WHITE PAPER

CONTENTS

Advanced Network Fault Detection and Correction Feature for NetWare

Compaq has a twofold solution to ensure high network availability of your Compaq server. The first line of defense is Compaq's network device drivers, which have built-in recovery mechanisms. These mechanisms allow recovery from many hardware failure events, network status events and other network errors.

The second solution is the Compaq Advanced Network Fault Detection and Correction Feature. This feature allows you to implement a secondary controller to take over network responsibilities should the main controller fail. This secondary controller does not handle any network activity unless a failure occurs with the primary controller.

This paper describes the recovery features provided by the Compaq network drivers as well as configuration recommendations and diagnostic processes to help you recover from network availability problems.
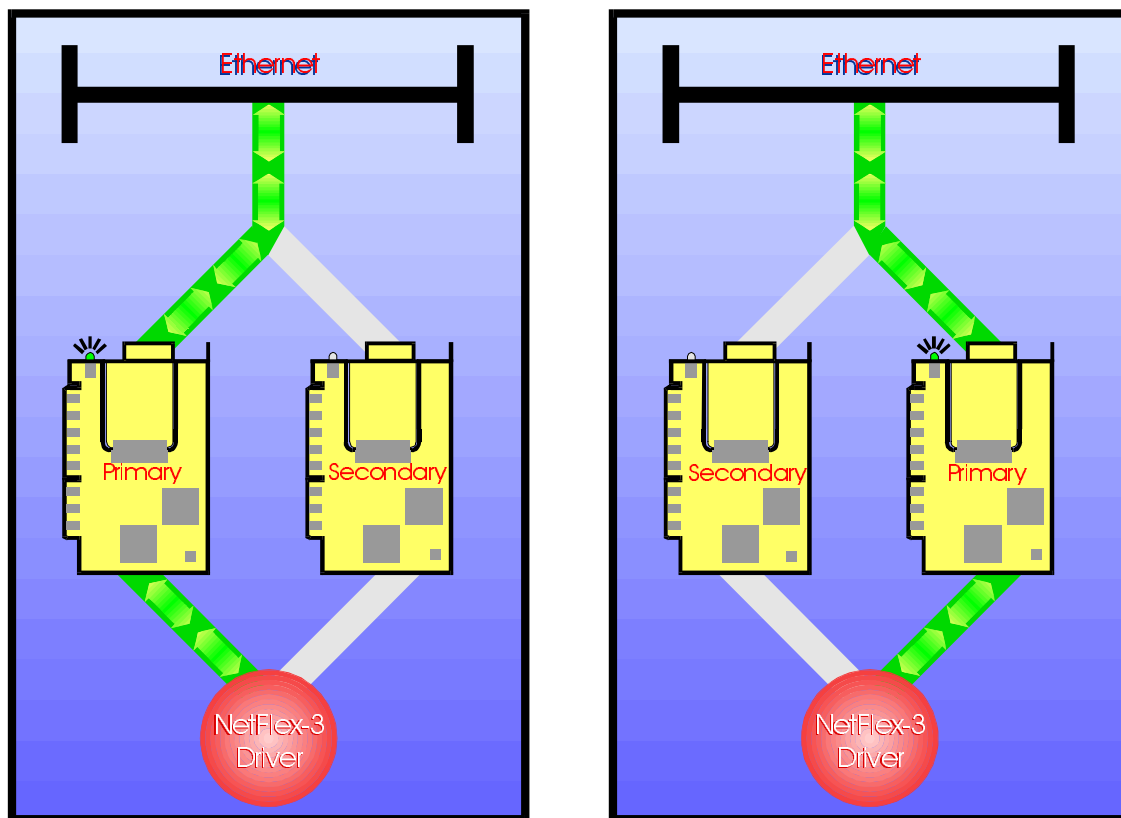
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Advanced Network Fault Detection and Correction Feature for NetWare
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COMPAQ'S HIGH NETWORK AVAILABILITY SOLUTIONS

All Compaq network device drivers provide integrated error recovery that allows the device drivers to detect failure events and recover from these errors. The drivers can reset the network interface card and continue running, usually without noticeable disturbance to normal operation. When the CPQNF3.LAN driver has been loaded using the Advanced Network Fault Dectection and Correction Feature and certain errors occur, the driver switches operation from the primary controller to the secondary controller. The following list describes errors that will cause the primary controller to switch to the secondary controller.

- Hardware Failure Events

    - Adapter Check Count

    - Transmit Timeout Errors

- Network Status Change

    - Link Status Change

    - Transmit Integrity Check Timeouts

Hardware Failure Events

Adapter Check Count

Adapter Check Count errors indicate that the hardware detected a problem. A console error message that details the problem is generated and an immediate switch-over to the secondary controller will occur. The Adapter Reset statistic and the Adapter Check Count statistic, viewable under MONITOR.NLM, will be incremented.

At the next scheduled maintenance, run Compaq Diagnostics on the controller experiencing the errors to determine if the board should be replaced.

Transmit Timeout Errors

This counter increments when a network packet does not transfer within the expected amount of time. The controller from which it was transmitted is presumed failed and is reset. Operation will switch to the secondary controller and operation should continue. The Adapter Reset statistic will also increment when a transmit timeout error occurs.

At the next scheduled maintenance check the following:

1. You may have a cable problem. Check to ensure that the network cables are properly connected. The Link Status LED on your network card should be lit if the driver is loaded and the adapter is connected to a hub.

2. Check the operation of the hub.

3. If problems continue, run Compaq Diagnostics.

Network Status Change

Changes in the network are detected through transmit integrity checks and link status changes.

Transmitter Integrity Check

When a secondary controller is installed in your server and idle time exists for either controller, the Transmitter Integrity Check feature transmits packets to itself. The secondary controller, since it is not active, uses this feature regularly. If the primary controller fails the Transmitter Integrity Check, the secondary controller assumes control of network activity. A console alert is generated and the event is logged in the console log. If at any time the secondary controller does not pass the Transmitter Integrity Check, an alert will be generated and the event will be logged in the console log.

The Transmitter Integrity Check feature can be disabled by setting the optional parameter, TXTESTTIME, to 0. The installation section provides more information about this keyword.

If you receive an alert indicating a link failure, first check the cable connections and the seating of the failed controller to ensure that everything is properly installed. If you still receive errors, replace the cables attached to the failed controller. At the next scheduled maintenance, run Compaq Diagnostics on the controller. It may require replacement.

Link Status Change

Link status changes may occur when a cable is unplugged and a hub problem occurs. If a link status change occurs on the primary controller, the secondary controller assumes control of network activity. If the secondary controller is attached to the same hub as the primary controller, the problem will be resolved if the cause was related to a cabling problem. However, if the hub is related to the problem, both controllers may be marked failed, an alert will be issued, and the event will be logged in the console log.

If you receive an alert, first check the cable connections and the seating of the failed controller to ensure that everything has been properly installed. If you still receive errors, replace the cables attached to the failed controller. Check the operation of your hub. At the next scheduled maintenance, run Compaq Diagnostics on the controller. It may require replacement.

Secondary Controller Recovery Process

When the driver detects failures on the primary controller and the secondary controller has a valid link, redundant recovery is automatic. At the time of switch-over (when the primary controller fails the Transmit Integrity Check), the MAC address of the primary controller is copied to the secondary controller by the driver. The MAC address is the unique address assigned to a particular network controller that identifies that network controller within the network. The secondary controller will then begin operation. If the secondary controller has been installed on a different hub from the primary controller, the controller pair can continue operation through hub power loss or hub failure on the one of the controllers.

INSTALLING NETFLEX-3 WITH NETWARE

Hardware Installation Tips

- Supported controllers:

    - NetFlex-3 Controllers

    - Netelligent 10 T PCI UTP Controllers

    - Netelligent 10/100 TX PCI UTP Controllers

- The secondary controller must be installed on the same network segment as the primary controller, but you can connect the secondary controller to a different hub. Should the primary controller failure be related to a hub problem, the secondary controller will continue operation.

- The modules on the NetFlex-3 must be identical; you cannot pair a NetFlex-3 100Base-TX module with a 100VG-AnyLAN module or a 10Base-T module.

- The Transmitter Integrity Check can not be detect link failures when the controllers are running in full duplex mode.

Software Installation Tips

The NetFlex-3 driver must be configured for the network fault detection feature. Three new command line parameters are available for configuring a controller pair for fault tolerant operation. An example of the load parameters, followed by an explanation of each parameter, can be found below.

```
LOAD CPQNF3 SLOT=3 PAIR=1 SECONDARY
LOAD CPQNF3 SLOT=4 PAIR=1 FRAME=ETHERNET_II TXTESTTIME=2
        NAME=CORPNET
```

PAIR

This keyword identifies the controller pair associated with the controller and must be used when loading both controllers. This parameter is valid only when using the Advanced NetWork Fault Detecton and Correction feature. If the SECONDARY keyword is not present, the controller will be recognized as the primary controller of the controller pair. The secondary controller must be loaded first.

SECONDARY

The SECONDARY keyword is required on the command line in order for the driver to load the secondary controller. When this keyword is present, the controller will be activated when the primary controller is loaded. Use this keyword in conjunction with the PAIR keyword. The secondary controller must be loaded before the primary controller.

TXTESTTIME

The TXTESTTIME parameter controls the frequency of test frame transmission. In order to verify that a valid network exists, a test frame is sent to the paired controllers whenever either controller is idle. The default is one second. The minimum setting is zero (disable test frame transmissions) and the maximum is 10 seconds.

NOTE: See the CPQNF3 Error Messages section of this document for more information about the error.

Verify Operation of the Secondary Controller

To check the operation of the secondary controller after installation, unplug the cable from the primary controller. Operation should switch to the secondary controller within a few seconds.

If the driver is unable to initiate startup of the secondary controller, an error message is sent to the console. The driver will attempt to restart a controller, alternating between the secondary controller and the primary controller until one of the controllers responds.

ONLINE CONFIGURATION WITH NETWARE

CPQONLIN.NLM

Use the Compaq Configuration Utility, CPQONLIN.NLM, to configure and monitor the status of the controllers. CPQONLIN allows you to switch control to the secondary controller at any time. If you suspect a problem with the primary controller, (MONITOR.NLM may show networking statistics incrementing rapidly), use CPQONLIN to switch to the secondary controller. At the next scheduled maintenance, run Compaq Diagnostics on the controller.

There are two modes of operation for the controller pair that can be set within CPQONLIN.NLM:

- Automatic Operation

- Manual Operation

Automatic Operation

When in automatic mode (default) if the primary controller experiences a failure for any reason, activity is automatically switched to the secondary controller. No intervention is required. You can manually switch activity from one controller to the other at any time using the CPQONLIN.NLM.

Manual Operation

When in manual mode, you must manually switch operation of the primary controller to the secondary controller. If a failure occurs, activity will not automatically switch to the secondary controller. Manual mode should only be used for test purposes.

CPQNF3.LAN ERROR MESSAGES

During initialization of your NetFlex-3 Controller, several error messages may occur. Make a note of these messages. The following list expands on those messages.

MESSAGE:	ACTION:
Adapter Check #: Receive List Error Adapter Check #: Transmit List Adapter Check #: Receive Ack Error Adapter Check #: Transmit Ack FATAL 403: Internal code initialization failed FATAL 406: Hardware resource conflict; adapter may be in use. FATAL 409: Invalid TLAN ICFGB! FATAL 411: Interface initialization failed FATAL 412: Unable to set event processors FATAL 420: Transmit frame buffer assignment error ERROR 425: New driver version required for adapter in slot # ERROR 201: Some TCBs may have been lost! ERROR 202: Some RCBs may have been lost!	These errors indicate that you may need to update your driver. Note the error and contact your service provider to obtain an update. The Transmit List Error may also indicate a problem with other NLMs installed on the server.
Adapter Check #: Data Parity Error Adapter Check #: Address Parity Error Adapter Check #: Master Abort Adapter Check #: Target Abort Adapter Check #: Internal Ack Counter Overflow Adapter Check #: Unknown Failure Code. FATAL 424: Slot #: Error #: Cannot read EEPROM!	Make sure the module on your NetFlex-3 Controller is connected properly. Check to make sure the board is firmly installed in its slot. Install the controller in a different slot in your system. If these suggestions do not resolve the problem, contact your service provider.
WARNING 301: Adapter in slot # is disabled and cannot be used. WARNING 302: An adapter on the PCI bus is disabled and cannot be used. ERROR 101: EISA Slot # not configured. ERROR 102: Adapter in slot # not configured. ERROR 103: Adapter bus #, device # not configured. FATAL 402: Invalid EISA configuration	The controller has been disabled by the System Configuration Utility. Rerun the System Configuration and ensure that the controller is configured for use. Run the System Configuration Utility to configure the system.
FATAL 401: ETHERTSM.NLM v#.## or greater required.	Obtain ETHERTSM.NLM and MSM.NLM of the specified version or later from the NPFC Supplement diskette and copy these files to your server. Reload the NetFlex-3 driver after loading the new ETHERTSM and MSM NLMs.
FATAL 407: Unable to allocate transmit queue memory. FATAL 408: Unable to allocate receive queue memory. FATAL 410: Unable to allocate TLAN interface memory. FATAL 419: Unable to allocate transmit frame buffers.	Add memory to your server or try loading the network driver first.
FATAL 421: Unable to allocate any RCBs	Add memory to your server. Check the Minimum and Maximum Physical Receive Packet Size parameter. You may need to

MESSAGE:	ACTION:
	increase these parameters based on the number and type of network controllers in your system.
ERROR 203: Cannot update adapter statistics ERROR 204: Adapter close failed ERROR 205: Adapter close failed in type # shutdown ERROR 206: Adapter reset failed ERROR 207: Adapter reset failed type # failed ERROR 208: Adapter re-initialization failed ERROR 209: Node address re-setting failed ERROR 210: Adapter re-open failed ERROR 211: Multicast table update failed ERROR 212: Promiscuous mode modify failed	The driver will usually continue to operate. During the next scheduled maintenance, check the seating of the board and run Compaq Diagnostics. The controller may require replacing or you may need a driver upgrade.
FATAL 413: Unable to initialize adapter FATAL 414: Unable to read Burned in Address FATAL 415: Unable to set node address ERROR 213: Unknown Network Status Event has occurred FATAL 416: Unable to open the adapter.	Run Compaq Diagnostics. Your controller may need replacing.
Slot #: VG network link is down. Check cabling.	Your cabling may be unplugged, frayed or damaged. The port on the hub may be disabled. Ensure that your hub has power.
Slot #: VG network access denied. Check hub configuration.	The hub you are connected to is not allowing access on the port to which your adapter connected. Reconfigure your hub.
Slot #: VG promiscuous mode not allowed. Check hub configuration.	The hub you are connected to is not allowing promiscuous mode. Reconfigure your hub.
Slot #: VG frame format mismatch. Check hub configuration.	The hub may be configured for Token Ring and the controller for Ethernet or vice versa.
WARNING 304: 10Base-T is not available. The UTP parameter is ignored.	The controller in use does not support 10Base-T. This parameter will be ignored.