

Cygwin/X User's Guide

Harold L Hunt, II

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by Harold L Hunt, II

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Chapter 1. Cygwin/X Overview

Cygwin/X is a port of the X Window System to Cygwin; Cygwin provides a UNIX-like API on the Win32 platform. As of 2004-03-09 the supported Win32 platforms are Windows 95, Windows 98, Windows Me, Windows NT 4.0, Windows 2000, Windows XP, and Windows Server 2003.

Chapter 2. Setting Up Cygwin/X

Cygwin/X Contents

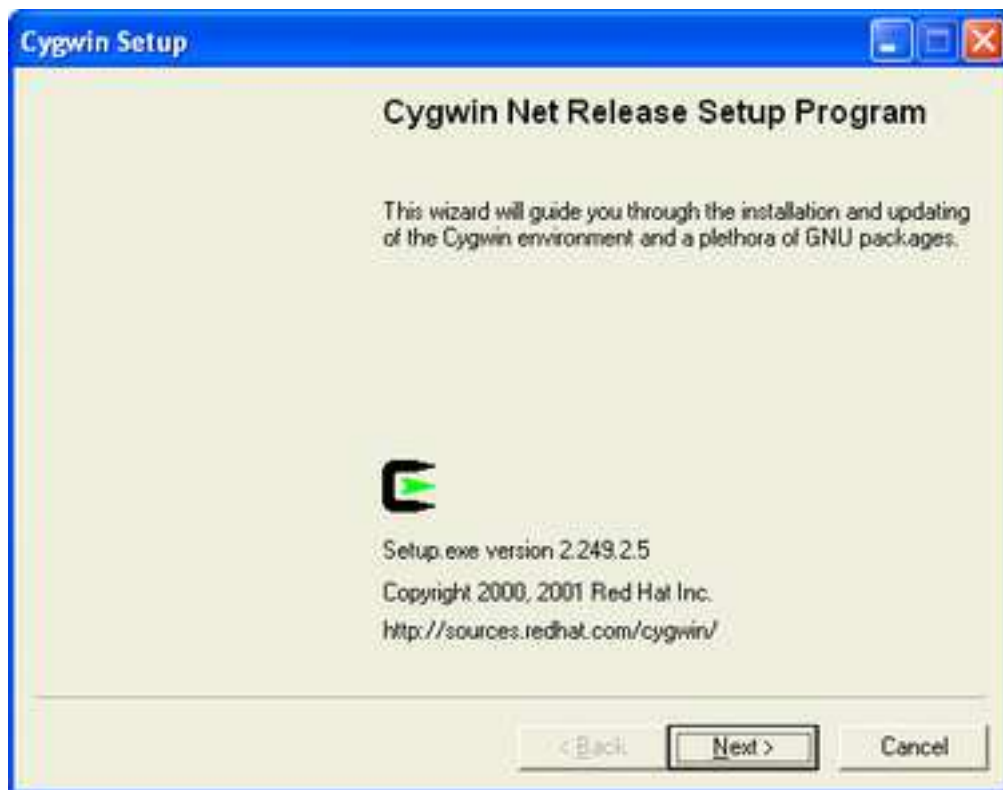
Cygwin/X consists of two parts: Cygwin, a port of the GNU tools to Win32, and Cygwin/X, a port of the X Window System to Win32. Both parts of Cygwin/X are needed to successfully run an X Server on a Win32 platform.

Installing Cygwin/X

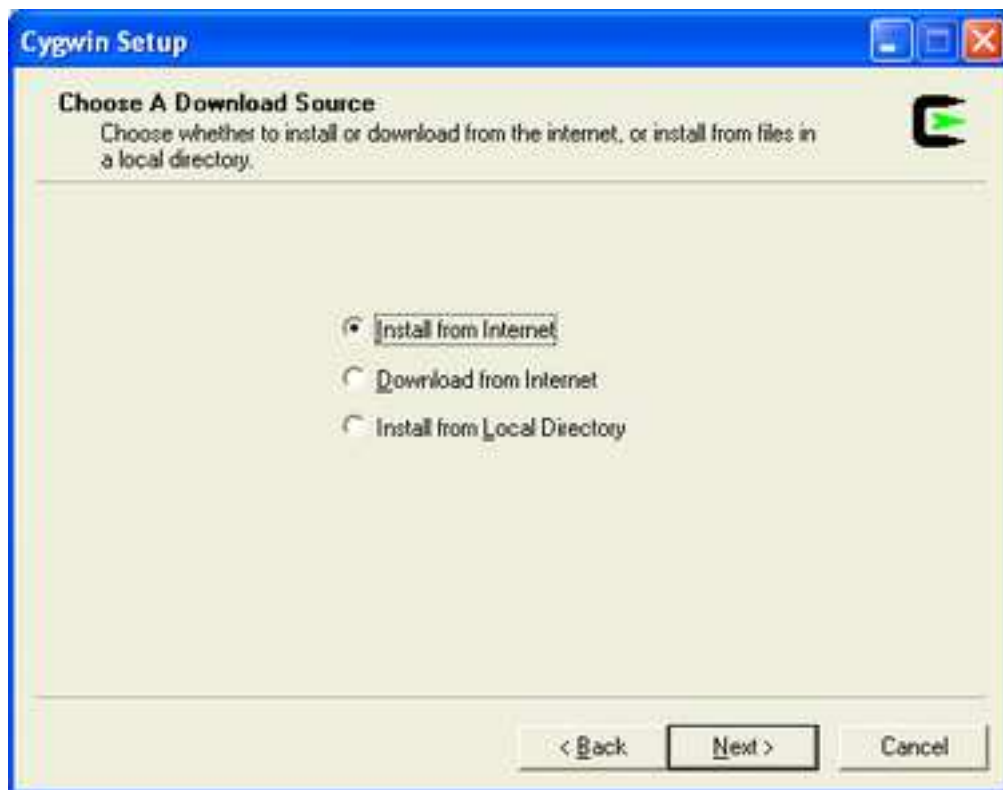
Cygwin tools are, in the words of the Cygwin development homepage, <http://cygwin.com/>, “ports of the popular GNU development tools and utilities for Windows 95, 98, and NT. They function by using the Cygwin library which provides a UNIX-like API on top of the Win32 API.” Cygwin allows the compilation of the X Window System source on Win32; several patches were made to the X Window System source to make it actually compile and run under Cygwin.

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

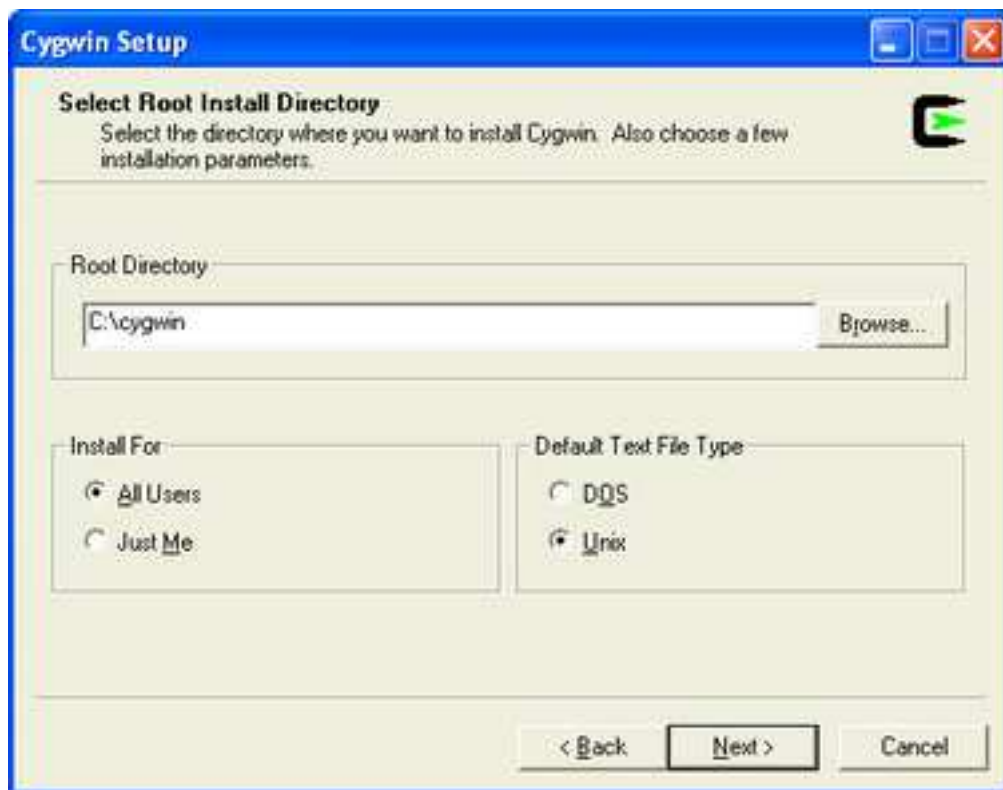
1. Open the Cygwin, <http://cygwin.com/> page in your web browser
2. Click the “Install Cygwin Now” link in the upper-right hand corner of the page; or, click the “Install” link next to “Latest net release:”, which should be near the top of the page in the main content area. This link downloads `setup.exe` from the primary Cygwin server; save `setup.exe` to the directory that you would like to store the downloaded packages in (e.g. `c:\cyginstall`); do not save `setup.exe` to `c:\cygwin`, as that is the default directory for the extraction and installation of the downloaded packages.
3. Run `setup.exe`, you will see the welcome screen:



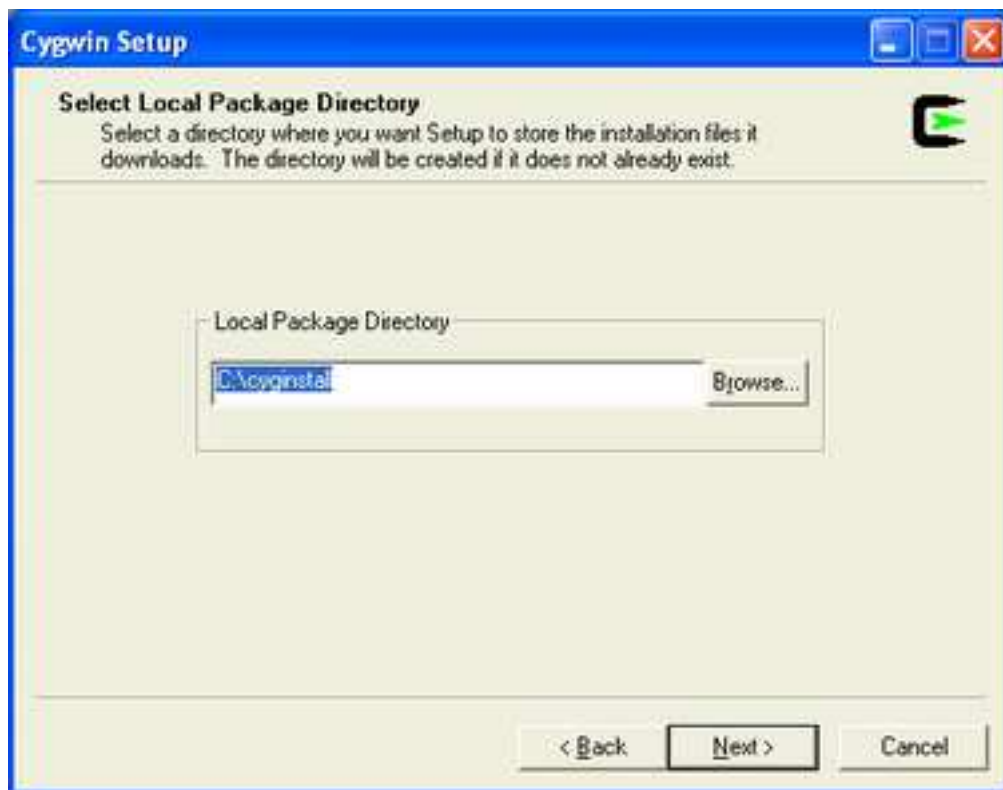
4. Click Next to proceed to the next screen.
5. Choose, Install from Internet, this will still save the package files to your download directory so that you can install Cygwin on any number of machines:



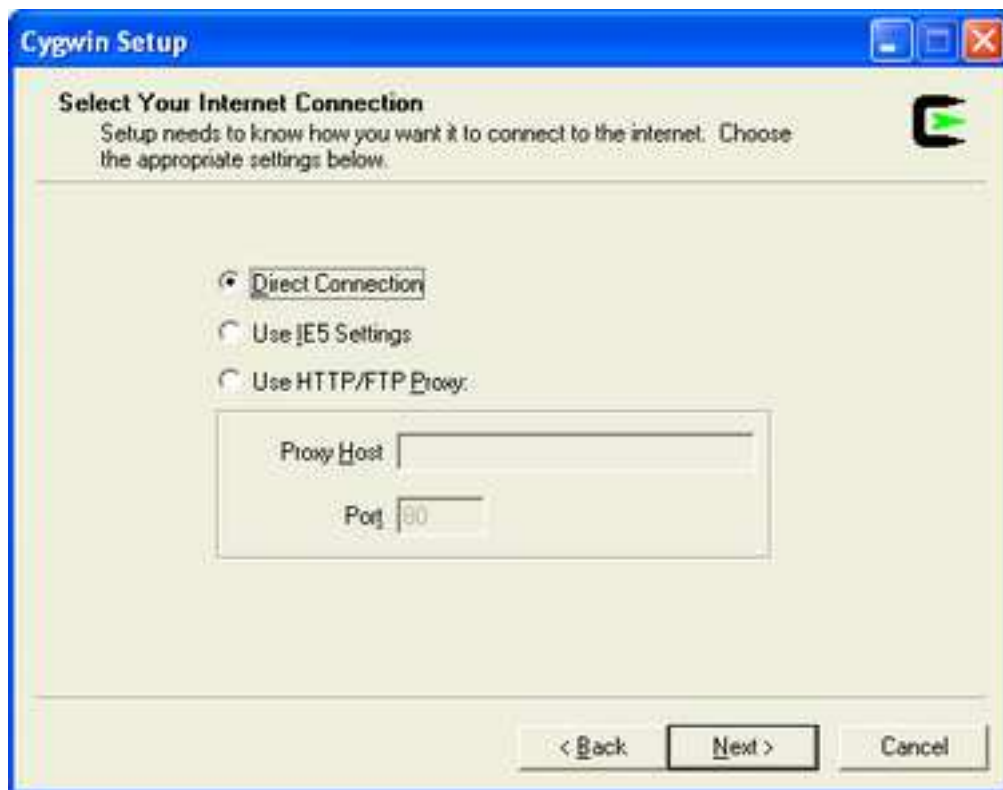
6. Click Next to proceed to the next screen.
7. The default Install Root is `c:\cygwin`; this should be fine for most installations. Leave Default Text File Type as UNIX. If you have several users on your NT machine, and you are logged in with local administrative privileges, you may wish to set Install For to All, but the default of Just Me will work fine for single user machines.



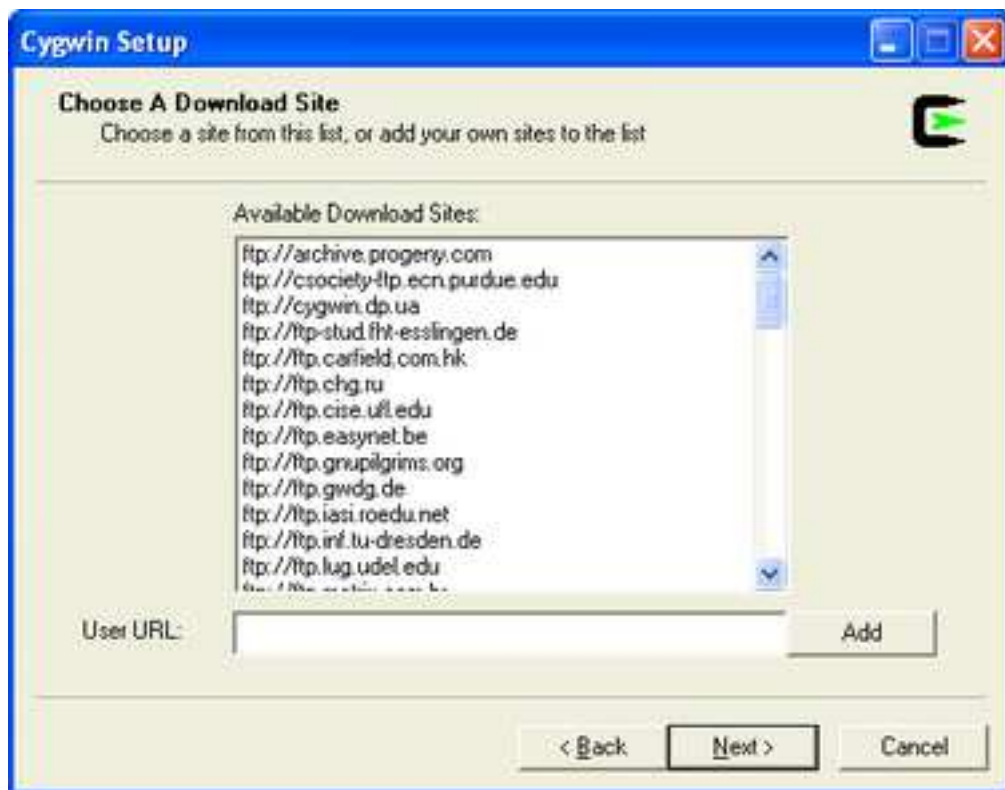
8. Click Next to proceed to the next screen.
9. Local Package Directory should default to the directory that you ran `setup.exe` from:



10. Click Next to proceed to the next screen.
11. Choose your proxy setup, or, just choose Direct Connection to limit the scope of download problems:



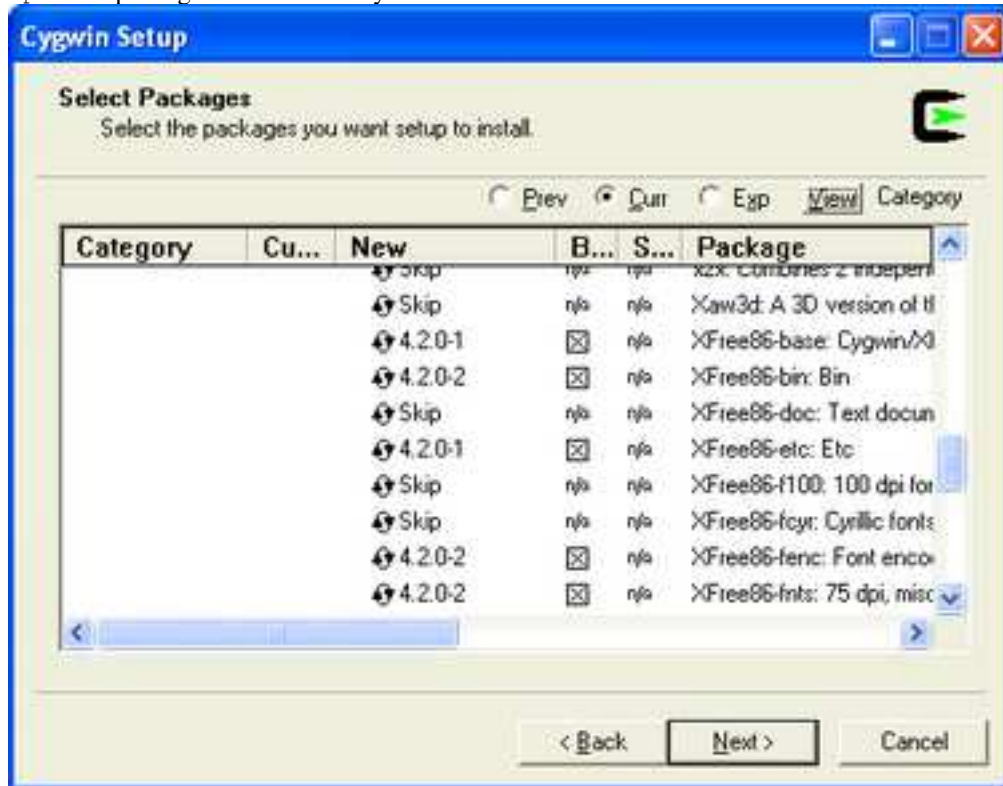
12. Click Next to proceed to the next screen.
13. Select your nearest mirror for downloading:



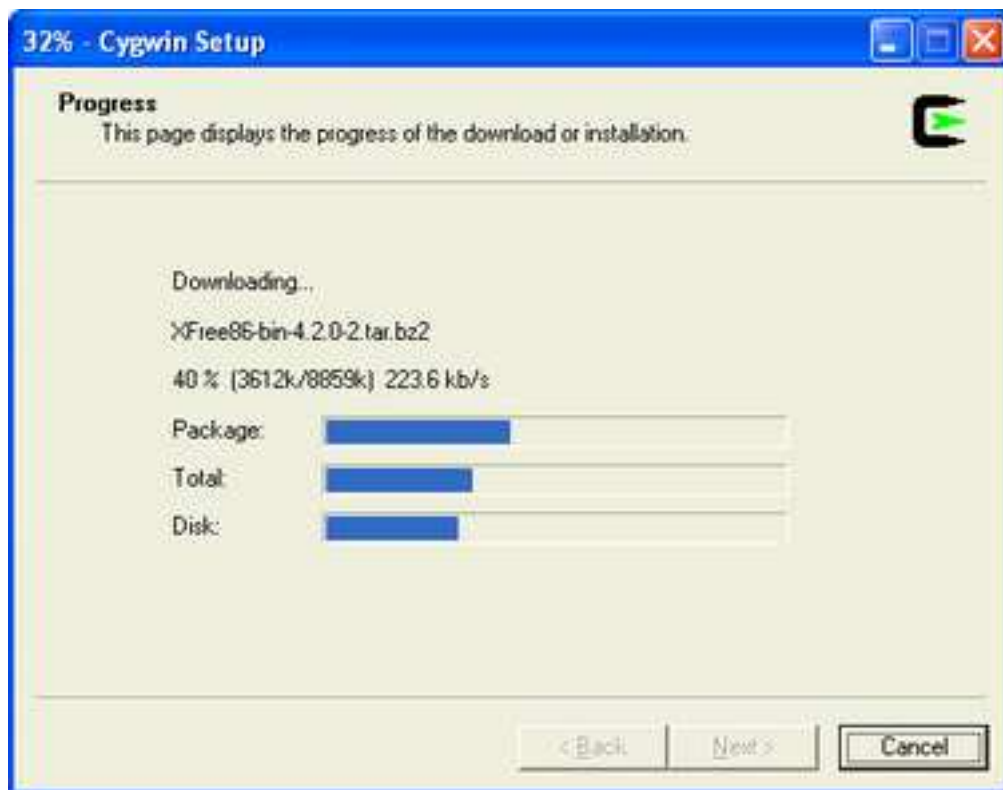
14. Click **Next** to proceed to the next screen; setup will download a list of available packages as it moves to the next screen.
15. On the next screen you will select the packages that will be downloaded and installed. A listing of the Cygwin/X packages is given below; a listing of the general Cygwin packages would be beyond the scope of this document.
 - `xorg-x11-base` (2 KiB; required, automatically selects a base set of packages for the typical installation)
 - `xorg-x11-bin` (1.2 MiB; optional, executables for xterm, twm, etc.)
 - `xorg-x11-bin-dlls` (2 MiB; optional, libraries (DLLs) for executables.)
 - `xorg-x11-bin-lndir` (5 KiB; optional, Indir program, useful for developing)
 - `xorg-x11-devel` (964 KiB; optional, additional files needed to compile programs for Cygwin/X)
 - `xorg-x11-etc` (335 KiB; required, configuration files for the X Server and programs in `xorg-x11-bin`)
 - `xorg-x11-f100` (12 MiB; optional, 100 dpi fonts (75 dpi fonts are used by default))
 - `xorg-x11-fcyr` (368 KiB; optional, Cyrillic fonts)
 - `xorg-x11-fenc` (489 KiB; required, font encodings)
 - `xorg-x11-fnts` (16.4 MiB; required, 75 dpi fonts)
 - `xorg-x11-fscl` (2.2 MiB; optional, Speedo and Type1 scalable fonts)

- `xorg-x11-fsrv` (201 KiB; optional, X Font Server)
- `xorg-x11-libs-data` (154 KiB; required, `X11R6/lib/` files)
- `xorg-x11-man-pages` (551 KiB; optional, **man** pages)
- `xorg-x11-man-pages-html` (596 KiB; optional, **man** pages in html format)
- `xorg-x11-nest` (1.1 MiB; optional, Xnest nested X Server)
- `X-start-menu-icons` (4 KiB; optional, adds icons for X Clients to the Start menu)
- `X-startup-scripts` (22 KiB; required, example X Server and client startup scripts)
- `xorg-x11-vfb` (1.2 MiB; optional, X Virtual Frame Buffer (Xvfb) server)
- `xorg-x11-xwin` (1.3 MiB; required, the Cygwin/X X Server)
- `xorg-x11-xwin-gl` (761 KiB; optional, the Cygwin/X X Server with ***EXPERIMENTAL*** GLX acceleration)

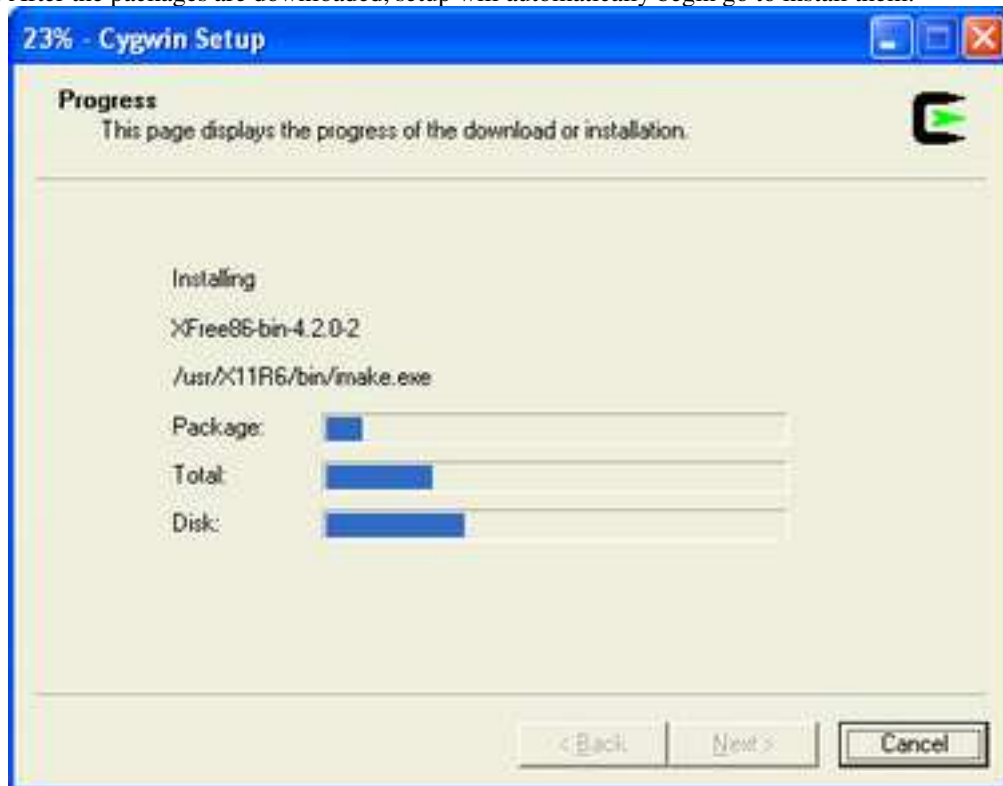
16. You must select the `xorg-x11-base` package, which is located in the `x11` category. The `xorg-x11-base` package is a helper package that automatically selects a working set of packages for you that will allow Cygwin/X to work. You may also want to ensure that the `inetutils` and `openssh` packages are selected if you wish to use **telnet** and **ssh** to connect to remote machines.



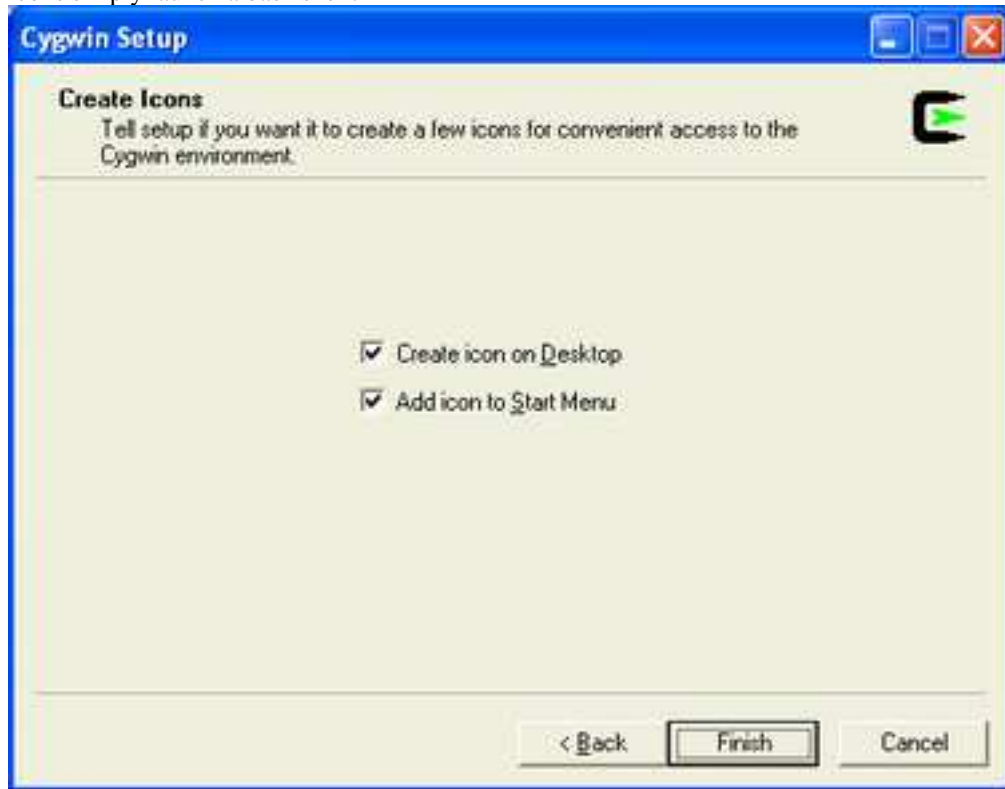
17. Click **Next** to begin the download process, you may want to try another mirror if you see a "Connecting" message on this screen for a long period of time:



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



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



20. Click Next to proceed to the next screen.
21. You should receive a message that the installation has completed.



You have now successfully installed Cygwin/X. Proceed to Chapter 4 for instructions on how to use Cygwin/X.

Chapter 3. Configuring Cygwin/X

Configuration Overview

Cygwin/X settings are configured primarily through command-line parameters passed to `XWin.exe`. Cygwin/X comes with a file called `startxwin.bat` that launches an X Server, a terminal, and a window manager.

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; you do not need to pass any parameters to **XWin.exe** to use the default behavior. Below is the syntax for **XWin.exe** parameters.

XWin.exe

```
[-help]
[-clipboard [-nunicodeclipboard]]
[-clipupdates clip_updates_above_n]
[-emulate3buttons timeout_in_milliseconds]
[-engine engine_number]
[-fullscreen [-depth depth_in_bits_per_pixel] [-refresh refresh_rate_in_hertz]]
[-ignoreinput]
[-lesspointer]
[-multiwindow]
[-multimonitors]
[-nodecoration]
[-rootless]
[-screen screen_number width height ...]
[-scrollbars]
[-[no]trayicon]
[-[no]unixkill]
[-[no]winkill]
[-[no]keyhook]
[-swcursor]
[-xkbrules XKBRules]
[-xkbmodel XKBModel]
[-xkblayout XKBLayout]
[-xkbvariant XKBVariant]
[-xkboptions XKBOptions]
[-logfile path_to_logfile]
[-logverbose verbosity_level]
```

Below is an example command line for **XWin.exe**.


```
XWin.exe -screen 0 800 600 -fullscreen -depth 32 -refresh 85
-emulate3buttons 100 -nowinkill -unixkill
```

Table 3-1. Parameter Descriptions

Parameter	Description
<code>[-help]</code>	Print a list of supported commandline options and their description similar to this list.
<code>[-clipboard [-nunicodeclipboard]]</code>	Enables the integrated version of xwinclip , which provides integration between the Cygwin/X clipboard and Windows clipboard. Do not use in conjunction with the xwinclip program. <i>-nunicodeclipboard</i> disables Unicode clipboard even if Cygwin/X is running on a NT-based platform
<code>[-clipupdates <i>clip_updates_above_n</i>]</code>	Groups together the regions in each update to the screen when there are more than the specified number of regions in an update. This works by fitting a clipping region around the updated regions, then transferring that entire region of the shadow frame buffer to the screen, rather than making many individual calls to transfer small portions of the shadow frame buffer to the screen. This has a diminished effect on NT-based platforms because they already group GDI operations together in a batch, which has a similar effect.
<code>[-emulate3buttons <i>timeout_in_milliseconds</i>]</code>	Note: scroll wheel mice often allow you to click the scroll wheel for middle mouse button functionality. Thus, most users with a scroll wheel mouse will not need to use this parameter. This option allows users with a two-button mouse to emulate a third mouse button by pressing both mouse buttons within the optional timeout specified in milliseconds. The default timeout is 50 milliseconds.

Parameter	Description
<code>[-engine <i>engine_number</i>]</code>	Do not use this parameter unless you are a Cygwin/X developer or are instructed by a Cygwin/X developer to do so. Cygwin/X's default behavior is to determine if DirectDraw or DirectDraw4 are present, then to examine the <code>-depth</code> and <code>-fullscreen</code> parameters to determine the engine with optimum performance that supports the specified depth and window configuration.
<code>[-fullscreen [-depth <i>depth_in_bits_per_pixel</i>] [-refresh <i>refresh_rate_in_hertz</i>]]</code>	The <code>-fullscreen</code> parameter tells Cygwin/X to open a given screen in fullscreen mode. The <code>-depth</code> parameter can only be used with <code>-fullscreen</code> and a DirectDraw based engine to specify the display depth that should be used for the fullscreen Cygwin/X screen. The <code>-refresh</code> parameter can only be used with <code>-fullscreen</code> and a DirectDraw based engine to specify the refresh rate that should be used for the fullscreen Cygwin/X screen.
<code>[-ignoreinput]</code>	Ignore keyboard and mouse input. This is usually only use for testing and debugging purposes.
<code>[-lesspointer]</code>	Hide the Windows mouse cursor when the mouse is over any Cygwin/X window (regardless of whether that window is active or inactive). This prevents the Windows mouse cursor from being placed overtop of the X cursor.
<code>[-multimonitors]</code>	Create a root window that covers all monitors on a system with multiple monitors.
<code>[-multiwindow]</code>	Start the integrated Windows-based window manager, which launches each top-level X window in its own Windows window. Not to be used together with <code>-rootless</code> nor <code>-fullscreen</code> .
<code>[-nodecoration]</code>	Do not give the Cygwin/X window a Windows window border, title bar, etc. This parameter only applies to windowed mode screens, i.e., this parameter is ignored when the <code>-fullscreen</code> parameter is specified.
<code>[-rootless]</code>	Use a transparent root window with an external window manager (such as twm). Not to be used with <code>-multiwindow</code> nor with <code>-fullscreen</code> .

Parameter	Description
<code>[-screen <i>screen_number width height ...</i>]</code>	<p>This parameter does not have to be specified. Cygwin/X's default behavior is to create a single screen that is roughly the size of the current Windows display area.</p> <p>This parameter may be used to specify the screen number, height, and width of one or several Cygwin/X screens; each Cygwin/X screen will be opened in its own window. When using multiple screens, be sure not to duplicate any screen numbers. Do note that, as of 2002-01-08, using multiple screens is not fully implemented; there are several bugs that must be fixed by someone that uses the multiple screens feature.</p> <p>Screen specific parameters, such as <i>-fullscreen</i>, can be applied as a default to all screens by placing those screen specific parameters before any <i>-screen</i> parameter. Screen specific parameters placed after the first <i>-screen</i> parameter will apply only to the immediately preceeding <i>-screen</i> parameter.</p>
<code>[-scrollbars]</code>	Enable resizing of the server display window. Do not use in conjunction with <i>-multiwindow</i> nor with <i>-rootless</i> .
<code>[-[no]trayicon]</code>	Enable or disable the tray icon; the default is to enable the tray icon.
<code>[-[no]unixkill]</code>	Enable or disable the Ctrl-Alt-Backspace key combo as a signal to exit Cygwin/X. The Ctrl-Alt-Backspace key combo is disabled by default.
<code>[-[no]winkill]</code>	Enable or disable the Alt-F4 key combo as a signal to exit Cygwin/X. The Alt-F4 key combo is enabled by default.
<code>[-[no]keyhook]</code>	Enable or disable grabbing of special windows keys like the Menu key or Alt-Tab . This is disabled by default.
<code>[-swcursor]</code>	Disable the use of the windows cursor and use the X11 software cursor instead.
<code>[-xkbrules <i>XKBRules</i>]</code>	Set the rules to use for XKB. This defaults to <i>xorg</i> .
<code>[-xkbmodel <i>XKBModel</i>]</code>	Set the model to use for XKB. This defaults to <i>pc105</i> .

Parameter	Description
<code>[-xkblayout <i>XKBLayout</i>]</code>	Set the layout to use for XKB. This defaults to a layout matching your current layout from windows or <i>us</i> if no matching layout was found.
<code>[-xkbvariant <i>XKBVariant</i>]</code>	Set the variant to use for XKB. This defaults to not set.
<code>[-xkboptions <i>XKBOptions</i>]</code>	Set the options to use for XKB. This defaults to not set.
<code>[-logfile <i>path_to_logfile</i>]</code>	Set the location of the logfile. This defaults to <i>/tmp/XWin.log</i> .
<code>[-logverbose <i>verbosity_level</i>]</code>	Set the level of logging verbosity. Currently only a few log messages respect this setting.

Chapter 4. Using Cygwin/X

Starting Cygwin/X

There are several methods of starting the Cygwin/X X Server with a startup script that optionally starts initial clients and loads keyboard modifier maps. Several startup methods are described below.

startxwin.bat

`startxwin.bat` - Use a MS-DOS batch file as the startup script. An example `startxwin.bat` is included in `X-startup-scripts`, which is extracted according to the instructions in the Section called *Installing Cygwin/X* in Chapter 2. Run `/usr/X11R6/bin/startxwin.bat` by double-clicking it in Windows Explorer.

startxwin.sh

`startxwin.sh` - Use an **sh** shell script as the startup script. An example `startxwin.sh` is included in `X-startup-scripts`, which is extracted according to the instructions in the Section called *Installing Cygwin/X* in Chapter 2. Run `/usr/X11R6/bin/startxwin.sh` in a Cygwin shell:

```
Username@CygwinHost ~  
$ sh /usr/X11R6/bin/startxwin.sh
```

startx

`startx` - Use the standard X Window System `startx` script with its attendant `~/.xinitrc` configuration file. First you need to create `~/.xinitrc` from the template in `/etc/X11/xinit/`:

```
Username@CygwinHost ~  
$ cp /etc/X11/xinit/xinitrc ~/.xinitrc
```

Now you may customize `~/.xinitrc` and start Cygwin/X with:

```
Username@CygwinHost ~  
$ cd /usr/X11R6/bin && startx
```

Or, you can run **startx** by first adding `/usr/X11R6/bin/` to the search path:

```
Username@CygwinHost ~  
$ PATH=%PATH:/usr/X11R6/bin
```

```
Username@CygwinHost ~  
$ startx
```

Or, you can run **startx** by first changing directories to `/usr/X11R6/bin/`:

```
Username@CygwinHost ~
```

```
$ cd /usr/X11R6/bin

Username@CygwinHost /usr/X11R6/bin
$ startx
```

Switching Out of Cygwin/X

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, press **Alt-F4** to shutdown the X Server; this is the default key combination to shutdown the X Server. The `-[no]winkill` and `-[no]unixkill` parameters can change the set of key combinations that will shutdown the X Server. Using the `-unixkill` allows the **Ctrl-Alt-Backspace** key combination to shutdown the X Server, in addition to the default **Alt-F4** key combination.

Window Managers

Cygwin/X works with window managers in a couple of different ways:

- Internal window manager (a.k.a. MultiWindow Mode) that creates a Windows window for each top-level X window. The internal window manager is launched using the `-multiwindow` command-line parameter to **XWin.exe**. 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 *lesstif* package)). These local window managers must be installed on Cygwin; they are run locally and cannot be used together with the internal window manager.
- Remote window managers via an XDMCP session, which you can read more about 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, and thus Cygwin/X, uses its own internal 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 system that is invoked via the `-clipboard` command-line parameter. See the Section called *Command Line Parameters* in Chapter 3 for more information on the `-clipboard` command-line parameter.

Shared Memory Support (MIT-SHM Extension)

Shared memory is provided by the **cygserver** service. On Windows NT, Windows 2000 and Windows XP cygserver can be installed as a windows service.

To install cygserver run the **cygserver-config** script. It will install the service.

`XWin.exe` will not use Shared Memory if the `CYGWIN` does not contain the `server` keyword. Starting **XWin.exe** with

```
CYGWIN=server XWin.exe
```

will enable Shared Memory support if the cygserver service is running.

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:

```
XWin.exe -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:

```
XWin.exe :0 -query remote_hostname_or_ip_address_0
```

```
XWin.exe :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://freedesktop.org/~xorg/X11R6.7.0/doc/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://freedesktop.org/~xorg/X11R6.7.0/doc/Xserver.1.html#sect6>) for more information.

Displaying Remote Clients

Displaying remote X clients with Cygwin/X is nearly identical to displaying remote X clients with any other X Server. You may use the secure **ssh** method, or the unsecure **telnet** method (not recommended).

Secure ssh

On your Windows machine:

1. Make sure you have the `openssh` package installed.
2. Launch Cygwin/X
3. Run the following in an X terminal:

```
Username@CygwinHost ~
$ ssh -Y -l username remote_hostname_or_ip_address
```

4. Enter your password when prompted by **ssh**.
5. Your **ssh** session should now show you a shell prompt for your remote machine.
6. 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.
7. 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.

Unsecure Telnet

On your Windows machine:

1. Make sure you have the `inetutils` package installed.
2. Launch Cygwin/X
3. In an X terminal type `/usr/X11R6/bin/xhost remote_hostname_or_ip_address`
4. In an X terminal type `/usr/bin/telnet remote_hostname_or_ip_address`. Use the explicit path to ensure that Cygwin's **telnet** is run instead of Microsoft's **telnet**; Microsoft's **telnet** will crash on startup when run from Cygwin/X.
5. Login to your remote machine via your **telnet** session
6. In your **telnet** session type, `DISPLAY=windows_hostname_or_ip_address:0.0`
7. In your **telnet** session type, `export DISPLAY`
8. You can now launch remote X clients in your **telnet** session, for example, **xterm&** will launch an `xterm` running on your remote host that will display on your Cygwin/X screen.
9. 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** sessions.

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