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## 9 Headless Systems & Remote Management

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Headless support is a key feature of XPe. Since the nature of the XP operating system is to have a graphical interface, designing an XPe headless device involves a number of technologies and features such as remote management, error recovery, user accounts and adding video for diagnostic support. This chapter will explore the Headless VGA component and various remote management technologies. Error recovery will be explored in greater depth in another chapter.

### 9.1 Headless VGA Driver

Many embedded systems do not expose a traditional user interface or, in many instances, any local user interface whatsoever. XPe supports building devices without a video monitor, keyboard or mouse. In Windows NT Embedded, three components/drivers constituted headless support: Null Video, Null Keyboard, and Null Mouse. XPe supports the absence of all three devices, but only the null video driver is needed.

**Note:** *Many PC platforms expect a video card and keyboard to be installed. On some PCs, the BIOS will halt the boot process if devices like VGA cards and keyboards are missing. Make sure that the BIOS can turn off detection of the video card and/or keyboard if you want to use the board in a headless system.*

XPe's Headless Video Driver (tsddd.dll) acts as a stubbed driver. GUI calls are still being made to the video driver, but the driver is not accessing any video hardware. The video information is kept in memory and an acknowledgement is returned that the video command was completed successfully. XPe also offers the ability to add back a video card or plug in a monitor. This "re-enabling" of video allows end users to access a user interface for diagnostic purposes.

There are several components that make up the video solution:

<b>Component</b>	<b>Component Browser Location</b>	<b>Comments</b>
Headless VGA Driver	Headless VGA Driver can be found in two locations: Software/System/System Services/Base/Headless VGA Driver  - or - Hardware/Devices/Display adapters/Headless VGA Driver.	To build a system that will boot with no VGA card, you must include one of these components, but not both. Both of these components contain the headless driver.
- or -	Terminal Service Core can be found in:	If you add the Terminal Services component to your configuration, the Headless VGA Driver is added to your configuration, but your run-time footprint will be considerably larger.
Terminal Services Core	Software/System/Management/Infrastructure/Terminal Services Core	

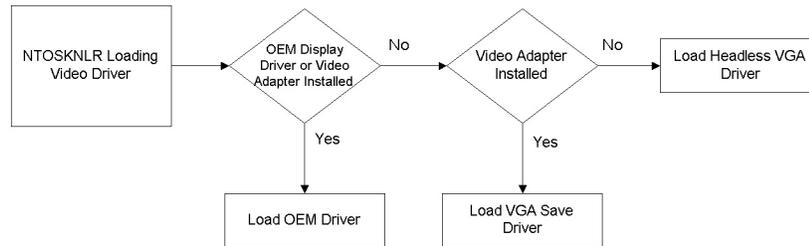
**Table 9.1 Video Components**

Component	Component Browser Location	Comments
VGA Boot Driver Component	Software/System/System Services/Base/VGA Boot Driver Automatically added to every configuration.	The VGA Boot Driver component, Bootvid.dll, is required by NTLDR regardless of whether a VGA card is present in your configuration.  To see this component, you must set the visibility threshold in Target Designer to 200 or less.
VGA Save Driver	Software/System/System Services/Base/VGA Save Automatically added to every configuration.	The default display driver. Must be present in the configuration.  To see this component, you must set the visibility threshold in Target Designer to 200 or less.

**Table 9.1 (Continued) Video Components**

The video drivers are processed in the following order:

1. If you include an OEM video driver in your run-time image, the OS attempts to load it.
2. If the OEM video driver fails to load, typically because the video hardware for the OEM-specific driver is not installed, the OS attempts to load the VGA Save Driver, Vga.sys.
3. If the VGA Save Driver fails to load, typically because there is no generic VGA-compatible video hardware, the OS attempts to load the Headless VGA Driver, Tsddd.dll.



**Figure 9.1 XPe Process for Loading Video Driver**

If you have a device without a VGA adapter, it is harmless to include the VGA Save Driver in your configuration. The VGA Save Driver will fail, and the OS will then load the Headless VGA Driver.

However, to prevent a bug check from occurring, you must include the Headless VGA Driver in your configuration for the Headless device to boot. Video output is enabled if you add a VGA card to your device, because the OEM Driver or VGA Save Driver will be loaded rather than the Headless VGA Driver. In other words, if you add the Headless VGA Driver, your target system will work with or without a VGA card installed; when you have a VGA card in the system, it is recognized and activated.

## 9.2 Remote Management

Headless devices still require some maintenance including setup for connection to the network, updating applications and drivers, and basic diagnostic tests. XPe comes with several tools to access headless and non-headless devices. XPe provides both character-mode and graphical management solutions for network connections.

Component	Component Browser Location	Comments
Telnet Server	Software/ System/Management/ Applications/ Telnet Server	Component allows users to connect to the XPe device from remote computers. When a Telnet client computer connects to the XPe device with Telnet server enabled, the remote user is prompted to enter a user name and password. Only user name and password combinations that are valid on the local server can be used to log on to that server.
Terminal Server Remote Desktop	Software/ System/ Management/ Infrastructure/ Terminal Server Remote Desktop	Uses the same technology as Windows Base Terminals. The Terminal Services Remote Desktop component provides remote access for the desktop of an XPe device running Terminal Services. The remote computer will prompt for a username and password. Only user name and password combinations that are valid on the local machine can be used to log on to that device.
IIS FTP Server	Software/System/Networking & Communications/Infrastructure/ IIS FTP Server	The IIS FTP Server component copies files to and from remote computer systems on a network using TCP/IP. This component also allows users to use File Transfer Protocol (FTP) commands to work with files. This component integrates with IIS, enabling you to transfer files using a Web browser. IIS FTP Server adds complete IIS support: 47 components and 60MB of uncompressed disk space. Stick to Telnet and FTP client if all you need is simple file access.

**Table 9.2 Key Remote Management Components**

Component	Component Browser Location	Comments
Event Log	Software/System/Management/ Applications/ Event Log	The Event Log component is a dynamic-link library (DLL) that runs as part of Services.exe. This component stores and retrieves events that can be viewed in the event viewer. By default, there are three types of logs: Security, System, and Application. A remote computer can access a device to view the event logs of the XPe machine.
Remote Registry Service	Software/System/System Services/Base/ Remote Registry Service	The Remote Registry Service component enables remote users to access an XPe device registry via their local registry editor.
Device Update Agent	Software/ System/ Management/Infrastructure/ Device Update Agent	Provides an incremental update service to update a deployed XPe image with the latest application, drivers, and QFEs.

**Table 9.2 (Continued) Key Remote Management Components**

**Note:** NT Embedded provided support for remote management over a serial connection. XPe does not provide this remote management support.

### 9.3 Administrator and User Accounts

Remote management tools require a local administrator/user account with password on the XPE device. NT Embedded had limited support for adding user accounts. XPe has made it simpler to add accounts to a configuration. In addition, the automatic logon component is provided to automatically login the correct user on boot.

Here are the components that affect the computer accounts:

Component	Component Browser Location	Comments
Administrator Account	Software/ System/ System Services/ Base/ Administrator Account -or- Software/ System/ Security/ Infrastructure/Administrator Account	By default this component is added to every configuration.
User Account	Software/ System/ System Services/ Base/ User Account -or- Software/ System/ Security/ Infrastructure/ User Account	Multiple User accounts can be added to a configuration. The User account can set up user name, password, and group membership.
Automatic Logon	Software/ System/ Security/ Infrastructure/ Automatic Logon	The Automatic Logon feature allows a user to automatically log on to a Windows XP-based system every time the system boots using configured information, and disables the Control+Alt+Delete logon box.  Requires the WinLogon Component
WinLogon (Standard)	Software/ System/ Security/ Infrastructure/ WinLogon	Logon support

**Table 9.3 Computer Account Components**

#### 9.4 Exercise 15 Headless VGA Process

The XPEA.SLX configuration will be used to walk through the process of headless VGA support. To run the Headless VGA driver, the target must have a removable video card. If the hardware or chipset (i.e. Intel 815) implements video on board, the VGA Save driver will run and not the Headless driver. The exercise can be completed

in either case. The target must also be connected to the network since Telnet will be used to prove the XPe target is running. A DHCP server will be needed on the network so the target can get a TCP/IP address.

#### **9.4.1 Part 1 VGA Save, Telnet, and Administrator Account**

1. Make sure that your target has a video card and monitor connected for this step of the exercise.
2. Open Target Designer and Open the XPEA.SLX configuration.
3. Add the Headless VGA driver component, which can be found at Hardware/ Devices/Display adapters/Headless VGA Driver.
4. Locate and disable the OEM video adapter component in the configuration. You may have to search on the adapter or manufacturer name. The component will match one of the adapter components in the XPe database **\\hardware\devices\display adapters**. By disabling the OEM component, the VGA Save driver will be loaded with the network card installed. Also take a look and verify that the VGA Save and VGA Boot Driver components are already part of the configuration.
5. Locate the Computer (HAL) component for your configuration, which could be Standard PC or Advanced Configuration and Power Interface PC. In the System Identification under the component settings, add the computer name **XPEA**.

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**System Identification**  
| [hide](#) | [more info](#) |

Computer name ( <a href="#">more info</a> )	<input type="text" value="XPEA"/>
Registered owner ( <a href="#">more info</a> )	<input type="text" value="OEM"/>
Registered organization ( <a href="#">more info</a> )	<input type="text" value="OEM"/>
Workgroup membership ( <a href="#">more info</a> )	<input type="text"/>

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**System Pagefile**  
| [show](#) | [more info](#) |

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**Power Management Settings**  
| [show](#) | [more info](#) |

**Figure 9.2 Adding a computer name**

6. In the configuration, highlight the Administrator Account component instance, and click on the **Advanced** button found in the Details pane.
7. Edit the `cmiUserPassword` property, and add “**password**” as the password. Click **Close** when finished.

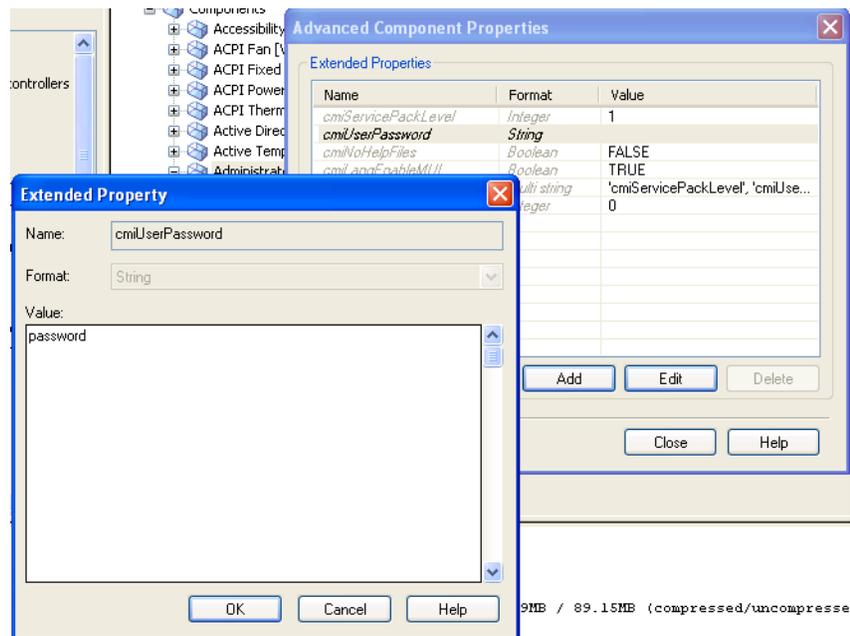
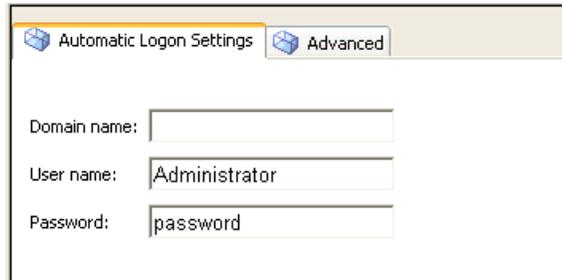


Figure 9.3 Adding a Administrator Password

8. Add the Automatic Logon Component to the configuration.
9. Edit the Automatic Logon Component settings and add the following:

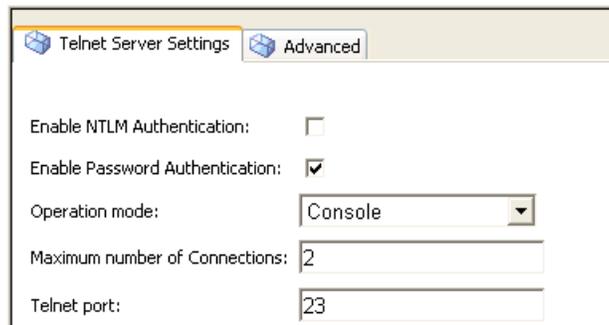
User name: **Administrator**

Password: **password**



**Figure 9.4 Configuring the Automatic Logon Component**

10. Add the Telnet Server component to the configuration.
11. Modify the Telnet Server component's settings by unchecking the NTLM Authentication box. NTLM authentication is typically not installed in the latest version of the Windows OS.



**Figure 9.5 Changing the setting for the Telnet Server Component**

12. Add the TCP/IP utilities component, found at Software/System/Network & Communications/Applications/TCP/IP Utilities.
13. Delete the MinLogon component.
14. Add the WinLogon Component.

15. Make sure that Auto-resolve is enabled. Run a Dependency Check. There will be one task to be completed for Telnet Server component. Complete the task and re-run Dependency Check.
16. Build the configuration, download the image to the target, and run the image. When the system boots after the FBA process, you will notice that the login screen is not as crisp because the VGA Save driver supports only the basic VGA modes.
17. On the development machine, open a command window and ping the XPe target:

**C:>ping xpea**

If you do not get a response, double-check the network connection, and on the target system run IPCONFIG /ALL to make sure the correct IP and subnet address are present.

18. If the you get a reply, in the same command window run the telnet client to access the XPe target:

**C:>telnet xpea**

19. You will be asked for the login name and password. Type the following to logon as the Administrator:

Login: **Administrator**

Password: **password**

The user name and password are case sensitive. The system should log you in. You can run applications like ipconfig.exe just as if you were at the console of the target machine.

```

=====
Welcome to Microsoft Telnet Server.
=====
C:\Documents and Settings\Administrator>ipconfig /all

Windows IP Configuration

    Host Name . . . . . : XPEA
    Primary Dns Suffix . . . . . :
    Node Type . . . . . : Unknown
    IP Routing Enabled. . . . . : No
    WINS Proxy Enabled. . . . . : No

Ethernet adapter {450825F3-6FA7-4B5D-A171-8A806F8A54FB}:

    Connection-specific DNS Suffix . . :
    Description . . . . . : Intel(R) PRO/100+ Management Adapter
    Physical Address. . . . . : 00-D0-B7-92-A5-12
    Dhcp Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . . : Yes
    IP Address. . . . . : 100.132.1.151
    Subnet Mask . . . . . : 255.0.0.0
    Default Gateway . . . . . :
    DHCP Server . . . . . : 100.132.1.50
    Lease Obtained. . . . . : Tuesday, March 11, 2003 3:28:15 PM
    Lease Expires . . . . . : Wednesday, March 19, 2003 3:28:15 PM

C:\Documents and Settings\Administrator>_

```

**Figure 9.6 Telnet Session between host and XPe Target**

20. Save the XPEA configuration.
21. Close the telnet session by typing **Exit** and hitting Return.

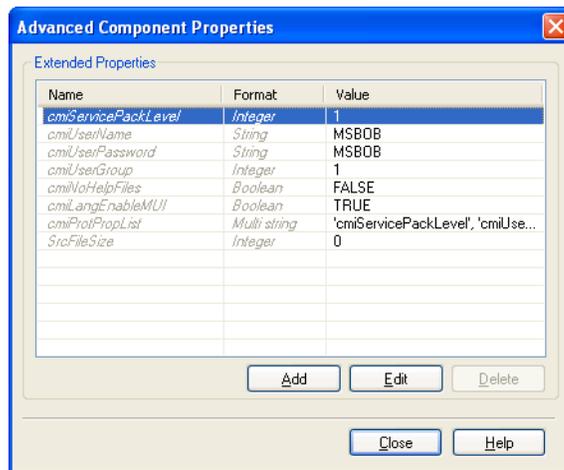
This step verified that the Telnet session is working. The next step will be to pull the video card from the system and make the XPe target completely headless.

#### **9.4.2 Part 2 Headless VGA and User Accounts**

Now let's make some changes to the configuration and the target system's hardware to run truly headless.

1. Add a User Account component to the XPEA configuration.
2. Highlight the User Account component instance in the configuration, and click on the **Advanced** button found in the Details pane.
3. Change **cmiUserName**, **cmiUserPassword**, and **cmiUserGroup** to the following:

cmiUserName: **MSBOB**  
cmiUserPassword: **MSBOB**  
cmiUserGroup: **1**



**Figure 9.7 Adding a New User and Password Account**

To logon to a User Account via Remote Management connection the account must be part of the Administrator's group. Just for reference, the cmiUserGroup values are as follows:

Value	Description
1	Administrators
2	Power Users
3	Users
4	Guests

**Table 9.4 cmiUserGroup values**

4. Change the Automatic Logon component to logon into the new user account. Be mindful of the capitalization.

5. Run a dependency check, build the image, and download the image to the target system.
6. Save the XPEA Configuration.
7. **Before you run the image**, verify that your target's BIOS will not halt on a missing video card or keyboard. Next, pull the video adapter card from the target and disconnect the keyboard and mouse. If you cannot disconnect the video card, unplug the video monitor – the VGA Save driver will run instead of the Headless video driver. Disconnecting the monitor will have the same effect.
8. Boot the target system and wait for it to go through the FBA process.
9. Try connecting to the target with Telnet and use the User Account to logon. The user name and password are case sensitive.
10. Disconnect from the target when finished.

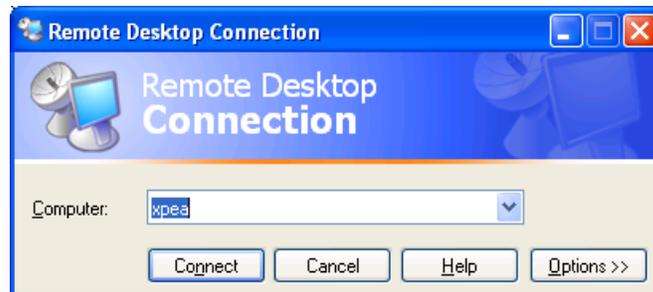
#### **9.4.3 Part 3 Terminal Server Remote Desktop**

Finally, let's implement another remote management technology, Terminal Server Remote Desktop. Remote Desktop is a support feature that is part of Windows XP. Remote Desktop allows IS/IT managers to troubleshoot a user computer over a TCP/IP connection. Remote Desktop is enabled via **Control Panel -> System -> Remote** check the "Allow user to connect remotely to this computer."

XPe takes advantage of the Remote Desktop feature as a remote management technology. A Smart Display or a TabletPC could be used to access a headless XPe device with a wireless (802.11) TCP/IP connection.

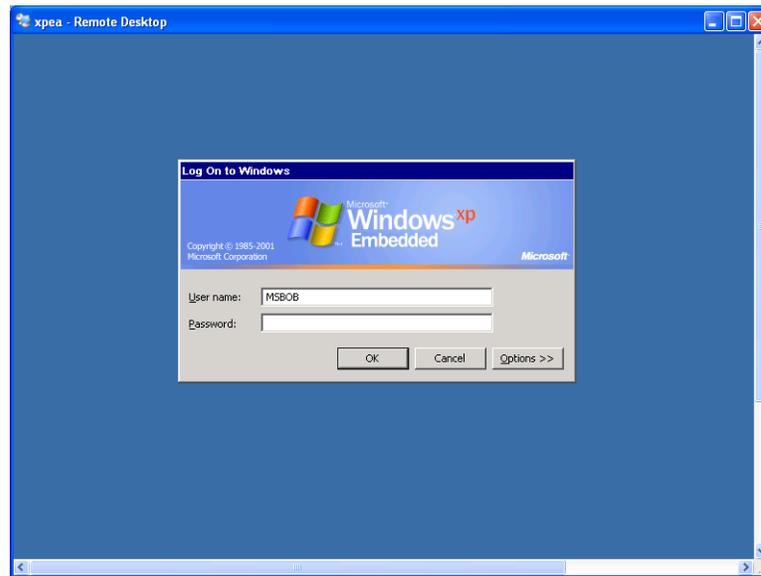
1. In the XPEA configuration, disable the Command Shell component.
2. Disable the Telnet Server Component.
3. Add the Task Manager Shell component.
4. Add the Terminal Server Remote Desktop component.
5. Make sure that Auto-resolve is enabled and run a dependency check on the configuration. There should be no further tasks or errors.

6. Re-install the video card, keyboard, and mouse on the target. Re-connect the monitor to the target.
7. Build and download the image to the target platform.
8. Boot the target, let FBA run, and reboot the target system.
9. Once the target is booted into the image, start Remote Desktop Connection on the host system, **Start->All Programs->Accessories->Communications->Remote Desktop Connection**.
10. A dialog appears asking for the computer name. Type in **XPEA** and click the **Connect** button.



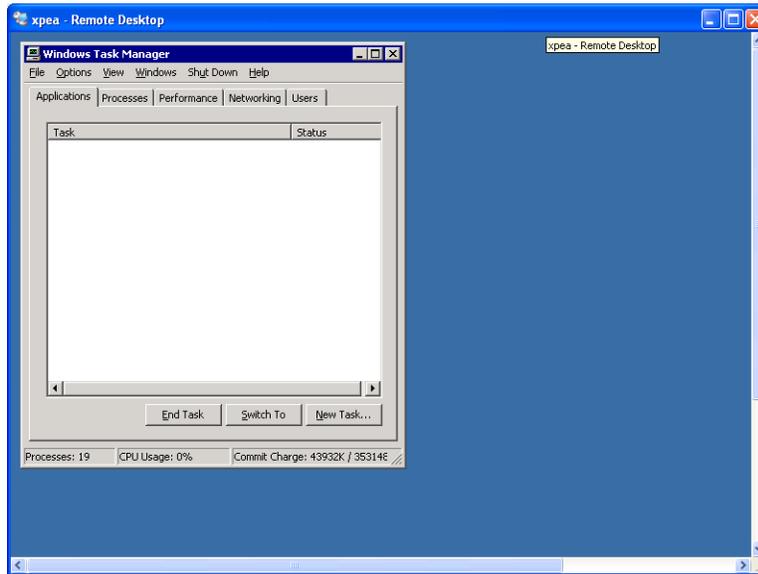
**Figure 9.8 Remote Desktop Connection**

11. The remote connection is established, and the remote window appears. A Windows Logon dialog box appears in the remote window. Type either the user account or the administrator account to gain access to the remote desktop.



**Figure 9.9 Logon to Remote Desktop**

12. The Remote Desktop logs in, and you will notice that the logon screen appears on the target system. XP only supports one connection to a machine at a time. If you logon to the target locally, the remote desktop connection would be terminated. You can see that the system has booted into the Task Manager Shell.



**Figure 9.10 Remote Desktop**

13. Save the XPEA configuration.
14. Logout of the remote desktop.

## **9.5 Summary**

The Null-VGA component allows for the development of headless XPe systems. The video driver loading scheme allows for a video monitor to be connected for debugging purposes and TCP/IP tools provide for remote managing of a headless XPe system.

The goal of a headless system is to install it and leave it unattended so it can do its work. Errors, however, can still occur. How the system responds to errors will be discussed in Chapter 13.