

DigiFlow v3.x: Getting Started

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1 Introduction

This document describes the installation and configuration process for DigiFlow. Use of DigiFlow is covered in the User Guide.

DigiFlow is an advanced image processing system designed specifically for measuring and analysing fluid flows using a wide variety of techniques developed by the author over the last eighteen years.

Note: If you are operating DigiFlow under a Site Licence, then please refer to the document “Getting started with a site licence” for the installation procedure.

2 Basic installation

DigiFlow installation requires little more than unpacking the distribution files into the desired directory. This is best done from an account with administrative rights.

1. Download the latest version from <http://www.dalzielresearch/digiflow/> . The download file is typically a self extracting archive.
2. Create a directory (folder) for DigiFlow (e.g. C:\Program Files\DigiFlow\ for 32-bit systems, or C:\Program Files (x86)\DigiFlow\ for 64-bit systems). It is best to avoid running DigiFlow in this directory; you should always use a directory belonging to a user rather than the system.
3. Change the permissions on this folder so that **Authenticated users** have **Full control**.
4. Copy the distribution file into the DigiFlow directory.

5. Start an Administrator prompt by right-clicking on a shortcut to the command prompt and selecting “Run as Administrator”. Once the command prompt has started, change to the folder where DigiFlow will be installed. (The commands `cd folder`, `md folder` and `dir` may be used to change, make and show the contents of a folder, respectively. Use `cd \Program Files\DigiFlow\` or `cd \Program Files (x86)\DigiFlow\` to change to the folder where DigiFlow is installed.)
6. At the Administrator prompt, type the name of the self-extracting archive (typically `DigiFlow_yyyymmdd.exe`, where `yyymmdd` represents the date for this build). This will extract all the necessary files.
7. If you have already been issued with a licence file (`DigiFlow_Licence.dfc`), then copy this to the installation directory.
8. Add the folder in which DigiFlow is installed to the search path.

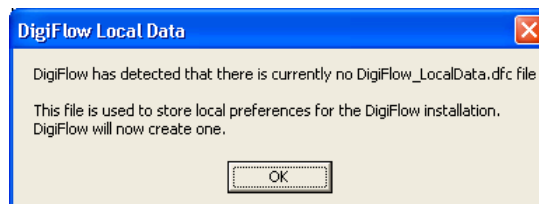
There is no need to reboot. DigiFlow can be used at this point, however, it is recommended that you first complete the configuration process described below.

3 Completing the setup

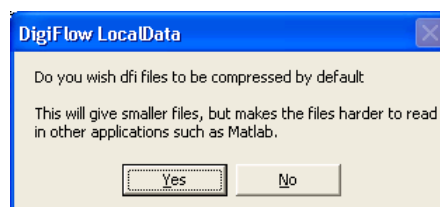
This phase of the installation is best done from an Administrator command prompt (see above on how to start such a prompt) in the folder in which DigiFlow is installed. Once you change to this folder, simply type `setup.bat` at the command prompt. If you do not start `setup.bat` from an Administrator command prompt, then it will prompt you for an administrative password.

3.1 Local settings

As different institutions have different ways of working, DigiFlow allows customisation of some features. These settings are stored in `DigiFlow_LocalData.dfc`. You may subsequently change these settings if you require by editing this file. Running `setup.bat` again will delete `DigiFlow_LocalData.dfc`, thus allowing the settings to be reset. Consult the User Guide for details of the contents of `DigiFlow_LocalData.dfc`.



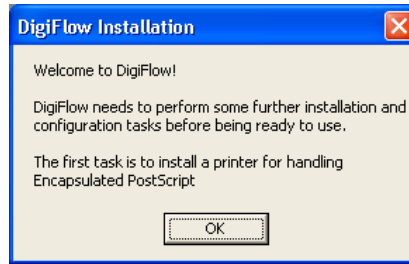
1. The most useful image/data format with DigiFlow is the `.dfi` file format. While there are many advantages to having DigiFlow automatically compress these files, their use in other applications such as Matlab is simplified if they are not compressed.



2. If DigiFlow detects a full licence (*i.e.* not a free licence), then it will also prompt you about whether you wish DigiFlow to automatically check for updates on www.dalzielresearch.com/digiflow/ . If you do not have a full licence at this point, but subsequently install a full licence, then DigiFlow will prompt you for your update option the first time you start DigiFlow after installing the new licence.

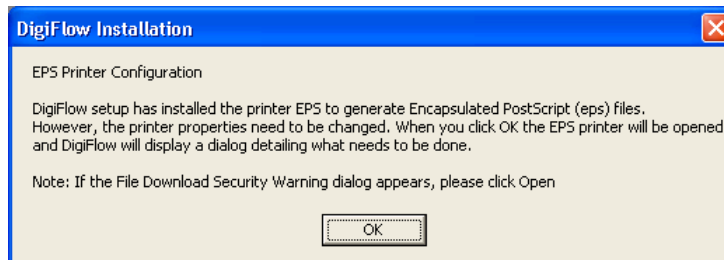
[]

3. The main window of DigiFlow is now shown, but the installation process continues.

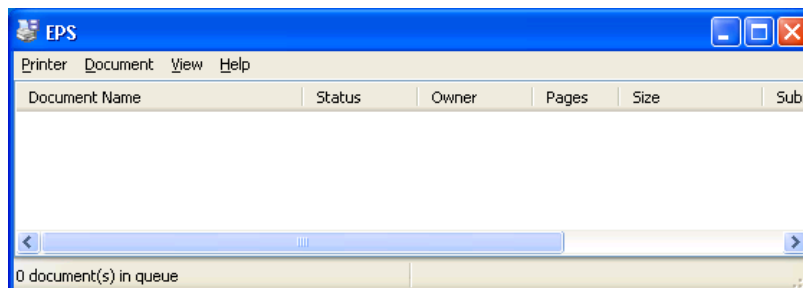
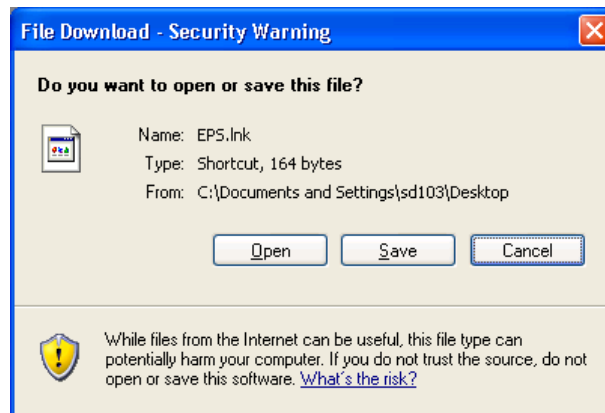


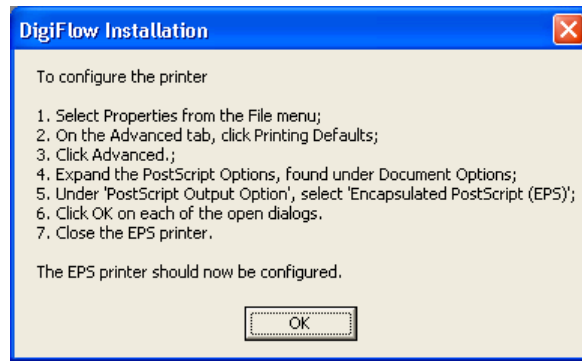
3.2 Encapsulated PostScript printer configuration

4. DigiFlow attempts to install a new printer named **EPS** which will be used to generate Encapsulated PostScript. During this process, a pair of standard Windows scripts will be run, first to install the printer, then a second to do the initial configuration of the printer. Each of these scripts runs in its own command prompt.

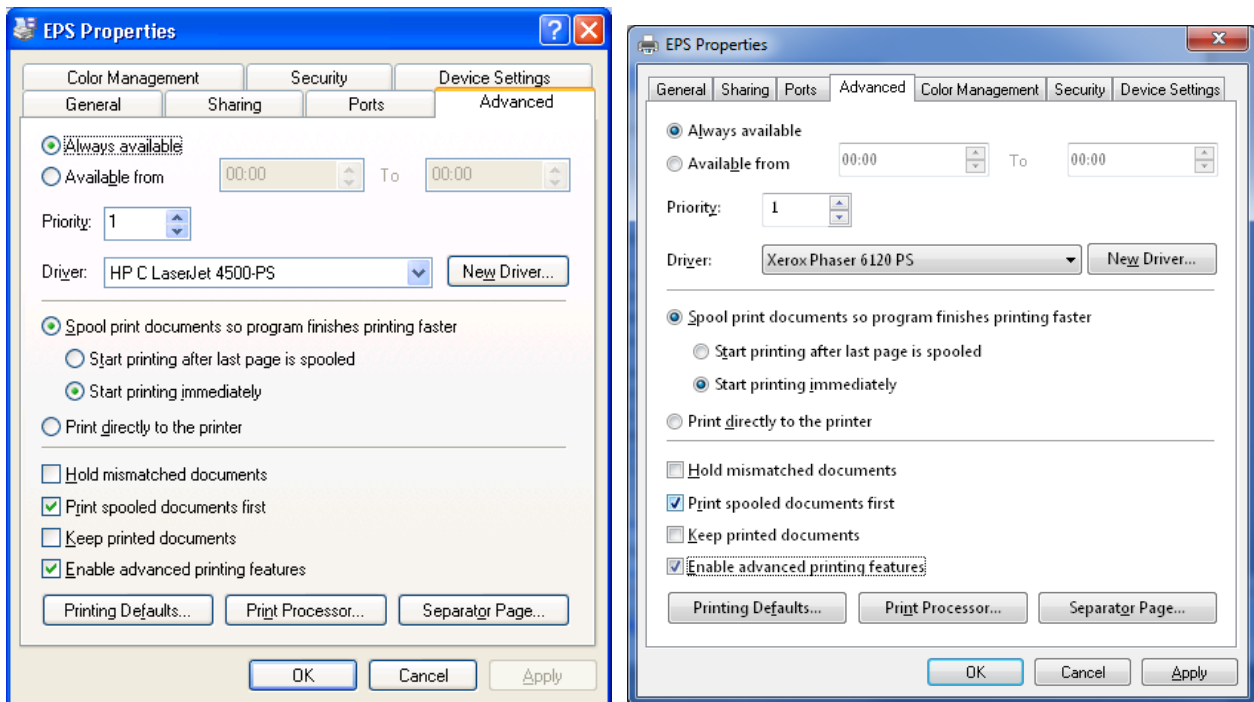


5. Once the printer is installed, it needs to be configured to produce Encapsulated PostScript. While starting the printer dialog, your system may generate a security dialog: you should select **Open**.



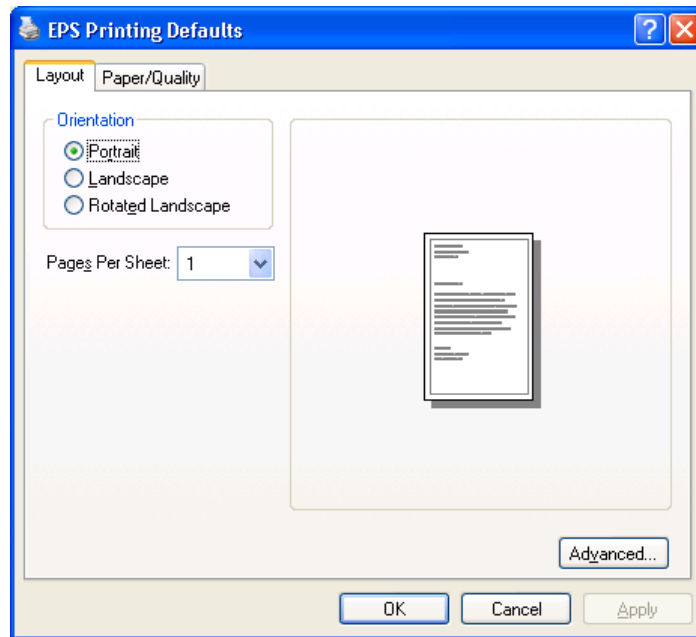


6. Select Properties from the Printer menu.

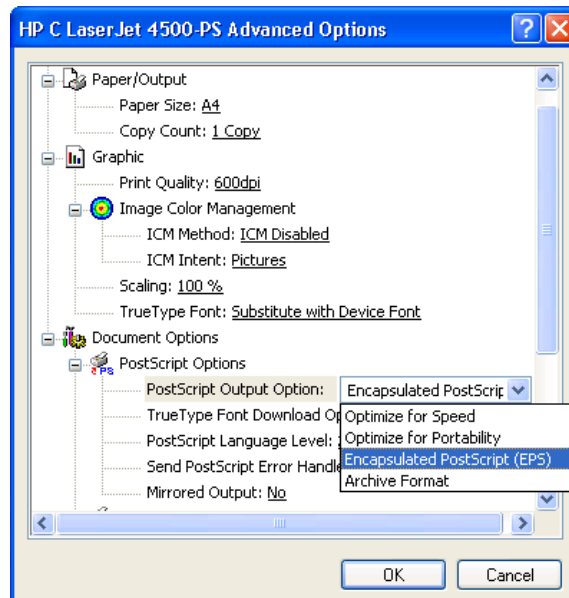


Note that for Windows XP, an HP printer driver is selected (left), whereas for Windows 7, a Xerox one is (right). Using an HP driver under Windows 7 can cause problems with the use of `\psfrag` when exporting `.eps` files.

7. Choose Printing Defaults on the Advanced tab.



8. Then select the Advanced button.

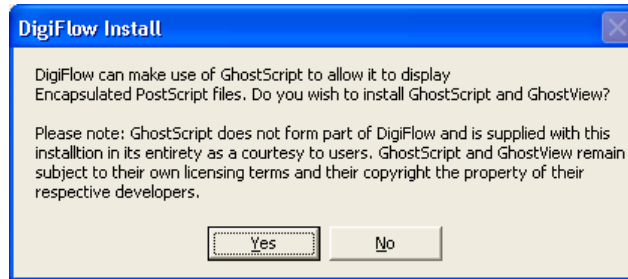


9. Under PostScript Options, choose Encapsulated PostScript, the OK until all printer dialogs are closed, and close the **EPS** printer.

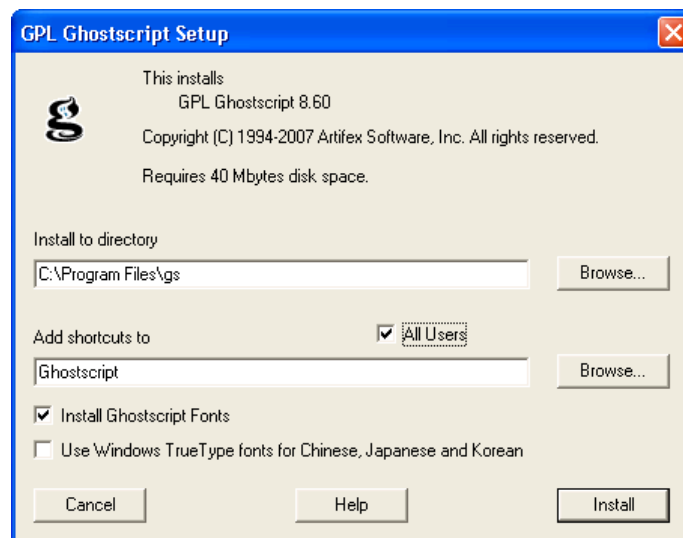
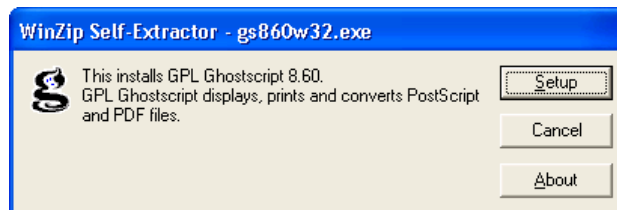
Note: Windows Vista users may wish to substitute an Adobe PostScript driver in place of the one invoked by the installation procedure as the Vista version of the latter driver formats its PostScript in a manner that is not compatible with the psfrag LaTeX package. The Adobe PostScript driver (the Windows XP one works) is available for free download from www.adobe.com.

Windows 7 users should avoid using an HP Universal driver for the EPS printer as this creates Encapsulated PostScript that causes problems with some applications. The installation script installs a “Xerox Phaser 6120 PS” driver.

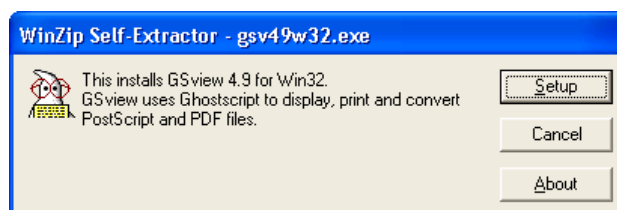
3.3 GhostScript and GhostView



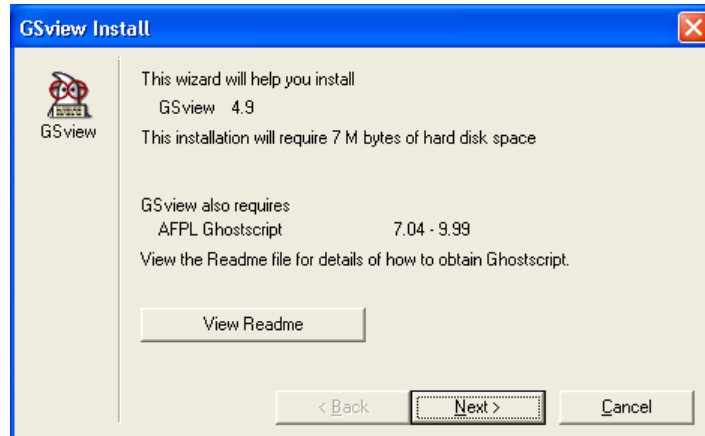
10. DigiFlow cannot itself read back in an Encapsulated PostScript file it produces. However, if DigiFlow detects that GhostScript is installed on the machine, then DigiFlow will attempt to use GhostScript to help it load the .eps file in an appropriate format. For this to be achieved, GhostScript must be on the system PATH and the GS_LIB environment variable must be set up to point to the GhostScript libraries. If you select **Yes** then DigiFlow will install the version of GhostScript (and GhostView) supplied on the installation disk. Note that GhostScript and GhostView remain the property of their respective developers and do not in any way form part of DigiFlow. They are included on the installation disk and installed in their entirety in accordance with their licences. Use of GhostScript and GhostView is governed entirely by their respective licences and not by the DigiFlow Licence. Refer to the DigiFlow manual for further details.



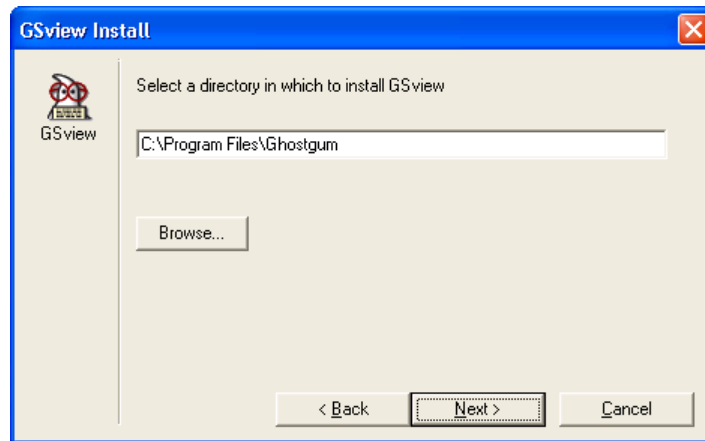
11. Select **All Users** and click **Install**. Installation of GhostScript will be completed. Note that DigiFlow will assume installation to the default path (C:\Program Files\gs).



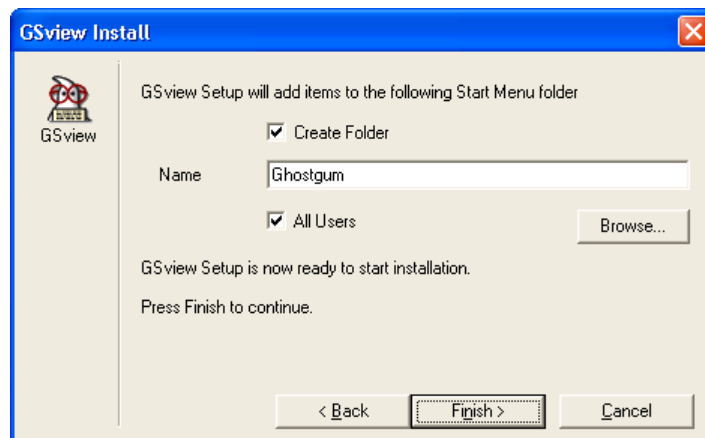
12. GhostView does not interact in any way with DigiFlow, but most users find it a convenient utility when viewing PostScript files. Of course, DigiFlow can be used to view Encapsulated PostScript files, but does not offer the same range of features.



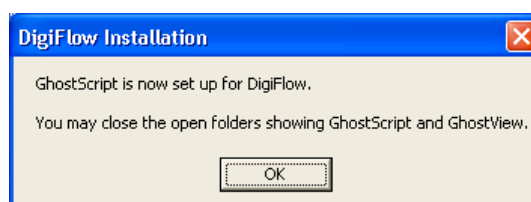
13. The GhostView installation wizard handles the installation. A subset of the wizard dialogs are shown here to emphasise some features.



14. DigiFlow will assume installation to the default path (C:\Program Files\gs).

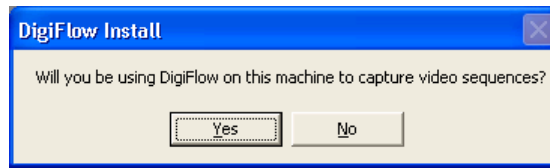


15. It is recommended that GhostView is made available to all users.

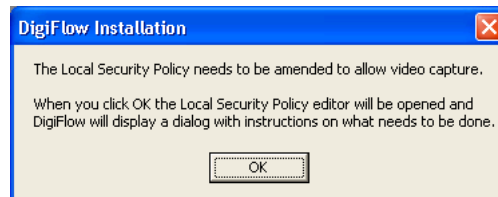


In addition to overseeing the installation process, DigiFlow has set up the Path and GS_Lib environment variable to make GhostScript and GhostView available from the command line by typing `gswin32 file.ps` or `gsview file.ps`, respectively.

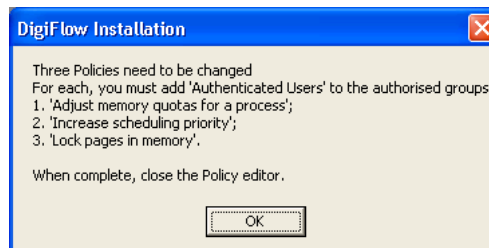
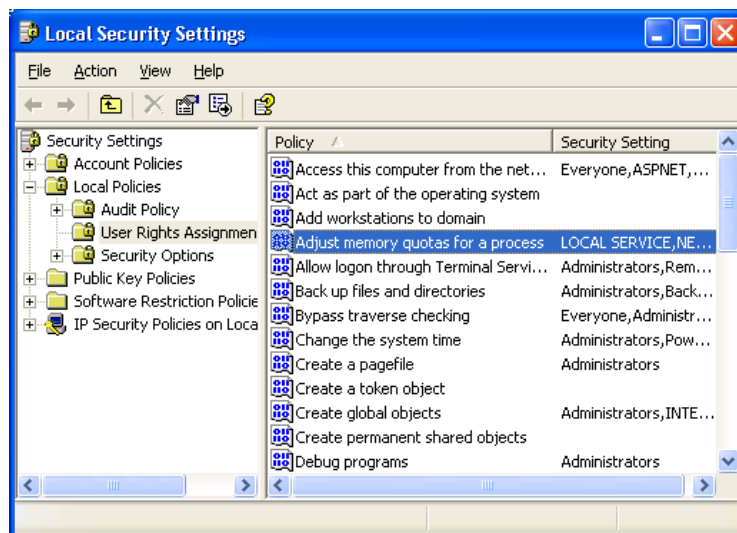
3.4 Video capture



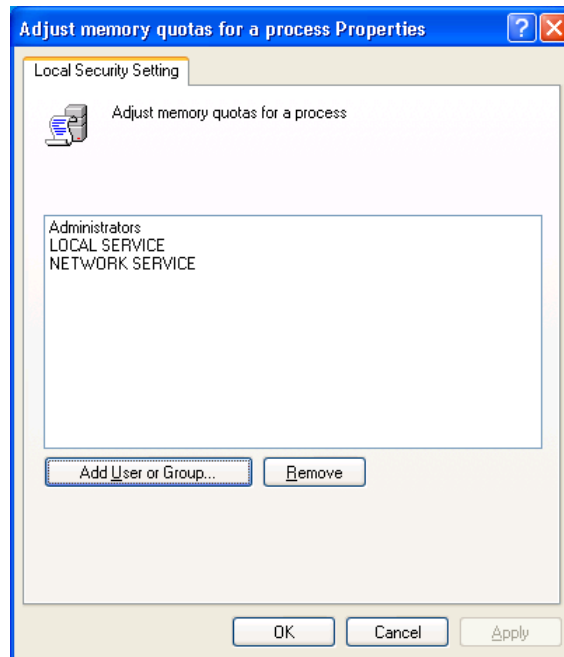
16. If you are going to use the workstation for capturing video sequences using a BitFlow framegrabber, then some additional configuration of Windows is required. Answering **Yes** to this question will start the next phase of configuration.



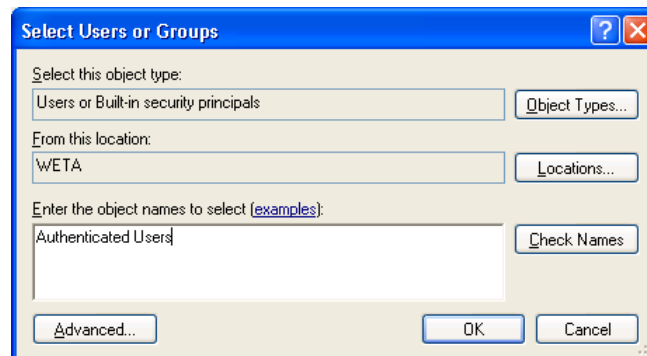
17. When **OK** is clicked, the Local Security Policy editor will be started.



18. Three policies need to be changed: **Adjust memory quotas for a process**, **Increase scheduling priority** and **Lock pages in memory**.



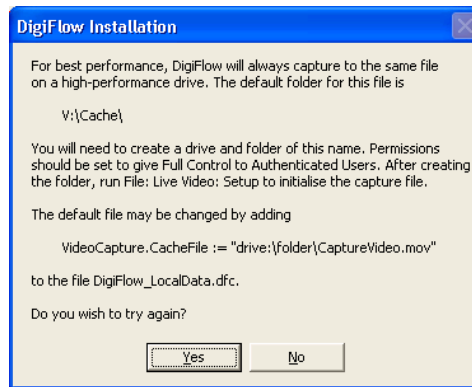
19. Double click on each policy in turn and select **Add User or Group**.



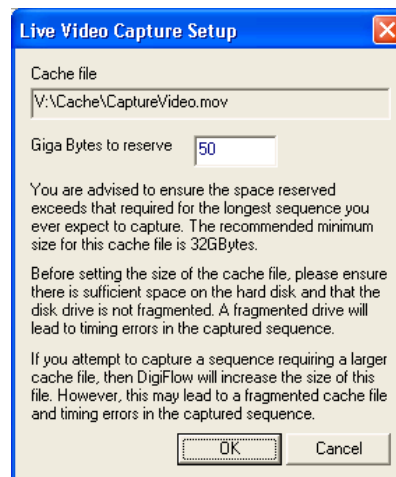
20. Add the group **Authenticated Users**.

21. When completed, close the Local Security Policy editor and click **OK** on the DigiFlow dialog.

22. The capture process in DigiFlow can be configured in two ways. Either you can directly specify the capture file and location each time (risking the user specifying a disk system with insufficient bandwidth), or setting up DigiFlow to capture to a fixed location and require the user to 'review' (and possibly edit) the sequence in order to copy it into their own directory space. This second method is the default and is generally preferred for multi-user systems as it allows users to utilise the capture facility like a video recorder while preventing retention of unwanted video footage. DigiFlow will now attempt to do the necessary preparatory work for this, unless you have disabled it by manually editing `DigiFlow_LocalData.dfc` on the server.

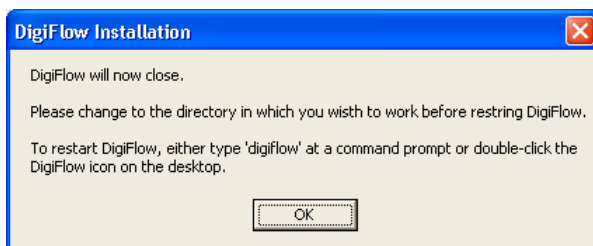


23. This dialog will be displayed only if DigiFlow cannot find the drive on which the capture file should reside. By default this is v: drive; the default may be changed by manually editing `DigiFlow_LocalData.dfc` on the server. It is strongly recommended that video capture is to a disk other than that containing the operating system in order to obtain adequate performance. The necessary disk system bandwidth may be in excess of 100MB/s in some cases (thus requiring a Mode 0 RAID array, or using Windows to ‘stripe’ across multiple disks), but for most cameras 40MB/s is sufficient and this may be achieved via a fast IDE or SATA disk (but not the one the operating system is on!). You can either use Disk Manager to re-label one of your existing hard disks (the preferred option), or create a network share on your local machine that you then connect to using `net use`. Either of these can be performed whilst DigiFlow remains open.



24. Once DigiFlow recognises you have created this directory, it will run **File: Live Video: Setup** (see the DigiFlow manual for further details) to create the initial capture file (the default is `V:\Cache\CaptureVideo.dfm`). **It is strongly recommended that you do this before writing any other data to the capture disk.** Once created, the capture file will be flagged as **Read only** by the operating system (although DigiFlow will still be able to write to it). The file will not shrink if a smaller sequence is captured, but may grow if one larger than that specified during **File: Live Video: Setup** is requested (note that there is a risk of fragmentation if this occurs). It is important, therefore, that you go through the review process outlined in the DigiFlow manual rather than simply copying this file, as in general only a part of the file will contain valid data.
25. The DigiFlow side of the video capture configuration is completed by DigiFlow setting the permissions on the capture folder so that Authenticated Users have Full Control.
26. The BitFlow framegrabber also needs to be set up prior to it being used by DigiFlow. Consult the DigiFlow manual for further details.

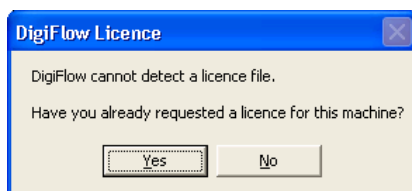
3.5 Completion of installation



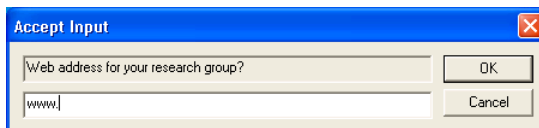
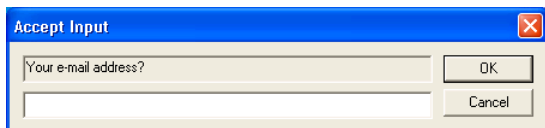
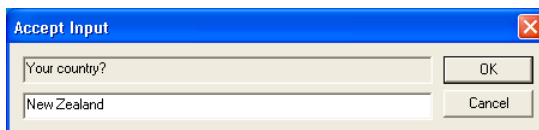
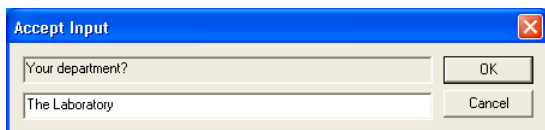
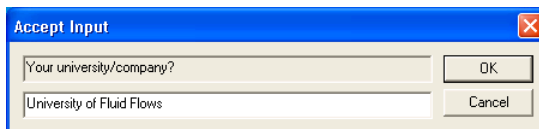
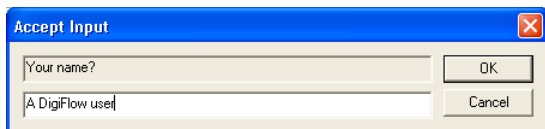
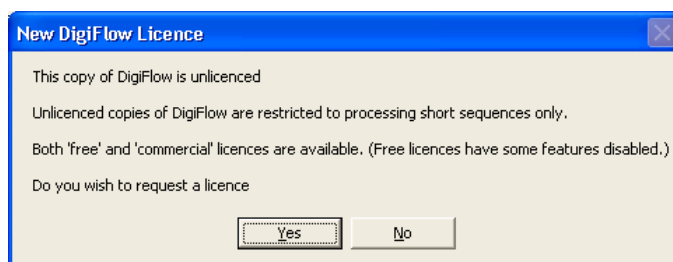
27. Installation of DigiFlow is complete. The current copy of DigiFlow will close. You should restart DigiFlow using the desktop shortcut or by typing `digiflow` at a command prompt when you are ready to start using it. There is no need to reboot.
28. Note: In rare cases, if QuickTime is installed just prior to the installation of DigiFlow, it is not possible for DigiFlow to set the search `PATH` correctly. If DigiFlow does not when `digiflow` is typed at a command prompt, then it may be necessary to manually edit the `PATH` environment variable. Right-click on **My Computer** and select **Properties** then the **Advanced** tab. After clicking the **Environment Variables** button, select `PATH` and re-enter the path to DigiFlow, retyping the last part of the previous entry for the variable (the problem is caused by a hidden character).

4 Obtaining a Licence Key

If DigiFlow is unable to find a valid licence file (`DigiFlow_Licence.dfc`), then you will be prompted for the information necessary for Dalziel Research Partners to generate a licence for you.



1. If you have a licence file already, then respond **Yes** and copy the licence file to the directory in which DigiFlow is installed. If you do not already have a licence file, then answer **No** and you will be prompted for the information necessary to generate the licence file.



- The `LicenceRequest.dat` file that is created by this process should be e-mailed to Dalziel Research Partners (digiflow@dalzielresearch.com). The `LicenceRequest.dat` file will be located in the directory from which DigiFlow was started; in this case it will be the directory in which DigiFlow is installed.



- The `LicenceRequest.dat` file does not contain any security-sensitive information, or any personal information other than what you enter. Please feel free to view the contents of this file before sending.

Two types of licence exist: *Free Licences* and *Commercial Licences*. The former provide a broad range of functionality, but have some of the more advanced features of DigiFlow disabled. The act of installing the Licence Key file is construed as agreement to the terms and conditions of the DigiFlow Licence. A copy of this Licence may be found at the end of the DigiFlow documentation.

5 Normal running of DigiFlow

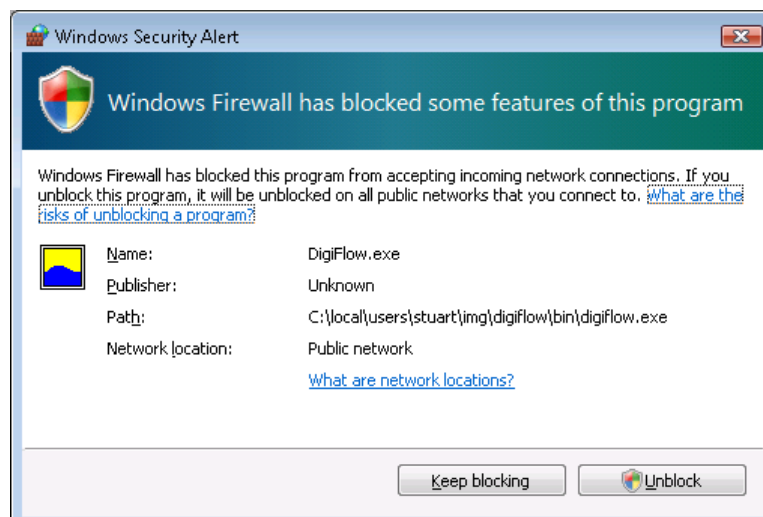
DigiFlow is normally run in one of two ways: typing `digiflow` at a command prompt or double clicking on a shortcut you have set up. In either case, DigiFlow is best run in a user-owned directory where the images to be processed reside. Experienced users tend to find starting DigiFlow from the command prompt is the most efficient approach.

If you prefer to use a shortcut you should specify a **Start in** directory located in your user file space.

6 Automatic updates

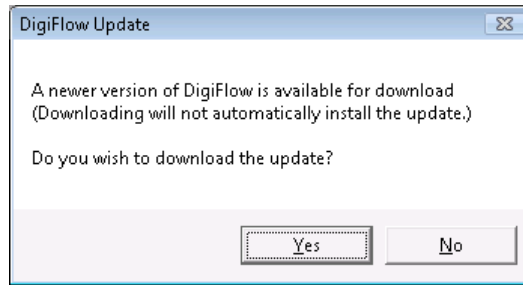
When installed with a full commercial licence, DigiFlow provides the possibility of automatically downloading and installing updates from the www.dalzielresearch.com/digiflow/ website. DigiFlow achieves this through its in-built ftp client (also available through the `dfc` macro language). If you wish to make use of this feature not only does it need to be enabled in DigiFlow, but also the operating system needs to allow DigiFlow to act as an ftp client.

The first time DigiFlow attempts to use its ftp facilities, the operating system will produce a dialog similar to the one below. To continue, you must click **Unblock**. (Alternatively, you can achieve the same result through the Windows Security Centre from the Control Panel.)

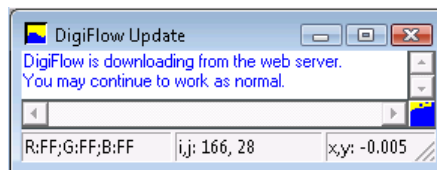


Note that by default DigiFlow will only check the web site when it is started if it has not done so within the last seven days.

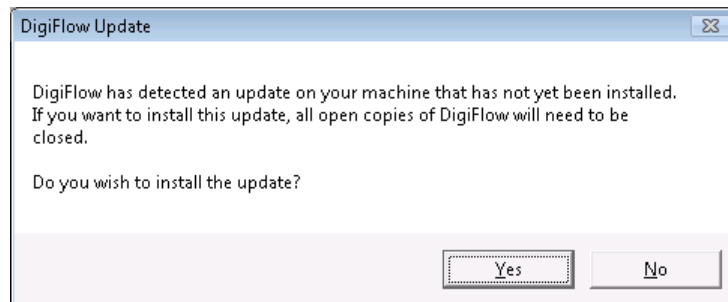
If DigiFlow identifies that there is an update available, then it will prompt you to download.



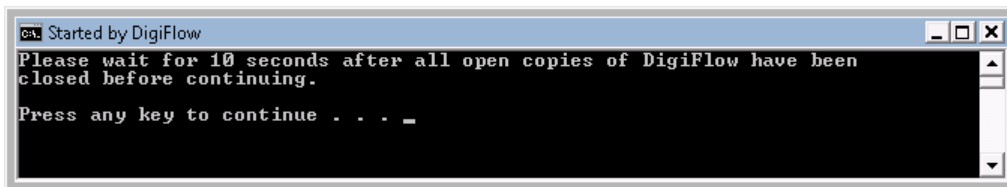
During the download process a window containing text will be displayed. Closing this window will stop the download. Note that you may continue to work normally while the update is downloaded; the download process will have minimal impact on performance, but it is probably best to avoid downloading while you are attempting to capture video from a DigiFlow controlled camera.



Once the download is complete you will be prompted as to whether you want the update installed. Answering **No** will allow you to continue working. Answering **Yes** will cause DigiFlow to be closed in order that the update is installed. If you answer **No**, you will be prompted to install the update the next time DigiFlow is installed.



If you ask for the update to be installed then DigiFlow will close and the following command prompt will be produced. If you have other copies of DigiFlow running then it is important that they are also shutdown before continuing with the update.



Pressing any key at the prompt will cause the update to be unzipped then DigiFlow restarted to allow you to continue work. (Note that the prompt itself will not close until the new copy of DigiFlow is itself closed.)

7 Help and documentation

The DigiFlow user guide is distributed in both [.pdf](#) and [html](#) formats. You may wish to create a shortcut to [digiflow.pdf](#), located in the directory in which DigiFlow is installed. The [html](#) version of the documentation ([digiflow.htm](#)) is linked with DigiFlow so that pressing the function key F1 will

provide context sensitive help. (Note that this feature requires a suitable web browser, such as Internet Explorer, to be installed.)

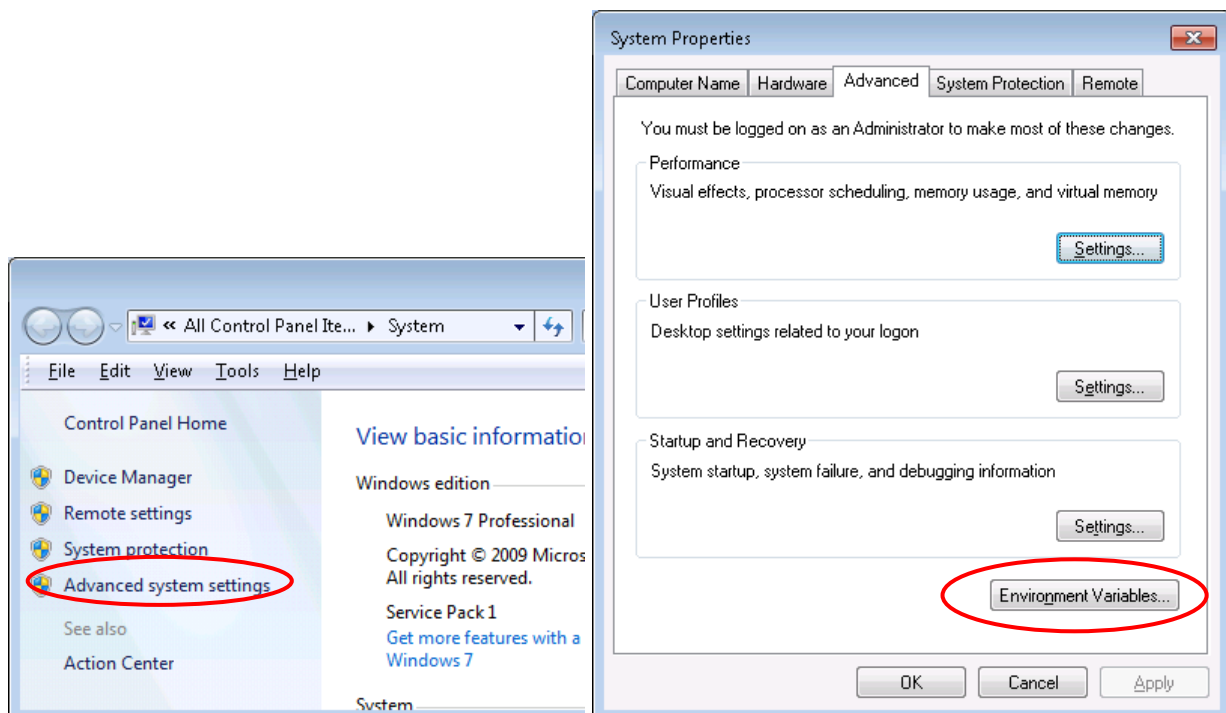
Help on the DigiFlow macro language (`dfc`) is available both through the **Help** menu, and through specific help features in dialogs that require such code.

8 Adding support for further image formats

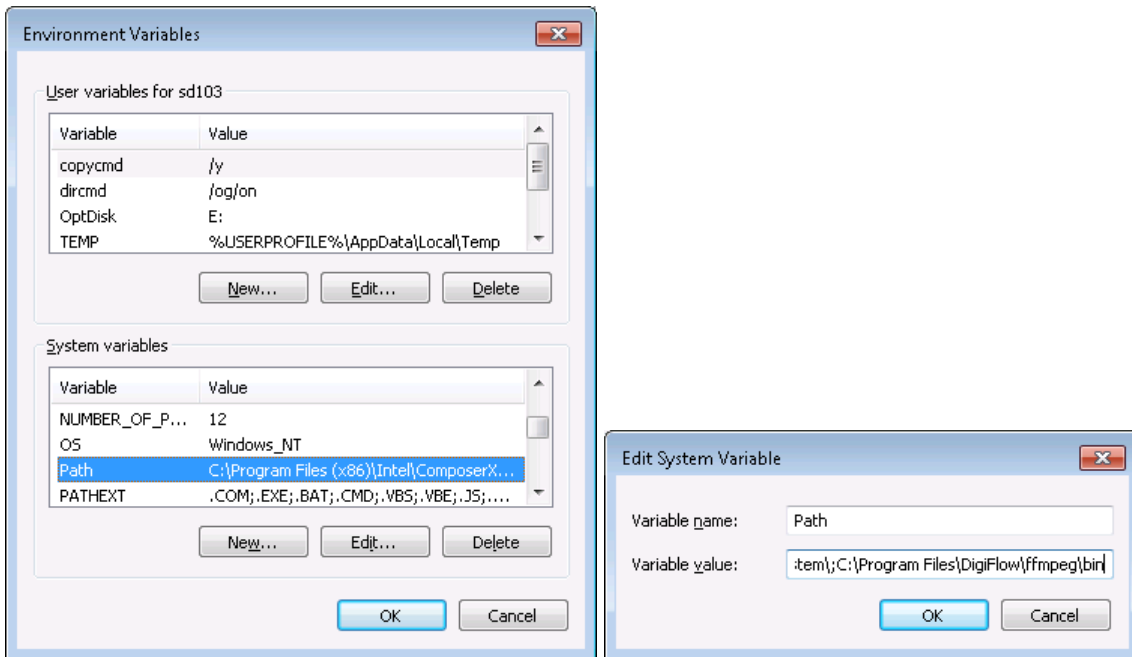
DigiFlow natively supports a relatively small range of image and movie formats. While for most users this is not a limitation, some users want to be able to process a much broader range of formats. To achieve this, DigiFlow can make use of the very extensive open source libraries incorporated within ffmpeg (see www.ffmpeg.org for details). Enabling DigiFlow's use of the ffmpeg libraries simply requires that an appropriate version of ffmpeg is loaded onto your computer and the folder containing it is put on the `PATH` so that the libraries can be found. Note that ffmpeg is subject to either the Gnu General Public Licence or the Gnu Lesser General Public Licence, depending on which version you choose to install. DigiFlow can interact with ffmpeg, it does not itself incorporate any ffmpeg code and ffmpeg is not supplied with DigiFlow.

The instructions below give details of how to install ffmpeg so that DigiFlow can make use of it.

4. The ffmpeg software is distributed as a 7zip archive. If your machine does not already have software capable of unpacking such an archive, you will need to install such software. A good option for this is the open source 7zip that can be obtained from <http://7-zip.org/>. Note that 7zip is a more modern equivalent of pkzip, performing many of the same roles.
5. Download the 32-bit build of ffmpeg for Windows from <http://ffmpeg.zeranoe.com/builds/win32/shared/ffmpeg-1.1-win32-shared.7z> and extract this 7zip archive into the folder where you wish ffmpeg to be installed. This folder can, in principle, be anywhere on your system. One option is to create an ffmpeg folder within the DigiFlow folder.
6. Identify the folder containing `ffmpeg.exe`. For example this might be `C:\Program Files\DigiFlow\ffmpeg\bin\`. This folder needs to be added to the system `PATH`.
7. Right-click on **My Computer** and select **Properties** then **Advanced System Settings** and the **Environment Variables** button.



- In the **Environment Variables** dialog, select the `Path` system variable and click **Edit**.



- Add a semicolon to the end of the current definition of `Path`, then add the name of the folder containing `ffmpeg.exe`. This might be, for example, `C:\Program Files\DigiFlow\ffmpeg\bin`.
- Close any open command prompts and open a new command prompt. Type `ffmpeg` at the prompt. If you have completed the installation successfully, then you will receive a message about `ffmpeg`.
- DigiFlow should now be able to find and use the `ffmpeg` libraries.

Through `ffmpeg`, DigiFlow can access highly compressed modern formats such as `.mp4`. You should be aware, however, that such formats are not well suited to processing. Not only do they use lossy compression, but also they are designed to be played in strict frame order and not intended for random frame access. For example, in an `.mp4` video, the only way of moving from the last to the second last frame may be to start again at the beginning and process all the preceding frames. This is because the compression is across multiple images (or the entire video) rather than simply compressing each frame. At present, DigiFlow will play such a file efficiently, but stepping it from one frame to the next may require a lot of cpu power!

9 User support

Holders of full licences (Commercial or Site) receive a broad base of support as part of their licence agreement. This support is normally provided via e-mail.

DigiFlow users operating on Free Licences are welcome to e-mail queries and problems to Dalziel Research Partners, although Dalziel Research Partners reserve the right not to follow through on a given query.

10 Feedback

All users are invited to send in comments or suggestions for improvements to DigiFlow. Dalziel Research Partners welcome copies of any publications that utilise results obtained with DigiFlow and 'favourite' images.

11 Uninstall

11.1 Uninstalling DigiFlow

DigiFlow may be removed at any time by simply deleting the directory tree where you installed it, removing this directory from the path, and deleting any shortcuts you created. DigiFlow does not install any files outside its own directory tree.

11.2 Uninstalling BitFlow drivers

Normally, the BitFlow drivers can be removed by simply selecting Uninstall from Programs and Settings in the Control Panel. However, sometimes a manual uninstall is necessary. BitFlow's guidance on this is duplicated below. If you have any doubt about how to perform any of these steps then you should consult with your computer administrator or other appropriate experienced personnel.

[Some steps may already be complete following an unsuccessful automatic uninstall]

1. Delete the SDK folder.
2. Delete the driver `C:\Windows\system32\drivers\Bitflow.sys`.
3. Delete the folder `C:\Windows\system32\drivers\BitFlowFlash`.
4. Delete the registry key `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\BitFlow` and all subkeys.
5. Turn the computer off and remove any BitFlow boards from the system.
6. Boot the computer
7. In the `INF` folder (`C:\Windows\inf`) search for any file, `*.inf`, that contains the string "bitflow". Usually there will be one or more files with the name something like `oem4.inf` or `oem10.inf`.
8. Delete any files the search finds. **IMPORTANT:** only the `oem*.inf` files that the search finds with "bitflow" in the file. Do not delete any other `oem*.inf` files.
9. Also delete any files with the same name but with the extension `.pnf`. In other words, these files come in pairs, for example, `oem4.inf` with `oem4.pnf` and `oem10.inf` with `oem10.pnf`, you need to delete both `*.inf` and the `*.pnf` files.
10. In the registry editor, go to the key: `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\PCI`
11. Look for any keys that start with `VEN_118D`. For example you might see a key: `VEN_118D&DEV_2000&SUBSYS_00000000&REV_00`. Delete these keys (and their subkeys). **Important:** only delete the keys and subkeys that start with `VEN_118D`. You may have to change the key permissions in order to delete these keys.
12. There may also be copies of the driver in the following folder: `C:\Windows\System32\DriverStore`. Search this folder and all of its subfolders for "BitFlow". Delete any subfolder that contain BitFlow components (`*.sys`, `*.cat`, `*.inf`). You may need to change folder permissions to delete this folders.
13. Go to the folder `C:\Windows\System32\DriverStore\FileRepository`. Search for any sub folder with "bitflow" in the name. Delete all of the folders. For Windows 7 and Vista, you will most likely need to take ownership and change permission of these folders before you can delete them.
14. Reboot your computer.

The computer should now be in the same state it was before any version of the SDK was installed.

(Note: neither BitFlow nor Dalziel Research Partners can take any responsibility for any inadvertent affects caused by following these instructions.)

12 Running under Wine

This section assumes some familiarity with both linux and Wine.

Linux users may wish to install DigiFlow under Wine. Although there are some performance issues with certain components (due to limitations in Wine's implementation of some Windows components), almost all of the facilities work without problem. The main exception is that video capture through a BitFlow framegrabber is not possible from within the Wine environment.

Once installed, DigiFlow may be started from a linux terminal either by typing `wine digiflow` at the prompt, or by opening a console with `wineconsole cmd` then starting DigiFlow in the normal manner by typing `digiflow` at the command prompt. Note: the first time you run DigiFlow you may have to provide the full path specification. However, DigiFlow will attempt to add itself to the `path` so this will not be necessary subsequently. If DigiFlow fails to add itself to the `path` then you will need to use the Wine `regedit` tool (type `wine regedit` at a linux terminal prompt) to add the path manually.

EPS Printer

If you wish to generate Encapsulated PostScript from DigiFlow within Wine then it will be necessary to create a compatible printer in the host linux environment. This requires (a) installing the `EPS.ppd` printer file found in the folder to which DigiFlow is installed, and (b) adding an entry for this printer to the `printers.conf` database within the cups system.

The printer may be created in one of two ways.

The easy way is often via the linux printer configuration utility. Specify the printer name as `EPS`, the device as `file:/dev/null`, and select the `EPS.ppd` file supplied with DigiFlow.

Alternatively, the `EPS.ppd` printer description file can be copied to the `/etc/cups/ppd` directory and the following entry added to `/etc/cups/printers.conf`:

```
<Printer EPS>
Info EPS
Location Here
DeviceURI file:/dev/null
State Idle
StateTime 1292489167
Accepting Yes
Shared Yes
JobSheets none none
QuotaPeriod 0
PageLimit 0
KLimit 0
OpPolicy default
ErrorPolicy stop-printer
Option scaling 30
Option page-left 27
</Printer>
```

You will need to restart cups after editing `printers.conf` by

```
sudo killall -HUP cupsd
```

DigiFlow should now be able to find the EPS printer from within Wine, and so generate Encapsulated PostScript. Unfortunately, however, the Wine implementation of Windows GDI commands is incomplete and both limits the fonts and prevents the `psfrag` options from working correctly.

Known issues

- Fonts in drawings are not rendered in the specified type face due to limitations in the Wine implementation of enhanced metafiles in the Windows GDI.

- `psfrag` does not function properly due to limitations in the Wine implementation of enhanced metafiles in the Windows GDI.
- Syntax colouring in the `dfcConsole` can be very slow due to limitations in the Wine implementation of a core dll.