Norton Ghost for NetWare

Setting Up TCP/IP

NOTE:

Note: At this time. Norton ghost for NetWare does not include an installation and configuration utility. You must configure the Ethernet protocol stack manually. A configuration utility will be added soon.
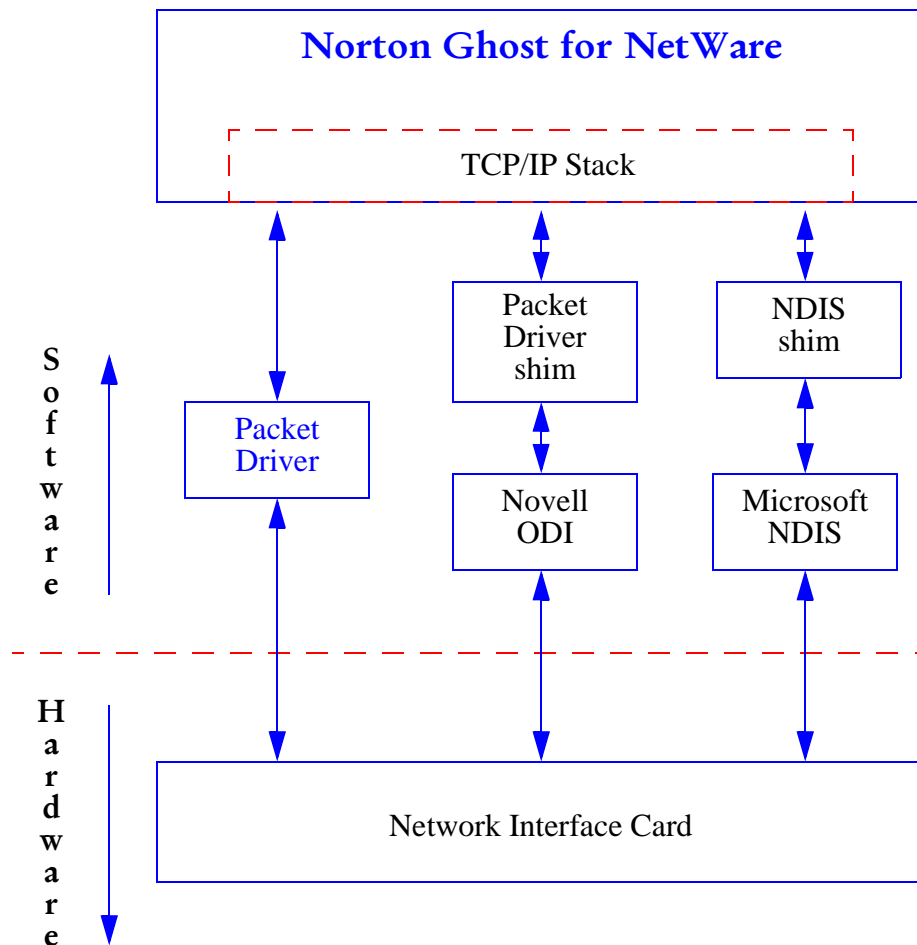
Network communication

To copy, clone or image files from one computer to another with Norton Ghost for NetWare, the computers must communicate in some manner. Norton Ghost for NetWare supports network communication using the TCP/IP stack. Norton Ghost for NetWare includes its own TCP/IP stack, so all you need do is install a driver to allow the TCP/IP stack to communicate with the network interface card. To do this, you must have suitable network adapters installed and connected between the machines. Appendix F includes a list of devices Norton Ghost for NetWare supports.

DOS device driver support

A network device driver serves as an interface between an Ethernet adapter and DOS applications including TCP/IP. Most network device drivers are real-mode device drivers or TSRs. Three standard network device drivers for use under DOS are:

Packet Driver

Novell's ODI

Microsoft's NDIS

Norton Ghost for NetWare

TCP/IP Stack		

Packet Driver

Packet Driver shim

NDIS shim

Novell ODI

Microsoft NDIS

S o f t w a r e

H a r d w a r e

Network Interface Card

Packet Driver

A packet driver is a device driver commonly used as an interface to Ethernet cards. The Packet Driver specification was developed by FTP Software, Inc. and was adopted by all major Ethernet manufacturers.

A packet driver provides a standard interface between an Ethernet board and application software, including the TCP/IP stack. Thus multiple protocol stacks can work over the same adapter. The driver determines the type of each packet, and passes it to the correct protocol stack.
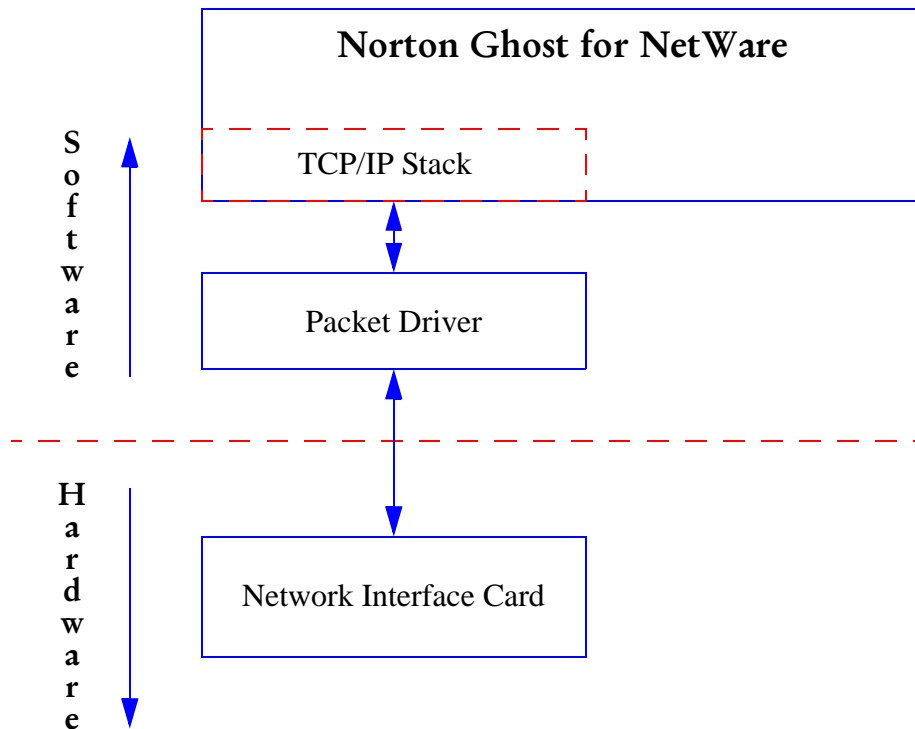
Usually, the packet driver works as a TSR or device driver, loaded from the AUTOEXEC.BAT file, so that it is always ready for use. It loads into memory at a given software interrupt vector. Any upper layer software, can call the packet driver using the interrupt. Packet drivers can support as many unique protocol stacks over an adapter as the PC memory allows. Applications come and go while the packet driver remains in a few kilobytes of memory.

The driver is specific to the particular hardware and provides a standard interface to the rest of the software. There are several interface standards including Clarkson Packet driver, Novell ODI and Microsoft NDIS.

Packet Driver is a real-mode device driver (API) defined by FTP Software, Inc. You can use it for DOS TCP/IP applications. You can get a Packet Driver for your Ethernet adapter from the adapter manufacturer. Typically, it comes with the adapter or you can get it from the manufacturer's website. You can get the packet driver collection via anonymous FTP from several sites, including oak.oakland.edu. Look in /pub/msdos/pktdrvr for pktd11.zip. You can also try the Packet Driver Collection at www.crynwr.com.

If you already have a packet driver installed on your PC, Norton Ghost for NetWare will recognize and use it. You may already have DOS TCP/IP packages that use Packet Drivers. If so, disable them by editing your CONFIG.SYS and AUTOEXEC.BAT files. Create a menu configuration for Norton Ghost for NetWare in your CONFIG.SYS and AUTOEXEC.BAT files. Here are some samples of CONFIG.SYS and AUTOEXEC.BAT files you may find useful.

Here is a sketch that shows the relationship between the Norton Ghost for NetWare, the TCP/IP stack, the packet driver and the network adapter.

Norton Ghost for NetWare

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TCP/IP Stack

Packet Driver

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Network Interface Card

ODI

Novell developed the Open Data-Link Interface (ODI) driver for NetWare.
The ODI driver is a Multiple Link Interface Driver (MLID). All ODI drivers
must adhere to Novell's ODI MLID specification. According to this
specification the Novell Internetwork Packet Exchange (IPX) can work
simultaneously with other protocols such as TCP/IP. ODI drivers are more
complex and often use more memory than the packet driver, but they are
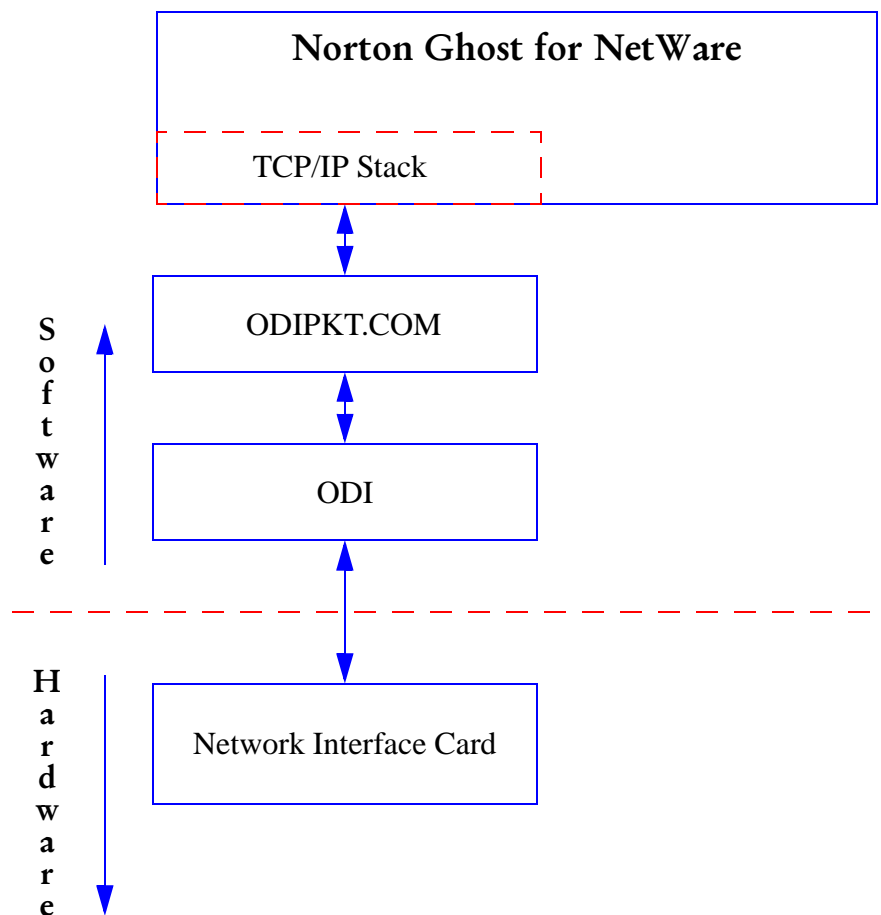faster. ODI driver is supported by Novell.

How the ODI driver works

The Multiple Link Interface Driver (MLID) controls the adapter card only. It
needs a Link Support Layer (LSL) module to move incoming packets to the
appropriate protocol stack. This layer is in the Novell lsl.com program and
you must license it from Novell. The ODI driver protocol supports eight

unique protocol stacks (maximum) over an adapter card if you have enough memory in your PC.

Open Data Interface (ODI) is a Novell network device driver. It enables DOS applications to use several networking protocols, such as TCP/IP and IPX/SPX on the same PC. Some drivers need the ODI Packet Driver Shim, ODIPKT.COM to communicate with the lower layers of the ODI drivers.

Here is a sketch that shows the relationship between the Norton Ghost for NetWare, the ODIPKT (driver), ODI and the network adapter.

NDIS

Microsoft and 3Com developed the Network Driver Interface Specification to provide a common shareable device interface for LAN Manager. NDIS drivers are more complex and often use more memory than the packet driver, but they are generally faster.

NDIS Driver Operation

NDIS drivers allow multiple protocol stacks to work over the same network interface card. The NDIS driver needs a protocol manager module to coordinate communication between the adapter and the different drivers. The protocol manager reads and sorts incoming packets, and directs them to the appropriate protocol stacks.

Some programs require the NDIS Packet Driver Shim, `DIS_PKT.DOS`.

There are two versions of NDIS 2.0. One, the earlier version, loads NDIS device drivers from the `CONFIG.SYS` file. The other, the later version, loads them upon execution of the `NET START` command, usually part of the `AUTOEXEC.BAT` file. This later version contains `SYSTEM.INI`, a configuration file.

If your PC is configured to run the later version, you must install the NDIS packet driver manually. This is covered below under, "Manual Configuration of the NDIS Packet Driver".

Selecting a Device Driver

Consider these points in deciding on a device driver:

If you already have a network device driver (packet driver) installed, Install detects it and offers you the option of using it, or adding an NDIS Packet Driver shim or ODI Packet Driver shim on top of it if required.

If you have no network device driver, Install offers to install Packet Driver. If your Ethernet NIC card is on the Packet Driver list, it is installed for you. A Packet Driver is smaller and easier to use than NDIS or ODI, and it requires less memory.

If your Ethernet card is not on the list, get NDIS 2.0 device drivers from the manufacturer. These are usually available for download over the internet. You need to know which directory they are in to complete the configuration.

Network device driver Installation

If you have any of these drivers loaded and running on your PC, Install detects them when it runs:

Packet Drivers

ODI

NDIS

When you run Install, one of the following occurs:

1   It detects Packet Driver
2   It detects ODI or NDIS, but not Packet Driver
3   It detects no driver

Packet Driver detected

Install returns the message:

```
Packet Driver detected. Use this driver [Y]
```

If you want to use this driver, press <ENTER>.

If you want to load a different driver, enter,

N, press <ENTER> and follow the steps that appear on the screen

ODI or NDIS detected

If Install detects ODI or NDIS 2.0, it installs an ODI or NDIS Packet Driver shim as needed.

No driver detected

If Install detects no driver, it displays a list of supported adapters. If your adapter is on the list, select it. If it is not on the list, select "Other." Next, Install asks you to choose the network driver you want from the list:

```
NDIS
ODI
Packet Driver
```

Once you have chosen a driver, go to the appropriate section about configuring it, below.

If you're not sure, read "About Network Drivers" in this chapter.

Configuring Network Drivers

This section covers the manual installation and configuration of various drivers. In most cases, Install installs and configures the drivers. However, sometimes you must do this manually.

Configuring Packet packet driver

To install a packet driver you must specify the operating parameters on the command line used to load the packet driver. Not all packet drivers use all parameters. Here is an example of a typical set of parameters for an ne2000 adapter.

```
ne2000 packet_int_no (int_level [io_addr])
```

For example:

```
ne2000 0x60 10 0x250)
```

Where

`ne2000` is the name of the driver

and,

`packet_int_no` is the software interrupt for the driver.

`int_level` is the hardware IRQ for the Ethernet card

When you use `ghost4n.ini` to install a packet driver, you must enter the command to run the packet driver from the DOS directory where it resides. For, example, if you use a 3COM 3C905 network interface card, and the driver is installed in the root directory on drive C:\ you would enter:

```
C:\3c90xpd 0x60
```

A software interrupt or entry point, is used to talk to the application. You can use any interrupt between `0x60h` and `0x7Fh`. Be careful in interrupt selection. Interrupts in the low 60's sometimes interfere with dbase programs. Interrupt is unavailable because the EMS interrupt interface. Interrupts 070 to 077 are used by the second interrupt controller as IRQ 8 through IRQ 15. In this example, we used `0x60h`.

Your installation may require additional command-line parameters. Refer to the documentation for the network adapter you use.

The utility, Install adds this line to the end of your `AUTOEXEC.BAT` file.

A typical packet driver screen

Here is a screen display from a 3Com EtherLink 3C90x packet driver.

```
3Com EtherLink 3C90x Family Bus Master Packet Driver v2.0c
(C) Copyright 1995 3Com Corp. All rights reserved.

NIC Type:              3C905 Fast Etherlink XL PCI NIC
Bus Type:               PCI
Slot:                  8 (0x8)
BusNo:                 0 (0x0)
I/O base:              56512 (0xDCC0)
Interrupt:             14 (0xE)
Transceiver:           MII based connector
Link Speed:            Half Duplex 100 (0x64)
 Defaulted
Ethernet Address:      00:10:4B:59:B0:D0
Packet Driver Interrupt: 98 (0x62)
```

Configuring the ODI driver

If have not installed the ODI driver, you can install one from the Novell Client Installation diskette. Consult your Novell documentation. The Install can install the ODI Packet Driver shim if you wish. Once you have installed the ODI driver, you can run Norton Ghost for NetWare.

Install checks the contents of the `net.cfg` file and modifies it if necessary. It does the following:

- Verifies that Novell's ODI configuration file "`NET.CFG`" includes the lines "`FRAME ETHERNET_II.`" If it does not, Install adds them.

  Your `NET.CFG` must contain link driver information in the format:

  ```
  Link Driver <NIC card name>
     FRAME <frame type 1> (logical board 0)
     FRAME <frame type 2> (logical board 1)
  ```

  Where: "logical board #" is the line number of the "`FRAME ETHERNET_II`" line in the link driver section of the configuration file. The first board is number 0, the second is 1 and so forth.

  Consult your Novell documentation for information on `NET.CFG`.

- Edits the `AUTOEXEC.BAT` file to add:

ODIPKT.COM <board> <interrupt # >

For example: `ODIPKT.COM 0 108`

Where `<board>` is the adapter (numbered in the link driver part of `NET.CFG` above) to which `ODIPKT` must bind.

and, `<interrupt #>` is the software interrupt the application uses to communicate with the interface card. The interrupt number may any value between 60h to 7Fh (96 to 127). The default value is 60h (96).

- Verifies the `NET.CFG` specifies a number of buffers and buffer size, for example:

```
Link support
Buffers 5 1600
```
or adds them if necessary.

- Adds the shim `ODIPKT.COM` to `NWCLIENT`, the Novell Client Installation directory.

Here is an example the configuration files configuring an ODI driver for a 3COM 3C905 adapter card.

```
NWCLIENT\NET.CGF
    LINK DRIVER 3C90xpd.com
        FRAME ETHERNET_802.3
        FRAME Ethernet_II
    Link Support
        Buffers 5 1600
```

and, in the `AUTOEXEC.BAT` file:

```
CALL C:\NWCLIENT\STARTNET.BAT
REM: followed by the line Install adds:
C:\NWCLIENT\ODIPKT 1 96
```

and, in the `NWCLIENT\STARTNET.BAT` file:

```
@ ECHO OFF
C:
CD \NWCLIENT
SET NWLANGUAGE+ENGLISH
LSL
3C5X9.COM
ODIPKT 1 96 (the new line)
IPXODI
VLM
```

You can get more information about the ODI packet driver at www.danlan.com.

Getting an NDIS Driver

Most manufacturers package an NDIS driver with their adapter cards. Or you can get one from the manufacturer's Internet site. Some NDIS drivers are available in either the /ndis directory from FTP Software's anonymous FTP server ftp.ftp.com or from their BBS in the NDIS file area.

Configuring the NDIS Driver

You can tell Install to install NDIS 2.0 support files. Be sure to back-up the DOS files that will be affected.

NDIS could be a good alternative if your system uses adapter cards that Install does not support. If so, you must get NDIS adapter drivers from the adapter card manufacturer. Appendix F includes a list of supported adapters.

When Install runs, it installs the files in the `C:\LANMAN` directory unless you specify otherwise. If your adapter is not on the list of supported adapters, you must input the path (directory) where the NDIS driver is located.

Install next asks for the driver's name. Enter the name or choose the default. this is the name used in the NDIS `PROTOL.INI` file.

Next, when prompted, enter the I/O address of the adapter card.

Based on the information you have supplied, ghost4nwini modifies your `CONFIG.SYS` and `PROTOCOL.INI` files.

Install adds a line to the `CONFIG.SYS` file to load the NDIS packet driver shim between the line that loads the protocol manager driver and the line that loads the adapter's NDIS packet driver. For example:

```
(PROTMAN DRIVER)
Device=<path>\DIS_PKT.DO
(Adapter NDIS driver)
```

Install also adds a section to the `PROTOCOL.INI` file. For example:

```
[pktdrv]
drivername=pktdrv$
bindings=<adapter driver's name>
intvec=<software interrupt #>
```

```
novell=no
```

Here is a typical 3COM 3C905 adapter installation:

```
CONFIG.SYS
Device=C:\LANMAN\PROTMAN.SYS /I:C:\LANMAN
Device=C:\LANMAN\DIS_PKT.SYS
Device=C:\LANMAN\ELNK3.DOS

AUTOEXEC.BAT
LANMAN\NETBIND.EXE

PROTOCOL.INI

drivername=PROTMAN$

[ELNK3_NIF]
drivername=ELNK3

[pktdrv]
drivername=pktdrv
bindings=<adapter driver's name>
intvec=<software interrupt #>
novell=no
```

You can get more information about the NDIL packet driver at:
www.danlan.com

Manually configuring the later NDIS driver

Install does not install the NDIS packet driver shim for new NDIS support files. Here is a procedure for manually configuring a packet driver shim.

Install the new NDIS support in C:\NET.

Edit CONFIG.SYS to include:
```
device=c:\net\ifshelp.sys
```

To start the driver each time you boot the computer, add this line to the AUTOEXEC.BAT file:
```
C:\NET\NETSTART
```

Add the following line to C:\NET:

```
DIS_PKT.DOS
```

Edit C:\NET\SYSTEM.INI. In the network driver section, change:

```
transport=ndishlp.sys,*netbeui
```

to:

```
transport=ndishlp.sys,*netbeui,c:\net\dis_pkt.dos
```

Edit C:\NET\PROTOCOL.INI to add:

```
drivername=pktdrv$
bindings=<adapter driver's name>
intvec=<software interrupt #>
novell=no
```

Here is another example:

Edit `CONFIG.SYS` to include:

```
device=c:\net\ifshelp.sys
```

To start the driver each time you boot the computer, add this line to the `AUTOEXEC.BAT` file:

```
C:\NET\NET START
```

Edit C:\NET\PROTOCOL.INI to add:

```
DriverName=PROTMAN$
[ELNK3_NIF]
DriverName=ELNK3
```

Here is a section for ghost4nw software packet drivers:

[pktdrv]

```
drivername=pktdrv$
bindings=ELNK_NIF
intvec=0x60
novell=no
```

SYSTEM.INI:

[network drivers]

```
netcard=elnk3.dos$
transport=ndishlp.sys,*netbeui,C:\NET\DIS_PKT.DOS
devdir=C:\NET
```

```
loadRMDrivers=YES
```

You can get more information about the NDIL packet driver at:
www.danlan.com

DHCP

If you want to connect two computers using TCP/IP, they both need IP
addresses. The Dynamic Host Configuration Protocol, DHCP, provides IP
addresses for use in configuring TCP/IP networks. You can configure Norton
Ghost for NetWare to work with a number of DHCP servers. This section
covers configuring Norton Ghost for NetWare for use with two types of
DHCP servers:

Microsoft Windows NT 4.0 DCHP Server and

Novell NetWare 4.11 DHCP Server

Using Microsoft Windows NT 4.0 DHCP Server

The *Microsoft Windows NT Server Networking Guide for Windows NT Version
4.0*, Chapter 7, "Managing Microsoft DHCP Servers" contains more
information about the Microsoft Windows NT DHCP Servers, gives more
data on this subject.

The following table shows the parameters

Option Code	Option Name	Description
1* >	Subnet Mask >	In "Create Scope" or "Scope Properties" box
3 >	Router IP >	Defined in "DHCP Option" box
4 >	Time Server	
6* >	DNS Server >	In "Create Scope" or "Scope Properties" box
12 >	Host Name	
15* >	DNS Domain Name	
40 >	NIS Domain Name	
41 >	NIS Server IP	
51* >	IP Lease Time >	In "Create Scope" or "Scope Properties" box
58 >	Lease Renew Time >	In "Create Scope" or "Scope Properties" box
59 >	Lease Rebind Time	

* Required

To configure the Microsoft NT DHCP Server you must create the site-specific options and set values for them.

Creating site-specific options

Using the `DHCP Manager`, you must create options 141, 142, 143 and 144. Follow these steps

1   Start the `DHCP Manager`

2   Select `DHCP Options`, then select `Default...`

3   Click `New...`

4   Choose a name, for example `G4NWsv1`, (or any name you like)

5   Choose `String` as the `data type`

6   Choose `141` as the `identifier`

7   For comment, use `G4NWsv1` or any name you like)

8   Repeat steps 3 through 7 for options `142` to `144`

9   Click `OK` to save and exit

Choosing values for the options

Now you must link Norton Ghost for NetWare with the options.

1   Start the `DHCP Manager`

2   Select `DHCP Options`, then select `Scope...` or, `Global...`

3   In the `Options` dialog (141 - 144) select the option you want. Move it from the `Unused Options` box to the `Active Options` box.

4   Select the option from the `Active Options` box.

5   Click `Value`. Add the Norton Ghost for NetWare property you want

6   Click `OK` to save and exit

Note: `Scope` options take precedence over `Global` options.

Using Novell NetWare 4.11 DHCP Server

The following table shows the parameters required for Novell NetWare's DHCP server

Option Code	Option Name	Description
1*	Subnet Mask	Defined when creating a subnet profile

Option Code	Option Name	Description
3	Router IP	Defined in Subnet Profile dialog
6*	DNS Server	Defined in the Subnet Profile dialog
15*	DNS Domain Name	
51*	IP Lease Time	In "Create Scope" or "Scope Properties" box
58	Lease Renew Time	In "Create Scope" or "Scope Properties" box
59	Lease Rebind Time	

* Required

The wattcp.cfg Network Configuration File

The wattcp.cfg configuration file contains the TCP/IP networking configuration details for Norton Ghost for NetWare running in DOS.

The wattcp file:

- specifies the IP address of the machine

- specifies the subnet mask

- allows the setting of other optional network parameters

- should be located in the same directory where ghost4nw.exe is started unless otherwise configured.

The key words available in the wattcp.cfg configuration file are:

IP

specifies the IP address of the local machine. Each machine must have a unique IP address. Norton Ghost for NetWare supports the use of DHCP and BOOTP servers and defaults to using them when the IP address is left blank or is invalid. DHCP and BOOTP provide automatic assignment of IP addresses to machines. This allows identical boot disks to be used on machines with similar network cards.

Netmask

specifies the network IP subnet mask.

Gateway (optional)

Specifies the IP address of the Gateway. This option is required when routers are present on the network and when participating PC's are located on different subnets.

Receive_Mode (optional)

Overrides the automatically configured packet driver mode used by Norton Ghost for NetWare. The modes, in order of preference are 4, 5, and 6.

Notes:

Comments in the file start with a ;

Options are set using the format: option = value

Example:

```
receive_mode=5;set receive mode
```

Editing wattcp.cfg

You can edit your watt.cfg file with Edit or and text edit program. Be sure to save it is text only.

Sample wattcp.cfg file

Here is a typical wattcp.cfg file. In actual use the characters are numbers.

```
IP=nnn.nnn.nnn.nnn
NETMASK=255.255.255.000
GATEWAY=nnn.nnn.nnn.nnn
```

Further information

Here are some Internet links that have additional Packet Driver, NDIS and ODI information:

www.ukans.edu/kanren/pktdrvr-info.html

www.jhu.edu/HAC/hcic/microcomputing/internet/pcpktdrv.html

www.ftp.com/techsup/ftpsoft/info/17.html

support.baynetworks.com/library/nautica_clam/relnotes/
 clam-update.html

helpdesk.uvic.ca/how-to/support/novell/drivers.html

www.eunet.lv/VIS/Nets/Lib/Internaut/tcpsoft.html

www.abdn.ac.uk/AUCC/publications/unotes/un6.htm

Here is the URL for Symantec's anonymous FTP site:

ftp://ftp.symantec.com/public/english_us_canada/products/
 ghost/