

# Documentation for PHOENICS

TR 110

Installation of PHOENICS  
**(Version 2018)**

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*Computer Simulation of fluid flow, heat flow,  
chemical reaction and stresses in solids*

## Installation of PHOENICS 2018

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## 1 Introduction

### 1.1 Purpose of the document

The purposes of this document are:

- To explain how to install the PHOENICS program suite on a computer running under Microsoft Windows.
- To describe how to test the success of the installation.
- To provide new users with a brief guide on starting to use PHOENICS.

The contents of this document are applicable to both recompilable, which enables the user to re-link the executables, and non-recompilable with which the user can only use the supplied executables.

### 1.2 System configuration

To install PHOENICS, the user needs to have a hard disk with at least a total of 2 GB free space. Additional space will also be required for running PHOENICS. How much space will depend on the size of simulations made; for complex models it is possible to generate individual output files which are more than 1GB in size. For efficient use of PHOENICS the user should have at least 10GB of free hard disk space available.

PHOENICS will run on all platforms of Microsoft Windows from version XP onwards and will run on Windows 10. It is recommended that the computer used for running PHOENICS has a minimum of 4GB RAM (2GB for computers still with a 32-bit operating system). The amount of available RAM may limit the size and complexity of simulations made, it is not uncommon for users to have 32GB of RAM or more. PHOENICS is available compiled as both 32-bit and 64-bit executables. The 32-bit version will run on any version of Windows, but individual processes are limited to 2GB in size and this will limit the size of the grid on which it is possible to run simulations. To go beyond this limit, the user will need to have a 64 bit version of the Windows operating system and use the 64-bit version of PHOENICS. Most new computers now come pre-installed with the 64-bit version of Windows.

There are no special graphics requirements; most modern graphics cards should have no problem running PHOENICS. However, we have found that some of the graphics cards that come integrated with the motherboard do give slow performance when rotating the domain with result contours displayed. To enable the clear display of results, the minimum recommended screen resolution is 1024\*768 pixels.

An Intel Visual Fortran compiler version 11.1 or later is required for the recompilable version of PHOENICS.

**Please note** that an Administrator account will be required to install the software.

### 1.3 The remainder of the document

Chapter 2 lists the items supplied with the installation

Chapter 3 describes the installation procedures

Chapter 4 shows how to test the success of the installation

Chapter 5 advises users on starting to use PHOENICS

Chapter 6 shows how to install the parallel version of PHOENICS

Appendix A gives information on how to obtain an unlocking string

Appendix B provides answers to Frequently Asked Questions and to troubleshooting

## **2 Specification of Items**

The following items will be supplied.

### **2.1 Software**

- A DVD containing the PHOENICS software.
- A DVD containing the INTEL Visual Fortran compiler (if the compiler was purchased).

### **2.2 Documentation**

- Installation of PHOENICS 2018;TR 110 (this document)

### 3 Installation Procedures

The quick installation instructions are provided inside the cover of the DVD case and these should enable experienced customers to upgrade their PHOENICS version successfully. Otherwise, it is recommended that the user read through the following sections before starting installation.

#### 3.1 Ensuring that there is sufficient free disk space.

At least 2 GB of free disk space must be available on the target machine before you start to install PHOENICS. It is recommended, though, that you have in excess of 10GB free space, so that you have sufficient space to store the results.

#### 3.2 Checking if PHOENICS has already been installed on the target machine

If an **earlier version** of PHOENICS is already present, it must be deleted, or the name of the existing installation directory changed **before** installing the new version. You may wish to preserve user files from working directories, such as `\phoenics\ld_priv1`, and user geometry files under `\phoenics\ld_satell\ld_object\users`. These can be copied to a temporary location using Windows Explorer, and later moved to the equivalent locations in the new installation.

To delete the old installation, open the **Control Panel** then in the section *Programs* click on the item *'Uninstall a program'*. Now scroll through the list of installed programs and find the PHOENICS installation – the previous version was labelled **PHOENICS 2017**. Double click on the line labelled PHOENICS to begin the install script and choose the option *'Remove'* then click on the button *'Next'* to begin the uninstall procedure. This will remove all the files which were originally installed, but leave behind any new files which have subsequently been added (e.g. your case files). If you wish to preserve any of these left over files then rename the phoenics folder, otherwise delete it before re-installing PHOENICS. To rename the old installation to, say, PHOENICS.OLD, open Windows Explorer, right click on the `\phoenics` folder, then on *Rename* and type in PHOENICS.OLD.

If a previous version of PHOENICS exists on this PC, and you do not rename or remove it, it will not be overwritten by this installation process. The installation process will finish normally, but no existing files will have been overwritten.

If you have an old PHOENICS version on your disk drive C:, and you would like to **keep the old version** on C:, then you can create a virtual drive and install PHOENICS on this virtual drive, with no need to rename or remove your old PHOENICS version from the C: drive.

Click on *'My computer'* icon to ascertain what drive letters are in use. Usually the C: drive will be the user's local hard drive and D: a removable drive (e.g. CD or DVD), other drive letters may already be in use for mapped network drives. Suppose the drive P: is not in use, you can create a virtual drive P:.

First, make a root level folder with a suitable name, e.g. `C:\PHOENICS2018`; then in a Command Prompt window, enter the command

```
SUBST P: C:\PHOENICS2018
```

You now have a virtual drive P: onto which you can load PHOENICS 2018 without affecting any older version of PHOENICS you may have on C:.

**Please note** that any *subst* drives are not remembered after a user logout. The drive will need to be re-created at each logon. This can be achieved by creating a batch file, say *map\_drive.bat* (within which is written the *subst* command above) and include this in the Startup folder under the Start menu.

#### 3.3 Installing the Intel Visual Fortran compiler

If the delivery is for a non-recompilable version of PHOENICS, then no compiler is required.

To install the compiler, insert the Intel Compiler DVD in the DVD drive. If Autorun (it is a default setting for the DVD drive on PCs) is enabled, follow the instructions on your screen. If installation does not start automatically, use Windows Explorer to open the DVD drive and then double-click on INSTALL to start the installation process.

### 3.4 Installing PHOENICS

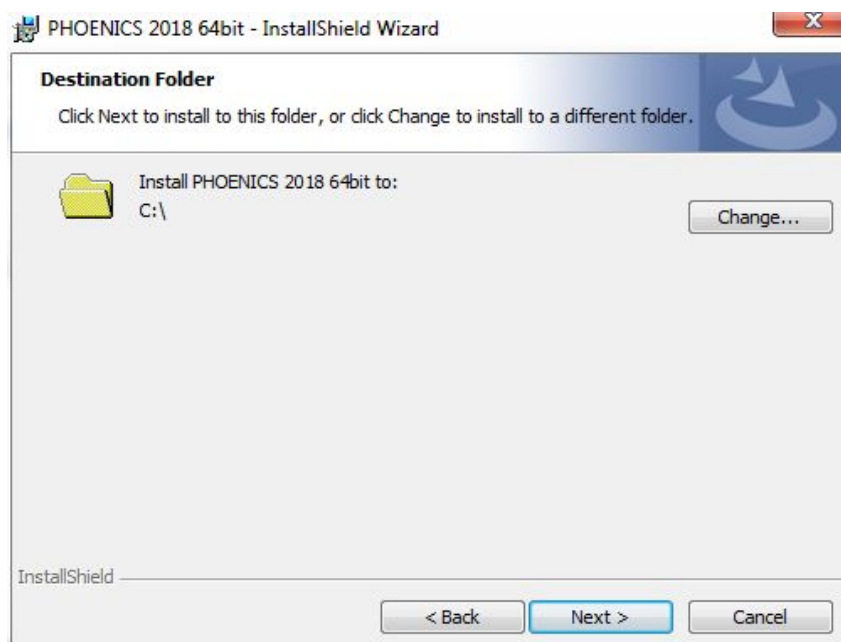
Follow the steps below to install the entire PHOENICS program suite on to the hard disk.

1. Load the DVD into your DVD reader. The setup program will automatically start.



If you do have a previous PHOENICS installation, refer to section 3.2 above for instructions on how to proceed.

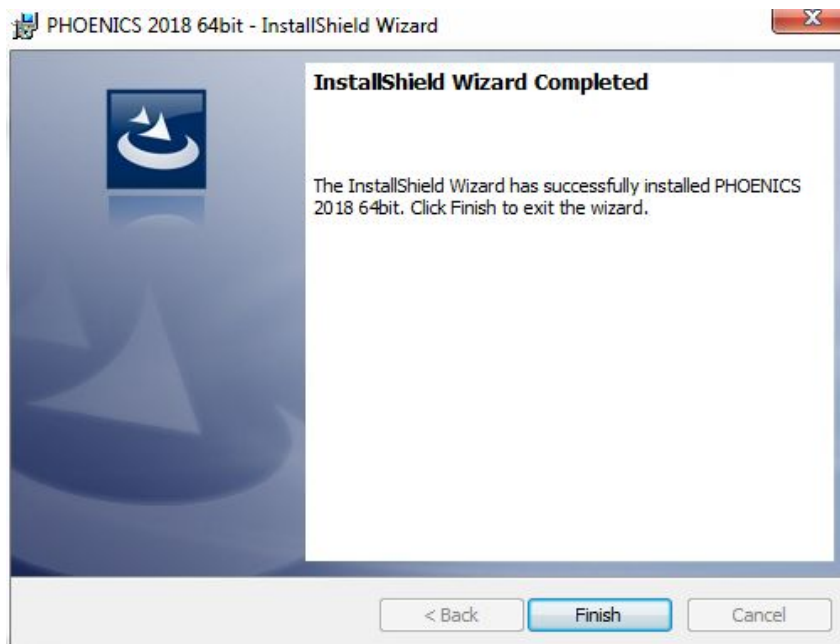
2. Select the installation location





In response to the screen prompt for the location of the phoenics directory, the user must specify the target location if other than **C:\phoenics**. Ideally the phoenics directory should be located in the root of whichever drive was selected for PHOENICS to be loaded on, but it can be installed elsewhere.

- An environment variable 'PHOENICS' is created by the installation process, and this variable is set to the pathname of the location of PHOENICS. For example, if PHOENICS is loaded into **c:\phoe2018\phoenics** then the value of the environment variable 'PHOENICS' is set to '**c:\phoe2018\phoenics**'. While it is possible to install within the directory 'C:\Program Files' it is not recommended for two reasons, one is that POLIS html files use absolute links which will not work unless the folder **phoenics** is at the root level and also the **phoenics** folder will be read-only for non-administrator accounts (see FAQs in Appendix B).



- If the installation is successful, the user will see three PHOENICS icons, **PHOENICS-VR**, **WINDF** and **POLIS** created on the desktop.



The **PHOENICS-VR** icon is a shortcut for the PHOENICS GUI; the **WINDF** icon is the shortcut for a Command Prompt window with the correct path for running the INTEL Fortran compiler as well as PHOENICS; Prelude is an alternative interface to the VR environment; **POLIS** icon is the shortcut for the PHOENICS On-Line Information System.

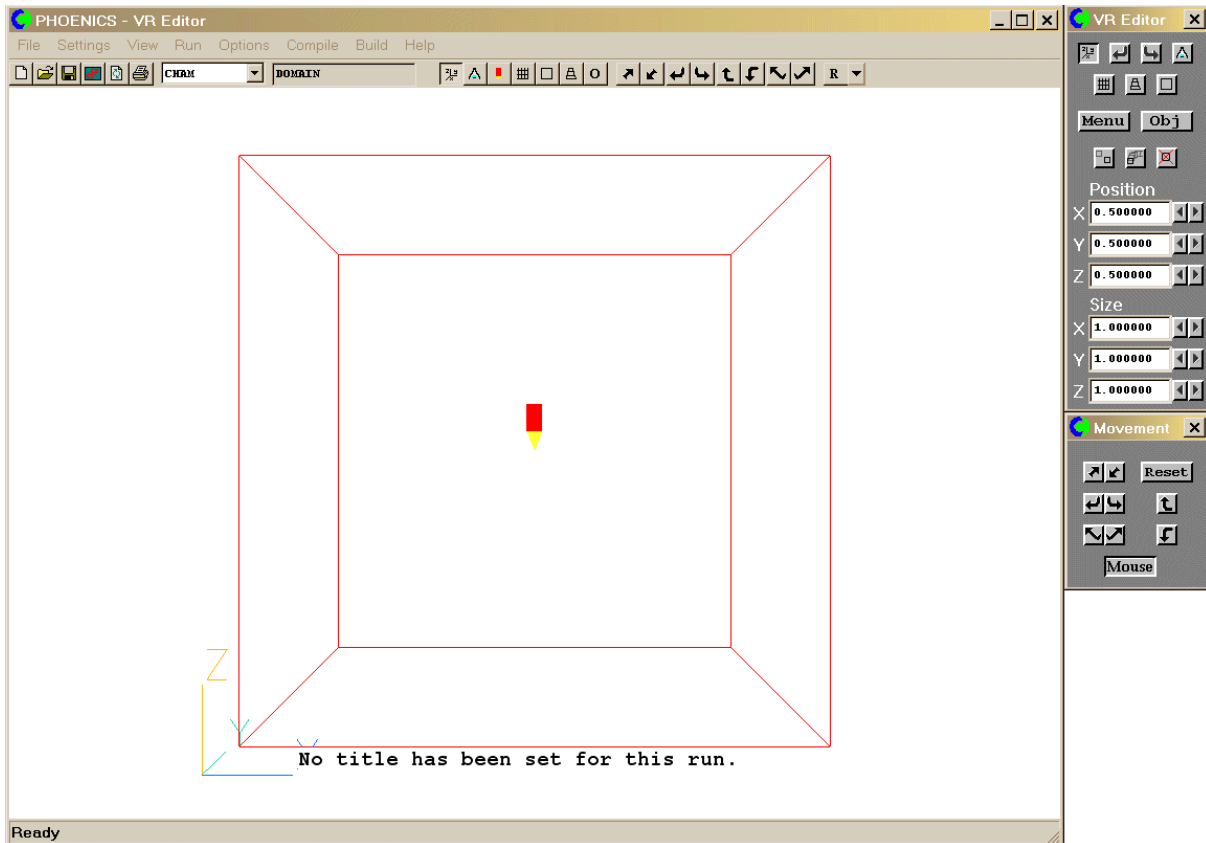
If PHOENICS is installed on one disk drive (e.g. C:) and the working directory is on a different drive (e.g. D:) then the PHOENICS-VR Icon will require changing. Click on the Icon with the right mouse button, select Properties and Shortcut, and change the drive letter in the field 'Start in: ' to be the required letter, in this case D:.

## 4 Brief test of the PHOENICS installation

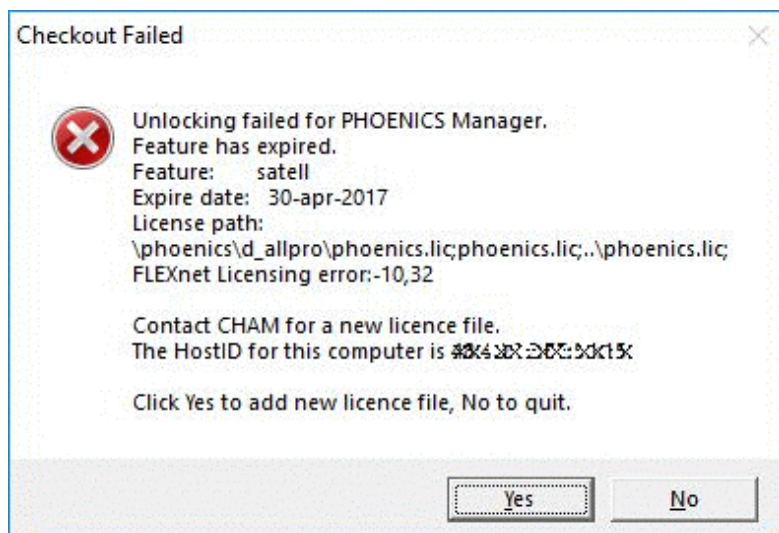
Before running anything more complex, it is recommended that the user tries running a simple case from the PHOENICS library of cases to check the software unlocking and that the necessary DLLs are being loaded correctly.

### 4.1 PHOENICS VR

Double-click on the CHAM icon, labelled '**PHOENICS VR**' in the desktop. The screen shown below should appear.



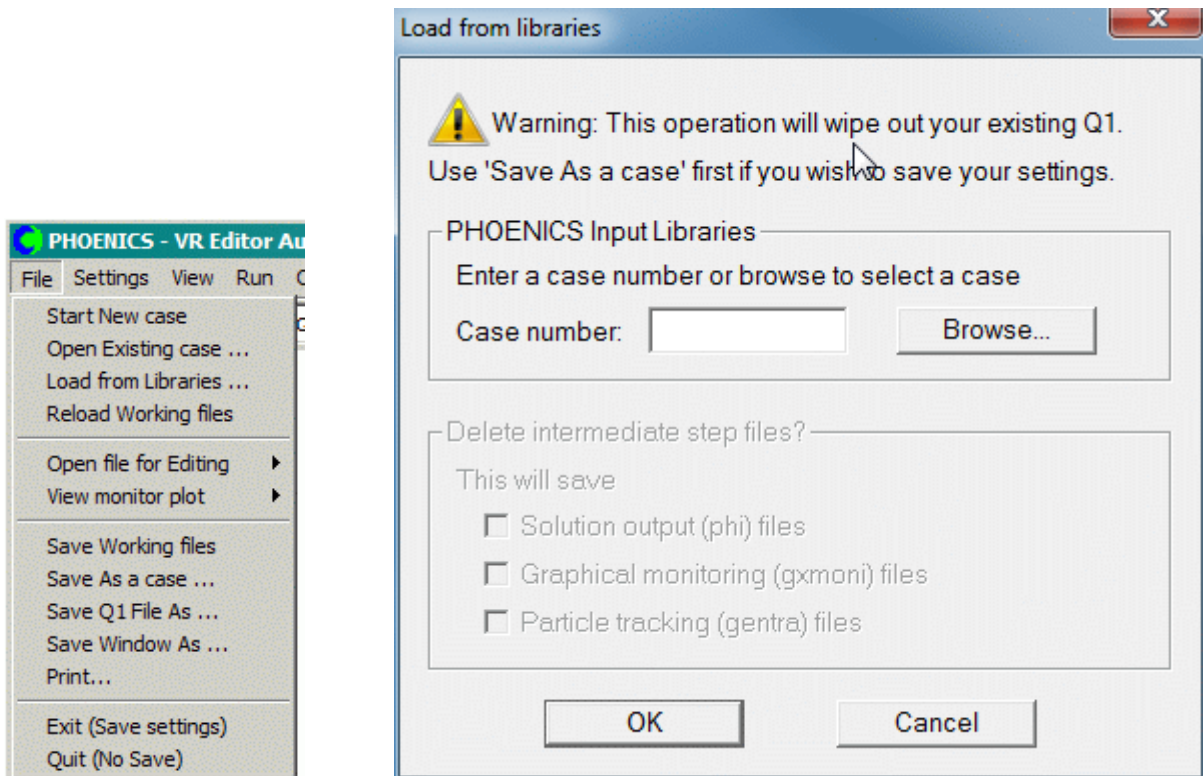
PHOENICS is provided with a temporary license file. If you received PHOENICS on a DVD disc, then this license file should provide up to two months usage before expiry. However, if you received PHOENICS as a download then you are likely to receive a dialog message that the code has expired.



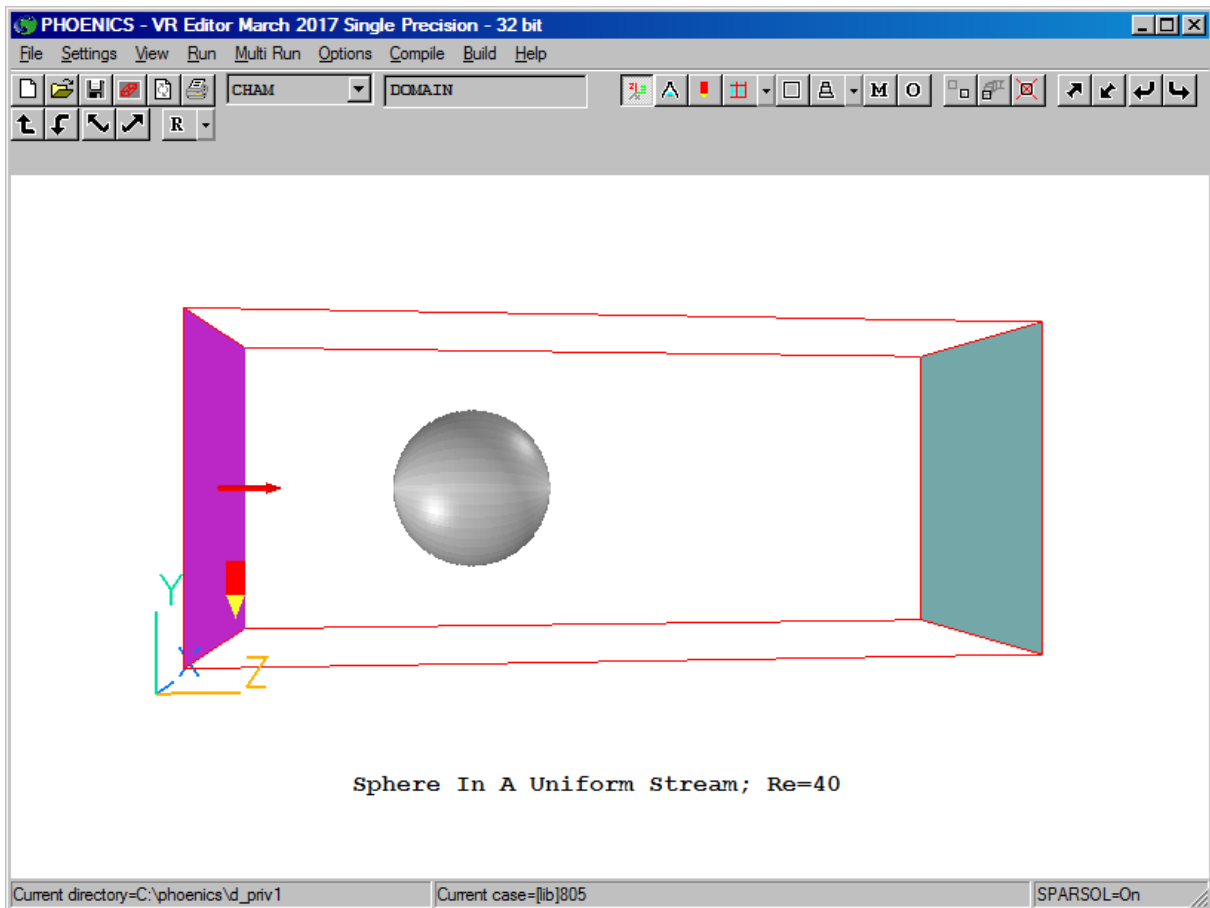
If you get the expired notice, then refer to Appendix A and contact CHAM for a new license file. The HostID required by CHAM for unlocking should match that displayed in your expired dialog message.

#### 4.2 Test run of simple library case using VR Editor and Earth

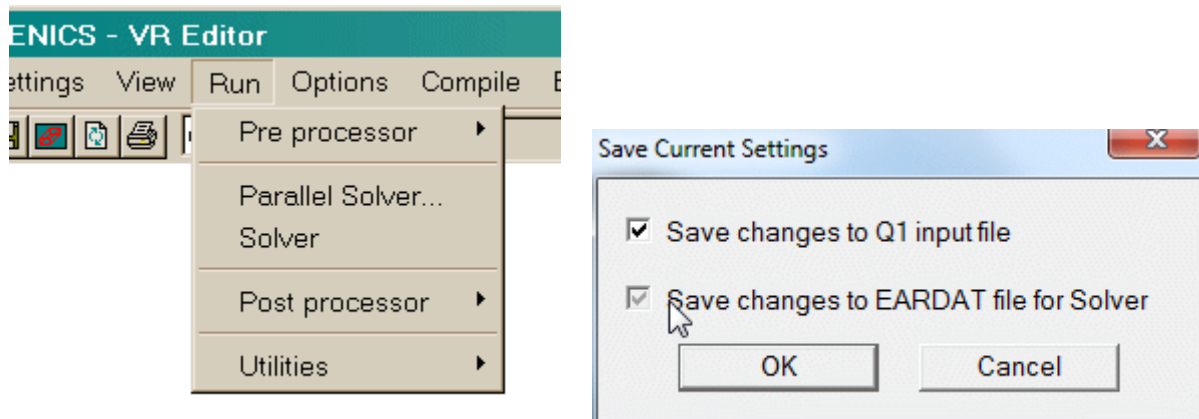
Once you have valid license file you can prepare a test run of the solver. For this is best to select a simple case from the PHOENICS library cases, a good example to use is library case 805 – ‘Sphere in a uniform stream’. To load the library case, from the File menu in PHOENICS VR select the item ‘Load from Libraries...’. This should lead to the dialog shown below.



This dialog acts as a warning that if you had a pre-existing case loaded into the VR-Editor then the following action(s) will overwrite your case. This reminder gives the user the opportunity to cancel and save their work before continuing. In the edit box to the right of ‘Case number:’ enter the number 805, and then click on the button ‘OK’. The PHOENICS VR window should then look like



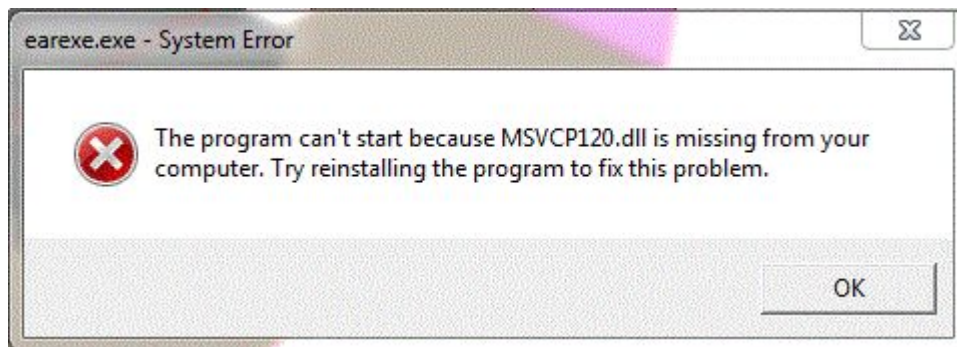
This is a simple case of airflow entering the domain from an inlet the left and passing a sphere set in the flow field, the air exits through an outlet on the right. One can make adjustments to the flow, but for this initial test run, run the model as it is. On the Run menu, select the item 'Solver'. Once selected, you will see the 'Save Current Settings' dialog below.



At this point you can choose whether any changes are saved to the current Q1 input file, by default this item will be ticked. This option is provided for those occasions when you wish to retain the original Q1. The file eardat will always be written at this time as it contains the input instructions for the solver. Clicking on the 'OK' button will launch the solver; 'Cancel' will abort the run. This run should only take a few seconds and you will see a new window appear on screen as below.



If the window does not appear then it indicates that the solver failed to start. If the solver did not start likely causes are either an unlocking failure or a failure to locate the necessary DLLs. If there is a failure in the DLL's the most likely candidate will be the Microsoft Visual C++ 2013 Redistributables which will present with the following error message.

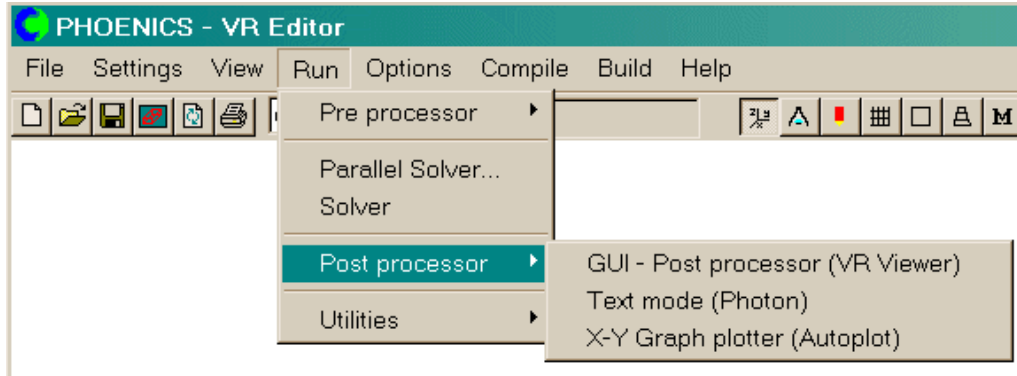


To correct this error it will be necessary to install the redistributable. This can either be downloaded from the Microsoft website or one can install using the copy provided in the installation within the directory \phoenics\ThirdPartySoftware. The file vc\_redist\_x64.exe is the redistributable for 64-bit applications and vc\_redist\_x86.exe the redistributable for 32-bit applications. A similar error but with a missing DLL MSVCP100.dll might also occur in which case one will need to install the Microsoft Visual C++ 2010 Redistributables.

Any failure in the unlocking should be recorded in the file 'lunit6' which will be located in the working directory (the default location this file should be c:\phoenics\d\_priv1\lunit6). If there is no message in 'lunit6' then check that you have the four DLLs present in the directory c:\phoenics\d\_earth\d\_win64 (or in c:\phoenics\d\_earth\d\_win32). The DLLs are named

mpich2.dll, mpich2.dll, mpich2mpi.dll and mpich2nemesis.dll. If the DLLs and unlocking are present and correct and the solver is still not running then contact CHAM for further assistance.

Once the solver has finished the window will close and the test is now complete. You may go on to view the results in the post processor.



Use the option 'GUI – Post processor (VR Viewer)' then click OK on the following dialog. Instructions on the use of the VR Viewer are available in documents [TR324](#) and [TR326](#).

## 5 Explanation of PHOENICS functionality

PHOENICS is a **general-purpose** software package which uses the techniques of CFD (*i.e.* Computational Fluid Dynamics) to predict quantitatively:

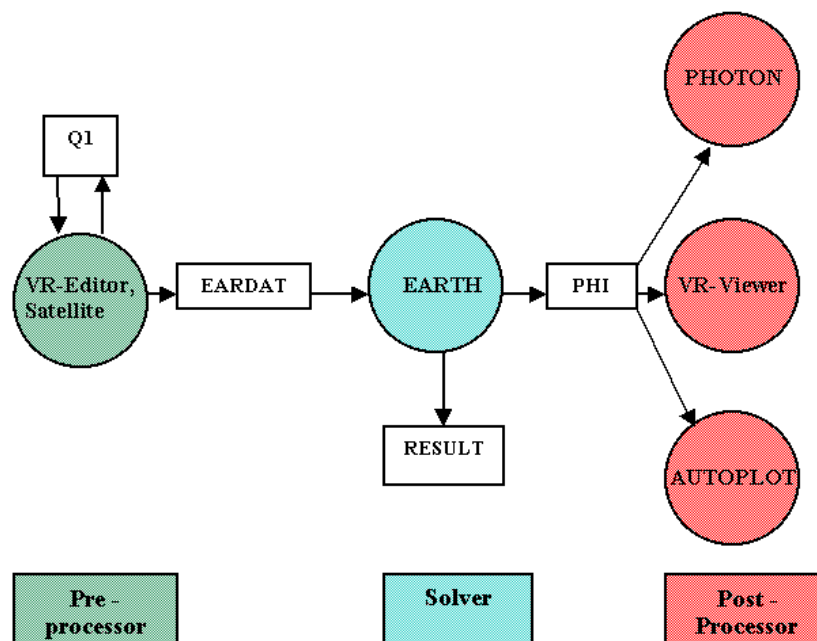
- how **fluids** (air, water, steam, oil, blood, etc) **flow** in and around:
  - engines,
  - process equipment,
  - buildings,
  - human beings,
  - lakes, river and oceans,
  - and so on;
- what are the associated changes of **temperature** and of **chemical and physical composition**;
- what are the associated **stresses** in the immersed or surrounding **solids**.

Its name is an acronym for *Parabolic Hyperbolic Or Elliptic Numerical Integration Code Series*, wherein "parabolic", "hyperbolic" and "elliptic" are the words which mathematicians use to distinguish the underlying equations. However, the mention of equations does not imply that PHOENICS is intended for mathematicians.

PHOENICS performs three main functions:

1. **problem definition** (*i.e.* pre-processing), in which the user prescribes the situation to be simulated and the questions which are to be answered;
2. **simulation** (*i.e.* data-processing), by means of computation, of what the laws of science imply in the prescribed circumstances;
3. **presentation** (*i.e.* post-processing) of the results of the computation, by way of graphical displays, tables of numbers, and other means.

PHOENICS therefore, like many but not all CFD codes, has a distinct software module, or set of modules, for each of the above three functions. Their interrelationships are shown below.



The four names in white rectangular boxes in the above diagram refer to files which are used for communication between modules, as follows:



- **Q1**, the user-readable input-data file, which is written in PIL, the PHOENICS Input Language, and is the main expression of what the user wishes to achieve.
- **EARDAT**, an ASCII file which expresses in EARTH-understandable form what the user has prescribed by way of Q1.
- **PHI**, which is written by EARTH in accordance with a format which enables PHOTON, AUTO PLOT and the Viewer to display the results of the computation graphically.
- **RESULT**, which is an ASCII file expressing the results in tabular and line-printer-plot form.

## 5.1 Pre-processing modules

The principal input file used by the PHOENICS pre-processor is the [Q1 file](#). This is an ASCII text file that contains a description of the scenario that is to be simulated and is written in the PHOENICS Input Language. This Q1 is read and processed by the pre-processor module Satellite into a form that is ready for the solver module Earth.

There are a number of ways in which the user can write a Q1, these include

- Using the Satellite GUI, the [VR Editor](#) build a representation of the computational domain
- Use the alternative GUI [Prelude](#)
- Write the Q1 directly in a text editor. The recommended editor is [pQ1ed](#) which is supplied with PHOENICS, alternatively one can use any convenient editor (for example Notepad).
- Write the Q1 within the Command mode of [Satellite](#).
- With the aid of a [PHOENICS Direct SimScene](#)

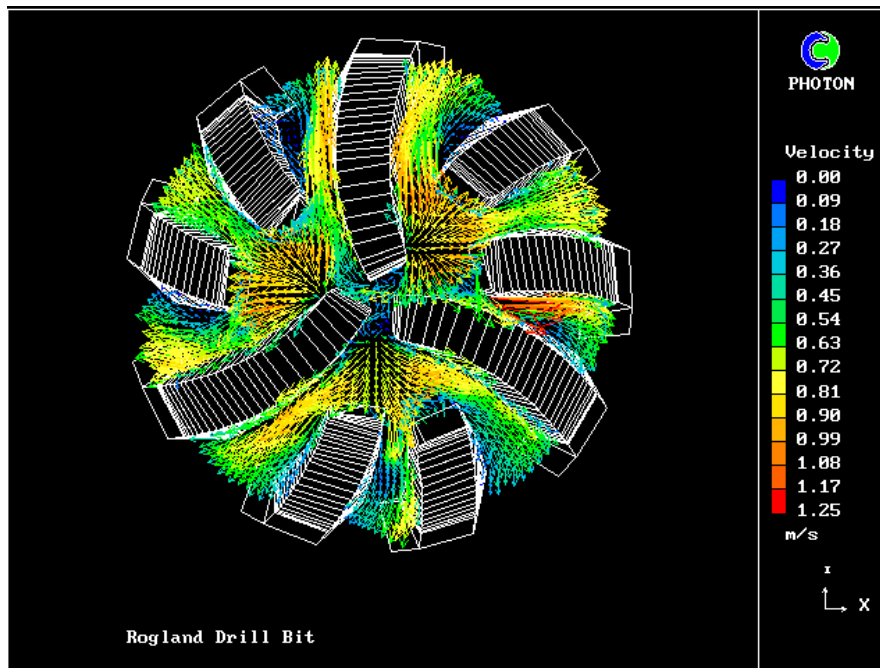
## 5.2 Post-processing modules

In addition to the VR-Viewer, PHOENICS has further modules for the graphical display of flow fields. Two of which are:

- PHOTON, and
- WinPHOTON

Both programs can be launched from the 'Run' then 'Post processor' menu item in the top menu of the VR Editor.

PHOTON(PHOENICS OuTput optiON) dates from the early years of PHOENICS; it is still the module which some users prefer to use.



WinPHOTON came into existence more recently. As its name suggests, its main role is to enable users to do by way of Windows-style mouse-clicks and dialog boxes what most users of PHOTON do by entering typed commands. WinPHOTON can also accept typed commands; but, as well as having a more-modern-looking menu system, it also has several functions which PHOTON, and indeed even the VR-Viewer, does not possess. Among these are:

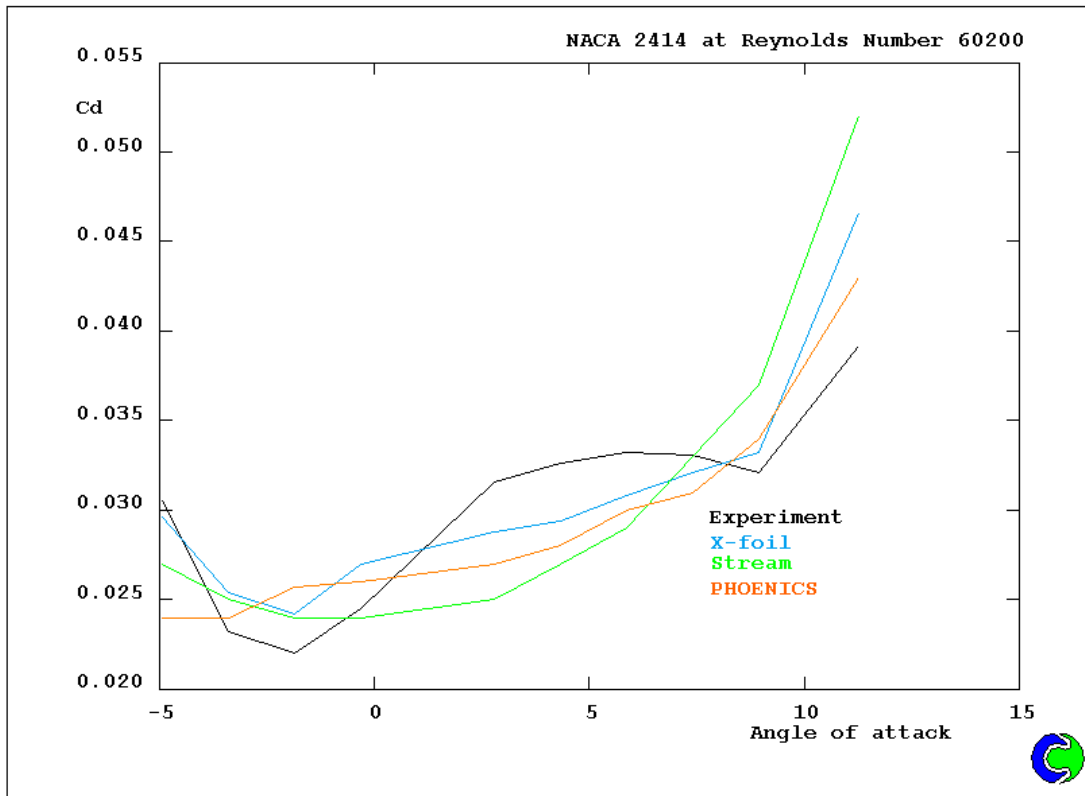
- enabling users to display new variables, derived from the usual ones by way of interactively supplied formulae;
- tabulating numerical values of user-selected variables at user-selected locations;
- permitting users to declare and use integer, real or character variables for use in macros, i.e. the so-called 'use' files which contain a succession of PHOTON commands.

The PHOTON/WinPHOTON programs also contain an additional line plotting module AUTO PLOT. AUTO PLOT provides X-Y graphs, made up of straight line segments joining the data points.

The data can be manipulated in a number of ways during plotting, specifically by:

- adding or subtracting a constant
- multiplying or dividing by a constant
- raising to a power
- taking base 10 or natural logarithms
- constructing new data elements can be constructed by operating on existing elements.

AUTO PLOT can access data from PHOENICS PHIDA and XYZDA files, and also from user-created files. It can plot data from many files simultaneously, allowing easy comparison of PHOENICS results with experimental or analytical results.



### 5.3 Additional post processing options

As well as the post-processing modules which are available within PHOENICS, the user can select additional output which will enable users to plot their results user third party graphics programs. There are output options available for Tecplot, FieldView and VTK formats and can be activated either through the Additional Interfaces option in the VR Editor or by adding the PIL lines to the Q1 before running the solver.

## 6 Parallel PHOENICS

### 6.1 Introduction

This chapter describes the installation of MPICH2 for the user who purchased a licence for running parallel PHOENICS on machines that are running on Microsoft Windows. It applies to installations on a single multi-core processor machine and clusters of multiple workstations or servers.

Typically users will switch to using the parallel PHOENICS solver for their larger cases in order to get to a converged solution quicker. Although it is possible to run the 32-bit solver generally one would only expect users to run the 64-bit solver in parallel.

All new computers will now come with multiple cores, some laptops will only have two cores, but most desktops will now have four or more cores. This enables users to often run parallel PHOENICS entirely on their own desktop machine thus eliminating the complications of setting up a computing cluster.

The workstations in the cluster should be joined by a switch or hub running at 100Mbps or more. For efficient operation the processors in a cluster should be of equal performance: if not, the loads will be unbalanced and the slowest processor will determine the speed of the system. MPICH2 also requires the ability to make TCP/IP socket connections between all hosts.

### 6.2 Preliminary Considerations

#### 6.2.1 Multi-core computers

The installation process for Parallel PHOENICS on a single workstation with multiple-cores/processors is simpler than the installation process for a cluster. It still requires the installation of MPICH2 to handle the message passing aspects, but one does not need to be concerned with firewalls nor with network connectivity issues. MPICH2 should be installed on the single workstation as outlined in section 6.3 (6.3.1-6.3.3 only), and the PATH set appropriately so that **mpiexec.exe** is visible. After completing the MPICH2 installation check that SMPD has been correctly installed as a service on the workstation.

#### 6.2.2 Computers on a Cluster

When setting up a group of computers to perform as a cluster, the computers should belong to the same Workgroup or Domain. Details of a computer's domain can be found on the Systems Properties page found by opening the Control Panel on the computer. If you need to change the domain settings, then you should consult your network administrator.

The user account that will be used to perform parallel computation across the cluster must be able to make remote connections to all computers in the cluster. For this reason it is recommended to use an Administrator account and that this account should have the same password on all computers in the cluster.

It is a requirement that MPICH2 be installed on each PC in the cluster. To install MPICH2 the user will need to be logged in using an account with Administrator permissions. This need not be the account on which you run PHOENICS, but please note it is preferable when running over a cluster to use an administrator account.

Workstations and servers running versions of Microsoft Windows will now have a personal Firewall switched on by default. Experienced users may configure the firewall settings to allow parallel PHOENICS to run successfully, but while installing and until the user is sure that MPICH2 has been configured correctly, it is recommended that any personal firewalls are turned off. Again consult your network administrator if you are unsure how to do this. After the user has established that MPICH2 is working correctly then, of course, you may switch the Firewall back on (see settings in section 6.4).

## 6.3 Installation of MPICH2

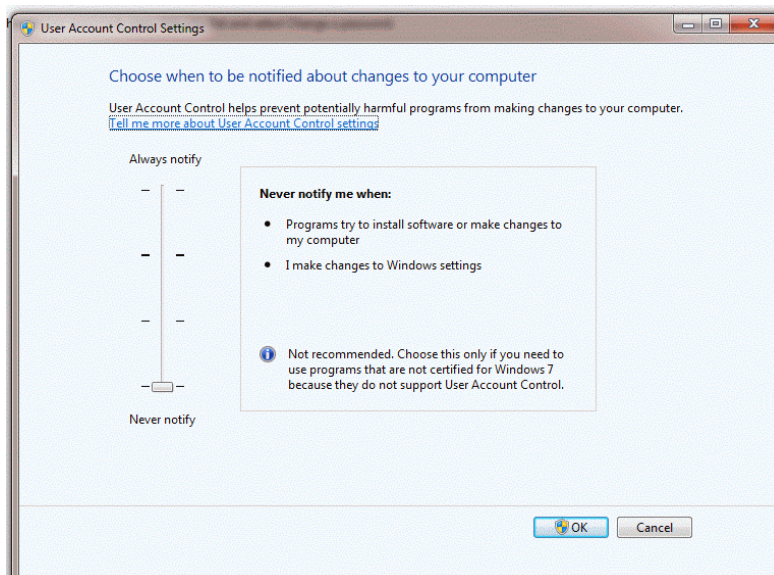
It will be assumed in what follows that PHOENICS has been successfully installed in accordance with the instructions in the earlier chapters of this document. A full PHOENICS installation need only be made on one machine in a parallel cluster (the head node from which jobs will be run); however it is recommended that an installation is made on each PC. If PHOENICS is only installed on the head node then it will be necessary to share the `\phoenics` directory so that all PCs may see it. Each machine in the cluster will also be required to have a valid local licence file 'phoenics.lic' accessible.

On Windows platforms Parallel PHOENICS uses MPICH2 as the message passing interface (MPI) for the communication between the different processes. MPICH2 is freely available on the Internet but for compatibility it is important that the installation is made from the MPI provided with PHOENICS package. Installation instructions are as follows:

### 6.3.1 Turn Off User Access Control

In order to run the MPICH2 installation program you must first be logged onto the PC using an account that has Administrator privileges. If the PC is running **Vista Business** or **Windows 7/8** you **must** switch off the User Account Control (UAC) while installing MPICH2. If you fail to switch off UAC, then the installation may complete without reporting any errors but in fact SMPD will not have been installed as a service nor will the necessary registry entries have been made.

To disable UAC open the Control Panel from the Start Menu, select item "User Accounts" and then "User Accounts" once more. On this page there should be an item "Change User Account Control settings", click on this item and then change the setting to its lowest one "Never notify" as below..



Then click OK to accept the changes and you will also be asked to restart the computer before the changes take effect.

### 6.3.2 Run the MPICH2 installer

The installer for 32bit MPICH2 is supplied as the file

```
\phoenics\ThirdPartySoftware\MPICH2\mpich2-1.4.1p1-win-ia32.msi
```

and that for 64bit MPICH2 is supplied as the file

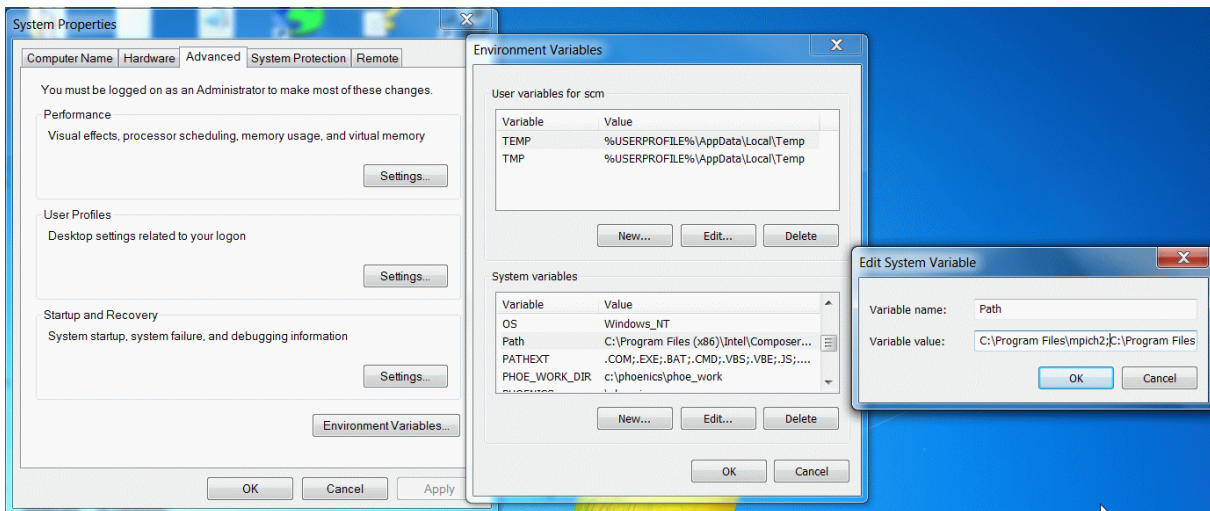
```
\phoenics\ThirdPartySoftware\MPICH2\mpich2-1.4.1p1-win-x86-64.msi
```

The relevant file should be executed prior to running Parallel PHOENICS, and this will initiate an Argonne National Laboratory installation of MPICH2 on your PC. Follow the installation instructions, and choose the default MPICH2 location in the Program Files folder (*C:\Program Files\MPICH2*) on your PC.

**Please note:** It is necessary to install MPICH2 (particularly the SMPD service) on all computers of a computing cluster.

### 6.3.3 Update Environment variable *PATH*

The PHOENICS parallel run scripts assume that **mpiexec.exe** is located on the user's *PATH* on the head and compute nodes. If the default location was chosen, this should be *C:\Program Files\MPICH2\bin*. The *PATH* is set through the System Properties dialog [launched from the Control Panel], and the image below shows the stages involved in setting the User variable **path**. Go to the Advance settings page and click on Environment Variables button. If the User variable **path** does not exist, click on New, otherwise highlight **path** and click on Edit. Add the necessary path entry for mpiexec.exe – *separate any path entries by semi colons*. [To modify the System variable **path**, consult with your network administrator.]



Since version 12, the Intel Compiler has included Intel's version of MPICH. This version is not compatible at the binary level with that used by PHOENICS, so it is important when using PHOENICS that MPICH2 appears in the *PATH* before the Intel Compiler. If you have the Intel compiler installed on your PC it is best to add *C:\Program Files\mpich2\bin;* at the beginning of the path. This will ensure that the correct version of **smpd** and **mpiexec** will be found when you try to run parallel.

**Note:** If the path is such that it allows the Intel version of **mpiexec** to be used then the parallel solver will stall on start-up and calculations will not proceed.

### 6.3.4 Registering user account

When running across a cluster it is recommended to register a user account from which to launch MPICH2 on the head node. While it is not essential, it does simplify matters if this account is an administrator on the workstations within the cluster. This account will then be used to launch parallel PHOENICS on the compute nodes. To register an account, open a Command Prompt window [either use the WINDF icon from the PHOENICS installation, or from the Start menu choose the Command Prompt option from the Accessories folder], and run the MPICH2 program **mpiexec.exe** with the option `-register`. You will be prompted for an account and password, e.g.

```
> mpiexec.exe -register
account: cfd1
password: *****
```

confirm: \*\*\*\*\*

Do you want this action to be persistent (y/n)? y

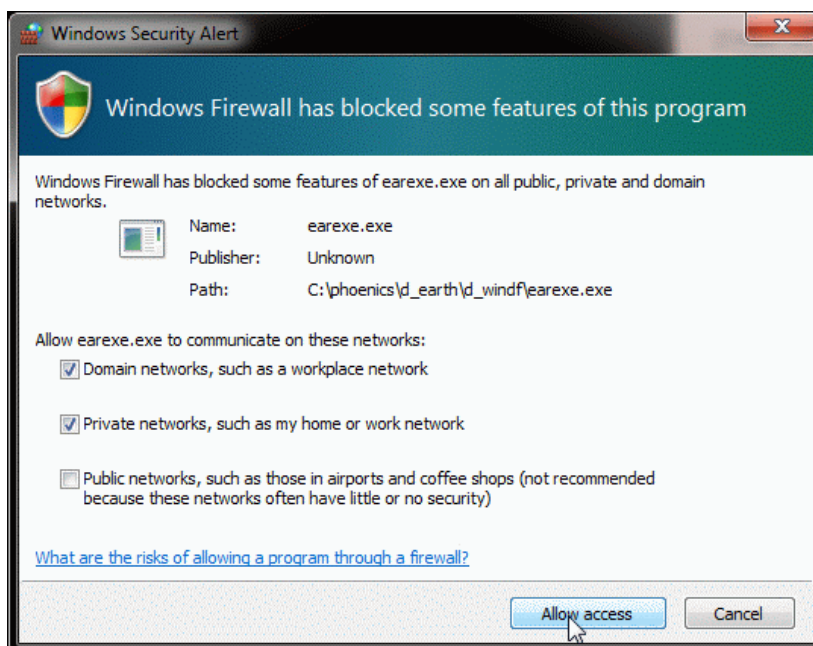
If the cluster has been set up within a network Domain (rather than a Workgroup), then in the above, you should also specify the domain as part of the account name. For example, if 'phoenics' is the domain and 'cfd1' is the user account within that domain, enter phoenics\cfd1. The response 'y' ensures that this action is persistent, i.e. this registration process does not have to be repeated for each session on this computer.

### 6.3.5 Turn On User Account Control

Once the installation of MPICH2 is concluded you may restore the UAC settings to their default levels.

## 6.4 Windows Firewall settings

If the firewall is activated, when the PHOENICS solver (earexe.exe) is run for the first time - in either sequential or parallel mode - a Windows Firewall Security Alert will be generated.



If the user is running (or intends to run) the solver in parallel mode then the user should click on the 'Allow access' button. On Windows 7 the user will need to also specify on which networks to allow access. Normally you would only be making parallel runs on either a domain or private network, so only these two items need be ticked before clicking on 'Allow Access'.

When running in parallel mode you will also get security alerts for the MPICH2 Process Manager (smpd.exe) and the MPICH2 Process launcher (mpiexec.exe). If you intend to run the parallel solver over a cluster it is essential that all three programs are unblocked/allowed access.

Allowing access to the three programs above on the head node is not yet sufficient to enable parallel PHOENICS to run across a cluster of computers. Before you can run across a cluster the user must first go to each of the compute nodes and allow access to the PHOENICS solver (earexe.exe) and the MPICH2 Process manager (smpd.exe).

On Windows 7, open the Control Panel and then click on 'System and Security'. Under the section 'Windows Firewall' there should be an item 'Allow a program or feature through Windows Firewall'. This will open a dialog from which you can check the permitted programs and allow you to add the additional programs. Click on the 'Allow another program...' button

and then use '*Browse...*' for the each following three programs in turn.

*C:\Phoenix\d\_earth\d\_win32\learexe.exe (or C:\Phoenix\d\_earth\d\_win64\learexe.exe)*

*C:\Program Files\mpich2\bin\smpd.exe*

*C:\Program Files\mpich2\bin\mpiexec.exe*

When adding the programs you can use the '*Network location types...*' button to restrict network locations to '*Domain*' and '*Home/Work*'. The '*Public*' network option should remain unticked.

On each of the compute nodes you will need to add the programs

*C:\Phoenix\d\_earth\d\_win32\learexe.exe (or C:\Phoenix\d\_earth\d\_win64\learexe.exe)*

*C:\Program Files\mpich2\bin\smpd.exe*

On Windows XP, open the Windows Firewall icon from the Control Panel, then go to the Exceptions Page. On the head node check that the above three programs are included. If any are missing you will need to use the "Add Program..." button to add them. You may also use the "Change scope.." button to restrict access to My network (subnet) only.

Users of other personal firewalls will need to unblock the above programs in a manner suitable for their firewall software.

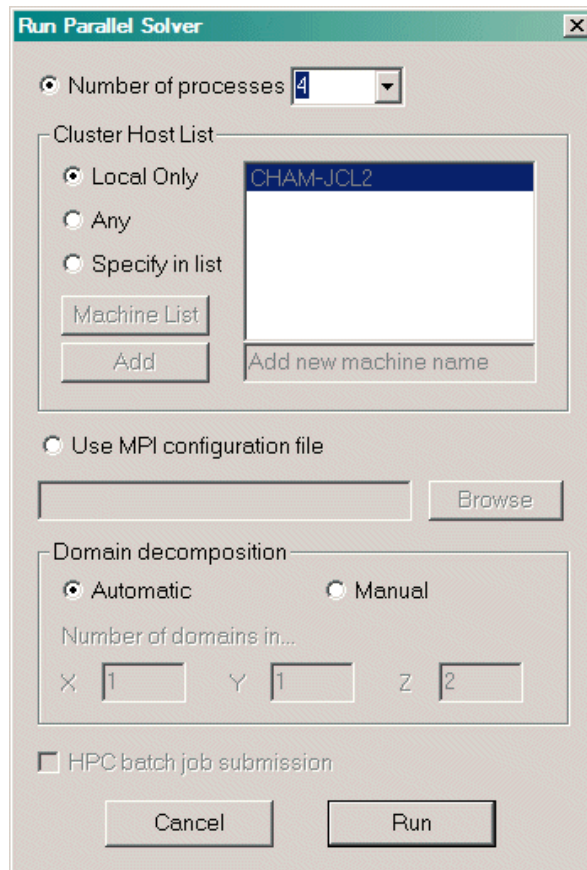
## **6.5 Running Parallel PHOENICS**

### **6.5.1 Running the standard parallel Earth**

The simplest way to launch parallel EARTH is from the VR-Editor, although it can be run from a Command Prompt window.

If a parallel PHOENICS licence has been purchased, an additional sub-menu, 'Parallel Solver', will appear under the 'Run' menu option in the VR-Editor. Once the parallel solver is chosen, a dialog box will appear on the screen where the user can either specify the number of processes to use or to specify a MPI configuration file.





The pulldown combo box provides the user with an option to select up to 64 processes in steps of 2. Those users who have more than 64 processors on their PC cluster may type the appropriate number into the box.

The 'Cluster Host List' portion of the dialog enables the user to select which hosts in the cluster are used for computation. Here there are three options,

- 'Local Only': the default, will just use cores on the local machine (i.e. that on which the instance of VR-Editor is running).
- 'Any': will use a computer assigned distribution of processes on the nodes in the cluster. These must have been previously identified in the cluster.
- 'Specify in list': users may select hosts from the scroll list. By default this list should contain those hosts previously identified in the cluster, but one can also add to the list by using the 'Add' button. Alternatively, one can supply a 'Machine List' file which contains a list of those workstations from which to select. This file is simply a text file with name of the workstations each on a separate line.

This mode of running the parallel solver will always launch the root process on the local machine and a convergence monitoring window will appear on screen (as per the sequential solver). If running across a cluster, then the run will attempt to launch an instance of the solver from the same location on each of the compute nodes. If the default locations are used, this will be `C:\phoenics\ld_earth\ld_win32\learexe.exe` for 32bit running (or `C:\phoenics\ld_earth\ld_win64\learexe.exe` for 64bit usage). If a Private Earth is to be used, then this also should be copied to the equivalent directory for each of the compute nodes.

When running across a cluster, it is important to consider the working directory on the compute nodes. This is because, by default, **mpiexec** will attempt to launch the process in the equivalent directory on all the workstations. So, if on the head node you are working in `c:\phoenics\myprojects\projectbeta` then this directory should also appear on all the

workstations in the cluster. The run will fail if this directory does not exist on all the workstations, unless the environment variable PHOE\_WORK\_DIR (see below) is used.

As it can difficult to always remember to create the working directory on all the cluster workstations there is an alternative. One can set up an environment variable PHOE\_WORK\_DIR on each PC in the cluster to point to an existing fixed directory

e.g. PHOE\_WORK\_DIR=C:\phoenics\mypar\_runs

Then all processes (aside from the launching process) will write their output to this location.

**PLEASE NOTE:** The use of PHOE\_WORK\_DIR is not recommended if you are likely to make multiple parallel runs simultaneously. This is because the second run (and subsequent runs) will overwrite the working files of the first.

The above methods of launching the parallel solver do not allow the user to fix the number of solver instances on each workstation. If you want that level of control, then the user will need to use the MPI Configuration file (see section 6.5.2 below).

## 6.5.2 Configuration File

The MPI configuration file option gives a more flexible way of launching the parallel solver. Assuming we have PHOENICS installed on **each computer** in the cluster, the following config file (**config4**) will use the public earexe.exe to run a single process on each of the four computers. The examples below assume 32bit running, for 64bit usage the text 'd\_win32' should be replaced by the text 'd\_win64'.

```
-localroot -np 1 -host cham-cfd1 c:\phoenics\d_earth\d_win32\earexe.exe
-np 1 -host cham-cfd2 c:\phoenics\d_earth\d_win32\earexe.exe
-np 1 -host cham-cfd3 c:\phoenics\d_earth\d_win32\earexe.exe
-np 1 -host cham-cfd4 c:\phoenics\d_earth\d_win32\earexe.exe
```

The following example (**config4h**) launches two processes on each of two computers where PHOENICS is installed only on the **head node**:

```
-localroot -np 2 -host cham-cfd1 c:\phoenics\d_earth\d_win32\earexe.exe
-np 2 -host cham-cfd2 \\cham-cfd1\phoenics\d_earth\d_win32\earexe.exe
```

Users should create their own configuration and 'run' files, based on the examples provided, tailored to their own installation. These can either be located in \phoenics\d\_utils\d\_win32 (or \phoenics\d\_utils\d\_win64) or the local working directory.

## 6.5.3 Cluster Operation

All Nodes in the cluster should belong to the same Workgroup or Domain, and the user should be logged into each Node on the Cluster using the same Workgroup/Domain User account and password.

A full PHOENICS installation must be made on the head node. A PHOENICS installation is strongly recommended on the other compute nodes, but it is not essential.

- a) If PHOENICS is only installed on the **head node** then the phoenics folder will need to be shared, with at least Read permissions, for the other **compute nodes** in the cluster. The Shared name which is chosen at the time the folder is shared is used in the configuration file, and in the example file '**config4h**' above the shared name is 'phoenics'.

While it is possible for compute nodes to refer to the licence and configuration files on the head node, in practice this has led to problems and the solver unexpectedly stalling. As a minimum therefore the following files should be copied onto each of the compute nodes:

```
C:\phoenics\d_allpro\phoenics.lic
```

```
C:\phoenics\d_allpro\coldat  
C:\phoenics\d_allpro\config  
C:\phoenics\d_allpro\prefix  
C:\phoenics\d_earth\earcon  
C:\phoenics\d_earth\props
```

The files `get_hostid.bat` and `lmhostid.exe` (in `c:\phoenics\d_allpro`) will also be needed initially to identify the compute node HOSTID necessary for unlocking the software.

The environment variable PHOENICS should be set to `C:\phoenics` on the compute nodes to indicate that the configuration files are stored locally. See section 6.3.3 for some help in setting environment variables.

Instead of running the solver directly from the network shared folder (see shared folder **phoenics** in **config4h** file above) one could also copy the solver to the compute nodes as

```
C:\phoenics\d_earth\d_win32\earexe.exe
```

or for 64bit running

```
C:\phoenics\d_earth\d_win64\earexe.exe
```

During a run of the parallel solver the processes on the compute nodes will need to read and write some working files. These are generally only of use to the program during a run or perhaps for diagnostic purposes if things go wrong, but they still need to be written somewhere. By default these will be in an equivalent directory to that used to start the run on the head node. So if the run was started from `c:\phoenics\d_priv1` on the head node the user will need to make sure that there is a directory of the same name on each of the compute nodes.

As the files created on the compute nodes may be considered scratch files (i.e. only of short term value) it is possible to set up an environment variable `PHOE_WORK_DIR` on each of the compute nodes to specify where these files will be stored. Thus one does not have to remember to create a working directory for each time you change the working directory on the head node.

- b) If PHOENICS is installed on each compute node (in addition to the head node) then the Workgroup/Domain User account used to log into each compute node must allow read access to all PHOENICS folders, and write access to the working folder (the default is `C:\phoenics\d_priv1`).

## 6.5.4 Automatic domain decomposition

When using the default automatic domain decomposition, parallel PHOENICS only differs from sequential when Earth is run: problem set-up and post-processing of results can be done in exactly the same way as for the sequential version. A case that has been run in sequential mode can normally be run in parallel without any changes being made. The output from a parallel PHOENICS simulation will be **result** and **phi** files, having the same format as for sequential simulations.

### 6.5.5 User-specified sub-domains

It is also possible to by-pass the automatic domain decomposition algorithm, and to specify how you want to decompose the calculation domain into sub-domains. This can be done by selecting 'Manual' in the Domain decomposition group box on the Run Parallel solver dialog (see section 6.5.1 above). When you first switch to manual decomposition the arrangement will match the automatic decomposition that would otherwise be used. Normally automatic

decomposition will suffice, but there may be occasions where a different decomposition is preferable to avoid a split at a critical location.

### 6.5.6 Command mode operation

In a Command Prompt window, if the EARTH executable is launched directly, then the sequential solver will be used; to run the parallel solver, the program name 'earexe' is used as an argument to mpiexec.

A script RUNPAR.BAT [nnodes] is provided. The optional argument [nnodes] indicates the number of processes to be launched on the current PC. The default is to launch two processes.

For example, RUNPAR 2 will execute the MPI command:

```
mpiexec -localroot -np 2 \phoenics\d_earth\d_win32\earexe
```

or for 64bit running

```
mpiexec -localroot -np 2 \phoenics\d_earth\d_win64\earexe
```

If a cluster has been defined by **smpd**, then the command will execute on two processors in the cluster, otherwise it will launch multiple processes on the local machine.

There are also 'run' commands which can be used in conjunction with configuration files, for example 'runcl4' uses the configuration file '**config4**'. **Config4** lists the PCs and processors to be used (see above Configuration file section above). The script runcl4 will execute the following command:

```
mpiexec -configfile \phoenics\d_utils\d_win32\config4
```

or for 64bit running

```
mpiexec -configfile \phoenics\d_utils\d_win64\config4
```

### 6.5.7 Testing Parallel PHOENICS

The parallel installation should be tested by loading a library case.

The different solver used for parallel operation requires a slight modification to the numerical controls. For example, the user may use main 'Menu' in the VR-Editor, and select 'Numerics' and then 'Iteration control': change the number of iterations for TEM1 (temperature) from 20 to 300. (Increasing the relaxation for the velocity components, U1 and W1, from 1.0 to 10.0 will also improve performance.)

For parallel operation it is recommended that velocities should be solved whole-field (rather than slab-by-slab); this can be achieved from the VR Editor (under 'Models', 'Solution control/extra variables') or by direct editing of the q1 file (by setting 'Y' as the third logical in a SOLUTN command).

## 6.6 Further Information

A copy of the MPICH2 user guide (**mpich2-1.4.1p1-userguide.pdf**) may be found in the directory \phoenics\ThirdPartySoftware\Mpich2.

## 6.7 Parallel Installation Troubleshooting

### 6.7.1 Unable to install MPICH2 due to missing packages

Previously it was found that the user either needed to install Microsoft's Visual Studio 2005/2008 or two Redistributable Packages (available as free downloads from the Microsoft website) before he could install MPICH2. With the current version of the installer MPICH2-1.4.1p1 on a computer running Windows 7, these packages no longer appear to be a pre-requisite. If you should find you need them, here are the links to download them:

*Microsoft .NET Framework version 2.0 Redistributable Package (x64)*

<http://www.microsoft.com/downloads/details.aspx?familyid=B44A0000-ACF8-4FA1-AFFB-40E78D788B00&displaylang=en>

*Microsoft Visual C++ 2005 SP1 Redistributable Package (x64)*

<http://www.microsoft.com/downloads/details.aspx?FamilyID=eb4ebe2d-33c0-4a47-9dd4-b9a6d7bd44da&DisplayLang=en>

These links were still correct July 2014, if you are unable to find them, try a search of the Microsoft site using the package name.

### 6.7.2 Check that *smpd.exe* is running on your computer

In order for parallel PHOENICS to start, the MPICH2 Process Manager (**smpd.exe**) must first be running on each computer in the cluster. This is also necessary if PHOENICS is running in parallel on a single multi-core computer. It should have been installed as a service during the MPICH2 installation process. If parallel PHOENICS fails to start, begin by checking whether **smpd.exe** is listed amongst the list of processes in the Task Manager – you will need to tick the item “Show processes from all users” before it will get displayed.

If **smpd.exe** is not listed amongst the processes then you will need to manually install it as an Administrator. In order to do this you will need to open a Command Prompt window, and on Vista/Windows 7 you will also need to use the “Run as Administrator” when starting the Command Prompt. To install the **smpd** as a service, in the Command Prompt window type:

```
smpd -install
```

### 6.7.3 Difficulty in locating hosts

If the head node has difficulty seeing one or more of the compute nodes and you are using static IP addresses in your cluster then you should consider defining the IP addresses in the host file on each of the PCs. The host file is normally located as

C:\Windows\system32\drivers\etc\hosts

An example ‘hosts’ file is:

```
# Copyright (c) 1993-1999 Microsoft Corp.
#
# This is a sample HOSTS file used by Microsoft TCP/IP for Windows.
#
# This file contains the mappings of IP addresses to host names. Each
# entry should be kept on an individual line. The IP address should
# be placed in the first column followed by the corresponding host name.
# The IP address and the host name should be separated by at least one
# space.
#
# Additionally, comments (such as these) may be inserted on individual
# lines or following the machine name denoted by a '#' symbol.
```

```

#
# For example:
#
#      102.54.94.97      rhino.acme.com      # source server
#      38.25.63.10      x.acme.com          # x client host

127.0.0.1      localhost
192.168.11.1   cham-cfd1
192.168.11.2   cham-cfd2
192.168.11.3   cham-cfd3
192.168.11.4   cham-cfd4

```

To determine the IP addresses, on each of the workstations in the cluster open a Command Prompt window and type the command *ipconfig*. Use the IPv4 Address located in the section *Ethernet adapter Local Area Connection* therein to define the IP address for the workstation in the hosts file.

#### 6.7.4 Registry not updated during installation

Sometimes on Windows 7 or Vista PCs the passphrase is not written to the registry correctly during installation. This can be checked by using the Windows program **regedit** and navigating to HKEY\_LOCAL\_MACHINE\Software\MPICH\SMPD. Assuming default values, the registry key 'phrase' should have the value **behappy**. Set the registry key phrase to this value if it is not present.

#### 6.7.5 Non-fatal error messages while running parallel

There are two non-fatal error messages that may occur in the Command Prompt window. The first is:

```
The system cannot find the path specified.
```

This will occur if the file *phoepath.bat* did not specify the correct location for the Intel compiler or if you don't have the Intel compiler installed on the computer.

The second non-fatal message is

```
Unable to open the HKEY_LOCAL_MACHINE\SOFTWARE\MPICH\SMPD\process\1264
registry key, error 5, Access is denied.
```

This can occur either if you are running from a non-administrator account or if you have UAC turned on. This error is not usually fatal and the run should continue. *The process number may be different to the one indicated above.*

#### 6.7.6 Incorrect unlocking on one of the compute nodes

If, when starting the parallel solver you find that it has stalled during the start up process, that is, if there are **earexe.exe** processes visible on all the compute nodes but consuming no CPU, then it may be a case of one of the compute nodes not being correctly unlocked. If this happens you will need to check the installations on each of the nodes separately to determine which has not been unlocked correctly.

#### 6.7.7 Firewall blocking on one of the compute nodes

If one of the compute nodes has not had the Firewall setting made correctly then the program **mpiexec.exe** should appear in the task manager of the head node, but **earexe.exe** will not appear in the list of processes on the compute node. It will appear to stall but will eventually time out with a message:

```
Error while connecting to host, a connection attempt failed because the
connected party did not properly respond after a period of time, or
established connection failed because connected host has failed to
respond. (10060)
Connect on sock (host=cham-cfd2, port: 8676) failed, exhausted all end
points unable to post a connect to start the connect command
```

```
Socket error: Error=-1  
Abort: Unable to connect to 'cham-cfd2:8676'  
Socket error: Error=-1
```

If this message occurs then check the firewall settings on host cham-cfd2 and ensure that the programs **smpd.exe** and **earexe.exe** have been allowed access (see 6.4 for detail).

## Appendix A. Unlocking PHOENICS

### FLEXIm

PHOENICS is normally unlocked using the FLEXIm system, and the delivery DVD contains a FLEXIm licence file which allows use of PHOENICS for an initial period of one or two months.

When run, the batch file `/phoenics/d_allpro/get_hostid.bat` will create a text file **lmhostid.txt**, which contains the FLEXIm HOSTID of that PC. Alternatively, the program `/phoenics/d_allpro/lmhostid.exe`, when run in a DOS window, displays the required FLEXIm HOSTID. This HOSTID should be sent to CHAM's Installation Section (see Contacting CHAM details below) in order to obtain a longterm licence file. The FLEXIm licence file '**phoenics.lic**' supplied by CHAM in response to such a request should be placed in `/phoenics/d_allpro`, and the existing `phoenics.lic` file deleted.

### USB dongle

A USB dongle may be supplied with the delivery, and the unique USB FLEXID will normally be known by CHAM. This FLEXID is printed on the USB dongle itself, and is of the form 9-abcd1234. When requesting a FLEXIm licence file the FLEXID value should be sent to CHAM's Installation Section (see Contacting CHAM details below).

### Rainbow Dongle

Existing PHOENICS users may have a Rainbow dongle, and in this case PHOENICS is locked/unlocked using a dongle-based unlocking string present in the CONFIG file in the directory `\phoenics\d_allpro`, and is initially supplied with a temporary unlocking string

A permanent unlocking string may be supplied with the PHOENICS delivery, or may be requested from CHAM's Installation Section (see Contacting CHAM details below). The dongle number is currently 10793.

An example of a dongle unlocking string and its location in the CONFIG file is shown below (the example is not currently valid). The unlocking string consists of the line starting with the text 'ID='

```
* ----- The configuration file CONFIG for PHOENICS version 3.5.1 -----
ID=:9(L8P3Y)P5ABG1AIOA/2D:SF                      dongle March 2012
*-----
SITE= CHAM
*-----
SATPRE=\phoenics\d_satell\
EARPRE=\phoenics\d_earth\
PHOPRE=\phoenics\d_photon\
AUTPRE=\phoenics\d_photon\
```

### Parallel

PHOENICS is unlocked using the FLEXIm system, and the delivery DVD contains a FLEXIm licence file which allows use of Parallel PHOENICS for an initial period of two months.

The FLEXIm HOSTID can be obtained as detailed under the paragraph 'FLEXIm' above.

Unlocking for a multi-processor machine is exactly the same whether parallel or sequential PHOENICS is being used on that PC.

For a Parallel cluster installation the HOSTID of all the machines in the cluster is required (because, although PHOENICS need only be installed on one machine, parallel Earth will run on each machine). This is the case for multi-processor installations and clusters of fewer than 16 nodes - alternative unlocking will be arranged for larger clusters.



### **AC3D**

AC3D can be obtained directly from Inivis ([www.inivis.com](http://www.inivis.com)).

The folder *phoenics\d\_ac3d\plugins* contains files which allow AC3D to be used in conjunction with PHOENICS, and AC3D should be installed on your PC such that it is in the folder

*\phoenics\d\_ac3d*

### **Contacting CHAM**

The FLEXIm HOSTID or USB FLEXID should be recorded on the unlocking request form provided and returned to:

Installation Section  
CHAM,  
Bakery House  
40 High Street,  
Wimbledon  
London SW19 5AU

Tel: 020 8947 7651, Fax: 020 8879 3497  
e-mail: [js@cham.co.uk](mailto:js@cham.co.uk)

## Appendix B. Frequently Asked Questions and Troubleshooting

### B.1 FAQ

#### 1. What is the PHOENICS directory structure?

A brief description of the first level subdirectories under `\phoenics` is given below.

**d\_ac3d** contains plug-ins for a stand-alone program AC3D (obtainable from Inivis) which can be used (among other things) to create objects for use in the VR Editor.

**d\_allpro** contains the binary code for the PHOENICS service routines shared by SATELLITE and EARTH, the program libraries for all modules and the graphics drivers used by SATELLITE, EARTH and PHOTON;

**d\_chmkin** containing files for the CHEMKIN interface.

**d\_earth** contains the binary code and some source files of the PHOENICS main solver program EARTH, together with the PHOENICS case libraries;

**d\_includ** contains the Fortran common blocks required for recompilation;

**d\_intfacs** contains the interfaces between PHOENICS and other codes;

**d\_pc** contains the PHOENICS Commander.

**d\_photon** contains the binary code of the PHOENICS post-processor program PHOTON, which now incorporates AUTO PLOT;

**d\_polis** contains all files for the PHOENICS On-Line Information System;

**d\_priv1** is referred to as a "private" working directory from which the user may run all the PHOENICS programs, or use the PHOENICS-VR Environment;

**d\_satell** contains the binary code of the PHOENICS pre-processor program SATELLITE, and the menu libraries;

**d\_shapem** contains the executable of Shapemaker, a geometry generator;

**d\_utils** contains utility batch files, such as run scripts, link scripts, and compiler option scripts. Also included are directories which contain many utility programs.

**ThirdPartySoftware** contains SimLab and MPICH2 installation programs. SimLab is an optional third party add-on which may be used to convert a variety of CAD formats into ones usable by PHOENICS. MPICH2 is the message passing interface library used by the parallel solver.

In addition there are subfolders **d\_win32** and **d\_win64** which contain the executable files (32bit or 64bit) which correspond to the subfolder name. The PHOENICS 2018 delivery contains all the files necessary for running on either a 32bit PC or a 64bit PC.

#### 2. How do I create a working directory?

A working directory, `\phoenics\d_priv1`, is provided with the installation. New working directories may also be created anywhere on the system. The following steps should be performed in order to create a working directory, such as **d\_work**.

To create the new folder, click the right mouse button on an empty part of the Windows desktop then select New, and Folder. Type in a name for the new folder, e.g. **d\_work**, then press <return>. Drag this **d\_work** folder to any convenient location.

Start the PHOENICS-VR Environment and click on Options, Change working directory. Use the browser to locate the new folder.

Note that the desktop icon created by the installation process is set to start PHOENICS with `\phoenics\d_priv1` as the working directory. This can be changed by bringing up the properties dialog box for the PHOENICS icon, and changing the 'Working' directory on the program tab. Many copies of the icon can be made, each with a different 'Working' folder.

### 3. Why did the PHOENICS On-line Information System (POLIS) not run correctly?

POLIS can be run from the PHOENICS-VR Editor or PHOENICS Commander by clicking on the appropriate button under HELP in the top tool bar. It can also be started on Windows systems from the CHAM-logo icon labelled 'POLIS' on the Desktop.

All the POLIS documents are in HTML format, and can be accessed directly through the Microsoft Internet Explorer. The address of the POLIS home page is usually **\phoenics\d\_polis\polis.htm**.

If PHOENICS is not installed at the root level (for example, if it is installed within C:\Program Files) then although the icon will link to the opening page, the links within the document will fail. Historically, the links in POLIS have been made with absolute paths and so POLIS must be located at a root level for the links to work. The answer is to make use of the subst command to map the location of the installation to the root level of a virtual drive (see section 3.2).

### 4. How to configure PHOENICS to enable POLIS to run on a separate drive

Normally, the POLIS files will be copied to the drive on which PHOENICS has been installed. The Desktop icon and Start-menu item will be set to this drive automatically by the installation program.

The drive letter used by the HELP button is stored in the file **\phoenics\d\_allpro\cham.ini**. At installation time, it is set to C. If PHOENICS is installed on another drive, say D, the **cham.ini** file must be edited (with Notepad or any other file editor) and the entry 'drive = ' in the [POLIS] section must be set to the correct drive letter.

### 5. Why don't the POLIS links work in Firefox?

POLIS uses absolute pathnames in its HTML links; unfortunately Firefox is unable to translate these links correctly from the file system. It is possible to get over this limitation by installing and using the IE Tab add-on. The IE Tab can be downloaded from the Firefox website, <http://www.mozilla.com>, and then follow the link to popular Add-ons. Just scroll down until you find the IE Tab, click on the 'Add to Firefox' button and install. The Tab will appear as a small icon to the left of the address bar, just click on it when you need to activate it.

The POLIS links will work correctly in Internet Explorer and Google Chrome.

### 6. What to do if the PHOENICS folder is Read-Only?

If PHOENICS has been installed by another user, or if it is located within 'C:\Program Files' then the user may have Read-Only access phoenics folder. This will make the default PHOENICS\_VR icon unworkable as it will attempt to open the program within *phoenics\d\_priv1* and fail because it will be unable to write to that directory.

If this happens then the (PC) Administrator will need to modify the properties of the PHOENICS-VR icon (right-click on the icon and select Properties) so that the folder pointed to for 'Start In:' is in a location to which users will have write access.

In addition to this the file permissions to the folder '*phoenics/d\_sapps/common/pq1ed*' will need to be changed so that Users have write permission, otherwise the pQ1 editor will fail.

## 7. How do I set or reset my PHOENICS Environment variable?

Click on the Start menu icon, then in the 'Search programs and files' edit box type *systempropertiesadvanced* then hit return to open the Systems Properties dialog. Next click on the button 'Environment Variables...' to open a further dialog. To create a new User variable click on 'New...' and enter *PHOENICS* as the variable name and *C:\phoenics* as the Variable value (if your installation is not located at *C:\phoenics* then enter the location of your installation). Then click 'OK' to close each of the dialogs in turn.

## 8. Can I open a new Command Prompt window to run PHOENICS?

PHOENICS can be run from a Command Prompt window opened by users, using individual commands such as:

- sat (to run SATELLITE)
- vre (to run the PHOENICS-VR Environment)
- ear (to run EARTH)
- pho (to run PHOTON)

providing that the PATH for that window has been suitably modified. The batch file **\phoenics\d\_utils\phoepath.bat** will modify the PATH correctly.

Users should check this file to ensure that the drive letters and paths for PHOENICS and the INTEL Visual Fortran Compiler are both correct.

## 9. What compiler options should I use?

For the 32bit Intel Visual Fortran version, the PHOENICS code has been compiled using the compiler options

```
ifort /threads /libs:static /winapp /compile_only /assume:byterecl /debug:none /O3  
/include:\phoenics\d_includ /include:\phoenics\d_includ\d_win32
```

For the 64bit Intel Visual Fortran version the compiler options are

```
ifort /define:_X64_ /integer_size:64 /threads /libs:static /winapp /compile_only  
/assume:byterecl /debug:none /O3 /include:\phoenics\d_includ  
/include:\phoenics\d_includ\d_win64
```

The current set of compiler options are specified in the batch file **COMPILE.BAT**, located in the directory **\phoenics\d\_utils\d\_win32 (or \phoenics\d\_utils\d\_win64)**.

## B.2 Troubleshooting

**Somehow the CHAM icon, PHOENICS-VR, disappears from my desktop. How do I recreate this icon.**

Should the PHOENICS-VR desktop Icon be deleted in error it can be recreated thus:

Select the following by clicking, using the left button of the mouse

- Start, then point to Programs
- Windows Explorer

Then, in 'All folders', double click on

- Phoenics
- d\_satell
- d\_win32 (or d\_win64 if using 64bit PHOENICS)

Finally, in the 'contents of d\_win32(or d\_win64) ' box, click right button of the mouse on

- satexe.exe
- Create Shortcut

A Shortcut to satexe.exe is now created. Drag this Shortcut, using the left mouse button, onto a suitable part of the Windows screen. Rename the icon, using the right button, to 'PHOENICS-VR'. Right-click on the icon and select 'Properties' then add the argument vre after SATEXE.EXE. Set the 'Start in' folder to a suitable location, e.g. \phoenics\d\_priv1.

**When I click on the PHOENICS-VR desktop icon, I get an error message that Windows cannot find C:\PHOENICS\D\_SATELL\D\_WIN32\SATEXE.EXE'.**

The desktop shortcut created by Install assumes that PHOENICS has been copied to drive C:. If you have copied it to another drive, you will have to modify the 'Cmd line' and 'Working' entries on the Program tab of Properties to reflect the correct drive letter. Click on the PHOENICS-VR icon with the right mouse button to bring up the Properties dialog box.

**I can't run any PHOENICS modules from a Command Prompt window with the 'runsat', 'runear' commands - I get 'bad command or file name' error messages.**

You should check if the path is correct by typing 'PATH' on the Command Prompt window. The correct path should point to \phoenics\d\_win32\d\_utils and \phoenics\d\_utils. If it does not, you must run the batch file <drive>:\PHOENICS\D\_UTILS\PHOEPATH.BAT in the DOS window before running any PHOENICS modules. Check that this file contains the correct drive letter for PHOENICS, and the correct path to the INTEL Fortran compiler.

**My Solver windows open and close too quickly for me to be able to see the messages.**

Edit the file \phoenics\d\_allpro\cham.ini ('Files', 'Open file for editing','cham.ini' from environment top menu bar) and replace the line

```
pause = off  
by  
pause = on
```

**My compile window opens and closes too quickly for me to be able to see the error messages.**

Edit file `\phoenics\d_utils\d_win32\compile.bat` (or `\phoenics\d_utils\d_win64\compile.bat`), and add `/list` to the argument list as follows:

```
ifort /list %IFACE% %CMP_OPTS% %INT_SIZE% %IDIR% %1
```

You will now generate listing files for each file compiled.

**The INTEL Visual Fortran compiler version does not appear to be accessible when I try to compile a program.**

In order to use the Visual Fortran compiler it must first be visible on the user's path. PHOENICS uses the file `\phoenics\d_utils\phoepath.bat` to set the users path correctly. This script depends on correct Environment variable being set when the Intel Visual Fortran Compiler was installed. The script should be good for versions of the Intel compiler between 11 and 16. The current compiler Intel Parallel Studio XE for Fortran is version 16.

If, for some reason, you do not have the Environment variable set you can modify the file **phoepath.bat** to explicitly set it. For example, if you have installed Intel Fortran Composer XE 2013 in its default location, in **phoepath.bat**, after the line

```
if defined phoenics (set pho=%phoenics%) else set pho=\phoenics
add
set IFORT_COMPILER14=C:\Program Files (x86)\ComposerXE-2013
```

Check that this is where the compiler is located and adjust the location if necessary.

**When I click on 'compile' from the VR Environment I encounter the error message 'Bad command'. How do I cure the problem?**

This problem is usually because the path name for the script **ifortvars.bat** is incorrect in the file `/phoenics/d_utils/phoepath.bat`. Please refer to the previous FAQ for the correct setting of the compiler path.

If the Compiler path is set correctly then the other possibility is that the path to the PHOENICS script is incorrect. The script PHOENICS uses for compilation is `compile.bat` and is normally located in `\phoenics\d_utils\d_win32` (or `\phoenics\d_utils\d_win64`). If you have installed PHOENICS somewhere other than the root directory and you do not have the Environment variable PHOENICS set correctly then it will fail to find the script. Refer to the following FAQ for instructions on how to do this.

**When I click on 'compile' from the VR Environment I encounter the error message 'Too many parameters'. How do I cure the problem?**

This error message may be cured by modifying the file `/phoenics/d_utils/phoepath.bat` so that the path statement:

```
echo Adding INTEL PHOENICS to path
path = \phoenics\d_utils\d_win32;\phoenics\d_utils;%path%
```

is replaced by

```
echo Adding INTEL PHOENICS to path
path = \phoenics\d_utils\d_win32;\phoenics\d_utils;c:\windows\system32
```

This means the path is set explicitly, rather than adding to an existing path by the use of %path%.

**I wish to see an EARTH window with variables, not the graphics window with spot values and residuals.**

You must turn the graphical convergence monitor off. Either:

in VR 'Main menu', 'Output', toggle 'Monitor display mode' from 'Graphics' to 'ASCII';

or

edit Q1 ('File', 'Open file for editing', 'Q1') and delete the reference to TSTSWP.

**PHOENICS starts but immediately stops. When I click on the PHOENICS icon, the PHOENICS-VR window appears and disappears almost immediately.**

Check in the working directory for the file **lu6pvr**. If it exists, open it with Notepad or some other file editor. It may contain an error message - usually indicating that unlocking is incorrect.

**I have put my unlocking string in the file phoenix/d\_allpro/config, but still get the message 'illegal or absent id string'.**

Check that you have entered the string correctly, paying particular attention to possible confusion between the upper-case letter O and the number 0.

Furthermore, the character string 'ID=:' must start in column 1. If a leading space is left in the string, it will not be recognised.

The message sent to you containing your unlocking string also contains your dongle id as a check, in the form:

NODEID=10793                    for a dongle

This line should not be entered in the config file.

**I have put PHOENICS on to a PC server, but could not run from another PC on my network.**

You will need to have local copies of some files and directories on each machine. You will also need to modify the **config** and **prefix** files, and to have the option TS\_OK in the licence file **phoenixs.lic**. Please contact CHAM to amend the licence file and for more information.

**PHOENICS has been working satisfactorily, but today it fails with a Microsoft error window reporting an error in 'satexe'. I have made no changes since yesterday, and my computer has not been upgraded or modified since PHOENICS last worked.**

If no changes have been made on your PC it is just possible that the length of the FLEXIm licence path list in the Registry has become too long. CHAM can supply instructions on clearing long pathname lists in the Registry, these can be obtained on request from User Support.

**When I run the Sequential Solver (EARTH) nothing happens on the screen and no error messages are displayed, and no result file is created.**

The sequential solver requires the dynamic-link libraries (DLL) fmpich2.dll, mpich2.dll and mpich2mpi.dll (mpich2nemesis.dll for 64-bit version) to be accessible at run time. That is they must either reside in same folder as the executable, the working directory or be on the user's path. The named library files are located in `/phoenics/d_earth/d_win32` (or `/phoenics/d_earth/d_win64`), copies are also in `/phoenics/d_utils/d_win32` (or `/phoenics/d_utils/d_win64`). If the solver cannot locate them they can be copied from there to your working folder. Alternatively, add the folder pathname `'\phoenics\d_utils\d_win32'` (or `'\phoenics\d_utils\d_win64'`) to your PATH.

**I get a message indicating there is insufficient Virtual Memory when I run a PHOENICS module**

The F-arrays for all the modules are now allocated dynamically at run-time, in the file CHAM.INI.

Sometimes, when running large cases, the Earth Solver will display a dialog complaining that there is insufficient virtual memory, and give the size of the F array it is trying to allocate. In many cases changing the CHAM.INI setting to allocate that much memory initially will allow the case to run.

**When I attempt to compile from within VR Editor, an error in the Command Prompt window indicates that the wrong compiler has been accessed**

This can happen if you have more than one Fortran compiler installed. The solution is to set up an Environment Variable PHOENICS\_COMPILER with a value which is the pathname to the correct compiler. The pathname would be similar to this

```
C:\Program Files (x86)\Intel\ComposerXE-2013\bin\ia32
```

**Under the VISTA Operating System I get grey rectangles when running the VR Viewer**

This is normally a consequence of the hardware acceleration on the graphics card. It can usually be fixed by upgrading the graphics file driver to the latest version. The simplest way to update the graphics card driver is to use Windows Update. If there is an update for your graphics card it should normally be indicated amongst the optional updates.

If updating the graphics card driver does not clear the problem, then you will need to turn off hardware acceleration while running PHOENICS VR. There are three ways of accomplishing this:

- a) Click on Start, Computer, System properties, Advanced system settings, Performance, Adjust visual effects, and remove the tick from 'Enable desktop composition'. Click OK and close the remaining dialogs
- b) You can also clear the grey rectangles by setting 'HardwareAccel = off' in CHAM.INI, but that disables all acceleration.
- c) Changing the Windows Theme to 'Windows Classic' also removes the grey rectangles, but also removes the Vista 'look and feel'.