

Description: Guide to setting up GENESIS64 redundancy

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 FrameWorX 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)

FrameWorX Server Redundancy

FrameWorX Server redundancy is used to establish a redundant pair of FrameWorX machine nodes. This allows for data point and subscription requests made through FrameWorX node names to be made in a redundant fashion using an aliased node name. Use the steps in the section “Setting up FrameWorX Redundancy” to set up redundancy for the following servers:

- FrameWorX Server

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 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, Service Pack, Update Pack, and Emergency Patches) and the same operating system. ICONICS recommends Windows Server 2012 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 Network Interface Card (NIC) 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 – see the application note, "GENESIS64 – High Availability Redundancy Solution".
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 the 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 by connecting the secondary server to the central configuration databases, then making the databases active.

You will 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 machines. 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 FrameWorX Redundancy

1. Open **Workbench** and navigate to **Platform Services** → **FrameWorX** → **Network Settings** → **FrameWorX Network** in the **Project Explorer**.
2. For each FrameWorX server pair, enter the **Server Name**. This name will be used for browsing redundant FrameWorX data points.
3. Specify the primary server in the **Primary Machine Name** column.
4. Specify the secondary server in the **Secondary Machine Name** column.
5. Optionally select to **Auto Switch to Primary**.
6. Restart the server.

Full Path: MyProject/Platform Services/FrameWorX/Network Settings
Configure the (redundant) FrameWorX servers connected to the local FrameWorX server.

Server Name	Primary Machine Name	Secondary Machine Name	Auto Switch To Primary
+ Click here to add new item			
ServerName	PrimaryServer	SecondaryServer	☒

Figure 1 – Setting up Redundant FrameWorX Servers

Setting up Classic OPC Redundancy

1. Open **Workbench** and navigate to **Platform Services** → **FrameWorX** → **Network Settings** → **GenBroker64 Network** in the **Project Explorer**.
2. Click on the **Redundancy Node Pairs** tab. On this tab, you will identify the primary and secondary servers for your Classic OPC data.

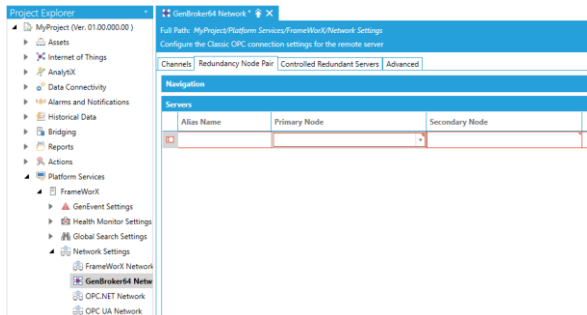


Figure 2 - Setting up Primary and Secondary Redundant Servers

- For each classic OPC server pair, enter the **Alias Name**. This name will be used for browsing redundant classic OPC data points.
- Specify the primary server in the **Primary** column.
- Specify the secondary server in the **Secondary** column.
- Repeat steps 3-5 for each primary-secondary pair of machines hosting your classic OPC Servers.
- Click on "Apply" when you are done.
- 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 notes 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

- Open **Workbench** and navigate to **Platform Services** → **FrameWorX** → **Network Settings** → **OPC UA Network** in the **Project Explorer**.
- For each OPC UA server pair, enter the **Server Name**. This name will be used for browsing redundant OPC UA data points.

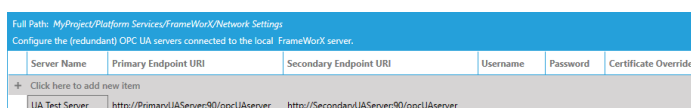


Figure 3 - Setting up Redundant UA Servers

- Specify the primary server in the **Primary Endpoint URI** column.
- Specify the secondary server in the **Secondary Endpoint URI** column.

- If security is enabled on the OPC UA Server, enter the appropriate **Username**, **Password**, and any necessary **Certificates**.
- Restart the server.
- Now open the **Data Browser** from **GraphWorX64**. 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

- On the thick client, open **Workbench** and in the **Tools** ribbon click on **FrameWorX Server Location**.
- This opens a dialog where you can specify your primary and secondary GENESIS64 server nodes, using HTTP, HTTPS, WS HTTP, or NET.TCP communication channels, as depicted in Figure 4. Change the **PrimaryServer** and **SecondaryServer** placeholders to match your actual server node names.

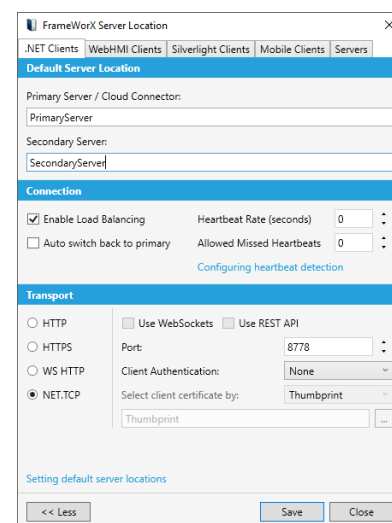


Figure 4 - Setting up Default FrameWorX Server Location

3. Also note that “**Auto Switch Back to Primary**” can be enabled to redirect all clients back to the Primary from the Secondary when the Primary server is available again.
4. For details about GENESIS64 server load balancing please refer to the 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 **FrameWorX Server Location**.
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 the 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.

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 a simple test, browse to

a point in the 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 server 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 in the 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. You can also see the active server changes in the **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 the states of the 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 standby 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.

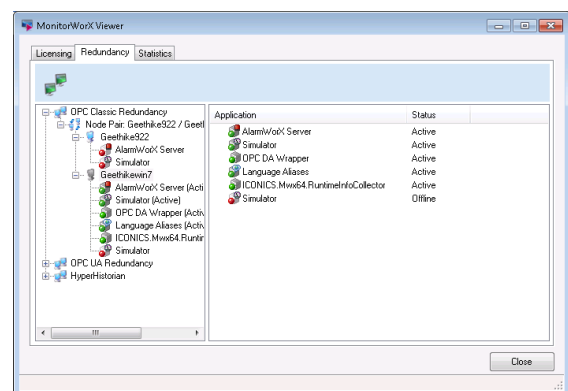


Figure 5 - Checking Redundancy Servers

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

Online Configuration Changes

If you are using a 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 its own configuration database), then you need to synchronize both databases after each change. The best way to achieve this is to make the change on the Primary machine, make a backup of the configuration database, and move to the Secondary Server and restore it (or vice versa). After this, restart Secondary Server or all ICONICS servers, so that 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 databases from one GENESIS64 server to another GENESIS64 server.

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

1. Open **SQL Server Management Studio** on the machine where you want to back up the configuration database. Log in as a user that has the sysadmin server role, or has been granted the db_backupoperator role for the configuration database in question.
2. Select the database you want to 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 db_owner permission for the configuration database in question.
7. Right-click on **Databases** and select **Restore Database**.
8. Type the name of the database into the **To Database** field.
9. Check **From device** 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**.

How to configure AlarmWorX64 Multimedia Faux Redundancy

AlarmWorX64 Multimedia does not officially support redundancy, but it can be paired with redundant AlarmWorX64 Servers so that each AlarmWorX64 Multimedia instance only sends out messages when its paired AlarmWorX64 Server is active. If the AlarmWorX64 Servers fail over, the AlarmWorX64 Multimedia servers will fail over as well.

To enable this feature, go to this location and edit lcoSetup64.ini:

C:\ProgramData\ICONICS

If you do not find the lcoSetup64.ini file in this location, search the C: drive for this file.

Set these INI entries:

[AWX32\AWXMMX32]

FauxRedundancy=1

FauxNodeName=MyNodeName

Replace **MyNodeName** with the node name of the AlarmWorX64 Server with which you'd like to pair this AlarmWorX64 Multimedia server. If AlarmWorX64 Multimedia and AlarmWorX64 Server are on the same machine, you'll want to use the local machine name.

Then, in the subscription(s) of each AlarmWorX64 Multimedia instance, only subscribe to the primary server. Explicitly subscribe to the primary node name from your node pair (in other words, don't leave the node name blank). Both AlarmWorX64 Multimedia servers should be looking at the primary server of the node pair, just like if you were subscribing with an AlarmWorX64 Viewer in a redundant scenario.

After you've made those changes, stop each AlarmWorX64 Multimedia instance and clear the journal table.