



# GENESIS64 – High Availability Redundancy Solution



## APPLICATION NOTE

August 2014

**Description:** Guide to configuring High Availability infrastructure  
**OS Requirement:** Windows Server 2012 / Windows Server 2012 R2

**General Requirement:** Appropriate Hardware and familiarity with GENESIS64 Redundancy concept

### Introduction

Certain critical processes require that a High Availability SCADA solution is available to ensure control of the process is maintained even through infrastructure failure.

GENESIS64™, being a web-based SCADA application requires little configuration to enable it for such a scenario. The following article describes the minimum steps required to configure this solution, based on off-the-shelf hardware components and built-in features of Windows Server 2012 Standard Edition.

### System Requirements

In order to provide a high availability solution, high availability infrastructure is required. The infrastructure for the example is defined below:

- 2 switches (allows for switch failure)
- Dual port, or 2 separate Network Interface Cards in each server (allows for NIC failure)
- Domain-connected machines
- SCADA servers running Windows Server 2012, either on host, or virtualised.

The resulting setup should have no single point of failure for the hardware as shown below. This can be replicated for the PLC network by adding 2 additional NIC's to the servers and connecting them to the PLC network.

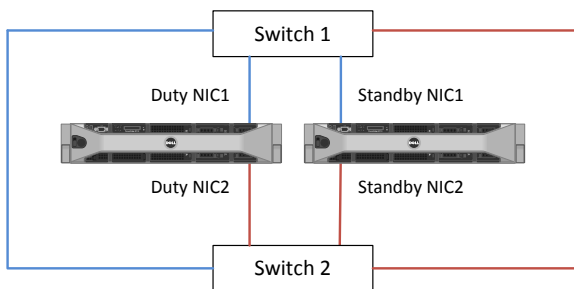


Figure 1 - Network infrastructure

### Server Configuration

Once your servers are installed with Windows Server 2012, ensure that they are connected to the domain, and you are logged on with a domain account that has local administrator privileges. It is assumed that you have the required roles and features installed to install GENESIS64, including Application Server Role, Web Server Role and .NET Framework 4.5 feature and Process Activation feature.

The first step is to name your network interfaces, as this will make it easier to work with. In this example, adapters are named NIC1 and NIC2 as shown below.



Figure 2 - Network interfaces

### NIC Teaming

Using a standard feature of Windows Server 2012, the 2 NIC's can then be teamed to form one logical adapter. Create and name your team by configuring the 2 adapters following the wizard.

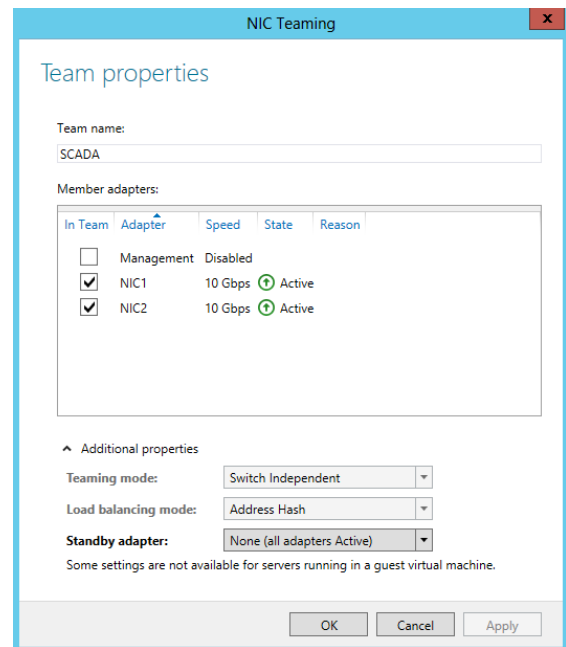


Figure 3 - NIC Teaming

For best performance, select both adapters as active.

**NOTE:** Certain options are not available when in a virtual environment, such as Teaming Mode and Load Balancing Mode. The defaults are preferred anyway.



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Once configured, the team should look as below.

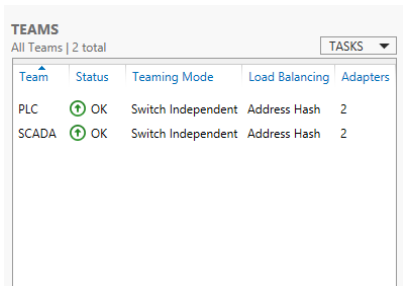


Figure 4 - NIC Teaming

Once configured, a new adapter will appear in your adapter list as below.

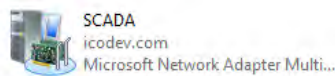


Figure 5 - Network adapter

Configure it for a static IP address. In this example, the Duty SCADA (icodutyscada) is assigned 10.0.0.2 and the Standby SCADA (icostandbyscada) is assigned 10.0.0.3.

Ensure that you are able to ping each server and test the team by disabling switches or disconnecting network cables and verify that the ping remains successful.

Once verified, install GENESIS64 as normal on both servers.

## Network Load Balancing

The key aspect of GENESIS64 is that all services run through IIS, and so this needs to be configured for High Availability as well. Luckily, Network Load Balancing (NLB) is available natively in Windows Server 2012 Standard Edition as well.

To configure NLB, first install the feature on both servers via the Server Manager as shown below.

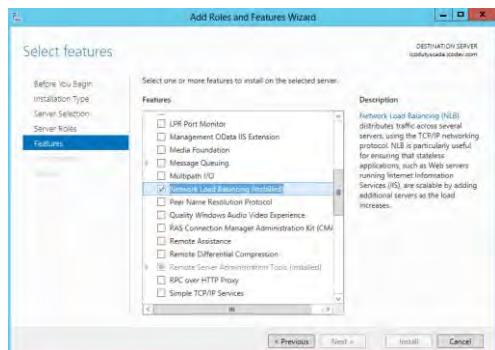


Figure 6 - Install NLB

In order for NLB to function, the clients need to access a common IP Address, which is different to either primary or secondary servers. In this example, 10.0.0.10 will be used with the name scada.

First, start the NLB manager and configure a new cluster. Add the dutyscada as the first node, and specify the details of the clustered host name and IP Address as shown in the example below.

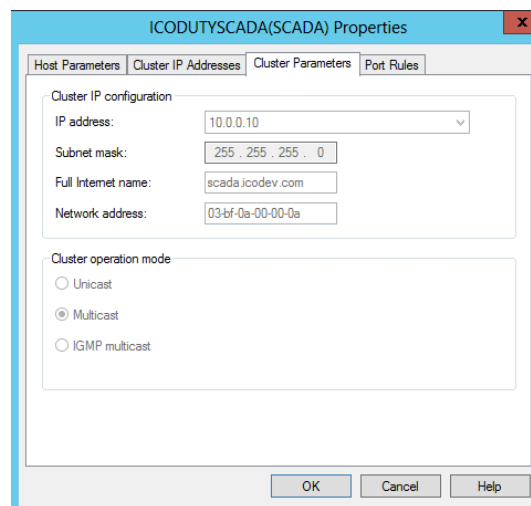


Figure 7 - Configure cluster

**WARNING:** Ensure to set Cluster Operation Mode to Multicast, rather than the default of Unicast. The reason for this is that Unicast is not compatible with NIC Teaming.

Finally, for the port rule, configure as shown in the image below.

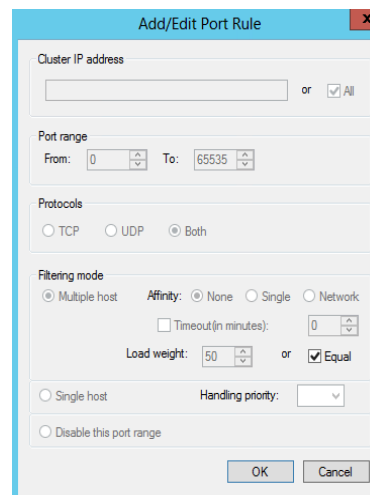


Figure 8 - Add/Edit port rule



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Ensure that Filtering mode is set to Multiple host (to allow the clients to fail over to the next host in the cluster), and set Affinity to None (to ensure that the failover is consistent without the clients trying to connect to a preferred host when it may be down. Finally, add the second node and ensure that the cluster is running as shown below.

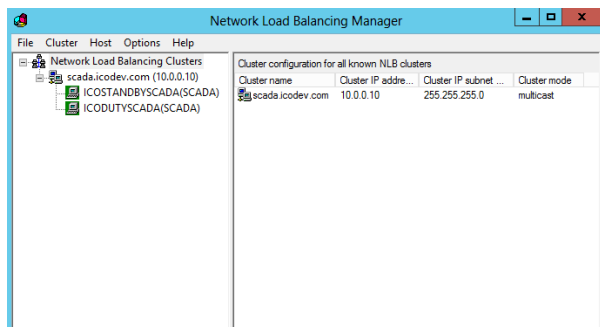


Figure 9 - NLB Manager

To test the cluster, from a client machine, ensure that you can ping the IP address (10.0.0.10) and hostname (scada) of the cluster. What you have now is a high availability server setup with a high availability web server.

### Configuring GENESIS64

Now that the server infrastructure is in place, configure your GENESIS64 application for redundancy as per other app notes.

It is important in this case that the redundancy configuration uses IP Addresses rather than node names if you have more than 1 NIC team configured. This is because you have multiple routes between the servers, and want to ensure that the redundancy status is based on the specific interface you configure.

This extends to alarm configurations where the subscription should be to the primary server by IP Address as shown below.

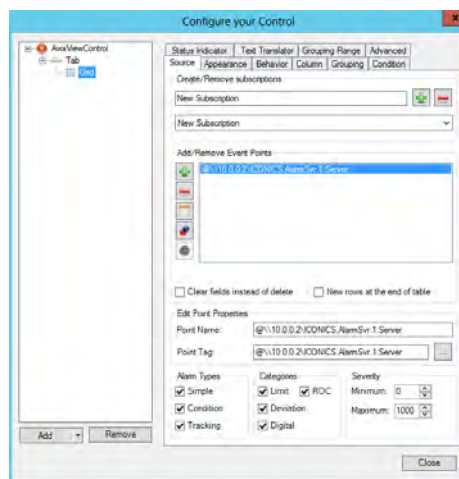


Figure 10 - Configure AWX Viewer

In the GenBroker™ redundancy configuration, ensure that you are using IP Addresses for the nodes as shown below. You are also able to update timeouts to quite a short period since your network infrastructure is highly available.

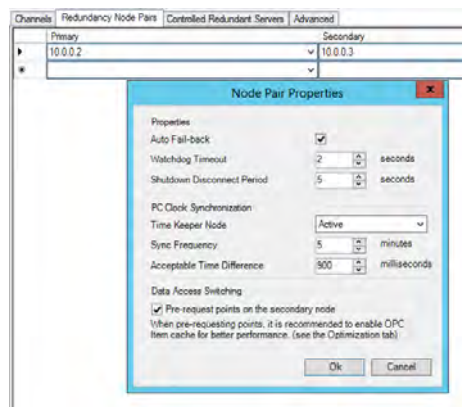


Figure 11 - Configure Node Pairs

It is important to ensure that the publishing path for the files on both servers is identical and that the files are identical on both servers. This is a 2 node example setup which does not rely on a separate front-end web server.

Finally, for page navigation in your GraphWorX64 displays, you are required to use the clustered host name or IP Address rather than the primary server as shown below.

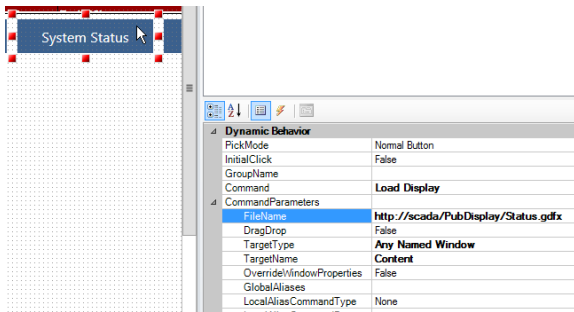


Figure 12 - Use clustered host name

This will ensure that when the primary IIS server fails, page navigation will continue by failing over to the secondary IIS server in the cluster. Alternatively, use relative paths only and set the path in the published html page as described below.

### Publish project

The final part of configuration that is required is to edit the .htm file that is created when publishing the pages from the primary server. Open the generated file that will reside in the location of your published GraphWorX64 displays and change the node name to the clustered host name (e.g. scada in this example) as shown below.

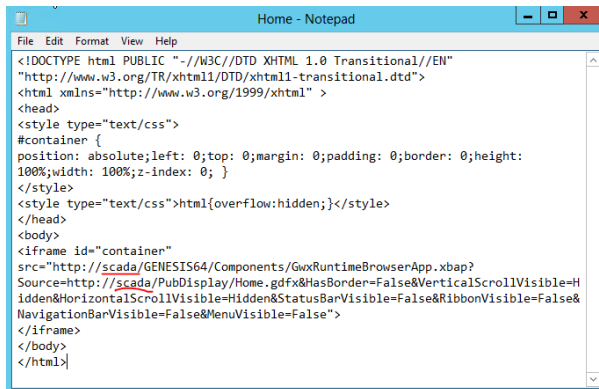


Figure 12 – Use clustered node name

Copy the file so that it is located on both the primary and secondary servers in the identical locations e.g. /PubDisplay/

### Test the Configuration

Now that the configurations are completed, reboot both servers and once alive, connect a client via the shared hostname (e.g. <http://scada/PubDisplay/Home.htm>) and verify that you are able to see the GraphWorX64 page.

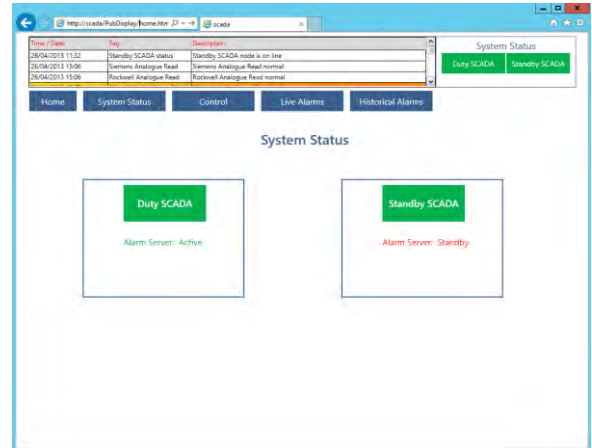


Figure 13 - Client page

Now, perform failure tests such as powering off a switch, disconnecting network cables, and rebooting duty SCADA or standby SCADA and you should not lose the ability to view data or navigate web pages from the client.