



GENESIS64 - Redundancy Setup Options



APPLICATION NOTE

September 2013

Description: Guide to setting up GENESIS64 redundancy.

OS Requirement: Vista x64/ Windows 7 x64/ Windows 8 x64/ Windows Server 2008 x64/ Windows Server 2008 R2 x64/ Windows Server 2012.

General Requirement: GENESIS64 v10.80 installed.

Introduction

Redundancy support is installed as part of the full GENESIS64 installation. With an appropriate license, it allows you to run GENESIS64 servers and clients in redundant mode such that if a primary server becomes unavailable the project will automatically continue running on the secondary server and all clients will re-connect to the secondary server for data. This protects against losing valuable production data and operability.

GENESIS64 redundancy supports OPC standards, increasing the reliability and availability of OPC data by allowing multiple OPC servers to be configured into redundant pairs. These redundant OPC server pairs appear as a single OPC server to any OPC client application. Redundancy can be added to an existing OPC server/client application without reconfiguring those applications. The only required action is a restart of the FrameWorX64 Server after setting the redundancy options.

To set up GENESIS64 redundancy you must have the clients and servers connected via a network, ready to be configured as redundant machines. All machines in the redundancy project should have their clocks synchronized. For detailed instructions to achieve this please refer to the Application note entitled *GENESIS64 - Synchronizing Machine Time*.

GENESIS64 supports redundancy for 64-bit client applications (GraphWorX64, AlarmWorX64, and TrendWorX64). It also supports the following OPC servers in both 64-bit and 32-bit:

- Classic OPC DA (any platform)
- OPC UA (any platform)
- Classic OPC HDA with TrendWorX32 Server (from GENESIS32 version 9, 32-bit)
- OPC UA HDA with Hyper Historian (64-bit)
- Classic OPC AE
- AlarmWorX64 Logger

NOTE: The TrendWorX64 Logger does not support redundancy.

This means that in GENESIS64 you can set up redundant servers for:

- Data redundancy (OPC DA, UA)

- Alarm redundancy (OPC AE)
- Historical redundancy using Hyper Historian (OPC HDA, UA HDA)

Classic OPC Redundancy

Classic OPC redundancy works with the 64-bit and 32-bit OPC servers listed below. To set up redundancy for classic OPC servers you define one or more node pairs. A node pair specifies the primary server and the redundant (secondary) server. Use the steps in section "Setting Up Classic OPC Redundancy" to set up redundancy for the following servers:

- AlarmWorX64 Server
- AlarmWorX64 Logger
- Generic OPC DA Servers

NOTE: For more information about Classic OPC DA redundancy settings see the application notes entitled, *DataWorX32 Professional - Getting Started with Redundancy* and *DataWorX32 Professional - Recommended Redundancy Settings*, which are available on the Customer Connection Portal.

OPC UA Redundancy

OPC UA redundancy works with the 64-bit and 32-bit OPC servers listed below. Use the steps in section "Setting up OPC UA Redundancy" section to set up redundancy for the following types of servers:

- UA (Data Access) Servers (like the ICONICS OPC Server Suite v5.x or Hyper Historian UA HDA)

NOTE: OPC UA redundancy works with OPC UA for Data Access and Historical OPC UA servers. Alarms & Conditions OPC UA Servers are not supported.

Best Practice for Setting up Redundancy

Follow up these steps for setting up redundant servers.

1. Install GENESIS64 on the primary and secondary servers. You must use the same GENESIS64 version (including the same Hot Fix Pack) and same operating system. ICONICS recommends Windows 2008 R2 64-bit.
2. Set up the client machines. See the section entitled, "Setting up Client Machines" for instructions for setting up thick or thin clients.
3. Set up your network. For increased reliability, your network should also be redundant. This can be accomplished by



adding a second NIC (Network Interface Card) to the server machines and setting up the machines to handle the redundant NICs via a MAC bridge. Alternatively, there may be special NIC cards available that have dual Ethernet ports or driver based redundancy. In any case, your switches, routers, and hubs should be also redundant and interconnected by redundant data cables.

4. Set up the firewalls. See the application note entitled *GENESIS64 - Communication through a Firewall, DMZ or Cloud*.
5. Activate and check the license on the server for a redundancy bit. Go to the MonitorWorX Viewer → Licensing tab → GENESIS64 tab and look for the item called, "GENESIS64 Redundancy".
6. Set up the configuration databases. You have following possible ways to store the configuration databases:
 - a. Central SQL Server – the primary and secondary servers will read their configurations from this one central SQL Server. This is the recommended scenario, because it avoids issues with synchronizing configurations.
 - b. Separate SQL Servers – the primary and secondary servers will have separate SQL Servers for their configurations. You will need to keep the databases synchronized between the two SQL Servers, usually with backup and restore operations after any changes.

NOTE: It is very important that separate SQL Server configuration databases remain identical. Databases that become out of sync may cause problems with redundancy.

7. Set up the primary server. See the sections entitled, "Setting up Classic OPC Redundancy" and "Setting up OPC UA Redundancy".
8. Set up the secondary server by copying all of the completed primary server configuration databases to the secondary SQL server (if you are using separate SQL Servers) or connecting the secondary server to the central configuration databases, then making the database active. You can need to use the backup and restore features in SQL Server Management Studio to copy the databases if you have separate SQL Servers. See the section entitled, "SQL Server Backup and Restore".
9. Set up the client machine. See the section entitled, "Setting up Client Machines".
10. Synchronize the clocks. See the application note entitled, *GENESIS64 – Synchronizing Machine Time*.
11. Restart all machines. This includes the primary server, secondary server, and clients.
12. Run a quick redundancy test. See the section entitled, "Testing the Redundant Servers".

Setting up Classic OPC Redundancy

1. Open Workbench and select the **FrameWorX Server** provider from the Project Explorer.
2. Expand your sever name → Classic OPC and double-click on **GenBroker**. GenBroker will open with its Channels tab showing.
3. Click on the **Redundancy Node Pairs** tab. On this tab, you will identify the primary and secondary servers for your Classic OPC data.

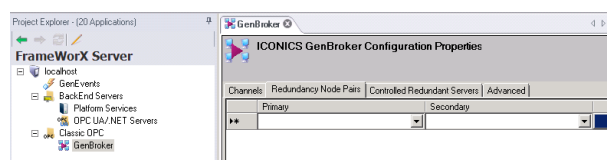


Figure 1 - Setting up Primary and Secondary Redundant Servers

4. Specify the Primary Server in the Primary column.
5. Specify Secondary Server in the Secondary column.
6. For each pair, click the Node Pair Properties button to set the node's properties. In most cases these can be left at the defaults.

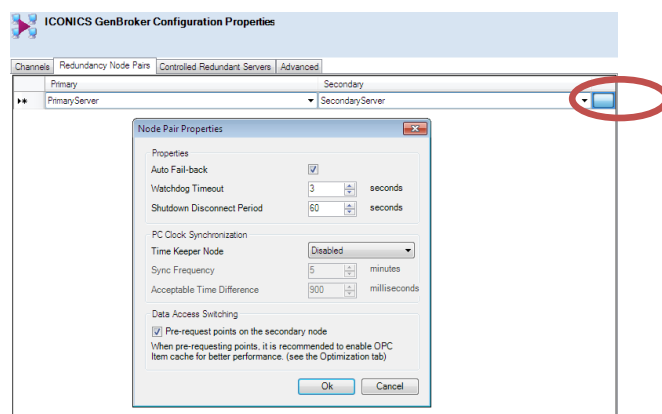


Figure 2 – Node Pair Properties

7. Repeat steps 4-6 for each Primary-Secondary pair of machines hosting your Classic OPC Servers.
8. Click on "Apply" when you are done.
9. Restart the server.

NOTE: For details about setting up Classic OPC redundancy including OPC DA and ICONICS AlarmWorX32 Server and AlarmWorX32 Logger please refer to the GENESIS32 Application note entitled *DataWorX32 Professional – Getting Started with Redundancy* and *DataWorX32 Professional – Recommended Redundancy Settings*, available on the Customer Connection Portal. The same settings apply for the AlarmWorX64 Server.



Setting up OPC UA Redundancy

1. Open Workbench and select the **FrameWorX Server** provider from the Project Explorer.
2. Expand your sever name → BackEnd Servers and double-click on **OPC UA/.NET Servers**.
3. For each OPC UA server pair, entering the Server Name. This name will be used for browsing redundant OPC UA data points.

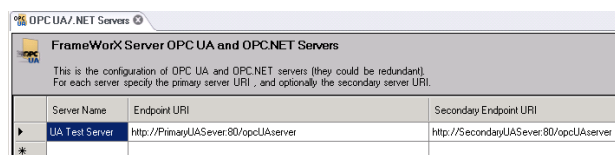


Figure 3 - Setting up Redundant UA Servers

4. Specify the Primary server in the **Endpoint URI** column.
5. Specify the Secondary server in the **Secondary Endpoint URI** column.
6. Restart the server.
7. Now open the Data Browser from GraphWorX64 and you can browse for the OPC UA redundant points by going to Home → OPC UA Server → the server name you defined in step 3.

Setting up Client Machines

Client machines connect to the GENESIS64 servers and read OPC data as well as security, licensing and other information. There are two different kinds of GENESIS64 client machines with respect to the communication settings configuration: thick clients (GENESIS64/.NET clients that have the GENESIS64 software installed) and thin clients (WebHMI/Silverlight clients that use Internet Explorer).

Thick (GENESIS64/.NET) Client Settings

1. On the thick client, open Workbench and in the Tools ribbon click on the FrameWorX Server button.
2. This opens a dialog where you can specify your Primary and Secondary GENESIS64 server nodes, using HTTP, WS HTTP, or NET.TCP communication channels, as depicted in picture bellow. (Change the "PrimaryServer" and "SecondaryServer" placeholders to match your actual server node names.)

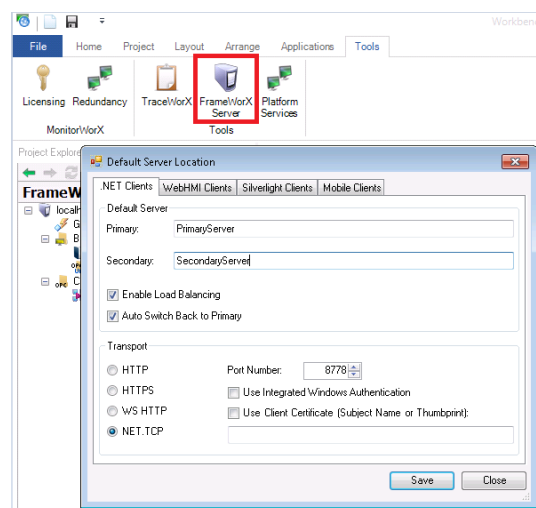


Figure 4 - Setting up Default FrameWorX Server Location

3. Also note that **"Auto Switch Back to Primary"** can be enabled as to redirect all clients back to the Primary server from Secondary when the Primary server is available again.
4. For details about GENESIS64 server load balancing please refer to application note *GENESIS64 – Load Balancing*.

Thin (WebHMI/Silverlight) Client Settings

1. On the Primary and Secondary redundancy servers, open Workbench and in the Tools ribbon click on the FrameWorX Server button.
2. Select the WebHMI Clients or Silverlight Clients tab, depending on your type of clients, and configure your primary and secondary server node names.

NOTE: For IIS redundancy settings refer to following application note - *WebHMI - Server Redundancy via Network Load Balancing*, available on our Customer Connection Portal.

Testing the Redundant Servers

If you are using the ICONICS OPC Server Suite in a redundancy scenario then both copies of the OPC Server Suite should be using the same .opf configuration file. If both OPC Server Suites are using their own copy of the file, this file must be kept identical. ICONICS recommends using a central data source for both servers, when possible, so that both servers will always be using the same exact configuration. Note that this central data source must be on a third (highly available) machine. If it is kept on the same machine as one of your redundant servers then you risk both OPC servers becoming unresponsive if the machine that holds the configuration becomes inaccessible.



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This applies to alarm servers and data loggers as well. If you are using redundant AlarmWorX64 Servers, for example, you should make sure that both AlarmWorX64 Server instances are using identical copies of the configuration database or that they are both using the same database hosted on a (highly available) third machine.

NOTE: If your configurations on the primary and secondary servers are different, you will experience unpredictable behavior. Therefore, if you keep the configurations in separate databases, please make sure that you update both when you make changes, and that the updates are exactly the same on both databases. The easiest way to make sure they are identical is to back up the updated configuration database from the Primary server and restore on the Secondary server (or vice versa) as you make changes.

When you are ready to test your redundancy you can use GraphWorX64 on a client machine. For the simplest test, browse a point in OPC server. For Classic OPC redundancy, the syntax for this point must start with the Primary server name. For example, if you are using the simulated Sine tag, your tag path should be similar to one below, where "PrimaryServer" is either the name of your primary computer or its IP address.

@\\PrimaryServer\\ICONICS.SimulatorOPCDA.2\\Numeric.Sine.Value

For OPC-UA redundancy open the Data Browser from GraphWorX64 and browse for the OPC UA redundant points by going to Home → OPC UA Server → the server name you defined section "Setting up OPC UA Redundancy".

You can test the redundancy by shutting down the primary server. Observe that the client machine's data source will switch to the secondary server, continuing to display valid data. Also notice the active server changes in Redundancy Viewer of the client machine.

MonitorWorX Viewer

To open the Redundancy Viewer, open the MonitorWorX Viewer and select the Redundancy tab.

Here you can observe states of redundant ICONICS Servers and all OPC DA servers (both Classic and UA, including third party servers). The Redundancy Viewer also allows you to switch the states of the above mentioned OPC servers between Active and Secondary in real-time. This is mainly useful for planned maintenance on the server machines.

You can right-click on a server and select "Make Active" to change the active server.

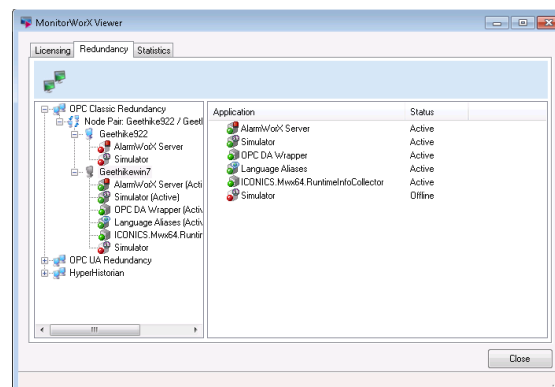


Figure 5 - Checking Redundancy Servers

NOTE: For more information about the MonitorWorX64 and monitoring tags see application note GENESIS64 – Using MonitorWorX Runtime Tags.

Online Configuration Changes

If you are using central configuration database, you don't need to take special care of the synchronization between configuration databases on the redundant nodes. Most of the servers support online changes (Hyper Historian, AlarmWorX64 Server, etc.), which means that you don't need to restart them after a change is made.

If you are using two different configuration databases (each redundant server is using own configuration database) you need to synchronize both databases after each change. The best way how to achieve this is to make the change on the Primary machine, make backup of the configuration database and move to the Secondary Server and restore (or vice versa). After this, restart Secondary Server or all ICONICS servers, so they can re-read the configuration database(s).

SQL Server Backup and Restore

GENESIS64 stores its configuration databases in SQL Server. You can use the backup and restore features of SQL Server to move configuration from one GENESIS64 server to another GENESIS64 server.

The following steps describe how to backup and restore databases in SQL Server 2008 R2 using MS SQL Server Management Studio:



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1. Open SQL Server Management Studio on the machine where you want to back up the configuration database. Log in as a user that is as sysadmin, or has been granted the db_backupoperator role for the configuration database in question.
2. Select database you want back up. Right-click on it and select Tasks → Back Up.
3. Choose a destination for the backup file, or leave it with the default.
4. Click OK. The backup file will be created
5. Take the backup file and copy it to the machine where you want to restore it.
6. Open SQL Server Management Studio. Log in as a user that is a sysadmin, dbcreator, or (if the database already exists) has dbowner permission for the configuration database in question.
7. Right-click on the Databases and select Restore Database.
8. Type the name of the database into the To Database field.
9. Check the "From device" checkbox and browse for the backup file.
10. After you add the backup file it will appear in the bottom window. Check the Restore checkbox and click OK.