

# AHE Server Installation and Configuration Guide

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# 1: AHE Server's X.509 certificate

## 1.1 AHE Server's X.509 host certificate

- 1.1.1 If your AHE host certificate is in p12 format then
  - 1.1.1.1 get the private key in PEM format from the .p12 certificate  
openssl pkcs12 -in hostcert.p12 -nocerts -out hostkey.pem
  - 1.1.1.2 take the encryption off the PEM format private key  
openssl rsa -in hostkey.pem -out hostunencryptedkey.pem
  - 1.1.1.3 get the public certificate in PEM format from the .p12 certificate  
openssl pkcs12 -in hostcert.p12 -nokeys -out hostcert.pem

The above certificate operations are listed at:

<http://kato.mvc.mcc.ac.uk/rss-wiki/HowTos/CertificateOperations>

The UK e-Science authority issues server/host certificates which are in p12 format.

## 1.2 AHE Server's public certificate location

- 1.2.1 Note the location of hostcert.pem. In Apache's httpd.conf (Section 2.2.1 and 10.2.1), set the location of the host certificate with the directive:

```
SSLCertificateFile /home/ahe-server/certificates/hostcert.pem
```

## 1.3 AHE Server's private key location

- 1.3.1 Note the location of hostunencryptedkey.pem. In Apache's httpd.conf (Section 2.2.1 and 10.2.1), set the location of the host key with the directive:

```
SSLCertificateKeyFile /home/ahe-server/certificates/hostunencryptedkey.pem
```

Please note that this is the path to the *unencrypted* key. This is not passphrase protected as the AHE server needs to make web service requests without prompting the AHE server account owner for the private key passphrase.

## 1.4 CA's certificate location

- 1.4.1 Download the Certificate Authority (CA)'s certificate in .pem format and save it as cacert.pem. The UK e-Science CA's certificate is available from <https://ca.grid-support.ac.uk>.
- 1.4.2 In Apache's httpd.conf (Section 2.2.1 and 10.2.1), set the location of the CA's certificate with the following directives:

```
SSLCertificateChainFile /home/ahe-server/certificates/cacert.pem  
SSLCACertificateFile /home/ahe-server/certificates/cacert.pem
```

## 1.5 CA's certificate revocation file location

- 1.5.1 Download the Certificate Authority (CA)'s certificate revocation file in .pem format and save it as cacrl.pem. The UK e-Science CA's certificate is available from <https://ca.grid-support.ac.uk>.

1.5.2 In Apache's httpd.conf (Section 2.2.1 and 10.2.1), set the location of the CA's certificate revocation file with the following directives:

```
SSLCARevocationFile /home/ahe-server/certificates/cacrl.pem
```

## 2: Install the AHE server

NOTE: In all the installation procedures in this document, we assume that:

1. \$AHE\_LOCATION is the location of the AHE installation.
2. \$AHE\_USER is the login account in which the ahe server will be installed and run from.
3. \$AHE\_USER\_HOME is \$AHE\_USER's home directory.

For example, if there is an account ahe-server, with the home directory at /home/ahe-server, then

```
$AHE_USER=ahe-server
$AHE_USER_HOME=/home/ahe-server
$AHE_LOCATION =/home/ahe-server/ahe-1.0.0
```

### 2.1 Download and Install the AHE server

#### 2.1.1 Pre-Requisites-

- 2.1.1.1 PostgreSQL (See Section 6)
- 2.1.1.2 Perl (See Section 7)
- 2.1.1.3 WSRF::Lite (See Section 9)
- 2.1.1.4 Apache (See Section 10)

In order to install and run the AHE server, the components listed above are required.

- 2.1.2 In order to run applications on grid resources via the AHE, the GridSAM service needs to be installed and running (See Section 8).

- 2.1.3 Download the source code tar-ball, aheserver-1.0.0.tgz from <http://www.realitygrid.org/AHE/index.shtml> and save it in

- 2.1.4 `tar -zxvf aheserver-1.0.0.tar.gz`
- 2.1.5 `cd $AHE_LOCATION`
- 2.1.6 Modify \$AHE\_LOCATION/config/httpd.conf based on local settings as described in Section 2.2.1
- 2.1.7 `cp $AHE_LOCATION/config/httpd.conf $AHE_USER_HOME/apache/httpd.conf`
- 2.1.8 Modify \$AHE\_LOCATION /config/envvars according to local settings as described in Section 2.2.3

### 2.2 Configure the AHE server

#### 2.2.1 httpd.conf – Apache's configuration file

- 2.2.1.1 The directives in \$AHE\_LOCATION/apache/httpd.conf that require change/configuration according to your local settings are listed below. The configurable values are italicized –

```
*-----$AHE_LOCATION/config/httpd.conf-----*
ServerRoot      "/home/ahe-server/apache"
#---other directives---#
<IfModule !mpm_winnt_module>
<IfModule !mpm_netware_module>
    User ahe-server
    Group ahe
</IfModule>
</IfModule>
#---other directives---#
SSLSessionCache    shmcb:/home/ahe-server/apache/logs/ssl_scache(512000)
```

```

#---other directives---#
SSLMutex file:/home/ahe-server/apache/logs/ssl_mutex
#---other directives---#
DavLockDB "/home/ahe-server/apache/var/DavLock"
#---other directives---#
Listen 8000
Listen 8443
<VirtualHost _default_:8000>
ServerAdmin xyz@ucl.ac.uk
ServerName hostname:8000
DocumentRoot "/home/ahe-server/apache/htdocs"
ErrorLog /home/ahe-server/apache/logs/error_log
TransferLog /home/ahe-server/apache/logs/access_log

Alias /filestage "/home/ahe-server/apache/filestage"
<Directory "/home/ahe-server/apache/filestage">
    Dav On
    <Limit HEAD GET POST OPTIONS PROPFIND MKCOL PUT DELETE LOCK
UNLOCK COPY MOVE PROPPATCH>
        Allow from all
        AuthType Basic
        AuthName "AHE File Staging Area"
        AuthUserFile /home/ahe-server/apache/user.passwd
        Require valid-user
    </Limit>
    Options Indexes
</Directory>

</VirtualHost>

<VirtualHost _default_:8443>
# General setup for the virtual host
DocumentRoot "/home/ahe-server/apache/htdocs"
ServerName hostname:8443
ServerAdmin xyz@ucl.ac.uk
ErrorLog /home/ahe-server/apache/logs/ssl_error_log
TransferLog /home/ahe-server/apache/logs/ssl_access_log

SSLEngine on
SSLCipherSuite
ALL:!ADH:!EXPORT56:RC4+RSA:+HIGH:+MEDIUM:+LOW:+SSLv2:+EXP:+e
NULL
SSLCertificateFile /home/ahe-server/certs/chemd-hostcert.pem
SSLCertificateKeyFile /home/ahe-server/certs/chemd-hostkey.pem
SSLCertificateChainFile /home/ahe-server/certs/cacert.pem
SSLCACertificateFile /home/ahe-server/certs/cacert.pem
SSLCARevocationFile /home/ahe-server/certs/cacrl.pem
SSLVerifyClient require
SSLVerifyDepth 3
#---uncomment the following to set-up Access Control based on X.509 Certificates--#
#<Location />
#SSLRequire ( %{SSL_CIPHER} !~ m/^(EXPINULL)/ \
#    and %{SSL_CLIENT_S_DN_O} eq "Snake Oil, Ltd." \
#    and %{SSL_CLIENT_S_DN_OU} in {"Staff", "CA", "Dev"} \
#    and %{TIME_WDAY} >= 1 and %{TIME_WDAY} <= 5 \
#    and %{TIME_HOUR} >= 8 and %{TIME_HOUR} <= 20    ) \
#    or %{REMOTE_ADDR} =~ m/^192\.76\.162\.[0-9]+\$/
#</Location>

#---other directives---#
CustomLog /home/ahe-server/apache/logs/ssl_request_log \
    "%t %h %{SSL_PROTOCOL}x %{SSL_CIPHER}x \"%r\" %b"

```

```
ScriptAlias /ahe/ "/home/ahe-server/ahe-1.0.0/cgi-bin/"
```

```
<Directory "/home/ahe-server/ahe-1.0.0/cgi-bin/">  
    SSLOptions +StdEnvVars  
    AllowOverride None  
    Options None  
    Order allow,deny  
    Allow from all  
</Directory>
```

```
Include /home/ahe-server/ahe-1.0.0/config/envvars
```

```
*-----*
```

2.2.1.2 Note that httpd.conf has an include directive for the file \$AHE\_LOCATION/config/envvars described below.

2.2.1.3 As mentioned in Section 2.1.7 above, copy \$AHE\_LOCATION/conf/httpd.conf to \$AHE\_USER\_HOME/apache/httpd.conf

## 2.2.2 cgi-bin scripts

2.2.2.1 All the AHE server's web services have a corresponding cgi-bin script in \$AHE\_LOCATION/cgi-bin

2.2.2.2 The path to AHE's cgi-bin directory needs to be set in Apache's httpd.conf with the directive as described in Section 2.2.1

```
ScriptAlias /ahe/ "/home/ahe-server/ahe-1.0.0/cgi-bin/"
```

```
<Directory "/home/ahe-server/ahe-1.0.0/cgi-bin/">  
    SSLOptions +StdEnvVars  
    AllowOverride None  
    Options None  
    Order allow,deny  
    Allow from all  
</Directory>
```

In the above example, its assumed that \$AHE\_LOCATION=/home/ahe-server/ahe-1.0.0

## 2.2.3 envvars

2.2.3.1 There is an include directive in the sample Apache-AHE configuration file \$AHE\_LOCATION/config/httpd.conf for the file \$AHE\_LOCATION/config/envvars.

```
Include /home/ahe-server/ahe-1.0.0/config/envvars
```

\$AHE\_LOCATION/config/envvars contains setenv directives for the environment variables required by the perl WS-Resources. Note in the example below, we assume that \$AHE\_LOCATION =/home/ahe-server/ahe-1.0.0.

```
SetEnv HTTPS_CA_FILE /home/ahe-server/certs/cacert.pem  
SetEnv HTTPS_CERT_FILE /home/ahe-server/certs/hostcert.pem  
SetEnv HTTPS_KEY_FILE /home/ahe-server/certs/hostunencrypteddkey.pem  
SetEnv HTTPS_DEBUG 0  
SetEnv WSRF_MODULES /home/ahe-server/WSRF-Lite/modules  
SetEnv URL https://hostname:8443/  
#the AHE_ApacheScriptAlias should be the same as the ScriptAlias for the cgi-bin  
#scripts in Section 2.2.2.2
```

```

SetEnv AHE_ApacheScriptAlias          ahe
SetEnv AHE_LOCATION                   /home/ahe-server/ahe-1.0.0
SetEnv AHE_DBI                        yes
SetEnv AHE_DBI_Source                 dbi:Pg:dbname=ahe_db;host=localhost;port=5432
SetEnv AHE_DBI_UserName               ahe-server
SetEnv AHE_DBI_Auth                   password
SetEnv AHE_PERLINC1                   /home/ahe-server/perl/lib
SetEnv AHE_PERLINC2                   /home/ahe-server/WSRF-Lite

```

2.2.3.2 Restart Apache after configuring \$AHE\_LOCATION/config/envvars according to your local settings.

## 2.2.4 ahe\_setperl

2.2.4.1 All the perl scripts in ahe-1.0.0/cgi-bin and ahe-1.0.0/scripts have the perl path set to home/ahe-server/perl/bin/perl. If your perl installation is at a different location, e.g. at /home/xyz/perl/bin/perl –  
\$AHE\_LOCATION /ahe\_setperl.pl –perl \$AHE\_USER\_HOME/perl/bin/perl

## 2.2.5 RMInfo

2.2.5.1 Configuration information for each Resource Manager (RM) represented by a GridSAM instance is stored in  
\$AHE\_LOCATION/config/RMInfo/RMList.xml.

2.2.5.2 An example that includes the complete entry for the National Grid Service (NGS) Leeds node is given below. The NGS Leeds RM has the applications NAMD, LAMMPS, and ahesort.pl installed.

```

<ahe:RM>
<wsa:EndpointReference xmlns:wsa="http://www.w3.org/2005/03/addressing">
  <wsa:Address>https://garfield.mvc.mcc.ac.uk:50050/gridsam_leeds/services/
gridsam
  </wsa:Address>
</wsa:EndpointReference>
<ahe:app>
  <ahe:name>namd</ahe:name>
  <ahe:JSDLTemplate>config/JSDLTemplates/namd.leeds.jsdl</ahe:JSDLTem
plate>
</ahe:app>
<ahe:app>
  <ahe:name>lammmps</ahe:name>

  <ahe:JSDLTemplate>config/JSDLTemplates/lammmps.leeds.jsdl</ahe:JSDLTe
mplate>
</ahe:app>
<ahe:app>
  <ahe:name>sort</ahe:name>
  <ahe:JSDLTemplate>config/JSDLTemplates/sort.leeds.jsdl</ahe:JSDLTempl
ate>
</ahe:app>
<ahe:type>NGS</ahe:type>
<ahe:CPUCount>128</ahe:CPUCount>
<ahe:arch>ia64</ahe:arch>
<ahe:memory>5000</ahe:memory>
<ahe:virtualMemory>10000</ahe:virtualMemory>
<ahe:opSys>FC</ahe:opSys>
<ahe:IP>127.0.0.1</ahe:IP>
<ahe:wallTimeLimit>1440</ahe:wallTimeLimit>

```

```
<ahe:commonName>leeds</ahe:commonName>
</ahe:RM>
```

```
<ahe:RM>
<wsa:EndpointReference xmlns:wsa="http://www.w3.org/2005/03/addressing">
  <wsa:Address>
    https://garfield.mvc.mcc.ac.uk:50050/gridsam\_man/services/gridsam
  </wsa:Address>
</wsa:EndpointReference>
...
<ahe:commonName>man</ahe:commonName>
</ahe:RM>
```

## 2.2.6 JSDL Template

- 2.2.6.1 All the JSDL templates are located in \$AHE\_LOCATION/config/JSDLTemplates.
- 2.2.6.2 The naming convention for JSDL templates is \$app.\$RM.jsdl, where, application, \$app is installed on \$RM. For example, namd.leeds.jsdl.
- 2.2.6.3 For each request to launch a particular application on a particular RM, the corresponding JSDL template is used by the AHE server.
- 2.2.6.4 The JSDL template is application-specific and RM (~grid resource)-specific. For each application on each RM, the corresponding JSDL template needs to have at least the following information set –
  - a) location of the executable on the grid resource
  - b) environment variables, if any, required to be able to run the application successfully

2.2.6.5 The JSDL template for NAMD on the NGS Leeds node is below:

```
<JobDefinition xmlns="http://schemas.ggf.org/jsdl/2005/11/jsdl">
  <JobDescription>
    <JobIdentification>
      <JobName>NAMD_NGS_LEEDS</JobName>
      <Description>THIS IS FOR NAMD ON THE NGS</Description>
      <JobAnnotation>NAMD Annotation</JobAnnotation>
      <JobProject>AHE Project</JobProject>
    </JobIdentification>
    <Application>
      <mpi:MPIApplication xmlns=http://schemas.ggf.org/jsdl/2005/11/jsdl-posix
        xmlns:mpi="urn:gridsam:mpi">
        <Executable>usr/local/Cluster-Apps/namd-2.5-intel/bin/namd2-mpi</Executable>
        <Environment name="NGSMODULES">gm/2.0.8</Environment>
      </mpi:MPIApplication>
    </Application>
  </JobDescription>
</JobDefinition>
```

## 3: Start-up the AHE server

### 3.1 Start-up the PostgreSQL server

- 3.1.1 Start up the PostgreSQL database installed in /home/ahe-server/pgsql  
cd \$AHE\_USER\_HOME/pgsql/bin  
postmaster -D \$AHE\_USER\_HOME/pgsql/data >logfile 2>&1

### 3.2 Start-up Apache

- 3.2.1 Start up Apache installed in /home/ahe-server/apache  
cd \$AHE\_USER\_HOME/apache/bin  
\$AHE\_USER\_HOME/apache/bin/apachectl -k start

On starting the Apache server, with the modified httpd.conf as described in Section 2.2.1 -

- 3.2.1.1 The AHE Application Server Registry factory is available at the following Endpoint Reference(EPR):  
<https://hostname:8443/ahe/AppServerRegistryDBI>
- 3.2.1.2 The AHE Application Server factory is available at the following Endpoint Reference( EPR):  
<https://hostname:8443/ahe/AppWSResource>
- 3.2.1.3 The default AHE file-staging area is available at the following Endpoint Reference(EPR):  
<http://hostname:8000/ahe/filestage>

### 3.3 Create the Application Server Registry

- 3.3.1 Populate the registry of Applications hosted within the AHE  
cd \$AHE\_LOCATION/scripts

If an application server registry already exists, destroy it -  
/ahe\_destroyAppServerRegistry.pl

Create the new application server registry -  
./ahe\_createAppServerRegistry.pl

- 3.3.2 Print out the list of Applications hosted within the AHE  
cd \$AHE\_LOCATION/scripts  
./ahe\_queryAppServerRegistry.pl

You should see:  
Printing Application Server Registry.....

Application Type: lammeps  
Application Factory EPR:  
<https://hostname:8443/ahe/AppWSResource>

Application Type: namd  
Application Factory EPR:  
<https://hostname:8443/ahe/AppWSResource>

...

## 4: Add a new Grid Resource to the AHE Server

The AHE Server interfaces with each Grid Resource's Resource Manager(RM) via GridSAM(See Section 8). Adding a new Grid Resource involves adding an RM entry into the AHE's RMList.xml configuration file.

### 4.1 Edit RMList.xml

- 4.1.1 Edit \$AHE\_LOCATION/config/RMInfo/RMList.xml to include a new <RM/> element with appropriate entries for the sub-elements. Follow the example of the NGS Leeds node in Section 2.2.5.2.
- 4.1.2 Note that for the new RM, the <wsa:EndpointReference> should contain the address of a live GridSAM service configured to connect to the new RM. GridSAM is the AHE's interface to the back-end Grid Resource
- 4.1.3 The entries for the sub-elements of the <RM/> element, e.g., <app/>, <CPUCount/> should be according to the new RM's properties.

### 4.2 Create JSDL Template

- 4.2.1 Create a JSDL Template in \$AHE\_LOCATION/config/JSDLTemplates/ for each application(NAMD, LAMMPS, LB2D, etc.) installed on the RM. Follow the example in Section 2.2.6.5 modifying the location of the executable and specification of environment variables as appropriate.

## 5: Host a new Application in the AHE Server

### 5.1 Add the new Application in each Grid Resource/RM's RMInfo

- 5.1.1 On the AHE server, in \$AHE\_LOCATION/config/RMInfo/RMList.xml for each <RM> element corresponding to the Grid Resources, add the <app> sub-element.

```
<ahe:app xmlns:ahe="http://www.rahwl.org/v1.0">
  <ahe:name>newApp</ahe:name>
<ahe:JSDLTemplate>config/JSDLTemplates/newApp.$RMName.jsdl</ahe:JSDLTemplate>
</ahe:app>
```

Each <RM> element can have multiple <app> sub-elements for each of the applications installed on the RM.

### 5.2 Create JSDL Template

- 5.2.1 Create JSDL Templates in \$AHE\_LOCATION/config/JSDLTemplates/ for each RM (TeraGrid-NCSA, NGS-Leeds, etc.) on which the new application is installed. Follow the example in Section 2.2.6.5 modifying the location of the executable and specification of environment variables as appropriate.

### 5.3 Re-populate the Application Server Registry

- 5.3.1 Destroy the old registry of Applications hosted within the AHE.  
cd \$AHE\_LOCATION/scripts  
./ahe\_destroyAppServerRegistry.pl
- 5.3.2 Populate the registry of Applications hosted within the AHE.  
cd \$AHE\_LOCATION/scripts  
./ahe\_createAppServerRegistry.pl
- 5.3.3 Print out the list of Applications hosted within the AHE  
cd \$AHE\_LOCATION/scripts  
./ahe\_queryAppServerRegistry.pl

You should see the new application:  
Printing Application Server Registry.....

...

Application Type: newApp  
Application Factory EPR:  
<https://hostname:8443/ahc/AppWSResource>

...

## 6: PostgreSQL Database

### 6.1 Install PostgreSQL in ahe-server home directory as non-root

- 6.1.1 Download postgresql-8.1.3.tar.gz from <http://www.postgresql.org/download/> into \$AHE\_USER\_HOME. The AHE server has been tested with PostgreSQL version 8.1.3.
- 6.1.2 tar -zxvf postgresql-8.1.3.tar.gz
- 6.1.3 cd postgresql-8.1.3
- 6.1.4 Configure the build process to install PostgreSQL in the ahe-server home directory  
./configure --prefix=\$AHE\_USER\_HOME/pgsql
- 6.1.5 Build PostgreSQL  
gmake
- 6.1.6 Test the newly built server before installing it  
gmake check
- 6.1.7 Install PostgreSQL files into the directories specified in configure  
gmake install
- 6.1.8 Post-installation set environment variable LD\_LIBRARY\_PATH  
export LD\_LIBRARY\_PATH=\$AHE\_USER\_HOME/pgsql/lib
- 6.1.9 Post-installation set environment variable PATH  
export PATH=\$AHE\_USER\_HOME/pgsql/bin:\$PATH
- 6.1.10 Post-installation set environment variable MANPATH  
export MANPATH=\$AHE\_USER\_HOME/pgsql/man:\$MANPATH
- 6.1.11 Initialize Postgresql data directory  
mkdir \$AHE\_USER\_HOME/pgsql/data  
\$AHE\_USER\_HOME/pgsql/bin/initdb -D /home/ahe-server/pgsql/data
- 6.1.12 Start up the PostgreSQL server  
\$AHE\_USER\_HOME/pgsql/bin/postmaster -D \$AHE\_USER\_HOME/pgsql/data  
>logfile 2>&1
- 6.1.13 Set \$AHE\_USER password, we assume \$AHE\_USER=ahe-server here,  
\$AHE\_USER\_HOME/pgsql/bin/psql template1  
template1=#ALTER USER "ahe-server" WITH SUPERUSER PASSWORD  
'password';  
template1=#\q
- 6.1.14 Modify \$AHE\_USER\_HOME/pgsql/data/pg\_hba.conf to check authorization-  
change all instances of "trust" to "md5".
- 6.1.15 Restart the PostgreSQL server-  
kill -INT `head -1 /home/ahe-server/pgsql/data/postmaster.pid`  
  
\$AHE\_USER\_HOME/pgsql/bin/postmaster -D \$AHE\_USER\_HOME/pgsql/data  
>logfile 2>&1

### 6.2 Configure PostgreSQL

- 6.2.1 Note the installed database server's hostname and port number. Note \$AHE\_USER's password.  
In order to work with the PostgreSQL database, the AHE server will need to have the following environment variables set in the configuration file,  
\$AHE\_LOCATION/config/envvars –  
AHE\_DBI\_Source dbi:Pg:dbname=ahe\_db;host=localhost;port=5432  
DBI\_UserName ahe-server  
DBI\_Password password  
During the AHE server-side development and testing, the PostgreSQL database and AHE server were co-located with the host=localhost above and the database server was listening on the default port=5432.

## 6.2.2 Create ahe\_db Database

### 6.2.2.1 Connect to the PostgreSQL template database

```
psql template1
```

### 6.2.2.2 Create the ahe\_db database

```
template1=# CREATE DATABASE ahe_db;
```

### 6.2.2.3 Quit the template database

```
template1=# \q
```

### 6.2.2.4 Connect to the newly created database to verify its creation

```
psql ahe_db
```

## 6.2.3 Create ServiceGroups Table in the ahe\_db Database

### 6.2.3.1 Connect to the ahe\_db database

```
psql ahe_db
```

### 6.2.3.2 Create the ServiceGroups table for storing WS-ResourceProperties

```
ahe_db=#CREATE TABLE ServiceGroups(  
                                Idx SERIAL PRIMARY KEY,  
                                ServiceGroupEPR text,  
                                ServiceGroupEntryEPR text,  
                                Content text,  
                                RPDoc text);
```

### 6.2.3.3 Test ServiceGroups table has been created correctly

#### 6.2.3.3.1 Listing tables in the ahe\_db database should print the following.

```
ahe_db=# \d
```

#### List of relations

Schema	Name	Type	Owner
Public	Servicegroups	Table	ahe-server
Public	Servicegroups_idx_seq	Sequence	ahe-server

#### 6.2.3.3.2 Listing columns in the ServiceGroups table should print the following.

```
ahe_db=# \d ServiceGroups
```

#### Table "public.servicegroups"

Column	Type	Modifiers
Idx	Integer	not null default nextval('servicegroups_idx_seq'::regclass)
Servicegroupepr	Text	
Servicegroupentryepr	Text	
Content	Text	
Rpdoc	Text	

Indexes:

```
"servicegroups_pkey" PRIMARY KEY, btree (idx)
```

## 6.2.4 Create Applications table in the ahe\_db Database

### 6.2.4.1 Connect to the ahe\_db Database

```
psql ahe_db
```

### 6.2.4.2 Create the Applications table for storing the list of applications

```
ahe_db=#CREATE TABLE Applications(  
                                Idx SERIAL PRIMARY KEY,  
                                Application text,  
                                AppServerRegistryEntryEPR text,  
                                Content text,  
                                );
```

### 6.2.4.3 Test Applications table has been created correctly

#### 6.2.4.3.1 Listing tables in the ahe\_db database should print the following.

```
ahe_db=# \d
```

#### List of relations

Schema	Name	Type	Owner
Public	Applications	Table	ahe-server

Public	Applications_idx_seq	Sequence	ahc-server
Public	Servicegroups	Table	ahc-server
Public	Servicegroups_idx_seq	Sequence	ahc-server

#### 6.2.4.3.2 Listing columns in the Applications table should print the following.

ahc\_db=# \d Applications

```

Table "public.applications"
Column          |          Type          | Modifiers
Idx              | Integer                | not null default
                  |                        | nextval('applications_idx_seq'::regclass)
Application     | Text
appserverregistryentrypr | Text
Content         | Text
Indexes:
    "applications_pkey" PRIMARY KEY, btree(idx)

```

#### 6.2.5 Install Perl DBI packages for PostgreSQL

In order for the AHC server to work with PostgreSQL, Perl DBI packages must be installed as described in Section 7.3

## 7: Perl

### 7.1 Install Perl in ahe-server home directory as non-root

- 7.1.1 Download and install the latest stable source code release of perl from CPAN. AHE has been written and tested with v 5.8.8 into \$AHE\_USER\_HOME.
- 7.1.1.1 wget <http://perl.com/CPAN/src/stable.tar.gz>
- 7.1.1.2 tar -zxvf stable.tar.gz
- 7.1.1.3 cd perl-5.8.8
- 7.1.1.4 sh Configure -de -Dprefix=\$AHE\_USER\_HOME/perl
- 7.1.1.5 make && make test && make install
- 7.1.1.6 Once perl is installed in the AHE server home directory, perl location on \*.pl scripts should point to the new location, \$AHE\_USER\_HOME/perl/bin/perl.
- 7.1.1.7 export PERL5LIB= \$AHE\_USER\_HOME/perl/lib:\$PERL5LIB
- 7.1.1.8 export PATH= \$AHE\_USER\_HOME/perl/bin:\$PATH

### 7.2 Install Perl package pre-requisites

- 7.2.1 Use CPAN to install the following packages. Some of these packages have further dependencies which are automatically installed with CPAN. If you would like to use the ahe-server's local (non-root) installation of perl make sure that the local installation of perl has precedence in \$PATH(\$PATH=\$AHE\_USER\_HOME/perl/bin/perl:\$PATH) and \$PERL5LIB(\$PERL5LIB=\$AHE\_USER\_HOME/perl/lib:\$PERL5LIB)
  - 7.2.1.1 XML::XPath
  - 7.2.1.2 XML::DOM::XPath
  - 7.2.1.3 Cwd
  - 7.2.1.4 HTTP::DAV
  - 7.2.1.5 SOAP::Lite
  - 7.2.1.6 DateTime::Format::W3CDTF
  - 7.2.1.7 DateTime::Format::Epoch
  - 7.2.1.8 Crypt::SSLeay
  - 7.2.1.9 Net::SSLeay
  - 7.2.1.10 Crypt::RSA

### 7.3 Install Perl DBI packages for PostgreSQL

Note: This should be done after PostgreSQL and Perl have already been installed in the ahe-server account as described in Sections 6.1 and 7.1 respectively.

- 7.3.1 cpan install DBI
- 7.3.2 cpan install Bundle::DBI
- 7.3.3 export POSTGRES\_LIB="\$AHE\_USER\_HOME/pgsql/lib"  
Note that during the development and testing the AHE server and database were co-located.
- 7.3.4 download DBD:Pg1.45.tar.gz from CPAN
- 7.3.5 tar -zxvf DBD:Pg1.45.tar.gz
- 7.3.6 cd DBD:Pg1.45
- 7.3.7 \$AHE\_USER\_HOME/perl/bin/perl Makefile.PL
- 7.3.8 make
- 7.3.9 make test
- 7.3.10 make install

## 8: OMII and GridSAM

### 8.1 Install a GridSAM instance using the OMII Stack Installers

#### 8.1.1 Refer to

<http://gridsam.sourceforge.net/1.1/quickstart.html#Installing+GridSAM+using+the+OMII+Stack+Installer>

for instructions on installing *the first* GridSAM instance.

### 8.2 Install multiple GridSAM instances

#### 8.2.1 Download GridSAM 1.1.0 from

<http://gridsam.sourceforge.net/2.0.0-SNAPSHOT/index.html>

#### 8.2.2 Follow the instructions on “Installing the GridSAM service” listed at

<http://gridsam.sourceforge.net/1.1/quickstart.html#Installing+the+GridSAM+service>

with the following change:

```
$> ant install -Dmii.server.home=${OMII_HOME} -Dtomcat.home=${OMII_HOME}/jakarta-tomcat-5.0.25 -Dinstance.name=gridsam_${RM}
```

where `$RM` is the name of the grid resource to which the gridsam instance will interface, e.g., gridsam instances configured to submit jobs to the TeraGrid sites at NCSA and SDSC and core NGS nodes at Leeds, Oxford, Manchester and RAL should be installed as follows:

```
$> ant install -Dmii.server.home=${OMII_HOME} -Dtomcat.home=${OMII_HOME}/jakarta-tomcat-5.0.25 -Dinstance.name=gridsam_ncsa
```

```
$> ant install -Dmii.server.home=${OMII_HOME} -Dtomcat.home=${OMII_HOME}/jakarta-tomcat-5.0.25 -Dinstance.name=gridsam_sdsc
```

```
$> ant install -Dmii.server.home=${OMII_HOME} -Dtomcat.home=${OMII_HOME}/jakarta-tomcat-5.0.25 -Dinstance.name=gridsam_leeds
```

```
$> ant install -Dmii.server.home=${OMII_HOME} -Dtomcat.home=${OMII_HOME}/jakarta-tomcat-5.0.25 -Dinstance.name=gridsam_oesc
```

```
$> ant install -Dmii.server.home=${OMII_HOME} -Dtomcat.home=${OMII_HOME}/jakarta-tomcat-5.0.25 -Dinstance.name=gridsam_man
```

```
$> ant install -Dmii.server.home=${OMII_HOME} -Dtomcat.home=${OMII_HOME}/jakarta-tomcat-5.0.25 -Dinstance.name=gridsam_rl
```

### 8.3 Configure multiple GridSAM instances

#### 8.3.1 Disable message-level security for each GridSAM instance and enable transport-layer security(https://) for GridSAM's tomcat container as per the instructions at

<http://gridsam.sourceforge.net/1.1/deploymentguide/httpsma.html>

#### 8.3.2 For each GridSAM instance, configure the Jobmanger.xml file in `$OMII_HOME/jakarta-tomcat-5.0.25/webapps/gridsam_${RM}/WEB-INF/classes/Jobmanager.xml`. The configuration instructions can be found at <http://gridsam.sourceforge.net/1.1/deploymentguide/gt2.html> in the section 'Configuration'.

### 8.4 Run GridSAM Services

#### 8.4.1 Refer to the sections on “Running the GridSAM Service” and “Shutting down GridSAM” at <http://gridsam.sourceforge.net/1.1/quickstart.html>

### 8.5 Note the EPR of each GridSAM instance

#### 8.5.1 The EndPoint Reference (EPR) of a GridSAM instance is the URL at which the service can be found. The EPR of each GridSAM instance, e.g.,

[https://omii.host.ac.uk:18443/gridsam\\_leeds/services/gridsam](https://omii.host.ac.uk:18443/gridsam_leeds/services/gridsam)

[https://omii.host.ac.uk:18443/gridsam\\_man/services/gridsam](https://omii.host.ac.uk:18443/gridsam_man/services/gridsam)

needs to be set in the `$AHE_LOCATION/config/RMInfo/RMList.xml` file.

## **8.6 GridSAM service providers**

- 8.6.1 For GridSAM instances hosted by other service providers, it is sufficient to know the EPR of the GridSAM instance hosted by them and set this in the \$AHE\_LOCATION/config/RMInfo/RMList.xml file

## 9: WSRF::Lite

### 9.1 Download and Install WSRF::Lite

Download and install the latest version of WSRF::Lite ([WSRF-Lite.0.6.tar](http://www.sve.man.ac.uk/Research/AtoZ/ILCT)) from <http://www.sve.man.ac.uk/Research/AtoZ/ILCT>

### 9.2 Test WSRF::Lite

Test your WSRF::Lite installation by deploying a sample WSRF::Lite web service. A WSRF::Lite tutorial is available at

<http://www-128.ibm.com/developerworks/edu/gr-dw-gr-wsrflite-i.html?ca=dnt-63>

Note that WSRF::Lite requires the Crypt::SSLeay and Crypt::RSA perl modules installed. If WSRF::Lite is not installed correctly, the services provided by the AHE server will not function.

### 9.3 Set environment variable WSRF\_MODULES in envvars

After installing WSRF::Lite, note the location of the WSRF-Lite directory. In order for the AHE server to use WSRF::Lite the environment variable WSRF\_MODULES will have to be set to this location in the configuration file

`$AHE_LOCATION/config/envvars`

```
Setenv WSRF_MODULES      /home/ahe-server/WSRF-Lite
```

## 10: Apache

### 10.1 Install and download Apache

- 10.1.1 Download the latest Apache version from <http://httpd.apache.org/download.cgi>. The AHE-server has been hosted within Apache 2.2
- 10.1.2 `tar -zxvf httpd-NN.tar.gz`
- 10.1.3 `cd httpd-NN`
- 10.1.4 `./configure --prefix=$AHE_USER_HOME/apache --with-ssl --enable-ssl --enable-mods-shared=all`
- 10.1.5 `make`
- 10.1.6 `make install`
- 10.1.7 Start the apache server  
`$AHE_USER_HOME/apache/bin/apachectl -k start`

### 10.2 Configure Apache

- 10.2.1 `httpd.conf`
  - 10.2.1.1 Follow instructions in Section 2 to host the AHE server within Apache. As mentioned in Section 2.2.1, copy `$AHE_LOCATION/conf/httpd.conf` to `$AHE_USER_HOME/apache/httpd.conf` and customize `$AHE_USER_HOME/apache/httpd.conf` according to local AHE-related settings. See Section 2.2.1 for configuration of `httpd.conf`
- 10.2.2 `cgi-bin` scripts
  - 10.2.2.1 Follow instructions in Section 2 to host the AHE server within Apache. As mentioned in Section 2.2.2, the path to AHE's `cgi-bin` directory needs to be set in Apache's `httpd.conf`. See Section 2.2.1 for configuration of `httpd.conf`
- 10.2.3 `envvars`
  - 10.2.3.1 Follow instructions in Section 2 to host the AHE server within Apache. `$AHE_Location/config/envvars` is used to set AHE-specific environment variables for Apache. See Section 2.2.3 for the complete listing of a sample `envvars` file.
- 10.2.4 Access control lists
  - 10.2.4.1 Follow instructions in Section 2 to host the AHE server within Apache. Apache access control can be set up with the `SSLRequire` directive in `httpd.conf`. See Section 2.2.1 for configuration of `httpd.conf`

```
SSLRequire ( %{SSL_CIPHER} !~ m/^(EXPINULL)/\  
and %{SSL_CLIENT_S_DN_O} eq "Snake Oil, Ltd." \  
and %{SSL_CLIENT_S_DN_OU} in {"Staff", "CA", "Dev"} \  
and %{TIME_WDAY} >= 1 and %{TIME_WDAY} <= 5 \  
and %{TIME_HOUR} >= 8 and %{TIME_HOUR} <= 20 )\  
or %{REMOTE_ADDR} =~ m/^192\.76\.162\.[0-9]+$/
```
- The AHE server depends on Apache for access control when instantiating WS-Resources. The AHE-server does fine-grained authorization when operations are invoked on WS-Resource instances.
- 10.2.5 `Webdav`
  - 10.2.5.1 Follow instructions in Section 2 to host the AHE server within Apache. `Webdav` set-up and configuration is done in `$AHE_USER_HOME/apache/httpd.conf`. See Section 2.2.1 on configuration of `httpd.conf`

## 10.2.6 AHE Server Certificates

### 10.2.6.1 Follow instructions in Section 2 to host the AHE server within Apache.

Location of the server's e-Science certificate needs to be set correctly in `$AHE_USER_HOME/apache/httpd.conf`. See Section 2.2.1 on configuration of `httpd.conf`

```
SSLCertificateFile /home/ahe-server/certificates/hostcert.pem
SSLCertificateKeyFile /home/ahe-server/certificates/hostunencryptedkey.pem
SSLCertificateChainFile /home/ahe-server/certificates/cacert.pem
SSLCACertificateFile /home/ahe-server/certificates/cacert.pem
SSLCARevocationFile /home/ahe-server/certificates/ca.crl
```

In the example above, `$AHE_USER_HOME=/home/ahe-server/`