XWHEP 5.7.5 User Guide

Installation, Usage and Programming
Edition 1, for XWHEP version 5.7.5
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1 Introduction

XtremWeb for High Energy Physics (*XWHEP*) is a global computing platform aiming to aggregate volunteer computing resources over the Internet. Contrary of what the name could make readers think, this is a general purpose platform, not specifically dedicated to High Energy Physics (*HEP*) community. The name should preferably be understood as XtremWeb *BY* High Energy Physics.

Historycally speaking, XtremWeb (`http://www.xtremweb.net/`) is a project initiated by Laboratoire de Recherche en Informatique (LRI) (`http://www.lri.fr/`).

In a pluri-disciplinal initiative, Laboratoire de l'Acclrateur Linaire (LAL) (`http://www.lal.in2p3.fr/`) and LRI joined their efforts to make what was a research platform aiming to study large scale distributed systems (*LSDS*) to a full production platform, naturally using HEP applications as first use cases (naturally, since LAL is an HEP laboratory). This common work having been a success, LAL continued not only to work with the platform in production, but also to extend and improve it in several ways under the name of XWHEP.

This document first presents XWHEP and its innovative features; then describes how to compile, install and deploy the platform. The last chapter is about inter-grid connections, the goal of such a feature, its security issues and finally how to make such inter-connections operable.

The targeted audience is not only developpers and administrators willing to deploy an LSDS, but also end users that can gain access to a new computing power. Finally volunteer PC owners who would like to participate to exciting research fields will also find useful informations here, on how to install and manage their PC as part of a global virtual cluster.

1.1 Reading conventions

- variables are refered like this : ${install.dir};
- ${version} refers to the version of XWHEP (currently 5.7.5);
- code samples are given using courrier font

```
$> make distrib
```

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2 XWHEP

2.1 Overview

XWHEP (`http://dghep.lal.in2p3.fr/spip.php?rubrique13`) is a middleware permitting to deploy a Global Computing platform (Large Scale Distributed System). XWHEP belongs to the so called *Cycle Stealing* environment family. Like the other Distributed System Platforms, an XWHEP platform uses remote resources (PCs, workstations, PDA, servers) connected to Internet or a pool of resources inside a LAN. Participants of an XWHEP platform cooperate by providing their computing ressources, such as processor, memory and/or disk space.

XWHEP is a project belonging to light weight GRID systems. Its a Free Software (GPL), Open Source and non-profit software platform to explore scientific issues and applications of Global Computing and Peer to Peer distributed systems.

The XWHEP software platform allows to setup and run Distributed System projects. Such project must be based on a community of participants. For example, XWHEP platforms allow a High School, a University... or a Company to setup and run a Global Computing or Peer to Peer distributed system for either a specific application or a range of applications.

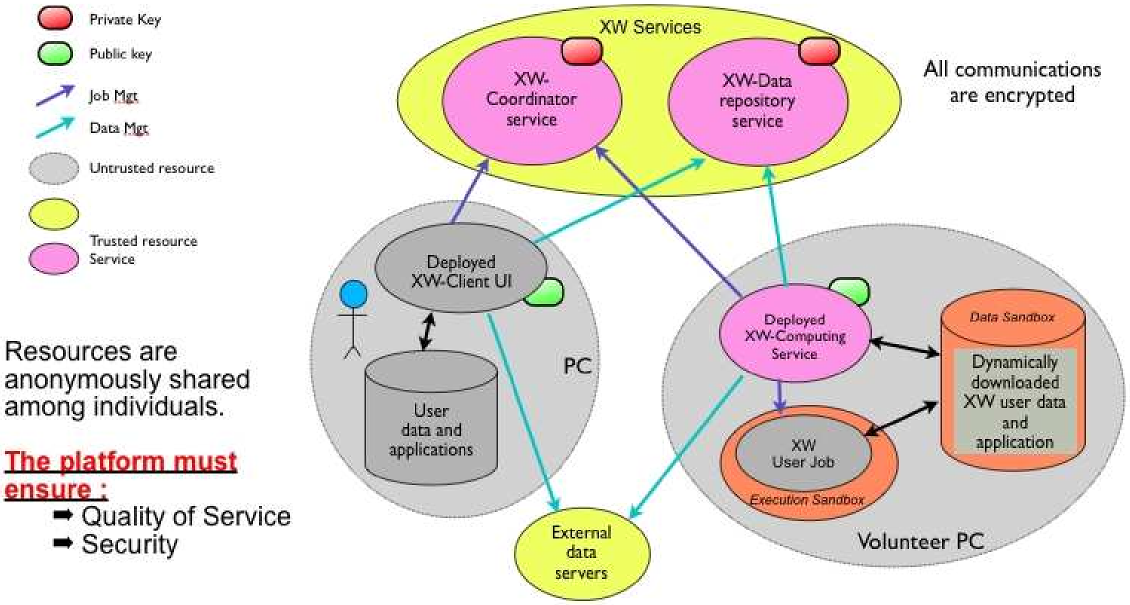
2.2 Architecture

The XWHEP project is made of three parts:

- the server is the centralized part in charge of the platform management; it is detailed on section Section 6.1 [XWHEP server], page 15;
- the worker is a distributed part deployed on PCs over the internet to provide computing ressources; it is detailed on section Section 6.2 [XWHEP worker], page 16;
- the client is a distributed part deployed on PCs over the internet which interacts with the platform; it is detailed on section Section 6.3 [XWHEP client], page 27.

This architecture corresponds to most of well known Global Computing Projects. Compared to some other platforms, XWHEP also allows to connect several Servers and Result Collectors on a single project (Workers keep a collection of Server and Result Collectors IP address). During the execution, the workers contact the Server to get jobs. In response, the Server sends a set of parameter and it also may send an application if the application is not already stored in the Workers. As soon as the Workers end their jobs, they contact the Result Collector to send the results. Depending on thezresult size, the communication between the Workers and the Result Collector use different protocols. Currently, the worker may send results with size up to 100 MBytes. In this architecture, the Client and the Server are the same computer.

Architecture


Private Key
Public key
Job Mgt
Data Mgt
Untrusted resource
Trusted resource
Service
Resources are anonymously shared among individuals.
The platform must ensure :
➡ Quality of Service
➡ Security
XW Services
XW-Coordinator service
XW-Data repository service
All communications are encrypted
Deployed XW-Client UI
User data and applications
PC
Deployed XW-Computing Service
Data Sandbox
Dynamically downloaded XW user data and application
XW User Job
Execution Sandbox
Volunteer PC
External data servers

2.3 What can I do with XWHEP

As a system software, XWHEP allows you to:

1. use a Peer-to-Peer computing platform.
2. participate (provide computing ressources) to a Global Computing or a Peer-to-Peer Project by joining an XWHEP platform (see the projects links on the main page),
3. be collaborator of XWHEP by helping us developing XWHEP ,
4. easily build your own General Purpose Global Computing System.

Participants may download the Worker software to participate. XWHEP Worker examines constantly the workload of your PC. When the workload becomes insignificant, your PC starts participating to a world wide experiment (research or large contests). For most of the PCs, the computation is done during the night.

Any one can download the entire software (Worker, Server, Lan administrator) to setup their own XWHEP platform.

Large institutions that are spred among several geographical sites and that are using cycle stealing to increase their computational power may use XWHEP to manage all the resources through a single environment. By downloading the entire XWHEP system you will be able to launch a Global Computing or a Peer-to-Peer Computing system. To do so, you will have to setup a community of workers. Dedicated Global Computing System particularly match the requirements of institutions like Schools, Universities, Laboratories, Libraries, Factories, Industries, ..., Companies that need a system allowing the use of idle resources during the nights or week-end.

2.4 Features

XWHEP is a generic multi purposes desktop grid platform (DG) enabling eSciences computations over volatile nodes.

Main features are :

- three tiers architecture with a centralized scheduller
- multi platforms (win32, linux, mac os x)
- virtual stable cluster over volatile volunteers individual PCs
- protocol agnostic
- data server
- multi applications
- multi users
- firewall bypassing
- automatic load balancing
- fault tolerance

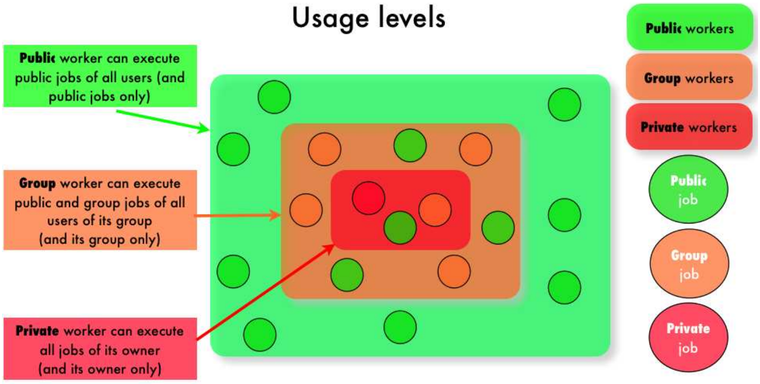
2.4.1 User management

The platform introduces the notion of users, which must be understood just like in a cluster. An user is an entity that has the rights to perform some actions within the platform such as insert an application, submit a job, retreive a job result and more. An user is defined by its login and password[1].; users have the responsability to ensure confidentiality and integrity of these informations. These informations are always needed to connect to the platform. They are sent with all messages; messages without these informations or with invalid ones are rejected by the server. They also define actions the user has the rights to execute (see [User rights], page 6). We can understand here that roles are not statically defined; they are dynamically defined by actions an user is allowed to request to server. An user identity that can be used to submit applications, datas and jobs may be considered as a client (this identity can be used to do so if the server allows requested actions for that identity). An identity that can be used to compute jobs may be considered as a worker (i.e. a distributed computing element - see Section 2.4.5 [Volunteer computing management], page 8).

An user may belong to a user group and not more than one. This helps to confine datas, applications, jobs and workers. With this feature, the platform defines three usage levels: **public**, **group** and **private** as shown in figure [Usage levels], page 4. The public level is the default one where applications, datas and jobs are public, accessible by all users, accordingly to their access rights (see Section 2.4.3 [Access rights], page 7).

[1] Since XWHEP 5.0.0, the platform also permits to use *X509 certificates*, but this is still usable under certains circunstances only.

Usage levels


Usage levels
Public worker can execute public jobs of all users (and public jobs only)
Group worker can execute public and group jobs of all users of its group (and its group only)
Private worker can execute all jobs of its owner (and its owner only)
Public workers
Group workers
Private workers
Public job
Group job
Private job

1. **Public usage level**. By default users are *public*: they don't belong to any group. They can use public applications and datas, submit public jobs that can be run by public workers. Public applications, datas and jobs are those accessible by all users accordingly to their access rights (see Section 2.4.3 [Access rights], page 7).

   A public worker is a worker that has enough user rights to execute public applications. A public applications must be inserted by an user that is defined with *administrator user level* (see [User rights], page 6). The application access rights defines the job ones; this is enforced by the server and there is no way modify this: any job referring a public application is public.

2. **Group usage level**. Users belonging to an user group can not only access public applications, datas, jobs and workers, but also those of its group. Note that an user can belong to one user group only. Applications, datas, jobs and workers are in an user group if and only if their owner belongs to an user group. The group access rights does not allow users not belonging to the group to access objects of the group.

   A group worker is a public worker defined a group: its identity is defined in the group and has enough user rights to execute group application. A group applications must be inserted by an user that is defined with *administrator user level.* The application access rights defines the job one; this is enforced by the server and there is no way modify this: any job referring a group application is a group job.

   Users defined in a group can still submit public jobs by referring a public applications. A group worker will execute any public job as soon as it is the same user group of the job owner.

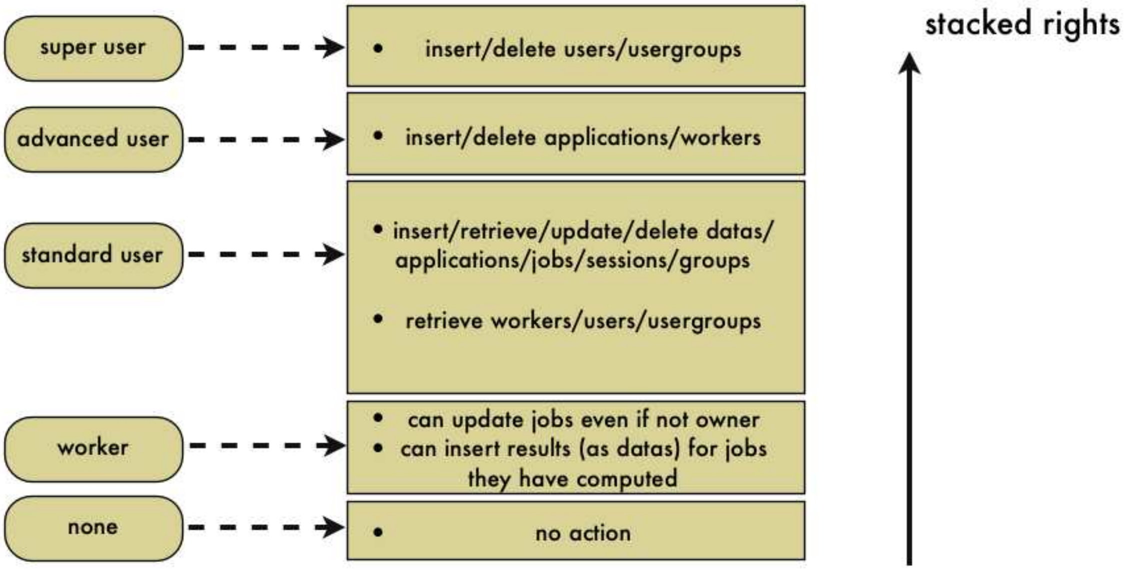
3. **Private usage level**. Finally, applications, datas, jobs and workers may be private ones. Only the owner can access private objects. Users that don't have *administrator user level* can insert private applications and private ones only. This mechanism aims to protect workers against malicious or erroneus code. The application access rights defines the job one; this is enforced by the server and there is no way modify this: any job referring a private application is a private job. Such jobs can only be executed by private workers only. A private worker is worker presenting a non privileged identity (i.e. anything but **not** a public worker). A private worker will execute jobs of its owner only: private, group or public jobs.

The middleware includes several commands to manage users within the platform; please refer to Section 6.3.4 [User management with the XWHEP client], page 29.

2.4.2 User rights

Each user identity is associated a user level which aims to determine actions the user can perform on the platform. Figure [User rights], page 6 shows the user levels stack.

User rights


super user
advanced user
standard user
worker
none
• insert/delete users/usergroups
• insert/delete applications/workers
• insert/retrieve/update/delete datas/ applications/jobs/sessions/groups
• retrieve workers/users/usergroups
• can update jobs even if not owner
• can insert results (as datas) for jobs they have computed
• no action
stacked rights

The user levels are as follow:

- **Standard user level** defines a non privileged level which can be used to insert, modify and deletes its own applications, datas, sessions, groups and jobs. A standard user can not insert public applications, but private ones only. On the other hand, it can insert private, public and group jobs and datas.
- **Advanced user level** defines a privileged level which is stacked over standard level and can also be used to insert, modify and deletes public applications and workers. This is the minimal level to insert group and public applications.
- **Super user level** defines a privileged level which is stacked over advanced level and can also be used to insert, modify and deletes users and user groups.
- **Worker level** is a very special case aiming to override access rights according to some security issues. This level is lower than standard one. Hence it cannot be used to insert/modify/delete anything (applications, datas etc.). This level can only be used to update a job and insert a job result (as a data). To do so, the worker must be the one noted as managing (e.g. running) the given job. If this condition is fullfilled, the

worker can modify the job (i.e. set the job status to *COMPLETED* etc.), overriding the job access rights.

The middleware includes several commands to manage users within the platform; please refer to Section 6.3.4 [User management with the XWHEP client], page 29.

2.4.3 Access rights

The platform introduces the notion of access rights which must be understood as *file system* ones.

Access rights are used to confine access of applications, datas and jobs. They define authorizations for the owner, the group and other users :

- 0400 Allow read by owner.
- 0200 Allow write by owner.
- 0100 For applications, allow execution by owner.
- 0040 Allow read by group members.
- 0020 Allow write by group members.
- 0010 For applications, allow execution by group members.
- 0004 Allow read by others.
- 0002 Allow write by others.
- 0001 For applications, allow execution by others.

Access rights can be combined to define access levels:

- Private : 0x700
- Group : 0x750
- Public : 0x755

Access rights rules :

- Access rights can only be modified by owner and privileged users.
- Application access rights are public by default if the application is inserted with advanced user level. They are private otherwise.
  There is no way to change applications access rights.
- Job access rights are those of the referred application. There is no way neither to override this rule, nor to change job access rights.
  Public applications are referred by public jobs only; group applications by groups jobs only; private applications by private jobs only.
- A job should never refer any datas with a lower access rights (e.g. a public job should never refer private or group datas). Because there is no predictable way to determine which worker will manage the job. If a user inserts a private datas and uses it with a

public job, that job could only be successfully computed by a private worker. In the case the job is managed by a public worker (which is highly probable since the job is public), that worker will not be able to retreive the private data expected by the public job. That public worker will then set the status of this public job as *ERROR*.
In one word, public jobs should always refer to public datas, group jobs should always refer to group datas; and private jobs should always refer to private datas.

- Data access rights are public by default. Data access rights only apply for datas stored on XWHEP server (see Section 2.4.6 [Data management], page 8).

The middleware includes several commands to manage access rights within the platform; please refer to Section 6.3.2.2 [Client generic actions], page 29.

2.4.4 Security

The platform trust nothing and implements all required mechanisms to ensure its integrity, as well as integrity of its installed applications, datas, jobs and connected workers.

As described in this document, Section 2.4.3 [Access rights], page 7, Section 2.4.1 [User management], page 4 and [User rights], page 6 ensure all together the expected security level so that :

- user management ensures security
- user groups and access rights ensure confidentiality.
- the server itself ensure integrity and perennation.

2.4.5 Volunteer computing management

A volunteer computing resource is called a *worker* in XWHEP. A worker is a computationnal entity aiming to execute jobs and return their results. A worker is typically a personnal computer.
The platform aggregates some informations from the worker but no personnal datas. Informations are CPU type and performances, memory and disk availability, and IP adress.
The platform uses worker CPU powers accordingly to worker local activation policies, in a non intrusive mode. The owner keeps total control of its machine and its installed worker. See Section 6.2.3 [Control the XWHEP worker], page 26.

The platform administrator keeps the ability to revoke any workers at any time. See Section 6.3.3 [Worker management with the XWHEP client], page 29.

2.4.6 Data management

The middleware includes several commands to manage datas within the platform; please refer to Section 6.3.5 [Data management with the XWHEP client], page 30.

2.4.7 Application management

The middleware includes several commands to manage applications within the platform; please refer to Section 6.3.6 [Application management with the XWHEP client], page 31.

2.4.8 Job management

2.4.9 Job state graph

The middleware includes several commands to manage jobs within the platform; please refer to Section 6.3.7 [Jobs management with the XWHEP client.], page 32.

2.5 Planned Features

- full usage of X509 certificates;
- result certification is not impletemented at all since it is a huge problem;
- worker sandbox is ready for Mac OS X 10.5 but not inserted in the current release. A sandbox feature is ready to use for all Linux platforms.
- replication and pessimistic message logging are implemented to prevent faults but not fully functionnal yet;
- server migration is planned

3 Getting XWHEP

The XWHEP package is downloadable from the web site (`http://dghep.lal.in2p3.fr/spip.php?article46`

You will find there sources and installers.

3.1 Downloading XWHEP source package

There are two ways to get the XWHEP sources; you can:

- download them from the web site (`http://dghep.lal.in2p3.fr/spip.php?article46`);

  You get XWHEP-${version}.tar.bz2.

  Untar it with the command

  ```
  tar xvfj XWHEP-${version}.tar.bz2.
  ```

- get them from the XWHEP SVN.

  One SVN commands are necessary:

  ```
  svn co https://svn.lal.in2p3.fr/projects/XWHEP/tags/${version}/  targetDir
  ```

  Where ${version} is the current version number (e.g 6.0.0).

3.2 Downloading XWHEP binary package

There are two ways to get the XWHEP sources; you can:

- download them from the web site (`http://dghep.lal.in2p3.fr/spip.php?article46`);

  You get XWHEP-${version}-bin.tar.gz.

  Untar it with the command

  ```
  tar xvfz XWHEP-${version}-bin.tar.gz.
  ```

4 Setting up XWHEP

The XWHEP deployment is a three steps process

- generate the binary package from source one (or directly download the binary package from XWHEP web site (`http://dghep.lal.in2p3.fr/spip.php?rubrique13`))
- generate server, worker and client installation packages from XWHEP binary package
- install server and deploy workers and clients

This chapter is divided as follow:

4.1 Pre-requisit

There are some requirements in order to be able to use XWHEP packages (both source and binary). All requirements are tested at deployement time (see Section 4.3 [Building the deployment packages], page 13).

Pre-requisit to install XWHEP are:

- A Mysql server. You must have a MySQL server up and running. Be sure that the following condition are met :
  1. Your server accept network connection. Please verify in the mysql configuration file (usually '`/etc/mysql/my/cnf`' that the field `skip networking` is commented.
  2. You have an account who holds enough privileges to add user and create databases. If you don't please ask your database administrator to help you.
- A Java environment (Sun JDK 1.5 or above is mandatory)

  `http://java.sun.com/`
- Several third partie Java classes are needed. They are included in XWHEP package:
  - jsse1.0.2 composed of '`jcert.jar`', '`jnet.jar`', '`jsse.jar`' for SSL (OpenSSL (`http://www.openssl.org/`));
  - '`openxml-1.2.jar`'(OpenXML (`http://www.philo.de/xml/`)), '`MinML.jar`'(MinML (`http://www.wilson.co.uk/xml/minml.htm`)) for parsing XML;
  - '`antlr.jar`' is a lexical translator (ANTLR (`http://www.antlr.org`)) to parse service calls;
  - '`hsqldb.jar`', a 100% Java SQL DataBase Engine, (HSQLDB (`http://hsqldb.sourceforge.net/`)) to embed database in server;
  - '`mysql-connector-java-5.1.6-bin.jar`' (MySQL (`http://dev.mysql.com/downloads/mysql/5.1`
    to access MySQL databases;

4.2 Building from sources

You are not compelled to build XWHEP from sources, you can download the binary package from the XWHEP web site (`http://dghep.lal.in2p3.fr/spip.php?rubrique13`). If you have done so, you can directly go to Section 4.3 [Building the deployment packages], page 13.

The XWHEP middleware is written in Java language, hence the Java package (`http://java.sun.com/`) is the first requirement to build and run XWHEP .
The build process use the Apache Ant (`http://ant.apache.org/`) build tool; it first expects the JAVA_HOME environment variable to be set.

Note for Windows users: it is possible to configure, build and install XWHEP in this platform, using Cygwin (`http://www.cygwin.com/`). This should work, but is not supported.

4.2.1 Sources package structure

The package contains seven directories:

- '`benchmark/`', a set of scripts to benchmark the platform
- '`build/`', needed files to compile, install etc.;
- '`classes/`', Third Party classes;
- '`doc/`', this documentation files;
- '`misc/`', several needed files, such as config ones;
- '`php/`', WEB SITE (php scripts) files;
- '`src/`', sources directory hierarchy.

You don't have to set any environnement variable, but for the following of the installation procedure, we assume that **${sources.dir}** is the place where XWHEP sources are stored and **${install.dir}** is the installation directory (where `make install` installs the binary package).

4.2.2 Preparing the build process

Several parameters should be set in '`build/build.conf`' configuration file to build and install the package.

- `install.dir` : contains the directory where the binary package will be installed
- `install.www.dir` : contains the directory where the PHP pages will be copied
- `ganglia.www.dir` : contains the directory where the ganglia templates for XWHEP will be copied
- `xwidl.opts` : you should never modify this

4.2.3 Preparing the binary package

The source package can prepare the binary package which aims to generate deployment packages. Binary package usage is described in Section 4.3 [Building the deployment packages], page 13.

At this point, you must have first read Section 4.2.2 [Preparing the build process], page 12.

As soon as '`build/build.conf`' has been edited, you can build and install the binary package using :

```
$> make && make install
```

Installation process includes several steps (assuming build.conf is correct...) :

- `distrib` : this compiles the Java files
- `package` : this install the binary package
- `doc` : this generates the JavaDoc (API documentation)
- `install` : this installs the binary package
- `uninstall` : this removes the binary package
- `clean` : this removes compiled Java files (but leaves the installed binary package)

4.3 Building the deployment packages.

The binary package aims to generate server, worker and client installation packages. These packages help to deploy the platform.
At this point, you either generated the binary package from source package as described in Section 4.2 [Building from sources], page 12, or downloaded the binary package from the web site (`http://dghep.lal.in2p3.fr/spip.php?rubrique15`).

We can not directly propose packages from our web site since it is impossible to create generic installers because each deployment has its own private datas (mysql configuration, electronic keys etc.).

If you have downloaded the XWHEP source package, please refer to Section 4.2 [Building from sources], page 12.

4.3.1 Binary package structure

The package contains seven directories:

- ‘`apptest/`’, a simple application to test XWHEP
- ‘`bin/`’, XWHEP scripts
- ‘`conf/`’, configuration files
- ‘`doc/`’, this documentation files;
- ‘`installers/`’, linux, Win32 and Mac OS X packages
- ‘`keystore/`’, electronic keys
- ‘`lib/`’, needed jar files

You don’t have to set any environnement variable, but for the following of the installation procedure, we assume that **${install.dir}** is the installation directory.

4.3.2 Running the binary package configuration script

The procedure is explained in the tutorial (`XWHEP-tutorial.html`).

4.4 Deploying the platform

If you have followed the procedure explained in the tutorial (`XWHEP-tutorial.html`), you now have your installation packages ready.

5 Monitoring the platform

6 Running and using the platform

This section describes how to manage and use the three XWHEP parts:

6.1 XWHEP server

The server is the centralized part in charge of the platform management. It aims to receive job requests from clients, schedule them on workers until succesfull completion, collect results and forward them back to clients.

6.1.1 Configuring the XWHEP server

You will find a '`conf/xtremweb.server.conf`' file in the distribution. If you have downloaded the sources distribution, the installation process create it for you in your installation directory by the `make install` command.

The configuration of the file consists of a pair of `keys` and their values separated by the '`=`' character. A line begining by '`#`' is a comment.

- Server configuration
  - **xtremweb.role** must be set to `server`
  - **admin.login** is the login of the platform administrator
  - **HomeDir** is the path containing applications and tasks
  - **ModulesLogged** sets the expected modules list. Existing modules are DBI, Comm, Task:
    - DBI: Database Interface
    - Comm: Communication received
    - Task: Tasks scheduled
  - **XWServer** contains a space separated servers list; this is used for replication only.

  - **port.tcp** port to connect the server through TCP (default 4321)
  - **port.udp** port to connect the server through UDP (default 4322)
  - **port.worker.http** port where the worker may listen at (default 4323)
  - **port.http** port to connect the server through HTTP (default 4324)
  - **port.https** port to connect the server through HTTPS (default 4325)
  - **port.xlmrpc** port to connect the server through XML RPC (default 4326)
  - **port.sunrpc** port to connect the server through SUN RPC (default 4327)
  - **java.nio** defines wether to use NIO. Forced to false with HTTP layer (default 4329)
- Database configuration
  - **XWdbHost** is the database server.
  - **XWdbName** is the database name Default in xtremweb.sql :"xtremweb" .

  - **XWdbUser** is the name of the user granted to access the database.
  - **XWdbPass** is the password of the user granted to access the database.
- Security configuration
  - **XWkeyStore** Put here the name of file containing the private key of the server and its certificate.
  - **XWpassPhrase** is the password needed to access that file '`XWCertPass`' by default.
- Logging facilities

  There are four levels: debug, info, warn and error.

6.1.2 Launch XWHEP server

Scripts to launch the server are stored in the '`bin/`' directory.

Be aware that the script uses some definition in '`bin/xtremwebconf.sh`'.
One should read and edit this file.

The script expect the configuration file to be located in '`conf/`' directory.

The script '`bin/xtremweb.server`' helps to manage the server. It request one argument which may take four values : console, start, stop and restart:

- **start** starts the server as daemon
- **console** starts the server in the foreground (not as daemon)
- **stop** stops the server
- **restart** stops and restarts the server.

Example:

```
xtremweb.server start
```

To launch the server, you must have sufficient privileges because the script try to execute the server under the "xtremweb" user defined in your '`xtremwebconf.sh`' file.

6.2 XWHEP worker

The worker is the distributed part in charge of the computation. It aims to request jobs from the server and try to execute them. The worker compute in a non intruding way so that the owner of the machine is not disturb, accordingly to an activation policy defined in the ⟨undefined⟩ [xtremweb.worker.conf], page ⟨undefined⟩.

6.2.1 The worker configuration file

You will find a 'conf/ xtremweb.worker.conf' file in the distribution. If you have downloaded the sources distribution, the installation process create it for you in your installation directory by the `make install` command.

The default configuration file for the worker is named 'xtremweb.worker.conf' and located in the 'conf/' directory. If the worker can't access this file, it looks in your home directory in the subdirectory '${HOME}/. XWHEP/xtremweb.worker.conf'. In the source distribution there is a template called 'xwrc.in' in the 'misc' directory. For more details about installation see ⟨undefined⟩ [What has been installed], page ⟨undefined⟩.
You can also provide any other configuration file, see Section 6.2.2 [Launch the XWHEP worker], page 20.

The configuration of the file consists of several pairs of 'keys' and their values separated by the : character. A line begining by # is a comment.

- Connection configuration
  - **dispatcher.servers** sets the server to connect to; it a space separated servers list.

  - **port.tcp** port to connect the server through TCP (default 4321)
  - **port.udp** port to connect the server through UDP (default 4322)
  - **port.worker.http** port where the worker may listen at (default 4323)
  - **port.http** port to connect the server through HTTP (default 4324)
  - **port.https** port to connect the server through HTTPS (default 4325)
  - **port.xlmrpc** port to connect the server through XML RPC (default 4326)
  - **port.sunrpc** port to connect the server through SUN RPC (default 4327)
  - **java.nio** defines wether to use NIO. Forced to false with HTTP layer (default 4329)
  - Activation Policy
    The activation policy defines the worker availability; a worker is available when it may compute in a non intruding way.
    - **activator.class** defines the activation policy (when the worker can compute?)
      Available policies:
      - **xtremweb.worker.AlwaysActive** : this always allows the worker to compute; this is the default.
      - **xtremweb.worker.DateActivator** : the worker availability is monitored by date and time.
        - **activator.date** defines dates and times 'a la' crontab, following these rules:
          - this string can contains two parameters : the **days of week**, then the **hours of days**
          - be aware that defining days with no hours, defines full days (e.g. 24 hours)
          - several comma separated gaps may be provided
          - Field grammar:
            - '*' : every possible values

      - <x> : a unic value
      - <x-y> : a couple of values separated by an hyphen (’-’) defining a gap from x to y
    - two fields are allowed :
      - 1st field defines days of week
        - ’*’ for every day
        - ’1’, ’sun’ or ’sunday’
        - ’2’, ’mon’ or ’monday’
        - ...
        - ’7’, ’sat’ or ’saturday’
        - <N-M> a couple (of integers or Strings) defining days from N to M
      - 2nd field defines hours
        - ’*’ every hour
        - <N> an integer defining a complete hour (0 <= N <= 23)
        - <N-M> a couple of integers defining hours from N:00 to M:59 (0,0 <= N,M <= 23,23)
    - Examples:
      - “* *” : every days, full day
      - “* 1” : every days, from 1:00AM to 1:59AM
      - “* 11-17” : every days, from 11:00AM to 5:59PM
      - “1 *” : every sunday, full day
      - “Thu” : every thursday, full day
      - “2-Thu *” : from tuesday to thursday, fulle days
      - “4-2” : from thursday to tuesday, full days
      - “Thu-Tue 18-3” : from thursday to tuesday, from 6:00PM to 3:59AM
      - “Thu-Tue 18-3, Sat-Sun *” : from thursday to tuesday, from 6:00PM to 3:59AM **AND** every week end, full day
- **xtremweb.worker.CpuActivator** : the worker computing availability is monitored by the CPU activity.
  - **cpuload** defines the CPU activity level where the worker must stop working
    If the owner of the machine request more than **cpuload**% of its CPU, the worker stops working.
  - under **win32** : this is automatically replaced by the **xtremweb.worker.WinSaver**
  - under **Mac OS X** : this is automatically replaced by the **xtremweb.worker.DateActivator**

    - **xtremweb.worker.MouseKbdActivator** : the worker computing availability is monitored by the mouse/keyboard activity.
      If the owner don't use its mouse/keyboard for 30 seconds, the worker may compute until the owner use mouse/keyboard.
      This does not work under **Mac OS X**
    - **xtremweb.worker.WinSaverActivator** : the worker computing availability is monitored by the screen saver activity : if the screen saver is running, the worker may compute.
      This this is **win32** only.
    - **xtremweb.worker.MacSaverActivator** : the worker computing availability is monitored by the screen saver activity : if the screen saver is running, the worker may compute.
      This is **Mac OS X** only.
      This does not work yet.
- Miscellaneous
  - **update.restartCommand** is not used
  - **alive.period** is not used; this is set by the server at connection time.
  - **tomcat.port** is not used yet.
  - **path.tmpdir** defines the directory where the worker can store things; default is system default (i.e. /tmp).
  - **workpool.size** sets the number of jobs the worker can compute simultaneously; default is the amount of CPU.
  - **tracer.enable** tells whether worker activity traces should be collected and sent to the server; default if no.
  - **notify.enable** tells to display an icon in the task tray.
    This is **win32** only.
  - **Logging facilities**. Please refer to Section 6.1 [XWHEP server], page 15.
- Security Configuration
  - **sandbox.enable** defines whether to use the sandbox. The sandbox is experimental and not provided in the distribution. For Mac OS X 10.5 and linux only.
  - **sandbox.name** defines whether to use the sandbox. The sandbox is experimental and not provided in the distribution. For Mac OS X 10.5 and linux only.
  - **sandbox.args** defines whether to use the sandbox. The sandbox is experimental and not provided in the distribution. For Mac OS X 10.5 and linux only.
  - **sandbox.embedded** defines whether the sandbox can be found in the Java Jar file. The sandbox is experimental and not provided in the distribution. For Mac OS X 10.5 and linux only.
  - **path.certfile** defines the SSL certificate file.

6.2.2 Launch the XWHEP worker

6.2.2.1 Linux.

Scripts to launch the worker are stored in the '`bin/`' directory.

Be aware that the script uses some definition in '`bin/xtremwebconf.sh`'.
One should read and edit this file.

The script '`bin/xtremweb.worker`' helps to manage the worker. It request one argument which may take four values : console, start, stop and restart:

- **start** starts the worker as daemon
- **console** starts the worker without backgrounding it
- **stop** stops the worker
- **restart** stops and restarts the server.

Example:

```
xtremweb.worker start
```

You can also run the worker without the script and provide your own configuration file:

```
java -jar lib/xtremweb.jar xtremweb.worker.Worker --xwconfig <a configuration file>
```

To launch the worker as daemon, you must have sufficient privileges because the script try to execute the server under the "xtremweb" user defined in your '`xtremwebconf.sh`' file.

6.2.2.2 Mac OS X.

The installer provide a worker that is launched at boot time.

The way to manage the worker is similar to Linux platform, except the script is in '`/Library/StartupItems/xtremweb.worker/`'. Please refer to See Section 6.2.2.1 [Launching under Linux], page 20 section.

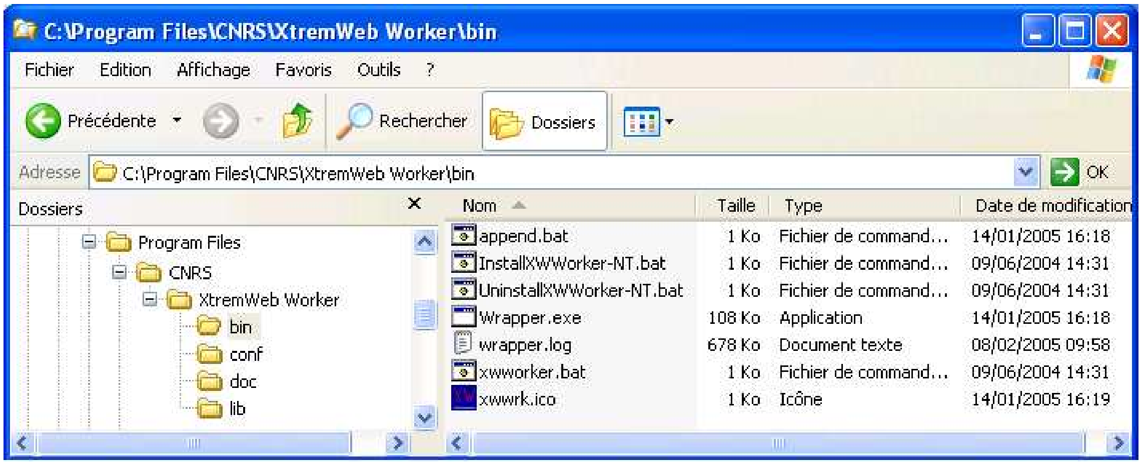
6.2.2.3 Win32.

Please note that all images included in this section are screen copies, hence they may contain text in french due to my Windows installation.
Hope this is understandable for non french reader :).

The package is provided as an '`.exe`' file downloadable from the platform web site.

As download finished, you can double click to run it; this creates a directory hierarchy typically in the '`Program Files`' folder, as shown in figure [Typicall installation], page 20.

Typicall installation



Adresse C:\Program Files\CNRS\XtremWeb Worker\bin

Nom	Taille	Type	Date de modification
append.bat	1 Ko	Fichier de command...	14/01/2005 16:18
InstallXWWorker-NT.bat	1 Ko	Fichier de command...	09/06/2004 14:31
UninstallXWWorker-NT.bat	1 Ko	Fichier de command...	09/06/2004 14:31
Wrapper.exe	108 Ko	Application	14/01/2005 16:18
wrapper.log	678 Ko	Document texte	08/02/2005 09:58
xwworker.bat	1 Ko	Fichier de command...	09/06/2004 14:31
xwwrk.ico	1 Ko	Icône	14/01/2005 16:19

The '`bin/`' directory contains several scripts as shown in ⟨undefined⟩ [Figure 3 : Install NT service], page ⟨undefined⟩.

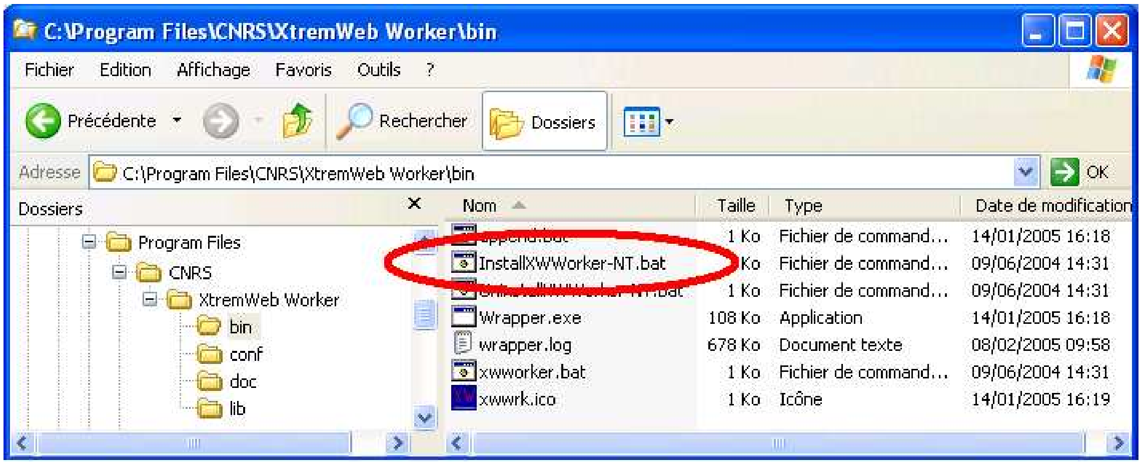
Among them are:

- xwworker.bat; double click to manually run the XWHEP worker;
- InstallXWWorker-NT.bat; double click to install the XWHEP worker as Windows service;
- UninstallXWWorker-NT.bat; double click to uninstall the XWHEP worker Windows service.

Preparing the worker package as Windows service is the best way to use it. It will then run in background without disturbing the owner of the machine; by default, it will only compute when the owner don't use it machine. See ⟨undefined⟩ [xtremweb.worker.conf], page ⟨undefined⟩ for more information on configuring the worker.

Double click on '`bin/InstallXWWorker-NT.bat`' to install the worker as Windows service as shown in figure [Install NT service], page 21.
Installing an NT service requires administrator privileges; please ask your system administrator, if needed.

Install the worker as NT service


C:\Program Files\CNRS\XtremWeb Worker\bin
Fichier Edition Affichage Favoris Outils ?
Précédente
Rechercher
Dossiers
Adresse C:\Program Files\CNRS\XtremWeb Worker\bin
OK
Dossiers
Program Files
CNRS
XtremWeb Worker
bin
conf
doc
lib

Nom	Taille	Type	Date de modification
append.bat	1 Ko	Fichier de command...	14/01/2005 16:18
InstallXWWorker-NT.bat	Ko	Fichier de command...	09/06/2004 14:31
UninstallXWWorker-NT.bat	1 Ko	Fichier de command...	09/06/2004 14:31
Wrapper.exe	108 Ko	Application	14/01/2005 16:18
wrapper.log	678 Ko	Document texte	08/02/2005 09:58
xwworker.bat	1 Ko	Fichier de command...	09/06/2004 14:31
xwwrk.ico	1 Ko	Icône	14/01/2005 16:19

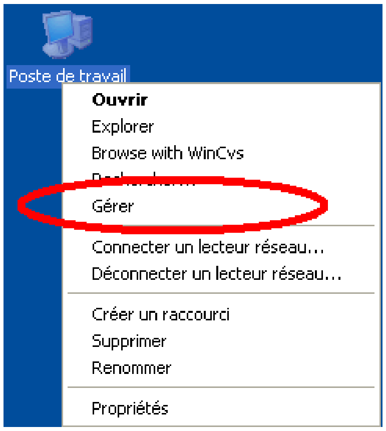
You can check that the worker service has been correctly installed.

This procedure will also help to manage the service :

- manually start the service;
- manually stop the service;

To do so, first right click on your workstation icon in your start menu or on your desktop, then click on “manage” item, as shown in figure [Manage NT workstation], page 22.

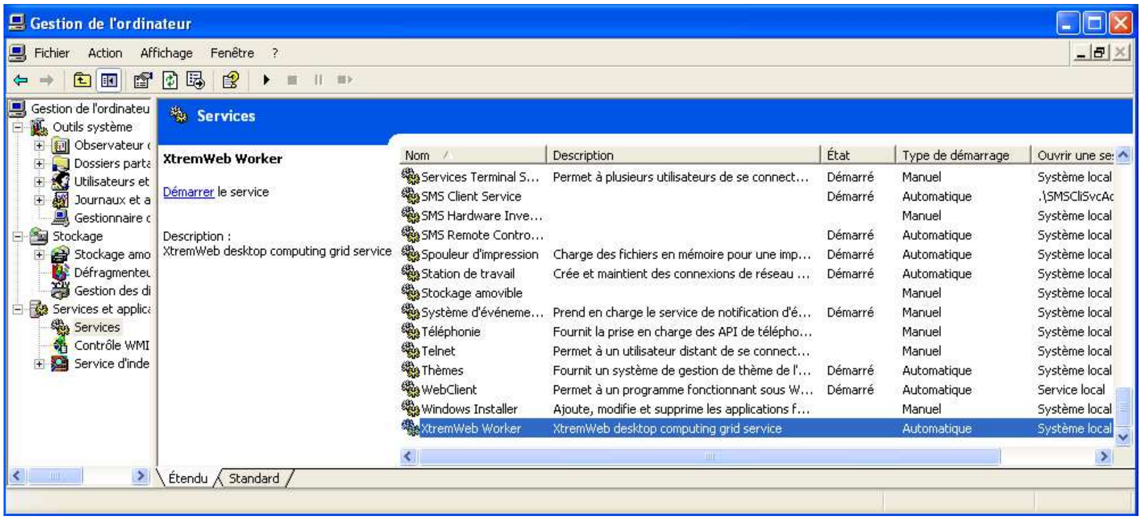
Select the “manage” option



This open the workstation management window.
Select the “services and applications” item, then the “services” item and look for the XWHEP service as shown in figure [NT service installed], page 23.
It should be the last one in the list, depending of your configuration.

If you don’t find the XWHEP worker in the list, it has not been correctly installed. Please, return to [Windows service], page 21 and try again.

Worker installed as NT service



XtremWeb Worker

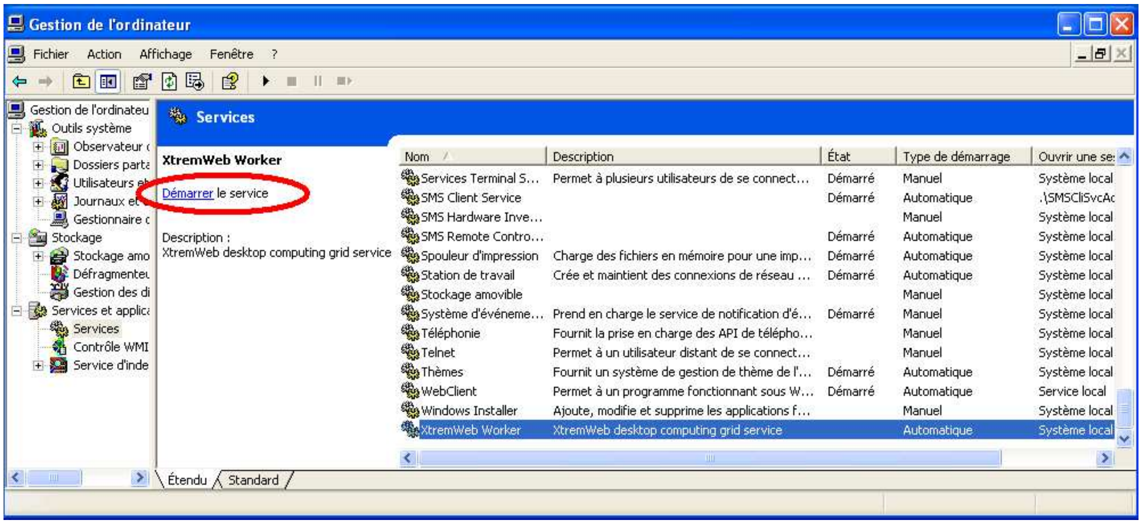
Démarrer le service

Description :
XtremWeb desktop computing grid service

Nom	Description	État	Type de démarrage	Ouvrir une se:
Services Terminal S...	Permet à plusieurs utilisateurs de se connect...	Démarré	Manuel	Système local
SMS Client Service		Démarré	Automatique	.\SMSCliSvcAc
SMS Hardware Inve...			Manuel	Système local
SMS Remote Contro...		Démarré	Automatique	Système local
Spouleur d'impression	Charge des fichiers en mémoire pour une imp...	Démarré	Automatique	Système local
Station de travail	Crée et maintient des connexions de réseau ...	Démarré	Automatique	Système local
Stockage amovible			Manuel	Système local
Système d'événeme...	Prend en charge le service de notification d'é...	Démarré	Manuel	Système local
Téléphonie	Fournit la prise en charge des API de télépho...		Manuel	Système local
Telnet	Permet à un utilisateur distant de se connect...		Manuel	Système local
Thèmes	Fournit un système de gestion de thème de l'...	Démarré	Automatique	Système local
WebClient	Permet à un programme fonctionnant sous W...	Démarré	Automatique	Service local
Windows Installer	Ajoute, modifie et supprime les applications f...		Manuel	Système local
XtremWeb Worker	XtremWeb desktop computing grid service		Automatique	Système local

You can click on the XWHEP worker service to select it and click on the “Start” item as shown in figure [Start the NT service], page 23.
Note that you don’t have to manually start the XWHEP worker; it is configured to start at every boot of your machine.

Start the worker NT service



XtremWeb Worker

Démarrer le service

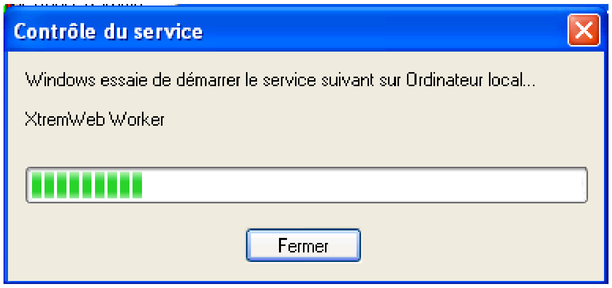
Description :
XtremWeb desktop computing grid service

Nom	Description	État	Type de démarrage	Ouvrir une se:
Services Terminal S...	Permet à plusieurs utilisateurs de se connect...	Démarré	Manuel	Système local
SMS Client Service		Démarré	Automatique	.\SMSCliSvcAc
SMS Hardware Inve...			Manuel	Système local
SMS Remote Contro...		Démarré	Automatique	Système local
Spouleur d'impression	Charge des fichiers en mémoire pour une imp...	Démarré	Automatique	Système local
Station de travail	Crée et maintient des connexions de réseau ...	Démarré	Automatique	Système local
Stockage amovible			Manuel	Système local
Système d'événeme...	Prend en charge le service de notification d'é...	Démarré	Manuel	Système local
Téléphonie	Fournit la prise en charge des API de télépho...		Manuel	Système local
Telnet	Permet à un utilisateur distant de se connect...		Manuel	Système local
Thèmes	Fournit un système de gestion de thème de l'...	Démarré	Automatique	Système local
WebClient	Permet à un programme fonctionnant sous W...	Démarré	Automatique	Service local
Windows Installer	Ajoute, modifie et supprime les applications f...		Manuel	Système local
XtremWeb Worker	XtremWeb desktop computing grid service		Automatique	Système local

A pop-up window then appears with a progression bar. as shown in figure [Starting the NT service], page 24.

If something goes wrong (not enough privileges, Java not correctly installed...) a warning window appears. Please, return to [Windows service], page 21 and try again.

Starting the worker NT service

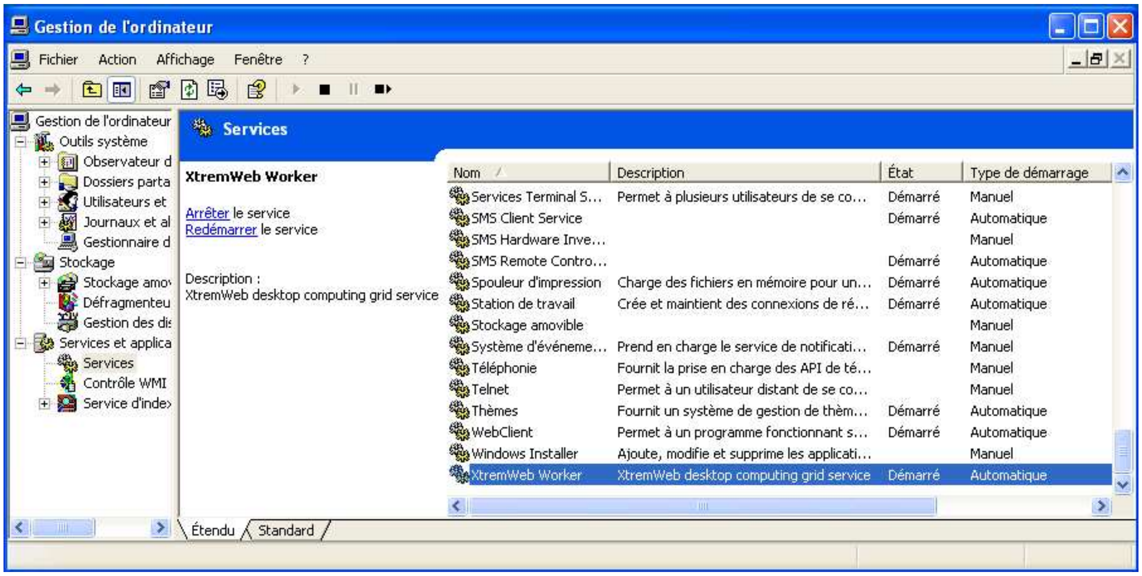


Windows essaie de démarrer le service suivant sur Ordinateur local...

XtremWeb Worker

If the service has successfully been started, the “state” column should display “started” (noted as in figure [NT service started], page 24) for the XWHEP worker service as shown in figure ⟨undefined⟩ [FNT service started], page ⟨undefined⟩.

Worker NT service started



XtremWeb Worker

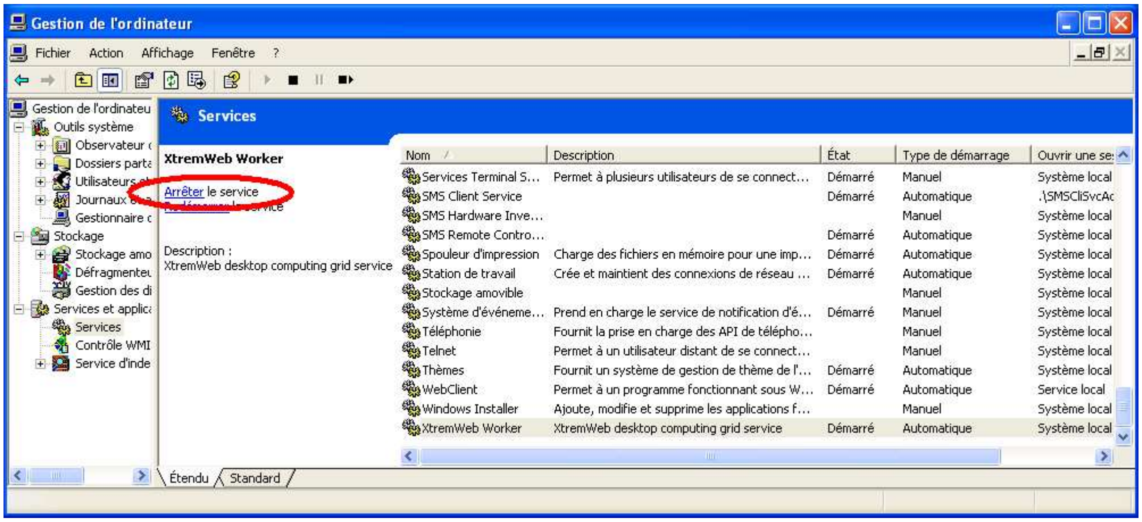
Arrêter le service
Redémarrer le service

Description :
XtremWeb desktop computing grid service

Nom	Description	État	Type de démarrage
Services Terminal S...	Permet à plusieurs utilisateurs de se co...	Démarré	Manuel
SMS Client Service		Démarré	Automatique
SMS Hardware Inve...			Manuel
SMS Remote Contro...		Démarré	Automatique
Spouleur d'impression	Charge des fichiers en mémoire pour un...	Démarré	Automatique
Station de travail	Crée et maintient des connexions de ré...	Démarré	Automatique
Stockage amovible			Manuel
Système d'événeme...	Prend en charge le service de notificati...	Démarré	Manuel
Téléphonie	Fournit la prise en charge des API de té...		Manuel
Telnet	Permet à un utilisateur distant de se co...		Manuel
Thèmes	Fournit un système de gestion de thèm...	Démarré	Automatique
WebClient	Permet à un programme fonctionnant s...	Démarré	Automatique
Windows Installer	Ajoute, modifie et supprime les applicati...		Manuel
XtremWeb Worker	XtremWeb desktop computing grid service	Démarré	Automatique

If you want to stop the XWHEP worker service, click to select it and click on the "Stop" item as shown in figure [Stop the NT service], page 25.

Stop the worker NT service



XtremWeb Worker

Arrêter le service
Redémarrer le service

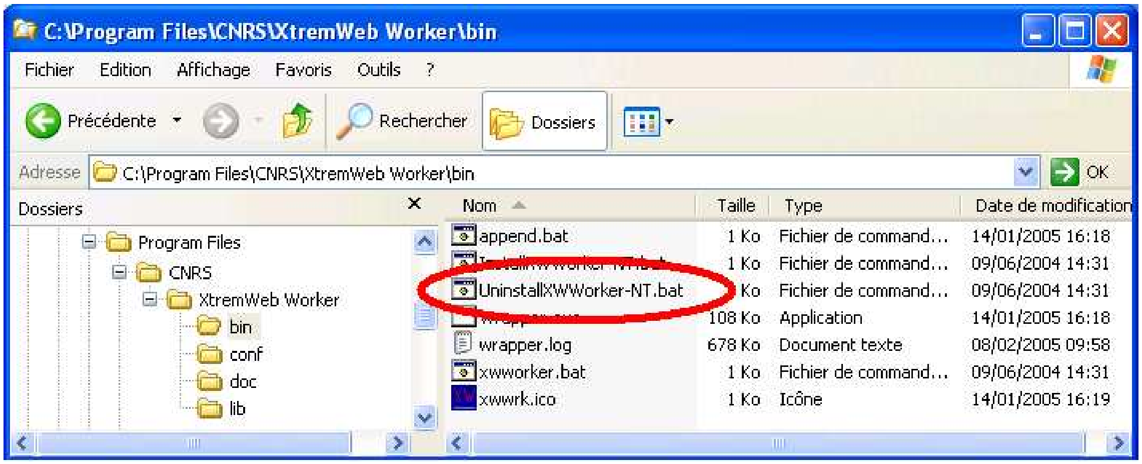
Description :
XtremWeb desktop computing grid service

Nom	Description	État	Type de démarrage	Ouvrir une se:
Services Terminal S...	Permet à plusieurs utilisateurs de se connect...	Démarré	Manuel	Système local
SMS Client Service		Démarré	Automatique	.\SMSCliSvcAc
SMS Hardware Inve...			Manuel	Système local
SMS Remote Contro...		Démarré	Automatique	Système local
Spouleur d'impression	Charge des fichiers en mémoire pour une imp...	Démarré	Automatique	Système local
Station de travail	Crée et maintient des connexions de réseau ...	Démarré	Automatique	Système local
Stockage amovible			Manuel	Système local
Système d'événeme...	Prend en charge le service de notification d'é...	Démarré	Manuel	Système local
Téléphonie	Fournit la prise en charge des API de télépho...		Manuel	Système local
Telnet	Permet à un utilisateur distant de se connect...		Manuel	Système local
Thèmes	Fournit un système de gestion de thème de l'...	Démarré	Automatique	Système local
WebClient	Permet à un programme fonctionnant sous W...	Démarré	Automatique	Service local
Windows Installer	Ajoute, modifie et supprime les applications f...		Manuel	Système local
XtremWeb Worker	XtremWeb desktop computing grid service	Démarré	Automatique	Système local

If you want to completly remove the XWHEP worker service, double click on ‘`bin/UninstallXWWorker-NT.bat`’ as chown in figure [Uninstall NT service], page 26. You must have enough privileges to do so. If needed, please ask your system administrator.

Note that this does not remove the XWHEP package from your computer. To do so, please use the standard Windows procedure through the “configuration pannel”.

Uninstall the worker NT service



Nom	Taille	Type	Date de modification
append.bat	1 Ko	Fichier de command...	14/01/2005 16:18
InstallXWWorker-NT.bat	1 Ko	Fichier de command...	09/06/2004 14:31
UninstallXWWorker-NT.bat	Ko	Fichier de command...	09/06/2004 14:31
wrapper.exe	108 Ko	Application	14/01/2005 16:18
wrapper.log	678 Ko	Document texte	08/02/2005 09:58
xwworker.bat	1 Ko	Fichier de command...	09/06/2004 14:31
xwwrk.ico	1 Ko	Icône	14/01/2005 16:19

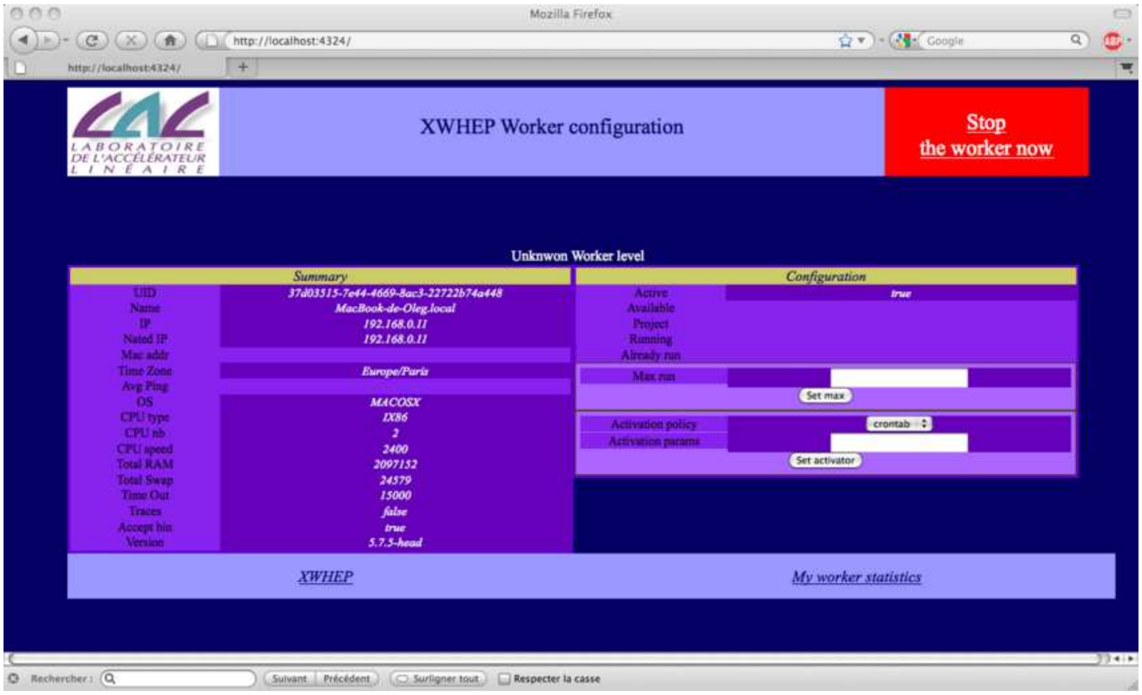
Please see Section 6.2 [XWHEP worker], page 16 to see how to configure and run the worker.

If you have followed the instructions detailed in Section 6.2.2.3 [Win32 installation], page 20, the worker is automatically launched for you.

Otherwise, you have to double click on ‘`xwworker.bat`’.

6.2.3 Control the XWHEP worker

Control the worker



XWHEP Worker configuration

Unknwon Worker level

Summary	
UID	37d03515-7e44-4669-8ac3-22722b74a448
Name	MacBook-de-Oleg.local
IP	192.168.0.11
Nated IP	192.168.0.11
Mac addr	
Time Zone	Europe/Paris
Avg Ping	
OS	MACOSX
CPU type	IX86
CPU nb	2
CPU speed	2400
Total RAM	2097152
Total Swap	24579
Time Out	15000
Traces	false
Accept bin	true
Version	5.7.5-head

Configuration	
Active	true
Available	
Project	
Running	
Already run	
Max run	
	Set max
Activation policy	crontab
Activation params	
	Set activator

6.3 XWHEP client

The client is the distributed part in charge of the platform usage. It aims to insert/delete applications, users and jobs, as to retrieve results. .
Actions are executed accordingly the user privilege level.

6.3.1 The client configuration file

The client configuration file is the same as for the worker.

Please refer to ⟨undefined⟩ [xtremweb.worker.conf], page ⟨undefined⟩.

6.3.2 Launch a XWHEP client

The client is a console application which aims to manage datas, applications, users and jobs, as to retrieve job results.

Scripts to run the client are stored in the '`bin/`' directory.

Be aware that the script uses some definition in '`bin/xtremwebconf.sh`'.

Several scripts are provided.

The client accepts both command and parameters; next sections detail them.

6.3.2.1 The client common parameters.

The client accepts some parameters which may be combined with all client actions.

- `--xwhelp` to get some helps
  - this parameters is optionnal ;
  - this parameters needs no argument ;
  - if this parameter is provided, the script shows some helps and exits.
- `--xwgui` to get the graphic user interface (see Section 6.3.10 [Client GUI], page 33)
  - this parameters is optionnal ;
  - this parameters needs no argument ;
  - if this parameter is provided, all other parameters are not used ;
  - if this parameter is provided, the client GUI is shown.
- `--xwconfig <a config file>` to provide a client configuration file.

  - this parameters is optionnal ;
  - this parameters needs one argument : a config file;.
  - if this parameter is not provided, the script looks whether a '`$HOME/.xtremweb/xwrc`' file exists.
- `--xwmacro <a macro file>` to provide a “macro” file (see Section 6.3.9 [Client macro file], page 33.)
  - this parameters is optionnal;
  - this parameters needs one argument : a “macro” file;.
  - if this parameter is provided, all other parameters are not used.
- `--xwformat <a format>` to get output in raw text, HTML, XML or CSV
  - this parameters is optionnal.
  - this parameters needs one argument which may take one of theses values;
    - **XML** to get the output as XML;
    - **HTML** to get the output as HTML;
    - **CSV** to get the output as comma separated values.
  - if this parameter is not provided, default output is XML.
- `--xwclean` to clean the cache.
- `--xwverbose` to get the most verbose mode.
- `--xwnoverbose` to get the least verbose mode.
- `--xwclientloopdelay` to set the client time out.

Some client parameters apply to specific client actions only; they are listed here and explained later in client actions sections.

- `--xwlabel <a label>` to give a label to the job when submitting a new job
- `--xwsession <session UID>` to insert a job into a session when submitting a new job
- `--xwgroup <group UID>` to insert a job into a group when submitting a new job
- `--xwcert <URI | UID>` to associate an X509 certificate when submitting a new job
- `--xwexpectedhost <host UID>` to associate a worker when submitting a new job
- `--xwenv <URI|UID>` to provide an environment when submitting a new job
- `--xwstdin <URI|UID>` to provide a standard input when submitting a new job
- `--xwnoextract` to tell the client to not expand the archive when downloading a result (this cancels `--xwrmzip`)
- `--xwrmzip` to tell the client to remove the archive when a result has been downloaded and extracted (this has no effect if `--xwnoextract` has also been provided)
- `--xwnoerase` to tell the client to not delete job when result has been downloaded
- `--xwoverride` to tell the client to redownload a file even if it exists on local FS

6.3.2.2 Client generic actions

There are two client actions that can be applied to all kind of object.

- `--xwremove <UID|URI>` to remove an object specified by its UID or URI. An object can be a user, an application, a job, a data... anything handled by the platform.
  A script to remove an object is provided with the package: '`bin/xwrm`'. Any removed object is marked as deleted in the database.

- `--xwchmod <UID|URI>` to modify an object access rights, specified by its UID or URI. An object can be a user, an application, a job, a data... anything handled by the platform.
  A script to change the access right of an object is provided with the package: '`bin/xwchmod`'.

6.3.3 Worker management with the XWHEP client

6.3.4 User management with the XWHEP client

The client accepts some parameters dedicated to user management : insert and delete users to/from the plateform.

The user management accepts some Section 6.3.2.1 [The client common parameters], page 28.

Here follow the client parameters dedicated to user management.

- `--xwgetusers` : list the users present in the plaform.
  - this parameters needs no argument;

  - this action requires administrator privileges to get full users list; otherwise one gets its own user informations only.
- `--xwsenduser <login> <password> <email> <rights> <usergroup> [--xwcert <X.509 cert or proxy>]` insert a new user binary in the platform;
  - this action requires administrator privileges;
  - this parameters needs four arguments in the exact following order:
    - **login** the login for this user.
    - **password** the password for this user.
    - **email** the email of this user.
    - **rights** the privilge level for this user.
    - **usergroup** to insert the user in a specific group.
    - **–xwcert** to specify the certificate to use if needed for authentication.
  - the **login** must be unic in the platform. If this login already exists, the insertion fails.

A set of scripts to manage the users is provided with the package : '`bin/xwusers`', '`bin/xwsenduser`', '`bin/xwusergroups`', '`bin/xwsendusergroup`'...

6.3.5 Data management with the XWHEP client

The client accepts some parameters dedicated to data management : insert, retreive and delete data to/from the plateform.

The data management accepts some Section 6.3.2.1 [The client common parameters], page 28.

Here follow the client parameters dedicated to data management.

- `--xwgetdatas` : list the datas present in the plaform.
  - this parameters needs no argument.
- `--xwsenddata <Application Name> <CPU> <OS> <URI to binary>` insert a new data in the platform;
  - this option needs four arguments in the exact following order:
    - **Application Name** is a name of your choice for this application;
    - **CPU** indicates the type of architecture the binary file has been compiled for (ix86, alpha, ...)
    - **OS** indicates the type of operating system the binary file has been compiled for (Linux, win32, ...)
    - **URI** is the path as a URI to the binary file for this application that will be executed by workers for jobs associated with this application.

  - this set of four arguments must be **UNIC** in the platform. If you insert e new application with the same arguments, then the existing application will be replaced by the new one. If you have more than one binary for one application (e.g, for Mac OS X, Win32, Linux...), insert an application for each binary, with the same **Application Name**, but with different **CPU**, **OS** and **URI** options.

A set of scripts to manage the datas is provided with the package : '`bin/xwdatas`', '`bin/xwsenddata`'.

6.3.6 Application management with the XWHEP client

The client accepts some parameters dedicated to application management : insert and delete applications to/from the plateform.

The application management accepts some Section 6.3.2.1 [The client common parameters], page 28.

Here follow the client parameters dedicated to application management.

- `--xwgetapps` : list the applications present in the plaform.
  - this parameters needs no argument.
- `--xwsendapp <Application Name> <CPU> <OS> <URI to binary>` insert a new application in the platform;
  - this action requires administrator privileges;
  - this option needs four arguments in the exact following order:
    - **Application Name** is a name of your choice for this application;
    - **CPU** indicates the type of architecture the binary file has been compiled for (ix86, alpha, ...)
    - **OS** indicates the type of operating system the binary file has been compiled for (Linux, win32, ...)
    - **URI** is the path as a URI to the binary file for this application that will be executed by workers for jobs associated with this application.
  - this set of four arguments must be **UNIC** in the platform. If you insert e new application with the same arguments, then the existing application will be replaced by the new one. If you have more than one binary for one application (e.g, for Mac OS X, Win32, Linux...), insert an application for each binary, with the same **Application Name**, but with different **CPU**, **OS** and **URI** options.

A set of scripts to manage the applications is provided with the package : '`bin/xwapps`', '`bin/xwsendapp`'.

6.3.7 Jobs management with the XWHEP client.

The client accepts some parameters dedicated to jobs management : insert and delete jobs to/from the plateform.

The job management accepts some Section 6.3.2.1 [The client common parameters], page 28.

Here follow the client parameters dedicated to job management.

- `--xwgetworks [jobUID, jobUID...]` : list job status.
  - this returns jobs for the user as provided in ⟨undefined⟩ [xtremweb.worker.conf], page ⟨undefined⟩;
  - this parameters needs zero or more arguments;
    - if no **job UID** is provided, this retrieves all jobs for the user;
    - **job UID** : one or more space separated jobUID may be provided.
- `--xwgettasks [jobUID, jobUID...]` : list status of job instances (i.e. job and associated running worker).
  - this returns job instance status for the user as provided in ⟨undefined⟩ [xtremweb.worker.conf], page ⟨undefined⟩;
  - this parameters needs zero or more arguments;
    - **job UID** job UID to retreive instance status for.
- `--xwsendwork <Application Name> [--xwenv <zip file> ] [--xwcert <cert or proxy>] [--xwlabel <label> ] [application parameters] [ '<' <input file>]` insert a new job.
  - this requires job insertion privilege level (rights above or equal to 5 as shown by ⟨undefined⟩ [xwusers], page ⟨undefined⟩).
  - this parameters needs at least one argument;
    - **application name** is required; it is the name of an installed application as shown by ⟨undefined⟩ [xwapps], page ⟨undefined⟩;
    - **–xwenv <zipfile>** is optionnal and specify a zip file containing a set of files needed by the job at runtime. This is known as the **job environment**. This option accepts a zip file, a directory structure or a file name. In the last cases, the client create a new zip file containing the provided directory and/or files for the job.
    - **–xwlabel <label>** is optionnal and specifies a symbolic label of your choice for this job.
    - **–xwcert <cert or proxy>** is optionnal and specifies what X.509 certificate or proxy tu use for this job.
    - **application parameters** is optionnal and specific to the requested application;
    - **input file** is optionnal and specify standard input for your job (this **must** be after the character '<');

A set of scripts to manage jobs are provided with the package in the '`bin/`' directory.

- xwworks;
- xwtasks.
- xwsendwork.

6.3.8 Results management with the XWHEP client.

The client accepts some parameters dedicated to job results management : retreive and delete job results.

The results management accepts some Section 6.3.2.1 [The client common parameters], page 28.

Here follow the client parameters dedicated to results management.

- `--xwresult [jobUID, jobUID...]` : retrieve job results.
  - this downloads job results for the user as provided in ⟨undefined⟩ [xtremweb.worker.conf], page ⟨undefined⟩. Resuls are stored on the client runtime directory.
  - this parameters needs zero or more arguments;
    - if no job UID is provided, this retrieves all results for the user;
    - job UID : one or more space separated jobUID may be provided.

6.3.9 The client macro file

The client accepts "macro" file, which is just a text file with one command per line.

A macro file is provided to the client with the parameter `--xwmacro <a macro file>`. This parameter cancels all other client parameters but the `--xwconfig` parameter.

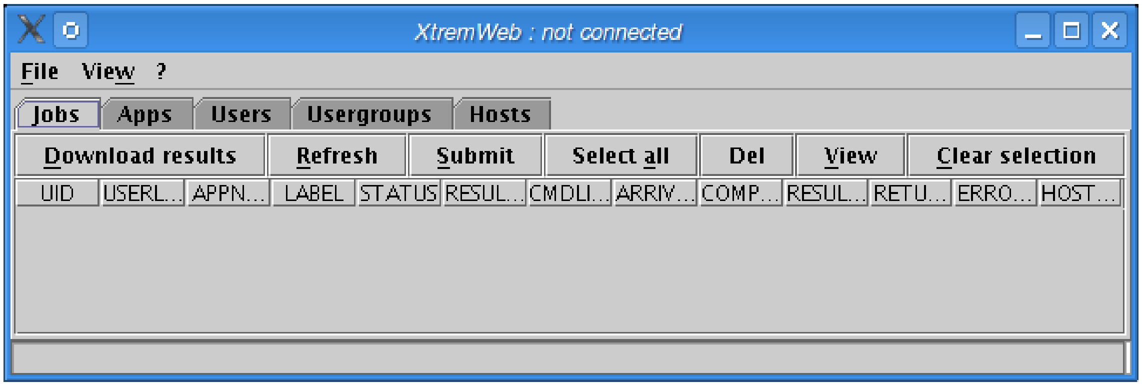
Examples:

```
xtremweb.client --xwmacro <a macro file>
xtremweb.client --xwconfig <a configuration file> --xwmacro <a macro file>
```

6.3.10 The client GUI

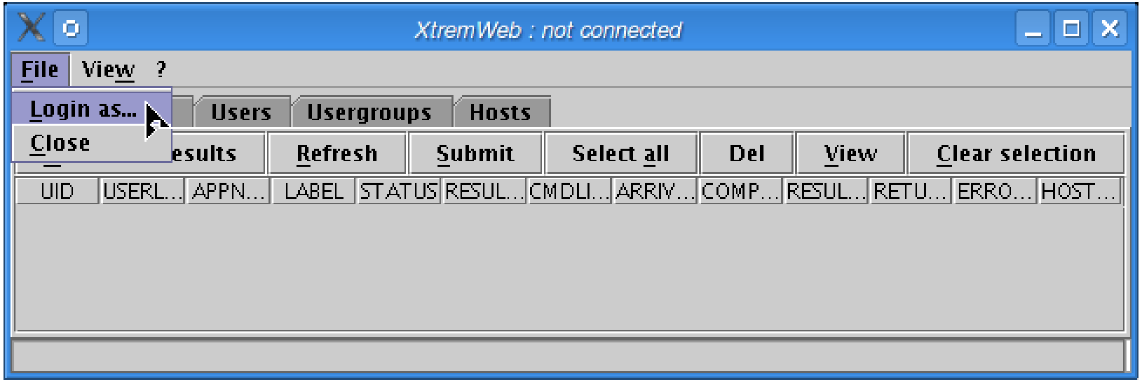
When launching the client with the –xwgui parameter (or when launching either the Mac OS X or Windows client), the main frame pops up as shown in figure [The client main frame], page 33.
As shown on the title, we are not connected to the platform yet.

The client main frame



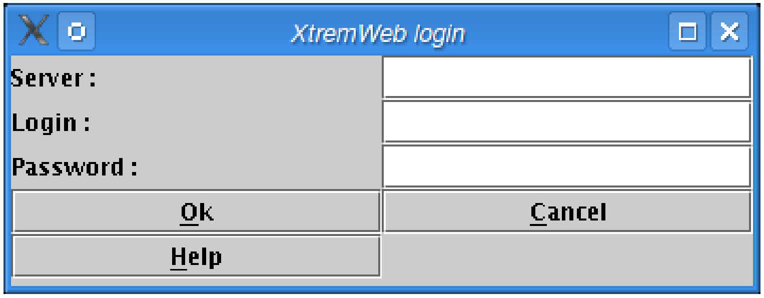
To connect, please select “Login as...” option in the “File” menu (figure [The “Login as...” menu option], page 34).

The “Login as...” menu option



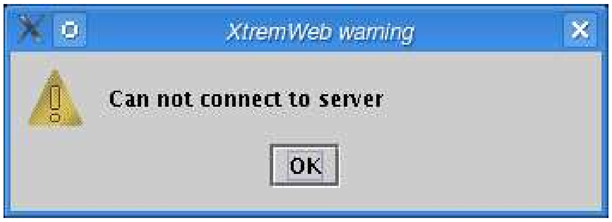
The login dialog pops up as shown on figure [Login dialog], page 34. You must fill the three fields.

The login dialog



If the server is not reachable the server error dialog pops up (figure [Server error dialog], page 34).

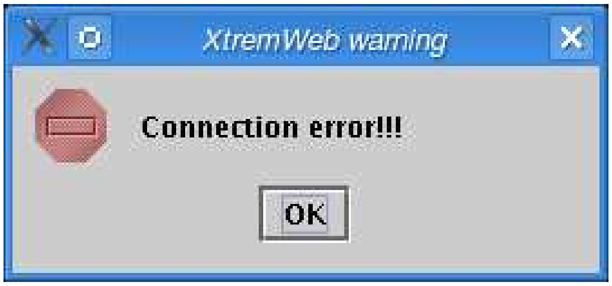
The server error dialog



Can not connect to server

If the login and/or password is not valid, or if the user is not authorized to connect, the error dialog pops up (figure [Connect error dialog], page 35).

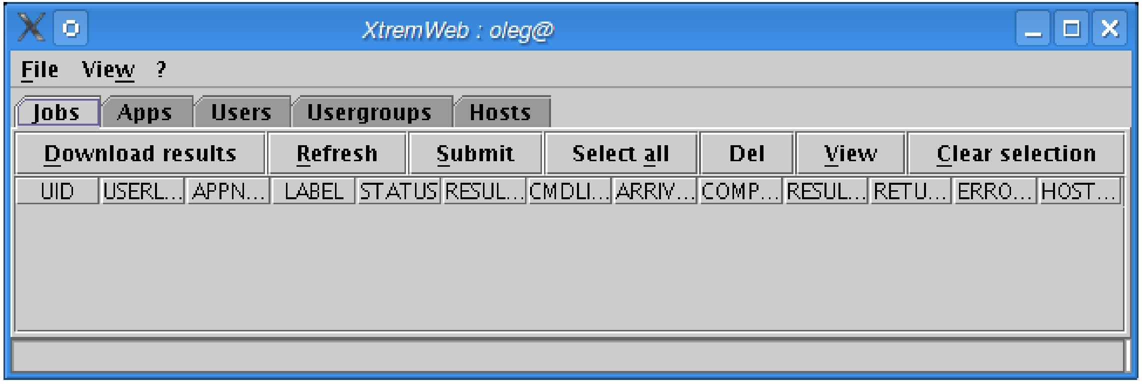
The connect error dialog



Connection error!!!

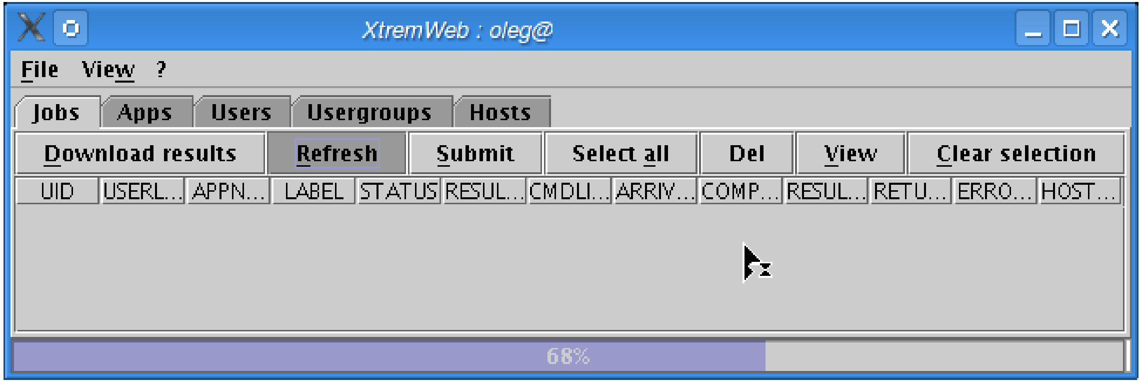
Once connected, the title displays the login (figure [Connected], page 35).

The user is connected



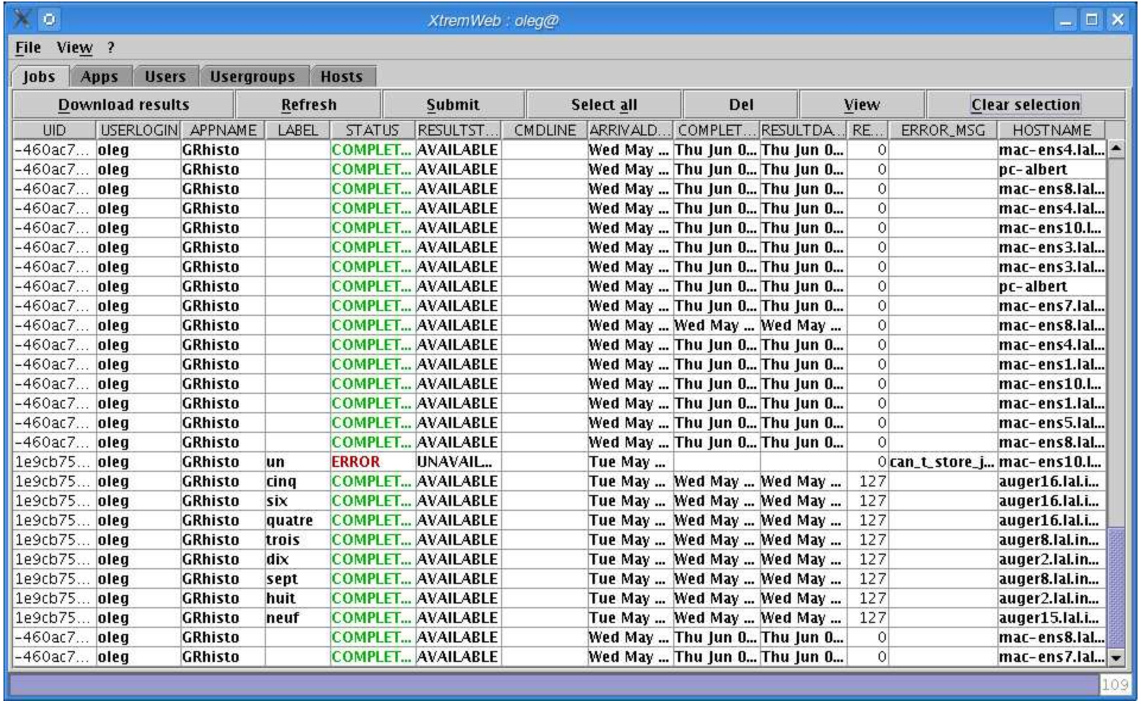
Click on “Refresh” to get your jobs list. The progress bar shows the download progression (figure [jobretreiving], page 35).

Figure 20 : Retreving jobs



As the download completes, your jobs are listed. The status bar shows the total of rows (figure [jobretreived], page 36).

Jobs retreived



UID	USERLOGIN	APPNAME	LABEL	STATUS	RESULTST...	CMDLINE	ARRIVALD...	COMPLET...	RESULTDA...	RE...	ERROR_MSG	HOSTNAME
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Thu Jun 0...	Thu Jun 0...	0		mac-ens4.lal...
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Thu Jun 0...	Thu Jun 0...	0		pc-albert
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Thu Jun 0...	Thu Jun 0...	0		mac-ens8.lal...
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Thu Jun 0...	Thu Jun 0...	0		mac-ens4.lal...
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Thu Jun 0...	Thu Jun 0...	0		mac-ens10.l...
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Thu Jun 0...	Thu Jun 0...	0		mac-ens3.lal...
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Thu Jun 0...	Thu Jun 0...	0		mac-ens3.lal...
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Thu Jun 0...	Thu Jun 0...	0		pc-albert
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Thu Jun 0...	Thu Jun 0...	0		mac-ens7.lal...
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Wed May ...	Wed May ...	0		mac-ens8.lal...
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Thu Jun 0...	Thu Jun 0...	0		mac-ens4.lal...
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Thu Jun 0...	Thu Jun 0...	0		mac-ens1.lal...
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Thu Jun 0...	Thu Jun 0...	0		mac-ens10.l...
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Thu Jun 0...	Thu Jun 0...	0		mac-ens1.lal...
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Thu Jun 0...	Thu Jun 0...	0		mac-ens5.lal...
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Thu Jun 0...	Thu Jun 0...	0		mac-ens8.lal...
1e9cb75...	oleg	GRhisto	un	ERROR	UNAVAIL...		Tue May ...			0	can_t_store_j...	mac-ens10.l...
1e9cb75...	oleg	GRhisto	cinq	COMPLET...	AVAILABLE		Tue May ...	Wed May ...	Wed May ...	127		auger16.lal.i...
1e9cb75...	oleg	GRhisto	six	COMPLET...	AVAILABLE		Tue May ...	Wed May ...	Wed May ...	127		auger16.lal.i...
1e9cb75...	oleg	GRhisto	quatre	COMPLET...	AVAILABLE		Tue May ...	Wed May ...	Wed May ...	127		auger16.lal.i...
1e9cb75...	oleg	GRhisto	trois	COMPLET...	AVAILABLE		Tue May ...	Wed May ...	Wed May ...	127		auger8.lal.in...
1e9cb75...	oleg	GRhisto	dix	COMPLET...	AVAILABLE		Tue May ...	Wed May ...	Wed May ...	127		auger2.lal.in...
1e9cb75...	oleg	GRhisto	sept	COMPLET...	AVAILABLE		Tue May ...	Wed May ...	Wed May ...	127		auger8.lal.in...
1e9cb75...	oleg	GRhisto	huit	COMPLET...	AVAILABLE		Tue May ...	Wed May ...	Wed May ...	127		auger2.lal.in...
1e9cb75...	oleg	GRhisto	neuf	COMPLET...	AVAILABLE		Tue May ...	Wed May ...	Wed May ...	127		auger15.lal.i...
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Thu Jun 0...	Thu Jun 0...	0		mac-ens8.lal...
-460ac7...	oleg	GRhisto		COMPLET...	AVAILABLE		Wed May ...	Thu Jun 0...	Thu Jun 0...	0		mac-ens7.lal...

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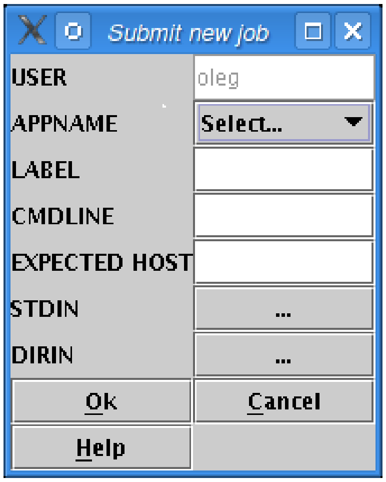
Click on “Submit” to submit a new job (figure [submit0], page 36).

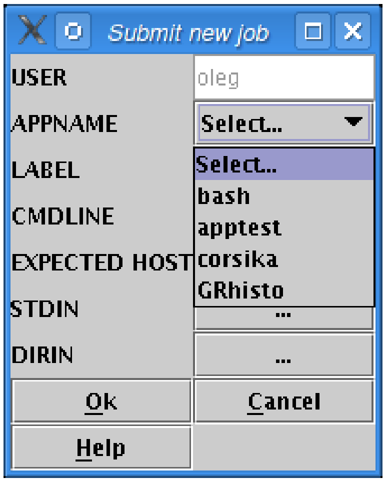
Submit a new job



USER	oleg
APPNAME	Select...
LABEL	
CMDLINE	
EXPECTED HOST	
STDIN	...
DIRIN	...

Select an application from the dropdown menu (figure [submit1], page 37).

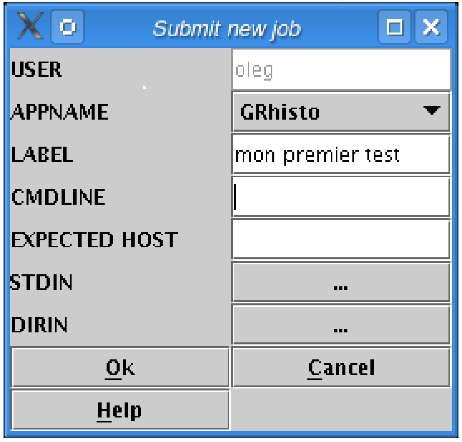
Submit a new job; select an application



USER oleg
APPNAME Select...
LABEL
CMDLINE
EXPECTED HOST
STDIN
DIRIN

Give a job label (this is optionnal) (figure [submit2], page 37).

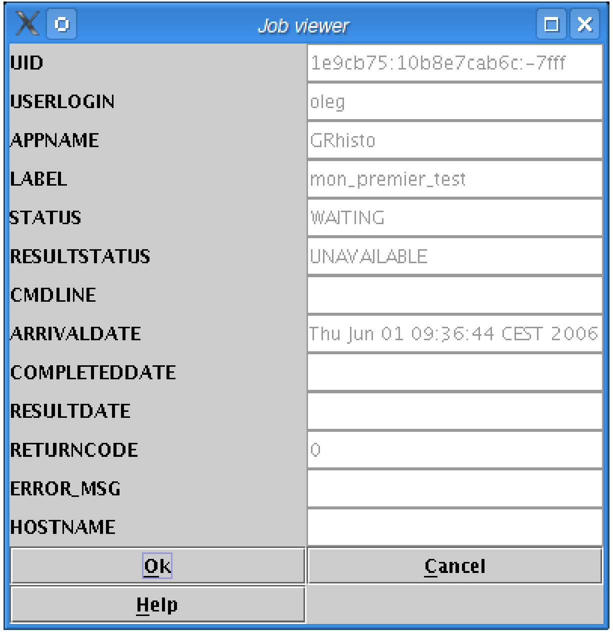
Figure 24 : Submit a new job; give a label



USER oleg
APPNAME GRhisto
LABEL mon premier test
CMDLINE
EXPECTED HOST
STDIN
DIRIN

Click on “View” (shown on figure [jobretreived], page 36) to see job details (figure [jobdetails], page 37).

Job details



UID	1e9cb75:10b8e7cab6c:-7fff
USERLOGIN	oleg
APPNAME	GRhisto
LABEL	mon_premier_test
STATUS	WAITING
RESULTSTATUS	UNAVAILABLE
CMDLINE	
ARRIVALDATE	Thu Jun 01 09:36:44 CEST 2006
COMPLETEDDATE	
RESULTDATE	
RETURNCODE	0
ERROR_MSG	
HOSTNAME	

7 Connecting XWHEP to other grids

Pilot Jobs is a way to use a Grid infrastructure to deploy end user jobs with an external scheduler (i.e. a scheduler which is not part of the infrastructure itself). XtremWeb and Condor teams have introduced this as *Gliding-in* in "XtremWeb & Condor : sharing resources between Internet connected Condor pools." *(O. Lodygensky, G. Fedak, F. Cappello, V. Neri, M. Livny, D. Thain at CCGRID 2003, Tokyo, JAPAN; May 12-15, 2003.)*

Security, monitoring and logging are the main issues in Pilot Jobs; see `http://edms.cern.ch/document/855383`.

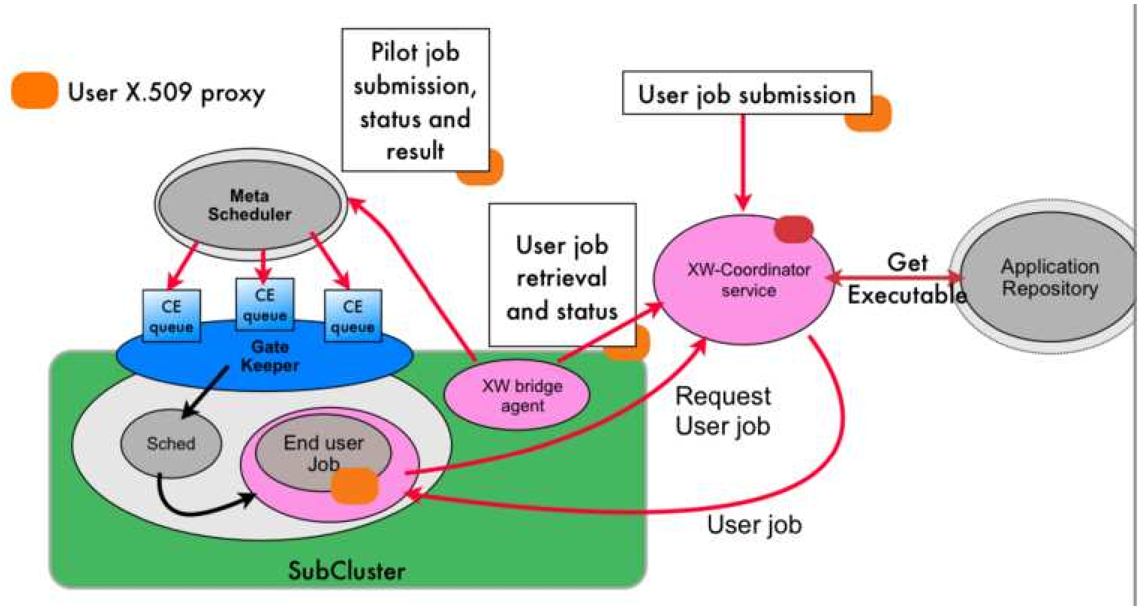
XWHEP solves these issues thanks to its innovative features:

- user rights management
- user rights delegation
- user groups
- user group applications

Security is ensured at three levels:

- computing node.
  - XWHEP includes a sandbox to isolate end user job computation
  - only validated applications from repository are candidate to run on SG nodes
- Application and data integrity.
  - application repository and data servers (including XWHEP) ensure integrity
- User authentication
  - only X.509 certied users can use SG nodes
  - users provide proxy certicate to submit a job to XWHEP scheduler
  - this proxy is used to submit Pilot Jobs to SG

Pilot Jobs



7.1 The Gliding-in approach

The *Gliding-in* approach to cluster resources spread in different Condor pool using the Global Computing system (XtremWeb) was first introduced in *xtremweb-condor*. The main principle consist in wrapping the XtremWeb worker as regular Condor task and submit this task to the Condor pool. Once the worker is executed on a Condor resource, the worker pulls jobs from the DG˜server, executes the XtremWeb task and return the result to the XtremWeb server. As a consequence, the Condor resources communicates directly to the XtremWeb server. Similar mechanisms are now commonly employed in Grid Computing *condor_grid2*. For example Dirac uses a combination of push/pull mechanism to execute jobs on several Grid clusters. The generic approach on the Grid is called a *pilot job*. Instead of submitting jobs directly to the Grids gatekeeper, this system submits so-called pilot jobs. When executed, the pilot job fetches jobs from an external job scheduler.

The gliding-in or pilot job approach has several advantages. While simple, this mechanism efficiently balance the load between heterogeneous computing sites. It benefits from the fault tolerance provided by the DG˜server; if Grid nodes fail then jobs are rescheduled to the next available resources. Finally, as the performance study of the Falkon *falkon* system shows, it gives better performances because series of jobs do not have to go through the gatekeeper queues which is generally characterized by long waiting time, and communication are direct between the computing element˜(*CE*) and the DG˜server without intermediate agent such as the superworker. From the security point of view, this approach breaks the Grid security rules which because jobs owner may be different than pilot job owners. This is a well known issue of pilot jobs and new solution such as *gLExec* are proposed to circumvent this security hole.

7.2 Bridging XtremWeb and EGEE

Our goal is to safely aggregate EGEE worker nodes in a single XtremWeb network. In this network, we assume that the users connect to the dispatcher administration domain to submit tasks. XtremWeb has the responsibility to ensure user authentication, hosts (workers) integrity, application and results protection and user execution logging.

In the rest of the paper, we based our study of the security model on the gliding-in technology. XtremWeb Workers are submitted to EGEE computing elements using JSDL wrappers.

7.2.1 User authentication and execution logging.

The coordinator site manages a list of authorized users as ACLs. It is the responsibility of the system administrator to register new users (and revoke non desired ones) on the coordinator. After registration, the coordinator provides a key to be used by the user for each subsequent connection. For each connection, a challenge is ran in order to ensure that the user is registered on the coordinator. All communications between the user XW client and the coordinator are encrypted using SSL. Then the coordinator works as a proxy for the user: all tasks are submitted to the workers through the coordinator credential. All executions on the workers are logged in the security perspective: all tasks contain a descriptor with the actual user credential so that workers and coordinator can take appropriate corrective action (user revocation), in case of security problem.

The design does not currently rely on certificates and presents a certain degree of risk for “Man is the Middle” (*MIM*) attacks but risks are very limited since 1) attacks should origin from within EGEE subclusters only (due to TCP protocols), and 2) workers and clients software include coordinator public key, then if one is able to securely ensure worker and client binaries installation to dedicated pools, the full system is not subject to *MIM* attacks since key exchanges will not be necessary any more.

A certification system based on X.509 certificates is under integration in XtremWeb. Subsequent experiments and futures XtremWeb installations will implement one, based on Open-SSL, allowing extension of clients and workers authentication by the coordinator.

7.2.2 Applications, parameters and results protection.

EGEE subclusters belonging to different administration domains fetch applications and tasks, and store results on the central coordinator. The only security issue concerning applications, parameters and results transfers is then about the connections between EGEE worker nodes and the coordinator. To ensure connection security between domains, 1) every connection from any client and worker to the coordinator is encrypted through *SSL* tunnels; 2) workers can only connect to the coordinator for which they have the public key. These two mechanisms prevent malicious participants to be able to intercept and read any connection, to connect to the coordinator and EGEE worker nodes to connect to a wrong XtremWeb coordinator.

7.2.3 Node integrity.

If, for any reason, a malicious user succeeds on accessing the system and launching an aggressive application, XtremWeb workers still protect their host by implementing *sandboxingSANDBOX2,SANDBOX3,SANDBOX1* for binary applications. This is a secure way

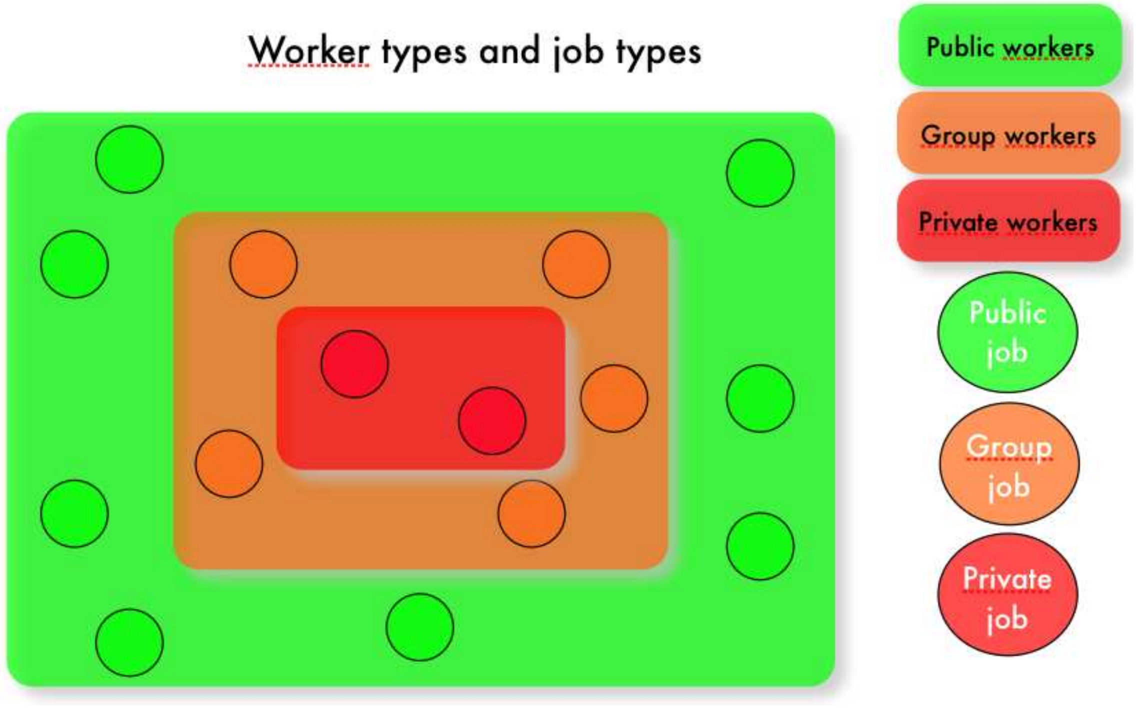
to execute applications, providing rights to do some actions and denying some others. One should note that Java applications are always executed inside a virtual machine which includes security*JAVASECURITY*; XtremWeb uses this functionality in two levels, one for the worker itself and a more restrictive one for the downloaded Java byte code. On the contrary, binary (or *native*) applications have access to the full hosting system by nature; workers are configured to run any task of that type inside a sand-box which is fully customizable, from memory usage to file system operations.
Java and sand-boxes, have performance costs*SANDBOX-PERF*; one can then disable this functionality on highly secured systems, such as clusters under a fully closed firewall.

7.2.4 Access confinement.

XtremWeb 2.0.0 introduces the notion of user rights and access rights. These new features permit to extend user actions over the platform as well as to define groups.
Access rights must be understood as linux file system ones (e.g. 0x755, uog+r etc.) and are used to define data (which is also a new paradigm in XtremWeb 2.0.0 but not discuss in this paper), application and job accesses. The default access is *0x755* which grants full access (read, write, execute) to owner, and limited access (read, execute) to users belonging to the owner group read and execute, as well as other users. Denying access to non group users, for example, consists to set access rights to *0x750*. The middleware includes the *xwchmod* command to do so.
Any user can insert its own applications in the platform. This feature could lead to security hazards since this could allow users to insert malicious applications. This is solved by access rights. A *standard* user can only insert *private* applications; any submitted jobs referring private applications are private too. There is no way to modify these; even *xwchmod* can't help to modify access rights of private entities (applications or jobs). A private entity has its access rights set to *0x700* which grants owner access only.
Inserting group or public entities needs advanced privileges which grants this action.

User rights, associated with access rights, permit to define public, groups and private levels. They define the action users can perform over the platform. The three main level rights are *standard*, *worker* and *advanced*. The *standard* level grants data management, job submission and private application insertion as defined earlier. The *advanced* level grants full access to the platform including private, group and public entities, as well as users, user groups and workers management.
To understand the last right level, *worker*, one must clearly understand that workers run under an identity registered on the coordinator. When a worker sends a message to request a job to compute, or for any other reason, it presents its identity, registered as an user identity and defining user rights level.
This level right permits to delegate user rights to workers so that they can access entities as if they were the entity owner. A public worker can bypass entities access rights in order to update them even if their access rights do not allow that action. This is used to update jobs status to *COMPLETED* when it has successfully been computed by a worker, or to store jobs results and set the owner to the job owner.
At installation time, the platform includes a specific user defined with worker level right,

aiming to deploy public workers.



On the other hand, we can also deploy private workers. Workers are private ones if they use a standard identity without the worker user rights level. Private workers will only compute private jobs.

Finally we can deploy group workers. Workers are group ones if they use an identity included in a group and defined with the worker user rights level. Group workers will only compute jobs of the same group.

The figure ⟨undefined⟩ [fig:groups], page ⟨undefined⟩ shows worker groups and the types of job they can run. We see that private jobs are run on private workers only, and groups jobs are run on group workers only. Public jobs can only be run on public workers.

7.3 Configuring the XWHEP bridge

You will find a '`conf/xtremweb.server.conf`' file in the distribution. If you have downloaded the sources distribution, the installation process create it for you in your installation directory by the `make install` command.

The configuration of the file consists of a pair of `keys` and their values separated by the '`=`' character. A line begining by '`#`' is a comment.

- Server configuration
  - **xtremweb.role** must be set to `server`
  - **admin.login** is the login of the platform administrator

  - **HomeDir** is the path containing applications and tasks
  - **ModulesLogged** sets the expected modules list. Existing modules are DBI, Comm, Task:
    - DBI: Database Interface
    - Comm: Communication received
    - Task: Tasks scheduled
  - **XWServer** contains a space separated servers list; this is used for replication only.

  - **port.tcp** port to connect the server through TCP (default 4321)
  - **port.udp** port to connect the server through UDP (default 4322)
  - **port.worker.http** port where the worker may listen at (default 4323)
  - **port.http** port to connect the server through HTTP (default 4324)
  - **port.https** port to connect the server through HTTPS (default 4325)
  - **port.xlmrpc** port to connect the server through XML RPC (default 4326)
  - **port.sunrpc** port to connect the server through SUN RPC (default 4327)
  - **java.nio** defines wether to use NIO. Forced to false with HTTP layer (default 4329)
- Database configuration
  - **XWdbHost** is the database server.
  - **XWdbName** is the database name Default in xtremweb.sql :"xtremweb" .
  - **XWdbUser** is the name of the user granted to access the database.
  - **XWdbPass** is the password of the user granted to access the database.
- Security configuration
  - **XWkeyStore** Put here the name of file containing the private key of the server and its certificate.
  - **XWpassPhrase** is the password needed to access that file '`XWCertPass`' by default.
- Logging facilities

  There are four levels: debug, info, warn and error.

7.4 Launching the XWHEP bridge

Scripts to launch the server are stored in the '`bin/`' directory.

Be aware that the script uses some definition in '`bin/xtremwebconf.sh`'.
One should read and edit this file.

The script expect the configuration file to be located in '`conf/`' directory.

The script '`bin/xtremweb.server`' helps to manage the server. It request one argument which may take four values : console, start, stop and restart:

- **start** starts the server as daemon

- **console** starts the server in the foreground (not as daemon)
- **stop** stops the server
- **restart** stops and restarts the server.

  Example:

  ```
  xtremweb.server start
  ```

To launch the server, you must have sufficient privileges because the script try to execute the server under the "xtremweb” user defined in your ‘`xtremwebconf.sh`’ file.

8 Troubleshooting and reporting bugs

Please report any bugs, remarks, questions etc. to our Trac web site (`http://trac.lal.in2p3.fr/DGHEP`): http://trac.lal.in2o3.fr/DGHEP

9 Troubleshooting and reporting bugs

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