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# Table of Contents

SECTION I: INTRODUCTION............................................................................................................... 4  

What is the Revelation Universal Driver Heavy? ................................................................. 4  
A Word About Licensing ........................................................................................................ 4  
Universal Driver Heavy OS and Software Requirements .................................................. 4  
FILE CHANGES .................................................................................................................. 5  
CONVENTIONS USED IN THIS DOCUMENT .................................................................. 5  
PRE-INSTALLATION REQUIREMENTS ............................................................................ 5  
UPGRADE REQUIREMENTS ............................................................................................... 5  
MATERIAL CHECKLIST ...................................................................................................... 5  
INSTALLATION OVERVIEW ............................................................................................... 5  

SECTION II: PRIMARY SERVER INSTALLATION .................................................................. 6  
PREPARING THE APPLICATION FOR LONG KEYS .......................................................... 6  
Universal Driver Heavy Client Installation ...................................................................... 6  
OpenInsight Client Installation .......................................................................................... 6  
Advanced Revelation Client Installation ......................................................................... 12  
Universal Driver Heavy Server Installation ..................................................................... 13  
Server Side Installation .................................................................................................... 13  
The System User/Group ....................................................................................................... 20  
Verifying the Revelation Universal Driver Heavy Installation ........................................... 20  
Services Dialog .................................................................................................................. 20  
Universal Driver Heavy Installation Summary .................................................................. 22  
OpenInsight .......................................................................................................................... 22  
Advanced Revelation ........................................................................................................ 22  

SECTION III MIRROR SERVER INSTALLATION .................................................................. 23  
Server Side Installation ....................................................................................................... 24  
The System User/Group ....................................................................................................... 29  
Verifying the Revelation Universal Driver Installation ..................................................... 29  
Services Dialog ................................................................................................................... 30  
Important Note .................................................................................................................... 30  
Universal Driver Installation Summary .......................................................................... 31  
OpenInsight .......................................................................................................................... 31  
Advanced Revelation ........................................................................................................ 31  

SECTION IV: SYNCHRONIZING THE PRIMARY AND MIRROR ........................................... 32  
Overview ............................................................................................................................... 32  
Updating the Mirror Server for the First Time ................................................................. 32  

SECTION V: MANAGING THE UNIVERSAL DRIVER HEAVY ............................................ 34  
Universal Driver Heavy Console ....................................................................................... 37  
Controlling the Universal Driver Heavy from a Script ...................................................... 43  

SECTION VI: TECHNICAL INFORMATION ......................................................................... 44  
Alternative Data Structures with the Universal Driver Heavy ........................................... 44  
Exempting Files from Mirroring ........................................................................................ 46  
Uninstalling the Universal Driver Heavy or the Universal Driver .................................... 46  
Command Line Parameters for LH47Heavy.exe ................................................................ 47  
Log Files ............................................................................................................................... 48  
Development VS. Runtime Systems .................................................................................. 48  
Recovering from a Hardware Failure ................................................................................ 48  
Recovering From Replay Errors ....................................................................................... 49  
Possible Errors in the Event Log ......................................................................................... 50  
Additional Registry Settings ............................................................................................... 51  
Universal Driver Heavy Worksheet .................................................................................. 51  
Appendix A: Error Messages in the UDH.log ................................................................... 52
Section I: Introduction

Thank you for purchasing the Revelation Universal Driver Heavy. The Revelation Universal Driver Heavy may be the most important product used to protect your Revelation application data. Although the Universal Driver Heavy is relatively easy to install, it is strongly encouraged that you familiarize yourself with this guide to ensure that the Universal Driver Heavy is optimally configured for your application. This installation guide is broken into six sections: Introduction, Primary Server Installation, Mirror Server Installation, Synchronizing the Primary and Mirror, Managing the Universal Driver Heavy, and Technical Information.

What is the Revelation Universal Driver Heavy?

The Revelation Universal Driver Heavy is a client/server product for real time mirroring of Linear Hash data between a primary server to a mirror server. It is designed to handle intensive Revelation applications that need to scale up and have high availability.

When configured correctly a backup of the mirror server can be performed without having to take the primary server offline. Should the primary server fail clients can be redirected to the mirror server to minimize downtime.

It also provides a management screen to set all needed options for the working of the Universal Driver Heavy, including scheduling backups, what to do in case of hardware failures, the ability to free held locks and extensive logging and troubleshooting capabilities.

A Word About Licensing

Installation of the Revelation Universal Driver Heavy indicates agreement and acceptance of the terms of the license. For details of the licensing agreement, consult the hard copy that was shipped in the package. If your copy of the Revelation Universal Driver Heavy did not include a copy of the license agreement, please call Revelation Software Support at 800-262-4747 or 201-594-1422 to request a copy.

Universal Driver Heavy OS and Software Requirements

The Universal Driver Heavy only can be installed on servers with Windows 2008, or Windows 2003 operating systems. The only supported workstations are Windows 7 Professional 32-bit & 64-bit, Windows 7 Ultimate 32-bit & 64-bit, Windows Vista Ultimate 32-bit & 64-bit, Windows Vista Business 32-bit & 64-bit, Windows XP Home Premium, Windows XP Professional. Any unsupported workstations will not be able to access your Revelation applications using the Universal Driver Heavy. If you are unsure if your configuration is compatible with the Universal Driver Heavy, please consult the Network Product Matrix in the Knowledge Base on the www.revelation.com website.

The Universal Driver Heavy can only be used with OpenInsight 4.1x and greater, or Advanced Revelation 3.12. Both installs of OpenInsight will need to either be development installs, or runtime installs with access to the Database Manager module built in to attach tables.
File Changes

Incorporated into the Universal Driver Heavy is the ability to create files larger than four gigabytes as well as support for very large frame sizes. Tables created with this driver will not be accessible by network drivers earlier than version 3.0

Starting with the 4.6 version network driver record keys are now limited to 552 characters. Existing records with keys over 552 will be reported as GFE (Group Format Errors). Attempts to write new records with long keys will result in FS1018 error message. For more information please refer to the knowledge base article “Network Driver Update for Large Keys”.

Conventions Used in this Document

To facilitate the explanations and instructions used throughout this Installation Guide, certain conventions will be used.

• If a word is **Monospaced and EMBOLDENED**, it represents a filename, directory, a keystroke or something that should be typed. If the emboldened word is also within `<ANGLED BRACKETS>`, the user must replace the angled brackets and the word within them with an appropriate word or phrase. Available selections will appear nearby, most often in a tabular format.

• If a word is “enclosed in double quotation marks”, it refers to something on the windows desktop, such as a button or menu choice. In some instances, a quoted word or phrase may be used to indicate a response that was generated by the system.

• ‘Single quotation marks’ will be used to indicate industry terms and to distinguish certain keywords.

• If a word is *italicized*, it expresses emphasis or importance.

Pre-installation Requirements

• Make certain that you have administrative privileges for the server and/or workstation onto which you want to install the Revelation Universal Driver Heavy, and the Universal Driver.

• Confirm that you have two properly licensed copies of your Revelation application

Upgrade Requirements

• Please uninstall your previous version of the Universal Driver Heavy on both the Primary and Mirror servers.

• Follow the installation instructions in this manual.

Material Checklist

Verify that you have all the materials that are shipped with the Revelation Universal Driver Heavy by your side during the installation. The shipped materials consist of:

• This Installation Guide
• The Universal Driver Heavy installation CD-Rom
• The Revelation Network Products License Guide
• Registration card with two Network Product Serial Numbers

There may be other accompanying documentation as well.

Installation Overview

The installation will take a number of steps to install on both the Primary Server and the Mirror Server. The installation program will prompt you for most of the information that you need. **You must have your Revelation applications already installed on the primary server. This is vital to the proper working of the Universal Driver Heavy.** The installation will take the following pattern:
Section II: Primary Server Installation

Preparing the Application for Long Keys

To ensure proper record mirroring keys have been standardized to a maximum of 552 characters. Please refer to the enclosed document “Network Driver Update for Large Keys” before continuing the installation. If the document cannot be located please refer to our technical support knowledge base at www.revelation.com.

Universal Driver Heavy Client Installation

The client side installation should be installed from the server that will have the Universal Driver Heavy.

The Revelation Universal Driver Heavy client will need to match the version of the Universal Driver Heavy on the Server for the Universal Driver to work. Using an older client driver (i.e. All Networks 2.1) on the client workstation may result in communication errors.

- OpenInsight users should follow the OpenInsight Client Installation instructions.
- Advanced Revelation users should follow the Advanced Revelation Client Installation instructions.

OpenInsight Client Installation

You will need Administrator Permissions to complete the following tasks.

1. Insert the Universal Driver Heavy CD in the CD-ROM drive of the server where the Revelation application resides.

2. Browse to the contents of the CD.
3. Right click on UDH47_CLIENT_setup and choose Run as administrator.
Welcome to the Revelation Universal Driver Heavy - Client 4.7 Setup Wizard

This wizard will guide you through the installation of Revelation Universal Driver Heavy - Client 4.7.

It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.

Click Next to continue.

License Agreement

Please review the license terms before installing Revelation Universal Driver Heavy - Client 4.7.

Press Page Down to see the rest of the agreement.

Revelation Software Universal Driver License Agreement

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If you accept the terms of the agreement, click the check-box below. You must accept the agreement to install Revelation Universal Driver Heavy - Client 4.7. Click Next to continue.

☑ I accept the terms in the License Agreement.

Revelation Software, Inc.
4. Specify the folder where your existing OpenInsight is installed.

![Image of installation screen]

Please specify the folder where your existing OpenInsight is installed. You may use the Browse button to browse to the proper location.

Existing OpenInsight Directory

C:\Revsoft\OpenInsight

Space required: 1.2MB
Space available: 22.8GB

Login...SYSPROG

User name: SYSPROG
Password:

Client 4.7 is being installed.

Extract: REV38000.IK... 100%
Extract: REV38000.OV... 100%
Extract: REVLOCKS
Extract: REVMEDIA.IK... 100%
Extract: REVMEDIA.OV
Output folder: C:\Revsoft\OpenInsight
<<Extraction Complete>>
Output folder: C:\Revsoft\OpenInsight
Starting up OpenInsight

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To verify that the new internal network driver has been installed, type the following command from a Windows command line:

```
<SHARENAME>:\REVSOFT\OINSIGHT\NETDRV.EXE
```

where `<SHARENAME>:\REVSOFT\OINSIGHT` indicates the full path to the location of OpenInsight. If this is not the location of OpenInsight, replace this with the appropriate path. The following figure is displayed showing that the new driver has been installed.
The current driver is listed for *Driver Type*. The new driver, “Universal Driver Heavy v4.7.0.0”, is displayed in the *Available Drivers* list.

*Important:* If the “Driver Type:” does not say “Universal Driver Heavy v4.7.0.0”, you must click it in the “Available Drivers” window and then click “OK”. This will select the appropriate driver and make it active.
Advanced Revelation Client Installation

The Advanced Revelation workstation setup assumes that Advanced Revelation is configured for multiple users and is loaded from the network. Installing the Universal Driver Heavy Client for Advanced Revelation requires two procedures:

1. Adding the new driver to the Network Types list.
2. Selecting the new driver once it is a valid driver type option.

Before performing these procedures, make sure that all users are logged out of Advanced Revelation applications. All of these commands must be performed from one of the workstations that run Advanced Revelation. They only need to be performed once per copy of Advanced Revelation, not once per workstation. If you are running Advanced Revelation from a Windows operating system, these procedures must be run from a DOS window.

Procedure 1 adds the new driver to the Advanced Revelation list of internal Network Types.

1. Insert the CD and extract the contents of ArevClient.zip to a temporary folder on your local computer. Note the location of the temporary folder as you'll need it later.
2. Start the Advanced Revelation Install/Upgrade program. From the DOS command line in the AREV directory type: `AREV install /x` then press the ENTER key.
3. The Install/Upgrade window is displayed.
4. Choose Install/Upgrade from the menu. You are instructed to insert Disk #1 into the A: drive.
5. Type the path to the temporary folder from step 1 and press the ENTER key. The new internal network driver, UNIVERSAL is displayed.
6. Press the ENTER key to select the new driver.
7. You are asked if you want to install the client network driver. Type: Yes to this question, then press the ENTER key to add the new driver to the list of Network Types as UNIVERSAL.
8. Additional information is displayed. Press the ENTER key to return to the Install/Upgrade main window.
9. When you are notified that the new driver has been added to the list of internal network drivers, choose Exit from the menu to close the Advanced Revelation Installation/Upgrade program.

Procedure 2 lists the steps to activate the new Advanced Revelation internal network driver so that it is used the next time Advanced Revelation is started.

1. Start Advanced Revelation with the LanPack user: `AREV LANPACK`.
2. Choose Network from the menu to display the current internal network driver type.
3. Press F2 to display a list of all valid Network Types/Drivers.
4. Select the new internal network driver, UNIVERSAL, then press the ENTER key.
5. A window listing the new driver is displayed; press the ENTER key again.
6. Click <Save> or press F9.
7. This displays a message indicating that the REVBOOT file has been renamed and that the new driver will be available the next time you log on to Advanced Revelation. Click <OK> or press the ENTER key to close the message window.
8. Choose Exit from the menu to logout.
9. Restart Advanced Revelation to use the new internal network driver.

At this point, please refer to the Universal Driver Heavy Server instructions to continue.
Universal Driver Heavy Server Installation

The installation of the Revelation Universal Driver Heavy is straightforward and consists of only a few steps. In short, these include:

- Server Side Installation
- Creating the SYSTEM user/group on the server

Server Side Installation

1. Confirm that there are no other instances of the Revelation Linear Hash Service running on the server. Go to Programs → Administrative Tools → Services and look for “Linear Hash Heavy”.
2. Browse to the contents of the CD drive.
3. Right click on UDH47_Primary_setup and choose Run as administrator.
4. Please review the license agreement before installing the Universal Driver Heavy 4.7.
5. Enter the Serial Number provided by Revelation Software or your vendor.
6. You are informed that the Revelation Universal Driver Heavy will be installed into the \REVSOFT\UNIVERSAL DRIVER HEAVY directory. If you would prefer a different destination directory, you can make the change at this screen. Confirm your choice by clicking “Next”. If this directory does not exist, you will receive a message saying it will be created.
7. Please specify the folder where your existing OpenInsight is installed.
8. Please specify the connection details to be used with the Universal Driver Heavy.

![Image of Revelation Universal Driver Heavy 4.7 Setup](image-url)

- **Connection Details**
  - Specify the connection details for the Universal Driver Heavy
  - Enter the IP Address or Host Name for this system (the Universal Driver Heavy server)
    - UDH-PRIMARY
  - Enter the TCP/IP Port to use for the Universal Driver Heavy
    - 777
  - Enter the IP Address or Host Name for the Mirror Server
    - 10.0.0.2
  - Enter the TCP/IP Port used by the Mirror Server
    - 9999

![Image of Revelation Universal Driver Heavy 4.7 Setup](image-url)

- **Choose Start Menu Folder**
  - Choose a Start Menu folder for the Revelation Universal Driver Heavy 4.7 shortcuts.

- Select the Start Menu folder in which you would like to create the program's shortcuts. You can also enter a name to create a new folder.

- **Universal Driver Heavy**
  - Accessories
  - Administrative Tools
  - Maintenance
  - Startup
  - VMware

- **Do not create shortcuts**

![Image of Revelation Universal Driver Heavy 4.7 Setup](image-url)
Completing the Revelation Universal Driver Heavy 4.7 Setup Wizard

Revelation Universal Driver Heavy 4.7 has been installed on your computer.

Click Finish to close this wizard.

- [ ] Start the Universal Driver Heavy
- [ ] Show Readme

< Back  Finish  Cancel
The System User/Group

In addition to the steps above, you need to ensure that the Universal Driver Heavy will have appropriate access to your files. By default, the Universal Driver Heavy logs into your server as the “System” user/group. This is a predefined user/group on the server. It is important that the System user/group be granted “Full” access to the shared data in the “Permissions” window (located in the “Security” tab of a shared drive’s properties). Furthermore, you should configure the security settings of the shared volume to both “Replace Permissions on Subdirectories” and “Replace Permissions on Existing Files”. For instructions on how to do this, consult your Microsoft Windows server documentation.

Verifying the Revelation Universal Driver Heavy Installation

After completing the installation procedure, you should verify that the software has been installed properly and is functioning. You can accomplish this from the Services dialog.

Services Dialog

There are a number of ways to check the Services running on your server, depending on the operating system. Please consult your Windows documentation for details. One way is the following. You can access the Services dialog by opening the Control Panel (via “Settings” in the “Start” Menu) and double-clicking on the “Services” icon (the picture displays two gears). Once you double-click on this icon, you will be presented with a listing of every service that is running on your server. Scroll through this list until you find the service labeled “Linear Hash Heavy”. This service is what the Revelation Universal Driver Heavy
registers itself to the operating system as. The status should read “Started”. You can try stopping and starting/restarting the service with the start and stop buttons to the right.

Your Services dialog should look similar to this:
Universal Driver Heavy Installation Summary

Please take a moment to make sure that you have installed the Universal Driver Heavy correctly. Here is a brief summary of the installation steps used to install the Revelation Universal Driver Heavy on the server.

OpenInsight

- Install the Universal Driver Client
- Install the Server Side of the Service
- Create the SYSTEM user/group

Advanced Revelation

- Install the Universal Driver Client
- Select the Universal Driver
- Install the Server Side of the Service
- Create the SYSTEM User
Section III Mirror Server Installation

The Install on the Mirror Server is a modified version of the Universal Driver Heavy and is not the same as the regular Universal Driver.

The installation of the Revelation Universal Driver is straightforward and consists of only a few steps. In short, these include:

- Server Side Installation
- Creating the SYSTEM user/group on the server
Server Side Installation

1. Confirm that there are no other instances of the Revelation Linear Hash Service running on the server.
2. Browse to the contents of the CD drive.
3. Right click on UDH47_Mirror_setup and choose Run as administrator.
Welcome to the Revelation Universal Heavy (Mirror) 4.7 Setup Wizard

This wizard will guide you through the installation of Revelation Universal Heavy (Mirror) 4.7.

It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.

Click Next to continue.

License Agreement

Please review the license terms before installing Revelation Universal Heavy (Mirror) 4.7.

Press Page Down to see the rest of the agreement.

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I accept the terms of the License Agreement

Click Next to continue.
4. Enter the Serial Number provided by Revelation Software or your vendor.

![Revelation Universal Heavy (Mirror) 4.7 Setup](image)

Enter Serial Number

Enter the Universal Driver serial number to continue.

Please enter the Serial Number provided by Revelation Software or your vendor.

5. You are informed that the Revelation Universal Driver will be installed into the 
   C:\REVSOFT\UNIVERSAL DRIVER directory. If you would prefer a different destination 
   directory, you can make the change at this screen. Confirm your choice by clicking “Next”. IF this 
   directory does not exist, you will receive a message saying it will be created.
Choose Install Location

Universal Driver 4.7 Folder

Please specify the folder where you wish to install the Universal Driver files. You may use the Browse button to browse to the proper location.

Universal Driver 4.7 Directory

[Text input field with path]

Browse...

Space required: 51.8MB
Space available: 23.1GB

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< Back  Next >  Cancel

Connection Details

Specify the connection details for the Universal Driver

Please specify the connection details to be used with the Universal Driver
Enter the TCP/IP Port to use for the Universal Driver

9999

Enter the IP Address or Host Name for this system (the Universal Driver server)

udh-mirror.lab.winwinds.int

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< Back  Next >  Cancel
Choose Start Menu Folder

Choose a Start Menu folder for the Revelation Universal Heavy (Mirror) 4.7 shortcuts.

Select the Start Menu folder in which you would like to create the program's shortcuts. You can also enter a name to create a new folder.

- Universal Driver
- Accessories
- Administrative Tools
- Maintenance
- Startup
- VMware

Do not create shortcuts

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< Back  Install  Cancel

Completing the Revelation Universal Heavy (Mirror) 4.7 Setup Wizard

Revelation Universal Heavy (Mirror) 4.7 has been installed on your computer.

Click Finish to close this wizard.

- Start the Universal Driver
- Show Readme

< Back  Finish  Cancel
The last screen allows you to automatically view the README document and to start the Linear Hash service, via checkboxes. It is strongly recommended that you leave both boxes checked. Click “Next” to complete the installation.

The System User/Group

In addition to the steps above, you need to ensure that the Universal Driver Heavy will have appropriate access to your files. By default, the Universal Driver Heavy logs into your server as the “System” user/group. This is a predefined user/group on the server. It is important that the System user/group be granted “Full” access to the shared data in the “Permissions” window (located in the “Security” tab of a shared drive’s properties). Furthermore, you should configure the security settings of the shared volume to both “Replace Permissions on Subdirectories” and “Replace Permissions on Existing Files”. For instructions on how to do this, consult your Microsoft Windows Server documentation.

![An example of the Security tab](image)

Verifying the Revelation Universal Driver Installation

After completing the installation procedure, you should verify that the software has been installed properly and is functioning. You can accomplish this using the services dialog.
Services Dialog

There are a number of ways to check the services running on your server, depending on the operating system. Please consult your Windows documentation for details. One way is the following. You can access the services dialog by opening the Control Panel (via “Settings” in the “Start” Menu) and double-clicking on the “Services” icon (the picture displays two gears). Once you double-click on this icon, you will be presented with a listing of every service that is running on your server. Scroll through this list until you find the service labeled “Linear Hash”. This service is what the Revelation Universal Driver registers itself to the operating system as. The status should read “Started”. You can try stopping and starting/restarting the service with the start and stop buttons to the right.

Your dialog should look the image on the next page.

The Services Dialog on the Mirror Server will list the Linear Hash – not the Linear Hash Heavy

Important Note

While the Primary Server is running OpenInsight, no copy of OpenInsight should access the Revelation data on the Mirror Server. Doing so may corrupt data and indexes on the Mirror Server, causing replication errors.
Universal Driver Installation Summary

Please take a moment to make sure that you have installed the Universal Driver Heavy correctly. Here is a brief summary of the installation steps used to install the Revelation Universal Driver Heavy on the server.

OpenInsight
- Install the Universal Driver Client
- Install the Server Side of the Service
- Create the SYSTEM user/group
- Verify Proper Service Installation

Advanced Revelation
- Install the Universal Driver Client
- Select the Universal Driver
- Install the Server Side of the Service
- Create the SYSTEM User
- Verify Proper Server Installation
Section IV: Synchronizing the Primary and Mirror

Overview

After the primary and mirror services are installed the two servers must be synchronized for the first time. From the primary server you will simply copy the entire OpenInsight directory (including subdirectories and data volumes) onto an identical path on the mirror server. Because the Universal Driver Heavy is designed to mirror only linear hash database tables all other static files must be pushed to the mirror server whenever there is a change. Refer to the section below “Development vs. Runtime Systems” for more information about changes that require updates to be copied to the mirror server.

Updating the Mirror Server for the First Time

These directions will walk you through copying the application from the primary server to the mirror server:

1. Close all instances of OpenInsight, AREV, OEngineServer service, and the Universal Driver Manager.
2. Stop the Linear Hash Heavy service on the primary server.
3. Stop the Linear Hash service on the mirror server.
4. Copy your application from the primary server to the mirror server.

IMPORTANT: Replication requires that the physical drive letter and path to the application be identical on the primary server and mirror server. If they do not match the primary server will not stay in mirroring mode. For example, if the primary server program location is C:\RevSoft\OpenInsight\Oinsight.exe the program and subdirectories must reside on the mirror server at same location.

5. Change the REVPARAM file on the mirror server’s application(s) to reflect the mirror server’s TcpIpPort and IP address.

Tip: Mirroring between the servers will work without performing this step but if a client attempts to launch OpenInsight from the mirror server the revparam file will redirect it back to the primary server.

6. Start the Linear Hash service on the mirror server.
7. Start the Linear Hash Heavy service on the primary server.
8. Confirm that the Universal Driver Manager can open and indicates the service is operating in mirror mode.

Tip: If the status indicator shows “Journal” mode you should change the mode to “Mirroring”. Verify that it remains in mirroring mode. If mirroring mode fails to remain enabled then check the file UDH.LOG for errors. It is located on the primary server in the Universal Driver Heavy directory.

9. Confirm that the application launches from the primary server.

After completing these steps you have placed a new copy of your application on the mirror server and verified that the service is operating in mirror mode.
**IMPORTANT**

Mirroring is a one way replication from the primary server to the mirror (secondary) server. To keep the primary and mirror servers in sync it is important that you not operate the application from the mirror server.
Section V: Managing the Universal Driver Heavy

What the Universal Driver Heavy Does

In normal operation, all table and record modification requests that are sent to the Primary Server are mirrored on the Mirror Server. Exceptions to this can be specified. See “Exempting Files from Mirroring” in the Technical Information Section. This does not mean a 2nd copy of OpenInsight is running on the Mirror Server, but instead, all file changes get mirrored. An included OpenInsight Application, called the Universal Driver Heavy (UDH) Manager controls these settings.

Manual or Timed “Pause”

When selected manually, or at specified times, the Primary Server will “pause” the mirroring to the Mirror Server. During this time, all table and record modification requests sent to the Primary Server will be saved to local journal files on the Primary Server. By default these journals are located in the Universal Driver Heavy directory.

Important: Transaction data (record contents and tables) is NOT written into these journal files. The journaling mode is designed to allow for clean backups of the mirror server.

The transition from mirror to journal mode is transparent to the clients and can be done at any time. However, it is recommended to only journal during off-peak times. Journaling during peak hours is possible but it will take longer for the mirror server to catch up to the primary server.

Communication (or other) Failure with the Mirror Server

Should the Primary Server be unable to communicate with the Mirror Server, the Primary Server will automatically “fall over” into journal mode. An entry in the log file and the error log file will indicate that this has happened, and a notification may be sent (depending on the settings in the Universal Driver Heavy Manager). When the error has been remedied, the user may press the APPLY button on the “Mirroring” tab in the Universal Driver Heavy Manager and the Primary Server will attempt to replay the journal files. Please see “Journal Replay” later in this document. Note: this default “fall over to journaling” behavior may be altered in the Universal Driver Heavy Manager.

Journal Replay

The journal replay process operates by starting an internal thread to read the journal files. The journal files are stored as a linked list in a FIFO (first in first out) queue. The START file indicates the first UDJRL* file to replay to the mirror server. At the end of the file a link to the next UDJRL* file directs replay to the next file. This continues until the END file is reached.

When the Universal Driver Heavy (UDH) service starts or is changed from journaling to mirroring mode it checks for the existence of files named START and END inside the UDH directory. These files are renamed to _START and _END to flag the journals are being processed and a UDCRIT.LOG file is created. The _START file directs the UDH to the first journal file to read and replay to the mirror server. If enough free memory is available the UDH will read several journals into memory before replaying the transactions to the mirror server. As the journal files are replayed they are deleted from the directory.

During the replay process new transactions are recorded in journal files at the end of the journal file list. The last journal file link is updated with the new journal file name and the new journal file now points to the END file. When the UDH has caught up to the new transactions entering the journal files it will stop creating journal files and change to mirror mode. The _START, _END, UDJRL*, and UDCRIT.LOG file are removed if the journal replace was successful.

The UDH.LOG file contains any errors or warnings during journal replay. Fatal errors replaying to the mirror server will cause the primary server to change from replaying mode back to journal mode.
IMPORTANT: The state of the mirror server is not consistent until all of the journal files are replayed and the primary server is in mirror mode.

Optimized Journal Replay
The UDH has the option to Sort & Process Journal files to minimize bandwidth during journal replay. This option should only be used if you are directed to by Revelation Software or your VAR.

At primary server startup, or when mirroring mode has been “unpaused”, the Universal Driver Heavy service will search for any journal files. If any files are found, a separate internal “journal replay” thread will be invoked to “replay” these entries to the Mirror Server. The next several paragraphs discuss the events during journal replay.

When the journals are ready to be replayed from the Primary Server to the Mirror Server, the special files START and END are renamed _START and _END. An internal flag is set so that the system knows there are no START records anymore. When a new transaction comes in during journal replay mode, the system first generates a new journal file name, and (since this is marked as the first journal to be created) a new START record is generated, thus beginning a new ‘chain’ of journal files while the old chain is being processed.

At the end of journal file replay, if there have been no errors, the journal thread checks for a file named START record that might have been generated during the duration of the replay; if found, the cycle continues, copying the START and END to _START and _END, as described in the last paragraph.

If for any reason the journal replay fails, any transaction information that has been read into memory but not successfully processed must be written out so it can be replayed at a later date. Therefore, the system creates a new journal file containing all the unprocessed transactions currently in memory. It then updates the current START and END records to include the new journal file, and any journal files that were left in the _START through _END chain. Thus, at the end of the unsuccessful replay, there will be a new START and END chain, containing all records that hadn't been processed, or that were processed but not transmitted to the BOIS. Mirroring will be disabled until the error(s) have been resolved.

1. Whenever the journal thread is in an uninterruptible state, an indicator that the journal thread is in a ‘critical section’ is set (the file UDHCRRIT.LOG will be placed into the journal directory);
2. The journal files are copied over to internal names for the Universal Driver Heavy to process;
3. Each journal file is “optimized” (redundant transactions are “compressed” into a single action);
4. Each action in the optimized journal file is invoked on the Mirror Server;
5. The internal journal files are deleted.

Should any communication (or other) errors be encountered during the replay process, the remainder of the journal information is rewritten so that, when the error is fixed, journal replay may be attempted again.

During journal replay, any ongoing table or item updates are journaled to their own journal files. When journal replay is complete for the current set of journal files, the Universal Driver Heavy service checks again for more journal files; if any are found, journal replay begins on that set of files (this behavior continues until, at the end of journal replay, no new journal files are found). Note that journal replay is designed to occur during lower-activity hours; performing journal replay during very high Primary Server activity may result in very long journal replay times.

At the start of the journal replay, the Universal Driver Heavy service will also check for the existence of the ‘critical section’ indicator, and any internal journal files. The presence of either of these indicates that a journal replay was interrupted before completion. At this point, journal replay – and journaling itself – cannot continue, as the state of the Primary Server in relation to the Mirror Server is unknown. Copying the Primary Server to the Mirror Server, and clearing these journal files, is the recommended solution for bringing the two systems back “in synch” at this point.
**Journal Replay Summary**
When in journaling mode database actions are recorded in files named UDJRL*. These files are present only when in journal and journal replay mode. If the check box “Sort & Process Journal” is enabled you may notice files named _UDJRL* appear.

---

<table>
<thead>
<tr>
<th>Summary of Journal Files</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the Universal Driver Heavy (UDH) directory contains files named UDJRL* the service is either journaling or replaying journal files.</td>
</tr>
<tr>
<td>Files named _UDJRL* in the UDH directory are being optimized for replay.</td>
</tr>
<tr>
<td>The file UDHCRTIT.LOG indicates the journaled files are now optimized and are being written to the mirror server. The service is attempting to change from replay mode into mirroring mode.</td>
</tr>
</tbody>
</table>
Universal Driver Heavy Console

Management of the parameters of the Universal Driver Heavy can be done almost exclusively from the UDH Server Manager Console application. This application is installed on the Primary Server where the Universal Driver Heavy is installed. By default, the path to this application is \Revsoft\Universal Driver Heavy\LH Manager. A shortcut is placed in “Start > Programs > Universal Driver Heavy > Universal Driver Heavy Manager”. By default, this application is exempted from mirroring to the Mirror Server.

When you open the program, you will start at the “Current Status” screen:

This screen provides information on the number of Active Sessions on the Primary Server, as well as the systems that are connected to the Primary Server.
The Mirroring Tab allows you to set up parameters for dealing with loss of synchronicity between the Primary Server and the Mirror Server. Here is a list of the options and what they refer to:

**Mirroring Status** – There are 3 possible states for the UDH to be in: mirroring, journaling, or replaying. When journaling is selected, the Primary Server will stop mirroring data on the Mirror Server and begin journaling on the Primary Server.

When Mirroring is selected the replay process will begin. Any data that is journaled on the Primary Server will be replayed to the mirror server. The icon will change to “Journaling” while this takes place. If the replay process is successful the icon will indicate “Mirroring” otherwise it will change back to “Journaling” if unsuccessful.

The Three Different States of the Mirroring Status Icon
Scheduled Backup of Mirror Server – Use this option to specify a time frame when the Universal Diver Heavy should automatically change to journaling mode. During this time frame the mirror server’s backup can backup files without the risk of accessing an open file. The LH Server Manager Console must be running on the Primary Server for scheduled journaling to occur.

IMPORTANT: The state of the mirror server is not consistent until all of the journal files are replayed and the status indicator shows “Mirroring”. The scheduled backup should be done during off-peak hours. Time in journaling mode should be minimized to ensure the mirror server returns to consistency.

Mirror Monitor/Alert Routine – This allows you to set an alert in the case of a loss of synchronicity between the Primary Server and the Mirror Server. From the drop down, select either Send Email or No Action. If you choose Send Email, you will need to configure specific settings in the Error Email Information tab.

Journal File Name - When the Primary Server journals, it creates journal files no larger than 999KB. By default, the journal will be created in the Universal Driver Heavy subdirectory beginning with the name listed. It will increase sequentially, starting with “0”. For example, UDRJNL0, UDRJNL1 etc.

Error File Path – This is the directory in which the Universal Driver Heavy error log will be written.

Mirror Error Action – The action to take when there is a loss of synchronicity between the Primary Server and Mirror Server. Choices are “Journal on Error” (by default), or “Send Error and Halt”. This will stop any data mirroring between the Primary Server and the Mirror Server. Please note – setting the action to “Send Error and Halt” will halt the writing of data on both the Primary and Mirror servers.

Mirror Address – Specifies the IP address of the Mirror Server and the port that it is using for its installed copy of the Universal Driver.

Sort & Process Journal – If checked, this option performs journal optimization. For most sites, this optimization does not provide any benefit and may actually reduce performance. Only select this option if instructed by Revelation Software or your VAR.

Remember that you will need to hit the “Apply” button in order for any changes to take place.
The Locks Screen

The Locks screen lets you examine what locks are held and who is holding them. To remove the lock, highlight the record key and click the Unlock button.
The Error Email Information tab allows you to configure who will receive an email in the event that there is a break in the synchronicity between the Primary Server and the Mirror Server. The data on the screen can only be modified if the Mirror Monitor/Alert Routine on the Mirroring Tab is set to “Send Email”.

An email message will not be sent if the Primary Server is journaling during a scheduled backup. Messages will only be sent if the communication between the primary and mirror services is broken.

The SMTP Server field is the SMTP server that you use for outgoing mail. This will vary based on your mail configuration and ISP, so please consult your Network Administrator for that information. The Username and Password fields may not need to be filled in – again, consult with your Network Administrator.

The To and From fields, on the other hand, will need to be filled in with a valid email address.

The content of the Subject and Body fields can be modified to suit your requirements. Lastly, the Timer Refresh Rate sets the frequency at which the LH Manager scans the communication between the two servers for issues.

Important: In order for the LH Server Manager Console to email error messages, it will need to be running. If the LH Server Manager Console is not running, mirroring and journaling will occur – but no email error messages will be sent.
The Log File Tab

The Log File information tab will allow you to view the log file that gets created when the status of the Universal Driver Heavy changes. It will also allow you to clear the log if it grows too large. It is important to keep an eye on the size of the log file. Under normal operations it will not grow rapidly, but if you do change the status of the Universal Driver Heavy with the LH Server Manager Console often, it will eventually grow large in size.
Controlling the Universal Driver Heavy from a Script

The status of the Universal Driver Heavy can be changed from a script. This is useful if you want to script the backup or if you cannot leave the Universal Driver Manager program open on the console. The RevCmd.exe program is a wrapper to OpenInsight for executing OpenInsight programs. RevCmd.exe is included as part of the OpenInsight installation and is not included with the UDH setup files. This command must be executed from the server, not a workstation.

Structure of the commands:

```
<OIPath>\revcmd\revcmd –a <appname> -u <username> -p <password> -e <LHManager> -r "<command>"
```

For example, to turn on journaling issue the command:

```
C:\OInsight\revcmd\revcmd –a SYSPROG –u SYSPROG –p SYSPROG –e "c:\RevSoft\Universal Driver Heavy\UDH_Manager" –r "CHANGEUDH 1"
```

The command “CHANGEUDH 1” is executed inside OpenInsight and revcmd terminates.

To switch to normal (mirroring) mode, execute “CHANGEUDH 0”:

```
C:\OInsight\revcmd\revcmd –a SYSPROG –u SYSPROG –p SYSPROG –e "c:\RevSoft\Universal Driver Heavy\UDH_Manager" –r "CHANGEUDH 0"
```

The execution of the script continues after the CHANGEUDH routine finishes. Execution does not pause until the UDH completely changes states. For example, the command “CHANGEUDH 1” to change to journal mode may return immediately but the UDH may remain in mirror mode for a short while until it gracefully closes connections and open files on the mirror server.
Section VI: Technical Information

Alternative Data structures with the Universal Driver Heavy

In the installation of the Universal Driver Heavy in Section II, it was assumed that your copy of OpenInsight or Advanced Revelation stored their data directly below the application. This will not always be the case. In many instances, you may want your data to be located parallel to your Revelation application, or in another directory entirely. For convenience, we will call this “hiding” your data.

In simplest terms, to hide your data, you will need to create a registry entry that allows your OpenInsight or Advanced Revelation application to recognize where your hidden data resides.

In the case of your data falling under the C:\Revsoft\OpenInsight\Data structure, there is a Revparam in the \Revsoft\OpenInsight that is controlling all the access to the data and subdirectories in the \OpenInsight directory.

If your application is in the C:\Revsoft\OpenInsight directory, but your data resides in the C:\Hidden directory, you need to make it possible for the Universal Driver Heavy to recognize where the C:\Hidden directory is.

Using the example above you would:

1. Create a REVPARAM in the C:\Hidden directory with the contents

   ServerOnly=1
   TcpIpPort=\Your TcpIpPort here>

2. Go to the registry entry for the Universal Driver Heavy:

![Registry Entry](image)

The revparam that re-routes the data to C:\Hidden
For 32-bit Operating Systems:
HKEY_LOCAL_MACHINE → SOFTWARE → Revsoft → Revelation Universal Driver Heavy → 4.7 → Shares

For 64-bit Operating Systems:
HKEY_LOCAL_MACHINE → SOFTWARE → Wow6432Node → Revelation Universal Driver Heavy → 4.7 → Shares

Under "Shares" create a new string value - give it a descriptive name, like "AppData". The value data should be the path to where the data is - in this case, "C:\Hidden".

3. Create a subdirectory under C:\Revsoft\OpenInsight\Hidden. Leave it empty, except for a single revparam file with the following contents:

```
ServerOnly=1
ShareName=AppData
ServerName=<IP address of current Server>
NamedPipeName=None
TcpIpPort=<Whatever TcpIpPort is specified for the Universal Driver on this Server>
```

4. Restart the Service and you will be able to attach any tables in the C:\Hidden directory.
It is vital that however that the organization of your Revelation application directories on the Primary Server is mirrored on the Mirror Server. There are two differences to take note of. On the Mirror Server, you need to specify the TcpIpPort of the Mirror Server and not the Primary Server. In the registry on the Mirror Server, it will be listed as the Universal Driver, not the Universal Driver Heavy.

**REVPARAM redirects are incompatible with the following actions:**

- VerifyLH and FixLH Routines
- OSRead/OSWrite (to the data volume)
- OpenInsight Copy_Table Function
- AREV MAKETABLE, COPYTABLE, and DELETETABLE

Features in the application that require use of the above functions should connect to a shared network drive.

**Exempting Files from Mirroring**

Not all files need be mirrored from the Primary Server to the Mirror Server. An example of this is the LH Server Manager Console. It is installed on the Primary Server to control the Universal Driver Heavy. Since the Universal Driver, not the Universal Driver Heavy, is not installed on the Mirror Server, any changes made in the LH Server Manager Console do not need to be replicated to the Mirror Server.

The installation of the Universal Driver Heavy flags the LH Server Manager Console as an application that is excluded from mirroring. In order to flag other applications or directories, you need to manually modify the registry.

For 32-bit Operating Systems:
START ➔ RUN ➔ REGEDIT ➔ HKEY_LOCAL_MACHINE ➔ SOFTWARE ➔ REVSOFT ➔ UNIVERSAL DRIVER HEAVY ➔ 4.7 ➔ “ExcludedPaths”

For 64-bit Operating Systems:
START ➔ RUN ➔ REGEDIT ➔ HKEY_LOCAL_MACHINE ➔ SOFTWARE ➔ Wow6432Node ➔ REVSOFT ➔ UNIVERSAL DRIVER HEAVY ➔ 4.7 ➔ “ExcludedPaths”

You can add to the “ExcludedPaths” directory. Restart the Service, at which point the directories listed in there will not mirror to the Mirror Server.

**Uninstalling the Universal Driver Heavy or the Universal Driver**

Go to the Add/Remove screen on your Windows Server. Select the Revelation Universal Driver Heavy from the Programs list. Click the Remove button. You should reboot your server to remove any cached information.
Command Line Parameters for LH47Heavy.exe

`LH47Heavy.exe`, the file used to control the Revelation Universal Driver Heavy, can accept parameters when used from the command line. The format for using these parameters is as follows:

`LH47Heavy.exe <parameter>`

**LH47 Heavy Command Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create</td>
<td>Creates the service and adds it to the list in the Server Management Services dialog box.</td>
</tr>
<tr>
<td>Start</td>
<td>Starts the Revelation Universal Driver Heavy. This command requires that the service already be created.</td>
</tr>
<tr>
<td>Install</td>
<td>Creates and starts the Revelation Universal Driver Heavy.</td>
</tr>
<tr>
<td>Stop</td>
<td>Stops the Revelation Universal Driver Heavy.</td>
</tr>
<tr>
<td>Delete</td>
<td>Removes the Revelation Universal Driver Heavy from the operating system and the Services dialog box.</td>
</tr>
<tr>
<td>Remove</td>
<td>Stops the Revelation Universal Driver Heavy and removes it from the operating system and the Services dialog box.</td>
</tr>
<tr>
<td>Pause</td>
<td>Temporarily pauses the execution of the Revelation Universal Driver Heavy.</td>
</tr>
<tr>
<td>Continue</td>
<td>Continues the execution of the Revelation Universal Driver Heavy after it was paused.</td>
</tr>
<tr>
<td>Status</td>
<td>Reports the operational state of the Revelation Universal Driver Heavy. The states can be: Not created The Revelation Universal Driver Heavy has not been created and isn’t recognized by the operating system. Created The Revelation Universal Driver Heavy has been created and is listed in the Server Management Services dialog box. Running The Revelation Universal Driver Heavy has been started and is running. Paused The Revelation Universal Driver Heavy has been paused.</td>
</tr>
<tr>
<td>Debug</td>
<td>Starts the Revelation Universal Driver Heavy as a Windows 2008, 2003, 2000 or NT server console application that displays a log of the work performed by the service. If the Revelation Universal Driver Heavy is already running, all users must log out of their OpenInsight/Advanced Revelation applications, then the service must be stopped before starting it using the debug parameter. The following keystrokes are used to control the service while in console mode: p Pauses the Revelation Universal Driver Heavy. C Continues the service. CTRL C Stops the Revelation Universal Driver Heavy. Q Stops the Revelation Universal Driver Heavy.</td>
</tr>
</tbody>
</table>
Log Files

By default, there are two different log files that the Universal Driver Heavy uses to track incidents and errors. Reviewing these logs if you have a problem mirroring or running can greatly aid in the trouble shooting process.

The udh.log is a log file that is created in the Universal Driver Heavy subdirectory. It keeps track of the starts and stops of the UDH on the Primary server, as well as if the data is mirroring or journaling, or if the journaling process completed successfully. Looking at the bottom of the log file will display the latest message from the Universal Driver Heavy.

The udmerr.log is a log file whose name and location is defined in the LH Server Manager Console. This is a log that is generated when the data between the Primary Server and the Mirror Server is out of synch. If you receive an error in this log when configuring your Primary and Mirror Servers, there is a mismatch between the two applications.

If you receive an error in this log while running the Primary and Mirror Servers, you may receive an email message if you configured the LH Server Manager Console to send emails when it encounters an error. The contents of this log will give you a description of what error has occurred. It is best that you resolve this error in order to keep your data in sync.

Development vs. Runtime Systems

There are considerations you need to pay attention to depending if you are running the Universal Driver Heavy in a Development system vs. a Runtime system. The Mirror server may or may not be an exact duplicate of the Primary Server. The Universal Driver Heavy only transfers changes to Linear Hash files. As a result, it is not possible for every action that can be done in OI on the Primary Server to move to the Secondary Server. For instance, if you create a new application on the Primary Server, you will need to manually copy the .DBT file created for the new application over to the Secondary Server. The same will happen with new data directories that are copied into the OpenInsight directory tree from another location. It is recommended that when making substantial development changes to an application on the Primary Server, you copy OpenInsight to the Secondary Server. The need to do this may not exist with your runtime application.

It is recommended that when making certain changes to an application on the Primary Server, you copy OpenInsight to the Secondary Server. Such changes are:

- Creating an Application
- Add an MFS
- Remove an MFS
- Attaching a new BFS or table type
- Performing a task that changes the DBT
- Creating a new directory in OpenInsight
- Applying an RDK

To copy the application from the primary to the mirror server you can follow the directions in “Recovering From Replay Errors”.

Recovering from a Hardware Failure

In the event the Primary Server fails you should perform these steps in order to get your Revelation application up and running on your Mirror Server. These steps assume your primary server has crashed and is off-line:
- Verify the REVPARAM file on the mirror server has the correct IP address and TCP port for the mirror server.

- Redirect the users shortcut's or drive mappings from the primary server to the mirror server.

When the primary server is rebuilt you will need to go through the steps of setting up the primary server with the exception that you will copy the OpenInsight system from the mirror server.

IMPORTANT
Mirroring is a one way replication from the primary server to the mirror (secondary) server for linear hash files only. It is important to keep your mirror server up to date. See “Development vs. Runtime Systems” for information about changes that require updating on the mirror server.

Recovering From Replay Errors
If an action is performed to the application environment (applying an RDK, moving data volumes, etc) the Universal Driver Heavy Manager may get stuck in journal mode if it can’t resolve the actions on the mirror server. If you cannot recover from the replay errors and the manager remains in journal mode the situation may require you to re-copy the application to the mirror server.

These directions will walk you through copying the application back to the mirror server and clear the journal files on the primary server.

1. Close all instances of OpenInsight, AREV, and the Universal Driver Manager.
2. Stop the Linear Hash Heavy service on the primary server and change the “Startup type:” from Automatic to Manual.
3. Stop the Linear Hash service on the mirror server and change the “Startup type:” from Automatic to Manual.
4. Rename the directory on the mirror server where the OpenInsight application is stored.
5. Reboot the primary server.
6. Copy your application from the primary server to the mirror server.
7. Change the REVPARAM file on the mirror server’s application(s) to reflect the mirror server’s TcpIpPort and IP address.
8. On the Primary Server, rename or delete the following files in the Universal Driver Heavy Directory:
   - udmerr.log
   - UDLOG
9. Delete the following files from the Universal Driver Heavy directory:
   - START
   - END
   - _START
   - _END
   - JRNL*
   - _JRNL
   - UDCRIT*
10. Start the Linear Hash service on the mirror server and change the “Startup type:” back to Automatic.
11. Start the Linear Hash Heavy service on the primary server and change the “Startup type:” back to Automatic.

12. Confirm that the Universal Driver Manager can open and indicates the service is operating in mirror mode.

13. Confirm that the application launches from the primary server.

14. Delete the renamed copy of your application on the Mirror Server.

After completing these steps you have placed a new copy of your application on the mirror server and reset the Universal Driver Heavy journal.

Possible Errors in the Event Log

Depending on the nature of the errors some errors will be logged to the Windows Application Event Log. This section describes how to interpret the information from the events. Under normal circumstances errors should not appear in the event viewer.

Below is an example error event.

Event Type: Error
Event Source: LinearHashHeavy
Event Category: None
Event ID: 30000
Date: 1/23/2009
Time: 5:20:05 PM
User: N/A
Computer: QUEEN
Description: The description for Event ID (30000) in Source (LinearHashHeavy) cannot be found. The local computer may not have the necessary registry information or message DLL files to display messages from a remote computer. You may be able to use the /AUXSOURCE= flag to retrieve this description; see Help and Support for details. The following information is part of the event: LHDeleteFile, Error Code: 1102, File C:\Revsoft\ArStress\Arev31\LHSTRESS\REV3900539005 (0), Group 0.

The critical information from the event log errors appear at the end of the event. In the example above the important text is bolded. The error code referenced correlates to the FS errors listed in the Programmers Reference help file. In this example situation you would look for FS1102 and be able to determine that this was a resource in use error during a file delete operation.
Additional Registry Settings

Changes to the registry require a restart of the universal driver service to take effect.

**JournalBatchLimit**
Maximum numbers of journal to ‘batch’ process together. The default is 100. Add a DWORD file to the registry of type decimal.

**ReplayDelay**
This is the number of milliseconds to delay on ‘foreground’ process when doing journal replay in ‘background’ thread. The default is 10. Add a String Value to the Registry.

**LogWarning**
Enable this value to show a warning message in the UDH log file if a journal contained a record that was not found in the system during replay. Normally this situation is not an error. It indicates the record was deleted by a client before the journal finished processing. If records are missing from the mirror server this setting will help determine if the primary server was unable to read the record or considered it deleted. Make a DWORD entry with the value of 1 to enable. A value of 0 or no entry will disable the warnings. Default is 0.

Universal Driver Heavy Worksheet

IP Address of the Universal Driver Heavy Primary Server: ________________________________

TcpIpPort of the Universal Driver Heavy on the Primary Server: ________________________________

Path to the Revelation Application on the Primary Server: ________________________________

IP Address of the Universal Driver Heavy Secondary Server: ________________________________

TcpIpPort of the Universal Driver Heavy on the Secondary Server: ________________________________

Path to the Revelation Application on the Secondary Server: ________________________________
Appendix A: Error messages in the UDH.log

- **CONTROL: Switch mirror ON** - received when the UDH Manager sends the command to turn on mirroring
- **CONTROL: Switch mirror OFF** - received when the UDH Manager sends the command to turn off mirroring (and turn on journaling)
- **Journal thread starting** - issued when the journal thread begins to look for any files needing replay
- **Mirror in backup** - cannot replay any journal files yet - If the journal thread sees that the mirror is in 'backup' state, we can't replay any journals yet
- **ERROR - MUTEX FAILED** - this is an interprocess communications error, and should never occur
- **ERROR - MUTEX RELEASE FAILED** - same as above
- **No START journal file found - in synch** - The journal thread did not encounter any START or _START files waiting to be processed
- **Starting to process journal files** - A START file has been found, so journal replay will begin
- **PENDING** journal files found: starting to process - An _START file was found, meaning that journal replay had been previously interrupted. These will be processed first, and then any START file found will be processed afterwards
- **WARNING: no existing _START pointer; using _END pointer** - after exiting from the optimisation loop due to error or maximum number of journal files processed, we must create new START and END records for the rest of the journal files that remain unprocessed. This message is generated if we can't find an _START file to "hook into" the new START and END chain
- **Journal replay finished** - one pass through the journal files (from START to END) has been completed
- **Journal replay failed** - recreating journal - an error occurred during the journal replay, so a new set of journal files has been created to include the journal information that did not get processed
- **Journal thread terminating** - all START and _START files have been found and processed, or an error occurred which makes journal processing impossible
- **Freeing optimised journal memory** - after a pass through the journal files (from START to END) has been completed, the optimised list of records to replay (held in memory) must be freed
- **Freed <xx> files and <xx> records** - the result of freeing the memory
- **ERROR *** ERROR *** Allocation error in JournalLinkAddItem (Create) in MirrorOptimiseJournal** - the server has run out of memory during the optimisation process. Reduce the maximum number of journals to process.
- **ERROR *** ERROR *** Allocation error in JournalLinkAddItem (Delete) in MirrorOptimiseJournal** - same as above
- **ERROR *** ERROR *** Allocation error in JournalLinkAddItem (Write/Delete) in MirrorOptimiseJournal** - same as above
- **ERROR *** ERROR *** Allocation error in JournalLinkAddItem (Clear) in MirrorOptimiseJournal** - same as above
- **PRIMARY server has encountered a problem** - when updating a record or file on the POIS, an error occurred. Mirroring is now disabled.
- **Previous replay interrupted, Cannot continue** - the 'critical file' (UDHCRIT) was found at the start of the journal replay thread; this shows that a previous journal replay was interrupted but not cleaned up properly. The POIS and BOIS will be out of synch
- **ERROR *** ERROR *** Expected journal file NOT FOUND in MirrorOptimiseJournal** - the journal thread did not find a particular journal file, when the Optimisation routine was called that file was no longer found. This error should not occur
- **FAILURE in LHInitialize in MirrorReplayJournal/Initialization** - the POIS could not communicate with the BOIS when journal replay began
- **FAILURE in LHOpenSession in MirrorReplayJournal/Initialization** - same as above
- **FAILURE in JournalParseFileName in MirrorReplayJournal/File Init** - the POIS could not convert a local file name into the appropriate file name and path on the BOIS during journal replay
- **FAILURE in LHOpenFile in MirrorReplayJournal/File Init** - the POIS could not open the appropriate file on the BOIS during journal replay
- **FAILURE in LHGetFileHeader in MirrorReplayJournal/JOURNAL_CMD_CREATE_FILE** - Unable to read table parameters from POIS table (needed to create new table on BOIS) during journal replay
- FAILURE in LHCreateFile in MirrorReplayJournal/JOURNAL_CMD_CREATE_FILE - Unable to create desired table on BOIS during journal replay
- FAILURE in LHGetOpenFile in MirrorReplayJournal/JOURNAL_CMD_CREATE_FILE - Unable to open newly-created table on BOIS during journal replay
- FAILURE in LHDeleteFile in MirrorReplayJournal/JOURNAL_CMD_DELETE_FILE - Unable to delete table on BOIS during journal replay
- FAILURE in LHWriteRecord in MirrorReplayJournal/JOURNAL_CMD_WRITE - Unable to update record in table on BOIS during journal replay
- FAILURE in LHDeleteRecord in MirrorReplayJournal/JOURNAL_CMD_DELETE - Unable to delete record in table on BOIS during journal replay
- FAILURE in LHClearFile in MirrorReplayJournal/JOURNAL_CMD_CLEAR - Unable to clear table on BOIS during journal replay
- ERROR *** ERROR *** Could not create JournalThread *** ERROR *** ERROR - Server unable to start up journal thread. Should not occur.
- ERROR *** ERROR *** Memory allocation failed during JournalLinkFindFile *** ERROR *** ERROR - Server unable to allocate memory. Should not occur.
- ERROR *** ERROR *** Memory allocation failed during JournalLinkAddItem *** ERROR *** ERROR - Server unable to allocate memory. Should not occur.
- Error in LHCreateFile (MIRROR) - Unable to create table on BOIS while mirroring
- Error in LHCreateFile/MirrorParseFileName (MIRROR) - Unable to convert local file name into appropriate file name and path on BOIS while mirroring
- Error in LHDeleteFile (MIRROR) - Unable to delete table on BOIS while mirroring
- Error in LHDeleteFile/MirrorParseFileName (MIRROR) - Unable to convert local file name into appropriate file name and path on BOIS while mirroring
- Error in LHOpenFile (MIRROR) - Unable to open table on BOIS while mirroring
- Error in LHOpenFile/MirrorParseFileName (MIRROR) - Unable to convert local file name into appropriate file name and path on BOIS while mirroring
- Error in LHWriteRecord (MIRROR) - Unable to write record in table on BOIS while mirroring
- Error in LHDeleteRecord (MIRROR) - Unable to delete record in table on BOIS while mirroring
- Error in LHClearFile (MIRROR) - Unable to clear table on BOIS while mirroring