PXESs Thin Client
Created by Diego Torres Milano
http://pxes.sourceforge.net/

Creating a Custom RDP ISO Image
Version 1.0 – January 26, 2004

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Contact

I created this document in response to the limited documentation of this project. My goal was not to repeat existing documentation but to create a series of steps that could be used or modified to create a custom PXES image. If you happen to find any errors or would like to just send me a comment then please do so at the email address above. I will not answer any questions concerning creating splash screen images and / or recompiling the kernel. Also please read this document in its entirety before emailing me questions—I may have already answered your question.

Description

PXES is a distribution of Linux that is customized to boot off a CD. Many distributions have started doing this for live evaluation reasons but PXES does this while keeping its memory footprint minimal. PXES requires at least 32mb of RAM. It has the capability of using a PXE enabled network card to boot entirely off the network. It can also be run directly off the CD or hard drive. However, running it off the hard drive means it is no longer running as a "true" thin client configuration.

Where PXES really shines is its amazing ability to be customized. It can be customized to run a number of free and commercial remote administration programs. We will focus mainly on PXES's ability to run a Remote Desktop connection to a Windows based computer.

Objective

The objective of this document is to aid in preparing and deploying PXES using a Windows Terminal Server and some old computers. This document will explain how to install PXES and many of the options found in PXES configuration tool. This document will also explain how to modify "some" of the other not so easily changed features. This document was written for PXES Thin Client version 0.7. There is no guarantee that this document will help you with any other versions of PXES. There is also no guarantee that this document will be updated as newer versions of PXES are released.

Installing

Everything in this document was prepared using Red Hat Linux 9.0. It is possible to do this on other distributions; however, this document will not get into any other distributions of Linux. If you would like to use another distribution besides Red Hat then take a look at the following document:

http://pxes.sourceforge.net/howtos/fedora-core-1.html

This document maybe for the Fedora Project but it does have a complete list of files and packages required to get about any distribution up and running pxesconfig.

I recommend using a machine that has all the development tools installed and the kernel source code. This document will not get into recreating the initrd or vmlinuz files but you will have the tools available to do so if you please.

To begin log into your Linux machine as root. Make your way to the PXES Thin Client homepage:

http://pxes.sourceforge.net/

Find the section labeled "downloads" and proceed to download the following files:

Glade-Perl-0.60-1.noarch.rpm
mknbi-1.2-6.noarch.rpm
pxes-base-i586-0.7-1.i386.rpm
pxesconfig-0.7-1.noarch.rpm

You may also need to download:

tftp-server-0.28-2.rpm
dhcp-3.0pl1-9.rpm

Some other tools that may be needed if not already installed with your linux distribution:

Gtk-Perl-0.7008-3.i386.rpm
binutils 2.11.90.0.8
mkisofs 1.10
hwdata .47
samba 3.0.1

Many of these are available in RPM format right on Red Hats CD's. If you are not using Red Hat and can't seem to find the files on your discs then these can be located using an RPM search service like the ones listed below:

http://rpm.pbone.net/

http://rpmfind.net/

For a more in depth step-by-step guide on how to install and configure all the RPM packages then please visit the PXES Homepage and click "readme" under version 0.6. You may wish to install the TFTP and DHCP server, however, I skipped this step since we already have both in our organization and are not interested in making PXES boot off the TFTP server. If this is what you wish to do then please take a look at the "readme" on the website for more information.

At the linux command prompt (#) while logged in as root type:

rpm –Uvh pxes-base-i586-0.7-1.i386.rpm

At this point it should fail with an error stating required dependencies are not found. Write down which ones they are. If you are missing anything besides the TFTP and DHCP package then you must install them first. (Remember the binutils, mkisofs, hwdata, samaba, and mknbi packages)

You can almost always install these packages using the same format:

rpm –Uvh <package>.rpm

You may not have to install all the packages; in any case RPM will return an error if they are already installed or if a newer version is installed. If an older version is installed then the newer version will replace it. (Hence the –Uvh which means to install or upgrade) You shouldn't have any problems with dependencies at this point; however, if you do then you "must" straighten them out before continuing. Whatever you do—DO NOT USE the --nodeps switch to bypass these dependencies; you are just asking for trouble!

Once all the dependencies are installed (minus TFTP and DHCP) then you can continue to install pxesbase. Note that if you do wish to install and use TFTP and DHCP then you should install and configure them first. Again, I recommended using the "readme" on the PXES homepage to accomplish this. If you do decide to install them then do so first then change the line below accordingly. (Remove --nodeps from line)

rpm –Uvh --nodeps pxes-base-i586-0.7-1.i386.rpm

You may have herd never to use --nodeps but in this case we are actually ok since the only thing it is dependant upon is the TFTP and DHCP packages. Besides, it is the disk you create that "may" be dependant upon these not the actual PXES program.

Again, if you wish to use the TFTP and DHCP packages then this guide may not be for you. Doing this is beyond the scope of this guide, at this moment. I still recommend reading this document as it may shed some light on something else you are trying to do.

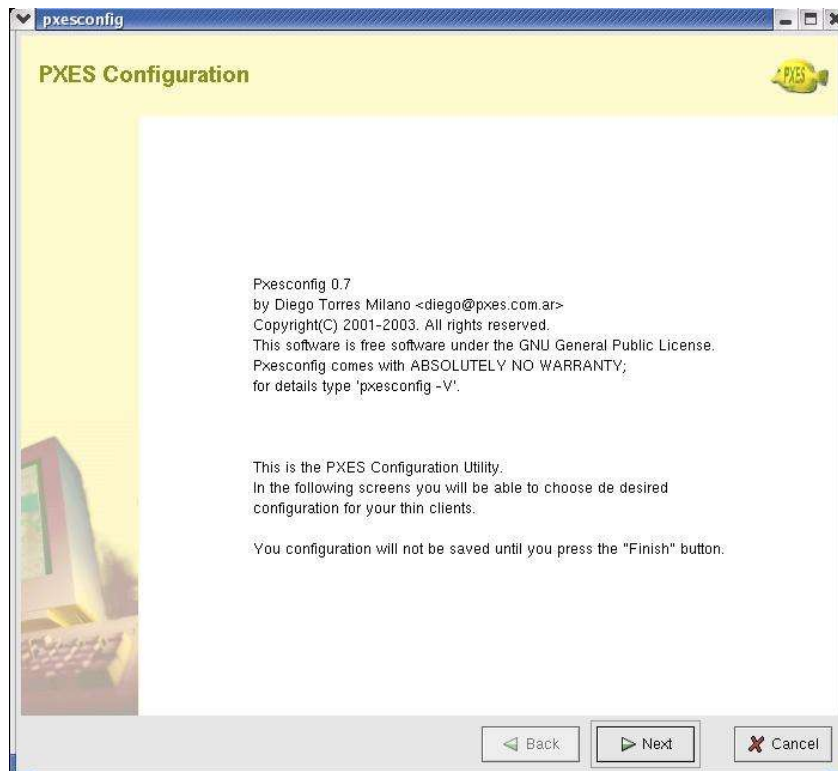Next we need to install pxesconfig's dependencies and pxesconfig itself:

rpm –Uvh Gtk-Perl-0.7008-3.i386.rpm
rpm –Uvh Glade-Perl-0.60-1.noarch.rpm
rpm –Uvh pxesconfig-0.7-1.noarch.rpm

Now we need to add an entry to the fstab file in order to mount the file system during its creation or configuration. Using your favorite text edit, open up /etc/fstab and add the following line:
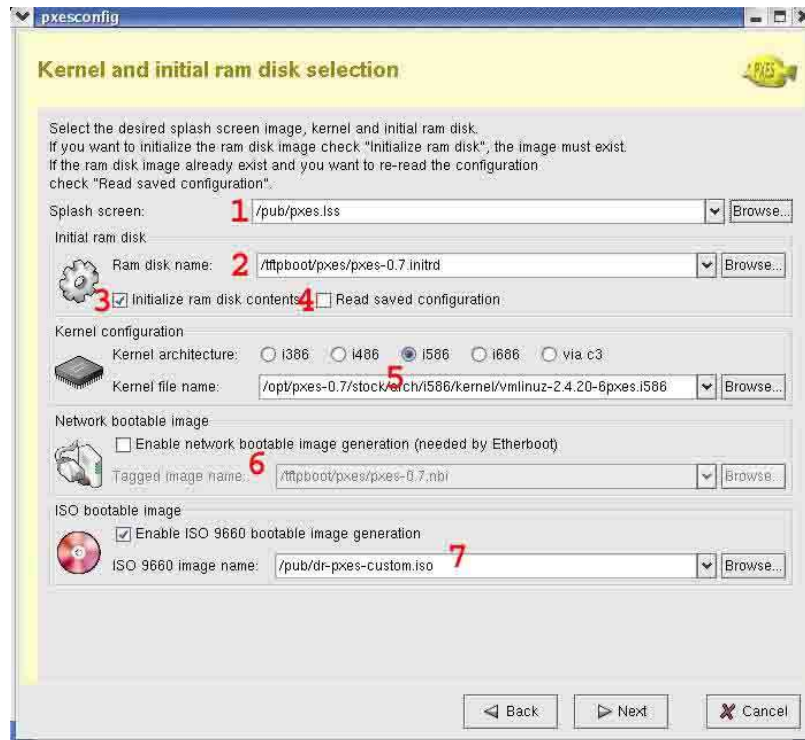
/tmp/pxes.initrd   /tmp/pxes   ext2   loop,noauto,user,auto 0 0
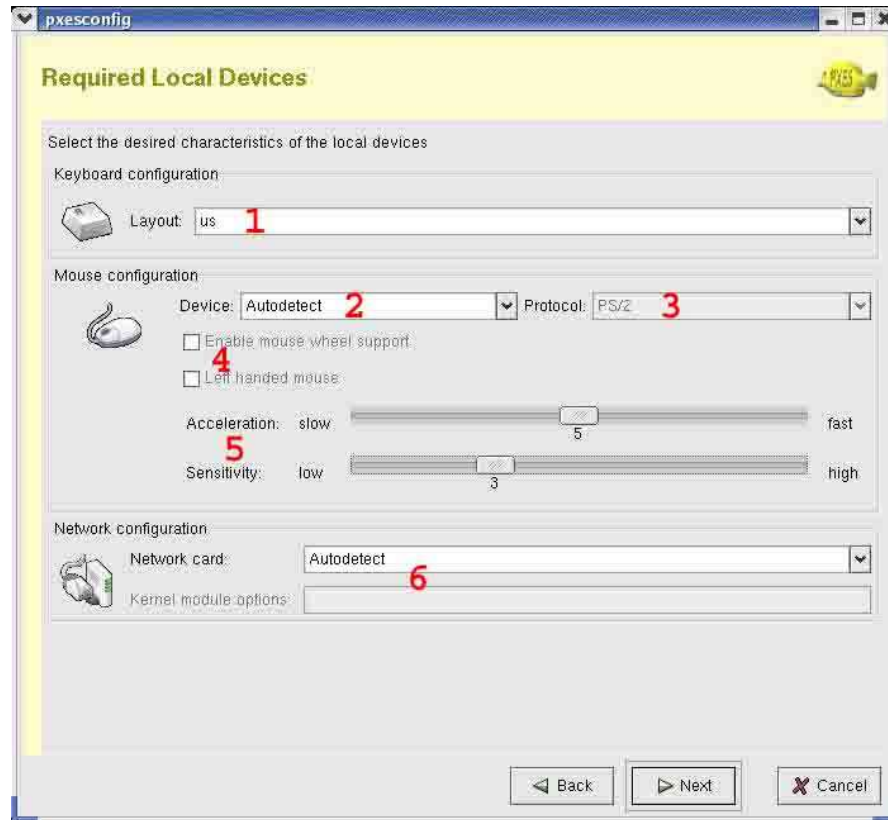

Configuring PXES

To launch pxesconfig issue the command /opt/bin/pxesconfig while logged in as root. You should see a screen like the one below:


Click next to continue to the next screen.

pxesconfig — Kernel and initial ram disk selection

Select the desired splash screen image, kernel and initial ram disk.
If you want to initialize the ram disk image check "Initialize ram disk", the image must exist.
If the ram disk image already exist and you want to re-read the configuration
check "Read saved configuration".

Splash screen: **1** /pub/pxes.lss

Initial ram disk
Ram disk name: **2** /tftpboot/pxes/pxes-0.7.initrd
3 ☑ Initialize ram disk contents **4** ☐ Read saved configuration

Kernel configuration
Kernel architecture: ○ i386 ○ i486 ◉ i586 ○ i686 ○ via c3 **5**
Kernel file name: /opt/pxes-0.7/stock/arch/i586/kernel/vmlinuz-2.4.20-6pxes.i586

Network bootable image
☐ Enable network bootable image generation (needed by Etherboot) **6**
Tagged image name: /tftpboot/pxes/pxes-0.7.nbi

ISO bootable image
☑ Enable ISO 9660 bootable image generation
ISO 9660 image name: /pub/dr-pxes-custom.iso **7**

◁ Back   ▷ Next   ✗ Cancel

1. The splash screen is in LSS format. I won't go into converting an image to LSS format here. The format the picture should be in to be converted to LSS is 640x400 and 16 colors. Here is a good program for doing exactly that: http://freshmeat.net/projects/gif2lss/

2. You can create your own ram disk image, however, for the sake of simplicity and the simple fact that there is not need for us to do so--we will leave it alone.

3. You will want to check this box to "create" our own image.

4. Had we created a prior image and just wanted to modify a few things then we would check this. In this case we have never run pxesconfig before so this should stay unchecked.

5. Choose the architecture you want PXES to be optimized for. By default, pxesconfig comes with only the i586 image. If you wish to create your own image for any reason then you would include it here. Please see the following document for more information: http://pxes.sourceforge.net/howtos/customizing_kernel_and_modules.html

6. This is used to create a Network Bootable Image. This switch is beyond the scope of this document. For our purposes it will be left unchecked.
7. The simplest way to get up and running with PXES is to have pxesconfig output everything to an ISO file that can be burned to a CD. This is where you will name and store the resulting ISO file.

pxesconfig

Required Local Devices

Select the desired characteristics of the local devices

Keyboard configuration

Layout: us **1**

Mouse configuration

Device: Autodetect **2**   Protocol: PS/2 **3**

☐ Enable mouse wheel support **4**

☐ Left handed mouse

Acceleration: slow ——————— fast **5**
                       5

Sensitivity: low ——————— high
                      3

Network configuration

Network card: Autodetect **6**

Kernel module options:

◁ Back   ▷ Next   ✗ Cancel

1. This is where you choose the keyboard configuration; use this to localize your copy of PXES.

2. Choose the mouse configuration, unless you have specific needs for a certain mouse driver you should leave this be.

3. This is where you choose the protocol / interface used by the mouse. (Ex. PS/2, serial, etc)

4. You can setup the mouse to use the mouse wheel or swap the buttons to make it act like a left-handed mouse but only if the mouse is not set to auto detect.

5. Adjust the acceleration and sensitivity of the mouse to your liking.

6. Configure the network card type and pass any parameters to card here. For best support leave this on Auto detect.
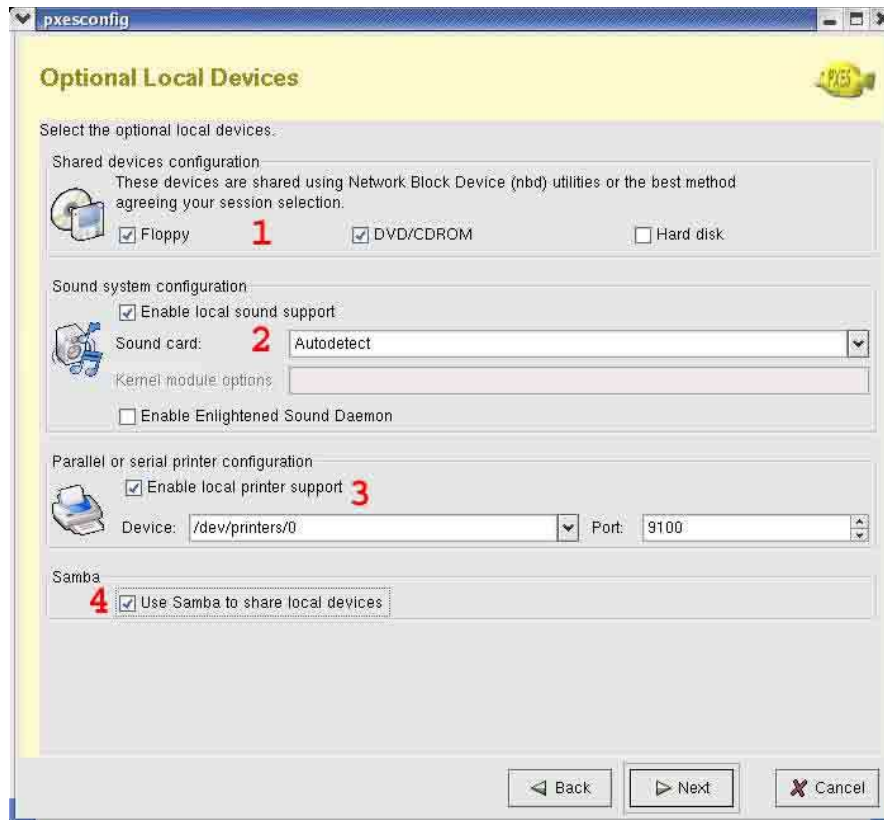
1. If you want to share the local CDROM, floppy, or hard drive then check these. You must have samba support enabled for these to do any good.

2. Enable sound support and configure your sound card. If you are going to use a Microsoft Windows 2003 Terminal Server then you should consider enabling sound support. For best results on different hardware consider leaving sound on auto detect.

3. Enable local printer support. In most cases the default is also fine. If you need to bypass a firewall you can change the port setting used.

4. Enable this to share the local hard drive, CDROM, floppy, and printer. Without having this enabled you CAN NOT use the local devices.

1. Choose the session you want PXES to default to. Since we are focusing on RDP (Remote Desktop) we will only select that.
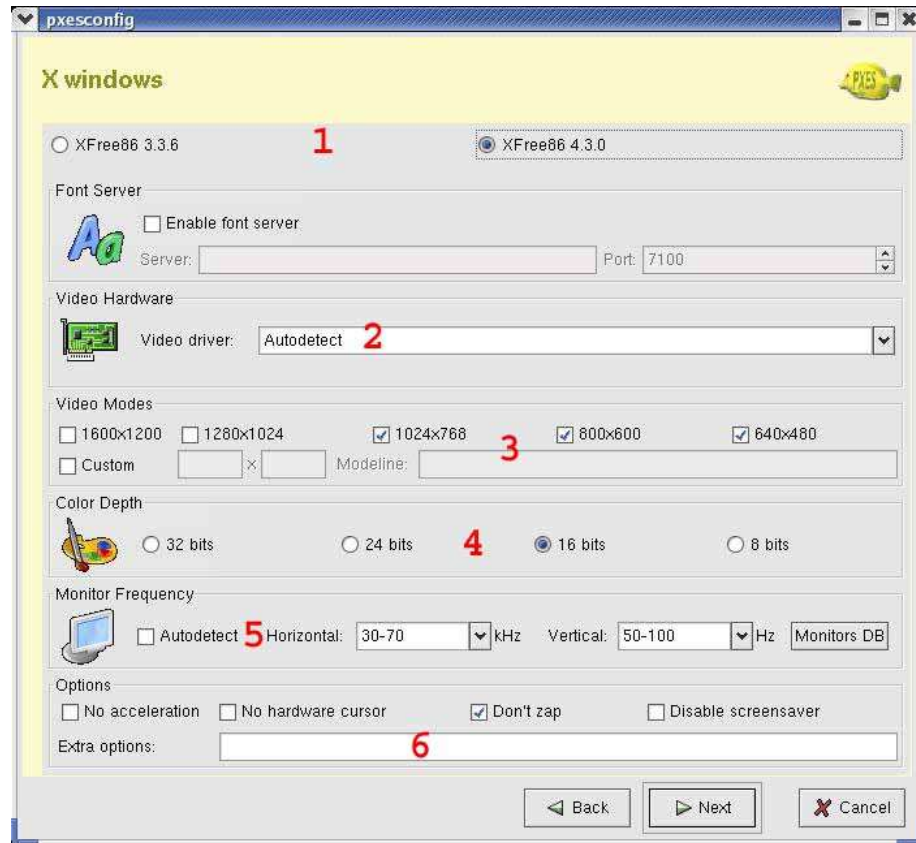
1. Choose which version of XWindows you wish to install. Version 3 will keep the disk size down but sacrifice driver support. If you're looking for good driver support for use on a variety of hardware then set this to version 4.

2. Like always, if you want this to run on a variety of hardware then keep this as auto detect, otherwise, choose your video card from the list.

3. Select the resolutions XWindows will run in. You can choose multiple resolutions and switch through them using <CTRL>-<ALT>-<+>

4. Select the screen color depth. I suggest 16bit color. It provides a nice screen and keeps network traffic at a minimal.

5. This is where you set the horizontal and vertical frequencies for the monitor that PXES will be running on. The default of 30-70 and 50-100 should be adequate for most monitors. If that does not work then auto detect does a really good job in most cases. However, if you will be running PXES on flat panel monitors then you will either need to set the frequencies to the monitor's specifications and risk breaking support for other monitors. If you are unsure of your monitors frequencies then I recommend making use of this site:

http://www.griffintechnology.com/archive/monitor.html

However, if you want to support a wide range of monitors I recommend a "safe mode" setting of 31.5-35.5 horizontal and 50-61 vertical. These frequencies should work on just about every monitor out there.

6. Include any extra options you may wish to pass to Xwindows.
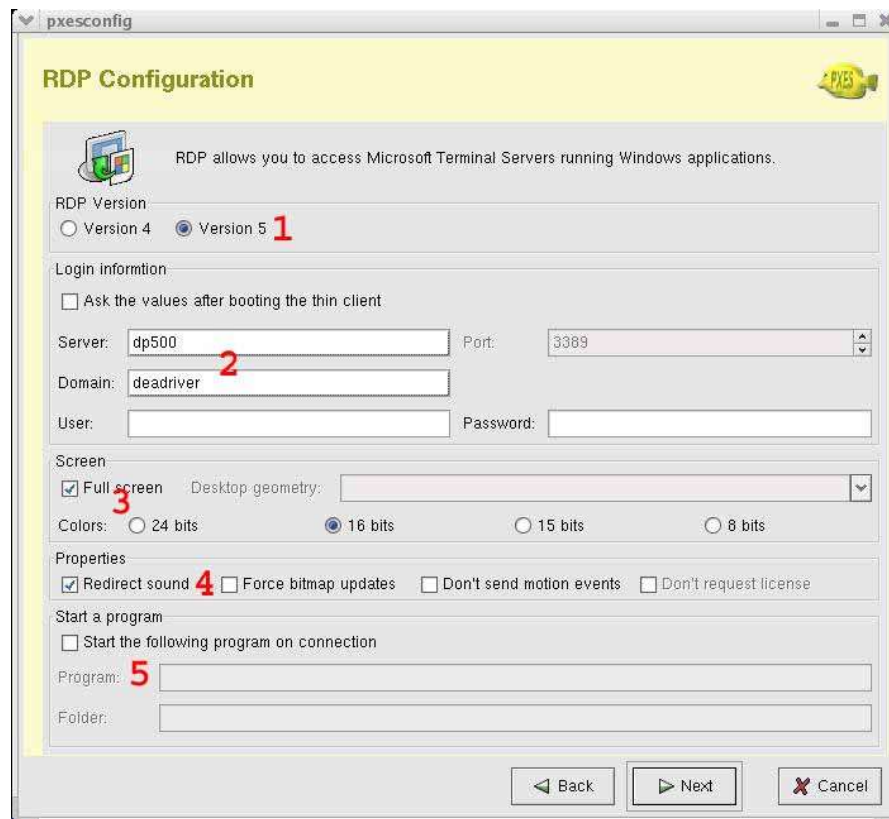

1. Which version of RDP do you wish to use. If you plan on connecting to a Windows 2003 Server then you will wish to use Version 5, however, you may find that Version 4 works better in certain situations.

2. Server and domain to connect to and user settings to use (optional). If you check the checkbox it will ask you these questions on every boot. The default will be whatever you fill in the boxes now. To automate the disk, leave this unchecked.

3. Set Remote Desktop windows resolution (windows or full screen) and also set the color depth.

4. Check the box if you are using a Windows 2003 Server and you wish to redirect sound.

5. Specify a program to start upon connection to the terminal server.
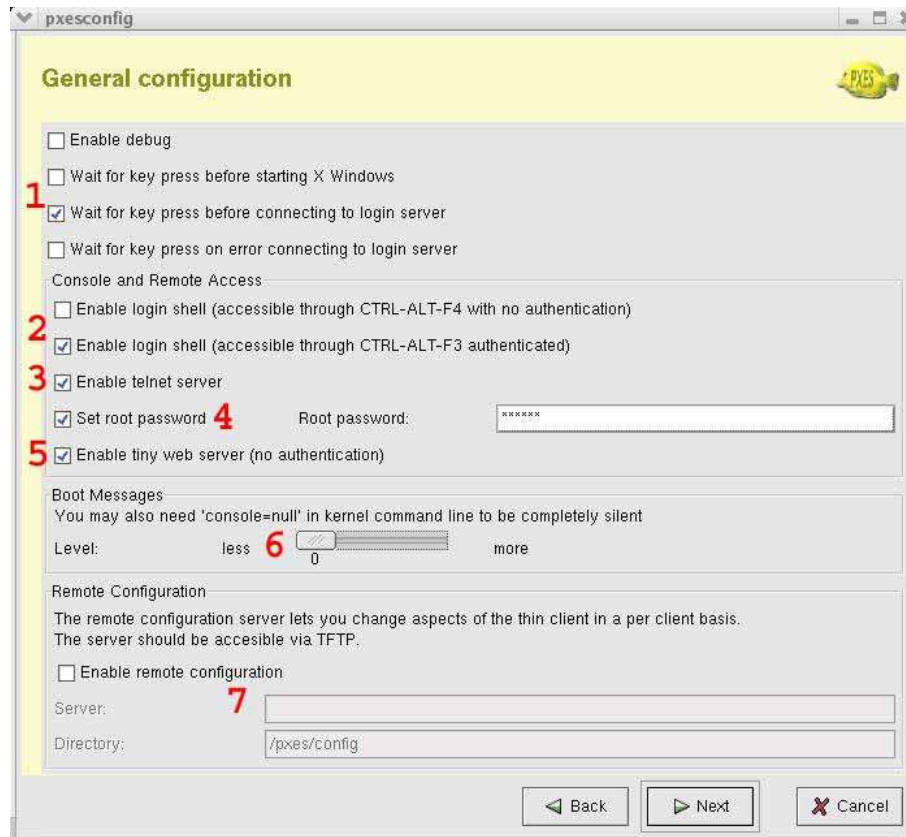
1. Choose which options you wish to build into the ISO image. Debug is used mostly for troubleshooting. Wait for key press before connecting to login server will avoid having machines sit at the Windows login screen while keeping a RDP session open. This will cause the clients to sit at a screen asking for a key press before connecting, this is usually a good idea.

2. Allow access to a login shell. You can set if it is authenticated or not. It is a good idea to lock down the program with a root password.

3. Enable the possibility to telnet into client. This is good to have if PXES will be deployed to places that you cannot always get to (offsite locations).

4. Don't forget to set the root password. If you do not set it then the default is "pxes".

5. This is another good thing to enable if PXES will be deployed to offsite locations. This allows you to point your web browser to the machine and get some information. This method does not provide ANY authentication and since it has the ability to "shut down" the system DO NOT USE this in a public network setting.

6. Choose how much console messages you wish to see. If you decide after all your testing to clean it up and keep kernel messages at a minimum then you will have

to add a kernel parameter, console=null. We will get into this a little more later on.

7. Choose the TFTP server and directory to connect and "pull" the configuration files. Again, this should not be hard to implement but this document makes no effort to configure remote PXES configuration via TFTP.
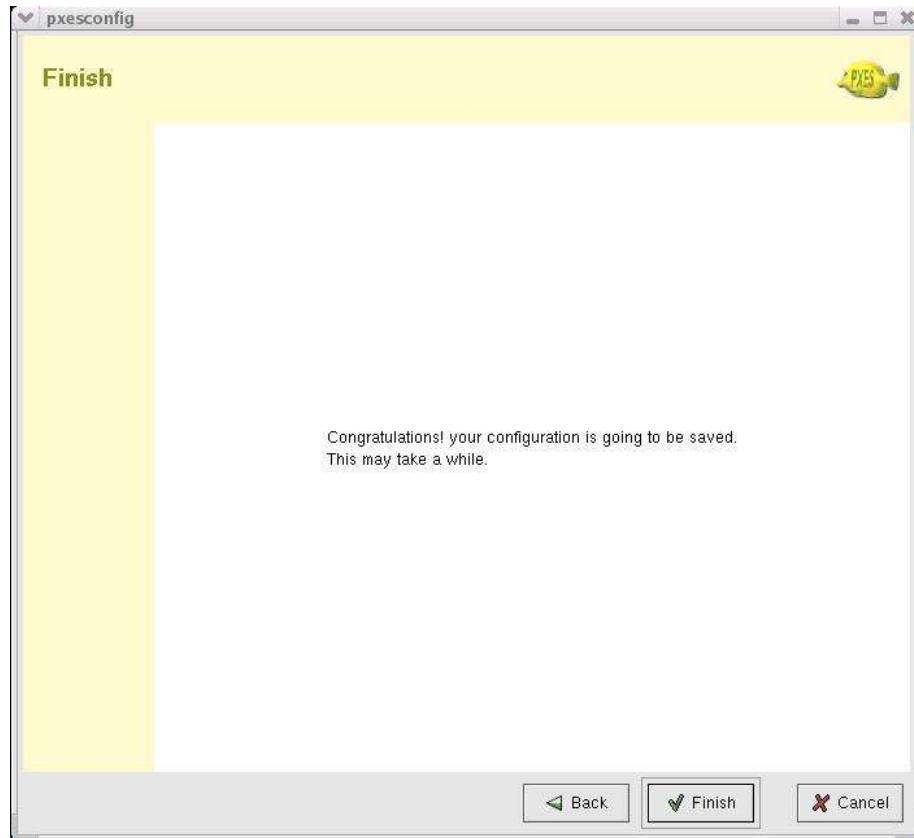
Your all done (almost), choose Finish and the program will begin building the ISO image for you.

You should see something like this while the image is being created. Finally this box should appear:
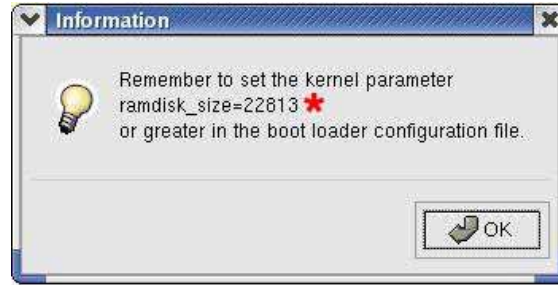
* Although pxesconfig will set this final option for you, it is a good idea to take note of it. We will be "changing" some files in the ISO image in a moment.

Aftermath

Now you need to get the ISO image to a Windows machine. I will leave that up to you. Once the image has been transferred, then go to the following website and download WinISO:

http://www.winiso.com

Install WinISO and open up the ISO file into it. Find your way to the /boot/isolinux folder. We want to extract a couple files. Extract isolinux.cfg, isolinux.cfg.tpl, and isopxes.msg. Now that we have extracted them we need to edit them.
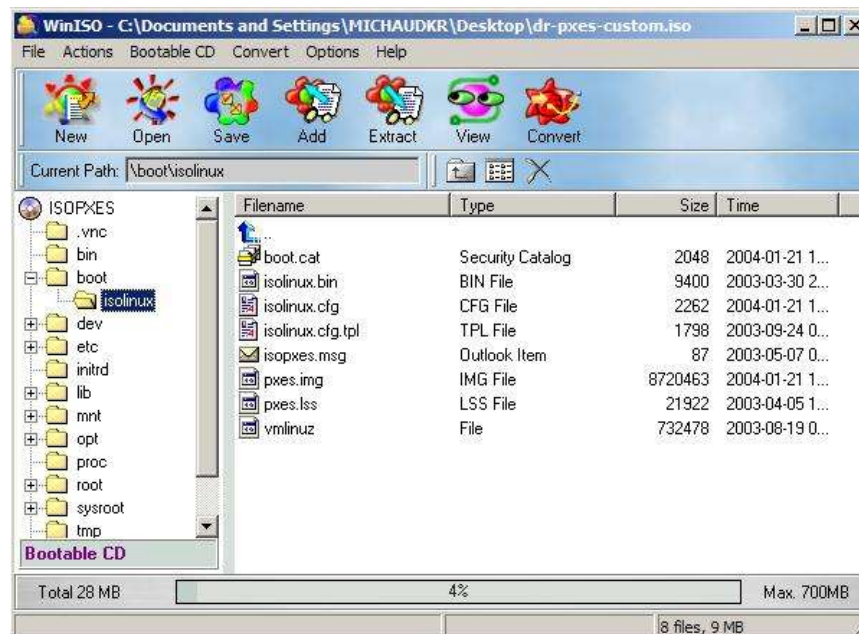
Open up the file isolinux.cfg. We want PXES to default to a RDP connection and not even try to connect any other method so change the beginning of the file to read something like:

DEFAULT rdp
PROMPT 0
TIMEOUT 10
DISPLAY isopxes.msg
F1 isopxes.msg

#LABEL pxes
 #   KERNEL vmlinuz
 #   APPEND ramdisk_size=12621 ro initrd=pxes.img root=/dev/ram
#
...
LABEL rdp
*   KERNEL vmlinuz*
*   APPEND ramdisk_size=22850 ro initrd=pxes.img root=/dev/ram*
*   SESSION_DEFAULT=rdp console=null*

DEFAULT says that the default boot method will be RDP (or label RDP). PROMPT 0 means we don't want to be bothered. TIMEOUT 10 is just in case you created yourself a nice splash screen and you would like it to show and not just pass on by. DISPLAY is the file that is displayed onto the boot screen; this is also the file that loads your splash screen. F1 means if the person presses F1 it will just redisplay isopxes.msg. The portion that follows afterwards is just showing to remark (#) out everything else but RDP. Remember the ram disk size—well if that doesn't have the correct size then change it. Notice the APPEND statement should all be one line. The only thing you would really want to change here is the console=null. This only works if you built the ISO image with no console messages. You need to add this to hide most messages.

Next open up isolinux.cfg.tpl. Make sure both isolinux.cfg and isolinux.cfg.tpl have identical beginnings. Then comment everything except RDP in isolinux.cfg.tpl. You do not need to add anything to the append line in this file.

Now open up isopxes.msg, take out all the text except for:

↑pxes.lss

This will display your splash screen! Now save all these files. Reopen the ISO file in WinISO. Make your way back to /boot/isolinux. Delete the three files, isolinux.cfg, isolinux.cfg.tpl, and isopxes.msg. Afterwards add each edited file back to the ISO image and save it.   Note that using the same steps above you can also replace the pxes.lss image file now if you haven't already done so using pxesconfig.

To further customize your disk you can add further options to the isolinux.cfg file. You can add video=vesa and vga=0x303 to the APPEND line. This will boot PXES into a graphical mode but only if the video card is fully VESA compliant. You can also pass kernel parameters to PXES at the PXES boot up splash screen. If you would like to learn more about these options then please take a look online for linux kernel options and isolinux.cfg configuration options.

That is it! You should now have a custom working copy of PXES Thin Client. If you followed this exactly then your disk should have its own splash screen. It should automatically boot to predetermined RDP session. It should have good driver and monitor support, and it should offer local CDROM and floppy access via samba. It should also provide local printer access. It will also support telnet / www connections to the client for your IT / IS department or for your own curiosity.

Lets not forget the final step. You need to burn the image to a CD. The most common mistake is to actually burn the ISO image onto the CD as a file. This will not work—you need a program like Nero, EZ CD Creator, or XCD Roast that can read in an ISO image and create a bootable CD from the image.

As you've seen PXES is very versatile and configurable. My suggestion is to play around with it and see what you can make it do. I'm hoping this was a good "starter" guide to configuring, using, and deploying PXES. If you wish to modify, add, reword, or submit any information to this document then please contact me using my email address at the top of this document.

Please do not email me about general PXES questions. I did not program it and cannot answer questions pertaining to that. My suggestion is to fire up your web browser and go to the PXES homepage and post a message to the web forum. People in the forums are very helpful and in most cases the question are answered in a day or two.

Last but not least, none of this would be possible if it were not for Diego Torres Milano. He has created this amazing project and has allowed the community to help mold into what it now is. Thank you!

Q & A

- How do I set up static configurations for dynamic clients?

Example: Your Company uses DHCP to hand out IP addresses and you need to statically map back the printer to the machine.

The simplest solution is to create a DHCP reserve on your server and reserve the IP addresses for the PXES clients by MAC address. The MAC address is the unique hardware address that each network device has. By reserving to this MAC address you are essentially holding that dynamic IP address for the client with the correct MAC address. I should mention that PXES clients will have the hostname like IP_192168001010. This is the hostname for a client with the IP address 192.168.1.10. Using DHCP reserve you can see how you can statically configure clients by hostname or IP address.

- I set up the DHCP reserve for the client but now I want to install and configure the printer connected to the client's printer port?

This question is best answered by this document:
http://www.stlighthouse.org/pxes/MicrosoftPrintingHowto.html

The trick is to configure the printer on the server as if it was connected to an HP Jet Direct device by the IP address or hostname. (See above)

- How come the stock PXES disk works on almost every machine I try but when I try my disk created with pxesconfig I can barely find a system it works on?

Have you tried recompiling the kernel? If so, you may have broken driver support. The most likely reason though is you included XFree86 version 3 in pxesconfig instead of version 4. Version 3 is much smaller because it has less driver support. Rerun pxesconfig but this time choose XFree86 version 4.

- How come I can't get my custom disk to work on flat panel monitors?

You can… but you need to adjust the horizontal and vertical sync rate in pxesconfig. Auto detect seems to work fine for most monitors, however, it fails on flat panels just like the default values do.   If you are only using the disk on flat panel monitors (identical) then you can configure the horizontal and vertical frequencies to the specifications in the users manual. If you don't have the manual and are unsure what it's settings are then look here:

http://www.griffintechnology.com/archive/monitor.html

For generic deployment purposes though a good setting is 31.5-35.5 horizontal and 50-61 vertical.

- How do I know what size to set my initial ram disk in isolinux.cfg?

Although pxesconfig will tell you what value to set the ram disk at, there are rare occasions when you need to "modify" the value. So how big should the ram disk be? Well, after pxesconfig has exited then make your way to the /tmp folder and type the following:

ls –l pxes.initrd

The size of the file is the size you wish to set the ram disk to.

- The CD I created boots--I can see my splash screen but then when it should start actually loading my ram disk and kernel it stops?

Many things can cause this. One possibility is the ram disk size in isolinux.cfg is not set large enough to accommodate the ram disk image.

- I get a kernel panic message when I boot the CD?

Again, many things can cause this, however, a common one is running out of memory to boot the system. PXES may be able to boot on 32MB of RAM but this depends on many factors. (Kernel size, drivers, sessions installed) In my experience adding more memory usually cures this problem.

- I'm looking to boot off the network so your guide doesn't work for me?

Well yes and no. I would hate to think you read this entire document and didn't gain even one shred of knowledge. Anyways, what your looking for is here:

http://pxes.sourceforge.net/howtos/ms_only_environment/index.html

This document can easily be adopted with the one above to create a network boot image.

- I'm looking to boot off the hard drive, your guide doesn't work for me?

Well this documents intent was to save time not waste time. Look here:

http://pxes.sourceforge.net/howtos/syslinuxhdboothowto.html

- I want to compile my own kernel and modules?

Take a look here:

http://pxes.sourceforge.net/howtos/customizing_kernel_and_modules.html

Note: As far as I am aware, pxesconfig will not work with kernel versions of 2.6.x and higher. Pxesconfig does not recognize the new kernel module extensions. (.ko instead of .o)

- I added the line console=null to the isolinux.cfg file but still see console message? OR
- I set Boot messages option to none but I'm still receiving boot messages?

You have to not only set Boot messages to none in pxesconfig but also add console=null to the correct APPEND line in isolinux.cfg.

- How come even though PXES has detected my sound card and I created a custom image that redirects sound I am still not getting any sound on the client side?

The server must be running Windows 2003 Server for sound redirection to work. If that is the case then something is probably not configured correctly on the server.

- I want to help add, fix, or amend this document?

Write me an email! michaud@deadriver.com

- I wish to help with the PXES project?

Consider donating money then! Check out the roadmap for more information:

http://pxes.sourceforge.net/donate.php