



Distributed OrcaFlex

Version 3.2e released January 2012

1. Introduction

Distributed OrcaFlex is a suite of programs that enables a collection of networked, OrcaFlex licensed computers to run OrcaFlex jobs, transparently, using spare processor time.

Distributed OrcaFlex consists of four separate programs:

- One machine on the network runs a Distributed OrcaFlex **server program** that coordinates the list of jobs to be run, allocates and reallocates jobs to the fastest available client and balances the load across available machines.
- A Distributed OrcaFlex **client program** is run on each machine available to run jobs (each such machine must have access to an OrcaFlex licence).
- A Distributed OrcaFlex **viewer program** can be run on any machine. This viewer program displays the current list of jobs and their current status (e.g. waiting, running, completed etc.), allows jobs to be submitted and cancelled and allows the user to set the number of jobs the machine will accept.
- Finally there is a **console** program (dofcmd.exe) that enables you to add and list jobs from a console window or batch file.

Each client can be enabled (willing to accept a set number of jobs) or disabled (set to refuse jobs) at any time. When the client program is running jobs, it does so at low operating system priority running jobs as background tasks that do not significantly interfere with other tasks on that machine. So if the machine is otherwise idle (e.g. at night) then the job will run at maximum speed, but if a user is working on the machine then they do not notice significant degradation in performance since their work takes priority and the Distributed OrcaFlex job only runs when the machine has done the user's work.

2. What's New

Version 3.2c - 3.2e

- Minor bug fixes.

Version 3.2b

- Can now handle significantly larger numbers of jobs (>20,000).

Version 3.1a

- The "Add File" dialog has been redesigned so you can now specify if an analysis should be statics or dynamics.
- When running statics, Distributed OrcaFlex will now export Shear7 output files for all lines that include Shear7 in statics.



Version 3.0a

- The Distributed OrcaFlex Client now runs as a windows service, no longer requiring a user to have logged into the machine before processing of jobs can begin.
- Load balancing has been improved allowing jobs to be moved from a faster, heavily loaded machines to slower, but underutilised machines.
- Memory footprint has been significantly reduced (requires OrcaFlex 9.3 or greater).
- Improved user control over how many jobs a Distributed OrcaFlex client will take on.

3. Installation

All the Distributed OrcaFlex programs are installed from the single Windows Installer file DistributedOrcaFlex.msi. Simply double-click this file to begin the installation. Each of the Server, Client and Viewer programs can be selected for installation, and each selected program will require some configuration data as part of the install process. These data are described in detail below: in most cases a default value is provided which will work perfectly well.

Notes: *The console program dofcmd.exe shares configuration data with the viewer, and is installed along with the viewer.*

You may choose to install the viewer without the client, but not vice versa: installing the client requires that you also install the viewer.

For correct operation, you must ensure that all parts of the Distributed OrcaFlex system (Server, clients and viewers) use the same software version.

4. Server Program

Distributed OrcaFlex server is a windows service, an application that starts automatically and runs in the background. This service controls Distributed OrcaFlex and although a short interruption of this service should not affect the overall running of Distributed OrcaFlex, a longer interruption will prevent users submitting jobs and stop queued jobs from starting. (Jobs already running should complete).

4.1. Hardware Requirements

The computer should be running Windows XP or later at 400Mhz or faster and must be connected to a network running TCP/IP. This machine can also be used to run the Distributed OrcaFlex client if required.

4.2. Settings

All of the configuration settings for the Distributed OrcaFlex server program are in the system registry under the following key:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\DOFServerService
```

This key contains the service configuration settings, which should not be changed. It also contains *Port*, *DeleteJobsFromListAfterDays*, *AllowJobsToBeMoved*, *DeleteClientsFromListAfterInactiveDays* and *WakeOnLANEnabled* which are the only user configurable items. Incorrect settings will prevent Distributed OrcaFlex from running correctly.

**Port: REG_DWORD**

Port is the TCP/IP port number that Distributed Orcaflex uses to communicate with the Distributed Orcaflex client machines. It is an integer between 1 and 65535. If this setting is missing then the default of 53412 will be used.

DeleteJobsFromListAfterDays: REG_DWORD

Jobs completed by Distributed OrcaFlex will remain in the queue so that their status can be viewed for several days after the job has completed (providing the queue has space to hold them). *DeleteJobsFromListAfterDays* is an integer specifying the number of days the job will remain in the queue after it has completed. If this setting is missing then the default of 3 days will be used.

When a jobs is deleted completely from the queue a copy of the job information is made in the file *%TEMP%\orcina\dof\JobLog.txt*, where *%TEMP%* is your temporary directory, for long term auditing. The file is a comma separated text file with one line for each job. Note that filenames containing commas will be enclosed in double quotes.

AllowJobsToBeMoved: REG_DWORD

Moving a job from one machine to a faster one takes time, so if the collection of machines running Distributed OrcaFlex are of very similar speeds, this optimisation can actually have a negative impact on job throughput. Setting *AllowJobsToBeMoved* to 0 disables this optimisation, any other value enables it. If the setting is missing, then the default of enabled will be used. Load balancing has been significantly improved rendering this setting unnecessary and should no longer be used.

DeleteClientsFromListAfterInactiveDays: REG_DWORD

When the Distributed OrcaFlex server loses contact with a client it's marked as 'Unavailable' in the client list. *DeleteClientsFromListAfterInactiveDays* is an integer specifying the number of days an 'Unavailable' client will remain in the list before it is removed. If this setting is missing, then the default of 4 days will be used.

WakeOnLANEnabled: REG_DWORD

If you are not using this functionality and don't want additional WOL packets on your network or you simply don't want machines that are hibernating or in standby being woken up, then you can disable it by setting this to 0. Wake on LAN will be enabled if this setting is missing or any value other than 0.

5. Client Program

This is a windows service that starts automatically and sits *silently*, in the background, running jobs allocated to it by the Server using spare processing time. It should not adversely affect the performance of the machine, although if the user of the machine is doing processor-intensive work, the Distributed OrcaFlex jobs running on that machine will be slowed down significantly.

5.1. Hardware Requirements

The computer should be running Windows XP or later at 400Mhz or faster, must be connected to a network running TCP/IP and have access to a common (w.r.t. all of the Distributed OrcaFlex client machines) area of file storage.



5.2. Installation

During the installation you will be prompted for a set of credentials for the Client service to run under. We recommend that you create a new user, for example, DOFUser that can then be used for all installations of the Distributed OrcaFlex client. This user should be created before you begin the installation and only be used for the Distributed OrcaFlex client service.

This user must have "Log on as a Services" rights and have been granted enough rights to be able to read and write all areas of the network filing system that jobs may be submitted from including the location of the default OrcFxAPI.DLL files. The "Log on as a service" right is normally set by group policy on the domain controller.

Using this method it is possible to allow several independent teams, that have private areas on the network filing system, to use one Distributed OrcaFlex server and make use of all the available licences to process jobs without allowing file access between teams. This is because each team has its own privileges but only the special Distributed OrcaFlex user has access to all areas.

5.3. Settings

The settings for the client program are stored in the system registry of the local machine, under the following key

```
HKEY_LOCAL_MACHINE\Software\Orcina
```

This key can contain the following entries, some of which are shared by the Viewer Program:

DOFPort: REG_DWORD

DOFPort is the TCP/IP port number that Distributed Orcaflex clients use to communicate with the Distributed Orcaflex server. It is an integer between 1 and 65535. If this setting is missing then the default of 53412 will be used.

DOFServerAddress: REG_SZ

DOFServerAddress is the TCP/IP network address or hostname of the Distributed Orcaflex server. There is no sensible value that can be used here for a default address, so it **must be set** correctly for the Distributed OrcaFlex clients to see the server.

DOFMaxNumberOfJobs: REG_DWORD

DOFMaxNumberOfJobs specifies the maximum number of jobs that any one client will run simultaneously. If this setting is missing then the number of physical processor cores is used.

DOFStartClientDisabled: REG_DWORD

Setting *DOFStartClientDisabled* to any value other than 0 will cause the client to start-up disabled i.e. not accepting jobs. If the setting is missing, then the client will start-up enabled.

DOFJobPriority: REG_DWORD

DOFJobPriority defines at what processor priority an OrcaFlex job will run at on the client machines. This is an integer value between 0 and 6, where 0 is the lowest and 6 is the



highest. It is strongly recommend that you do not use a value greater than 2, which is the default setting. Note: Using values higher than 2 can seriously affect the OrcaFlex client machines ability to interact with the user.

6. Viewer program

This is the main user interface to Distributed OrcaFlex and allows users to submit jobs, cancel jobs, view the progress of the jobs, see which machines are participating in Distributed OrcaFlex and control the behaviour of the client.

6.1. Hardware Requirements

The hardware requirements for the viewer program are the same as that for the client program.

6.2. Settings

The settings for the viewer program are stored in the system registry of the local machine, under the following key:

```
HKEY_LOCAL_MACHINE\Software\Orcina
```

This key can contain the following entries, some of which are shared by the Client Program:

DOFPort: REG_DWORD

See description for the Client program's *DOFPort* setting.

DOFServerAddress: REG_SZ

See description for Client program's *DOFServerAddress* setting.

DOFAutoSaveTimeMins: REG_DWORD

DOFAutoSaveTimeMins defines the number of minutes between backup saves. The auto backup save allows any other client to pick up the job if one of the clients fails. The default value is 60 minutes. This option will only function correctly if running OrcFxAPI version 8.4a or later.

DOFDefaultDLLFileName: REG_SZ

DOFDefaultDLLFileName is the full path to the OrcFxAPI.dll file that should be used when one is not specified when submitting jobs. The DLL must be on a network drive that all of the clients can 'see'.

6.3. Starting

The viewer program is started by running the executable DistributedOrcaFlex.exe, from a shortcut on the desktop or Start menu. The default installation will ensure that this is started automatically when a user logs in.

6.4. Using the Viewer Program

Active Clients Page

This page shows the names of all the client machines that are running or are able to run OrcaFlex jobs, along with the version of the software, the machine details, the number of processor cores, the maximum number of jobs that that client will accept, the number of jobs the client is running and the client machine speed index. The machine speed index is an indicator of how fast that client machine will run OrcaFlex jobs, where the larger the index the faster the machine. Distributed OrcaFlex will attempt to allocate jobs in such a way as to make maximum use of the faster machines whilst trying to minimise the impact on any one machine.

Active Jobs Page

Each Distributed OrcaFlex job is identified by its file name. The Owner column shows the name of the user who submitted the job to the queue. Each job has a status, which will be one of Pending, Starting, Running, Completed, Cancelled, Paused or Moving. Jobs that were Cancelled by a user will not be restarted whereas jobs that failed on a particular machine will be marked as Paused and restarted on the next available machine.

The Completion Time column shows either the actual time the job completed or, if it is in brackets, the estimated time to completion. It should be stressed that this is only an estimate and will change if machine loading changes or the job is paused or moved to another machine. Estimated time to completion is only available when running version 8.5a (or later) of the OrcFxAPI.

The second column shows the version of the OrcFxAPI that is being used to run the job. It is important that this version is the same or higher than the version of OrcaFlex that was used to create the dat file. Results may be affected if an older version of the OrcFxAPI is used as it may not support all of the features required by the dat file.

The *Auto Save (Mins)* column displays the interval in minutes between successive auto saves.

By selecting a user's name and/or a job status from the drop down lists in the toolbar you can alter what is shown in the Active Jobs page.

Submitting Jobs

OrcaFlex jobs are submitted to Distributed OrcaFlex by clicking the *Add Jobs* button on the toolbar or pressing the *Insert* key, which pops up a the *Submit* dialog. From the *Jobs* tab, click *Add* and select one or more files from a networked drive (OrcaFlex dat or sim files must be on a network drive so that all clients will be able to locate them) then choose *Static* or *Dynamic* analysis, and finally click *Open*. Note that for the *Static* analysis options to have any effect, the OrcFxAPI DLL used must be version 9.3a or greater, otherwise a dynamic analysis will be run.

On the *Settings* tab, the following options are available.

- **Auto save interval (mins):** Distributed OrcaFlex will attempt to save the current simulation state at this time interval so that if a machine fails another machine can pick up the job from the last simulation saved. A value of 0 will result in no backup saves.

This feature is only available when running OrcFxAPI version 8.4a or later. Attempting to use this feature with earlier version of the DLL will not cause any problems and the



simulation will run, but no backups will be made and a warning will be provided in the *Progress* column.

- **OrcFxAPI filename:** In order to run a simulation the user must specify the location of the OrcFxAPI.dll that should be used – again this must be on a network drive in a location that all the client machines have access to. To use the default OrcFxAPI.dll (as specified during installation) leave the box blank.

When you have selected all the files, click on the *Submit* button.

If a partially completed simulation file is submitted to the jobs list, Distributed OrcaFlex will complete the simulation.

Jobs can also be submitted by simply dragging them onto the Jobs List from Windows Explorer, which will bring up the *Submit* files dialog.

Resubmitting Jobs

Any job or jobs can be resubmitted to the job queue by selecting the job or jobs and clicking the **Resubmit** button or pressing *CTRL-R*. The jobs are resubmitted with the same parameters as when they were first submitted.

Cancelling Jobs

To cancel a Job, select the job or jobs and click the *Cancel Jobs* button or press the *Delete* key.

Viewing Jobs with OrcaFlex

With a job selected, you can view the data file or the simulation file by clicking the relevant button on the toolbar. If AutoSave is enabled (and you are using version OrcFxAPI 8.4a or greater) then the '.sim' file may be the partially completed simulation. For this to work '.dat' and '.sim' files should have a file association with OrcaFlex, and must exist for the selected job. An alternative to using the toolbar buttons is to press *ENTER* or *CTRL-ENTER* respectively.

Note: *The viewer's functionality is also available by clicking the right mouse button on a selected job.*

6.5. Enabling and Disabling

The client program can be enabled and disabled by right clicking the OrcaFlex icon in the task bar and selecting the "Available Processors" menu item. From this menu you can disable the client by selecting "None" or enable it by specifying how many processor cores you wish to make available to Distributed OrcaFlex.

If the number of processors cores available is reduced or the client is disabled, then after a short period of time, jobs running on the local machine will be paused to achieve the desired loading. Paused jobs will then be picked up by other machines.

A line though the Distributed OrcaFlex tray icon indicates that it is disabled and will not start any more jobs, although it will stay light blue while it saves currently processing jobs.

If the Client program is not running then the tray icon will be grey indicating that the viewer has been unable to establish a connection with it.



6.6. Client program as an Application

In some circumstances, running the Distributed OrcaFlex Client as a windows service is unsuitable, so the ability to run as a normal application has been maintained. Although in this configuration a user must always be logged in for the client to be active.

If you wish to do this, you must first stop and disable the OrcaFlex Client service that the installer configured and start the client each time a user logs in by using the following command:

```
DOFClient.exe -RunAsApp
```

The client will then use the currently logged on users credentials to access the network.

6.7. OrcaFlex Licences

A Client will only ever claim one OrcaFlex licence regardless of the number of jobs running simultaneously on that machines. In addition to this, a user physically sitting at that machine will be able to share the same single licence. If no jobs are running, the client will not claim a licence.

However, if you log into the machine via Windows Remote Desktop, then a second licence will be required for that user to run OrcaFlex.

An alternative is to use a product like VNC (www.realvnc.com) which results in the same licence usage as if you were sitting at the machine, i.e. only one OrcaFlex licence is required for both the user and the client to operate.

7. Console Program

This is a console program which can be used for submitting jobs for processing or showing the status of queued jobs.

7.1. Hardware Requirements

The hardware requirements for `dofcmd.exe` are the same as that for the viewer program.

7.2. Settings

The settings for `dofcmd.exe` are stored in the system registry. The `dofcmd.exe` program shares its settings with the viewer program (see 6.2 Viewer Program Settings). For ease of use, you may wish to either add the Distributed OrcaFlex installation folder to your PATH environment variable or copy `dofcmd.exe` from there to a location already on your PATH.

7.3. Using the Console Program

The console program has two uses, to add to and list the jobs in the queue. To list jobs in the queue, type the following command into a console window:

```
dofcmd -list
```

The output from this command is the jobs queue in text format. There is one job per line, with each line consisting of comma separated values containing the following fields: Job ID, Simulation file name including full path, Owner, Status, Start Time, Completed Time, Name of machine last run on, IP address of machine last run on, AutoSave interval,



OrcFxA API DLL version and Status string. Note that filenames and any status text containing commas will be enclosed in double quotes.

These items are explained in more detail in section 6.4 (Using the Viewer Program), except for the Job ID. This is a unique identifier that can be used to identify this job across all client machines and in subsequent calls to the console program.

The command

```
dofcmd -add [OPTIONS] <filename1> ... <filenameN>
```

will add the files listed to the Distributed OrcaFlex queue using the following [OPTIONS]:

| | |
|---------------------|--|
| -dynamics | Runs a dynamic analysis on the jobs added (this is the default). |
| -statics | Runs a static analysis on the jobs added. Requires DLL version 9.3a or above. |
| -dllname=<filename> | Where <filename> specifies the full path of the OrcFxA API DLL. If this option is missing then the default DLL will be used. |
| -autosave=<n> | <n> is the autosave interval in minutes. If this option is missing then the default autosave time will be used. |
| -wait | Waits until all jobs have completed before returning. |

The files to be added can be OrcaFlex data or simulation files (*.dat, *.yml or *.sim). Alternatively, text files containing lists of OrcaFlex data or simulation files can be specified.

A return value of 0 means the call was successful, a value of 1 means that an error message was generated and sent to *stdout*.

Just typing the following at the console with no parameters will display help:

```
dofcmd
```

8. Standby and Hibernation

In order to reduce power consumption, Distributed OrcaFlex server is now capable of waking machines running the DOFClient program from Windows Standby or Hibernation states when they are required to run jobs. In order for this to function correctly, the client machine's BIOS needs to be configured to allow "Wake On Lan" (WOL) and the network card's "Power Management" needs to be configured to allow it to bring the machine out of standby state (Network Card, Properties, Power Management).

The Client List tab in the viewer now reports the following states:

| | |
|--------------|--|
| Active: | Client connected to the server and is ready to accept jobs. |
| Sleeping: | Client is hibernating (or possibly switched off). |
| Waking: | Server is attempting to wake the machine from hibernate state. |
| Unavailable: | Client has been shutdown, or the server was unable to wake it. |

If WOL is disabled by using the Distributed OrcaFlex Server setting, then clients will never go into the Sleeping or Waking states and will be either Active or Unavailable.

Note that the server cannot be allowed to hibernate or go into standby, and must be running at all times.



9. Points To Note

9.1. External Functions

Users should be aware of the following way in which Distributed OrcaFlex functions:

Any dat files that use "External Functions" (See OrcFxAPI help file) should only be submitted to Distributed OrcaFlex for processing if you are using OrcFxAPI version 8.6a or later. This is because in earlier versions there is no mechanism for the External Functions to save their state (which is required when a job is moved from one machine to another), causing the results to be affected.

9.2. OrcaFlex Upgrades

Installing an upgrade to OrcaFlex on machines that also have Distributed OrcaFlex installed does not update the default OrcFxAPI.DLL (used when processing jobs). The location of the default OrcFxAPI.DLL is defined on each of the client machines by the registry setting "DOFDefaultDLLFileName" which is a string containing the full UNC path to the DLL. This single copy of the DLL is shared by all Distributed OrcaFlex enabled machines and will need to be manually replaced with the latest version.

If the location of the default OrcFxAPI.DLL needs to be changed, then it is very important that all the client machines running the DOF Viewer have their registry setting updated to reflect the new location.