three products, Microsoft Exchange, Lotus Notes/Domino and Novell Groupwise, representing an estimated 80% - 95% market share, has left many organizations complaining about a lack of alternatives.

Furthermore, the proprietary nature of today's email systems means that the dominant vendors carry their own application specific ecosystem that doesn't conform or co-exist well with data center infrastructure. For example, backup tools and procedures, storage architecture, management and monitoring tools, directories and clustering are all unique parts of the email ecosystem, not reusable for other applications. Similiarly, infrastructure investments in these areas are not extensible to email.

Issues of TCO, security, reliability, performance, licensing lock-in and lack of choice in today's proprietary email systems have left organizations dissatisfied. The **Osterman Research** survey found that more than 42% of CIOs and IT managers would consider switching email servers to a system that offered better performance, lower cost and other advantages if there was no disruption to end users. In addition 14% of messaging executives said they intend to migrate to a different messaging system within the next 12 months and 21% in 24 months respectively. This is a clear signal that a broad and growing demand for alternatives exists.

## The Destination: Email Infrastructure on Linux

Restoring the balance of power between customers and vendors, along with gaining greater flexibility, transparency and freedom of choice have been key drivers for Linux adoption and the open source movement, creating one of the biggest disruptive shifts in the industry. The advantages that Linux offers – reliability, security, price/performance, flexibility and freedom from lock-in – to email infrastructure strike at the very heart of the issues plaguing email systems today.

Early indications suggest a growing trend toward Linux-based email infrastructure. **Osterman Research** found that within two years more than 55% of email decision makers will be using or considering Linux-based email.

### LOWER TCO

Industry consensus is that companies use freedom of choice to their advantage. In the **Osterman Research** survey, the top three benefits expected from a Linux-based messaging system were lower initial cost, avoiding vendor lock-in and reducing TCO.

**IBM**'s vice president of competitive technologies John Shedletsky highlights the close relationship between freedom of choice and TCO. IT Manager's Journal (June 2004) quotes him as suggesting that one of the biggest advantages in the TCO of a Linux/open source-based system is "the simple fact that you as an organization are escaping a single-vendor lock-in. This means that when it comes time to renegotiate your license renewals, you'll have a lot more power on your side if you have alternatives ready to install."

Among organizations that have adopted Linux, the price/performance advantage of Linux and the "L-intel" architecture over UNIX/RISC or "W-intel" (Windows-Intel) are well understood and one of the top reasons that organizations are migrating to Linux. While the TCO debate comparing Linux to Windows rages on, the general consensus is that Linux offers lower TCO when the overall Windows ecosystem is included in the analysis.

Similarly, email TCO should include a comprehensive assessment of the overall email ecosystem. *A well-designed email system that fully exploits the power of Linux allows organizations to reduce cost by leveraging commercial and open source tools for building out the email ecosystem.*

A particularly powerful example of the use of open source is in performing real-time backup of email, which is important to maintaining service levels at 99.99% or greater availability. Most email systems require an investment in email-specific backup tools and complex procedures to perform real-time backups. Conversely, the same tools and procedures used to perform storage backup of any Linux system can be re-used to backup a Linux email system that has taken an open systems approach and based its message store on the Linux file system. In fact, Logical Volume Manager (LVM), an open source technology, is commonly used for real-time backup as an alternative to costly commercial products.

The number of messaging related open source projects has continued to grow as an increasing number of open source and commercial vendors embrace Linux. To keep abreast of open source projects, SourceForge and Freshmeat offer a wealth of information ranging from email clients and filters to mailing-list servers and mail-transport agents (MTA). SourceForge (www.sourceforge.net) provides the world's largest repository of open-source code and applications on the Internet. Freshmeat (http://freshmeat.net/) is also a popular site that maintains a very large index of Linux, UNIX and cross-platform software and carefully catalogs applications released under an open source license.

Lastly, no TCO analysis is complete without including the human capital required to support email. It is critical that existing investments in people, training and infrastructure can be leveraged throughout the transition to a more open infrastructure. Practically speaking, most organizations will use a combination of commercial and Linux/open source technologies based on their expertise, IT investments, requirements and risk profile.

## IMPROVED SECURITY AND RELIABILITY

Mounting data suggest that users of Linux systems experience fewer viruses and successful hacks. **According to Evans Data's Summer 2004 Linux Development Survey**, 92% of respondents said that their Linux systems had never been infected with a virus, and 78% said that their Linux systems had never been hacked.

**Stacey Quandt**, senior business analyst with **Robert Frances Group** and former analyst at the Open Source Development Labs (OSDL) and Forrester Research, reported that significant technical enhancements in Linux version 2.6 enabled superior security to other operating systems on the market (Figure 2).

FIGURE 2

**Base security**
Linux is superior. Capabilities here include authentication, access control, cryptography, audit trail/logging.

**Application security**
Linux is somewhat superior. This category covers such concerns as firewalls, intrusion-detection software, Web servers, email, and smart-card support.

**Open standards**
Linux is superior. This category relates to capabilities such as POSIX, IPSec, Transport Layer Security, and Common Criteria.

*NewsForge of May 25, 2004 published Quandt's examination, "Linux and Windows Security Compared."*

FIGURE 3

| OS | Failure Rate |
|---|---|
| Linux | 9% |
| HP-UX | 20% |
| IBM AIX | 20% |
| Windows | 21% |
| Sun Solaris | 22% |

The open source nature of Linux means that there are thousands of developers involved in development and testing. A powerful aspect of the open source model is that when there are bugs and security breaches, they are quickly detected and repaired within hours or days in contrast with weeks and months of wait time for a security fix from a single vendor.

In addition to improved security, Linux offers a superior foundation for achieving high availability in email due to its comparatively superior quality and reliability. This was quantified in a study by the **University of Wisconsin** which found that Linux had the lowest percentage of failures of any operating system, including Windows and other UNIX variants (Figure 3).

## FREEDOM FROM LOCK-IN: OPEN SYSTEMS AND OPEN SOURCE

Open systems and open source have given customers increased choice and lower switching costs. Whereas changing operating system vendors has traditionally been a very costly, complex and disruptive endeavor, changing Linux vendors with no or minimal disruption is now possible.

The industry's first hardware independent operating system, Linux also gives customers the flexibility to run their email infrastructure on a multitude of hardware platforms ranging from low-cost Intel sytems to the IBM z-Series mainframe systems. *The flexibility to change the underlying hardware platform or Linux vendor while preserving the investment in email infrastructure affords customers a degree of flexibility not possible before.*

The manner in which an email system has been designed will determine whether these advantages are exposed. The following design points are key to determining the degree of choice and flexibility a Linux email system offers:

- Open Systems Architecture (OSA)
- Native, full-function support for open standards, as well as de facto industry standards (e.g. SMTP, POP/IMAP, MAPI, SOAP, XML)
- The use of Linux tools for email system management
- Easy integration with open source technology
- Linux file system-based message store
- Full-function support for the desktop and email client of choice, including a platform-independent, desktop-grade web client

### OPEN SYSTEMS ARCHITECTURE (OSA)

OSA specifically refers to a modular, componetized architecture that has well defined, published interfaces that conform to open standards where possible. This building block approach has the advantage of reusable components that are extensible and can be integrated using standards.

### STANDARDS SUPPORT

Standards support is essential to ensuring interoperability in heterogeneous environments. In this regard, support for proprietary standards that have become de facto industry standards may be equally important to open standards. A good example is MAPI, a proprietary API and protocol that delivers advanced email and calendaring functionality to MS Outlook, the dominant email client in use today. The popularity of Outlook has elevated the importance of MAPI, making native support of this standard as or more important than many open email protocols.

SOAP and XML have the potential to play an important role in the evolution of messaging architecture. They can help faciliate the move away from monolithic email systems based on proprietary standards to a componentized architecture that enables tight integration and plug 'n play using open standards. An email system that exploits SOAP and XML offers much greater flexibility and ease of integration.

### MESSAGE STORE BASED ON THE LINUX FILE SYSTEM

A message store that is based on the Linux file system offers many advantages over proprietary database message stores.

- The problem of database corruptions, a major contributor to system downtime, is eliminated altogether
- Standard Linux tools can be used for managing the message store at a high degree of granularity including the use of open source for real-time backups

Linux and Open Source are changing the dynamics of the vendor-customer relationship. Freedom from lock-in gives customers greater choices and control over their destiny.

## The Journey: Migration and Co-existence

The destination of a Linux-based email infrastructure holds great promise. To be viable, however, the journey must be equally compelling in its simplicity. Surprisingly, migrating to Linux email can be less costly and disruptive than an upgrade of the email system already in place.

Given the mission-critical nature of email, organizations are well advised to take an evolutionary not revolutionary approach. Abrupt or wholesale changes run the risk of being disruptive and costly, ultimately proving to be counter-productive. Migration need not be an all-or-nothing proposition. The co-existence and interoperability between Linux and proprietary systems is essential to optimizing the overall IT investment.

The **Osterman Research** survey identified the top two barriers to migration as 1) insufficient Linux messaging experience and 2) expected disruption to end users.

### LEVERAGING LINUX EXPERTISE

Organizations that have deployed other infrastructure and applications on Linux, such as web servers and databases, are well positioned to migrate their email infrastructure to Linux. Linux skills, tools and procedures already in the organization can be extended to the email system. Cross-pollination of skills between Linux administrators and email administrators is one way that organizations can foster a knowledge transfer from within. Alternatively, a growing industy of system integrators, consultants and email providers now offering training and support for developing in-house Linux messaging expertise.

Email vendors are also rapidly adapting Linux email and calendaring products to the skill sets of today's email administrators. Open source and commercial products alike have begun developing GUI's that ease administration and look much like familiar messaging products deployed today.

## AVOIDING END USER DISRUPTION

In the same Osterman Research survey, 34% of respondents said they would consider switching to Linux-based messaging servers within 12 months if there was no disruption to email users and 55% said they would consider the same within 24 months.

A key requirement for Linux email systems is that they provide full-function support for the desktops and email clients already in use. Similarly, the actual migration of the email infrastructure should be achieved in a manner that is virtually transparent to end users. This means no or minimal end user downtime even during the migration process. No changes in usability and all end user data -- email, calendars, shared folders, address books -- should be migrated with 100% fidelity, eliminating disruption, data integrity issues or the need for user retraining.

Rich, desktop-grade web client access through an interface that is interoperable with the desktop mail client already in use is also critical to eliminating end user disruption. For example, MS Outlook users should expect to use a web client interface that is virtually identical in its interface, usability and functionality.

## BROWSER-BASED ACCESS TO EMAIL – A GROWING TREND

The anytime, anywhere convenience of bowser-based access to email has made it increasingly popular. Some 82% of organizations responding to the **Osterman Research** survey have noticed an increase in the percentage of employees accessing email from home due to wider availability of webmail clients and broadband access. More surprising is the fact that 80% of respondents indicated they would consider using a web mail client exclusively if it offered comparable functionality to their desktop mail client and required no retraining.

Powerful, desktop-grade web mail clients that support important productivity functions such as drag-and-drop, cut-and-paste and drop-down menus are available today. Advanced email, calendaring and collaborative functions are also increasingly available. This has begun elevating web-based mail clients from an anytime, anywhere secondary method of access to a primary means of access. At the same time, the emergence of alternative browsers like Mozilla and Firefox is increasing the requirement for cross-browser support. A rich function, desktop-grade web client that is browser-independent should be a key criteria in the selection of any Linux email system.

## CO-EXISTING WITH LEGACY EMAIL SYSTEMS

The new Linux-based system should have a flexible architecture that allows organizations to choose which servers to migrate and when, with rich, full-function interoperability and compatibility with existing infrastructure and email systems in place. A system that is designed to support an ecosystem of open source, proprietary solutions and cross-platform support enables migration to Linux while preserving existing investments in proprietary software.

# Success Criteria

For a successful migration to Linux-based messaging, a solution must:

- Provide rich, full-function support for a broad range of desktops and email clients
- Preserve or enhance the level of functionality supported by the current email system
- Optimize the investment in the current messaging ecosystem and other Linux investments
- Interoperate with the email systems already deployed
- Provide a flexible, open systems architecture that readily supports a wide range of commercial and open source components
- Offer a low-risk, migration path that is not disruptive to end users

These are important considerations that will have a direct impact on total cost of ownership (TCO) and the success of a migration to Linux email infrastructure.

Linux-based email infrastructure holds the promise of greater choice and flexibility and freedom from lock-in. Organizations in the process of adopting Linux infrastructure will find it worthwhile to give Linux-based email infrastructure a careful look.

# For Further Reading

The following table lists references appearing in this paper.

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