The Advantages of Email Archiving in MS Exchange Server Migrations

Steps for a Faster, Simpler, and More Affordable Migration

White Paper by The Radicati Group, Inc.

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1.0 Introduction

For most organizations, email is almost as important to daily operations as electricity. A single day without email would be crippling, resulting in delayed projects, lost customers, and a negative impact on the bottom line.

Email technology has continued to evolve steadily over the years. Today's e-mail systems provide a wealth of features in addition to core messaging functionality, such as anti-spam and anti-virus protection, content filtering, wireless e-mail, file and folder sharing, contact and calendar management, and more. These features are important to protecting IT security, improving productivity and facilitating internal and external communications. The evolution of Corporate Email technology makes it essential for organizations to provide their users with an up-to-date messaging platform.

With over 125 million seats deployed, Microsoft Exchange Server is the world's leading Corporate Email platform. In December 2006, Microsoft released the latest version of the software, Exchange Server 2007. Exchange Server 2007 offers a host of benefits over previous versions of the platform, particularly for the 50% of Exchange Server users that are still deployed on Exchange Server 5.5 or Exchange Server 2000. Upgrading to Exchange Server 2007 will be important for businesses in coming years, as the new platform will deliver benefits to both end users and administrators, and provide companies with a technological competitive advantage.

- **End User Benefits:** Exchange Server 2007 offers state-of-the-art unified messaging capabilities that can increase user productivity and improve worker responsiveness. The platform also offers real-time mobile access to messages and PIM data from mobile devices such as mobile phones and smartphones.

- **Administrative Benefits:** Exchange Server 2007 is a 64-bit application, resulting in improved performance and storage utilization. The solution features a new modular architecture that streamlines deployment and server management. Security features, like integrated anti-spam, anti-virus and content management, improve e-mail security and protect corporate data.

Figure 1: Exchange Server 2007 Benefits

Wireless 'push' access to e-mail and PIM data	Improved performance due to x64 architecture
Access to voicemail through Outlook	Improved storage management due to x64
Voice access to Outlook over phone	Role-Based server architecture streamlines deployment
Remote access to files with SharePoint	Integrated Anti-Spam and Anti-Virus protection
Improved Outlook Web Access 2007 web client	Integrated Content Management
Self-service account management	Automatic Intra-Org Encryption
Improve e-mail search capabilities	Local/Cluster Continuous Replication protects data

Despite the benefits of Exchange Server 2007, some businesses may be intimidated by the migration process to the new platform. Unlike prior versions of the software, in-place upgrades will not be available with Exchange Server 2007 since the software relies on the x64 platform. Businesses with Exchange Server 2000 or 2003 will need to run both their legacy Exchange Server platform and Exchange Server 2007 in coexistence mode during the migration process. Exchange Server 5.5 users must first migrate to Exchange Server 2000/2003 before migrating to Exchange Server 2007.

The migration to a new server platform and the transfer of mailbox content to Exchange Server 2007 are key challenges for businesses during the migration process. This migration can take hours or even days to complete, possibly resulting in server downtime and a reduction in end-user productivity.

However, there are steps that a business can take to streamline the migration process. Using an email archiving solution prior to migration can greatly reduce the volume of mailbox content to be migrated, resulting in faster, simpler, and more affordable migrations.

This whitepaper explores the ways Hewlett-Packard's **Reference Information Storage System (RISS)**, together with **Reference Information Manager (RIM) for Messaging**, can be used to facilitate email migrations.

2.0 Email Migration Challenges

Email migration is one of the most intimidating projects IT organizations can undertake. The prospect of moving an entire organization's mailbox content to a new platform carries a number of risks. For one, administrators must be careful not to lose important messages during migration. After all, the messaging system is home to extremely valuable content, including documents, business contacts, intellectual property, and digital records. Secondly, it's imperative for employees to maintain access to their inbox at all times, which is not possible for most migrations. Every hour the messaging system is offline translates to a loss in productivity, lost sales and opportunities, as well as frustration.

With these risks in mind, some of the top challenges of email migration include:

Message Retention – Since users have become so comfortable "living" in their email client, many treat the inbox as if it were a file cabinet. As a result, individual mailboxes hold project files, intellectual property, company records, contact information, and other valuable assets which can't be purged. While it would be a lot easier to deploy a new messaging system from scratch with no initial messages, the target environment must retain all the old content and provide easy access for users. Not only is this retention essential for productivity and legal protection, but it is also a requirement for many organizations subject to government and industry regulations.

Storage – In a typical migration, hundreds of gigabytes of mailbox content is stored in the original messaging system. Most migration tools involve a period of co-existence, where copies of mailbox content exist on both the original email system and the target system. Unfortunately, this approach is slow and demands a great deal of storage and IT resources, which is expensive and often impractical.

Time – Email migration is certainly a case where "time is money." The process of moving mailbox content can take weeks to complete, consuming the valuable time of administrators and taxing IT infrastructure. End-users are inevitably burdened with downtime as well, negatively impacting their productivity.

Cost – Email migrations can carry significant costs. Aside from the obvious new software licenses, organizations often need to deploy new hardware to keep up with the storage and bandwidth requirements of email. Migrations also consume significant time of both administrators and end-users, as mentioned above.

PST Files – Aside from mailbox content, many users maintain personal PST files to retain old messages, which are stored on local or networked disc drives, the most expensive form of storage. These files are usually large, unmanaged, and non-compliant. An ideal migration project would eliminate the need for creating PST files and free up the valuable infrastructure resources they consume. Unfortunately, most migrations do not address PST files.

The issues above apply to most Exchange Server 2007 email migrations, whether they are from Exchange Server 5.5, Exchange Server 2000, Exchange Server 2003, or even from another platform (i.e. IBM Lotus Domino).

Migrations from Exchange Server 5.5 involve some additional challenges. Since Exchange Server 2007 utilizes Active Directory, Exchange Server 5.5 users must first migrate to Exchange Server 2000 or Exchange Server 2003 before migrating to Exchange Server 2007. This process can be particularly daunting since it requires two separate data migrations, one from Exchange Server 5.5 to Exchange Server 2000/2003, and the other from Exchange Server 2000/2003 to Exchange Server 2007.

Businesses have two options when migrating from Exchange Server 2000/2003 to Exchange Server 2007. If a business wants to preserve an existing Exchange organization, Exchange Server 2007 can be deployed alongside existing Exchange Server 2000/2003 servers in coexistence mode. If a business wants to deploy an entirely new Exchange Server 2007 organization, new Exchange Server 2007 servers must be deployed, a new organization must be set up, and messages must be migrated from the existing system to the new platform.

In all cases, businesses must move mailboxes from the existing Exchange Server deployment to Exchange Server 2007. Additionally, since Exchange Server 2007 does not support in-place upgrades, new servers will need to be deployed.

3.0 How Email Archiving Eases Migration

Email migrations are complex and risky on their own, so it may seem counter-intuitive to introduce another new technology into the email environment prior to the migration project. However, email archiving solutions, such as RISS/RIM for Messaging from Hewlett-Packard, can significantly ease email migration and ongoing messaging operations.

The primary way archiving solutions help is by drastically reducing the size of the original mail store, so only a fraction of the data needs to be transferred to the target environment. This is achieved by the use of single instancing technology, which removes duplicate messages from the mail stores. This greatly simplifies the migration process, resulting in faster deployments, less downtime, and major cost savings.

Figure 2, next page, illustrates a typical Exchange Server 5.5 to Exchange Server 2007 email migration *without* the help of an email archiving solution.

The first step of this migration is to address the directory. Exchange Server 2007 relies on Active Directory, while Exchange Server 5.5 uses its own domain structure directory. However, Exchange Server 5.5 is no longer supported by Microsoft, and direct migrations from Exchange Server 5.5 to Exchange Server 2007 are not possible. Instead, businesses must first migrate their directory from Exchange Server 5.5 to Exchange Server 2000 or Exchange Server 2003, which both rely on Active Directory. Once this step is completed, Active Directory will hold usernames, passwords, group membership, and other mailbox properties.

After the Exchange Server 5.5 directory is migrated to Active Directory, Exchange Server 2007 can be deployed in coexistence with the existing Exchange Server 2000/2003 deployment. Businesses can then move resources from the existing Exchange Server 2000/2003 deployment to Exchange Server 2007.

With the new Active Directory structure up and running, it's time to take on the most difficult aspect of migration—moving personal mailbox data and shared folders. Without the help of an email archiving solution, every bit of data takes a complex two-step migration path from Exchange Server 5.5 to Exchange Server 2000/2003, and then from Exchange Server 2000/2003 to Exchange Server 2007. The use of migration tools usually involves a period of co-existence where both original and target mailbox content consume IT resources.
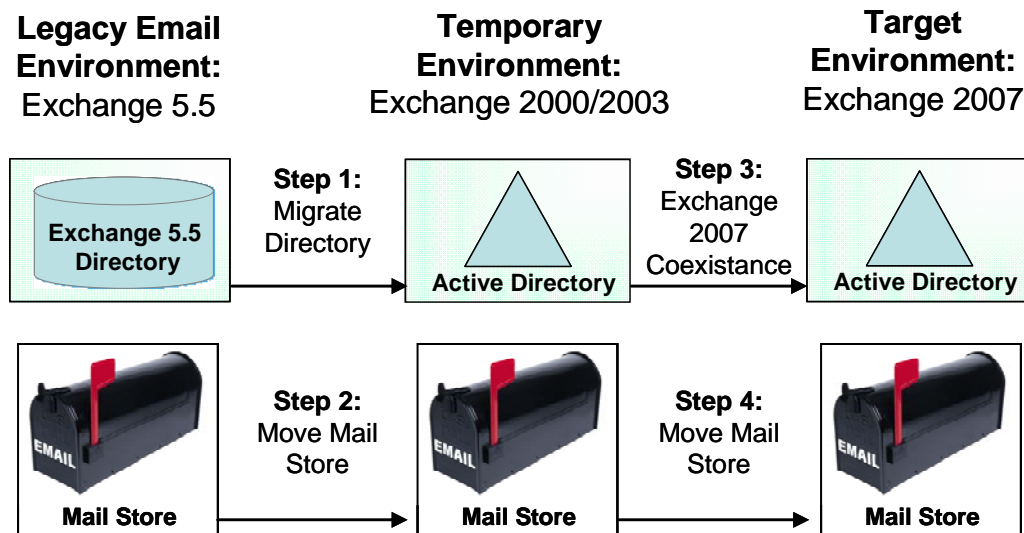
Legacy Email Environment: Exchange 5.5		Temporary Environment: Exchange 2000/2003		Target Environment: Exchange 2007
Exchange 5.5 Directory	Step 1: Migrate Directory	Active Directory	Step 3: Exchange 2007 Coexistance	Active Directory
Mail Store	Step 2: Move Mail Store	Mail Store	Step 4: Move Mail Store	Mail Store

Figure 2: Email Migration *Without* Email Archiving

Figure 3 illustrates an Exchange Server 5.5 to Exchange Server 2007 email migration **with** the help of HP's RISS/RIM for Messaging email archiving solution. As in the previous scenario, users must first move from Exchange Server 5.5 to Exchange Server 2000/2003. After this is accomplished, Exchange Server 2007 can be deployed in coexistence mode and organizational data and the mail store can be transferred.

However, with the RISS/RIM for Messaging archiving appliance installed, the volume of data that must be migrated from Exchange Server 5.5 to Exchange Server 2007 is dramatically reduced. After Exchange Server 5.5 messages are archived with RISS/RIM for Messaging, only the remaining messages and stubs need to be moved. This is particularly valuable with migrations from Exchange Server 5.5 to Exchange Server 2007, since this process first requires a migration to Exchange Server 2000/2003, then a migration to Exchange Server 2007.

Depending on how aggressively customers archive, RISS/RIM for Messaging can reduce the data to be migrated by as much as 80%. RISS/RIM for Messaging "mines" messages out of the Exchange Server 5.5 mail store based on customized policies. These policies are flexible and can be based on a variety of factors, such as the age or size of messages. Of course, all messages can be tagged for archival if the customer desires. A "stub" is left behind in the inbox, so users can access archived messages with a standard double-click. Suddenly, the most challenging aspect of migration is no longer much of a challenge at all.

Once Exchange Server 2000/2003 is up and running, Exchange Server 2007 servers can be deployed in coexistence mode. Archived messages can be accessed from RISS/RIM for Messaging directly through the email client or with a Web-based search tool. RISS/RIM for Messaging will continue to archive messages from Exchange Server 2007 as they meet policy requirements. End-users benefit from a virtually infinite mailbox without having to learn any new technology.

All of these benefits apply not only to MS Exchange Server 5.5 environments, but also to IBM Lotus Notes/Domino upgrades and migrations. Since RISS/RIM for Messaging stores messages in a neutral repository, not in the Notes format, it is capable of archiving data from mixed messaging environments, while providing end-users seamless access to all messages, regardless of the origin.

Not pictured in Figure 2 or Figure 3 are PST files because they can be handled many ways in a migration. If organizations want to keep PST files, they can be imported directly into the Exchange Server 2007 environment. Since PST files generally contain non-compliant messages and consume expensive

storage media, most organizations would prefer to eliminate them entirely. With RISS/RIM for Messaging, PST files can be archived for good, and the need for them in the future is eliminated by providing a more efficient method of archiving.

RISS/RIM for Messaging's PST Importer tool allows administrators to import the contents of PST files into the RISS appliance for search and archiving. In addition, selective archiving can be performed on PST files to place "tombstones" inside the PST files in place of messages and attachments, allowing organizations to reclaim valuable storage space currently consumed by existing user PST files on the network.
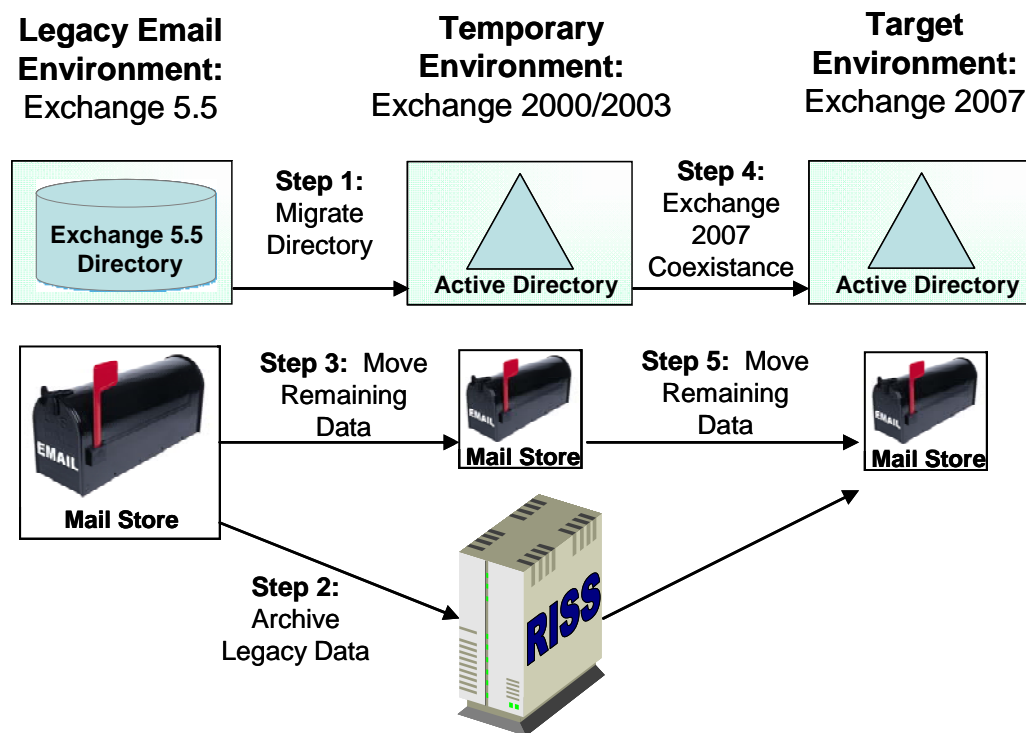
Figure 3: Email Migration *With* Email Archiving

RISS/RIM for Messaging can also be used for a Lotus Domino to MS Exchange Server 2007 migration or for a Domino to Domino upgrade. As shown in Figure 4, the mail from the Notes client is submitted to the HP gateway via Notes mail routing. The messages are then converted from Notes native format to a neutral HTML format. Once the conversion is done, the messages are sent to RISS/RIM for Messaging by SMTP.

To access archived Domino messages, customers can use their Notes client and retrieve messages directly, as if they were still held in the Domino store. In addition, customers can search for messages using the RISS/RIM for Messaging Web UI. In fact, messages are available though the Web UI even during the migration process.

RISS/RIM for Messaging's support of both Exchange Server and Domino is especially appealing for the many organizations with a mixed messaging environment. Whether these organizations want to consolidate messaging systems or simply archive mail into a single repository, RISS/RIM for Messaging provides a simple, all-in-one answer.

**RISS/RIM for Messaging in a Lotus
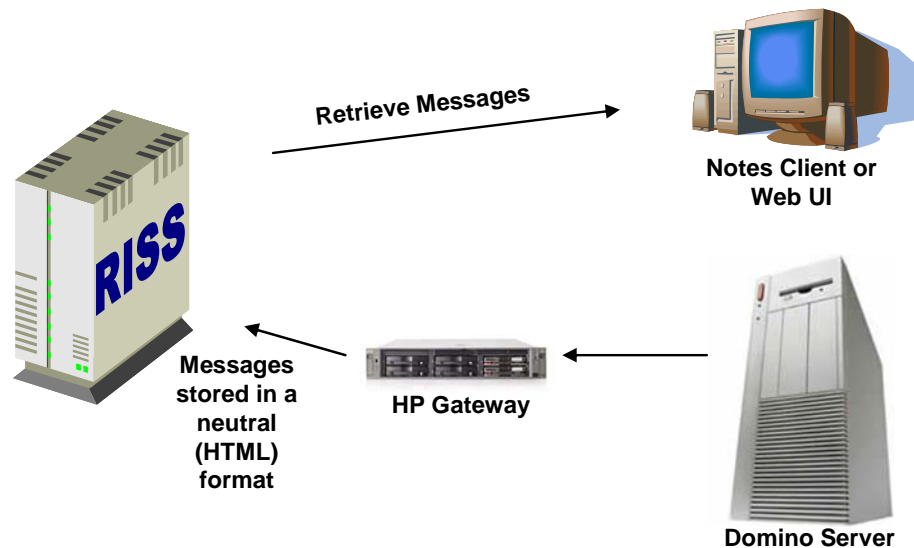Notes/Domino Environment**

Figure 4: RISS/RIM for Messaging in a Lotus Notes/Domino Environment

3.1 Benefits of a RISS/RIM for Messaging Assisted Migration

When we revisit the common challenges of migration, as discussed in Section 2.0 of this whitepaper, we find that email archiving solutions like RISS/RIM for Messaging have the ability to solve many of them and reduce the overall risks associated with migration.

Message Retention – RISS/RIM for Messaging allows organizations to affordably retain all messages during a migration and beyond, so nothing is lost. For organizations facing government and industry regulations, this is a must, but it's a good idea for *all* organizations to maintain a full archive, since messages can contain valuable and relevant information years later, and can play an important role in legal protection as well.

Storage – As shown in Figure 3, previous page, archiving messages from the original message system prior to migration greatly reduces the amount of data to be migrated. In turn, this results in significant time and cost savings, but the benefits of RISS/RIM don't end at migration. RISS/RIM for Messaging continually archives messages as they meet policy conditions, yet end-users maintain instant access to those messages.   With RISS/RIM for Messaging in place, Exchange Servers are kept lean so they can run as smoothly as possible.

Time – With as much as 80% of the original mail store archived by RISS/RIM for Messaging, migration of the remaining data can be completed in a fraction of the time. This also streamlines the backup/restore process, since the Exchange database is smaller, easier to manage and less time consuming to backup. Not only does this save administrators' time, but it also keeps downtime to a minimum, so employees can remain productive and continue to use email during the migration.

Cost – RISS/RIM for Messaging can save organizations considerable money during a migration in a number of ways:

- A simplified migration requires less IT administrator attention. Administrative resources can be delegated to other more strategic IT initiatives.

- Less migration downtime means no lost productivity of end-users, no lost customers, and no disruption to everyday business.

- Archiving messages to RISS/RIM for Messaging moves storage from messaging servers to a less expensive media. With more free space for messaging servers, more users can be allocated per server, which means fewer overall servers (hardware and software) to buy, manage, and maintain.

- PST files can be eliminated, freeing up expensive storage resources on local and networked drives.

- RISS/RIM for Messaging minimizes co-existence time during a migration, once again saving IT resources.

- With all messages retained and easily searchable, businesses are protected in the event of regulatory audits and lawsuits, which can translate to significant cost savings.

4.0 RISS/RIM for Messaging Overview

HP's RISS/RIM for Messaging email archiving solution is an easy to manage appliance capable of archiving messages from either MS Exchange Server or Lotus Notes/Domino.[1]

Customers can choose to implement RISS/RIM for Messaging one of two ways:

1. *Compliance Archiving* – All messages sent and received are archived into RISS.

2. *Selective Archiving* – Organizations set archive policies, RISS mines mailboxes and messages that meet archive policies are sent to the RISS archive. Users find and access archived messages via inbox 'stub' or via web search tool.

Figure 5 compares a Compliance Archiving and Selective Archiving deployment of RISS/RIM for Messaging in a typical email environment.

In the Compliance Archiving scenario, all messages are automatically archived with RISS/RIM. This is a requirement for many businesses, and RISS/RIM provides these companies with a quick and reliable archival solution.

In the Selective Archiving scenario, businesses set archive policies to mine messages from the mail store. These policies can be based on message size, age, attachment, mailbox size, keywords, phrases, sender, receiver, and more. Once the policies are set, RISS mines mailboxes via MAPI (MS Exchange Server) or native Notes protocol, looking for messages that meet policy requirements. Administrators control how often RISS goes mining for emails, which is usually about once a day. As messages are archived, indexed, date and time stamped, a stub of only a few kilobytes is left behind in the mail client. These stubs are basically pointer files which users can double click to view messages instantly, just as if the original message was still sitting in the mail store. Users can also search and retrieve messages using the advanced Web search tool that comes with RISS/RIM for Messaging.

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[1] RISS/RIM for Messaging is compatible with Exchange Server 5.5, 2000, 2003, 2007 and Lotus Domino R6 and R7.

Selective archiving benefits businesses by decreasing the size of the mail store, which can enable businesses to consolidate servers and reduce acquisition and maintenance cost. Selective archiving also reduces the burden on administrators, and promotes efficient and effective mail store management. The outcome of selective archiving is a streamlined messaging environment that costs less to deploy and manage.
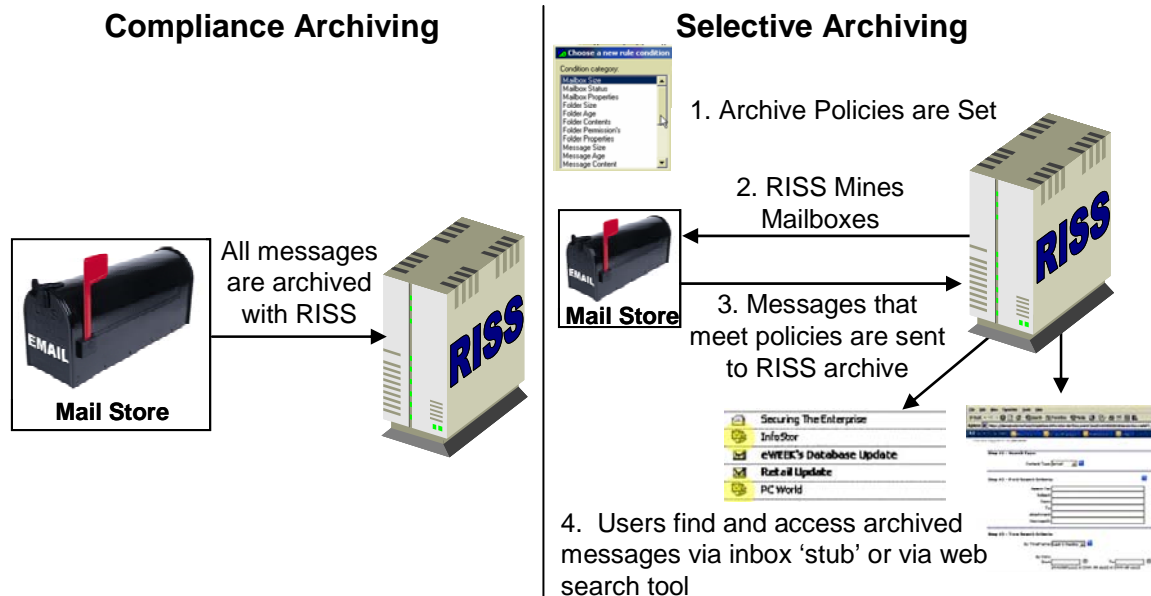

Figure 5: RISS/RIM for Messaging Overview

For end-users, RISS/RIM for Messaging is transparent and doesn't require any training. Employees don't have to waste time managing the size of their inbox and can concentrate on business matters, while enjoying a virtually infinite mailbox.

On the backend, RISS/RIM for Messaging is just as impressive. It is architected on HP RISS SmartCell, which is a "scale-as-you-grow" system designed to break email records down into manageable pieces. Each cell in the grid provides mirrored storage, full content indexing, and even processing power, which ensures fast retrieval of messages, no matter how large an organization scales. Each smart cell currently provides 1.4 TB of storage, with larger capacities planned for the future. The RISS/RIM for Messaging solution also provides single-instance storage, which means duplicate messages are only stored once.
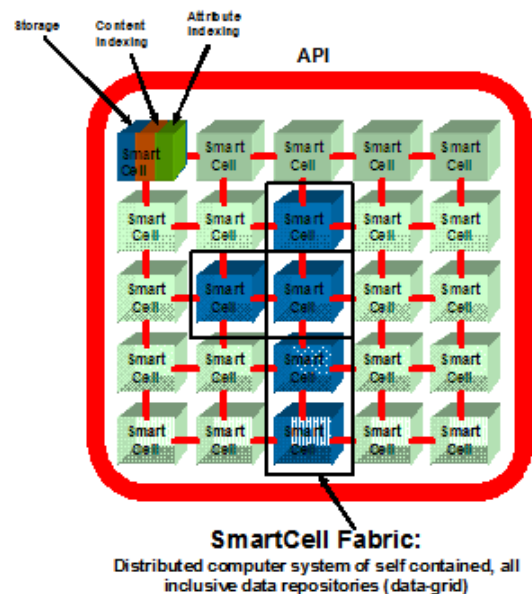

SmartCell Fabric:
Distributed computer system of self contained, all inclusive data repositories (data-grid)

Figure 6: SmartCell Fabric

4.1 Why RISS/RIM?

There are a lot of other email archiving solutions that can also facilitate email migrations, so why choose RISS/RIM for Messaging?

- Perhaps the most important reason to choose RISS/RIM for Messaging is the fact that it is a completely integrated appliance (HW + SW + services) solution. Most other email archiving products require customers to integrate hardware and software, providing their own hardware, which is rarely optimized for the archiving software. The all-in-one appliance approach of RISS/RIM for Messaging offers a number of significant benefits over piecemeal solutions:

  - RISS/RIM for Messaging is a complete solution out of the box. Other implementations, however, require application-aware middleware to determine what information in the application should be archived based on policy. This approach requires a file system for the archived data, plus an indexing engine which usually needs its own database and storage. On top of this, Content Addressable Software (CAS) is required to drive the hardware storage layer which is comprised of traditional SAN, NAS, or direct-attached storage.

  - Installation of RISS/RIM for Messaging is relatively straightforward, with only one appliance and a message application-specific gateway component required to complete the install.

  - RISS/RIM for Messaging includes a single management interface called RISS Platform Control Center (PCC), which provides administrators with a single place to monitor and manage the appliance. Competitive solutions, on the other hand, typically involve multiple points of administration for the various components of the system requiring different skill sets, ultimately requiring more administrative time and money.

  - Since RISS/RIM for Messaging is an all-in-one appliance, support and maintenance is provided by one vendor (HP). Other solutions require managing multiple vendors and associated support costs. When problems occur, this can cause "finger pointing" between support vendors which ultimately delays the repair and costs money through lost business.

- HP's SmartCell Storage Grid system allows for virtually unlimited scalability with no compromise to speed and performance. Accessing archived messages is often even faster than the mail server, since RISS/RIM for Messaging is a dedicated device. (Figure 6)

- RISS/RIM for Messaging works with both MS Exchange Server and Lotus Notes/Domino, so organizations with a mixed messaging environment can archive and retrieve all messages onto a single platform without having to consolidate messaging servers or deploy two archiving platforms.

  - For organizations migrating from Lotus Notes/Domino to Exchange Server 2003, RISS/RIM for Messaging can make the process significantly easier since it supports both messaging platforms in a neutral repository.

- RISS/RIM for Messaging has the ability to fully index every record, including attachments. Competitive solutions, on the other hand, often rely on external indexing.

- The advanced Web search tool, included with RISS/RIM for Messaging, provides fast access to all archived records. Since message retrieval is so fast and simple, end-users can retrieve messages without the help of the IT staff.

5.0 HP Services

When choosing an email archiving solution, it's important to evaluate not only the technology, but also the vendor. Is it a reputable company that will be around in ten years? Does the vendor have a long history of outstanding MS Exchange Server expertise to assist in the migration process, or are they new to MS Exchange Server?

The vendor should be *active* in the technology, continuously updating their knowledge on MS Exchange Server, Domino, and the intricacies of email migration. Organizations should choose a vendor that has a tight relationship with Microsoft, but is not exclusively tied to MS Exchange Server or Microsoft technology, because it is important to get *objective* advice regarding your messaging environment. Choosing a vendor based on these factors is just as important as evaluating technology.

HP Services brings an extensive level of expertise to the table. HP's Frontline Partnership with Microsoft - built over twenty years of joint product development, testing, services, and support - complements HP's history of working in open environments with multiple technologies. Microsoft and HP have over 20 years of joint product development, testing, services, and support. HP Services follows a strict, well-proven methodology in its Exchange Server 2007 migration consulting engagements which involves three phases:

1. *Design and Planning* – The HP services team examines the organizational requirements and constraints for the new messaging system, and then designs and plans a messaging infrastructure topology along with a migration approach.

2. *Implementation* – The second step of preparing the environment involves three stages:

   a. A proof of concept pilot is conducted to test the design specifications.
   b. A production pilot includes a partial rollout to further test the design, ensuring it will work before the full deployment. In this stage, the help desk is also tested and prepared for the full rollout.
   c. Once the pilot tests are complete and successful, a full rollout to the remaining users is conducted.

3. *On-going Management* – After a successful migration, HP can assist with changing requirements as they evolve.

In addition to three-step migration service listed above, HP offers a "review" service, which provides a review of an organization's messaging design, operations, or a review of some issue the organization is having regarding its messaging system.

HP's expertise with Microsoft solutions include:

- Over 22,000 Microsoft-trained professionals, including over 3,600 Microsoft-certified service professionals
- Over 11 million Windows and Windows NT seats
- Over 15 million Exchange 2000/2003 seats deployed or under contract

6.0 Conclusions and Recommendations

Providing employees with a current messaging system is critical to maintaining a competitive advantage, but migrating to Exchange Server 2007, whether it is from Exchange Server 5.5, Exchange Server 2000, Exchange Server 2003, or Lotus Notes/Domino can be challenging, costly, time consuming, and risky to business operations.

Implementing RISS/RIM for Messaging can significantly ease migration projects, resulting in faster, simpler, more affordable migrations, while minimizing business risk. RISS/RIM for Messaging achieves this by archiving messages before migration, so much less data needs to be migrated. Some of the key benefits of this approach to migration include:

- Cost Savings:
    - Faster migration means less administrative work hours.
    - Minimal downtime means no lost sales and no lost productivity.
    - With the bulk of storage on RISS/RIM for Messaging, email servers stay lean and efficient. More users can fit on a single server, so administrators have fewer servers (hardware and software) to buy, maintain, and manage.
    - RISS/RIM for Messaging can eliminate the need for PST files, which are a strain on expensive local and networked drives.

- RISS/RIM for Messaging ensures that no messages are lost in the migration.

- Virtually unlimited storage for end-users, increasing their productivity potential.

- By retaining all messages, RISS/RIM for Messaging provides protection from legal issues and regulations.

RISS/RIM for Messaging is unlike any other email archiving solution on the market. It's a complete appliance solution that's easy to install and manage. With its SmartCell grid architecture, customers can scale as they grow, never compromising their ability to find archived messages instantly using RISS/RIM for Messaging's advanced Web search utility. Unlike competitive products, RISS/RIM for Messaging fully indexes every record, including attachments, so organizations can find messages fast and meet tough regulatory requirements.

For organizations looking for more migration assistance, the HP services team provides a wealth of MS Exchange Server expertise, based on over 20 years as a Frontline Microsoft partner.

About Hewlett-Packard

HP focuses on simplifying technology experiences for all of its customers – from individual consumers to the largest businesses. With a portfolio that spans printing, personal computing, software, services and IT infrastructure, HP is among the world's largest IT companies, with revenue totaling $94.1 billion for the four fiscal quarters ended Jan. 31, 2007. More information about HP (NYSE: HPQ) is available at http://www.hp.com.

About The Radicati Group, Inc.

The Radicati Group covers all aspects of email security, email archiving, regulatory compliance, wireless technologies, identity management, instant messaging, unified communications, VoIP, and more. The company provides both quantitative and qualitative information, including detailed market size, installed base and forecast information on a worldwide basis, as well as detailed country breakouts.

The Radicati Group works with corporate organizations to assist them in selecting the right products and technologies to support their business needs, as well as with vendors to define the best strategic direction for their products. The company also work with investment firms on a worldwide basis to help them identify and assess new investment opportunities.

The Radicati Group, Inc. is headquartered in Palo Alto, CA, with offices in London, Melbourne and Hong Kong.

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