Aspen Readme

April 23, 2007

1 Documentation Conventions

In this documentation, a greater-than symbol (>) is used to separate actions within a step and items in a cross-reference path.

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3 Release Notes

This is an alpha release of the product. There are incomplete features, UI styling, and documentation.

1. Presence is not available unless you have access to an existing SiteScape Zon server. The ICEcorps Zon software is not included with this alpha release.
2. Drag and Drop/Copy and Paste Applet - For the FireFox 1.5.0.4 browser on SUSE Linux using JRE Version 1.4.x, the Drag and Drop of files to the applet does not work. The work around for this is to use the Copy and Paste functionality. To get both “Drag and Drop” as well as “Copy and Paste” to work, you must use JRE version 1.5.x with your browser.

The term “`Aspen`” is used in this document as the product name for the current alpha version. The actual product name for release is “`ICEcorps`.”

4 Installing & Configuring Aspen

The following sections cover how to initially install and configure Aspen*:

4.1 Prerequisites

You need a few things before you install Aspen:

1. A good, solid computer with lots of memory.
2. JDK 1.5 installed. (Preferably a relatively recent vintage)
3. A database:
   - MySQL 5 for Linux or Windows
   - SQLserver for Windows

Required RAM:

2 GB minimum.

NOTE: You may potentially run with less RAM for specific development and testing configurations without simultaneous users, lots of database traffic, etc.

How much disk do you need?

This depends on how much data you plan to put into the system.

The software takes about 250 MB.

4.2 Steps for Installing Aspen

The following sequence shows the steps you want to follow to install Aspen:

1. Install JDK
2. Install and Configure the Database
3. Download the appropriate Aspen kit
4. Edit the installer.xml file (see
5. Run the installer (on Linux, do a `chmod +x installer.linux` to make the installer executable)
6. Starting and Stopping Aspen
7. Initial Login
8. Adding Users

4.3 Database Planning

Aspen (and LifeRay) uses a separate, dedicated, database within your database server.

A set of SQL configuration scripts are used to initialize the database (creating the necessary tables, etc.).

Aspen's default database is MySQL. It also supports SQLserver on Windows. (It will support Oracle.)

Aspen's database requirements are relatively modest. The bulk of the data uploaded to Aspen is stored in a file repository (see File System Planning) - the database is primarily used for storing metadata and descriptive text.

Because the amount of data stored in the database is highly sensitive to the usage patterns of Aspen (which are highly variable) there is no reliable formula for determining disk space usage, but the following can be used as a guideline:

- numberAttachments x averageAttachmentSize = totalAttachmentSpace
- totalAttachmentSpace * .04 = sqlDataSpace
- sqlDataSpace x 5 = sqlStorageSapce

MySQL

- MySQL 5 is required
- Specify `root` for the administrator password (or make commensurate changes in the Aspen `installer.xml` file)
- Set the default character set to UTF-8 by selecting "*Best support for Multilingualism*"

Microsoft SQLserver

- You can use SQLserver 2000 or SQLserver 2005
- Make sure to select SQL Server and Windows for authentication (the default is Windows only)
- Set the administrator password to "`sa`" (or make commensurate changes in the Aspen `installer.xml` file)

4.4 File System Planning

Aspen software and configuration files are stored in a tree shared with LifeRay, Tomcat, etc. There are some temporary files also located here, but mainly locks, etc.

Aspen data is stored in the database (see Database Planning) and on the file system. The file system usage is divided up into several functional areas:

- `filerepository` - This is where all attachment files are located, so it tends to be a large consumer of disk space. The tree is roughly organized by zone, binder (folder/workspace), and entry.
- `archiveStore` - Only activated in the Enterprise version of Aspen, this is where previous versions of files are stored. The files are stored here to meet compliance and archival goals.
- `cachefilestore` - This tree holds information derived from the attachments, such as thumbnails, scaled images, text, and HTML renderings. Depending on the nature of the attachments this tree consumes somewhat less space than the file repository (but it can, conceivably, store more).
- `lucene` - This tree holds the search index for the data. It tends to be a fraction of the space consumed by the file repository, but it is also sensitive to the type of information stored.
- Other trees - These are other trees that are not configurable and typically consume a small amount of space (relatively speaking).
  - `rss` - Caches of RSS feeds for folders
  - `temp` - Temporary files
  - `definitions` - Custom definitions are stored here

4.5 Editing the Installer (.xml) File

The `installer.xml` file provides the Aspen installer with detailed configuration information regarding network, memory, database, file system, e-mail, presence, and other settings. Edit this file with your specific data. An example `installer.xml` file is shown below:

```
<!--                                                                -->
<!--           Aspen Installation Configuration File                -->
<!--                                                                -->
<AspenConfig>
    <!--                                                              -->
    <!--                    Network Settings                          -->
    <!--                                                              -->
    <!--  The host name or IP address of the server must be         -->
    <!--  specified here.  The default, localhost, is only          -->
    <!--  appropriate for test configurations with no remote        -->
    <!--  access.                                                     -->
    <!--                                                              -->
    <Network>
        <Host name="myhost" port="8080" />
        <WebServices endpoint="http://myhost:8080" />
    </Network>
    <!--                                                              -->
    <!--               Memory (RAM) Settings                          -->
    <!--                                                              -->
    <!--  Aspen requires a minimum of 512m to operate.              -->
    <!--  1g is recommended for basic production.                   -->
    <!--  More is better.                                             -->
    <!--                                                              -->
    <Memory>
        <JavaVirtualMachine mx="1g" />
    </Memory>
    <!--                                                              -->
    <!--               File System Configuration                      -->
    <!--                                                              -->
    <FileSystem configName="basic">
      <!-- The basic configuration only requires that you  -->
      <!-- specify a root directory for the data and       -->
      <!-- we'll take care of the rest.                    -->
      <Config id="basic">
        <RootDirectory path="/home/aspendata"  />
      </Config>
      <!-- The advanced configuration requires that you    -->
      <!-- specify individual directory locations.         -->
      <Config id="advanced">
        <RootDirectory path="/home/aspendata"  />
        <FileRepositories />
        <ArchiveStore   />
        <CacheStore     />
        <LuceneIndex    />
        <Other          />
      </Config>
    </FileSystem>
    <!--                                                              -->
```

```
    <!--              Database Configuration                        -->
    <!--                                                            -->
    <!-- Modify the configName to your desired configuration.    -->
    <!-- Change the Resources for the configuration if needed    -->
    <!-- (the defaults are pretty good)                            -->
    <Database  configName="MySQL_Default">
        <Config id="MySQL_Default" type="MySql">
            <Resource for="liferay"
                driverClassName="com.mysql.jdbc.Driver"
                url="jdbc:mysql://localhost:3306/
lportal?useUnicode=true&amp;characterEncoding=UTF-8"
                username="root"
                password="root"
            />
            <Resource for="aspen"
                driverClassName="com.mysql.jdbc.Driver"
                url="jdbc:mysql://localhost:3306/
sitescape?useUnicode=true&amp;characterEncoding=UTF-8"
                username="root"
                password="root"
            />
        </Config>
        <Config id="SQLServer_Default" type="SQLserver">
            <Resource for="liferay"
                driverClassName="net.sourceforge.jtds.jdbc.Driver"
                url="jdbc:jtds:sqlserver://localhost/
lportal;SelectMethod=cursor"
                username="sa"
                password="sa"
             />
            <Resource for="aspen"
                driverClassName="net.sourceforge.jtds.jdbc.Driver"
                url="jdbc:jtds:sqlserver://localhost/
sitescape;SelectMethod=cursor"
                username="sa"
                password="sa"
             />
        </Config>
    </Database>
  <!--                          -->
  <!--              Email Configuration Settings                 -->
    <!--                                                          -->
    <!--  Edit the Outbound and Inbound settings as required.    -->
    <!--                                                          -->
    <!--                                                          -->
    <!--  For inbound mail (postings) you need to specify either -->
    <!--  pop3 or imap, and fill out the settings for which one  -->
    <!--  you choose.                                             -->
    <!--                                                          -->
    <EmailSettings>
        <Outbound>
            <Resource
                mail.smtp.host="mailhost.yourcompany.com"
                mail.smtp.user="aspen@yourcompany.com."
```

```
                mail.smtp.password=""
                mail.smtp.auth="false"
                mail.smtp.port="25"
            />
         </Outbound>
        <Inbound>
            <Resource
                mail.store.protocol="pop3"
                mail.pop3.host="localhost"
                 mail.pop3.auth="true"
                mail.pop3.user="popEmailUserId"
                mail.pop3.password="passwordHere"
                mail.pop3.port="110"

                mail.imap.host="localhost"
                mail.imap.auth="true"
                mail.imap.user="imapEmailUserId"
                mail.imap.password="passwordHere"
                mail.imap.port="143"

                mail.smtp.user="aspen@sitescape.com"
                mail.transport.protocol="smtp"
                mail.smtp.host="localhost"
                mail.smtp.port="25"
            />
        </Inbound>
    </EmailSettings>
    <!--                                                                -->
    <!--              Presence Configuration Settings                   -->
    <!--                                                                -->
    <Presence>
        <Resource
            presence.service.enable="false"
           presence.service.jabber.server="zon-server.yourcompany.com"
            presence.broker.admin.id="admin"
            presence.broker.admin.passwd="admin"
            presence.broker.jabber.domain="newzon"
            presence.broker.default.community.id="yourcommunity"
            presence.broker.zon.url="http://zon-
server.yourcompany.com:8000/imidio_api/"        />
    </Presence>
    <!--                Custom Configuration Settings                   -->
    <!--                                                                -->
    <!--  Custom properties set here will be placed in the       -->
    <!--  ssf-ext.properties file.                                      -->
    <!--                                                                -->
    <CustomProperties>
        <Resource
        />
    </CustomProperties>
</AspenConfig>
```

4.6 Run the Installer: Sample Installer Sequence

```
Aspen Installer 0.1.0
Installing this software requires agreement to the terms and
conditions set forth in the:
SiteScape End User License Agreement for Beta Software
You can review this agreement again at the download site.
Note: You must answer "YES" to install the software.
Have you read and agree with the license? : yes
JAVA_HOME is set to: C:\Program Files\Java\jdk1.5.0_11
Creating installer working directory: C:/aspen/temp-installer
Enter the type of installation:
  1. Aspen Enterprise 0.1.0 with Liferay/Tomcat - FULL INSTALL
  2. Aspen Enterprise 0.1.0 with Liferay/Tomcat - UPDATE
  3. Aspen Lucene Server  (Not Available)
  4. Apply settings only  (Use with care)
Installation type [1]: 1
We have to install the software into a dedicated directory
Install directory: [C:/aspen-team-0.1.0]:
   Directory C:/aspen-team-0.1.0 does not exist.  Creating...
Copying deployment kits to work directory...
   (this takes about a minute)
   ... done
Ready to apply kits to the installation directory
Enter Y to install, enter N to cancel installation [Y]:
Installing Aspen (LifeRay/Tomcat) ... (this will take a minute or so)
Installing Aspen converters ...
   ... done
Applying installation settings...
   Loading installer.xml...
   Loading current configuration files...
   Database settings...
      using database configuration: SQLServer_Default
      Database type is: SQLServer
   File system settings...
      using configuration: basic
   File system root path: C:/aspendata
   Email settings...
   Network settings...
   Custom settings...
   Startup files...
   Writing all settings...
   Settings applied.
New installation selected.  Getting database creation scripts....
   Creating Liferay database for SQLServer ...
osql -U sa -P Born2test -i C:/aspen/temp-installer/liferay/create/
create-sql-server.sql
   Creating Aspen database for SQLServer ...
osql -U sa -P Born2test -i C:/aspen/temp-installer/aspen/create/
create-database-sqlserver.sql
   Databases created.
Installation completed.
You can startup Aspen/Liferay by running the startup script
in: C:/aspen-team-0.1.0/liferay-portal-tomcat-jdk5-4.1.2/bin
```

4.7 Starting and Stopping Aspen

Starting Aspen

On Windows:

```
/yourinstall/liferay-portal-tomcat-jdk5-4.1.2/bin/startup.bat
```

On Linux:

```
/yourinstall/liferay-portal-tomcat-jdk5-4.1.2/bin/startup.sh
```

NOTE: While this is dependent on your system configuration, it can take upwards of 60 seconds before Aspen/Liferay starts accepting web transactions. Initial transactions also tend to be slower as various caches load into RAM. These delays are amplified somewhat when working with a new installation or updated software as the JSPs are recompiled as they are referenced.

Log Files / Monitoring

On Windows:

A Tomcat window appears when you issue the startup.bat command. Messages (good and bad) appear here.

On Linux:

Unlike Windows, the Tomcat process starts as a background process and no window appears. To monitor the messages in real time:

```
tail -f /yourinstall/liferay-portal-tomcat-jdk5-4.1.2/logs/
catalina.out
```

Stopping Aspen

On Windows:

```
/yourinstall/liferay-portal-tomcat-jdk5-4.1.2/bin/shutdown.bat
```

On Linux:

```
/yourinstall/liferay-portal-tomcat-jdk5-4.1.2/bin/shutdown.sh
```

4.8 Initial Logon

After installing Aspen/Liferay you need to log in. Liferay predefines a number of accounts, including a system administrator account.

1. Access your installation via the following URL: `http://yourhost.name.here:8080`
2. At the login screen enter: `liferay.com.1`
3. Enter the following Password: `test`

   This brings up the initial LifeRay portal window. There are no Aspen portlets predefined for the system administrator account.
4. Click on the "*Add Content*" link in the upper-right-hand corner. This brings up a panel of portlets along the left-hand margin. Expand the "*ICEcorps*" section and add the following portlets:
   - ICEcorps Administration
   - ICEcorps Navigator

   The portlets are placed in the narrow column on the left side. For each of the two Aspen portlets mouse down on the title and drag them over the right-hand column above the other portlets. They move to fill the column. Click on the links to initialize the portlets.

4.9 Adding Users

As this is a teaming product, you probably want to add some people besides yourself.

There are two methods of managing users:

1. Basic User Management - create and manage individual accounts manually
2. LDAP/eDirectory - synchronize user account management to a corporate directory

Regardless of which method you choose it is important to realize that because Aspen is embedded within a portal, a portion of user management is delegated to the portal. For example, the portal is responsible for all user authentications.

Basic User Management

This capability comes "out of the box" with the product - no additional setup is required.

Using the Liferay "*Enterprise Admin*" portlet, click on the *Users* tab. (Note: Liferay has two portlets, "*Enterprise Admin*" and "*Admin*." Both have "*Users*" tabs, but they do very different things. Make sure you are using the correct portlet.) This brings up a list of current Liferay accounts. You can refer to the Liferay documentation for more advanced management, but the basic steps needed are:

1. Click *Add*.
2. Fill in the *First*, *Last Name*, assign a *User ID*, and specify the e-mail address.
3. Click *Save*.
4. Liferay shows an extended form.
5. In the second section you can set the timezone and portal window size. While Aspen can operate in an 800x600 pixel window, we recommend the 1024x768 or Full Screen option.
6. Click *Save*.
7. Click on the *Password* tab.
8. Type in the password.
9. Click *Save*.

The account is now created and ready for use. The user does appear in Aspen until they log in. The first time the user logs in, Aspen creates their user workspace, including a blog, calendar, and file area.

User Management with LDAP/eDirectory

If you want to use a corporate directory as the master reference for user accounts you need to configure both Liferay and Aspen in a similar manner. Aspen's LDAP configuration pages are designed to look and work in a similar fashion to Liferay, easing this task significantly. You can refer to the Liferay documentation for more detailed information, but the basic steps needed are:

1. Using the Liferay "*Admin*" portlet, click on the *Users* tab. (Note: Liferay has two portlets, "*Enterprise Admin*" and "*Admin*". Both have "*Users*" tabs, but they do very different things. Make sure you are using the correct portlet.)
2. Click on the *Authentication* tab.
3. Click on the *LDAP* tab.
4. Fill out the form with the values needed to map to your corporate directory.
5. Click *Save*.
6. Using the *ICEcorps Administration* portlet, click on "*Configure LDAP*."
7. Fill out the form using the corresponding values that were used to configure Liferay. (See below for details on this form).
8. Click *Apply*.

The Aspen LDAP Configuration Form

This form is similar to the Liferay form but includes additional information on scheduling synchronization of all users and, optionally, groups.

Connection settings:

- URL: `ldap://host:port/dc=foo,dc=bar`
  - e.g., `ldap://192.168.3.3:389/dc=sleepy,dc=com`
- Principal: LDAP principal to authenticate access with
  - e.g., `cn=admin,o=itdepartment`
- Credentials: Above principal's password or authenticating token

Users settings:

- Ldap attribute that identifies the user
  - e.g, `uid`
- Attribute mapping - This is how you map the LDAP attribute names of the user record to the Aspen internal identifiers. Syntax is: `aspenId=ldapAttName`
  - e.g, `lastName=sn`
  - e.g., `name=uid`
  - AspenIds: `lastName, firstName, name, description, email, Address, phone`
- Select "*Synchronize user profiles*" (recommended)
- Select "*Register LDAP user profiles automaticially*" (recommended)
- Select others as appropriate

Groups settings:

- Register LDAP group profiles automatically (recommended)
- Synchronize group membership (recommended)

4.10 Mail Setup

Aspen e-mail integration is divided into two primary functions:

1. Notification - e-mail messages generated by Aspen to inform people of events (e.g., new entries, changes) occurring within Aspen.
2. Posting - the processing of e-mail messages sent to Aspen with the intent of having the e-mail content added to a particular folder (as a new entry or reply).

System Configuration

As part of installing and configuring Aspen, the system administrator must supply information related to the address and access to the mail system. E-mail integration is not required and the level of integration is configurable.

The `installer.xml` file contains sections on e-mail configuration for both notification (Outbound) and posting (Inbound).

Outbound configuration requires the basic information for generating SMTP mail messages: server, port, and optional authentication information.

Aspen posting works by the system accessing a single e-mail account (sometimes referred to as the "posting account"). Using your e-mail system, multiple e-mail addresses (aliases) can be mapped to this account. Aspen periodically reads e-mail sent to this account and apply the messages to individual folders (more on this below).

Create the account using your normal e-mail system management tools. You can configure the posting account to use either POP3 or IMAP. Aspen needs a host, port, e-mail account id and password for the posting feature to work.

Setting up Incoming Mail schedule

In the *ICEcorps Administration* portlet, click on the "*Configure site incoming email schedule*" link. This brings up a form that instructs Aspen how when to check the posting e-mail account. You may choose to poll at specific times during the day or at some regular frequency.

The right-hand side of the setup page lists any aliases and the folder that is using that alias. You set up the alias address to folder mapping within the folders themselves (see next section).

Associating an E-mail Address with a Folder

If you enable incoming e-mail the final step that you need to take is to associate a particular e-mail alias address with a folder. When this is done, e-mail sent to that address is "read" by the folder and turned into entries (or replies).

1. Navigate to the folder you want to receive e-mail and click on the "*Manage this folder*" menu item, then select "*Email settings*".
2. Enter the e-mail alias address you want to associate with this folder. Click on the *Apply* button to save the address.

You can optionally set up the notification schedule for this folder at the same time (see next section).

Establishing a Notification Schedule for a Folder

You can configure each folder to send out e-mail messages highlighting activity within the folder.

1. Navigate to the folder you want to receive e-mail and click on the "*Manage this folder*" menu item, then select "*Email settings*".
2. Enable outgoing mail and select the type of schedule you want for notification. You can configure the schedule for specific times of the day or a regular frequency. You also need to specify who is to receive the e-mail. This can be a combination of users, groups, and arbitrary e-mail addresses.
3. Click the *Apply* button to save the schedule.

4.11 Memory Guidelines

Java virtual machine uses a memory pool that is configurable at startup time. (You can see `catalina.bat/.sh` for all of Tomcat's startup options).

Memory settings are defined in the `installer.xml` file. The default configuration assumes 1GB is available for the Java virtual machine.

Virtual memory configurations in excess of 2GB for large production environments are common, therefore 64-bit server systems are recommended.

LifeRay has its own (non-trivial) memory pools that needs to be factored in when determining overall memory demands. These are not accounted for in great detail here.

Aspen memory usage factors:

1. Number of sessions (users logged in)
2. Number of active/concurrent sessions
3. Hibernate cache (database)
4. Lucene cache

The largest and most important of these are the Hibernate and Lucene caches.

Hibernate Cache

Hibernate is a software framework that manages the mapping between Java objects and relational databases. Consequently, it has a sophisticated cache system that works on top of any database caching mechanisms.

By default Aspen uses the `ehcache` plug-in, which is a non-clustering cache manager. Fine tuning of the Hibernate cache is done through `ehcache.xml`.

Lucene Cache

Lucene has a number of tuning parameters. At this time, we have not done any work with them.

4.12 Document Support

When a file is uploaded into Aspen it is processed in a number of ways:

1. Textual content is extracted and sent to the search engine. For some file types (e.g., word processing documents) the textual content is obvious. For others, such as graphics files, there may be little or no textual content beyond basic metadata.
2. If possible, a thumbnail (and scaled image - somewhat larger than a thumbnail) of the file is created. The thumbnail of a multi-page document shows the first page.
3. If possible, an browser-only renderable (HTML) version of the file is created. This allows people who do not have the ability to open the file with its native application to get an idea of what is in the file. The rendering is on a "best effort" basis and the level of detail and fidelity of the rendering varies greatly.

The Open and Enterprise versions of Aspen vary greatly in their ability to perform the above tasks.

The Open version uses `OpenOffice` to provide access to common `Microsoft` and `OpenOffice` document formats, and that is about it.

The Enterprise version uses a licensed technology from the Stellent* company (now part of Oracle*) which provides processing capabilities to a wide spectrum of file types (over 200).

Editing Support

There are two ways of editing files stored in Aspen:

1. Download the file to your desktop. Edit the file. Upload the file to the entry (as an attachment). A new version of the attachment is created reflecting your changes. It is possible to manually "lock" the entry if you want to prevent other people from modifying any of the attached files.
2. Certain file types provide an [Edit] button which allows for "edit in place". When available, clicking on the [Edit] button will launch a small Java applet which, in turn, launches the associated edit program for the file. The program accesses the file stored in Aspen through `WebDAV` and is subject to the individual file locking protocols that `WebDAV` provides. Saving the file (or exiting the application) creates a new version of the attachment - no interaction with the browser is needed.

Because the "edit in place" option requires the WebDAV URL support by the application, which is not universally supported by the operating systems, Aspen must be configured to know which applications are "WebDAV-aware".

The following table (still very much a work in progress) shows the planned default configuration of file/document support in Aspen.

		HTML View		Thumbnails		Application		Edit via	Search	
Ext	**Description**	Open	Ent	Open	Ent	Windows	Linux	WebDAV	Open	Ent
doc	MS Word	?	X		X	winword	ooffice	X	X	X
xls	MS Excel	?	X		X	excel	ooffice	X	X	X
ppt	MS Powerpoint	?	X		X	powerpnt	ooffice	X	X	X
ods	OO Calc	X	X		X	soffice	ooffice	X	X	X
odg	OO Draw	X	X		X	soffice	ooffice	X	X	X
odp	OO Impress	X	X		X	soffice	ooffice	X	X	X
odf	OO Math	X	X		X	soffice	ooffice	X	X	X
odt	OO Writer	X	X		X	soffice	ooffice	X	X	X
sxw	OO Text	?	X		X	soffice	ooffice	X	X	X
docx	MS Word 2007		X		X	winword	?	W		X
xlsx	MS Excel 2007		X		X	excel	?	W		X
pptx	MS Powerpoint 2007		X		X	powerpnt	?	W		X
123	Lotus 1-2-3		X		X					X
avi	Windows Multimedia		X		X					X
bmp	Bitmap Graphic		X		X					X
cdr	Corel Draw		X		X					X
cgm	Computer Graphics Metafile		X		X					X
dsf	Micrographix Designer		X		X					X
dwg	AutoCAD Drawing Format		X		X					X
dxf	AutoCAD Exchange Format		X		X					X
gif	Graphics			?	X					X
hpgl	HP Graphics Language		X		X					X
htm	HTML		X		X					X
html	HTML		X		X					X
jpg	Graphics			X	X					X
lwp	Lotus WordPro		X		X					X
mdb	MS Access		X		X					X
mov	QuickTime Movie		X		X					X
mp3	Audio		X		X					X
mpeg	Movie		X		X					X
mpg	Movie		X		X					X
mpp	MS Project		X		X					X
pdf	Adobe Portable Document		X		X					X
png	Graphics			?	X					X
pps	MS Powerpoint		X		X	powerpnt		?		X
ps	Postscript		X		X					X
psd	Adobe Photoshop		X		X					X
qt	QuickTime Movie		X		X					X
rm	Real Movie		X		X					X
rtf	Rich Text Format		X		X					X
tif	Graphics		X		X					X
tiff	Graphics		X		X					X
txt	Text		X		X				X	X
vsd	MS Visio		X		X	??		?		X
wav	Windows Wave Audio		X		X					X
wk1	Lotus Worksheet		X		X					X
wk3	Lotus Worksheet		X		X					X
wk4	Lotus Worksheet		X		X					X
wpd	WordPerfect		X		X					X
xbm	X-Windows Bitmap		X		X					X
xml	XML		X		X					X
xpm	X-Windows Pixmap		X		X					X
zip	Compressed files (PKZIP)		X		X					X