OfficeGRID - Administrator's manual

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Contents

1 Introduction

Welcome to OfficeGRID!

This manual describes and explains the OfficeGRID software with focus on information relevant for **administrators**.

OfficeGRID from MESH Technologies[1] is a high performance Grid middleware which brings Grid technologies to everyone. With OfficeGRID is simple and easy to harness the excess power of the computers available at locations ranging from small offices to entire organisations and companies.

OfficeGRID runs on all major computing platforms:

- Microsoft Windows[2]
- Linux[3]
- Mac OS X[4]

OfficeGRID consists of the following components:

Server Each OfficeGRID includes a server, which should be available at all times. Users contact the server whenever they want to submit new jobs, query Grid or job status, retrieve completed job output, remove old jobs, and so on. A server handles job file storage and job queues end generally takes care of the job flow in the Grid.

Executor A server controls a number of executors, that take care of the actual job execution. When an executor is idle it requests a suitable job from the server, and if such a job is waiting in the job queue, it is dispatched to the executor. It is then executed and results are handed back to the server. If no suitable jobs are available, the executor will wait a while before requesting a job again. Executors can be bound to serve only a subset of the job queues for more fine grained control. Additionally an executor can be identified by platform and tags. Platform can be used to make sure that Windows specific jobs end up on Windows based executors, Linux jobs on Linux based executors and so on, if the Grid contains multiple executor platforms. Tags are normally used for identifying executors with specific run-time environments, which may be a particular application like Java, etc.

User Interfaces There are two user interfaces for OfficeGRID interaction - a graphical interface for user friendly job handling and a set of command line applications for efficient/scripted job handling.

Web interface OfficeGRID installations may include a web server that allows administrators and possibly users to monitor and interact with OfficeGRID through a web interface.

2 File Layout

The most important program and setup files in the installation are described here.

2.1 All

officegrid.cfg is the OfficeGRID configuration file which is per default shared by all installed components. It is a plain text file and it contains a configuration section for each component. It is possible to manually specify which configuration file to use using the OG_CONFIG variable if the system wide configuration for some reason does not fit for your purpose.

Simply set OG_CONFIG to the path of the preferred configuration before running the OfficeGRID commands.

2.2 Client

ogtaskbar is a graphical client which provides a task bar icon with pop-up windows for monitoring and submitting jobs.

og_NAME where NAME may be replaced by one of submit, shcmd, stat, status, res, ... are the command line applications, which are particularly useful for scripting purposes.

2.3 Executor

ogexecutor is the main executor application which may be started directly or with the appropriate 'service wrapper'. The latter depends on the platform, and it is further described in the individual platform sections below.

2.4 Server

ogserver is the main server application which may be started directly or with the appropriate 'service wrapper'. The latter depends on the platform, and it is further described in the individual platform sections below.

og.lic is the OfficeGRID license file used by the server to grant the Executors access to handle jobs. Trial versions of OfficeGRID includes only a limited license restricting the number of concurrent executors and it expires after a number of days (the actual terms for the trial license are available on the web[1]).

og.db is the OfficeGRID server data base used to keep track of jobs and executors.

2.5 Web Admin

ogwebadmin is an optional web server component which gives access to server statistics as well as a web interface to job manipulation. It may be started directly or with the appropriate 'service wrapper'. The latter depends on the platform, and it is further described in the individual platform sections below.

3 Installation

The OfficeGRID files are generally installed under a single directory, but apart from that the installation methods depends on your platform.

3.1 Windows: Install Wizard

The Windows installer uses the traditional install wizard approach. It runs through a number of dialogs where installation details are selected before actually installing anything.

Simply download the OfficeGRID Windows installer from the web[1] and run it to start the installation.

The installation directory is selected during the installation and the default is to install all files under

```
$PROGRAMFILES\OfficeGRID
```

which on an English version of Windows, maps to

```
c:\Program Files\OfficeGRID
```

On localised versions of Windows, PROGRAMFILES may very well map to another location. The install path and configuration path is automatically added to the PATH environment, so the installed binaries should work from the command line. Installation automatically takes care of adding system services that handle automatic starting of the installed server and executor components after boot up. After finishing the installation process it is necessary to reboot for the final steps of the installation to take effect.

3.2 Linux: Distribution Specific Binary Packages

Each of the distribution specific packages takes care of preparing automatic startup of any installed server and executor components. Additionally they add a few links and shortcuts to make the client tools easier to access. So its only a matter of making any desired configuration changes after installing the package.

Install the `officegrid-trial` package to try out a limited version of OfficeGRID for free, or install `officegrid-full` with your purchased license and your own configuration file for the full version.

In case you want a distributed setup without installing all components on each host, it is also possible to pick and choose between the individual office-

grid packages instead of using either of the officegrid-full and officegrid-trial meta packages.

All packages are digitally signed with our GPG key, so that their authenticity may (optionally) be verified before installation. With some distributions it is possible to install a package to automatically enable this package verification, while other ones may require manual download and import of the package signing key to achieve this. For the latter situation the GPG public key is available from:

`http://meshtechnologies.com/pub/gpg/mesh.asc`

Detailed information about managing Debian and Ubuntu packages is available in [5]. Similarly information about managing RPM packages is available in [6].

3.2.1 Debian

Debian packages are available from:

`http://meshtechnologies.com/pub/linux/debian/pool/officegrid/`

For easy package management just add the line

```
deb http://meshtechnologies.com/pub/linux/debian etch main non-free
```

to your package repositories. Please note that it may be possible to replace "etch" with the code name of your particular version of Debian. Even though we do not support "'all"' versions, we do try to support at least the latest stable versions.

After adding the OfficeGRID repository, use your favourite package manager (apt-get, aptitude, synaptic, ..) to install the officegrid packages.

If you want to make sure that packages are authentic and originating from MESH, please install the `mesh-archive-keyring` package first and update the package list before installing the officegrid packages. The mesh-archive-keyring installation will result in a warning message about an untrusted source, but that can safely be ignored.

As an example with *apt-get* the optional key installation would be:

```
apt-get update
apt-get install mesh-archive-keyring
```

please answer yes when you're warned about installing the package from 'an untrusted source' (which is MESH in this case).

The actual OfficeGRID installation of the trial version would then be:

```
apt-get update
apt-get install officegrid-trial
```

3.2.2 Ubuntu

Ubuntu packages are available from:

```
http://meshtechnologies.com/pub/linux/ubuntu/pool/officegrid/
```

For easy package management just add the line

```
deb http://meshtechnologies.com/pub/linux/ubuntu hardy main non-free
```

to your package repositories. Please note that it may be possible to replace "hardy" with the code name of your particular version of Ubuntu. Even though we do not support "'all"' versions, we do try to support at least the latest stable versions.

After adding the OfficeGRID repository, use your favourite package manager (apt-get, aptitude, synaptic, ..) to install the officegrid packages.

If you want to make sure that packages are authentic and originating from MESH, please install the `mesh-archive-keyring` package first and update the package list before installing the officegrid packages. The mesh-archive-keyring installation will result in a warning message about an untrusted source, but that can safely be ignored.

As an example with *apt-get* the optional key installation would be:

```
apt-get update
apt-get install mesh-archive-keyring
```

please answer yes when you're warned about installing the package from 'an untrusted source' (which is MESH in this case).

The actual OfficeGRID installation of the trial version would then be:

```
apt-get update
apt-get install officegrid-trial
```

3.2.3 Red Hat, Fedora, Suse, Mandriva (RPM distributions)

RPM packaged versions of OfficeGRID are available from:

```
http://meshtechnologies.com/pub/linux/rpm/pool/
```

For easy package management with the *yum* package manager, just make sure that yum is installed and then create a yum repository file (e.g. /etc/yum.repos.d/mesh.repo) with the following contents:

```
[main]
name=MESH Software - main - $basearch
baseurl=http://meshtechnologies.com/pub/linux/fedora/pool/backports
enabled=1
gpgkey=http://meshtechnologies.com/pub/gpg/mesh.asc
gpgcheck=1

[non-free]
name=MESH Software - non-free - $basearch
baseurl=http://meshtechnologies.com/pub/linux/fedora/pool/officegrid
enabled=1
gpgkey=http://meshtechnologies.com/pub/gpg/mesh.asc
gpgcheck=1
```

Now you can use yum to install the officegrid-X packages:

```
yum install officegrid-trial
```

The first time you install a package from the MESH repository you will be asked if it is OK to install and use the MESH GPG key for package verification. Please answer yes for the highest level of security.

3.3 Other Linux Distributions (Generic Install Script)

The Generic Install Script is a distribution independent installer, which handles most of the tasks that would otherwise be handled by the packages. It does lack a few features available in the packages, though, so it is slightly

more complicated to install this way. Thus the distribution specific package installation method is **recommended** when possible.

All component files are installed in /usr/local/og and it is not possible to select another location during install. However, it is possible to use symlinks to select another actual storage location. Simply install and move the installed directory to the desired location before adding a symlink from /usr/local/og to the desired location. The generic install script attempts to auto detect the host linux distribution and use the corresponding tools to enable automatic start up of the server and executor components. Thus if the installer is run on a fully supported distribution, services will be auto-started after future reboots. If the auto detection fails, the installation will continue, but it will warn about missing autostart support.

Please note that most of the commands in this section require administrative or root privileges. Thus it may be necessary to add *sudo* in front of the commands or switch to the root user with the *su* command before proceeding.

Simply download the appropriate OfficeGRID generic Linux installer script from the web[1] and run it from a terminal to start the installation. For the 32-bit version the install command is:

```
sh OfficeGRID-generic-x86.sh
```

and for the 64-bit version it is:

```
sh OfficeGRID-generic-x86_64.sh
```

In either case please follow the on screen instructions to complete the installation. You may optionally append ENABLE and DISTRO arguments to the install command in order get a finer grained control of the install process.

After the installation is done it is possible to manually install the OfficeGRID Python module with the following command:

```
cd /usr/local/og/api && python setup.py install
```

After installation it may be convenient to add links from the executables in /usr/local/og/ to /usr/bin/ so that the client applications are automatically available in the default PATH. Alternatively the same effect may be achieved by adding /usr/local/og to the system wide path.

4 Upgrading

Upgrading OfficeGRID resembles the installation procedure described above.

IMPORTANT: Before upgrading it is always a good idea to back up the central files:

- officegrid.cfg
- og.lic
- og.db

After the upgrade at least og.db should be copied to the installation directory if not there already. If you changed the configuration in officegrid.cfg, it may also need to be copied back and the same applies to the license, og.lic, unless it is a trial license.

If OfficeGRID was installed with an installer (i.e. Windows or Generic Linux installations), simply download the updated OfficeGRID installer from the web[1] and run it. It will then replace the existing installation with a new one.

If OfficeGRID was installed with the prepackaged binaries, then upgrades can be handled with the package manager, just like any other packages.

5 Resource Reservation

In recent versions of OfficeGRID, jobs and executors support resource reservations and limits. Executors can specify the available amount of system resources like CPU cores, memory, disk, network and wall time. Likewise jobs can request a specific amount of each of the resources as a way of booking those resources on the executor where they run. The OfficeGRID server takes care of only handing out jobs to executors that provide the requested resources. Thus if an executor is configured to use four CPU cores, the server will only hand out jobs to it until all four cores are reserved or until another resource is depleted. As an example the executor may be assigned one dual core job and two single core jobs to run concurrently. When one of the jobs finishes, the executor may be able to take a new job if the remaining free resources allow it.

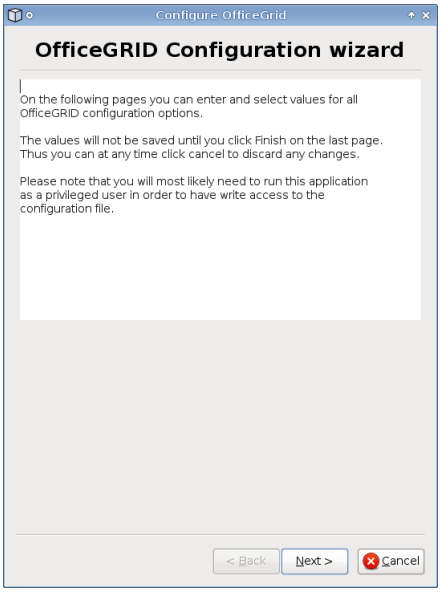
6 Configuration

The base installation includes a simple local server, executor and client configuration. In case a more advanced setup is desired, it is necessary to change the OfficeGRID configuration. This can be done by using the configuration wizard or by manually editing the configuration file, officegrid.cfg.

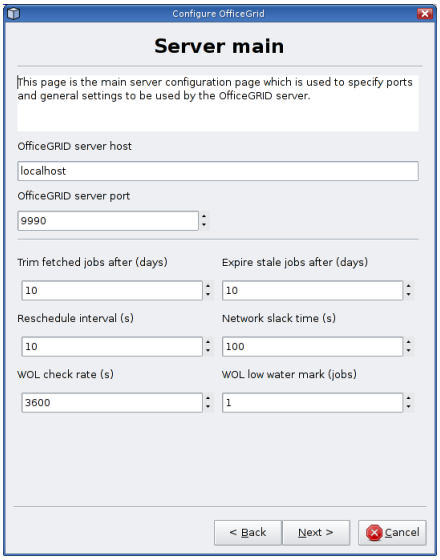
6.1 Configuration Wizard

Open the configuration wizard, which takes you through a number of configuration questions and finally updates the OfficeGRID configuration according to your replies. The wizard can be started from the application menu or by running the `ogconfwiz` command from the command line. Depending on the installation and platform some or all of the below pages may be accessible.

The intro page gives a few instructions for newcomers. Simply click `next` to proceed:

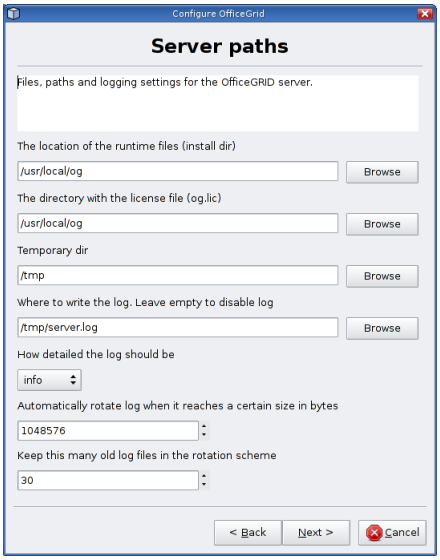


The server page includes general server options:

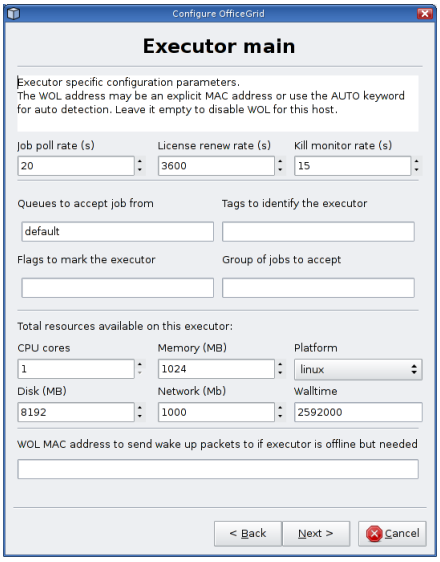


The server notification page contains server options related to job notification:

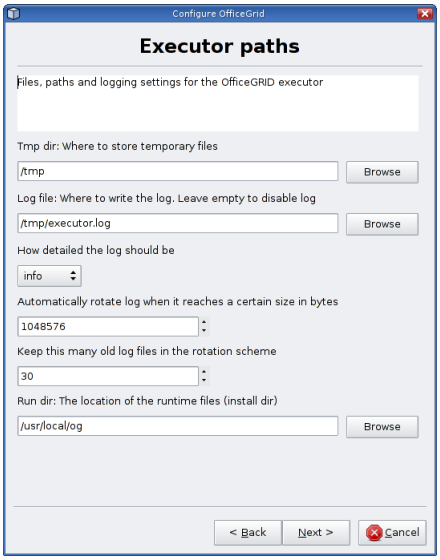
The server paths page contains file specific server options:



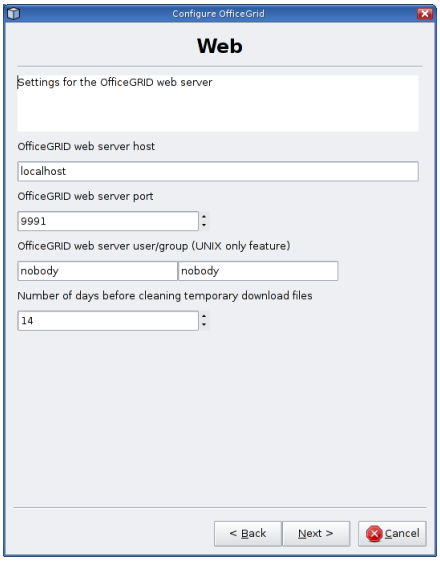
The executor page includes general executor options:



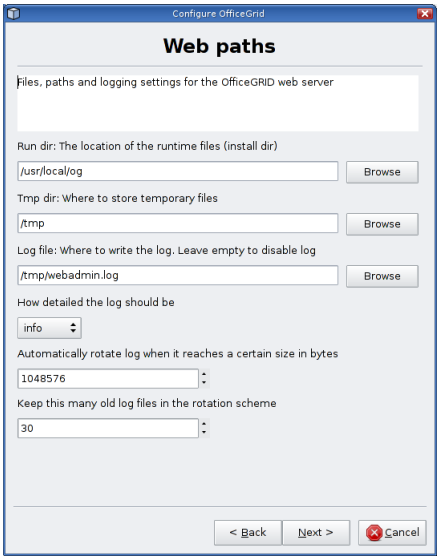
The executor paths page contains file specific executor options:



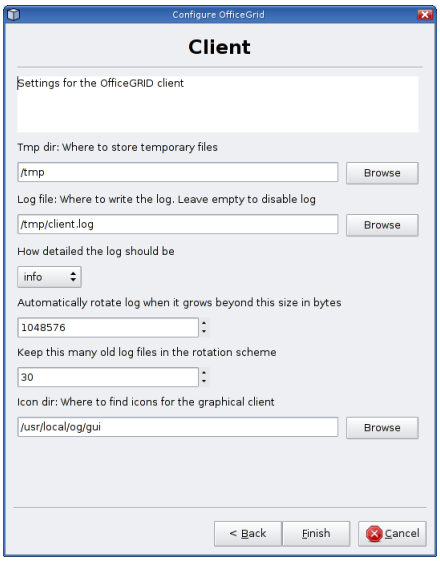
The web page includes general web interface options:



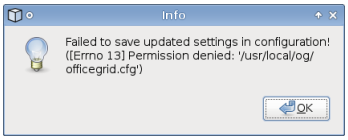
The web paths page contains file specific web interface options:



The client page contains all client options and a `finish` button instead of a `next` button. No changes are saved before you click `finish`, so you may use the `back` and `next` buttons to navigate back and forth through the pages as much as you want before finally saving the changes or discarding them by clicking `cancel`.



In some cases saving the configuration changes may result in an error message. This is most often a matter of write permissions to the configuration file.



So if you get an error like the one above, please run the wizard again logged in as a user with write permissions on the file (Hint: in most cases you need administrative rights).

"'Important:"' On some platforms including Windows Vista it may not even yield an error if the configuration wizard is running as a user without write permissions on the configuration file, but the correct file simply won't be updated! If this is the case, please explicitly run the configuration wizard with administrator privileges in order to actually modify the real configuration. Right clicking the configuration wizard icon "may" provide such an option, but otherwise please refer to the documentation for your particular operating system for further details about running commands with administrator privileges.

As seen above each field in the wizard has a short description, but please feel free to contact MESH in case it isn't clear what they mean.

6.2 Manual Configuration Changes

Open up the OfficeGRID configuration file, officegrid.cfg, in your favourite editor and change the settings. It uses a 'ini' file like structure where [NAME] represents a section and '#' marks the rest of the line as a comment. Each of the options in the configuration is accompanied by a short description, so hopefully most options are self-explanatory.

The configuration file is separated in to the following sections:

- Default
- Server
- Executor
- Client

6.3 RUN_DIR, TMP_DIR and cache

The OfficeGRID server keeps all the jobs on disk in order to prevent data loss across a reboot. Similarly any running jobs on executor hosts will attempt to return job results later in case of server down time.

You should make sure that the RUN_DIR in the configuration is set up in a location where it will not run out of disk space. It does not require enormous amount of space, but enough to hold the job data base. TMP_DIR is used for communication between server and executors, for all job files and for the job file cache, so it may require a lot of space depending on the submitted jobs.

The server keeps all jobs including their files in TMP_DIR unless the TRIM option is enabled. Thus if TMP_DIR is limited in space and you don't need the old jobs (e.g. for statistical purposes), you may consider enabling the TRIM option.

6.4 QUEUEs, TAGs and PLATFORMs

Very flexible setups are possible using the QUEUE, TAG and PLATFORM settings. In a multi-platform setup with Windows, Linux and OS X hosts it is important that jobs that need to be executed on a Windows host are actually only sent to such hosts. With the Platform setting in the execution part of the configuration, it is possible to mark an executor as a particular platform. Jobs can similarly specify which platforms they require, and the server will then automatically make sure that the requirement is fulfilled.

Different user or executor priorities can be modelled with multiple queues. Per default all executors are bound to the queue called 'default', but in the configuration it is possible to change this for each executor. If for example a number of executors are reserved for a particular project, they can be bound to a project specific queue, that the project members can then use to run their jobs.

Specific applications or hardware resources on executors can be managed with tags. If e.g. one or more resources include application X required by some jobs, it may be an advantage to add a matching tag to those resources and use the same tag in jobs that require X.

Please note that there aren't any restrictions on user access to different queues or tags at the moment, so it should only be used on a voluntary basis for now.

6.5 CORES, MEMORY, DISK and NETWORK

These four executor resource options are available in order to tell the server how to hand out concurrent jobs to the executor. Each option may be set to the keyword UNLIMITED to disable limitation on that particular resource on the executor. This results in a setup very much like the original

OfficeGRID behaviour without reservations and limits. These resources are consumable so setting any of the options to a non-negative value, X, will make sure that the executor will never run jobs with a total reservation of more than X units of that particular resource at any time. I.e. if an executor is configured to use 8 CPU cores, the server will not hand out any job to the executor if the job would bring the sum of reservations for the locally running jobs up to more than 8 cores. In practice the server may stop handing out jobs to the executor even before all 8 cores are filled, because any of the other resource limits may be reached before that point, or because no jobs fit within the remaining available resources.

Please note that the correctness of the reservations is completely left to the users, and that at the time of this writing there are no enforcement of these consumable limits when the job is running on the executor. However, consequently using them honestly is much recommended, because it makes job scheduling much more efficient and generally leads to better resource utilisation.

6.6 WALLTIME

The wall time resource option, is slightly different from the other limits, because it is not consumable. Instead it prevents all jobs from running for more than the specified wall clock time. If set to the keyword UNLIMITED the limit is disabled, but a positive value limits the allowed runtime for all jobs. Time is in seconds or "w:d:h:m:s"-format where w is weeks, d is days, h is hours, m is minutes and s is seconds. Also accepts suffix format strings like "m:s", "h:m:s" or "d:h:m:s". Thus "3:20" means 3 minutes and 20 seconds. The server will only schedule jobs with a wall time reservation less than or equal to to configured executor WALLTIME, and the limit applies to "each" job instead of the total sum of all locally running jobs. The wall time limit is actively enforced, so if a job reserves (significantly) less time that it actually takes to finish, it will be killed by the executor. Wall time estimates are often difficult to predict, but it is recommended to try, because it improves the chances of efficient scheduling significantly. Even a wall time very much above the actual run time is far easier for the scheduler to handle than no limit.

6.7 Wake on LAN (WOL)

From version 2.2.3 OfficeGRID allows very flexible and power-saving Grid setups where executors can be shut down or suspended until they are actually needed for job execution. Using the Wake on LAN[8] feature of most

modern computers, the server can periodically analyse the current job queue load and actively wake up any offline, WOL enabled executors suitable for actual job execution. Thus it is possible to save power by turning off or suspending your office PCs before leaving the office and still get any incoming jobs executed. Executors are WOL enabled by setting the WOL_MAC option in the EXECUTOR section of the configuration. Either set the option to the colon separated physical address (also known as MAC address) or use the 'AUTOMATIC' keyword to let OfficeGRID try to auto detect it. There is also support for the so called Secure WOL where the WOL packet includes a configured password. Simply set the WOL_PASSWORD configuration option to the password, written on the same form as the MAC address and it will be included in the WOL packet.

In case of unusual network setups the optional options WOL_IP and WOL_PORT may additionally be used to specify a specific broadcast IP address and port to use for the WOL operation. If left unset the default of IP 255.255.255.255 and port 9 are used. Each of the WOL_MAC, WOL_IP and WOL_PORT may be a space separated list of entries which will then be linked in order to try to wake up multiple network interfaces with maximum flexibility.

On the server side it is possible to specify the WOL analysis rate with the WOL_RATE configuration option. The lower bound for WOL action is controlled with the WOL_LIMIT configuration option. It specifies the number of suitable waiting jobs required to trigger WOL of any given executor. Thus if WOL_LIMIT is set to 10, executors will only be awoken if there are more than 10 waiting jobs that the executor could potentially execute.

"'Please note"' that it may be necessary to enable WOL support in the BIOS of the executor host. The computer or motherboard manual will normally include further instructions if WOL is supported.

7 Running the Server and Executor Components

Unless you used the Generic Linux Installer for installation on an unsupported distribution, any installed server and executor components will automatically be started. Thus in most cases this section is only relevant in case you wish to manually stop and start the services for some reason. As an example most OfficeGRID configuration changes related to the server or executor will only take effect after a restart.

7.1 Windows

OfficeGRID installs server and executors as native Windows services. To modify these open up Administration from the Control Panel. Then open the Services management and find the OfficeGRID server or executor service. Right click on service to get a menu with choices of start and stop depending on the current status.

7.2 Linux

After installing OfficeGRID the server components can be started with the commands:

```
/etc/init.d/officegrid-server start
/etc/init.d/officegrid-executor start
/etc/init.d/officegrid-webadmin start
```

stopped with:

```
/etc/init.d/officegrid-webadmin stop
/etc/init.d/officegrid-executor stop
/etc/init.d/officegrid-server stop
```

and restarted with:

```
/etc/init.d/officegrid-server restart
/etc/init.d/officegrid-executor restart
/etc/init.d/officegrid-webadmin restart
```

8 Server Maintenance

The OfficeGRID server and executor automatically cleans up temporary job directories, stored in the directory specified by the TMP_DIR configuration variable, but finished jobs are not automatically removed unless the TRIM option is enabled. Old jobs will automatically be purged after a number of days if TRIM is set. It is possible to configure the frequency of this clean up with the TRIM_INTERVAL option in the configuration.

9 Logging

Each of the OfficeGRID components include logging support. In the configuration the log file and log level can be set with the LOG_FILE and LOG_LEVEL variables.

10 Web Administration

OfficeGRID includes an optional web server component which gives web based access to most administrative operations. In the default setup the web server runs on port 9991 on the localhost interface, thus from the same host it can be accessed by pointing a browser to:

```
http://localhost:9991/admin/
```

The HOST or PORT options in the WEB section of the configuration can be used to modify the listening address. E.g. changing the HOST option to the IP or FQDN of the host will allow access from other hosts. However, please beware of the security implications if you do so.

Through the web server it is possible to monitor job statistics like the number of executed job, execution time, and queue load. The actual data can be filtered in a number of ways and they are displayed in various formats. In addition to the statistical features the web server also provides a number of operations similar to those available to a client.

11 Uninstalling

Removing the OfficeGRID installation is as simple as the installation, and the procedure is described for each platform in the next sections.

11.1 Windows

An uninstall shortcut is included in the Start menu and it runs an uninstall wizard which removes all installed components.

11.2 Linux: Distribution Specific Binary Package

Each of the distribution specific packages takes care of stopping services and cleaning up when removed with the package manager of the system.

11.3 Linux: Distribution Independent Install Script

The Generic Linux Installer script installs an uninstall script which may be run in a shell as:

```
sh /usr/local/og/installscripts/remove.sh
```

please follow the instructions to uninstall OfficeGRID.

12 Questions and Comments

Please refer to the web page[1] for more OfficeGRID documentation and answers to most common questions. In case you have any additional questions or comments, please send us an e-mail:

officegrid [at] meshtechnologies.com

13 References

1 MESH Technologies - http://meshtechnologies.com

2 Microsoft Windows - http://www.microsoft.com

3 Linux - http://en.wikipedia.org/wiki/Linux

4 Apple Mac OS X - http://www.apple.com/macosx/

5 Ubuntu Software Management - https://help.ubuntu.com/community/AptGetHowto

6 Software Management with Yum - http://docs.fedoraproject.org/yum/

7 Python Programming Language – Official Website - http://www.python.org/

8 Wake on LAN – Wikipedia article - http://en.wikipedia.org/wiki/Wake-on-LAN