Cygwin/X User's Guide

Harold L Hunt, II

Jon Turney

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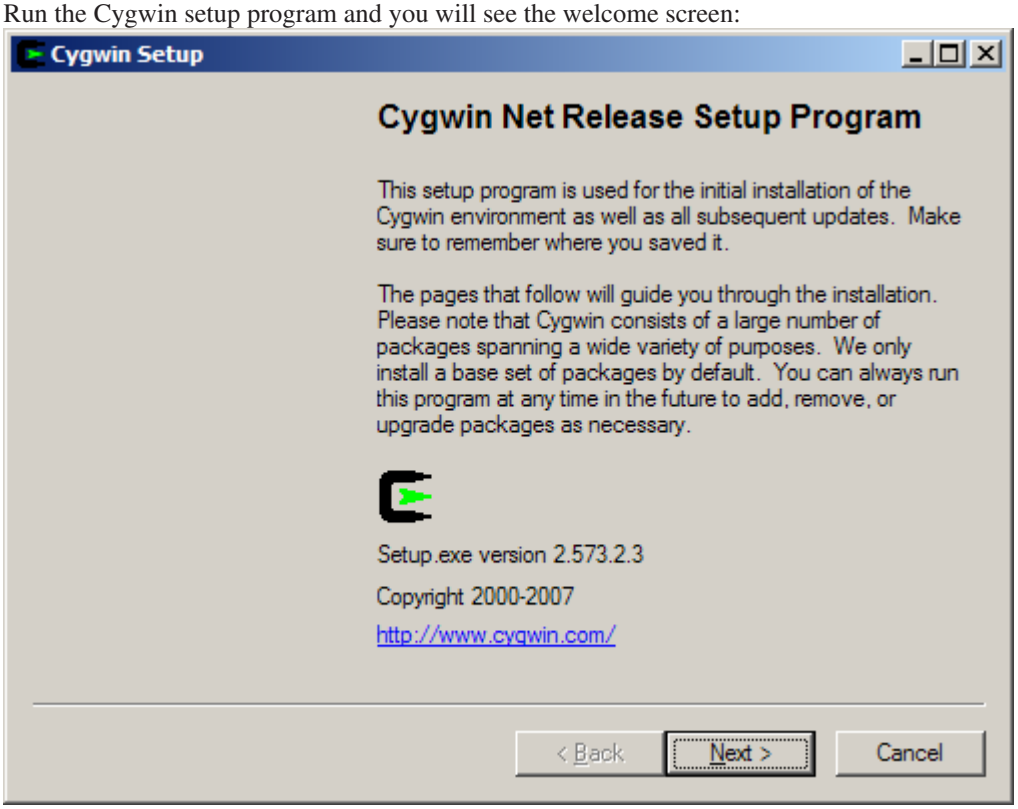
Cygwin/X is a port of the X Window System to Cygwin. The Cygwin library provides a UNIX-like API on the Win32 platform.

Chapter 2. Setting Up Cygwin/X

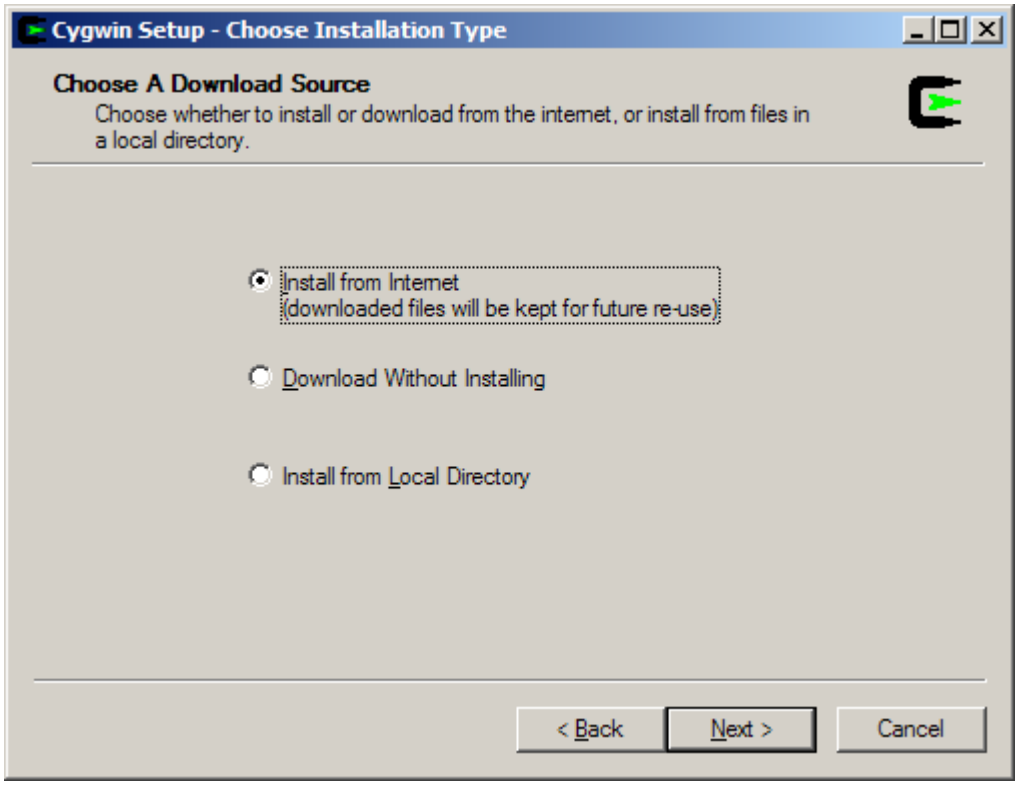
Installing Cygwin/X

Cygwin has a nice setup program that downloads and installs the necessary Cygwin packages for you.

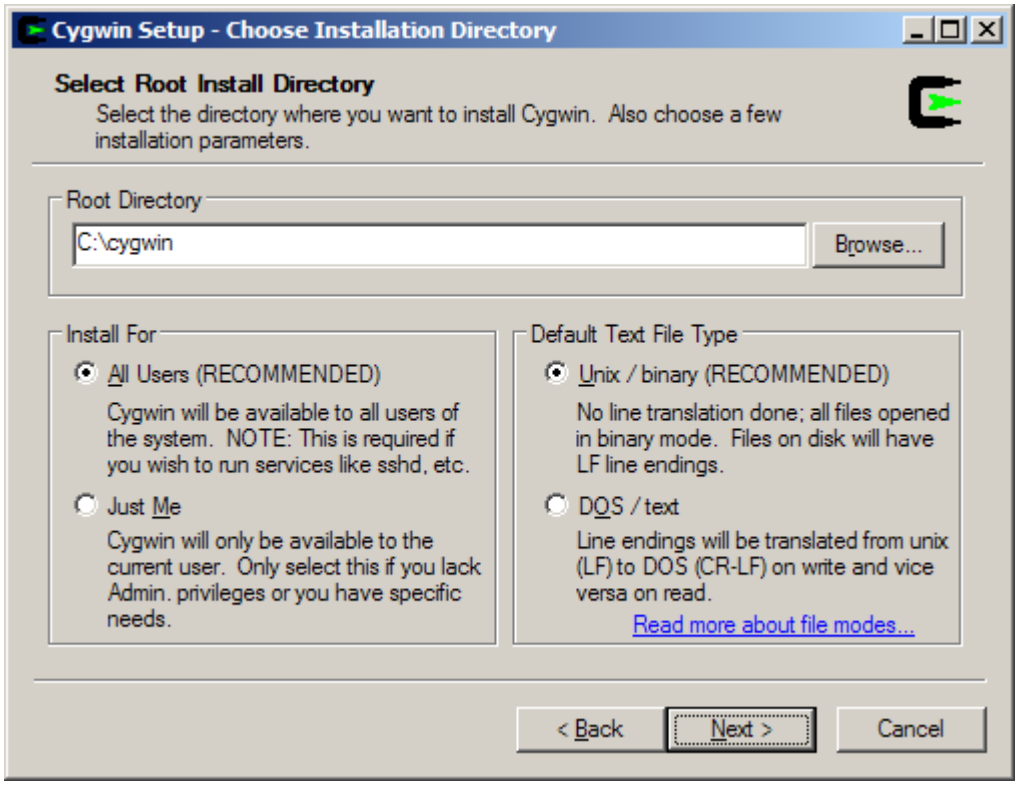
1. Open the Cygwin, http://cygwin.com/ page in your web browser
2. Click on the “setup-x86.exe” (http://cygwin.com/setup-x86.exe) (32-bit installation) or “setup-x86_64.exe” (http://cygwin.com/setup-x86_64.exe) (64-bit installation) link to download the appropriate setup program from the primary Cygwin server. Save it to the directory that you would like to store the downloaded packages in (e.g. `c:\download`). Do not save to `c:\cygwin`, as that is the default directory for the extraction and installation of the downloaded packages.
3. Run the Cygwin setup program and you will see the welcome screen:



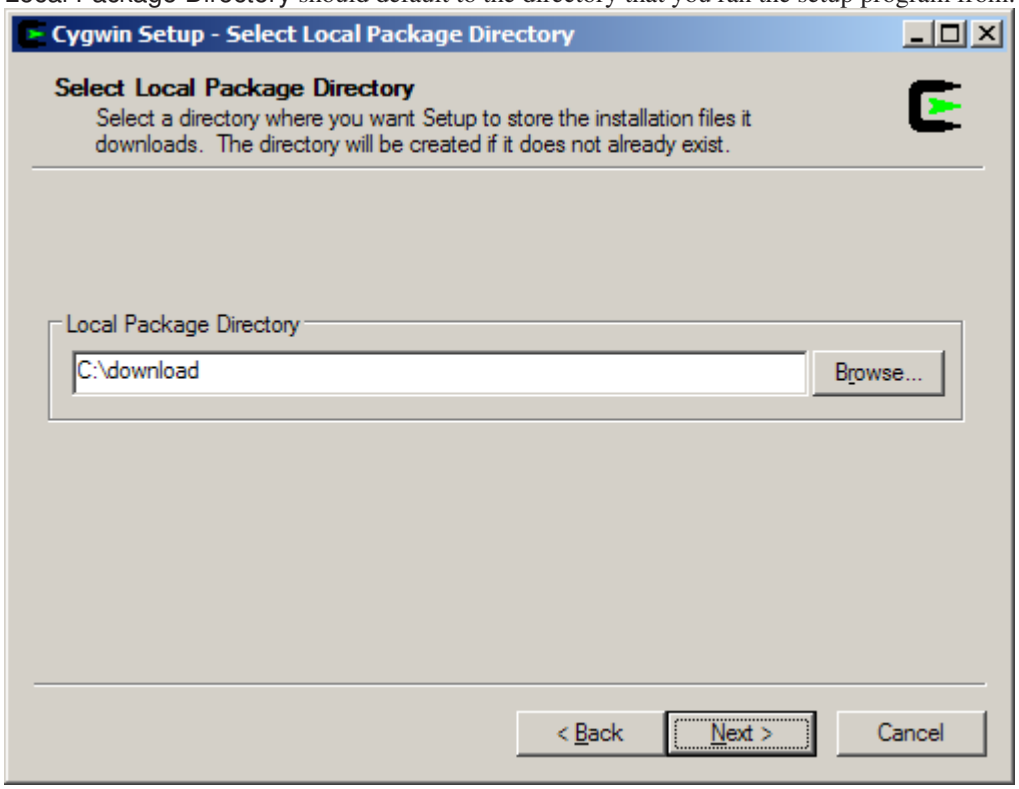
4. Click Next to proceed to the next screen.
5. Choose, Install from Internet, this will still save the package files to your download directory so that you can install Cygwin on any number of machines:



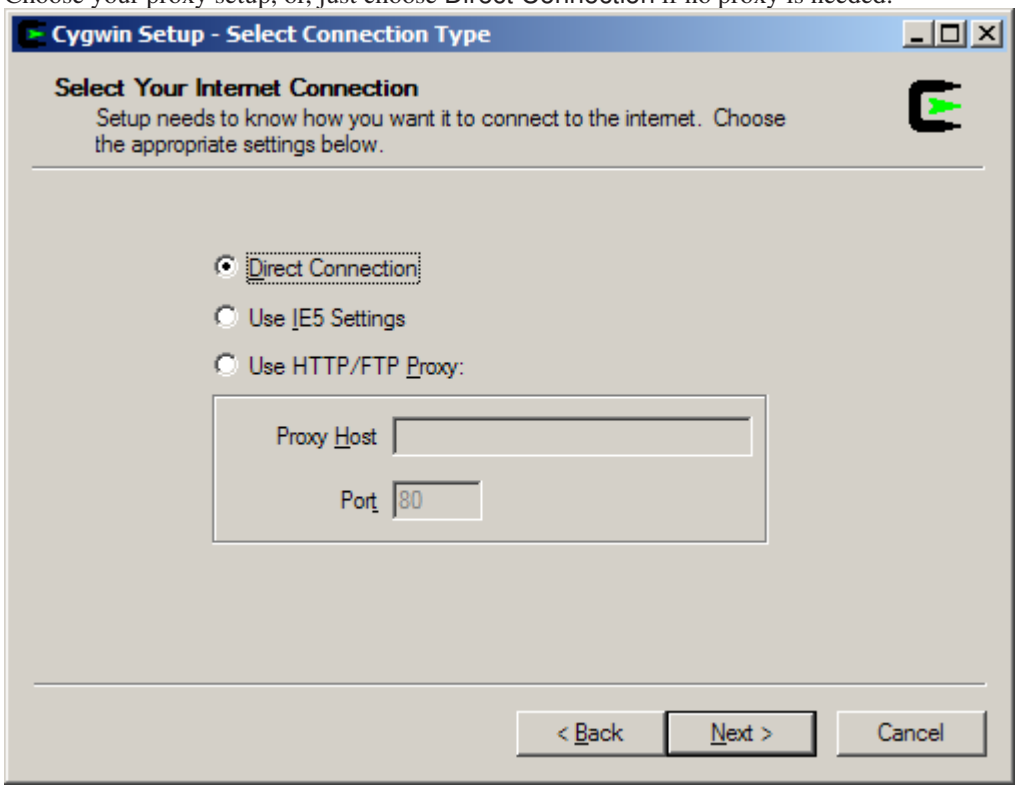
6. Click Next to proceed to the next screen.
7. The default Install Root is `c:\cygwin` which should be fine for most installations. Leave Default Text File Type as UNIX. Leave Install For set to All unless you lack local administrative privileges.



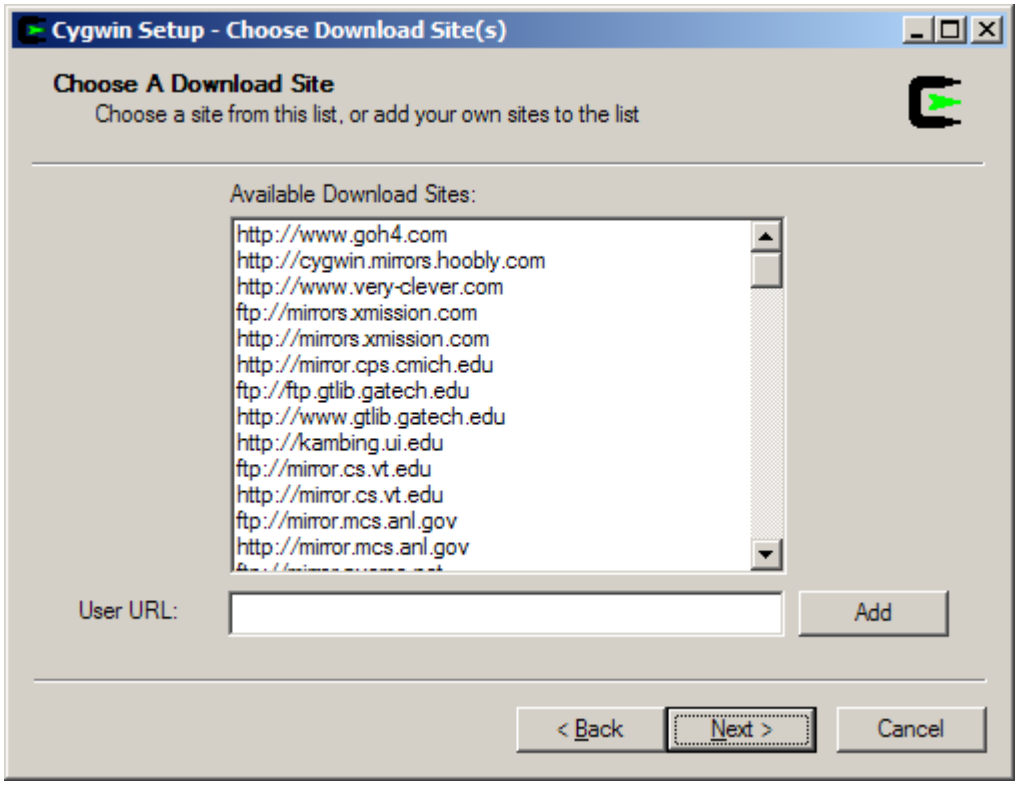
8. Click Next to proceed to the next screen.
9. Local Package Directory should default to the directory that you ran the setup program from:



10. Click Next to proceed to the next screen.
11. Choose your proxy setup, or, just choose Direct Connection if no proxy is needed:



12. Click Next to proceed to the next screen.
13. Select your nearest mirror for downloading:



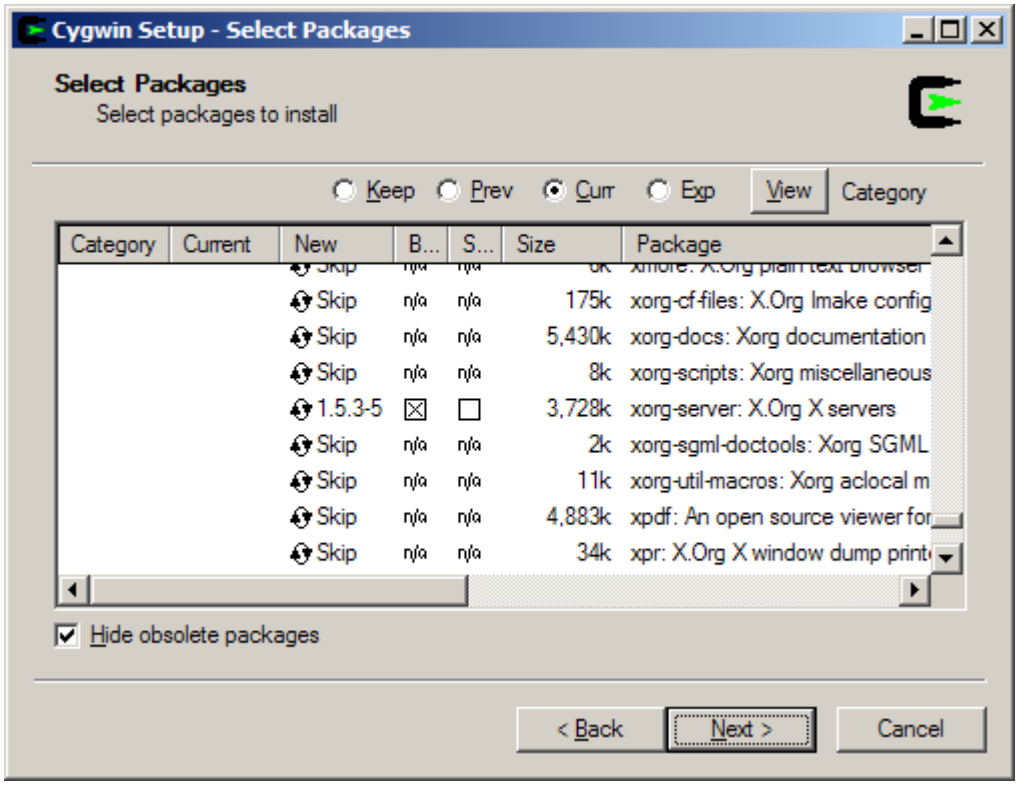
14. Click Next to proceed to the next screen; setup will download a list of available packages as it moves to the next screen.

15. On the next screen you will select the packages that will be downloaded and installed. A listing of the Cygwin/X packages is given below; a listing of the general Cygwin packages would be beyond the scope of this document.

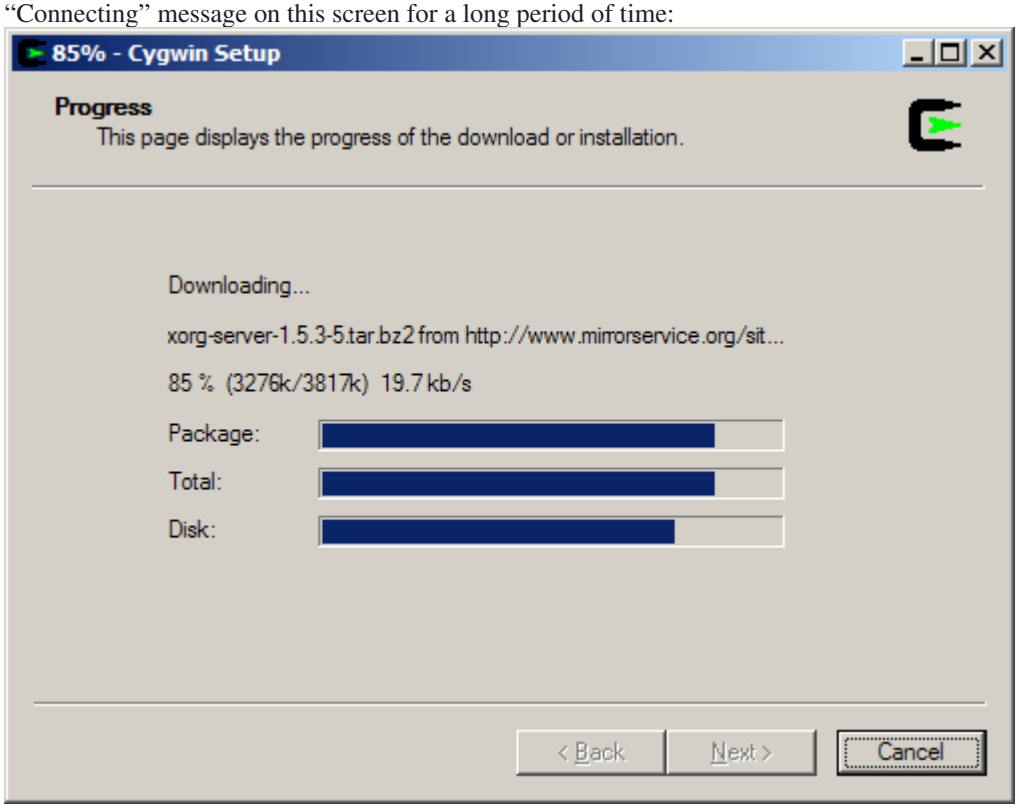
    Cygwin/X packages are located in the `X11` category.

    - `xorg-server` (required, the Cygwin/X X Server)
    - `xinit` (required, scripts for starting the X server: **xinit**, **startx**, **startwin** (and a shortcut on the Start Menu to run it), **startxdmcp.bat**)
    - `xorg-docs` (optional, **man** pages)
    - `xlaunch` (optional, a wizard for starting X sessions)
    - You may also select any X client programs you want to use, and any fonts you would like to have available.
    - You may also want to ensure that the `openssh` package is selected if you wish to use **ssh** connections to run remote X clients.
    - You may also want to ensure that the `inetutils` or `rsh` packages are selected if you wish to use **telnet** or **rsh** connections to run remote X clients. (not recommended)

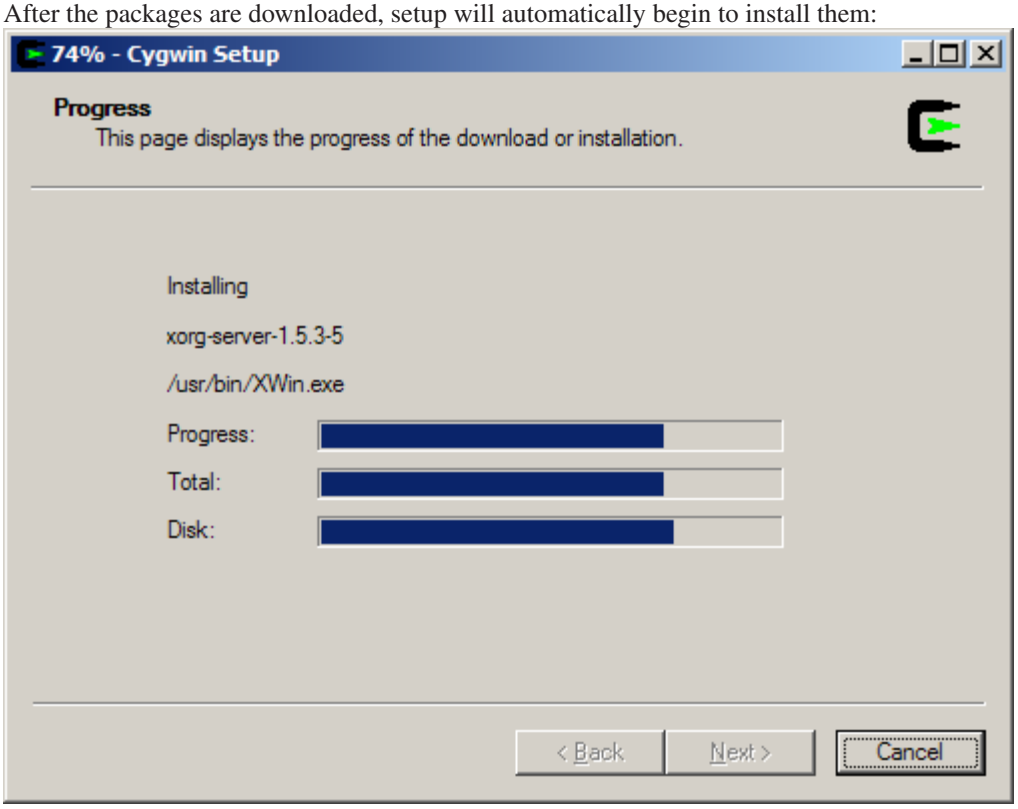
    You can run setup again in the future to add more packages.



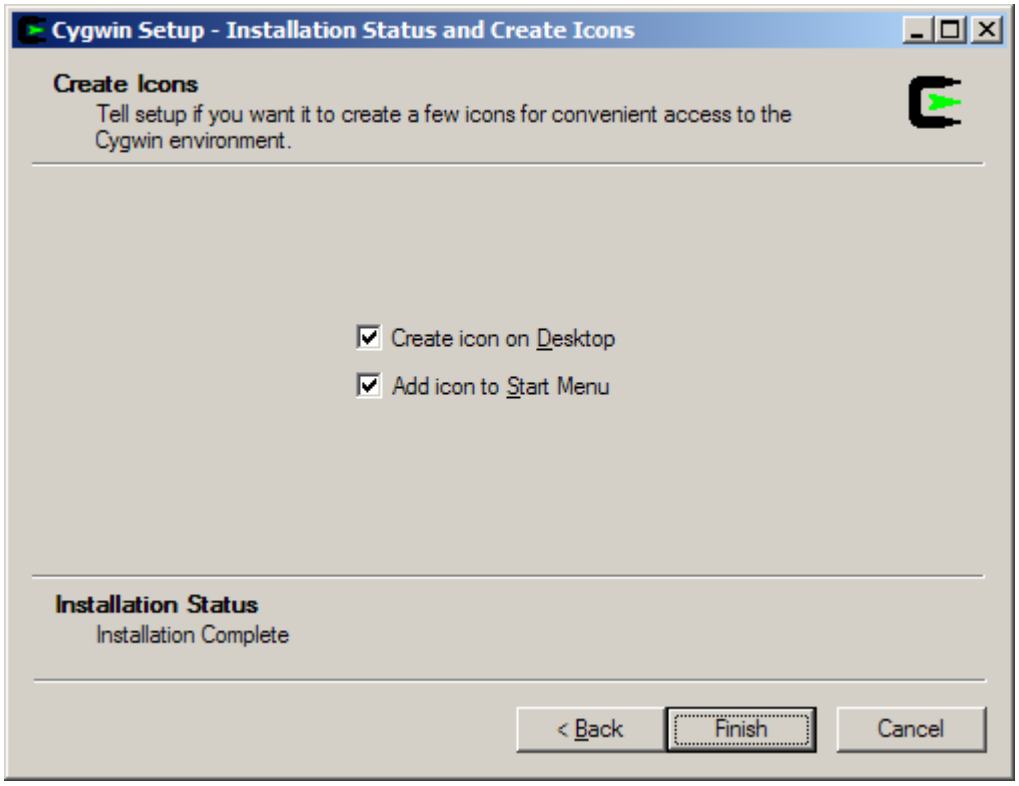
16. Click Next to begin the download process, you may want to try another mirror if you see a "Connecting" message on this screen for a long period of time:



17. After the packages are downloaded, setup will automatically begin to install them:



18. I highly recommend allowing Cygwin Setup to create Desktop and Start Menu icons for you; these icons simply launch a bash shell:



19. Click Finish to close the setup program.

You have now successfully installed Cygwin/X.

Chapter 3. Configuring Cygwin/X

Configuration overview

Cygwin/X settings are configured primarily through command-line parameters passed to `X`.

A `XWinrc` file is used to configure the notification area icon menu, and customize window appearance in multiwindow mode.

Windowing mode

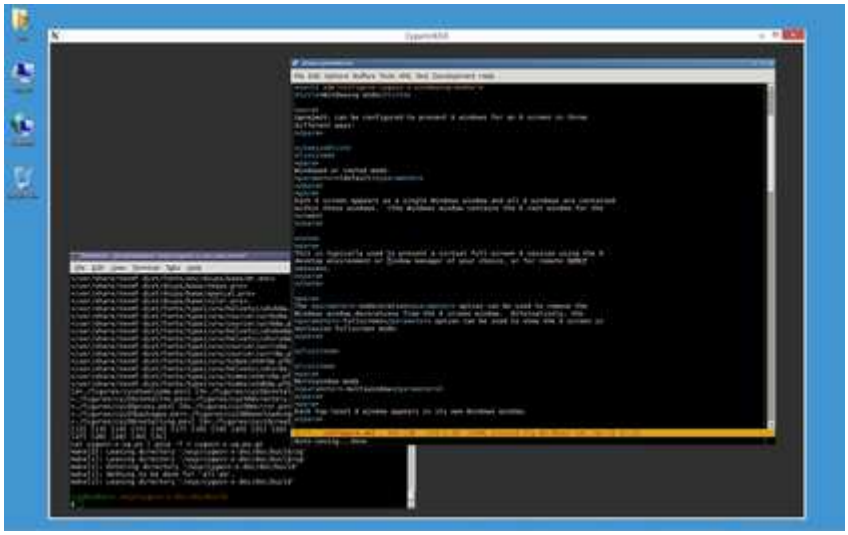
Cygwin/X can be configured to present X windows for an X screen in three different ways:

- Windowed or rooted mode. *`(default)`*

  Each X screen appears as a single Windows window and all X windows are contained within those windows. (the Windows window contains the X root window for the screen)

  Note: This is typically used to present a virtual full-screen X session using the X desktop environment or window manager of your choice, or for remote XDMCP sessions, e.g.:

An XDMCP session to a remote Fedora host



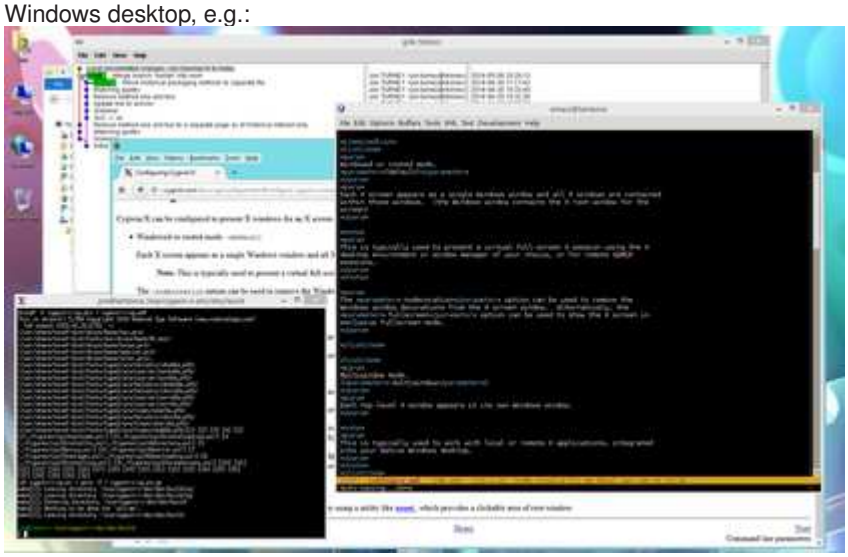
xfce4-terminal and emacs under the Openbox window manager in windowed mode

The `-nodecoration` option can be used to remove the Windows window decorations from the X screen window. Alternatively, the `-fullscreen` option can be used to show the X screen in exclusive fullscreen mode.

- Multiwindow mode. (`-multiwindow`)

  Each top-level X window appears in its own Windows window.

  Note: This is typically used to work with local or remote X applications, integrated into your native Windows desktop, e.g.:



X applications (emacs, gitk and xterm) and Windows applications (explorer and firefox) in multiwindow mode

- Rootless mode. (`-rootless`)

  The X root window is hidden from view, but top-level X windows are drawn.

  > **Note:** This is typically used to work with local or remote X applications, integrated into your native Windows desktop, but controlled using the X window manager of your choice.
  >
  > Because the X root window is hidden in this mode, this is not particulaly useful with X window managers with which you need to interact with the root window (for example, clicking on the root window to get a menu listing programs you can launch) [1] , but is more useful with X window managers which work with a dock or panel window for selecting applications from.
  >
  > Also note that the X window manager has no knowledge of the stacking of Windows windows, and vice versa, so raising one X window above a Windows window raises all of the X windows, and raising one Windows window above an X window raises it above all of the X windows. Exactly as if all X windows were being drawn into a hidden Windows window :-)

Command line parameters

Cygwin/X, by default, runs in windowed mode with the largest window that will fit on your Windows desktop, using the best performing engine that is installed on your system, with clipboard integration enabled. You do not need to pass any parameters to **X** to use the default behavior.

Up to date documentation of **X** options can be read with **man XWin** (http://x.cygwin.com/docs/man1/XWin.1.html).

XWinrc configuration file

With the `.XWinrc` configuration file it is possible to:

- Add items and submenus into the menu opened by right-clicking on the notification area icon.
- In multiwindow mode: add items and submenus into the Windows window system menu (opened by clicking on the icon in the top-left of the Windows window frame) and override the window icon and window styles for Windows windows, by window name or window class name.

Full documentation of the **XWinrc** file format and command can be read with **man XWinrc** (http://x.cygwin.com/docs/man5/XWinrc.5.html).

Notes

1. Although this can be worked around, to some extent, by using a utility like **xroot** (http://www.sealiesoftware.com/xroot.c) , which provides a clickable area of root window.

Chapter 4. Using Cygwin/X

Starting Cygwin/X

Described below are several methods of starting up the Cygwin/X X Server with a startup utility that optionally starts initial clients (for example, a terminal, a window manager, or a desktop environment) and performs X server configuration (for example, loading a keyboard map).

Starting in multiwindow mode (startxwin)

The custom XWin startup utility **startxwin** [1] starts the X server in multiwindow mode.

startxwin is included in the `xinit` package (installed by following the instructions in the Section called *Installing Cygwin/X* in Chapter 2).

Run **startxwin** by: [2]

- using the "XWin Server" shortcut under "Cygwin-X" on the Start Menu
- Starting `/usr/bin/startxwin` in a Cygwin shell:

```
$ startxwin
```

You can then start X clients from the right-click menu of the notification area icon, or (after setting DISPLAY appropriately) from the Cygwin terminal.

You may create a `~/.startxwinrc` script to customize the client programs started, rather than using the default `/etc/X11/xinit/startxwinrc` script.

Full documentation for **startxwin** can be read with **man startxwin** (http://x.cygwin.com/docs/man1/startxwin.1.html).

Starting an X desktop environment session or X window manager in windowed mode

Several of these are packaged for Cygwin.

- MATE Desktop Environment: install the `mate-session-manager` package
- Openbox window manager: install the `openbox` package
- WindowMaker window manager: install the `WindowMaker` package
- Xfce Desktop Environment: install the `xfce4-session` package

and use the provided Start Menu shortcut. [3]

Packages for several other desktop environments (e.g. GNOME, KDE, LXDE, ROX, Sugar) and window managers (e.g. Blackbox, dwm, Enlightenment, Fluxbox) are available in cygwinports. (http://cygwinports.org/)

Starting an X session with XLaunch

XLaunch is a GUI wizard for starting the Cygwin/X X server and a local or remote X client. These sessions can be saved and shared as `.xlaunch` files.

XLaunch is included in the `xlaunch` package (installed by following the instructions in the Section called *Installing Cygwin/X* in Chapter 2).

Run **xlaunch** using the "XLaunch" shortcut under "Cygwin-X" on the Start Menu.

Documentation for **xlaunch** is available at http://x.cygwin.com/docs/xlaunch/ and as online help within the program.

Starting in windowed mode (startx)

Use the standard X Window System **startx** command and its associated `~/.xinitrc` configuration file.

Run **startx** in a Cygwin shell:

```
$ startx
```

Full documentation for **startx** can be read with **man startx** (http://www.x.org/releases/X11R7.5/doc/man/man1/startx.1.html).

You may create a `~/.xinitrc` from the template in `/etc/X11/xinit/xinitrc` and then customize `~/.xinitrc` to start client programs and configure your X server.

```
$ cp /etc/X11/xinit/xinitrc ~/.xinitrc
[edit ~/.xinitrc as desired]
```

> **Note: startx** waits until `~/.xinitrc` exits (which is often waiting for a window manager started by it to exit) and then kills X, so the last client started by should be started with **exec** and without **&**.

Alternatively, if you just want to start a single client program (perhaps a window manager), you don't need to use a `~/.xinitrc`, and can start the client directly from **startx**, e.g. [4]

```
$ startx /usr/bin/fvwm2
```

> **Note:** The client name supplied to **startx** must begin with / or ., otherwise it is treated as an option to the default **xterm** client.

Notes for advanced users

Advanced users may wish to start the X server by invoking **XWin** directly, for example, to start XDMCP sessions (See the Section called *Remote sessions via XDMCP*).

If you want to have a Start Menu shortcut which runs **startxwin** with custom options, you should use a copy of the Start Menu shortcut installed by `xinit`, so that your changes are not overwritten when the `xinit` package is updated.

Obsolete startup methods

The MS-DOS batch file `startxwin.bat` and bash shell script `startxwin.sh` previously used to start the X server are no longer provided. This implementation made it difficult to reliably wait until the the X server had started before starting any clients. Use `startxwin` instead.

The executable `startxwin.exe` previously used to start the X server has been retired and replaced with a shell script **startxwin**.

Switching out of Cygwin/X

When running in windowed mode, press **Alt**-**Tab** to switch from Cygwin/X to your Windows desktop or other running Windows applications.

Stopping Cygwin/X

When you are done using Cygwin/X, you can shutdown the X server by:

- Selecting the "Exit..." option from the notification area icon menu
- In Windowed mode: Press **Alt**-**F4** to shutdown the X Server. This can be disabled using the *`-nowinkill`* option.
- In Windowed mode: Close the X server window in the conventional ways, e.g. by clicking on the "X" button at the upper-right corner of the X screen window frame, or choosing "Close" from the control menu opened by left-clicking on the X logo icon at the upper-left corner of the X screen window frame.
- Using the *`-unixkill`* option allows the **Ctrl**-**Alt**-**Backspace** key combination to shutdown the X Server.

If clients are still connected to the X server, you will be prompted to confirm you wish to shutdown the X server.

Window managers

A window manager is required in order to decorate, move, resize, and perform other operations on individual X windows.

Cygwin/X can work with window managers in several different ways:

- Internal window manager for multiwindow mode. The internal window manager that creates a Windows window for each top-level X window is automatically started when using the `-multiwindow` command-line parameter to **X**. See the Section called *Command line parameters* in Chapter 3 for more information on the `-multiwindow` command-line parameter.
- External local window managers (e.g. **twm**, **mwm** (part of the motif package), **fvwm2**, **openbox**, **aewm++**, **WindowMaker**). These local window managers must be installed on Cygwin and run locally.
- Remote window managers started by logging into an XDMCP session. You can read more about XDMCP in the Section called *Remote sessions via XDMCP*.
- Remote window manager launched through an **ssh** tunnel. This is not Cygwin/X-specific, so you should be able to find information about launching remote window managers from other sources. See the Section called *Secure ssh* for more information on using **ssh**.

Windows Clipboard integration

The X Window System uses its own clipboard system that is distinct from the clipboard system used by Windows. Copying and pasting text between these two clipboard systems requires a clipboard integration program that watches for updates to either clipboard and copies data between them when either one is updated. Cygwin/X has an internal clipboard integration program that is enabled by default.

The clipboard integration monitors the X PRIMARY (selected/highlighted text) and CLIBPOARD (cut/copied text) selections for changes in ownership, and makes the contents of the most recent one to change available to paste from the Windows clipboard. It also monitors the contents of the Windows clipboard for changes, taking ownership of the PRIMARY and CLIPBOARD selections, and making the contents of the Windows clipboard available in them.

> **Note:** Some X clients, notably ones written in Tcl/Tk, do not re-assert ownership of the PRIMARY selection or update it's timestamp when it's contents change, which currently prevents the clipboard integration program from correctly noticing that the PRIMARY selection's contents have changed.

> **Note:** With some X clients, it may be inconvenient that updating the PRIMARY selection causes that to overwrite the Windows clipboard contents you were just about to paste, so monitoring of the X PRIMARY selection can be disabled using the `-noprimary` option, or temporarily using the "Clipboard may use PRIMARY selection" toggle on the notification area icon menu.

See the Section called *Command line parameters* in Chapter 3 for more information on the `-[no]clipboard` and `-[no]primary` command-line options.

Shared memory support

Shared memory is needed by the MIT-SHM and XFree86-BigFont extensions, which may provide better performance for local applications which use large images or fonts and are written to use those extensions.

In Cygwin, XSI shared memory is provided by the **cygserver** Windows service. To install **cygserver**, install it using the setup program, run the **cygserver-config** script to install the service, and then reboot or use **cygrunsrv -S cygserver** to start the service.

> **Note:** *This note is applicable to Cygwin 1.5 only. Cygwin 1.7 automatically enables shared memory if the **cygserver** Windows service is running.*
>
> Shared memory will only be used if the *CYGWIN* environment variable contains the *server* keyword.
>
> For example, starting **X** with
>
> ```
> CYGWIN=server X
> ```
>
> or setting the *CYGWIN* environment variable in the Windows control panel to contain *server* will enable shared memory support if the **cygserver** service is running.

Displaying remote clients

Displaying remote X clients with Cygwin/X is identical to displaying remote X clients with any other X Server.

It is recommended that you use the secure method of tunnelling the X connection over **ssh**.

Alternatively, you can use the host-based access control provided by the X server, connecting to the remote machine using **telnet** or **rsh** and directing clients to connect to the server by setting the DISPLAY environment variable. This method is insecure and not recommended.

Secure ssh

On your Windows machine:

1. Make sure you have the `openssh` package installed.
2. Launch Cygwin/X
3. Ensure the DISPLAY environment variable is set correctly. (This step is not neccessary if you are entering your commands into an X terminal, as DISPLAY must already be set in that case)

   ```
   $ export DISPLAY=:0.0
   ```

4. Run the **ssh** command to connect to the remote host:

   ```
   $ ssh -Y username@remote_hostname_or_ip_address
   ```

5. Enter your password when prompted by **ssh**.

6. Your **ssh** session should now show you a shell prompt for your remote machine.

   Note: The ssh server will automatically set the DISPLAY environment variable appropriately, typically to something like `localhost:10.0`, so clients will connect to a proxy X11 display on the remote host from which the X11 protocol will be forwarded over ssh to your X server.

   If your login scripts unconditionally set DISPLAY to something else, this will break X11 forwarding.

7. You can now launch remote X clients in your **ssh** session, for example:

   ```
   $ xterm &
   ```

   will launch an xterm running on your remote host that will display on your Cygwin/X screen.

8. Launch other remote clients in the same manner. I recommend starting the remote clients in the background, by appending `&` to the command name, so that you don't have to open several **ssh** sessions.

   Note: By default, the OpenSSH server does not allow forwarded X connections. This must be configured on the remote host by adding `X11Forwarding yes` to the `sshd_config` configuration file. The OpenSSH server must be restarted or SIGHUP'ed to re-read the configuration file after it is changed.

   Note: The OpenSSH server requires the **xauth** command to be available to forward X connections. Consequently, it must be installed on the remote host.

Insecure telnet or rsh (Not recommended)

An example of connecting remote clients using host-based authorization.

On your Windows machine:

1. Make sure you have the `inetutils` package installed (for **telnet**) or `rsh` package (for **rsh**).
2. Launch Cygwin/X

   Note: You must provide the *`-listen tcp`* option to **startx** or **startxwin** so that the X server will listen for TCP/IP connections. (See this FAQ (../faq/cygwin-x-faq.html#q-remote-clients-cant-connect) for more details).

3. In an X terminal, use the **xhost** command to allow the remote host access to make connections to your X server:

```
$ xhost remote_hostname_or_ip_address
```

4. Run the **telnet** or **rsh** command to connect to the remote host:

   ```
   $ /usr/bin/telnet remote_hostname_or_ip_address
   ```
   or
   ```
   $ rsh remote_hostname_or_ip_address
   ```

   Note: Use the explicit path to ensure that Cygwin's **telnet** is run instead of Microsoft's **telnet**. Microsoft's **telnet** cannot read input or display output correctly when run from a Cygwin shell.

5. Login to your remote machine
6. Ensure the DISPLAY environment variable is set correctly in your remote session.

   ```
   $ export DISPLAY=windows_hostname_or_ip_address:0.0
   ```
7. You can now launch remote X clients in your **ssh** session, for example:

   ```
   $ xterm &
   ```
   will launch an xterm running on your remote host that will display on your Cygwin/X screen.
8. Launch other remote clients in the same manner. I recommend starting the remote clients in the background, by appending `&` to the command name, so that you don't have to open several **telnet** or **rsh** sessions.

   Note: This is *insecure* because (1) when you log in, your username and password may be transmitted in clear across the network between you and the remote host (2) the X protocol is transmitted in clear across the network between you and the remote host, and (3) you have allowed any user on the remote host to connect to your X server and monitor your X session. For these reasons, use ssh forwarding, if at all possible.

Remote sessions via XDMCP

Cygwin/X can be used login to one or several remote sessions using XDMCP (X Display Manager Control Protocol).

Start Cygwin/X with a command similar to the following to login to a single remote session using XDMCP:

`X -query remote_hostname_or_ip_address`

You may login to several remote sessions with a single or multiple hosts using XDMCP. Each session will need a separate display number, specified by the *`:display_number`* parameter, such as *`:0`*. A display number is not the same as a screen number, as a single display can have multiple screens associated with it. Each display listens on a different network port number, so each display can connect

to multiple machines. Start Cygwin/X with command lines similar to the following to login to several remote sessions using XDMCP:

```
X :0 -query remote_hostname_or_ip_address_0
```

```
X :1 -query remote_hostname_or_ip_address_1
```

Note that the *:display_number* parameter is a general X Server parameter, not specific to Cygwin/X. Further documentation of the *:display_number* parameter can be found in the X Server manual page (http://x.cygwin.com/docs/man1/Xserver.1.html). XDMCP is a complex system that is not specific to Cygwin/X; further discussion of XDMCP is beyond the scope of this document. You may wish to read the Linux XDMCP HOWTO (http://en.tldp.org/HOWTO/XDMCP-HOWTO/) or the X Server XDMCP Options (http://x.cygwin.com/docs/man1/Xserver.1.html#lbAH) for more information.

Note: For security reasons, XDMCP is not enabled by default on most modern UNIX distributions. You will have to enable remote logins to your X Display Manager (**xdm**, **kdm**, **gdm**, etc.). See the configuration documentation for your X Display Manager and/or UNIX distribution. The Cygwin/X FAQ section on XDMCP (http://x.cygwin.com/docs/faq/cygwin-x-faq.html#xdmcp) may also be helpful.

Note: XDMCP suffers from some of the same security problems noted in the previous section, but unfortunately cannot be tunnelled over **ssh** due to it's use of UDP. A similar effect can be achieved with a command like `ssh -Y remote_hostname_or_ip_address Xnest :1 -query localhost`

Note: In some cases, e.g. if you have multiple network interfaces, it may be necessary to use the *-from local_ip* parameter to specify the local IP address to be used.

OpenGL (GLX)

Note: Hardware-accelerated OpenGL is still under active development and should be considered beta quality, but should be working well enough to be useful. Please report problems with specific OpenGL applications to the cygwin mailing list.

The Cygwin/X X Server supports both software OpenGL rendering (using the mesa software renderer), and hardware accelerated OpenGL rendering (using the native Windows OpenGL (WGL) interface).

The X server command line options *-wgl* and *-nowgl* turn on and off the use of the native Windows OpenGL implementation. Currently *-wgl* is only supported in multiwindow mode, and is on by default in that mode. *-wgl* has no effect if your display driver does not support hardware-accelerated OpenGL.

Table 4-1. Summary of OpenGL rendering options

	software rendering [a]	**hardware-accelerated rendering**
indirect (Uses GLX protocol, limited to OpenGL 1.4)	start server with `+iglx -nowgl` options **export LIBGL_ALWAYS_INDIRECT=1**	start server with `+iglx -wgl` options **export LIBGL_ALWAYS_INDIRECT=1**
direct		start server with `-wgl` option **export LIBGL_USE_WGL=1** [b] (local clients only)
Notes: a. The software renderer used (e.g. llvmpipe, softpipe) can be selected using the GALLIUM_DRIVER environment variable. b. Since direct accelerated rendering is currently experimental, the LIBGL_USE_WGL environment variable is required to enable it, but that will be removed when the feature is mature, at which point it will be the default and **export LIBGL_ALWAYS_SOFTWARE=1** will be required to force software rendering.		

Currently the default configurations are:

- For local clients the default is direct, software rendering.

  To use the experimental direct, hardware-accelerated rendering, you must do **export LIBGL_USE_WGL=1** before starting the client application.

- For remote clients, Mesa's libGL prefers to use client-side software rendering and then transfer the rendered image to the server.

  To force indirect rendering (which takes place on the server), you must start the server with the `+iglx` option and do **export LIBGL_ALWAYS_INDIRECT=1** before starting the client application.

  There is a performance trade-off between rendering performance and network latency, so you might wish to try both direct and indirect rendering and see which performs best in your specific circumstances.

If **glxinfo | grep OpenGL** outputs something mentioning your graphics card vendor, you have hardware-accelerated rendering. If it mentions Mesa, you have software rendering.

Please ensure you are using the latest display drivers for your graphics hardware before reporting any visual issues with WGL.

Known issues:

- OpenGL drawing is just drawn on top of the X window. This works well enough when the OpenGL window is a top-level window, or is non-top-level and has no occluding relatives and is drawn after anything it occludes, but can mis-render in more complex scenarios.

- OpenGL windows with static contents aren't re-drawn when occluded by a native Window and then exposed. Workaround: force the window to redraw, e.g. by resizing it.
- When an OpenGL window is behind a native application window which uses layered windows for translucency, the OpenGL rendering is drawn over the top, flickering.
- Rendering to GLX pixmaps is only partially implemented due to WGL limitations.

Input internationalization

Compose key ('Multi_key')

The compose key is a dead key which introduces a multi-key sequence to generate a character.

You can configure the compose key by using **setxkbmap** e.g. `setxkbmap -option compose:rctrl` or starting the X server with the `-xkboption` option, e.g. `X -xkboption compose:ralt`. The possibilities for the compose key, e.g. ralt, lwin, rwin, menu, lctrl, rctrl, caps, etc. are listed in the xkeyboard-config(7) (http://www.x.org/releases/current/doc/man/man7/xkeyboard-config.7.html) man page.

Alternatively, the option `lv3:ralt_switch_multikey` configures Right Alt as 3rd-level shift, Shift + Right Alt [5] as Compose. Note that this option is on by default in the gb layout.

The standard compose key sequences available are determined by the locale. Refer to the compose key sequence charts (http://www.x.org/releases/current/doc/libX11/i18n/compose/libX11-keys.html) for the available compose key sequences for each locale. Note that most locales using a Microsoft codepage character set (e.g. with a LANG environment variable of the form *LL_CC*.CP*nnn*) are not currently recognized by Xlib.

See the Compose(5) (http://www.x.org/releases/current/doc/man/man5/Compose.5.html) man page for more details on how the locale is mapped to a compose key sequence file and how to configure custom compose key sequences.

Input Method Editors (IMEs)

If an IME is configured, it should be started as part of a remote session (See the Section called *Remote sessions via XDMCP*).

To use an IME with remote clients started from a command line (See the Section called *Displaying remote clients*), the IME must be started explicitly, e.g.

Starting the ibus IME

After configuring ibus with **ibus-setup**, start the ibus daemon

```
$ ibus-daemon -drx
```

and set XMODIFIERS so XIM clients will use ibus

```
$ export XMODIFIERS="@im=ibus"
```

Starting other IMEs

Similarly for fcitx, gcim, iiimf, scim, uim, etc.

Terminal Server or Fast User Switching

When multiple users may start X servers on same computer, each X server must have a unique display number.

Instead of specifying a display number using the *`:display_number`* option, such as *`:0`*, starting the X server with the `-displayfd` option, locates an unused display number and writes it to the specified file descriptor.

startx, **xinit** and **startxwin** notice this option, and transparently use it to determine the display number for any clients they start, and then pass on the display number to the specified file descriptor.

> **Note:** It may be necessary to also use the *`-engine 1`* option (GDI drawing) for the X server windows to draw correctly when connecting to a Terminal Server using RDP, depending on the Windows version and/or graphics driver in use.

> **Note:** Automatically communicating the allocated display number to all future X clients started by the user who started the X server is left as an exercise for the reader.

Customizing the notification area icon menu

You can customize the right-click menu for the XWin icon in the Windows notification area (system tray) using the XWinrc file. e.g.

```
$ cp /etc/X11/system.XWinrc./etc/X11/xinit/xinitrc ~/.XWinrc
[edit ~/.Xwinrc as desired]
```

See the Section called *XWinrc configuration file* in Chapter 3 for more details.

Notes

1. **startxwin** is a specialized version of **startx** with a few differences appropriate to running in multiwindow mode, rather than windowed mode.

- **startxwin** supplies the **-multiwindow** option to X
- It uses a different script to start clients (`~/.startxwinrc` rather than `~/.xinitrc`), because `~/.xinitrc` will normally end by starting a window manager, which would be incorrect for `~/.startxwinrc` (as it would discover the internal window manager is already running and exit immediately).
- Note that **startxwin** *no longer* exits after `~/.startxwinrc` has completed, leaving X running, but, similar to **startx**, waits until `~/.startxwinrc` exits and then kills X.

  If you don't want the X server to exit until explicitly told to do so, end your `~/.startxwinrc` with something like **exec sleep infinity**.

2. It's not recommended to start `startxwin` from a MS-DOS shell or by double-clicking it in Windows Explorer. To do so means that the X server is not started from a login shell, and programs started from the notification area icon menu will not inherit the environment of a login shell. This may lead to unexpected behaviour, for example, if you have customizations to your login shell start-up scripts which set environment variables.
3. Alternatively, these sessions can be started from the command line, e.g.

   ```
   startx /usr/bin/dbus-launch mate-session
   ```

   or

   ```
   echo "/usr/bin/dbus-launch startxfce4" > ~/.xinitrc
   ```

   and then running **startx**.
4. Note that **startxwin** and **startx** use the special option `--` to mark the end of client options and the beginning of server options, So, for example, if you wish to also start the X server with the options `-emulate3buttons` and `-noclipboard`, as described in
   the Section called *Command line parameters* in Chapter 3, use the following command:

   ```
   $ startx /usr/bin/fvwm2 -- -emulate3buttons -noclipboard
   ```

5. pressing the keys in that order. Right Alt + Shift is 4th-level shift.

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