GRANTS.GOV℠

REFERENCE IMPLEMENTATION SETUP INSTRUCTIONS

Systems Integration

Version 3.5

Prepared by:

Northrop Grumman Information Technology
1700 Research Boulevard
Rockville, Maryland 20850

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Final

This report is confidential and intended solely for the use and information of the client to whom it is addressed.

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Record Of Changes

Version Number	Date of Change	Made By	Description of Change
1.0	7/29/2003	System Integration	Original
2.0	8/06/2003	Systems Integration	Formatting/Revisions
3.0	2/04/2004	Systems Integration	Formatting/Revisions
3.5	2/09/2004	Systems Integration	Formatting/Revisions

1. Introduction

The Reference Implementation document provides instructions for installing and configuring the Grants.gov Web Services Reference Implementation to work with the *trws.grants.gov* Grants.gov environment. This document demonstrates the mutual authentication components; it also demonstrates more realistically the use of the *Status, OpportunityID,* and *CFDANumber* filters.

The following sections describe the system requirements necessary to deploy and execute the Reference Implementation, as well as steps to download, install, and configure the open source tools that are used in the development and execution of the reference implementation.

NOTE: The installation of the open source tools is a one-time process only.

2. System Requirements

The instructions assume you will be deploying and executing the Reference Implementation application on a Windows platform. The instructions given in this document are also applicable, to a great extent, to a UNIX/Linux platform.

The application uses the following software:

- MySQL Database, version 4.0
- Tomcat Servlet Container, version 4.1.29
- J2SE 1.4.2
- J2EE 1.4. The application uses JSP's and servlets, and therefore a recent version of J2EE is required to run the application.
- Certain JAXB and JAXP .jar files from the Java Web Services Developer's Pack (JWSDP), version 1.2.
- SOAP with Attachments API for Java (SAAJ) .jar files from the Java Web Services Developer's Pack (JWSDP), version 1.1, as well as Java API for XML Messaging (JAXM) 1.1 .jar files.

NOTE: The .jar files necessary to run the reference implementation are made available to you via .jar files in the reference implementation WEB-INF\lib folder, and so installation of the Java Web Services Developer's Pack (JWSDP), version 1.2, and Java API for XML Messaging (JAXM) 1.1 is not technically required to run the reference implementation application. However, you may want to install them in order to explore some or all of the various Web Services related features provided in the API's.

3. Downloading the Reference Implementation

1. Download and save the *webServices.zip* file containing the Reference Implementation application files and documentation.
2. Extract the *webServices.zip* file into a folder of your own choosing, such as c:\webServices. The path to this folder will be referred to as:

   "[REFIMPL_HOME]"

NOTE Instructions for deploying the Reference Implementation are provided in Section 9. Deploying the Reference Implementation Application.

4. Installing the MySQL Database

1. Download and save MySQL Version 4.0 database zip file for Windows from http://www.mysql.com/downloads/mysql-4.0.html
2. Download and save MySQL Control Center zip file for Windows from http://www.mysql.com/downloads/mysqlcc.html
3. Install MySQL and the Control Center by following the instruction from http://www.mysql.com/doc/en/index.html.
4. Below are the steps and the SQL script that will create the proper database tables based on the Entity Relationship Diagrams shown on the next page.
   - Start the MySQL database server by going to mysql\bin folder and double clicking on "*mysqld-max-nt.exe*".
   - Run "*install.bat*" found in the [REFIMPL_HOME]\db folder. (Before running, you may need to modify the MYSQL_HOME variable to point to your installation directory.) This will create the *grants_gov* database with its 13 tables as described in section 4.1.

***NOTE**:* This script can be re-run at any time to effectively "refresh" the database; i.e., to delete any existing data in the database.

Entity Relationship Diagrams

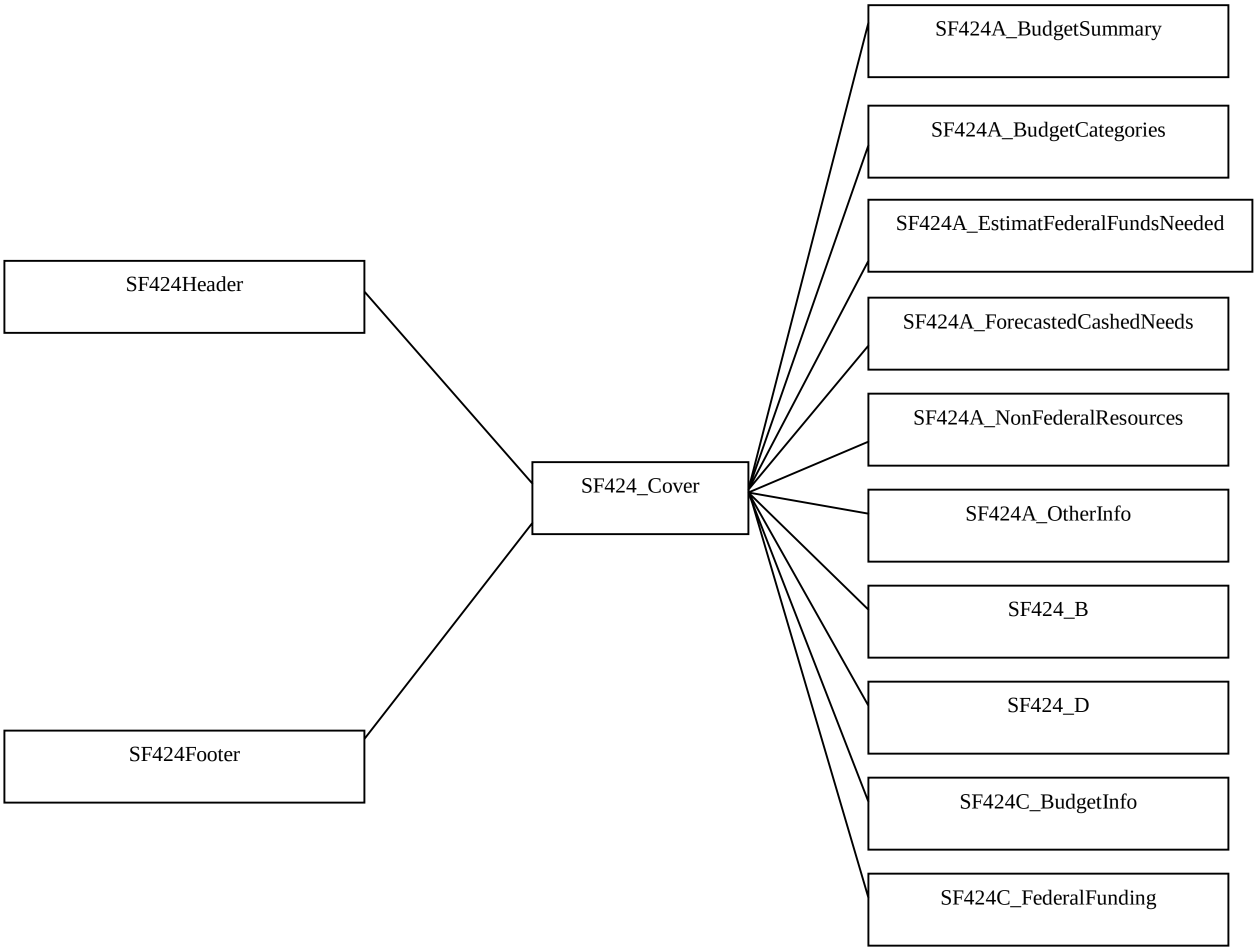


Figure 4-1. Entity Relationship Diagrams

4.1 The Grants.gov Database Tables

Table 4-1. TABLE sf424a_budgetcategories

Field Name	Data Type
BudgetCategoryIndex	Int(11)
FormVersionIdentifier	varchar(30)
Grants_govTrackingNumber	varchar(240)
GrantActivity	float
BudgetPersonnelRequestedAmount	float
BudgetFringeBenefitsRequestedAmount	float
BudgetTravelRequestedAmount	float
BudgetEquipmentRequestedAmount	float
BudgetSuppliesRequestedAmount	float
BudgetContractualRequestedAmount	float
BudgetConstructionRequestedAmount	float
BudgetOtherRequestedAmount	float
BudgetTotalDirectChargesAmount	float
BudgetIndirectChargesAmount	float
BudgetTotalAmount	float
ProgramIncomeAmount	float

Table 4-2. TABLE sf424a_budgetsummary

Field Name	Data Type
BudegetSummaryIndex	int(11)
FormVersionIdentifier	varchar(30)
Grants_govTrackingNumber	varchar(240)
ActivityTitle	varchar(120)
CFDANumber	varchar(15)
BudgetFederalEstimatedUnobligatedAmount	float
BudgetNonFederalEstimatedUnobligatedAmount	float
BudgetFederalNewOrRevisedAmount	float
BudgetNonFederalNewOrRevisedAmount	float
BudgetTotalNewOrRevisedAmount	float

Table 4-3. TABLE sf424a_estimatfederalfundsneeded

Field Name	Data Type
EstimateFederalFundsNeededIndex	int(11)
FormVersionIdentifier	varchar(30)
Grants_govTrackingNumber	varchar(240)
GrantAcitivity	varchar(100)
BudgetFirstYearAmount	float
BudgetSecondYearAmount	float
BudgetThirdYearAmount	float
BudgetBudgetFourthYearAmount	float

Table 4-4. TABLE sf424a_forecastedcashneeds

Field Name	Data Type
ForecastedCashNeedsIndex	int(11)
FormVersionIdentifier	varchar(30)
Grants_govTrackingNumber	varchar(240)
TimeFrame	varchar(100)
BudgetFederalForecastedAmount	float
BudgetNonFederalForecastedAmount	float
BudgetTotalForecastedAmount	float

Table 4-5. TABLE sf424a_nonfederalresources

Field Name	Data Type
NonFederalResourcesIndex	Int(11)
FormVersionIdentifier	varchar(30)
Grants_govTrackingNumber	varchar(240)
GrantActivity	varchar(100)
BudgetApplicantContributionAmount	float
BudgetStateContributionAmount	float
BudgetOtherContributionAmount	float
BudgetTotalContributionAmount	float

Table 4-6. TABLE sf424a_otherinfo

Field Name	Data Type
OtherInfoIndex	Int(11)
FormVersionIdentifier	varchar(30)
Grants_govTrackingNumber	varchar(240)
OtherDirectChargesExplanation	varchar(100)
OtherIndirectChargesExplanation	varchar(100)
Remarks	varchar(250)

Table 4-7. TABLE sf424b

Field Name	Data Type
TableIndex	Int(11)
FormVersionIdentifier	varchar(30)
Grants_govTrackingNumber	varchar(240)
RepresentativeName	varchar(30)
RepresentativeTitle	varchar(45)
ApplicantOrganizationName	varchar(60)
SubmittedDate	date
ProgramType	varchar(100)

Table 4-8. TABLE sf424c_budgetinfo

Field Name	Data Type
BudgetInfoIndex	Int(11)
FormVersionIdentifier	varchar(30)
Grants_govTrackingNumber	varchar(240)
CostClassification	varchar(100)
BudgetEstimatedCostAmount	float
BudgetNonAllowableCostAmount	float
BudgetTotalAllowableCostAmount	float

Table 4-9. TABLE sf424c_federalfunding

Field Name	Data Type
FederalFundingINdex	Int(11)
FormVersionIdentifier	varchar(30)
Grants_govTrackingNumber	varchar(240)
FederalFundingPercentageShareValue	float
BudgetEstimatedCostAmount	float
Contingencies	float
CostSubtotalBeforeContingencies	float
CostSubtotalAfterContingencies	float
ProgramIncome	float
TotalProjectCosts	float

Table 4-10. TABLE sf424cover

Field Name	Data Type
FormVersionIdentifier	varchar(30)
Grants_govTrackingNumber	varchar(240)
AuthorizedRepresentativeSignature	varchar(144)
SignedDate	date
AgencySchemaVersion	varchar(3)

Field Name	Data Type
SubmissionTypeCode	varchar(100)
SubmittedDate	date
ApplicationTypeCode	varchar(100)
AgencyName	varchar(60)
AgencyReceivedDate	date
StateReceivedDate	date
StateID	varchar(30)
FederalID	varchar(30)
CFDANumber	varchar(15)
ActivityTitle	varchar(120)
Assurance	tinyint(1)
StateReviewCode	varchar(100)
StateReviewDate	date
RevisionCode1	varchar(100)
RevisionCode2	varchar(100)
RevisionOtherExplanation	varchar(45)
ApplicantID	varchar(30)
ApplicantTypeCode	varchar(100)
ApplicantTypeCodeOtherExplanation	varchar(50)
OrganizationName	varchar(120)
DUNSID	varchar(13)
DepartmentName	varchar(30)
DivisionName	varchar(30)
EmployerID	varchar(30)
Street	varchar(110)
City	varchar(35)
County	varchar(30)
StateCode	varchar(2)
ZipCode	varchar(15)
Country	varchar(3)
DelinquentFederalDebtIndicator	tinyint(1)
DelinquentFederalDebtExplanation	longtext
OrganizationCongressionalDistrict	varchar(30)
ProjectTitle	varchar(200)
Location	varchar(45)
ProposedStartDate	date
ProposedEndDate	date
ProjectCongressionalDistrict	varchar(30)
FederalEstimatedAmount	float
ApplicantEstimatedAmount	float
StateEstimatedAmount	float
LocalEstimatedAmount	float

Field Name	Data Type
OtherEstimatedAmount	float
ProgramIncomeEstimatedAmount	float
TotalEstimatedAmount	float
ApplicantNamePrefix	varchar(10)
ApplicantGivenName1	varchar(35)
ApplicantGivenName2	varchar(25)
ApplicantFamilyName	varchar(60)
ApplicantNameSuffix	varchar(10)
ApplicantTelephoneNumber	varchar(25)
ApplicantFaxNumber	varchar(25)
ApplicantEmail	varchar(80)
AORNamePrefix	varchar(10)
AORGivenName1	varchar(35)
AORGivenName2	varchar(25)
AORFamilyName	varchar(60)
AORNameSuffix	varchar(10)
AORTelephoneNumber	varchar(25)
RepresentativeTitle	varchar(45)

Table 4-11. TABLE sf424footer

Field Name	Data Type
Grants_govTrackingNumber	varchar(240)
ReceivedDateTime	datetime
SubmittedName	varchar(240)
HashValue	longtext
HashAlgorithm	varchar(100)
SchemaVersion	varchar(100)

Table 4-12. TABLE sf424d

Field Name	Data Type
Grants_govTrackingNumber	varchar(240)
FormVersionIdentifier	varchar(30)
RepresentativeName	varchar(30)
RepresentativeTitle	varchar(45)
ApplicantOrganizationName	varchar(60)
SubmittedDate	date
ProgramType	varchar(100)

Table 4-13. TABLE sf424header

Field Name	Data Type
Grants_govTrackingNumber	varchar(240)
AgencyName	varchar(60)
CFDANumber	varchar(15)
ActivityTitle	varchar(120)
OpportunityID	varchar(100)
OpportunityTitle	varchar(255)
CompetitionID	varchar(100)
OpeningDate	date
ClosingDate	date
SubmissionTitle	varchar(240)
HashValue	longtext
HashAlgorithm	varchar(100)
SchemaVersion	varchar(100)

5. Installing the Java 2 Platform, Standard Edition

1. Go to http://java.sun.com.
2. Click on the "J2SE (Core/Desktop)".
3. On the next page, click on the "J2SE 1.4.2" link.
4. On the download page, click on the "Java 2 Platform, Standard Edition version 1.4.2" link for Windows.
5. On the next page, click on SDK "Download" to the right of the "32-bit/64-bit for Windows/Linux/Solaris SPARC 32-bit for Solaris x86" field.
6. Go to the bottom of the next page and click on the "ACCEPT" radio button.
7. On the next page, click on "Windows Offline Installation, Multi-language (j2sdk-1_4_2_03-windows-i586-p.exe, 48.30 MB)".
8. Download and save the .exe file. This file will take a bit longer to download due to its size.
9. Create a *java* directory on your C:\ drive (i.e., c:\java). You can also choose a location where you normally install your Java 2 Platform software.
10. Find and execute the "*j2sdk-1_4_2_03-windows-i586-p.exe*" file that was downloaded. Install j2sdk into the directory you have created/selected in step 9. The path to your installation directory is referred to as: "[JAVA_HOME]".
11. Once the installation is complete, copy the contents of the [REFIMPL_HOME]\jwsdp\jaxp\endorsed folder, (supplied to you as part of the Reference Implementation download) to the [JAVA_HOME]\jre\lib\extfolder. This is required as the JAXP (not JAXB) classes are built into the JDK 1.4.x JRE.
12. Create an Environment variable for Java from **Control Panel→System→Advanced** with "Variable Name" of JAVA_HOME and "Variable Value" of "c:\java\j2sdk1.4.2" (i.e., the path to the folder where you installed J2SE 1.4.2). As an alternative, you can use the supplied "*jakarta-tomcat-4_1_29.bat"* file (preferable), which sets the JAVA_HOME, J2EE_HOME, and CATALINA_HOME environment variables prior to invoking Tomcat's "*startup.bat*".

6. Installing the Java 2 Platform, Enterprise Edition

1. Go to http://java.sun.com.
2. Click on "J2EE (Enterprise/Server)".
3. On the next page, Click on "Get the SDK".
4. On the next page, click on the "Download" button for the "Java 2 Platform, Enterprise Edition 1.4 SDK Developer Release".

5. Go to the bottom of the next page and click on the "ACCEPT" radio button.

6. Go to the middle of the next page and click on the "J2EE(TM) SDK 1.4 Developer Release, English (j2eesdk-1_4-dr-windows-eval.exe, 116.92 MB)" link.

7. Download and save the .zip file.

8. Find and run the "*j2eesdk-1_4-dr-windows-eval.exe*" setup executable. Install *j2eesdk* into the directory you have created/selected in step 9 of section 5. The path to your installation directory is referred to as "[J2EE_HOME]".

13. Create an Environment variable for J2EE from **Control Panel→System→Advanced** with "Variable Name" of J2EE_HOME and "Variable Value" of "C:\java\ j2eesdk1.4_beta2" (i.e., the path to the folder where you installed J2EE 1.4.2). As an alternative, use the supplied "*jakarta-tomcat-4_1_29.bat"* file (preferable), which sets the JAVA_HOME, J2EE_HOME, and CATALINA_HOME environment variables prior to invoking Tomcat's "*startup.bat*".

7. Installing Java Web Services Developer's Pack

The Reference Implementation application is based upon the reference implementation of JAXB provided in the Java Web Services Developer's Pack (JWSDP), version 1.2. Although you only need four jar files to work with JAXB, you are not able to download just these four files at this time. Normally, you would be required to download and install the entire JWSDP.

The required .jar files have been extracted and made available to you as part of the Reference Implementation download in the [REFIMPL_HOME]\lib folder. As such, installation of the JWSDP is not technically required. However, you may want to install it in order to explore some or all of the various Web Services related features provided in its API's. Sun's umbrella site for Web Services is http://java.sun.com/webservices/.

8. Installing the Tomcat Servlet Container

1. Go to "jakarta-tomcat-4.1.29.exe", and save the .exe file.

2. Find and run the jakarta-tomcat-4.1.27.exe file to create the Tomcat servlet container. Make sure the install is using the *j2sdk1.4.2* that you previously installed. When choosing install options, set the type of install to *normal*.

9. Deploying the Reference Implementation Application

In this version, the Reference Implementation application is provided in the *webSvcApps* folder, vs. being packaged in a Web Archive (WAR) file. To deploy the application, take the following steps:

1. Copy the entire *webSvcApps* folder provided as part of the Reference Implementation download to the <*tomcat*>*webapps* directory of the Tomcat Servlet Container. The application files will automatically be deployed upon the next startup of Tomcat.

2. Review *<tomcat>\webapps\webServices\WEB-INF\application.properties*, especially those that pertain to the "Client" (agency) side.

   By default, the Reference Implementation application is configured to work with the *trws.grants.gov* Grants.gov training environment in order to properly demonstrate the mutual authentication components, as well as to more realistically demonstrate the use of the *Status*, *OpportunityID*, and *CFDANumber* filters in the *GetApplicationList* Web Service.

   You can also test the Reference Implementation in a 'Standalone' mode, where both the Sending and Receiving servlets reside on the same machine (localhost), or even between two instances of the Reference Implementation by redeploying the same Reference Implementation on a second instance of Tomcat on a separate PC or laptop. In the last scenario, change the *<tomcat>\webapps\webServices\WEB-INF\application.properties* entries to point to the IP address or hostname (computer name) of the second instance. Both instances of Tomcat are required to be running for the demo to work..

10. Starting the Reference Implementation Application

To start and use the application, follow the steps below. Note that these steps must be followed each time your PC or laptop is restarted (rebooted).

1. Right click on "Start" and click on "Explore".
2. Click on C:\ drive.
3. Click on "MYSQL" directory and then the "bin" folder.
4. Double-click on "mysql-max-nt.exe". This will start the database server.
5. Double-click on the supplied "*jakarta-tomcat-4_1_29.bat"* file to startup Tomcat.

NOTE: First edit "*jakarta-tomcat-4_1_29.bat"* to ensure that the JAVA_HOME, J2EE_HOME, and CATALINA_HOME variables properly reflect your environment.

11. Configuring Tomcat and the Reference Implementation for Mutual Authentication

This section describes the steps necessary to configure Tomcat and the Reference Implementation to work with Mutual Authentication.

The following list describes various SSL related components, their function, and how they are used:

- **cacerts**: truststore containing CA root certificates, as well as the self-signed *tomcat-sv.pem* and *weblogic-sv.pem* certificates. Use as is, or import the tomcat-sv.pem and *weblogic-sv.pem* certificates into your own *cacerts* (or equivalent) truststore file.

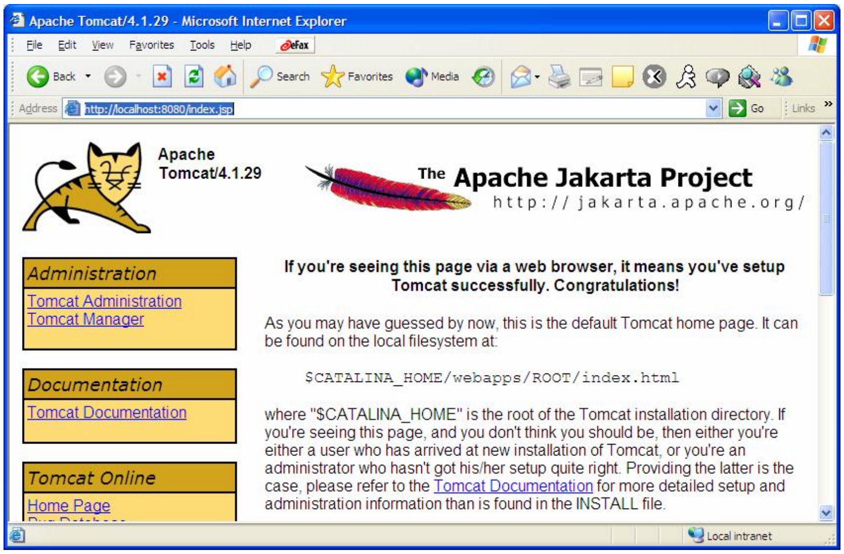
NOTE: This file is typically found in the *[JAVA_HOME]\jre\lib\security\* folder.

- **server.xml**: provided as an example of what Tomcat's server.xml file might look like once an SSL connector has been configured on Tomcat. Instructions for configuring an SSL connector on Tomcat are provided below.
- **tomcat-sv.keystore**: the JKS keystore containing tomcat's public/private keypair corresponding to the self-signed *tomcat-sv.pem* certificate. The keystore and keypair passwords have been set to "*changeit*".
- **tomcat-sv.pem**: a copy of tomcat's self-signed client/server certificate is provided as a reference. The corresponding public/private keypair is stored in the included JKS *tomcat-sv.keystore*. This certificate has already been imported into the enclosed *cacerts* truststore. If you chose to use your own truststore, you will have to import the *tomcat-sv.pem* certificate in order for it to be trusted, as this certificate is self-signed.
- **weblogic-sv-trws.pem**: a copy of the weblogic server certificate from trws.grants.gov is provided as reference. This certificate has already been imported into the enclosed *cacerts* truststore. If you chose to use your own truststore, you will have to import the *weblogic-sv.pem* certificate in order for it to be trusted, as this certificate is self-signed.

In addition to the truststore and keystore setup mentioned above, you will also need to perform the following steps in order to configure Tomcat to work with the Grants.gov training environment.

NOTE: These instructions have been tested on tomcat versions 4.1.24, 4.1.27, and 4.1.29. Other versions may differ slightly.

1. Startup Tomcat, then enter the following URL in a browser: http://localhost:8080/index.jsp. The resulting page is shown below:


Apache Tomcat/4.1.29 - Microsoft Internet Explorer
File Edit View Favorites Tools Help eFax
Back Search Favorites Media
Address http://localhost:8080/index.jsp Go Links
Apache Tomcat/4.1.29
The Apache Jakarta Project
http://jakarta.apache.org/
Administration
Tomcat Administration
Tomcat Manager
Documentation
Tomcat Documentation
Tomcat Online
Home Page
Local intranet

If you're seeing this page via a web browser, it means you've setup Tomcat successfully. Congratulations!

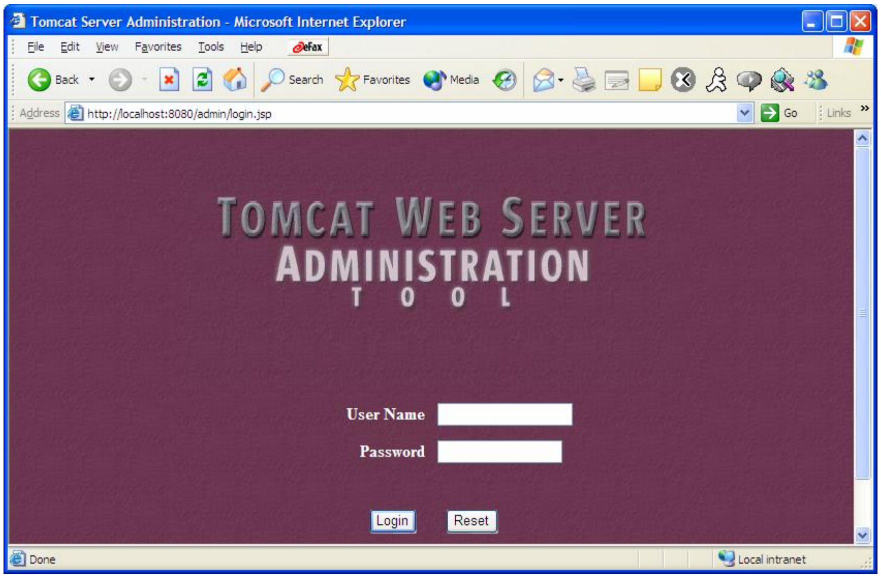
As you may have guessed by now, this is the default Tomcat home page. It can be found on the local filesystem at:

```
$CATALINA_HOME/webapps/ROOT/index.html
```

where "$CATALINA_HOME" is the root of the Tomcat installation directory. If you're seeing this page, and you don't think you should be, then either you're either a user who has arrived at new installation of Tomcat, or you're an administrator who hasn't got his/her setup quite right. Providing the latter is the case, please refer to the Tomcat Documentation for more detailed setup and administration information than is found in the INSTALL file.

Figure 11-1. Apache Tomcat Web page

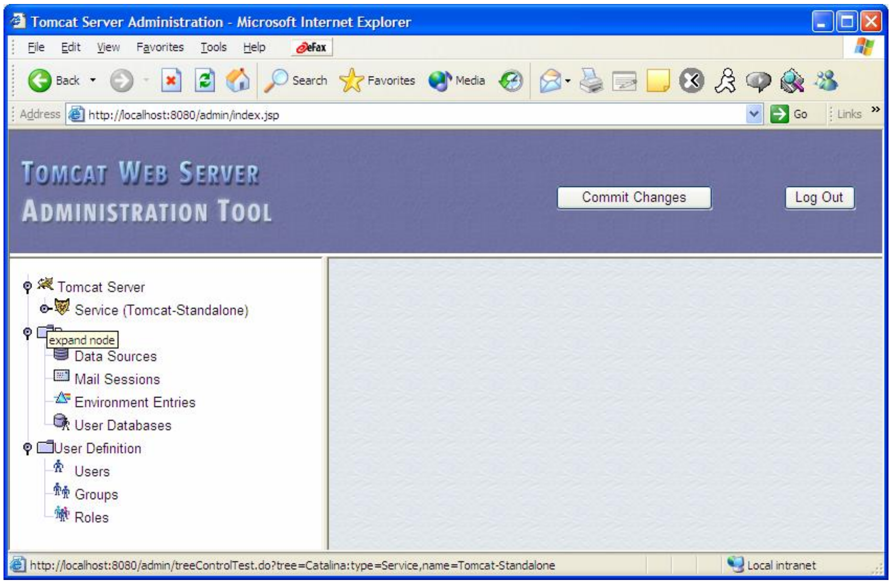
2. Click on the Tomcat Administration link on the left hand menu. The resulting page is shown below:


Tomcat Server Administration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Go Links
TOMCAT WEB SERVER
ADMINISTRATION
TOOL
User Name
Password
Login
Reset
Done
Local intranet

Address http://localhost:8080/admin/login.jsp

Figure 11-2. Tomcat Web Server Administration Tool

3. Enter the Admin *User Name* and *Password* created during the Tomcat Installation, and then click on the "*Login*" button. If you can't remember what the User Name and password are, review the [TOMCAT_HOME]\conf\ tomcat-users.xml. Use the *User Name* and *Password* that corresponds to the "admin" user. The resulting page following a successful login is shown below:

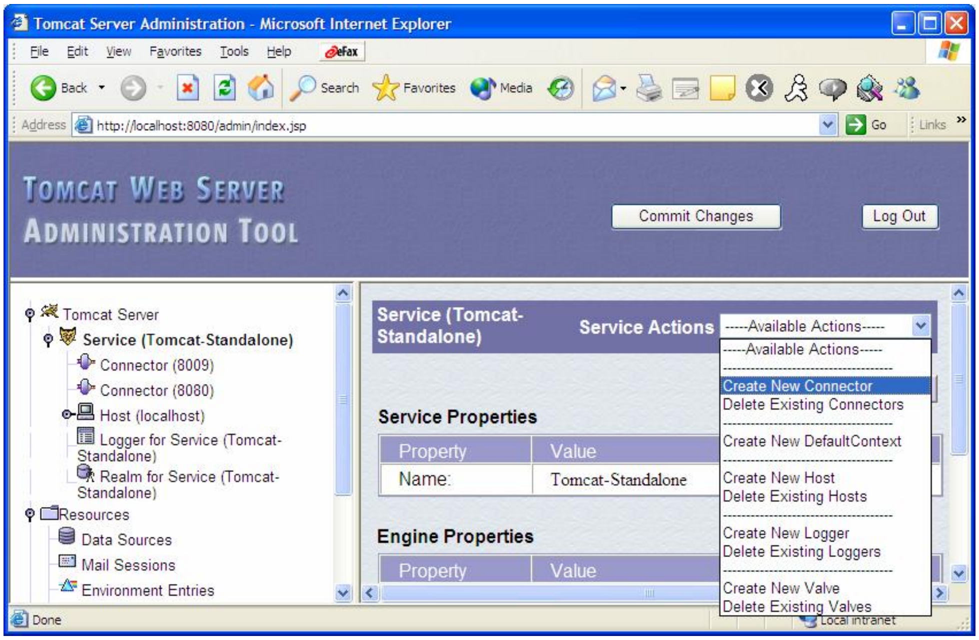


Address http://localhost:8080/admin/index.jsp

http://localhost:8080/admin/treeControlTest.do?tree=Catalina:type=Service,name=Tomcat-Standalone

Figure 11-3. Screen Displayed After Successful Login

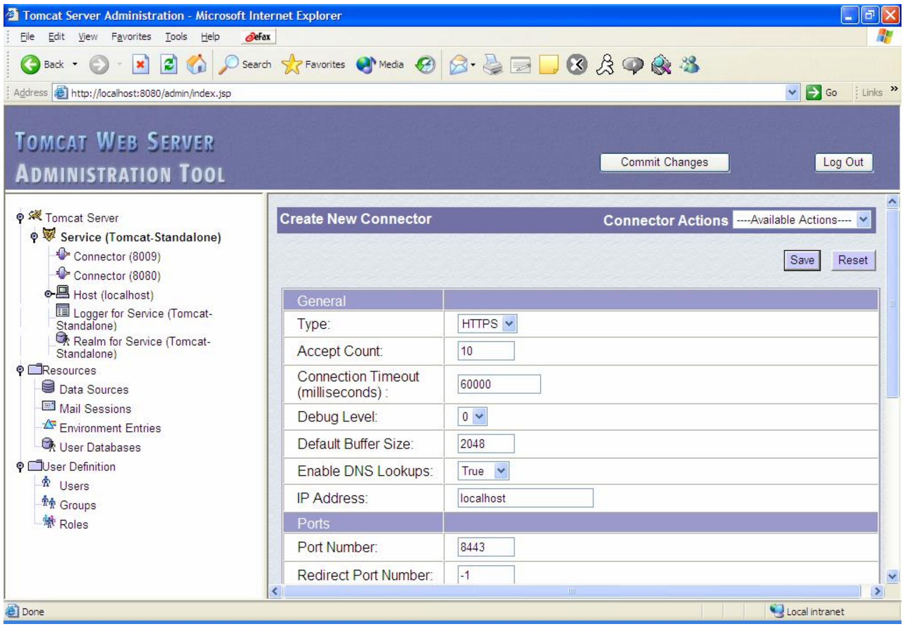
4. Expand the *Service (Tomcat-Standalone)* node, select the node itself, click on the *Service Actions* drop-down on the right-hand side, and select the '*Create New Connector*' option, as shown below:


Tomcat Server Administration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://localhost:8080/admin/index.jsp Go Links
Tomcat Web Server Administration Tool
Commit Changes
Log Out
Tomcat Server
Service (Tomcat-Standalone)
Connector (8009)
Connector (8080)
Host (localhost)
Logger for Service (Tomcat-Standalone)
Realm for Service (Tomcat-Standalone)
Resources
Data Sources
Mail Sessions
Environment Entries
Service (Tomcat-Standalone)
Service Actions
-----Available Actions-----
-----Available Actions-----
Create New Connector
Delete Existing Connectors
Create New DefaultContext
Create New Host
Delete Existing Hosts
Create New Logger
Delete Existing Loggers
Create New Valve
Delete Existing Valves
Service Properties
Engine Properties
Done
Local intranet

Property	Value
Name:	Tomcat-Standalone

Figure 11-4. Create New Connector Option Screen

5. The resulting '*Create New Connector*' page is shown below:


Tomcat Server Administration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://localhost:8080/admin/index.jsp Go Links
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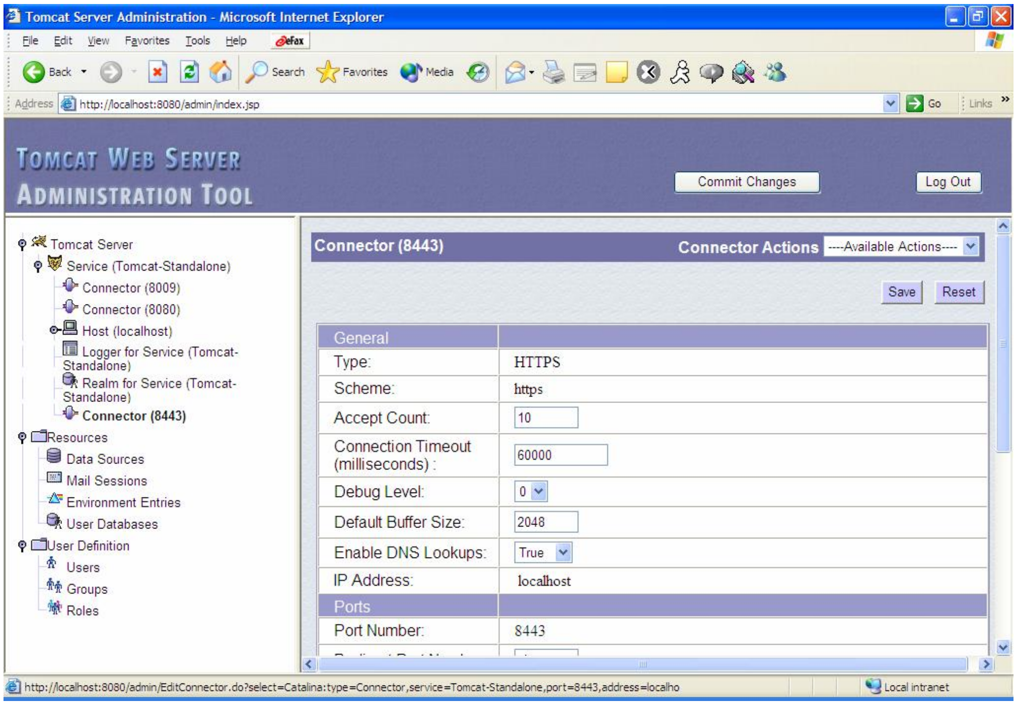
Host (localhost)
Logger for Service (Tomcat-Standalone)
Realm for Service (Tomcat-Standalone)
Resources
Data Sources
Mail Sessions
Environment Entries
User Databases
User Definition
Users
Groups
Roles
Create New Connector
Connector Actions
----Available Actions----
Save
Reset
Done
Local intranet

General	
Type:	HTTPS
Accept Count:	10
Connection Timeout (milliseconds) :	60000
Debug Level:	0
Default Buffer Size:	2048
Enable DNS Lookups:	True
IP Address:	localhost
Ports	
Port Number:	8443
Redirect Port Number:	-1

Figure 11-5. Create New Connector Screen

6. Fill in or set the following fields with the indicated values:
   - Type: **HTTPS**
   - Debug Level: **9**
   - IP Address: **localhost**
   - Port Number: **8443** ← *implies SSL will be running on port 8443 on the server*
   - Keystore Filename: ***Absolute path to the provided tomcat keystore***; i.e., C:\Documents and Settings\Dan\ tomcat-sv-keystore.jks
   - Keystore Password: **changeit**

   All the other fields can be left unchanged with their default values.
7. Click the "Save" button. If all the fields have been entered correctly, you will get a "*Save Successful!*" screen, and the SSL connector will be added to the list of configured connectors on the left hand side, as shown below:


Tomcat Server Administration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back
Search
Favorites
Media
Address http://localhost:8080/admin/index.jsp
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Tomcat Web Server
Administration Tool
Commit Changes
Log Out
Tomcat Server
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Connector (8080)
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User Databases
User Definition
Users
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Roles
Connector (8443)
Connector Actions
----Available Actions----
Save
Reset
http://localhost:8080/admin/EditConnector.do?select=Catalina:type=Connector,service=Tomcat-Standalone,port=8443,address=localho
Local intranet

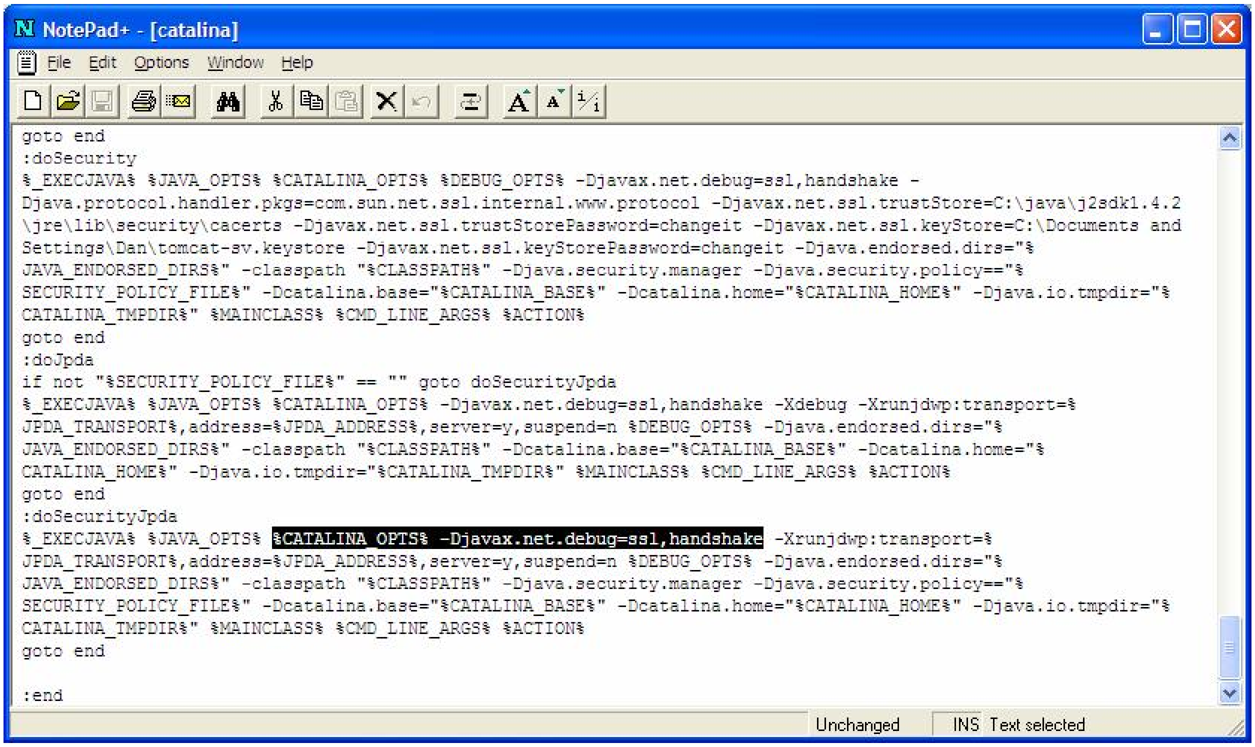
General	
Type:	HTTPS
Scheme:	https
Accept Count:	10
Connection Timeout (milliseconds) :	60000
Debug Level:	0
Default Buffer Size:	2048
Enable DNS Lookups:	True
IP Address:	localhost
Ports	
Port Number:	8443

Figure 11-6. SSL Connector Displayed on List of Configured Connectors

8. Click the "Commit Changes" button on the header section of the page. A sample of the resulting [TOMCAT_HOME]\conf*server.xml* file is included in this distribution, and the relevant portion of this file is shown below. Make sure the *keystoreFile* and *keystorePass* directives match your environment; i.e., match the absolute path to the location of the *tomcat-sv-keystore.jks*, and the password of "changeit", respectively:

```
<!-- -->
   <Connector className="org.apache.coyote.tomcat4.CoyoteConnector"
acceptCount="10" bufferSize="2048" compression="off" connectionLinger="-1"
connectionTimeout="60000" debug="9" disableUploadTimeout="true"
enableLookups="false" maxKeepAliveRequests="100" maxProcessors="20"
minProcessors="5" port="8443"
protocolHandlerClassName="org.apache.coyote.http11.Http11Protocol"
proxyPort="0" redirectPort="-1" scheme="https" secure="true"
tcpNoDelay="true" useURIValidationHack="true">
      <Factory
className="org.apache.coyote.tomcat4.CoyoteServerSocketFactory"
clientAuth="true" keystoreFile="C:\Documents and Settings\Dan\ tomcat-sv-
keystore.jks" keystorePass="changeit" keystoreType="JKS" protocol="TLS"
randomFile="C:\Documents and Settings\Dan\random.pem"
rootFile="C:\Documents and Settings\Dan\root.pem"/>
   </Connector>
<!-- -->
```

9. Review the [TOMCAT_HOME]*\bin\catalina.bat* (or equivalent) script file used to startup tomcat in order to verify that certain SSL debug command-line options have been set.



```
goto end
:doSecurity
%_EXECJAVA% %JAVA_OPTS% %CATALINA_OPTS% %DEBUG_OPTS% -Djavax.net.debug=ssl,handshake -
Djava.protocol.handler.pkgs=com.sun.net.ssl.internal.www.protocol -Djavax.net.ssl.trustStore=C:\java\j2sdk1.4.2
\jre\lib\security\cacerts -Djavax.net.ssl.trustStorePassword=changeit -Djavax.net.ssl.keyStore=C:\Documents and
Settings\Dan\tomcat-sv.keystore -Djavax.net.ssl.keyStorePassword=changeit -Djava.endorsed.dirs="%
JAVA_ENDORSED_DIRS%" -classpath "%CLASSPATH%" -Djava.security.manager -Djava.security.policy=="%
SECURITY_POLICY_FILE%" -Dcatalina.base="%CATALINA_BASE%" -Dcatalina.home="%CATALINA_HOME%" -Djava.io.tmpdir="%
CATALINA_TMPDIR%" %MAINCLASS% %CMD_LINE_ARGS% %ACTION%
goto end
:doJpda
if not "%SECURITY_POLICY_FILE%" == "" goto doSecurityJpda
%_EXECJAVA% %JAVA_OPTS% %CATALINA_OPTS% -Djavax.net.debug=ssl,handshake -Xdebug -Xrunjdwp:transport=%
JPDA_TRANSPORT%,address=%JPDA_ADDRESS%,server=y,suspend=n %DEBUG_OPTS% -Djava.endorsed.dirs="%
JAVA_ENDORSED_DIRS%" -classpath "%CLASSPATH%" -Dcatalina.base="%CATALINA_BASE%" -Dcatalina.home="%
CATALINA_HOME%" -Djava.io.tmpdir="%CATALINA_TMPDIR%" %MAINCLASS% %CMD_LINE_ARGS% %ACTION%
goto end
:doSecurityJpda
%_EXECJAVA% %JAVA_OPTS% %CATALINA_OPTS% -Djavax.net.debug=ssl,handshake -Xrunjdwp:transport=%
JPDA_TRANSPORT%,address=%JPDA_ADDRESS%,server=y,suspend=n %DEBUG_OPTS% -Djava.endorsed.dirs="%
JAVA_ENDORSED_DIRS%" -classpath "%CLASSPATH%" -Djava.security.manager -Djava.security.policy=="%
SECURITY_POLICY_FILE%" -Dcatalina.base="%CATALINA_BASE%" -Dcatalina.home="%CATALINA_HOME%" -Djava.io.tmpdir="%
CATALINA_TMPDIR%" %MAINCLASS% %CMD_LINE_ARGS% %ACTION%
goto end

:end
```

Figure 11-7. Tomcat Home Script File

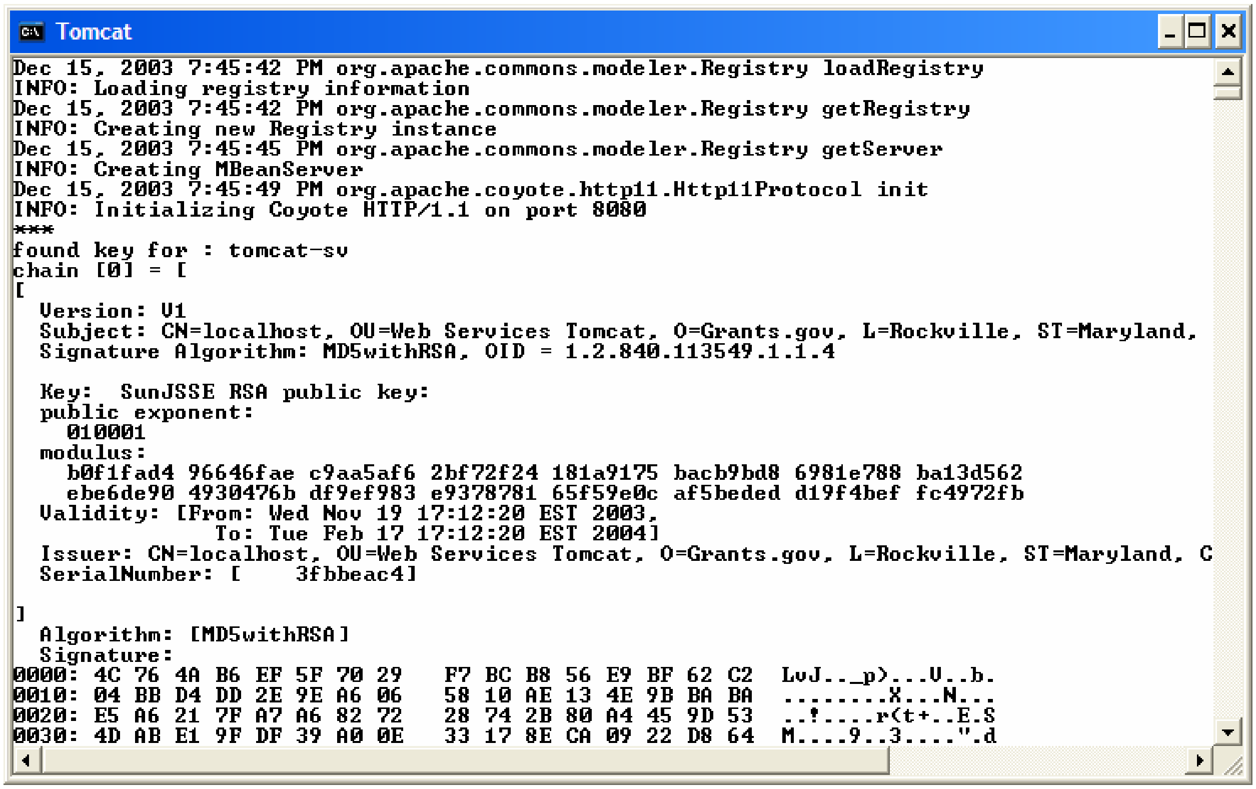
10. Modify some of the client-side properties found in *application.properties* file located in [TOMCAT_HOME]\webapps\webSvcApps\WEB-INF\ folder to properly configure the JSSE properties needed to get mutual authentication to work. Note that the properties point to the provided *tomcat-sv-keystore.jks* and *cacerts* files. The relevant section from the *application.properties* file is shown below:

    ```
    // used to configure tomcat for mutual authentication; make sure to
    escape "\" character

    javax.net.ssl.keyStore=C:\\Documents and Settings\\Dan\\ tomcat-sv-
    keystore.jks
    javax.net.ssl.keyStorePassword=changeit
    javax.net.ssl.trustStore=C:\\java\\j2sdk1.4.2\\jre\\lib\\security\\cacert
    s
    javax.net.ssl.trustStorePassword=changeit
    ```

    The remaining *application.properties* have been preconfigured to work with the Grants.gov training environment, and should not need to be changed.

11. Start up tomcat. Depending on which version of tomcat you have, and whether you have configured tomcat to display debug SSL messages, you should see something similar to the following displayed in your tomcat console window:



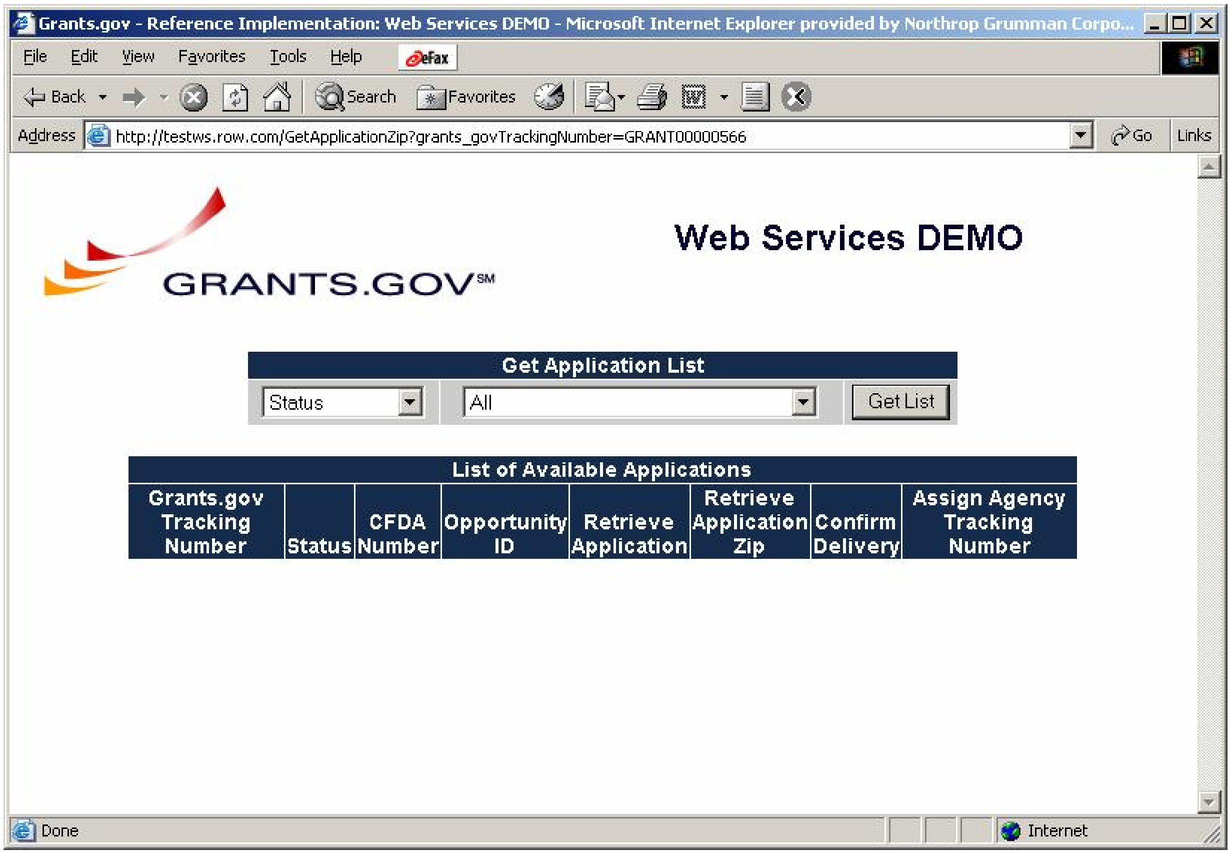
```
Dec 15, 2003 7:45:42 PM org.apache.commons.modeler.Registry loadRegistry
INFO: Loading registry information
Dec 15, 2003 7:45:42 PM org.apache.commons.modeler.Registry getRegistry
INFO: Creating new Registry instance
Dec 15, 2003 7:45:45 PM org.apache.commons.modeler.Registry getServer
INFO: Creating MBeanServer
Dec 15, 2003 7:45:49 PM org.apache.coyote.http11.Http11Protocol init
INFO: Initializing Coyote HTTP/1.1 on port 8080
***
found key for : tomcat-sv
chain [0] = [
[
  Version: V1
  Subject: CN=localhost, OU=Web Services Tomcat, O=Grants.gov, L=Rockville, ST=Maryland,
  Signature Algorithm: MD5withRSA, OID = 1.2.840.113549.1.1.4

  Key:  SunJSSE RSA public key:
  public exponent:
    010001
  modulus:
    b0f1fad4 96646fae c9aa5af6 2bf72f24 181a9175 bacb9bd8 6981e788 ba13d562
    ebe6de90 4930476b df9ef983 e9378781 65f59e0c af5beded d19f4bef fc4972fb
  Validity: [From: Wed Nov 19 17:12:20 EST 2003,
               To: Tue Feb 17 17:12:20 EST 2004]
  Issuer: CN=localhost, OU=Web Services Tomcat, O=Grants.gov, L=Rockville, ST=Maryland, C
  SerialNumber: [    3fbbeac4]

]
  Algorithm: [MD5withRSA]
  Signature:
0000: 4C 76 4A B6 EF 5F 70 29   F7 BC B8 56 E9 BF 62 C2  LvJ.._p)...V..b.
0010: 04 BB D4 DD 2E 9E A6 06   58 10 AE 13 4E 9B BA BA  ........X...N...
0020: E5 A6 21 7F A7 A6 82 72   28 74 2B 80 A4 45 9D 53  ..!....r(t+..E.S
0030: 4D AB E1 9F DF 39 A0 0E   33 17 8E CA 09 22 D8 64  M....9..3....".d
```

Figure 11-8. Tomcat Console Window

12. Open up a browser window. Type in: http://localhost:8080/webSvcApps/WebServices. If all the components have been properly installed, you should see the following:



Grants.gov - Reference Implementation: Web Services DEMO - Microsoft Internet Explorer provided by Northrop Grumman Corpo...
File Edit View Favorites Tools Help
Back Search Favorites
Go Links
Web Services DEMO
GRANTS.GOV℠
Get Application List
Get List
Done
Internet

Address: http://testws.row.com/GetApplicationZip?grants_govTrackingNumber=GRANT00000566

Status: Status

All

List of Available Applications

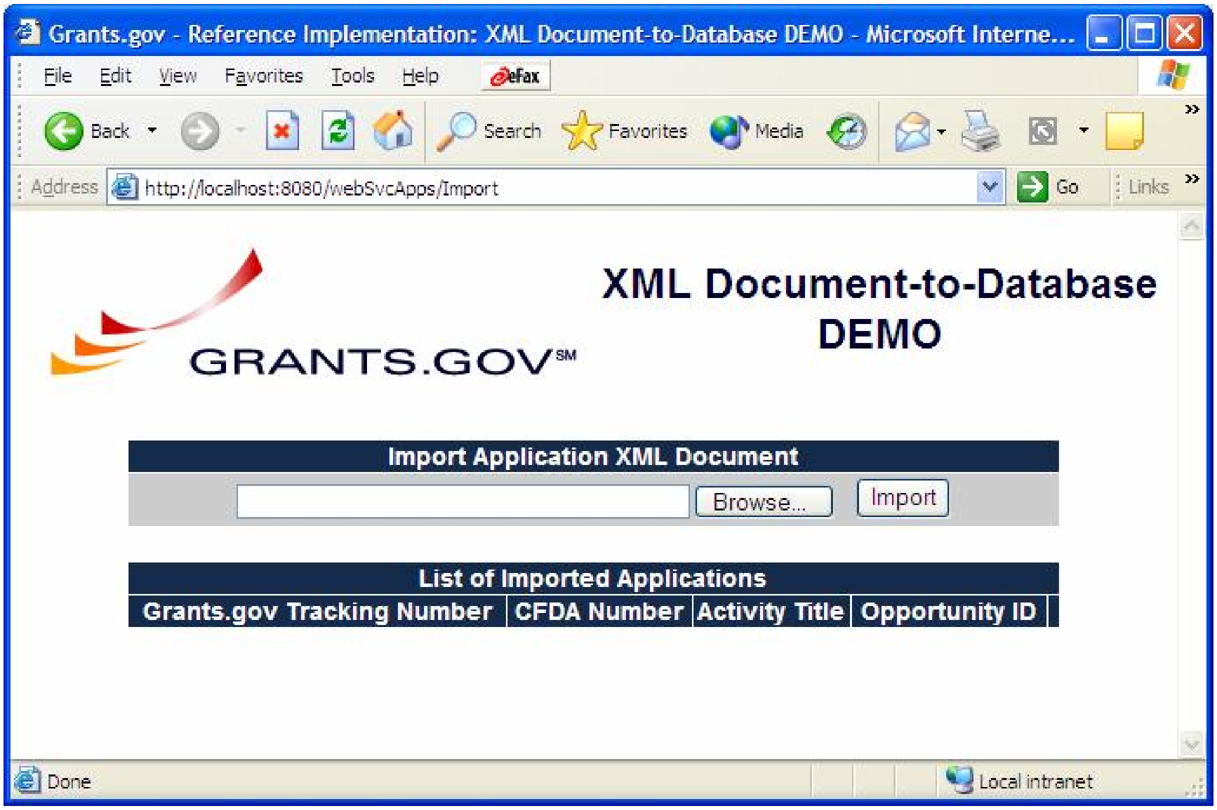
Grants.gov Tracking Number	Status	CFDA Number	Opportunity ID	Retrieve Application	Retrieve Application Zip	Confirm Delivery	Assign Agency Tracking Number

Figure 11-9. Web Service Demo Screen

At this point, you can try some of the Web Service functions described in section 13 Running the “Web Services” Portion of the Reference Implementation Application.

12. Running the “XML Document-to-Database” Portion of the Reference Implementation Application

1. Open a web browser and enter “http://localhost:8080/webSvcApps/Import”. The address is case sensitive. This should bring up the XML Document-to-Database “Import” screen, as shown below:



http://localhost:8080/webSvcApps/Import

XML Document-to-Database DEMO

Import Application XML Document

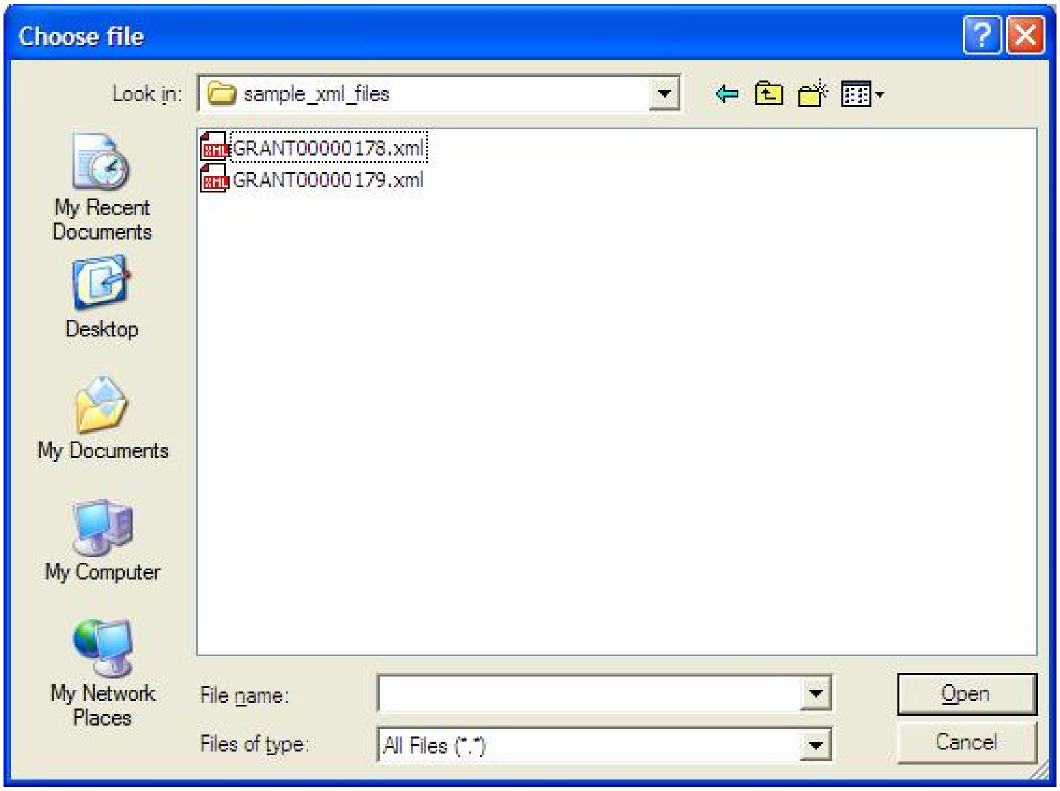
List of Imported Applications

Grants.gov Tracking Number	CFDA Number	Activity Title	Opportunity ID

Figure 12-1. XML Document-to-Database “Import” screen

2. To Import and View some of the details of an XML Document:

   - Click on the “Browse” button, and then navigate to the “REFIMPL_HOME\ sample_xml_files” folder provided as part of the Reference Implementation download. Your screen should look similar to the following:



Choose file

Look in: sample_xml_files

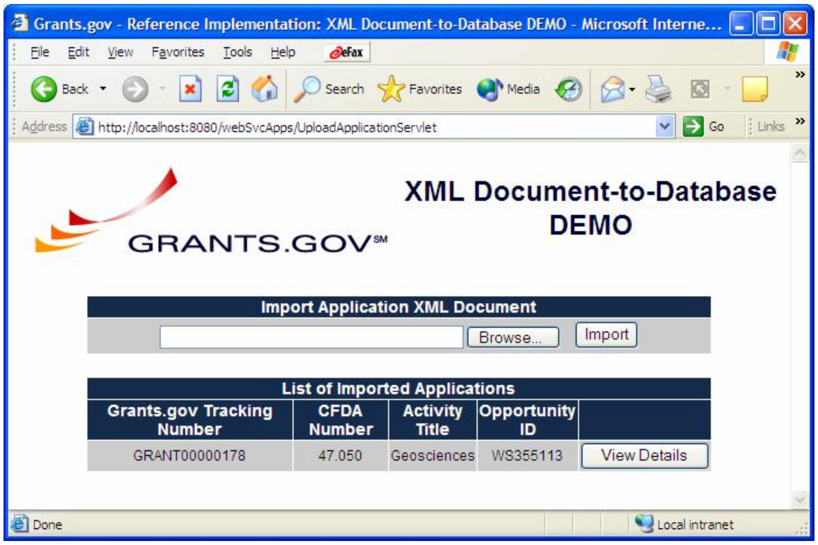
GRANT00000178.xml
GRANT00000179.xml

File name:

Files of type: All Files (*.*)

Figure 12-2. Import and View Details of an XML Document

- Select one of the XML Documents that have been provided, and then click on “Open”.
- Once the “browse” window closes, the original “Import” screen will be redisplayed with the path to the selected XML document inserted in the field next to the “Browse” button. Click on the “Import” button. The application will now import the XML Document into the database, then refresh to the same Demo screen. A new row for the imported XML Document should now be visible in the “List of Imported Applications” on the same page, as shown below. Repeat the process for any other XML documents you may wish to import.


Grants.gov - Reference Implementation: XML Document-to-Database DEMO - Microsoft Interne...
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://localhost:8080/webSvcApps/UploadApplicationServlet
Go Links
GRANTS.GOV℠
Browse...
Import
View Details
Done
Local intranet

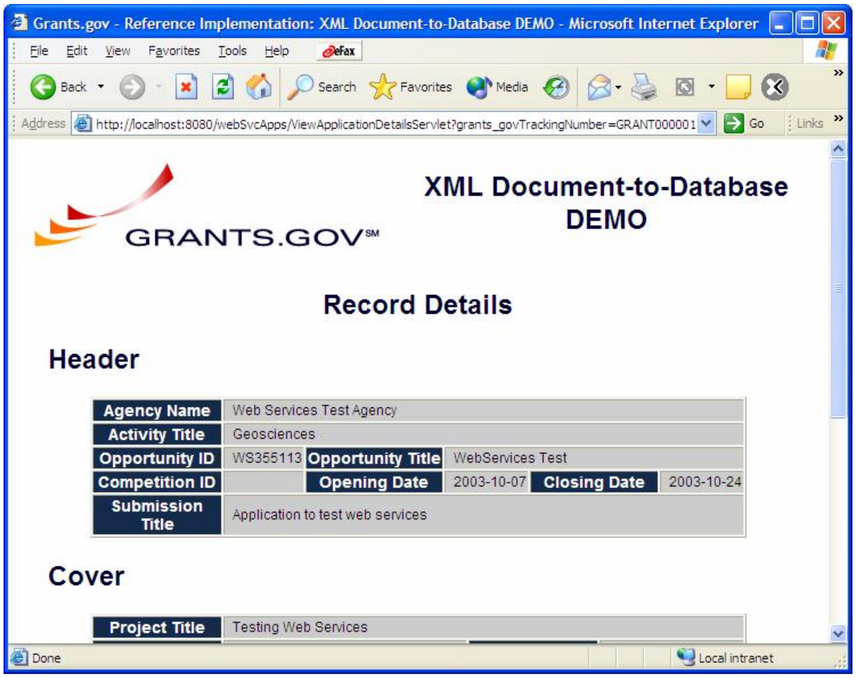
XML Document-to-Database DEMO

Import Application XML Document

List of Imported Applications				
Grants.gov Tracking Number	CFDA Number	Activity Title	Opportunity ID	
GRANT00000178	47.050	Geosciences	WS355113	View Details

Figure 12-3. Select one of the XML Documents

- To view some of the details of the document, click on the "View Details" button, which will direct you to a "View Details" screen similar to the one below. The details displayed on this screen have been retrieved from the database.


Grants.gov - Reference Implementation: XML Document-to-Database DEMO - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://localhost:8080/webSvcApps/ViewApplicationDetailsServlet?grants_govTrackingNumber=GRANT000001
Go Links
GRANTS.GOV℠
Done
Local intranet

XML Document-to-Database DEMO

Record Details

Header

Agency Name	Web Services Test Agency				
Activity Title	Geosciences				
Opportunity ID	WS355113	Opportunity Title	WebServices Test		
Competition ID		Opening Date	2003-10-07	Closing Date	2003-10-24
Submission Title	Application to test web services				

Cover

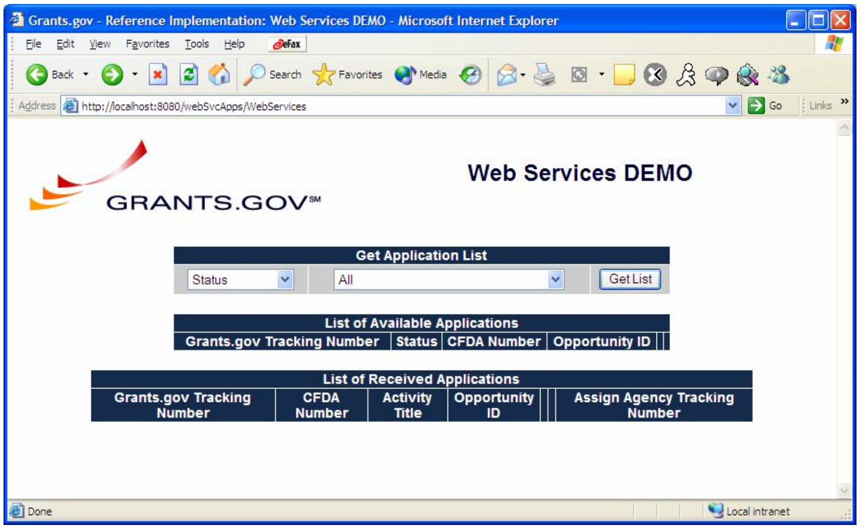
Project Title	Testing Web Services

Figure 12-4. View Details of the Document

- At this point, you can get back to the original "Import" screen by clicking on the "Return to List" link at the bottom of the View Details screen.

13. Running the “Web Services” Portion of the Reference Implementation Application

1. Open a web browser and enter http://localhost:8080/webSvcApps/WebServices. This should bring up the Web Services Demo screen, as shown below:



Grants.gov - Reference Implementation: Web Services DEMO - Microsoft Internet Explorer

Address: http://localhost:8080/webSvcApps/WebServices

Web Services DEMO

Get Application List		
Status	All	Get List

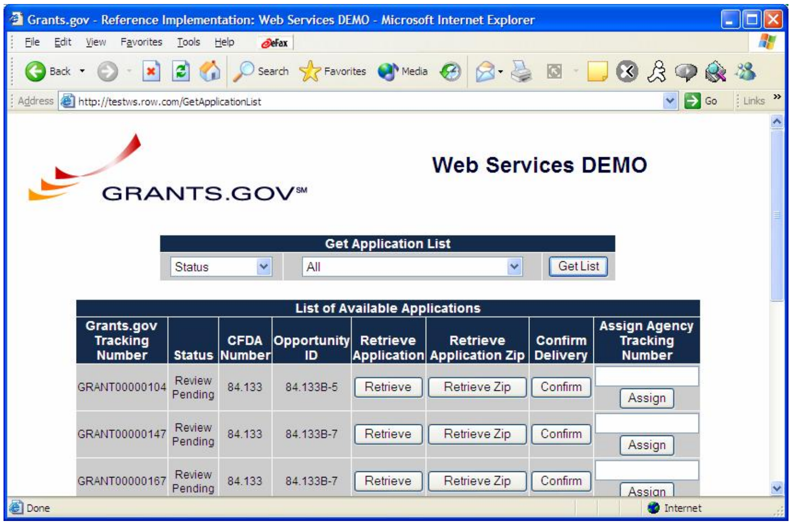
List of Available Applications				
Grants.gov Tracking Number	Status	CFDA Number	Opportunity ID	

List of Received Applications					
Grants.gov Tracking Number	CFDA Number	Activity Title	Opportunity ID		Assign Agency Tracking Number

Figure 13-1. Web Services Demo Screen

2. To get a list of the XML documents available for retrieval via the provided Web Service servlets:

   - Click on the “Get List” button. This will internally invoke the *GetApplicationList* Web Service, and the list of available applications on the Grants.gov training environment will be returned, as shown below:



Grants.gov - Reference Implementation: Web Services DEMO - Microsoft Internet Explorer

Address: http://testws.row.com/GetApplicationList

Web Services DEMO

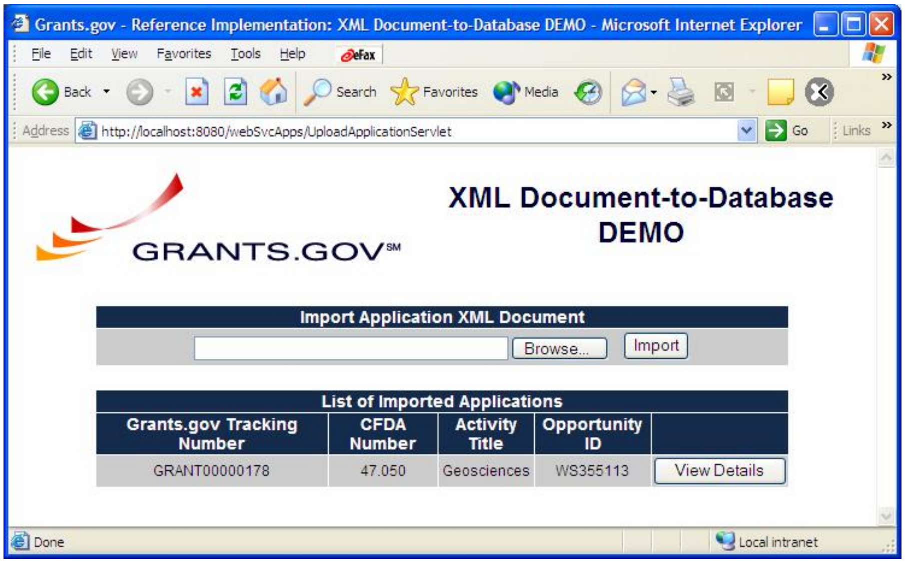
Get Application List		
Status	All	Get List

List of Available Applications							
Grants.gov Tracking Number	Status	CFDA Number	Opportunity ID	Retrieve Application	Retrieve Application Zip	Confirm Delivery	Assign Agency Tracking Number
GRANT00000104	Review Pending	84.133	84.133B-5	Retrieve	Retrieve Zip	Confirm	Assign
GRANT00000147	Review Pending	84.133	84.133B-7	Retrieve	Retrieve Zip	Confirm	Assign
GRANT00000167	Review Pending	84.133	84.133B-7	Retrieve	Retrieve Zip	Confirm	Assign

Figure 13-2. List of Available Applications

3. To retrieve a specific application via the *GetApplication* Web Service, Click "*Retrieve" *for one of the applications for which the status is "*Validated"*. Doing so will invoke the *GetApplication* Web Service, with the appropriate Grants.gov Tracking number. The application will now retrieve the XML Document via the *GetApplication* Web Service and import it into the MySQL database (provided that the *insertIntoMySQLDatabase* property in the *\WEB-INF\application.properties* file is set to "true"), then refresh to the same Demo screen.

   A new row for the imported XML Document should now be visible in the "List of Received Applications" on the same page, as shown below:


Grants.gov - Reference Implementation: XML Document-to-Database DEMO - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address
Go
Links
GRANTS.GOV℠
Browse...
Import
Done
Local intranet

Address: http://localhost:8080/webSvcApps/UploadApplicationServlet

XML Document-to-Database DEMO

Import Application XML Document

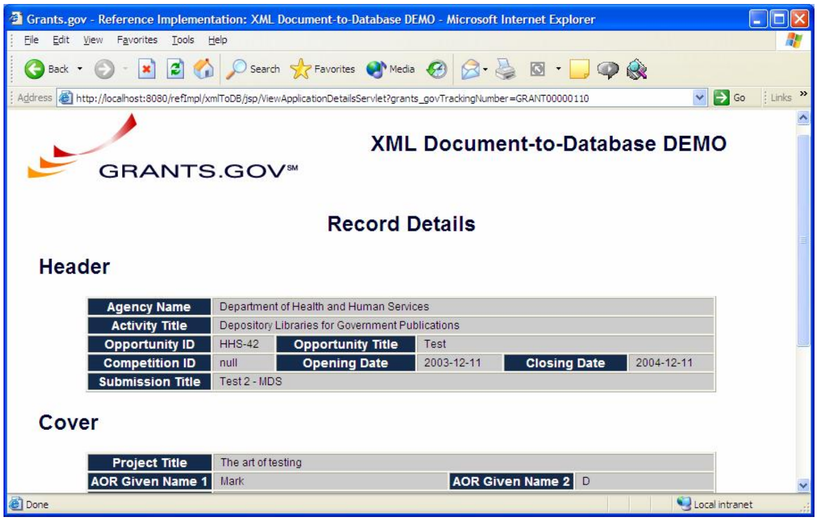
List of Imported Applications

Grants.gov Tracking Number	CFDA Number	Activity Title	Opportunity ID	
GRANT00000178	47.050	Geosciences	WS355113	View Details

Figure 13-3. List of Received Applications

Once you retrieve a specific application, the *List of Available Applications* is cleared. This is intentional, and not a bug. The Reference Implementation does not employ sessions or other persistence mechanisms to store the information returned by the *GetApplicationList* Web Service. To retrieve additional applications, click on "*GetList"* button again to refresh the *List of Available Applications*. Click on the appropriate "*Retrieve"* button for any other XML documents you may wish to receive and import.

To view some of the details of the document, click on the "View Details" button, which will direct you to a "View Details" screen similar to the one below. The details displayed on this screen have been retrieved from the database.



Grants.gov - Reference Implementation: XML Document-to-Database DEMO - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address
Go Links
GRANTS.GOV℠
Done
Local intranet

http://localhost:8080/refImpl/xmlToDB/jsp/ViewApplicationDetailsServlet?grants_govTrackingNumber=GRANT00000110

XML Document-to-Database DEMO

Record Details

Header

Agency Name	Department of Health and Human Services				
Activity Title	Depository Libraries for Government Publications				
Opportunity ID	HHS-42	Opportunity Title	Test		
Competition ID	null	Opening Date	2003-12-11	Closing Date	2004-12-11
Submission Title	Test 2 - MDS				

Cover

Project Title	The art of testing		
AOR Given Name 1	Mark	AOR Given Name 2	D

Figure 13-4. View Details of the Document

At this point, you can get back to the original “Demo” screen by clicking on the “Return to List” link at the bottom of the View Details screen.

If you want to rerun the demo, you can delete the contents of the MySQL Database tables by executing the *[REFIMPL_HOME]\db\install.bat* script. This will drop all the tables in the database and recreate them, effectively deleting the data as well. You can demo the remaining *GetApplicationZip*, *AssignAgencyTrackingNumber*, and *ConfirmApplicationDelivery* Web Services functions in a similar manner.

14. Reviewing SOAP Request and Response Messages

Request and response SOAP messages for any of the Web Services functions are written to the file system for review purposes. Attachments also get written out to the file system within the same folder. These files are typically found in the directory from which Tomcat was started, such as [TOMCAT_HOME]\bin\. If you startup Tomcat from the **Start → Programs → Apache Tomcat 4.1** menu, the files may be written to c:\WINDOWS\SYSTEM32. At other times, you may have to search for the location of these files.

The filename follows the pattern {function name}RequestMessage.txt | ResponseMessage.txt; i.e., *GetApplicationListRequestMessage.txt* or *GetApplicationListResponseMessage.txt*.

15. Reviewing Debug Messages

Any Reference Implementation related debug messages are written to [TOMCAT_HOME]\logs\ ws_debug.log. If you have a UNIX emulator installed such as *cygwin*, you can *tail* the log and watch the debug text scroll by as a Web Service function gets executed. Otherwise, you might have to execute a Web Service function and then review the resulting debug messages by opening the *ws_debug.log* file in *notepad* or some other text editor.

16. Acronyms List

Table 16-1. Acronyms and Definitions

Acronym	Description
API	Application Programming Interface
CA	Certificate Authority
CFDA	Catalog of Federal Domestic Assistance
JDK	Java Development Kit
J2EE	Java 2 platform, Enterprise Edition. A Java platform designed for the intensive computing needs in large enterprises.
J2SE	Java 2 platform, Standard Edition
JAXB	Java Architecture for XML Binding
JAXM	Java API for XML Messaging
JAXP	Java API for XML Parsing
JDK	Java Development Kit
JSP	Java Server Pages
JWSDP	Java Web Services Developer Pack
SAAJ	SOAP with Attachments API for Java
SOAP	Simple Object Access Protocol
SSL	Secure Socket Layer
XML	eXtensible Markup Language