



GWAVA Inc.

# GWAVA Retain

For GroupWise®

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## Linux Install Guide

For version 1.7

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## **Technical Support**

If you have a technical support question, please consult the GWAVA Technical Support section of our website at [www.gwava.com](http://www.gwava.com).

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## **Intended Audience**

This manual is intended for IT administrators in their use of Retain for GroupWise or anyone wanting to learn more about Retain for GroupWise. It includes installation instructions and feature descriptions.

## **Organization**

The guide is organized into two sections, Overview and Installation. The Overview section covers all the basic information needed to plan where to implement and install the different parts of Retain in your System. The Installation section briefly goes over the necessary steps to install Retain.

General use and management of Retain is covered in the User's Guide, please read that guide for setup and configuration steps and information.

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## IMPORTANT NOTES

### Current Retain Customers, Retain 1.7 Upgrade

Retain 1.7 contains several important changes from Retain 1.5, and performs these updates the first time 1.7 is run. To run the update, run Retain 1.7 after the update and login as administrator. Retain will then perform the update. **DO NOT INTERRUPT THE UPDATE OR DATABASE CORRUPTION MAY RESULT.** Wait until the Retain console notifies you that the update has completed, then restart Tomcat.

### Updates

#### Deletion Manager

Retain 1.6 and above include a new Deletion Manager option. This option will not be visible unless the administrator account is granted the Deletion Manager rights in user management.

There are two major updates to the system:

#### ➤ **Indexer updated**

Lucene, the indexing engine that Retain uses to catalog and index the mail archive, has been updated from version 2.2 to 2.3. The update changes the index schema, providing performance enhancements. Because of the update, once 1.7 has been installed and run, it is impossible to return to a previous version, as the previous version will view the index as broken. **The upgrade is permanent.**

#### ➤ **Database update**

There is a database update between 1.7 and previous versions. With large databases, the update can take hours. When you first connect to the Retain Server console after the upgrade, you will be prompted to initiate the database update. This is the only screen available until the database update is complete. **DO NOT INTERRUPT THE UPDATE OR DATABASE CORRUPTION MAY RESULT.** If any errors occur, Retain lists them in the Server logs. The Retain Server logs are nested with the embedded Tomcat 5 logs, which differs depending on installation platform.

Linux: /opt/beginfinite/retain/tomcat/logs

Windows: C:\Program Files\Apache Software Foundation\Tomcat 5.5\logs

If you are running your MySQL on Linux, see the [important schema note in the MySQL quick start guide](#).

### **Retain Server moving to 64-bit architecture**

Retain Server, to accommodate the needs of large systems and stability, is moving to 64-bit architecture. 32-bit Server support will end with the Retain 1.x tree and **Retain 2.x will only support 64-bit server operation.** It is suggested that administrators begin planning their systems accordingly. The Retain Worker will still be supported on both 32-bit and 64-bit systems.

The list of supported operating systems is as follows:

SuSE Enterprise Linux 9 SP4 32-bit

SuSE Enterprise Linux 10 SP2 32-bit

Open Enterprise Server 1, 2 (Linux) 32-bit versions

SuSE Enterprise Linux 10 SP2 64-bit

Open Enterprise Server 2 64-bit

NetWare 6.5 (Retain Worker only)

Microsoft Windows Server 2000, 2003 32-bit

Microsoft Windows Server 2003 64-bit

#### New Supported Software or features:

Retain also now supports 64-bit JVM and Centera for SLES 10 SP2, OES2, and Windows Server 2003.

Retain also supports NetApp.

Retain now performs LDAP email address lookups. For large eDirectory trees, email addresses will need to be indexed for this feature to work. GroupWise does not index these addresses by default. Retain also supports auto-creation of users in Livelink. Retain supports the Hitachi Content Archive Platform, (HCAP).

#### GroupWise 8 Support

Retain 1.7 provides full support for GroupWise 8

#### Java Support

The supported versions of Java have been unified for the Retain Server platform. **SUN Java 1.5 is the only supported version and is required for full functionality, IBM's Java platforms are not supported.** Retain 1.7 will not work with Java 1.4x. It is strongly recommended that the JDK package is installed and used instead of the JRE package, for the diagnostic tools included with the JDK software package. Retain will automatically install Sun JDK 1.5 for you if the Retain Server has internet access. If the Retain Server does not have internet Access you must manually install java before installing Retain.

#### Stubbing Server

Retain now has an integrated server to take advantage of the stubbing abilities of GroupWise 8. The Stubbing feature in GroupWise 8 allows Retain to replace archived messages and items in the GroupWise Post office that exceed a certain size with smaller 'stubs' that link back to the full message or item in the Retain Archive. The end user experience is not changed. Stubbing is not appropriate for every system. **To use stubbing, it is strongly recommended that the GroupWise system be at least 8.0HP1. Previous versions of GroupWise do not contain critical stability fixes.**

## Tomcat 5.5.27 Now Embedded With Retain

Retain now ships with Tomcat embedded. Retain 1.7 requires you to install and use the embedded Retain-Tomcat. Installation on an existing Retain system running a standard Tomcat installation will remove the current Retain-Tomcat connection and install the embedded Tomcat that comes with Retain. Installation instructions are located in the [install section](#).

Retain-Tomcat will not interfere with the standard installation and ports; they have been changed, as follows:

HTTP port:	48080
AJP port:	48009
Home Directory:	/opt/beginfinite/retain/tomcat
Log Directory:	/opt/beginfinite/retain/tomcat/logs
Start Script:	/etc/init.d/retain-tomcat5   start   stop   restart   status
Configuration file:	/etc/opt/beginfinite/retain/tomcat/j2ee
Memory Tuning:	Defaults to initial memory of 256MB and max of 1024MB. (Memory should still be tuned.)

The Retain install script, RetainInstall.sh, detects whether the embedded Retain-Tomcat installation is present or not, and then prompts you to install the embedded Retain-Tomcat if it is missing.

The embedded Retain-Tomcat install shuts down and removes the Retain files from the standard Tomcat installation. Retain-Tomcat is then installed. The standard Tomcat installation will still automatically start on boot if it was set to do so, and the memory that was set aside for that service will still be unavailable to the new Retain-Tomcat installation. Because of the considerable memory resources that the standard Tomcat will consume, it is **STRONGLY** recommended that the memory tuning previously performed be removed, and if possible, the standard Tomcat installation completely removed via YaST, or disabled. It is also recommended that the Retain Server is run on its own dedicated machine.

To ensure compatibility and performance for Retain in the future, the embedded Retain-Tomcat will be the only supported method of running Retain. Due to these tweaks, Retain-Tomcat is not suitable to run any other web services and may be incompatible.

## Overview

Retain is GWAVA's long-term archiving solution and retention system designed specifically for Novell GroupWise 7.0.1 and higher. Retain uses a web-based, centralized management system to schedule and configure archive jobs. Retain can work with GroupWise retention and purge systems and settings and is designed as a cross-platform solution with full auditing built in.

## What Retain does

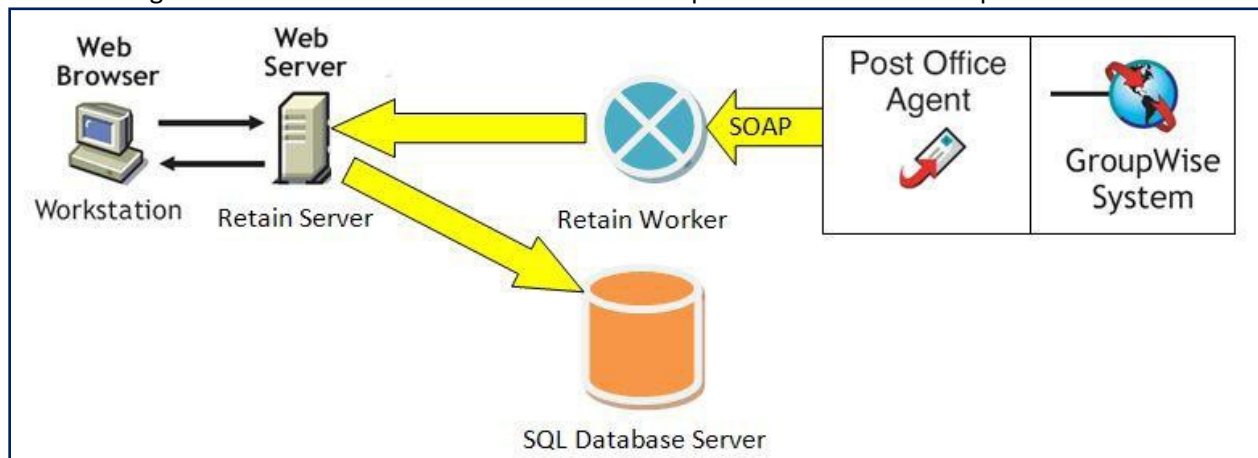
Retain provides a service of long-term storage of data as well as providing search, retrieval, and review services for retained messages. Retain is NOT a backup or emergency restoration system. (For this, we recommend GWAVA Reload.) Retain dredges messages from GroupWise post offices and stores them for long-term reference. Users may log in and review their personal archived mail and search through it.

## How Retain works

The Retain Worker process uses *SOAP* and a trusted application key to collect GroupWise data as defined in a specified profile and according to a defined schedule. This data is handed to the Retain Server which in turn stores the collected data in an administrator-defined location. Users log in to the Retain Server to search through and access their archived messages. User rights are managed by the administrator.

## Architecture

Retain for GroupWise consists of three main parts which can be installed on the same server or they can be spread out across different servers. This gives the administrator enormous flexibility in choosing where data gets stored and which servers will be used to perform Retain for GroupWise's functions.



- **Retain Server:** This is the heart and soul of Retain for GroupWise itself. All functions are controlled from the Retain Server. The server also manages the Retain Worker and stores its data in the database server. Usually there is only one Retain Server per system.
- **Retain Worker:** There is at least one per system, usually installed on each computer running a GroupWise Post Office Agent. (GWPOA) The worker does the actual data collection work. The collected data is handed to the server. The server stores the data in a database.



- **SQL Database Server:** This is an SQL server where Retain for GroupWise stores the collected data. It is not actually part of Retain for GroupWise itself. Retain for GroupWise was designed to support many different databases. The default is MySQL 5.0, but Retain also supports MySQL 5.0, Oracle 10 and 11, MS SQL server 2000, MS SQL server 2005, and PostgreSQL 8.2+

**Installation, maintenance, tuning and backup of the database is the customer's responsibility.**

### **Best Practices for Component Placement**

Retain for GroupWise components communicate via TCP/IP. Placing all the components in the same server will yield the best communication speed. However, this is impractical in a large scale environment. Thus, you must balance the performance of the components on the physical servers with the speed of the network links joining them.

### **How Retain Stores the Archives**

Retain for GroupWise uses a hybrid data storage approach. The database contains all the metadata, folder structure and attachment information but does not hold the actual message text or actual attachments. These are stored on the file system. Data is hashed using the SHA-256 algorithm which can be used to detect tampering.

### **Other components that Retain for GroupWise depends on:**

The following items must be ready before you install Retain for GroupWise's core components.

- SuSE Linux Enterprise Server 9 SP3+, OES Linux 1.0 SP2+, OES 2, SuSE Linux Enterprise Server 10
- Novell GroupWise
- Apache Web Server
- Sun's 1.5 JDK (This is installed automatically in the installation script on systems with internet access. The JDK is recommended, as it provides additional troubleshooting options. This is the ONLY supported version of Java.)
- SQL Database for storage (MySQL 5.0, Oracle 10/11, MS SQL 2000/2005, or PostgreSQL 8.2)

## System Requirements

The hardest part about installing Retain is preparing GroupWise and your server(s). You must first decide *where* you want everything installed. Once the support and core components are installed, using Retain is the same no matter what platform it is installed on. You may spread out Retain's components on different servers or run them all on one.

### Minimum System Requirements

- Pentium 4 (or higher) at least 3.0GHz
- 2 GB of Ram (for the Server) 64 MB of Ram (for the Worker)
- Apache 2.0x for SLES 9 and OES 1, Apache 2.2 for SLES 10.1 and OES 2
- MySQL 5.0x (or alternate supported database version)
- Sun Java 1.5 JDK 32-bit or 64-bit versions
- As much storage space as mail system requires. (see [Estimating storage requirements](#))

### Suggested Requirements

- Dual-Core 3 GHz or better Processor
- 4 GB of system Ram or more installed
- If you have a 64-bit server, consider allocating more memory for Retain, up to 8 GB or RAM on large scale systems. Initial install only allocates 1 GB. See [Tomcat Memory Tuning in Appendix B](#) for information to allocate more Tomcat memory.)
- 160 MB Ram free for Retain Worker

### Supported Linux Versions:

- Open Enterprise Server Linux 1.0 SP2+ (32-bit)
- Open Enterprise Server 2 Linux (32 and 64-bit)
- SuSE Linux Enterprise Server 9 SP3+ (32-bit)
- SuSE Linux Enterprise Server 10 SP2 (32-bit and 64-bit)

### Novell GroupWise Requirements:

- GroupWise 8, 7. (For GroupWise 7 Retain requires 7.03 or higher. 7.01 and above may function with Retain, but are no longer tested. 7.03 contains significant bug fixes and enhanced SOAP performance. 7.03HP1 recommended because it fixes a large memory leak in the original 7.03 release.)
- 7.0.3 Or later is recommended for bug fixes and performance improvements.
- SOAP port must be enabled on all POAs to be scanned for messages.
- SSL is ok, but costs significantly in performance.

## Server hardware, memory, and storage

At a minimum the Retain Server component must be installed on a 2 GB RAM machine, with 1 GB RAM reserved exclusively for the Retain Server, (applies to all platforms). In addition to base memory requirements, Retain-Tomcat will require memory proportional to the amount of users on your Retain Server. Please see the section on tuning Tomcat for details.

- ***Retain-Tomcat must be adjusted prior to running Retain for GroupWise. Without adjustment, Tomcat can run out of memory, causing it to crash. This will disable all web applications that depend on it. Please see the section on memory tuning for Tomcat.***

CPU should be **at least** a Pentium 4 or higher, **at least** 1.0 GHz, *the faster, the better*.

- ***A considerably more powerful CPU, such as a dual core 3+ GHz, is highly recommended.***

Disk storage needs are diverse and vary widely from system to system due to mail flow and type of mail in the respective system. Retain for GroupWise compresses data as it stores, much like GroupWise does. So the storage requirements will be similar to GroupWise. Bear in mind however, that storage requirements are dependent on WHAT you decide to store and how much data you add to the GroupWise system as time moves forward. Remember that Retain for GroupWise storage is cumulative and nothing is ever lost. Generally, assuming you will store “everything”, the initial storage requirements will be 100% of your post office size. If you want an idea of how much more you will need as time goes on, you will have to factor in how much your post office has grown over time and deduct how much is generally pruned or deleted from GroupWise.

### 2 TB Storage Limit – File System Considerations

It is important to consider that some file storage systems have a limit of 2 TB. If your data storage needs will exceed this amount, please choose a file system that can accommodate this. This is something you should verify on all parts of the storage system you choose, from the hardware on up. If you believe your data storage requirements will exceed 2TB, you may wish to consider an enterprise-class storage subsystem like a SAN. Many excellent choices exist in the marketplace. Be sure your chosen platform for Retain Server can use it. This is a function of the operating system. Windows server 2003 and higher can manage more than 2 TB of storage, but requires special partitioning to accomplish this task.

### Supported SQL Database Servers

- MySQL 5.0x
- Oracle 10/11
- MS SQL Server 2000 / 2005
- PostgreSQL 8.2+

Both 32-bit and 64-bit versions of the above databases are supported. A 64-bit dedicated database server tuned to use most of the Server’s RAM is recommended wherever possible. As with all database servers, the more RAM the better the performance. Database Servers usually rank their priorities, in order: RAM, disk speed, and CPU speed. Some also recommend placing transaction log files on a separate volume. Such configuration is beyond the scope of this manual and the responsibility of the customer.

## Backup and Restore of Database and Retain

- Backup and restore of the SQL database is your responsibility and is beyond the scope of this manual.
- Retain for GroupWise has built-in routines to backup its indexes and configuration database.
  - Your backup strategy should focus on these backup files. Doing this, you can back up the system while Retain for GroupWise is running.

## Known Incompatibilities

*The following are systems known to be incompatible with Retain for GroupWise. DO NOT USE THESE on the same server as Retain for GroupWise.*

- **Apache 1.x** – Retain for GroupWise will NOT function with Apache 1.x
- **MySQL 4.x** – DO NOT USE THIS; it will cause data corruption. Use only MySQL 5.x and above.
- **iFolder 3.x** – iFolder 3.x and Retain for GroupWise must NOT be used on the same server. Disruption to the Retain Worker will result.
- **GroupWise WebAccess** – only incompatible if using Microsoft IIS for running Retain for GroupWise
- **Retain cannot access mailboxes with either of the following set**
  - Disabled/Expired account
    - The GroupWise SOAP API cannot log into these accounts and is subject to the same limitations as standard GroupWise clients.
  - Limited client license
    - Novell has addressed the limited client license issue in GroupWise 7 SP3.*

## Design Considerations

Retain for GroupWise is designed to be as flexible as possible, giving you choices as to where to install its components. Here are some points to keep in mind when deciding where to put everything.

### SQL Database Server

- Where should the SQL database server be placed in the network? The faster the network connection the better. Local installation gives the best communication speed, but it's usually unrealistic to do so. In a large system, you might have the database on a server by itself for performance or security reasons. Then, network speed and reliability become key considerations.
- **The SQL server MUST NOT depend on an NFS share. NFS locking is not reliable enough for any database system and will result in database corruption. NFS shares should not be utilized in any database system.**
- Network link between the Retain Server and SQL Database Server must be speedy and reliable.
- **MUST SUPPORT UTF-8 character set**, and collation (MySQL 5.0x is an example of this).
- The Retain database will have to be manually created by the administrator, and a user account must be assigned with full rights. See the Database section. ([Appendix A](#))
- Storage requirements: Roughly equivalent to your cumulative POs, minus OFFILES and OFINDEX.
- **Backup, Clustering, Tuning is the customer's responsibility.** For specific instructions see your SQL Database Server manual. Tuning an SQL Database Server can make huge performance differences.

### Retain Server

- Preferably installed on the same box as the POA for communications speed, reliable address book caching and authentication. This POA can be a low usage one.
  - In a larger installation, you might create a secondary domain with a dummy post office just for the purposes of speeding up the address book caching and user lookups.
  - The default POA should be highly available. A special POA just for this is a good idea.
- CPU requirements are high. The bigger and faster the better.
- Storage requirements: Approximately the same as your GroupWise Post Offices, assuming you are archiving "everything". See Appendix C for more information.
- Backup and Clustering: Backup of indexes and internal database may be done automatically. Attachments can be safely backed up manually.
- We recommend other web applications such as GroupWise WebAccess or iManager NOT be installed on this same server.
- iFolder 3 must NEVER be installed on the same box as Retain Server.

### Retain Worker

- The piece that actually grabs data on a scheduled basis from the POAs is the Retain Worker. It then passes this data to Retain Server.
- Requires a reliable, speedy network connection between Retain Server and Retain Worker.
- Requires a reliable, speedy network connection to Post Office Agents being accessed.
- How many and where? Placing each worker local (on the same machine) to the SOAP POA is recommended to provide maximum network throughput and don't need SSL at the SOAP POA.

We then compress what we send to the Retain Server. So often one per POA and locally placed is better.

If you run more than one POA on the same server, you will encounter a long-standing Novell bug. You will have to manually edit the PO redirection tables. Novell doesn't recommend more than one POA on a server for a variety of reasons. You can have more than one Worker on a server but one worker will handle only one job at a time.

- DO NOT put iFolder 3 on a Retain Worker machine.
- To reiterate, it's recommended to put the Worker on the same server as the POA it dredges for performance reasons.

## GroupWise Address Book

Retain for GroupWise gathers mail from known users. Users known to GroupWise are stored in GroupWise's **System Address Book**. Retain for GroupWise caches this information locally.

Often, the address book needs to be updated as users are added. The Retain Server component NEVER deletes a user from the cached address book.

Over time, Retain for GroupWise will know about all GroupWise users on the system, both current and past. Because Retain for GroupWise stores past users in its cached address book, it can distinguish between two users of the same name. For example, "John Smith" will be recognized as a different user from "John Smith" who worked at the company six months ago.

## GroupWise

- SOAP MUST be enabled at all Post Office Agents being contacted by Retain Worker.
- SSL must be universally on/off at all SOAP Ports. One or the other, but not a mixed state. We can always change from plaintext to SSL, but not the reverse downgrade. However, it costs in performance. SSL in general is VERY performance intensive. Therefore we recommend leaving SSL off, and having a Retain Worker installed local to each POA in question.
- During the setup wizard, you'll need to generate a **Trusted Application Key** on a Win32 workstation with full rights to the primary domain. (This is in the General Admin guide)
- (optional) Retention and/or Smart Purge flags enabled.
- It's recommended that backup jobs by the Retain Worker occur at off hours, to avoid overloading the Post Office Agent.
- Address Book caching is recommended every 24 hours.

## Retain-Tomcat

- Normally you can connect to the embedded Tomcat directly via port 48080. This is a good diagnostic to ensure that it is running. Make sure to allow a few minutes after the service is started before the system becomes available.
- **Retain-Tomcat memory usage must be fine tuned.** This cannot be stressed enough. Default values are insufficient for normal operation of Retain for GroupWise. See [tuning Tomcat section](#), below.

## Installation Preparation

### Preparing Your Server(s)

The general steps to preparing your server are:

- 1) Java (JDK) – ONLY for systems with no internet access.
- 2) Apache
- 3) SQL Server
- 4) You're ready to install Retain for GroupWise core components.

### Linux

*Applies to: SuSE Linux Enterprise Server 9 SP3+*

#### Java

Retain 1.7 requires Sun's Java 1.5 JDK. This is installed automatically on systems that have internet access.

#### Apache

Apache Web Server 2.0 is included in the installation sources. You can install Apache 2.0x via YAST (apache2). Then go to Network services, and activate HTTP SERVER to run on boot. You'll also want to make sure mod\_jk is installed via YAST (apache2-jakarta-tomcat-connector). \*\*\* **Apache 1.3x is not supported**. Installing the OES Web Services as part of the OES install probably pre-installed Java, and Apache, (including mod\_JK).

#### SQL Server

Retain requires a supported SQL server connection. Supported SQL servers are: MySQL 5.0, Oracle 10/11, PostgreSQL 8.2+, or MS SQL Server 2000/2005.

## Retain Installation

### SuSE Linux Enterprise Server 10

SLES 10 features JDK 1.42 and Apache 2.2x. In YaST, search for apache2; make sure Apache 2.2x is installed. Then go to Network services, and activate HTTP SERVER to run on boot. *Java 1.42 is NOT SUPPORTED. The Retain install will automatically download and install the appropriate Sun JDK 1.5 if the server has a connection to the internet. If the server does not have an internet connection, you must install Sun JDK 1.5 manually.*

**\*\*\* NOTE: BE SURE YOUR SERVER'S CLOCK IS ACCURATE BEFORE YOU BEGIN! USING NTP IS RECOMMENDED TO KEEP YOUR CLOCK ACCURATE.**

Once you've downloaded the Retain Installation package and unzipped it, the files in the working directory should look like this:

ALWAYS RUN THE INSTALLER.txt	Setup Tomcat for Windows.exe
java.sh	tomcatinstall.sh
license.txt	<common>
readme.txt	<doc>
RetainInstall.sh (Linux install script)	<linux>
RetainInstall.ips (NetWare install script)	<NetWare>
RetainInstall.exe (Windows installer)	<precompile>
RetainWorker.zip (core Retain Worker)	<tools>
RetainServer.zip (core Retain Server)	<win32>
RetainStubServer.zip (core Retain Stub Server)	<win64>

### Install Procedure on Linux

- 1) Install the SQL server of your choice and create the database
- 2) Unzip the install files to a work directory. (Your distribution directory) (Example: /root/retain)
- 3) Open a terminal session such as Gnome terminal.
- 4) Navigate to the directory where you unzipped the install files. (Example: cd /root/retain)
- 5) We now need to install Retain-Tomcat, and Retain. Enter the following commands:

chmod +x \*.sh (This command flags the install scripts to be executable)

./tomcatinstall.sh (This command installs Retain-Tomcat and removes the Retain hooks from the standard Tomcat installation. It is recommended to disable the current Tomcat installation; you will be instructed to do so at the conclusion of the tomcatinstall.sh script. Consider removing the old Tomcat installation via YaST.)

--Optional-- If you are not uninstalling a previous Tomcat version, the following command removes the previous Tomcat instance from running and allocating system resources.

chkconfig --del tomcat (chkconfig --del tomcat5 on SLES 10) (Also see the [memory tuning section](#) to return the general Tomcat tuning back to normal.)

./RetainInstall.sh (This command initializes the Retain installation. Move on to step 6.)

- 6) Read and accept the license agreement.



7) The install will check your Java version, if you are not running Sun Java JDK 1.5.0.16, it will then be downloaded automatically. The installer will detect whether you are running 32-bit or 64-bit OS, and automatically download and install the correct version. (If you have run a 32-bit Java 1.5 version on a 64-bit server, the installer will not detect a mismatch. We strongly recommend you uninstall the 32-bit version and install 64-bit SUN Java in its place.)

8) The installer will prompt you to accept or deny the Java license agreement. Accept to continue.

9) After Java 1.5 has been installed, you will be prompted to specify the JAVA-HOME switch to the Sun JDK 1.5. If you have nothing specified, or another version, specify the correct version here. The syntax should show:

JAVA\_HOME=/opt/beginfinite/retain/java/jdk1.5.0\_16

(Java is now installed and the Retain installation continues)

10) Determine whether Retain Server, Retain Worker or both will be installed.

- Apache and Retain-Tomcat will be stopped
- Retain for GroupWise will be unzipped into /opt/beginfinite/retain.
- The data will be stored in /var/opt/beginfinite/retain by default.
- Backups of modified files go in /opt/beginfinite/retain/backup
- The Apache integration file is in /opt/beginfinite/retain/ws
- Apache and Tomcat are made to restart and their runlevels are altered to run automatically on system start.

11) Determine whether or not to install the Stubbing Server. **To use stubbing, it is strongly recommended that the GroupWise system be at least 8.0HP1. Previous versions of GroupWise do not contain critical stability fixes.**

**--If you have a current Retain System installed and running, you will be prompted to upgrade or overwrite your current system.--**

12) If you installed Retain Server on this machine, you will be asked if you wish to Pre-compile the JSPs. Pre-compiling JSPs can vastly improve the user interface performance and is recommended for a better experience. It may take several minutes to complete. Pre-compiling JSPs will fail, (with "cannot find compiler" message), if you have not set up JAVA\_HOME correctly in the installation step 9.

13) Reboot.

14) In a terminal window, check the status of **apache 2** and Retain Tomcat. They should both be "running":

rcapache2 status

/etc/init.d/retain-tomcat status

15) You are now ready to continue on to the configuration tasks. See the General Admin guide.

## Custom Storage Path Rights

During the configuration, you choose a storage path for the archived mail. Retain requires read and write access and permissions to the storage path. If you are specifying a storage path other than the default (/var/opt/beginfinite/retain) then you need to grant rights and ownership to Retain.

After running ./RetainInstall.sh, find out which user Retain is using to access the file system. (For SLES 10.1 the user is called 'tomcat').

In a console, type:

l /opt/beginfinite/retain

```
vm-sles10-retain:~ # l /opt/beginfinite/retain
total 1
drwxrwxr--  6 tomcat www  160 Mar  7 13:03 ./
drwxr-xr-x  3 root   root   72 Mar  7 13:03 ../
drwxr-xr-x 14 tomcat www  528 Mar  7 12:58 RetainServer/
drwxr-xr-x  7 tomcat www  416 Mar  7 12:58 RetainWorker/
drwxrwxr--  3 tomcat www   72 Mar  7 13:03 backup/
drwxrwxr--  2 tomcat www   88 Mar  7 13:03 ws/
```

This shows the User and the group that own the directory structure.

In the system shown, Retain is using Tomcat as the user.

Create the directory structure for the desired storage location, and then grant the permissions and ownership to the Retain user.

(mkdir <desired directory structure>)

(chown -R <user> <storage directory>)

(chmod -R 744 <storage directory>)

(In this example, we have already mounted our SAN or physical drive to the /retain directory and wish to store mail in the /retain/archives directory.)

```
mkdir /retain/archives
```

```
chown -R tomcat /retain/archives
```

```
chmod -R 744 /retain/archives
```

```
vm-sles10-retain:/retain # mkdir /retain/archives
vm-sles10-retain:/retain # chown -R tomcat /retain/archives
vm-sles10-retain:/retain # chmod -R 744 /retain/archives
```

Now check the directories for ownership.

```
l /retain
```

```
vm-sles10-retain:/retain # l /retain
total 1
drwxr--r--  3 tomcat root  72 Mar  7 16:06 ./
drwxr-xr-x 25 root   root 608 Mar  7 16:01 ../
drwxr--r--  2 tomcat root  48 Mar  7 16:06 archives/
vm-sles10-retain:/retain #
```

Tomcat now has rights to the storage location.

## Appendix A

### SQL Servers

The SQL start guides are included here as a courtesy. It is your responsibility to find the proper installation procedures and documentation from your chosen database vendor. ***The entire responsibility for installation, care, and maintenance of the database server lies with the customer. We do not provide any kind of support for the database server.***

**WARNING: NFS shares should not be utilized in any database system. NFS locking is insufficient for database requirements and will result in corruption.**

**MySQL – WARNING: MySQL 4.x is provided with this version and it is installable via YaST. Do NOT use it; it is NOT compatible with Retain for GroupWise and will corrupt your data if used. Uninstall MySQL 4, and get MySQL 5.0x** MySQL 5.0 needs to be downloaded and installed.

#### MySQL Quick Start Guide

This guide is provided purely as a courtesy and will detail a very basic installation and database creation for Retain. This guide is provided with **no warranty and no MySQL support** offered.

**\*\*\* WARNING: OES 1.0/SLES 9 come with MySQL 4.x installations. DO NOT use these!** Retain for GroupWise is not compatible with their storage format. Irreparable corruption and loss of data is almost guaranteed. Beginfinite inc. and GWAVA Retain assumes no responsibility for running Retain for GroupWise against MySQL 4.x!

To use MySQL with Retain for GroupWise, you will need to do the following:

- 1) Download MySQL
- 2) Install it to the server of your choice.
- 3) Log in and create a database for Retain for GroupWise to use.
- 4) Create a user with rights for Retain for GroupWise
- 5) Retain for GroupWise will do all the rest.

## Getting MySQL

Although SLES 9 and SLES 10 come with MySQL 5 as an optional package to be installed by YAST, the version supplied by Novell is out of date, buggy, and prone to data corruption. It is STRONGLY recommended you download and install the latest RPMs from MySQL.

1) Go to <http://www.mysql.com>

2) Get MySQL 5.0.x

Get the following binaries appropriate for your system. (Linux x86 Generic RPM (dynamically linked) – for x86 systems, Linux AMD64 build packages for x86-64 systems, etc.) Make sure to obtain all of the following binary packages:

1) Server package

2) Client programs

3) Shared Client Libraries

***NOTE: MySQL 5.0x is the latest RELEASED version of MySQL. MySQL 5.1x is beta quality and 5.2x is alpha quality, hence we do not recommend their usage nor have we tested them.***

## MySQL Optimization

MySQL requires careful memory tuning. By default it assumes it is running on a 64 MB Server. In fact, you should give at least 1 GB RAM to MySQL. Larger sites may well allocate 2, 4, 16, or even 64 GBs of RAM depending on their data store. We do not support or discuss memory tuning requirements.

However the following links may help (Retain uses InnoDB tables):

<http://www.mysqlperformanceblog.com/files/presentations/UC2007-Innodb-Performance-Optimization.pdf> covers InnoDB specifically. Clear and concise; the "bible" for optimization:

<http://www.mysqlperformanceblog.com/files/presentations/UC2007-MySQL-Server-Settings-Tuning.pdf>

Also, for basic optimization directly after MySQL installation, see:

<http://www.mysqlperformanceblog.com/2006/09/29/what-to-tune-in-mysql-server-after-installation/>

### MySQL 5.0x Installation Procedure on Linux

*Applies to:* SLES 9/OES Linux 1.0/SLES 10

1) Log in as root

2) Get MySQL 5.x

3) Open a command-line terminal (like a DOS box in Windows)

4) Go to the directory where the RPM is.

5) For each rpm you downloaded, type

`rpm -ihv <rpmfilename>.rpm`

6) Create a directory where you want your data stored.

7) Type

`mysql_install_db --datadir=<datadirectory>`

8) Start MySQL:

MySQL is a standard Linux service, with a script stored in /etc/init.d. It is configured to run automatically on restart.

9) From the command line, type

/etc/init.d/mysql <command> --datadir=<datadirectory> where available commands are stop, start, and restart, as appropriate.

10) Create a password: type

```
mysqladmin -u root password '<yourrootpassword>'
```

11) Log in to MySQL by typing:

```
mysql --user=root --password=<yourrootpassword>
```

12) You are now ready to create the database. See below.

**\*\*\* You may proceed exactly as the SLES 9 instructions instruct after the client and server are installed. One minor difference is that MySQL is not set to run on restart with SLES 10. Change this with the runLevel Editor in YAST.**

## Create a new database for Retain MySQL

*Applies to:* All platforms

1) Log in to MySQL, as in the last step of the installation procedures.

2) Enter the command:

```
CREATE DATABASE retain DEFAULT CHARACTER SET 'utf8' DEFAULT COLLATE 'utf8_general_ci';
```

**\*\*\* This is critical. Not storing the database in UTF-8 format guarantees irreparable corruption for non US-ASCII characters. \*\*\***

3) If you make a mistake, enter this command:

```
DROP DATABASE retain;
```

...and repeat step 2.

## Create a user for Retain for GroupWise and grant rights.

It is poor security practice to use the root account for ordinary database access. Retain for GroupWise needs a user account created that has full rights to the retain database. The example below will use mjb as the username and the password will be turnip. You may substitute these values for the user name and password you desire.

1) While logged in to MySQL, enter the following commands:

```
GRANT ALL PRIVILEGES ON retain.* TO 'mjb'@'%' IDENTIFIED BY 'turnip';
GRANT ALL PRIVILEGES ON retain.* TO 'mjb'@'localhost' IDENTIFIED BY 'turnip';
```

(Both commands are needed. The '%' is a wildcard. If you want to restrict the connection to a specific ip address, put that address instead. )

## Further tuning

You need to know:

- MySQL server IP Address/HostName
- data port
- database username
- database password

***It is your responsibility to learn more about your SQL Database Server. Tuning these for performance often requires an experienced DBA. It is your responsibility to backup the database store, and make it fault tolerant.***

**Schema update note:** On Linux, some systems have encountered an error after a schema update caused when MySQL cannot create a temporary file for the result of a Retain query.

The following appears in the RetainServer log:

```
2008-10-27 00:00:59,786 [TP-Processor2] ERROR com.maintainet.dao.HibernateUtil -
SCHEMA UPDATE FAILURE: Something went wrong during Schema Update - contact tech
support immediately
2008-10-27 00:00:59,786 [TP-Processor2] ERROR com.gwava.utils.ErrorHandle -
reportError: SchemaUpdate :: EXCEPTION :
org.hibernate.exception.GenericJDBCException: could not get table metadata: Audit
org.hibernate.exception.GenericJDBCException: could not get table metadata: Audit
```

This is usually caused when MySQL cannot create or has lost rights to the tmp working directory. Try the following from a system terminal:

1. `mkdir /var/lib/mysql/tmp`
2. `chown mysql:mysql /var/lib/mysql/tmp`
3. add the following line into the [mysqld] section of /etc/my.cnf: `tmpdir = /var/lib/mysql/tmp`
4. Restart the Server

## **Other Databases**

### **SQL Server 2005 (SP1+ required)**

1. Install as default instance, with Latin 1 as standard encoding.
2. Enable SQL Server Authentication in addition to Windows Authentication
3. Verify server is listening on port 1433 (telnet ip address 1433)
4. Run SQL Server Management Studio, connect to Server
5. Under Security/Logins, right click and create a new user, (for example retainuser) that uses SQL Server authentication. Assign a password.
6. Right click on Databases, and create a new database named retain and assign retainuser as the owner. (There are other ways to grant the permissions but this is easiest)

### **SQL Server 2000 (SP4 required)**

1. Install as default instance, with Latin 1 as standard encoding.
2. Enable SQL Server Authentication in addition to Windows Authentication
3. Make sure TCP IP is enabled, on port 1433, during setup.
4. Verify server is listening on port 1433 (telnet ip address 1433)
5. Run Enterprise Manager, connect to Server
6. Under Security/Logins, right click and create a new user, (for example retainuser) that uses SQL Server authentication. Assign a password.
7. Right click on Databases, and create a new database named retain
8. Expand retain, and under users create a new user (retainuser) and assign all rights to the db
9. Right click on retain, and make sure retainuser has all of the Permissions set.

## ORACLE 10/11

We support the usage of Oracle 10 and 11 on all platforms. However, **we do not support the installation or tuning of Oracle** for this purpose.

The instructions below serve as a guideline, but may result in poorly performing, insecure environments,

Oracle Installation instructions vary wildly depending the version, OS, storage, clustering, etc. so consult your DBA. There is no one-size-fits-all. This is also true of other SQL Server products, but Oracle even more so.

Using Oracle with Retain consists of

- Installation of the Oracle Server
- setting up a TCP IP listener
- Setting up a new database named retain
- creating a user to access the database, and granting sufficient rights.

### *Installation*

Install your Oracle Server normally, according to your standards and practices. One option is to use the Universal Installer, specifying a custom installation, choose the type of Oracle Server to install, and to Install Files Only

### *TCPIP Listener*

Next use the Net Configuration Assistant (or manually edit the Oracle Listener configuration) to create a TCP based listener on port 1521. This allows TCPIP clients to connect to Oracle and is required for Retain.

### *Database Creation*

Next, either use the Database Configuration Assistant or manually create the database with your favorite tool.

Regardless, you want to create a database and sid, named retain, and create your SYSTEM account

An example of a create statement (which should *not* be used as is)

```
connect "SYS"/"&&sysPassword" as SYSDBA
set echo on
spool C:\oracle\product\10.2.0\admin\retain\scripts\CreateDB.log
startup nomount pfile="C:\oracle\product\10.2.0\admin\retain\scripts\init.ora";
CREATE DATABASE "retain"
MAXINSTANCES 8
MAXLOGHISTORY 1
```



```

MAXLOGFILES 16
MAXLOGMEMBERS 3
MAXDATAFILES 100
DATAFILE 'C:\oracle\product\10.2.0\oradata\retain\system01.dbf' SIZE 300M REUSE AUTOEXTEND ON
NEXT 10240K MAXSIZE UNLIMITED
EXTENT MANAGEMENT LOCAL
SYSAUX DATAFILE 'C:\oracle\product\10.2.0\oradata\retain\sysaux01.dbf' SIZE 120M REUSE
AUTOEXTEND ON NEXT 10240K MAXSIZE UNLIMITED
SMALLFILE DEFAULT TEMPORARY TABLESPACE TEMP TEMPFILE
'C:\oracle\product\10.2.0\oradata\retain\temp01.dbf' SIZE 20M REUSE AUTOEXTEND ON NEXT 640K
MAXSIZE UNLIMITED
SMALLFILE UNDO TABLESPACE "UNDOTBS1" DATAFILE
'C:\oracle\product\10.2.0\oradata\retain\undotbs01.dbf' SIZE 200M REUSE AUTOEXTEND ON NEXT
5120K MAXSIZE UNLIMITED
CHARACTER SET AL32UTF8
NATIONAL CHARACTER SET AL16UTF16
LOGFILE GROUP 1 ('C:\oracle\product\10.2.0\oradata\retain\redo01.log') SIZE 51200K,
GROUP 2 ('C:\oracle\product\10.2.0\oradata\retain\redo02.log') SIZE 51200K,
GROUP 3 ('C:\oracle\product\10.2.0\oradata\retain\redo03.log') SIZE 51200K
USER SYS IDENTIFIED BY "&&sysPassword" USER SYSTEM IDENTIFIED BY "&&systemPassword";
spool off

```

The most critical items to note are the CHARACTER SET (AL32UTF8 aka UTF8), and the NATIONAL CHARACTER SET (AL16UTF16). If using a GUI based installed, be careful to set these - they are easily missed. (They are located on the Encoding tab of the 10th step or so of the wizard).

### *User Account Creation*

Finally, using the SYSTEM account, connect to the database, create a user, and grant full system privileges to the account.

An example is shown below:

```

CREATE USER user-name IDENTIFIED BY password;
grant dba to user-name;

```

Restart everything, and verify you can telnet on the TCP LISTENER's PORT (1521 if as above).

### *Tuning*

Tuning Oracle is quite far beyond the scope of this manual. The manuals on Oracle's site, as well as several days of training are strongly recommended.

## PostgreSQL 8.2

1. When installing, specify the UTF-8 encoding, and if the Retain Server is on another machine, that you want to accept connections on all addresses, not just local host
2. Connect to PostgreSQL using psql command line with the PostgreSQL user you created.
3. Create a new user. In the example below, we are creating a user called retainuser with a password of turnip

```
CREATE ROLE retainuser LOGIN ENCRYPTED PASSWORD 'password';
```

4. Create the retain database, and assign ownership to the user created in previous step.

```
CREATE DATABASE retain WITH ENCODING='UTF8' OWNER=retainuser;
```

5. If the Retain Server is on another machine, you'll also need to edit the pg\_hba.conf, and restart PostgreSQL.

Here's an example entry, delimited with tabs, for a user mjb being granted rights to access retain from 192.168.2.2

```
host    retain  mjb    192.168.2.2/32 md5
```

Here is another example, the same except allowing anyone on 192.168.2.x to connect

```
host    retain  all    192.168.2.2/24 md5
```

## Appendix B

### Tomcat Memory Tuning

#### General Recommendations

The following are our general recommendations for the maximum memory allocation parameter. The initial memory allocation parameter may be anywhere from 50%-100% of these values. These parameters are discussed in more detail in the next section.

#### Retain Server Component

A minimum of 1 GB of RAM is recommended. For larger systems, 2-16 GB RAM may be fully warranted. Remember, if this RAM is in use by Tomcat, it is unavailable to other server processes – leave sufficient physical RAM for these. Of course, these other server processes are ideally minimal. Also, remember this memory is shared with other web applications.

#### Retain Worker Component(s)

The Retain Worker component(s) have been designed to be light weight. Nonetheless, a minimum of 64MB RAM is recommended, and 160MB is strongly recommended, to give room for future functionality. Remember, if this RAM is in use by Tomcat, it is unavailable to other server processes – leave sufficient physical RAM for these. Also, remember this memory is shared with other web applications.

#### Tomcat Configuration Parameters

There are three significant parameters:

##### 1) Memory allocated upon Tomcat startup

- Indicates how much memory is immediately allocated and reserved to Tomcat upon startup. This memory will be in usage for the entire lifetime of Tomcat and never available to the other server processes.
- Typically this is set to 50%-100% of the maximum memory parameter discussed below. It can be lower, but pre-allocating a sizeable percentage of memory **enhances performance** and reduces memory fragmentation.

##### 2) Maximum Memory available to Tomcat

- If the memory usage grows beyond the startup allocation, Tomcat will allocate additional blocks of memory in chunks as needed up to this limit. It will never return this memory to the general server memory pool. (Although memory internally will be freed and reused for Tomcat applications).
- Tomcat guarantees that it will never exceed this memory allocation parameter. If Tomcat runs out of memory, it will try to reclaim unused memory via garbage collection. If this is insufficient, the web application will be denied the memory allocation. Unpredictable (but invariably unpleasant) results will then occur.
- **This is the most critical parameter to tune.**

### 3) Stack Size

- For each thread (which includes each and every concurrent user request), Tomcat will allocate stack space.
- This value is typically measured in KB, and defaults to 512KB.
- It is allocated per concurrent users, and is in fact far too generous a number in general. 1000 users for example would take 500 MB of RAM just for stack space, before the program even allocates memory to run!
- Generally we recommend reducing this number to 160k. Increase conservatively, in 64 KB chunks, if you see out-of-stack-space errors in the logs.

**NOTE: 32-bit Linux can allocate a maximum of 3 GB of memory for Java and Tomcat.**

**Retain should be tuned to use between 2 GB to 16GB of memory.**

For the embedded Tomcat (5.5.27), which ships with Retain, Edit the following configuration file:  
**/etc/opt/beginfinite/retain/tomcat/j2ee**

Retain-Tomcat is pre-tuned to use 256 MB initial memory, with a max of 1024 MB. This will not be enough for the server.

Edit the following line with the appropriate parameters for your system:

**CATALINA\_OPTS="-Xms256m -Xmx1024m -Xss160k"**

This line sets the initial memory pool at 256MB, the maximum at 1024MB, and the stack size at 160KB.

By default, the embedded Retain-Tomcat is pre-tuned for basic functions, with 1024MB as the default for the RetainServer, and 256MB for the RetainWorker. THIS WILL NOT BE ENOUGH IN A FULL PRODUCTION ENVIRONMENT. Please tune to fit your system needs.

#### **Checking memory:**

After logging into Retain Server, click the bug icon at the upper left. Among other stats, you'll see the tomcat Memory statistics. These are for all web apps, not just Retain Server.

## UPGRADED SYSTEMS

*If you upgraded, it is **STRONGLY** recommended to revert any previous memory tuning back to normal for the original Tomcat while using the embedded Retain-Tomcat that comes with Retain. If you are not using the standard Tomcat for any other web resource, simply uninstall, or completely disable, the standard Tomcat installation.*

*Every OS has a different methodology! Please read carefully.*

*To return memory tuning to default revert the edits you created or restore a backup configuration file, (if you created one). If not, default memory settings are explained below.*

### SLES 9:

- 1) Edit `/usr/share/tomcat/catalina.sh`.
- 2) Find a line right below the `#!/bin/sh`, it may look similar to this, depending on what you set for your memory values:

```
CATALINA_OPTS="-Xms512m -Xmx1024m -Xss160k"
```

Change it back to the original setting:

```
CATALINA_OPTS=""
```

### OES Linux:

*If you are using the OES Tomcat4 instance (default)*

- 1) Edit `/etc/opt/novell/tomcat4/tomcat4.conf`.
- 2) Edit `JAVA_OPTS`, (The default may have contained some settings already). Your line may look similar depending on your settings.
- 3) `JAVA_OPTS="-Xms512m -Xmx1024m -Xss160k"`

**\*\*\* A typical OES Linux server uses lots of web services, you may keep some memory tuning to maintain the other web services performance.**

Change it back to the default or original setting.

```
JAVA_OPTS="-Xmx256M -Xss512k"
```

*If you are using the SLES Tomcat5 instance, apply the SLES 9 instructions.*

### SLES 10:

- 1) Edit `/etc/sysconfig/j2ee`
- 2) Find and change the `CATALINA_OPTS` line back to the original setting: (Your line may look different depending on the memory values you set.).
- 3) `CATALINA_OPTS="-Xms512m -Xmx1024m -Xss160k"`

Change it back to the original setting:

```
CATALINA_OPTS=""
```

## Appendix C

### Estimating Storage Requirements

How much storage space you will need in your Retain for GroupWise system is dependent on many factors. While there is no hard-and-fast rule, we have provided the following guide to help you evaluate your own needs. If you have GWAVA Redline, you could use its reports to help you with your estimates. In all cases, you are making an estimate for how much disk space to provide to Retain for GroupWise. When rounding your figures, round up to provide more disk space than you estimate you need.

**Calculation guide:** Use the table below to help you calculate your storage requirements for Retain for GroupWise. Do this for each post office you plan to store in Retain for GroupWise and add up the results to get a final figure.

1. Get the disk space used by the post office, usually measurable in Gigabytes (GB). If you use GroupWise Document Management and its data is stored within the post office, run a library report using **GWCHECK** and subtract these values. Alternately, get the size of your post office directory and subtract the size of the DMS directory within it.
2. Estimate how much your post offices will grow in size over the upcoming years. There are many ways to estimate this. See below for suggestions. Remember that Retain for GroupWise is cumulative.
3. Decide how long you want to keep your data (retention time) in years.
4. Calculate your disk space requirements by multiplying your estimated growth per year by the number of years and adding the current size of your post office.

Parameter	Answer	Value #
Post Office Space Used (GB): (not including document management)		1
Yearly Additional Disk Space (GB): (estimate)		2
How long will you keep your data (Years)		3
Disk Space Requirements (GB): Calculate: [value 2] x [value 3] + [value 1]		4
Add 35% for indexes to get a Grand Total (GB) Calculate [value 4] x 1.35		5

Remember, this is only an ESTIMATE, assuming you will be storing EVERYTHING. As you restrict what you will actually store, this figure will go down. For example, do you want to store 50MB attachments? It is your choice.

### **Suggestions on methods to estimate your post office growth per year**

Post office growth varies wildly from company to company and even from post office to post office. There is no hard-and-fast rule which works for everybody. However, some historical data from your own company can help you make a reasonable estimate to determine your ongoing disk space requirements. It is very strongly recommended that the file system you use to store your Retain for GroupWise data be either LVM, NSS or some other system which will allow you to simply add to the storage pool as your needs dictate. Retain for GroupWise tends to need less disk space than your GroupWise post office. It's a small amount less but a conservative estimate would be to simply say "the same amount". Naturally, this only applies if you are storing "everything". Not every organization will store "everything". If, for instance, you're only storing data for certain specific users, you can run GWCheck to determine approximately how much of the post office is used by their data. Redline has a report on post office usage which will tell you right away how much space these users are taking. Take this figure as your baseline "post office size today". Everything else will be calculated based on this figure.  $\text{Current Size} = \text{Past Size} + \text{Additions} - \text{Deletions}$  Retain for GroupWise Needs = Past Size + Additions So the real challenge is making a reasonable estimate of what was or will be deleted. Calculate these figures for each post office you plan to store in your Retain for GroupWise archive and add the results together to get a final total. Suggested Method

- 1) Take your post office size today. (Present Size)
- 2) Take the size of the post office at some point in the past – as close to a year as you can get. (Past Size)
- 3) Calculate the size difference between them (Size Increase) and the time difference (Time Difference)
- 4) Extrapolate the size difference over the year. You'll get an estimate of NET growth. (mail was deleted too).
- 5) Estimate how much mail was deleted from the system. This will be a wild guess at best but only you can make such an estimate.
- 6) Your annual growth will be Net Growth + Deletions.

Even if you can measure your actual growth from last year to this year, it is a NET growth. In addition, rates of growth tend to go up as bandwidth increases because people are simply sending larger and larger items. Some people store things in GroupWise like it was a filing cabinet. So it's a good idea to overestimate your needs and plan accordingly.

## Appendix D

### Uninstalling Retain for GroupWise

Should you wish to uninstall Retain for GroupWise, use the following general procedure. Actual steps will vary according to your host Operating System.

1. Shut Down Tomcat
2. Shut Down Apache
3. Remove the data storage path (delete the files)
  - a. Can be: sys:retain, \retain, /var/opt/beginfinite/retain ... etc.
  - b. See the Retain Administration Guide section on storage to see where your data actually is placed.
4. Remove the program files
  - a. Can be: on Linux /opt/beginfinite/retain, on other platforms, stored under storage path
5. Remove the RetainWorker.xml and RetainServer.xml from Tomcat.
  - a. Linux Tomcat5 `/usr/share/tomcat5/conf/Catalina/localhost`
6. Remove the directories under tomcat/work (but NOT work itself)
  - a. Linux: `rm -r /usr/share/tomcat5/work`
7. Remove references to Retain for GroupWise in httpd.conf
  - a. Can be: /etc/apache2, sys:\apache2/conf, or <InstallPath>\conf).
8. (optional) remove MySQL, Apache, Tomcat
9. If Apache and Tomcat were not removed, restart them both to verify that they load without problems.