LinkMaster Help

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Introduction

LinkMaster is a fully-featured data-bridging product that is built upon Kepware Technologies' OPC client/server technology and demonstrates unparalleled compatibility and performance. It is a multi-threaded application that links data between OPC servers, and can act as an OPC-to-DDE converter for DDE Client Access.

LinkMaster has the capabilities of both a client and a server. As a client, it can access data from one or more OPC servers. As a server, it can collect, organize, and link data from other OPC servers and then offer that data to an OPC/DDE client. For example, some situations may require that data be transferred from one server component to another (or from one OPC client to another) when the two components were not designed for direct communications. LinkMaster solves this problem by acting as a universal go-between for OPC server and client components.

System Requirements

LinkMaster has minimum system requirements for both software and hardware that must be met in order for it to operate as designed. This application supports the following Microsoft Windows operating systems:

- Windows 7*
- Windows Server 2008/2008 R2*
- Windows Vista Business/Ultimate*
- Windows Server 2003 SP2*
- Windows XP SP2*
- Windows 2000 SP4

*When installed on a 64 bit operating system, the application will run in a subsystem of Windows called WOW64 (Windows-on-Windows 64 bit). WOW64 is included on all 64 bit versions of Windows and is designed to make differences between the operating systems transparent to the user.

LinkMaster requires the following hardware at a minimum:

- 2.0 GHz Processor
- 1 GB installed RAM
- 180 MB available disk space
- Ethernet Card

Components

LinkMaster implements client/server architecture. The components include Runtime, Configuration, and Event Viewer.

Runtime

The Runtime is the client/server component that starts as a service by default. Data clients can connect to the Runtime remotely or locally; likewise, the Runtime can connect to local or remote OPC servers.

Configuration

The Configuration is the client/user interface that is used to modify the Runtime's project. It can be launched by a single local user.

Event Viewer

The Event Viewer is a stand-alone event monitoring application that can collect information, warnings, and error events. It monitors and displays events that occur on the local Runtime. For more information, refer to **Options - Event Log**.

Process Modes

The Runtime's process mode can be changed; however, doing so while client/server connections are active will interrupt the connection for a short period of time. The modes of operation are System Service and Interactive.

System Service

By default, the Runtime is installed and runs as a service. When System Service is selected, the Runtime does not require user intervention and will start when the operating system opens. This provides user independent access to the Runtime by the clients/servers.

Interactive

When Interactive is selected, the Runtime will remain stopped until a client attempts to connect to it. Once started, it will run until all clients have disconnected and shutdown. The Runtime will also shutdown if the user account logs off the operating system.

Note: Interactive is required when a communication interface (such as DDE) must exchange information with the user desktop and the server is installed on Windows Vista, Windows Server 2008, or later operating systems. For more information, refer to **DDE**.

See Also: Options - Runtime Process

LinkMaster Features

Link Item Management

LinkMaster's link management system creates a link database structure that fits the nature of the application. Users can add multiple link groups and then assign them link items. LinkMaster's drag and drop editing and tag

browsing methods makes adding a large number of tags easy. For more information, refer to **How Do I... Drag and Drop Items**.

Interactive Updates

LinkMaster's Interactive Updates feature provide users with a detailed view of link information being handled by the Runtime. When enabled, link information will be displayed in both the Link Group View and Link Property View of the Configuration. Interactive Updates are enabled by default but can be controlled from the View menu option or by a button on the toolbar. For more information, refer **View Menu**.

Data Scaling

LinkMaster supports direct scaling of link item data. Scaling allows raw data to be converted to engineering units for OPC client applications. LinkMaster provides a number of unique scaling features, such as Linear and Square Root formula scaling. Users can also specify the range of the raw data input and the engineering range of the scaled value. In some cases, the raw data input received may exceed the range set for the raw data. If this occurs, the engineering value will be forced outside of the specified range. To prevent this, LinkMaster can clamp the scaled value to the engineering ranges. For more information, refer to **Link Item Properties - Scaling**.

Note: In most cases, it is assumed that a scaled value results in a floating-point number. LinkMaster doesn't make this assumption, and can select the scaled engineering value to be any valid OPC data type. This means users can scale a 16 bit integer value to a 32 bit integer value.

CSV Import and Export

LinkMaster supports the import and export of tag data in a Comma Separated Variable (CSV) file. When using CSV import and export, tags are created quickly and easily in the desired application. For more information, refer to **CSV Import and Export**.

Redundancy

LinkMaster supports the operation of two LinkMaster machines as a redundant pair. One LinkMaster machine will operate as the primary node and actively perform the link transfers while the other node operates as the secondary node. If the primary node fails, the secondary node will take over the role of the primary and perform the link transfers. When the primary node returns, the secondary node will stop the link transfers and let the primary node perform its operations. For more information, refer to **Options - Redundancy**.

COM and DCOM

OPC servers are based on Microsoft's COM technology and can share data with remote client applications using Distributed COM (DCOM). DCOM uses a single OPC server to provide data to client applications running both locally and on remote machines. LinkMaster allows remote access to the supported DDE formats using what is known as Net DDE. Net DDE allows a remote DDE client application to use the machine name of a remote DDE server when specifying a DDE link.

In terms of OPC connections, LinkMaster will properly configure the DCOM settings that allow remote OPC clients to access and browse. For DDE clients, LinkMaster will automatically start Net DDE services and register all of the required DDE shares, allowing remote DDE clients access to device data.

Note: Net DDE services are disabled by default because it can be time consuming to establish DDE share names for the application.

Interfaces and Connectivity

Client applications can use any of the following client/server technologies to simultaneously access data from the server. For more information on a specific interface, select a link from the list below.

OPC DA
DDE

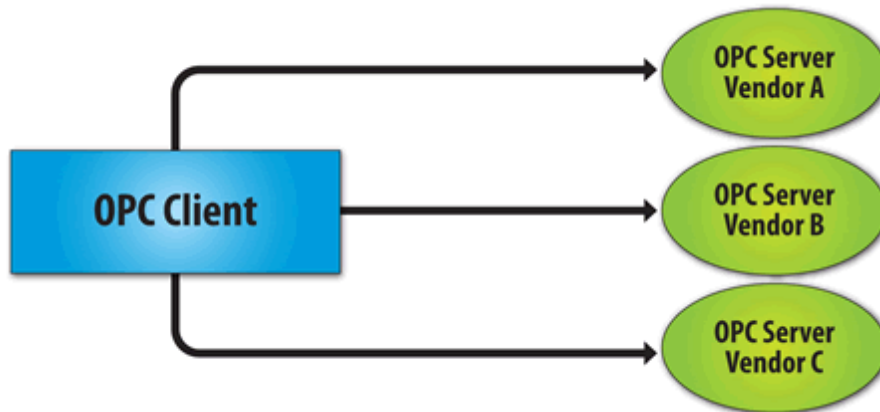## OPC DA

Supported Client/Server Technologies
1.0a
2.05a
3.0*

*3.0 is only supported by the OPC server interface.

Overview
"OPC" stands for Open Productivity and Connectivity in industrial automation and the enterprise systems that support industry. It is a client/server technology where one application acts as the server (providing data) and another acts as a client (using data).

OPC is composed of a series of standards specifications: OPC Data Access (DA) is the most prolific standard. OPC DA is a widely accepted industrial communication standard that enables data exchange between multi-vendor devices and control applications without proprietary restrictions. An OPC server can communicate data continuously among PLCs on the shop floor, RTUs in the field, HMI stations, and software applications on desktop PCs. OPC compliance makes continuous real-time communication possible (even when the hardware and software are from different vendors).

OPC Data Access 1.0a was the original specification developed by the OPC Foundation in 1996. Although it continues to be supported by many of the OPC client applications in use today, OPC Data Access 2.0 Enhanced OPC better utilizes the underlying Microsoft COM technology. OPC Data Access 3.0 is the latest version of the OPC DA interface.

DDE

Supported Formats
CF_Text
XL_Table
Advanced DDE
Network DDE

Overview
LinkMaster provides an optional DDE server interface that supports the following formats: CF_Text, XL_Table, and Advanced DDE. CF_Text and XL_Table are standard DDE formats developed by Microsoft for use with all DDE aware applications. Advanced DDE is a high performance format supported by a number of client applications specific to the industrial market. For more information, refer to **Project Properties - DDE**.

CF_Text and XL_Table

The DDE format CF_Text is the standard DDE format as defined by Microsoft. All DDE aware applications support the CF_Text format. XL_Table is the standard DDE format as defined by Microsoft that is used by Excel.

Advanced DDE

Advanced DDE is the DDE format defined by Rockwell Automation. Today, all Rockwell Client applications are Advanced DDE aware. Advanced DDE is a variation on the normal CF_Text format, which allows larger amounts of data to transfer between applications at higher rates of speed (and with better error handling).

Network DDE

Network DDE (Net DDE) is the standard for remote DDE connection as defined by Microsoft. It uses the CF_Text format. For more information, refer to **How Do I... Use Net DDE with LinkMaster**.
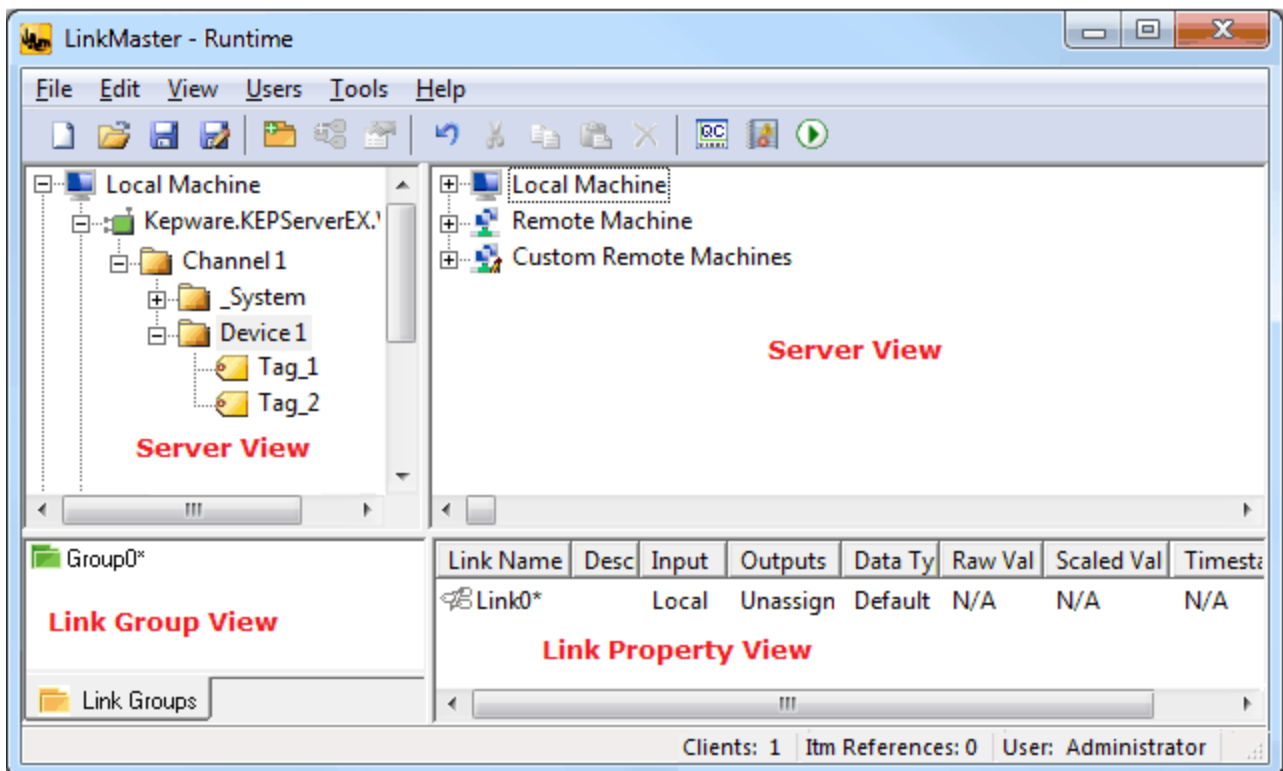
Requirements

In order for the DDE interface to connect with the server, the Runtime Process Mode must be set to Interactive.

See Also: Process Modes

Navigating the Configuration

The application Configuration is divided into four panes: the Server Views, the Link Group View, and the Link Property View.

Descriptions of the panes are as follows:

- **Server View:** This view displays the Local, Remote, and Custom machines available for connection. The upper left and right panes are identical, and display two different instances of the same object.
- **Link Group View:** This view displays all of the link groups that have been created in the project.
- **Link Property View:** This view displays the link items that belong to a selected link group.

See Also: Project Properties and **LinkMaster Options**.

Project Properties

To access the Project Properties tabs from the Configuration, click **File | Project Properties**. For more information, select a link from the list below.

Project Properties - DDE
Project Properties - OPC DA Settings
Project Properties - OPC DA Compliance

Project Properties - DDE

Because a number of applications require Dynamic Data Exchange (DDE) to share data, LinkMaster provides access to DDE applications that support one of the following DDE formats: CF_Text, XL_Table and Advanced DDE. CF_Text and XL_Table are standard DDE formats developed by Microsoft for use with all DDE aware applications. Advanced DDE is a high performance format supported by a number of client applications specific to the industrial market.
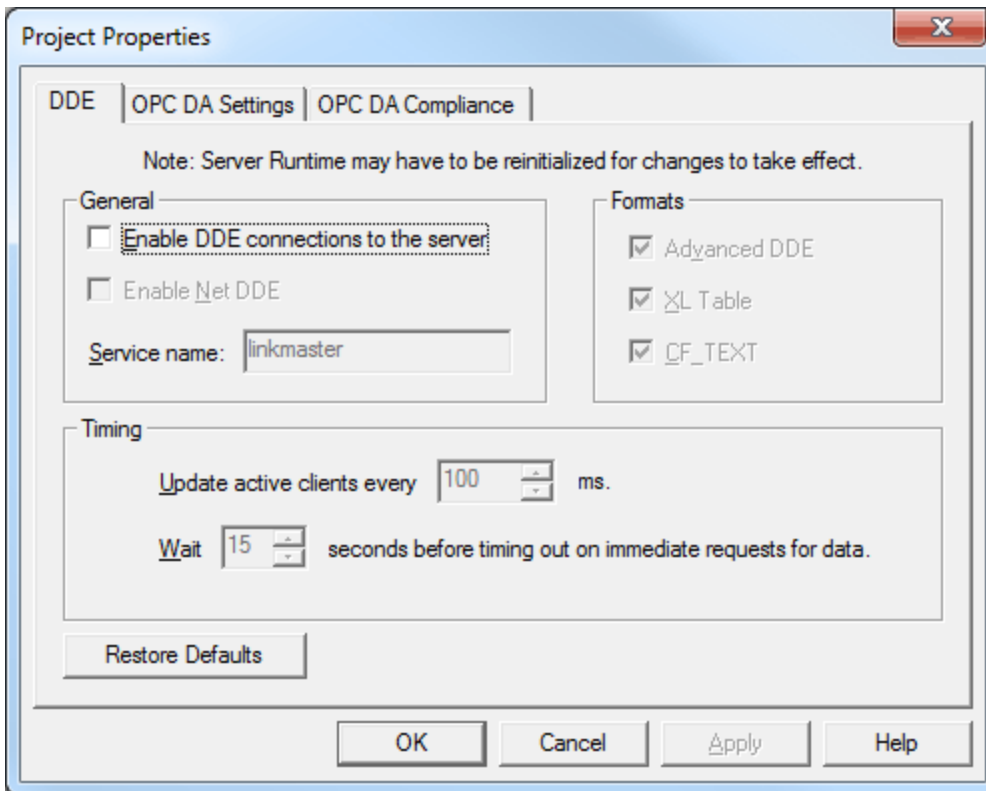
Descriptions of the parameters are as follows:

- **Enable DDE Connections to the Server:** When checked, this option enables the DDE server portion of the server. When unchecked, the server will not respond to any request for DDE data. The default setting is unchecked.

   Note: If intending to use the server only as an OPC server, users may want to disable DDE operation. Doing so can increase the data's security and improve the server's overall performance.
- **Enable Net DDE:** When checked, this option enables Microsoft's Net DDE services . The default setting is unchecked.

   Note: If intending to only use the server with local DDE client applications, users should keep Net DDE disabled. Starting the Net DDE services can be a time consuming process that can slow the startup of the server. Enabling Net DDE will cause the server to automatically register its share names and start the Net DDE service manager. The DDE shares will be removed when the server shuts down. For more information, refer to **How Do I... Use Net DDE with LinkMaster**.
- **Service Name:** This parameter specifies how the server will appear as an application name to DDE clients. This name will initially be set to allow compatibility with the previous versions of the server. Users that need to replace an existing DDE server can change the service name to match the DDE server that is being replaced. A string of 1 to 32 characters can be entered.
- **Formats:** This parameter specifies the DDE format to provide to client applications. All three formats are enabled by default. This is particularly useful for users experiencing problems connecting a DDE client application to the server: each of the DDE formats can be disabled to isolate a specific format for testing purposes.

   Note: Every DDE aware application must support CF_Text at a minimum.
- **Update Active Clients Every *x*:** This parameter batches up DDE data so that it can be transferred to client applications. When using a DDE format, performance gains only come when large blocks of server data can be sent in a single DDE response. To improve the ability of the server to gather a large block of data, the update timer can be set to allow a pool of new data to accumulate before a being sent to a client application. The valid range is 20 to 60000 milliseconds. The default setting is 100 milliseconds.
- **Wait *x* seconds before timing out on immediate requests for data:** This parameter specifies a timeout for the completion of DDE request. If a DDE client request (either a Read or Write operation) on

the server cannot be completed within the specified timeout, an error will be returned to the DDE Client. The valid range is 1 to 30 seconds. The default setting is 15 seconds.

- **Restore Defaults:** When clicked, this button will restore the parameters to their default settings.

Note: The Runtime may have to be reinitialized in order for changes to take effect.

Project Properties - OPC DA Settings

LinkMaster supports the OPC Foundation's Data Access Specifications for 1.0, 2.0, and 3.0 simultaneously. Although this provides the utmost level of compatibility, there may be times when forcing the server to use one method over another is necessary. The OPC DA Options dialog is used to make these selections.
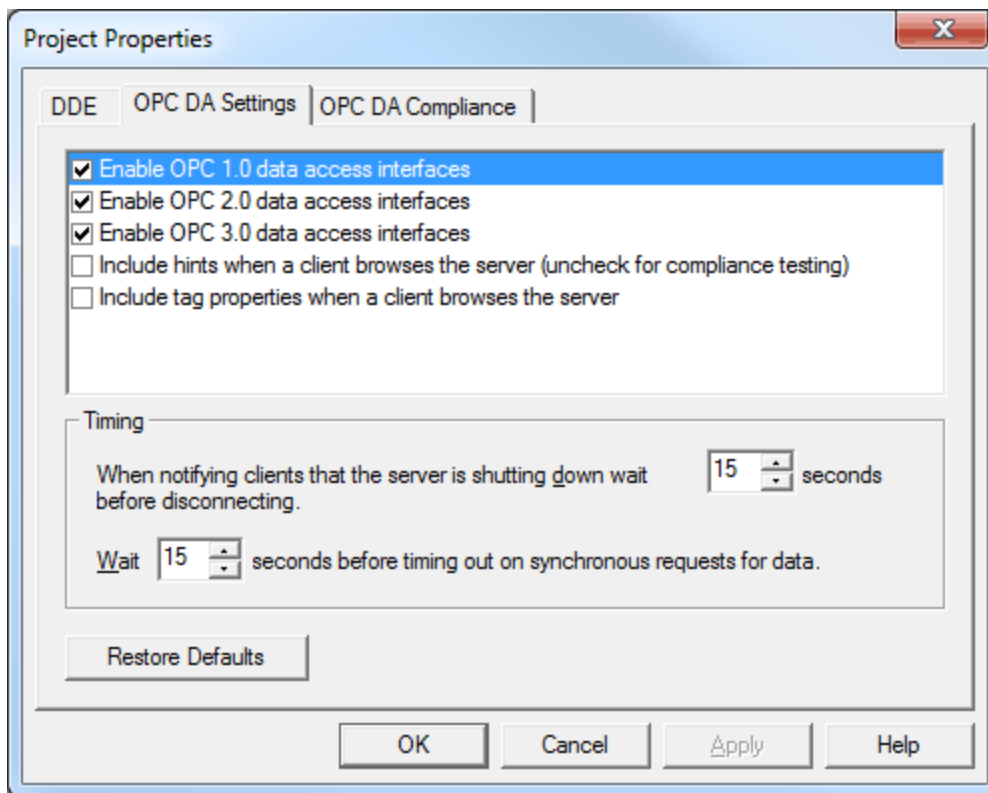
Descriptions of the parameters are as follows:

- **Enable OPC 1.0 data access interfaces:** When checked, this option allows the server to accept OPC client connections from OPC clients that support the 1.0 specification. The default setting is checked.
- **Enable OPC 2.0 data access interfaces:** When checked, this option allows the server to accept OPC client connections from OPC clients that support the 2.0 specification. The default setting is checked.
- **Enable OPC 3.0 data access interfaces:** When checked, this option allows the server to accept OPC client connections from OPC clients that support the 3.0 specification. The default setting is checked.
- **Include hints when a client browses the server:** When checked, this option allows OPC client applications to browse the address formatting Hints available for each communications driver. The default setting is unchecked.

    Note: Hints provide a visual quick reference of how a particular device's data can be addressed. This can be useful when entering Dynamic Tags from the OPC client. The hint items are not valid OPC tags. Some OPC client applications may try to add the hint tags to their tag database. When this occurs, the client will receive an error from the server. This is not a problem for most clients, although it can cause others to stop adding tags automatically or report errors. Users can prevent this from occurring by turning the hints On or Off.

- **Include tag properties when a client browses the server:** When checked, this option allows OPC client applications to browse the tag properties available for each tag in the address space. The default setting is disabled.

- **When notifying clients that the server is shutting down, wait *x* seconds before dis-connecting:** This parameter specifies how long the server will wait for an OPC client to return from the server shutdown event. If the client application does not return within the timeout period, the server will complete its shutdown and exit. The valid range is 10 to 60 seconds. The default setting is 15 seconds.
- **Wait *x* seconds before timing out on synchronous requests for data:** This parameter specifies how long the server will wait for a synchronous Read or Write operation to complete. If a synchronous operation is in progress and the timeout is exceeded, the server will force the operation to complete with a failure to the OPC client. This prevents OPC clients from appearing to become locked up when using syn-chronous operations. The valid range is 5 to 60 seconds. The default setting is 15 seconds.

Project Properties - OPC DA Compliance

The OPC DA Compliance option allows users to tailor the server's operation to better meet the needs of rare OPC clients. These options should not need to be adjusted for most OPC client applications.
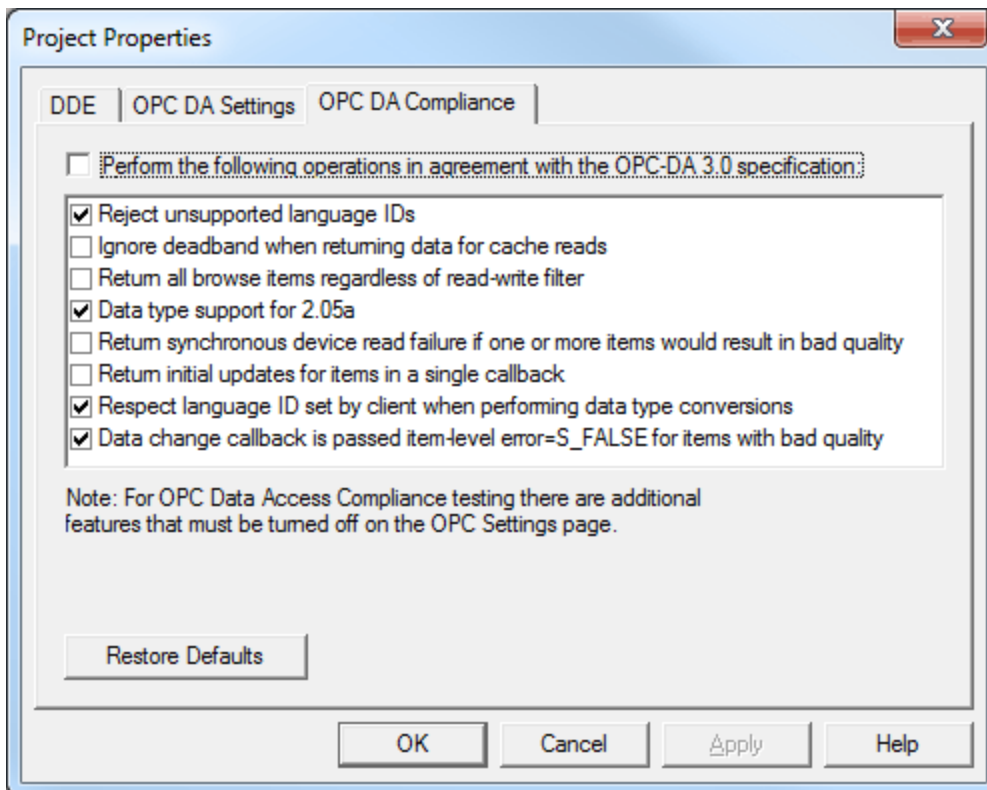
Descriptions of the parameters are as follows:

- **Perform the following operations in agreement with the OPC DA 3.0 specification:** When checked, this option enables the options available in the list box, and makes all options conform to OPC compliancy. The default setting is unchecked.
- **Reject unsupported Language IDs:** When checked, this option only allows Language IDs that are natively supported by the server. The default setting is checked.

  Note: If the OPC client application attempts to add an OPC group to the server and receives a general fail-ure, it is possible the client has given the server a Language ID that is not natively supported. If this occurs, the server will reject the group addition. To resolve this particular issue, disable the compliant fea-ture to force the server to accept any Language ID.
- **Ignore dead-band when returning data for cache needs:** When checked, this option allows the server to ignore the deadband setting on OPC groups added to the server. The default setting is unchecked.

  Note: For some OPC clients, passing the correct value for deadband causes problems that may result in

the OPC client (such as, having good data even though it does not appear to be updating frequently or at all). This condition is rare.

- **Return all browse items regardless of read-write filter:** When checked, this option causes the server to return all tags to an OPC client application when a browse request is made, regardless of the access filter applied to the OPC clients tag browser. The default setting is unchecked.
- **Data type support for 2.05a:** When checked, this option causes the server to adhere to the data type requirements and expected behaviors for data type coercion that were added to the 2.05a specification. The default setting is checked.
- **Return synchronous device read failure if one or more items would result in bad quality:** When checked, this option causes the server to return a failure if one or more items for a synchronous device Read results in a bad quality read. Compliance requires the server to return success, indicating that the server could complete the request even though the data for one or more items may include a bad and/or uncertain quality. The default setting is unchecked.
- **Return initial updates for items in a single callback:** When checked, this option causes the server to return all outstanding initial item updates in a single callback. When not selected, the server returns initial updates as they are available (which could result in multiple callbacks). The default setting is unchecked.
- **Respect Language ID set by client when performing data type conversions:** When checked, this option determines whether the server uses the Locale ID of the running Windows Operating System or the Locale ID set by the OPC client when performing data type conversions. The default setting is checked.

  Note: For example, a string representing a floating point number such as 1,200 would be converted to One Thousand - Twelve Hundred if converted using English metrics, but would be One and Two-Tenths if converted using German metrics. Thus, if German software is running on an English OS, users need to determine how the comma will be handled. This setting allows for such flexibility. By default, and due to historical implementation, the server respects the Locale ID of the operating system.
- **Data change callback is passed item-level error=S_FALSE for items with bad quality:** When checked, this option causes the server to return S_FALSE in the item error array for items without good quality. This setting will default to True for existing projects that are set to full compliance, and False for those that are not. When set to False, the legacy behavior of returning E_FAIL (0x80004005) will occur.

View Menu

Users can enable Interactive Updates and specify the update interval through the **View** menu.
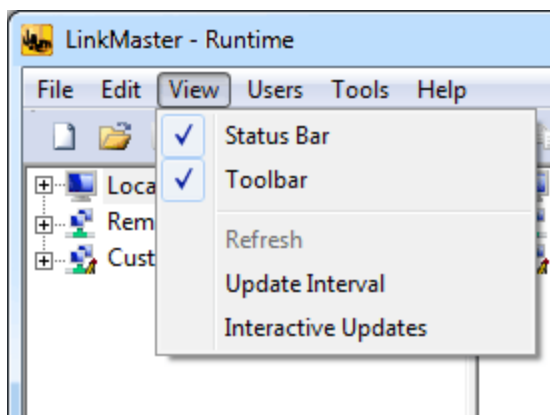

Descriptions of the options are as follows:

- **Update Interval:** When selected, this option invokes the View Update Interval. This dialog specifies the update interval that will be used for Interactive Updates.
- **Interactive Updates:** When checked, this option displays active link information in the Link Property View. When unchecked, the Configuration maintains its active client connection with the Runtime, but releases its link item references. For more information, refer to the "Interactive Updates" subtopic below.

Note: Changes made to these selections will have no effect on Third Party client and server applications that connect to LinkMaster's Runtime. They only affect the user's local view in the Configuration.

Interactive Updates

To provide Interactive Updates, the Configuration uses a local OPC DA client connection to the Runtime. When changes are made to the project, the local copy of the project that is maintained by the Configuration will not be synchronized with the Runtime project until a file save operations is performed. This is most noticeable when changes are made to the Link Group Properties or Link Item Properties. For example, if a link item's access is changed to Read Only, that change will not take effect until the project is saved. For more information, refer to **Saving a Project**.
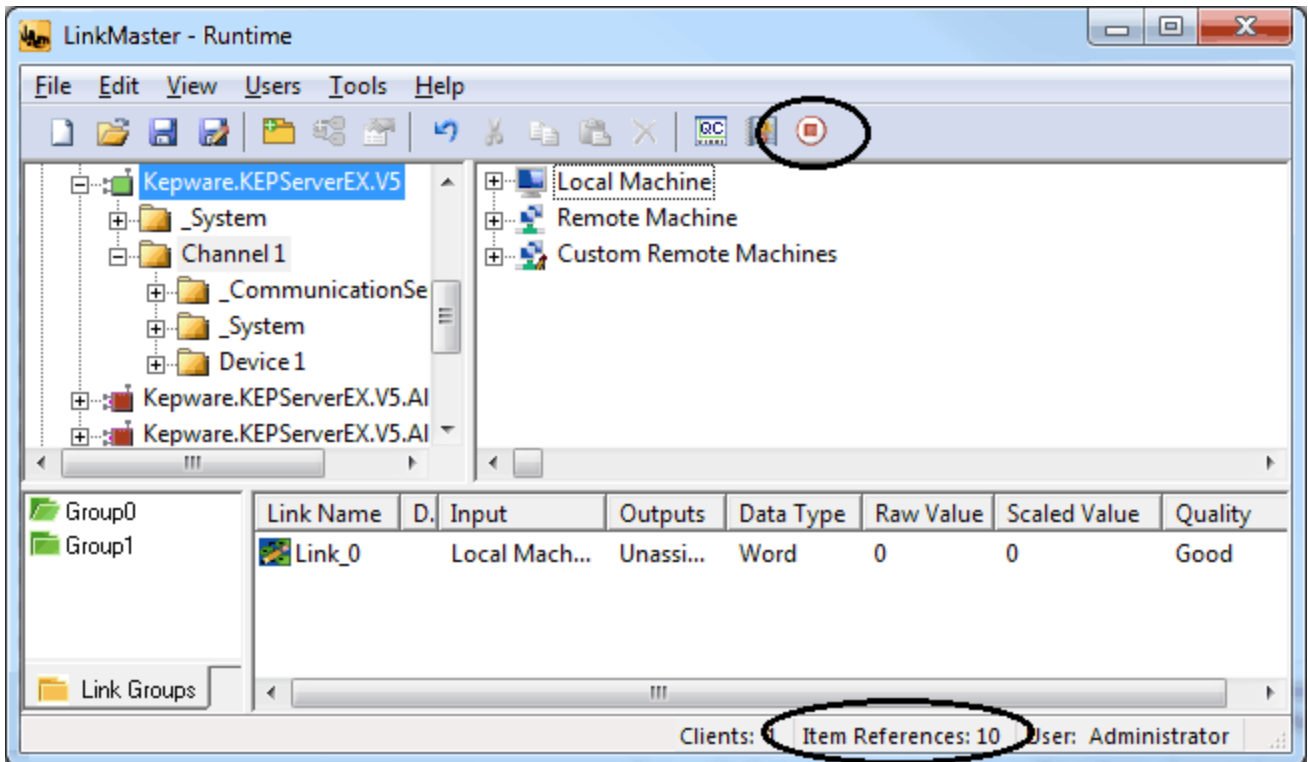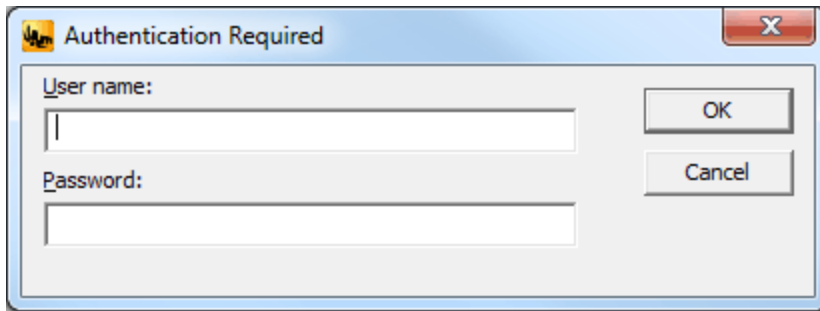

Users Menu

Accessing the User Manager

Users can access user accounts quickly through the configuration. For more information, refer to the instructions below.
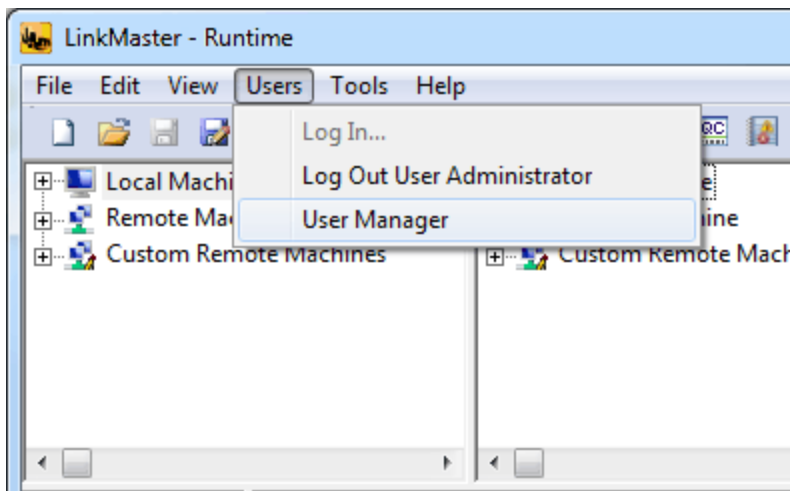
1. To start, click **Users** | **Log In**.
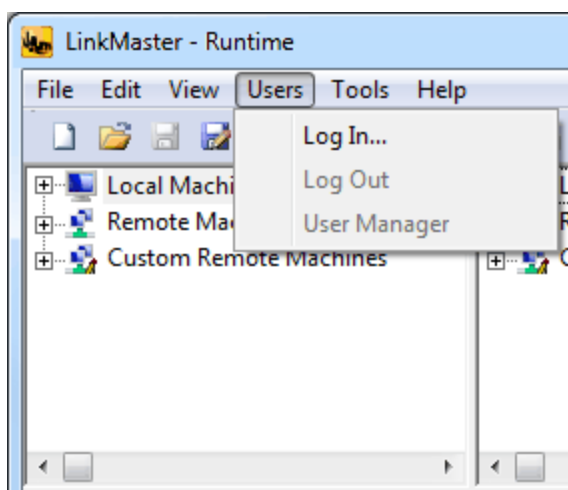
2. At this point, authentication is required. Enter a User Name and Password, and then click **OK**.
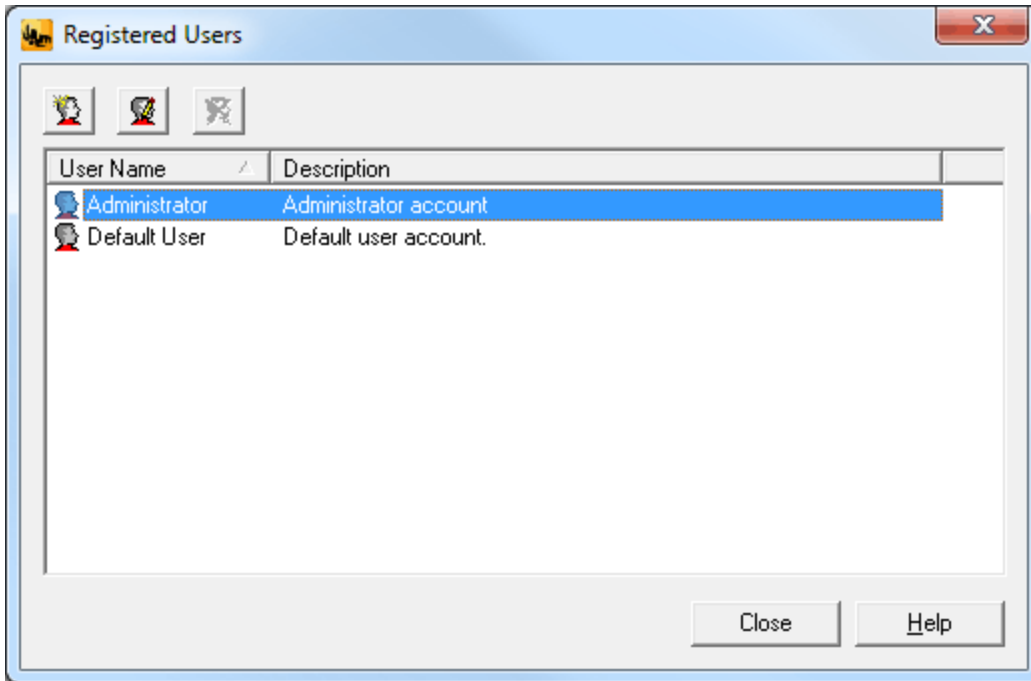
3. Next, click **Users** | **User Manager**.

Note: If logged in as the Administrator at time of change, users must click **Users** | **Log Out User Administrator** before accessing another user account.

User Manager
The User Manager is used to control the actions available to operators in LinkMaster. There are two user accounts available by default: Administrator and Default User.

Descriptions of the accounts are as follows:

- **Administrator:** This account is used to add additional users to the system or to change the settings of existing accounts. The password for the Administrator account is blank by default, as this disables the security settings for connecting the Configuration. Setting the password will enable the User Management System. The Administrator account cannot be deleted, but its password can be changed.
- **Default User:** This account is used when no other account is active, which is the normal condition. The Default User account cannot be deleted. It can only be disabled when the Administrator denies the Default User all privileges.

  Note: The default user account grants full access: if limited access is unnecessary, the User Manager system does not need to be edited.

User Properties

Descriptions of the parameters are as follows:

- **Name:** This parameter specifies a name for the user account. User names are case sensitive, and can be up to 31 characters in length.
- **Description:** This parameter allows a brief description of the user account. This can be particularly helpful for ensuring that operators log in to the proper account.
- **Assign/Change Password:** When checked, this option enables the Password and Confirm fields. Description of the fields are as follows:
- **Password:** This field specifies the password that the user must enter in order to log into the system. The password can be up to 15 characters in length. It must be entered correctly in both the Password and Confirm fields for the change to be accepted. Each time a user account is edited, the password must be re-entered. If the field is left blank, the password will be removed from the account.
- **Confirm:** This field confirms the password entered in the parameter above.
- **Edit Project and Settings:** When checked, this option allows the user account to perform the specified tasks.
- **Modify Application Settings:** When checked, this option allows the user account to modify application settings.
- **Disconnect Clients:** When checked, this option allows the user account to disconnect clients.
- **Reset Event Log:** When checked, this option allows the user account to reset the Event Log.

  Note: When the User Manager system is used, LinkMaster will log the current account name to the Event Log for all actions taken by the user. To prevent the log from being lost, disable the "Reset Event Log" setting on all accounts.
- **Manage Licenses:** When checked, this option allows the user account to manage licenses.

Adding Additional User Accounts
For more information on adding additional user accounts, refer to the instructions below.

1. To start, click **Users** | **Log In** and then log in as the administrator.

2. Next, click **Users** | **User Manager** and then select **User Manager**.

3. Select the new user icon.

4. In **User Properties**, specify the name, password, and privilege parameters.

5. When finished, click **OK**.

6. In the user list, select the desired user and then click **Apply**.

7. Then, click **Close**.

Note: To edit an existing user account, select the account and click the **Edit User** icon. To delete a user account, select the account and then click the **Delete User** icon.

Tools Menu

Users can access connection commands for the Configuration and client through the **Tools** menu.
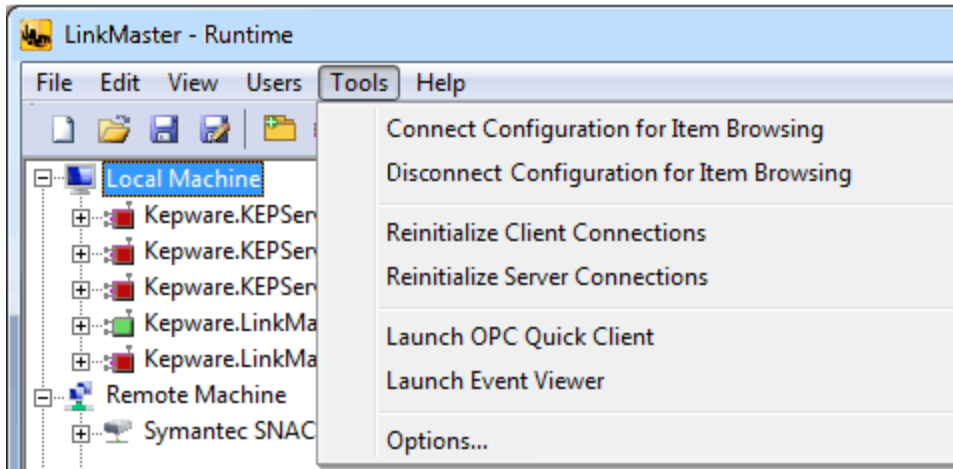
Descriptions of the options are as follows:

- **Connect Configuration for Item Browsing:** When selected, this option will connect the Configuration to the Runtime for item browsing.
- **Disconnect Configuration for Item Browsing:** When selected, this option will disconnect the Configuration for item browsing.
- **Reinitialize Client Connections:** When selected, this option will reinitialize connections to the client.
- **Reinitialize Server Connections:** When selected, this option will reinitialize connections with the server.
- **Launch OPC Quick Client:** When selected, this option will launch the OPC Quick Client.
- **Launch Event Viewer:** When selected, this option will launch the Event Viewer.
- **Options:** When selected, this option will invoke the Options dialog. For more information, refer to **Link-Master Options**.

LinkMaster Options

To access the LinkMaster Options tabs from the configuration, click **Tools** | **Options**. These settings are configured on an individual basis. For more information, select a link from the list below.

Options - General
Options - Runtime Process
Options - Runtime Options
Options - Communications
Options - Links
Options - Redundancy
Options - Event Log

Options - General

The General tab is used to specify project file settings, confirmations, and exit options. To access the General options, click **Tools** | **Options**. The dialog will be displayed as shown below.
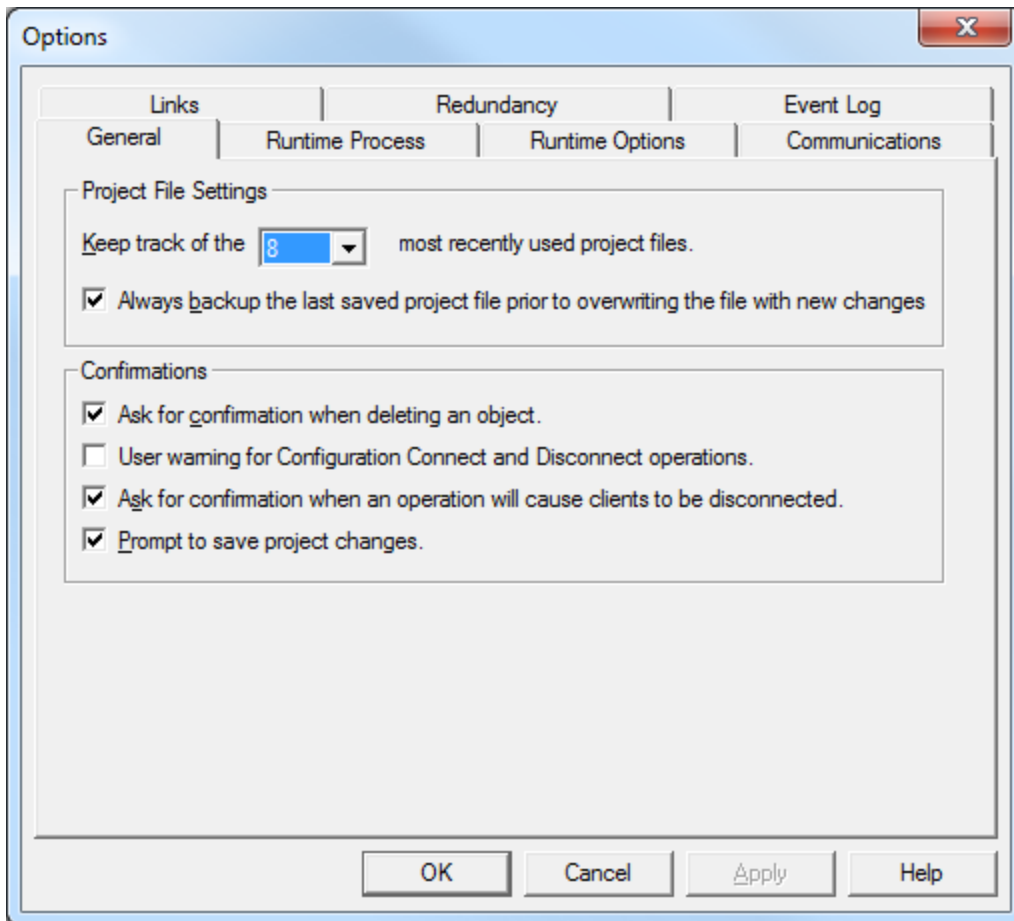
Project File Settings

Descriptions of the parameters are as follows:

- **Keep track of the _x_ most recently used projectfiles:** This parameter specifies how many project files are presented on the MRU list located in the File menu. The valid range is 1 to 16. The default setting is 8.

- **Always backup the last saved project prior to overwriting the file with new changes:** When checked, this option will automatically backup the last saved LinkMaster project (*.lmf) before LinkMaster overwrites that file with a new one. The backup file will be named "projectname.lmf.bak" and will be stored in the \Project Backups folder. The default setting is checked.

- **Ask for confirmation when deleting an object:** When checked, this option will display a warning message to the operator when a delete or cut operation is entered. The operator must confirm before the delete or cut operation is completed. The default setting is checked.

- **User warning for Configuration Connect and Disconnect operations:** When checked, this option will invoke a warning message when users attempt an operation that will cause the configuration to con-nect or disconnect. The default setting is unchecked.

- **Ask for confirmation when an operation will cause clients to be disconnected:** When checked, this option will display a warning message when the operator invokes an operation that would disconnect it from the application. The operator must confirm before the disconnect sequence is initiated. The default setting is checked.

- **Prompt to save project changes:** When checked, this option will display a warning message when Link-Master is being shut down with outstanding changes in the project. The default setting is checked.

  Note: LinkMaster supports the Data Access 2.0 shutdown event. If an operator action will cause con-nections to OPC clients that are using the 2.0 Data Access specifications to be lost, LinkMaster will issue a shutdown event to these clients. If the clients are designed to utilize this event, they can properly dis-connect their OPC resources. OPC clients that do not support the shutdown event may have issues once LinkMaster shuts down.

Options - Runtime Process

The Runtime Process tab is used to specify the Runtime's process mode, as well as how it utilizes the PC's resources.
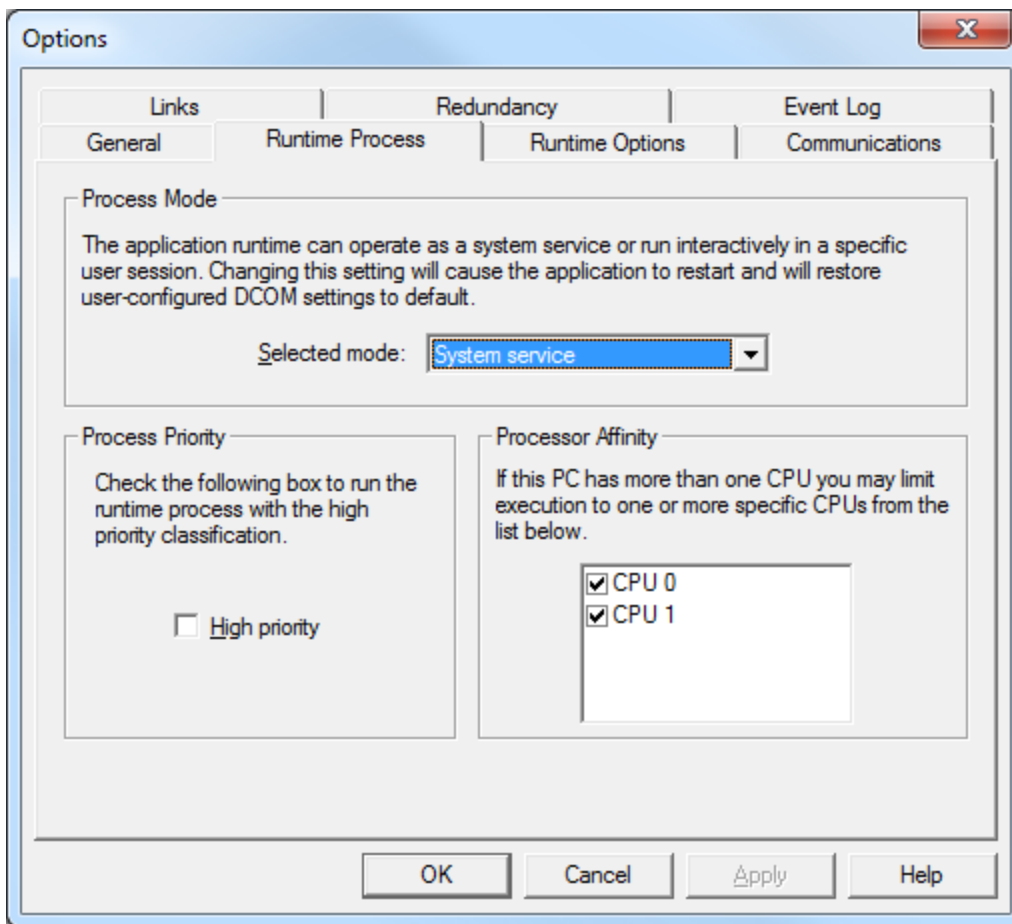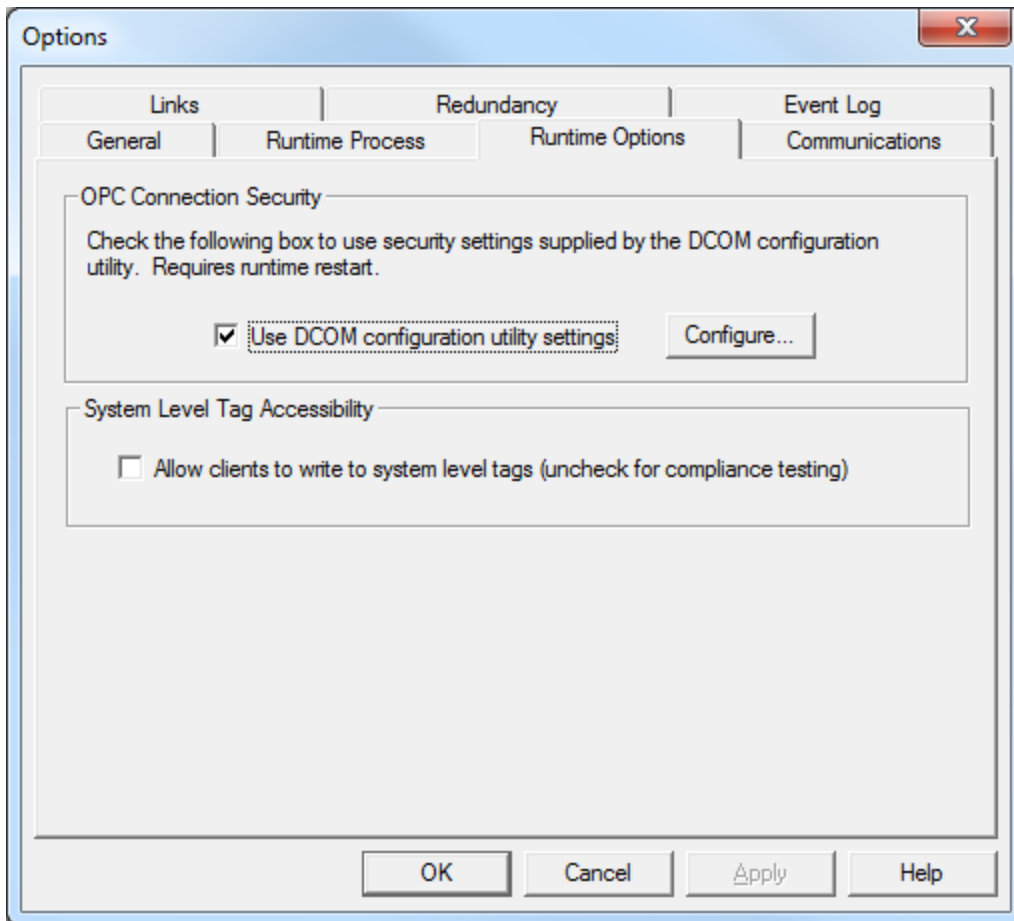

Descriptions of the parameters are as follows:

- **Selected Mode:** This parameter specifies whether the application will be running as System Service or Interactive. By default, the application installs and runs as System Service. Changing this setting causes all clients, both Configuration and process, to be disconnected and the application to be stopped and restarted. It will also restore user-configured DCOM settings to default.
- **High Priority:** When checked, this option allows the application to have priority access to resources. The default setting is unchecked (normal).

  Note: Microsoft recommends against setting applications to a high priority as it can adversely affect other applications running on the same PC.
- **Processor Affinity:** This parameter specifies which CPUs the application can be executed on when it is run on PCs containing more than one.

Options - Runtime Options

The Runtime Options tab is used to change settings in the project that's being executed in the Runtime.

Descriptions of the parameters are as follows:

- **Use DCOM configuration utility settings:** When checked, this option allows users to select authentication and launch and access security requirements through the DCOM Configuration Utility. Users can both specify the level of security to implement and restrict access for certain users and/or applications. The default setting is checked.

   Note: When this setting is disabled, the application will override the DCOM settings set for the application and will not perform any authentication on the calls received from client applications. It will impersonate the security of the client when performing any actions on behalf of the client application. Disabling this setting provides the lowest level of security and is not recommended. If this setting is chosen, users should ensure that the client and applications are running in a secure environment so that the application is not compromised.

- **Allow clients to write to system level tags:** When checked, this option will allow clients to write to system level tags. The default setting is unchecked.

Options- Communications

The Communications tab is used to specify how often LinkMaster will query connected servers for possible lost communications. In the event that a server is disconnected, LinkMaster will attempt to regain connection to the lost servers at the user-defined interval.

To access the Communications Options, click **Tools | Options**. Then, select the **Communications** tab.
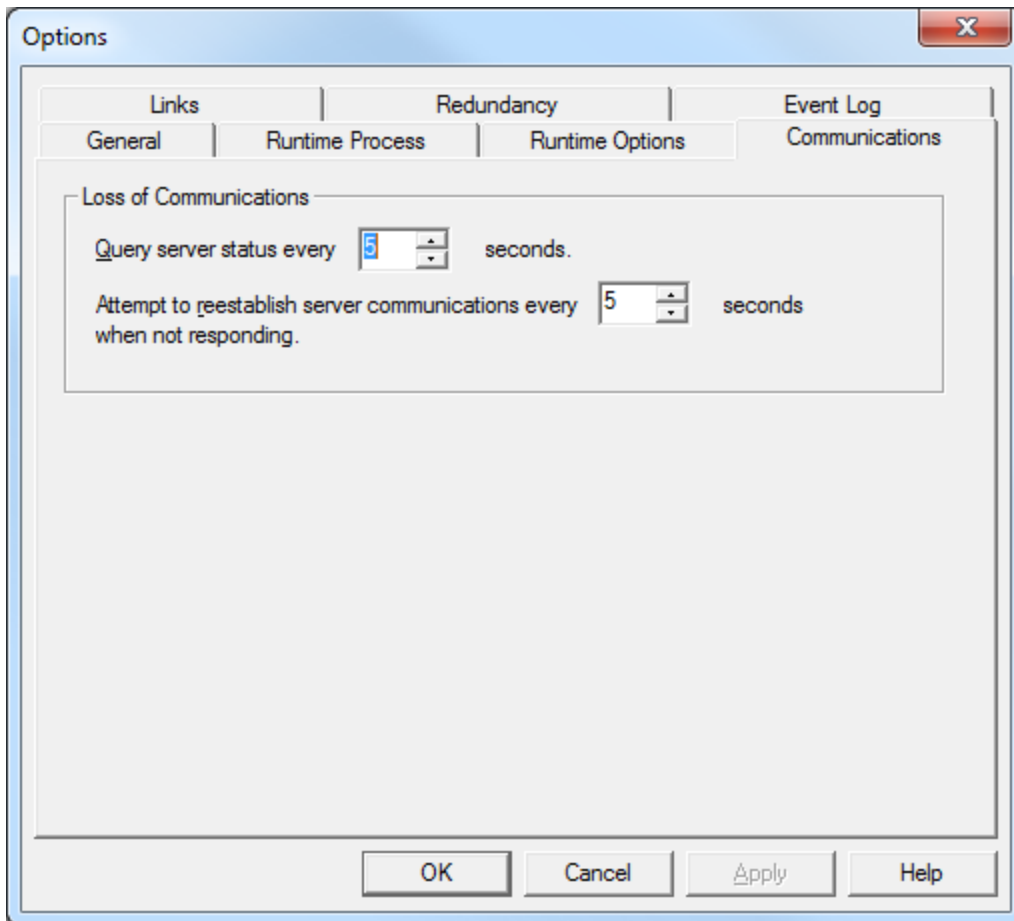
Descriptions of the parameters are as follows:

- **Query server status every *x* seconds:** This parameter specifies how often LinkMaster will check to make sure the connected OPC servers have not been disconnected. The valid range is 5 to 30 seconds. The default setting is 5 seconds.
- **Attempt to reestablish server every *x* seconds when not responding:** This parameter specifies how often LinkMaster will attempt to reconnect with an OPC server after communications have been lost. The valid range is 5 to 30 seconds. The default setting is 5 seconds.

Options - Links

The Links tab is used to specify the dead value, write optimizations, and item failure recovery options.
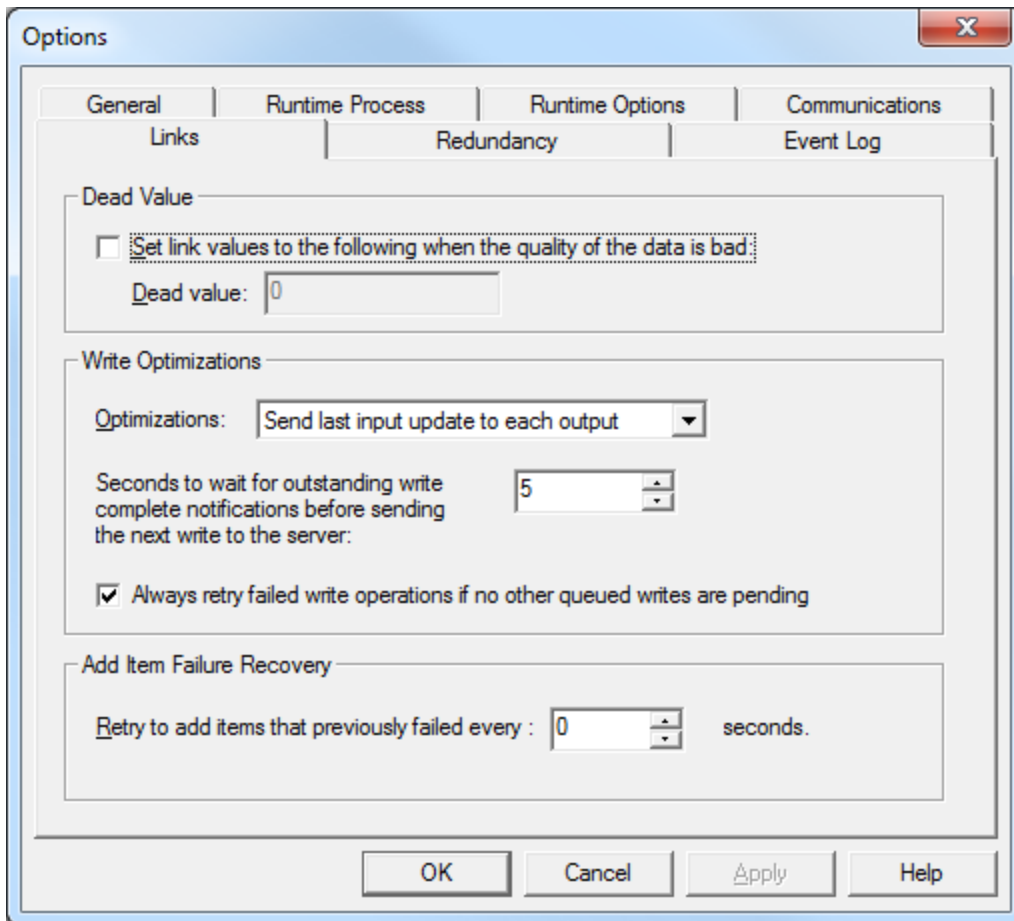
Descriptions of the parameters are as follows:

- **Set link values to the following when the quality of the data is lost:** This parameter specifies what the link item values will be set to if they change to Bad. The default setting is to display the last Good value or no value at all (depending on whether the link has received an update).

  Note: The user-defined dead value will not be transferred to the output item if it is beyond the range of the link item's Output data type. The link item would also be considered invalid in this state.

  Important: Boolean link items can only have a value of 1 (TRUE) or 0 (FALSE). When the dead value is set to a non-zero value, the link item will be set to 1 (TRUE) when the value becomes bad. Similarly, when the dead value is set to zero, the link item will be set to 0 (FALSE).

- **Optimizations:** This parameter specifies the type of optimizations to apply to the writes. Options include Send last input update to each output and Send all input updates to each output. The default setting is Send last input update to each output. Descriptions of the options are as follows:

  - **Send last input update to each output:** This option sends only the most recent input update to the corresponding output item. This can minimize the load on the OPC server's write queue.
  - **Send all input updates to each output:** This option sends all write requests to the corresponding outputs.

- **Seconds to wait for outstanding write complete notifications before sending the next write to the server:** This parameter specifies the amount of time to wait for outstanding write complete notifications before the next write will be sent to the server. This setting can optimize the write performance of servers that are slower or fail to notify LinkMaster when a write completes. The valid range is 0 to 60 seconds. The default setting is 5 seconds.

  Caution: Selecting **Send all input updates** can lead to server overload if the **Seconds to wait for outstanding write complete notifications before sending the next write to the server** time interval is set too low. This is because write requests can build up in the cache and cause undue strain to the server.

- **Always retry failed write operations if no other queued writes are pending:** When checked, Link-Master will attempt to retry writes that have previously failed. The default setting is checked.
- **Retry to add items that previously failed every ___ seconds:** This parameter specifies how often the application should re-attempt to add items that were previously rejected by an OPC server. This situation may occur in servers that allow incoming client connections before the available item list is fully initialized.

Options - Redundancy

Two LinkMaster-enabled machines can be run as a redundant pair. When the Redundancy option is turned on, the following process will occur:

1. One LinkMaster machine will operate as the primary node and actively perform link transfers. The second LinkMaster machine will operate as the secondary node. There are three types of secondary nodes: Secondary (Hot), Secondary (Warm), and Secondary (Cold).

2. The primary node will periodically send the secondary node a ping to inform that it is up and running. If the secondary node does not receive the ping from the primary node during a pre-configured amount of time, the secondary node will assume the primary node is no longer functional. It will then take over the role of the primary node and perform the link transfers as though it were the primary node.

3. When the primary node returns, the secondary node will stop performing link transfers. The primary node will then resume its operations.

Note: If the primary and secondary nodes experience a connection failure, the secondary node will assume that the primary node is not functional and will begin performing link transfers. If the primary node is still active and performing link transfers, then both the primary and secondary nodes will be transferring data between inputs and outputs.
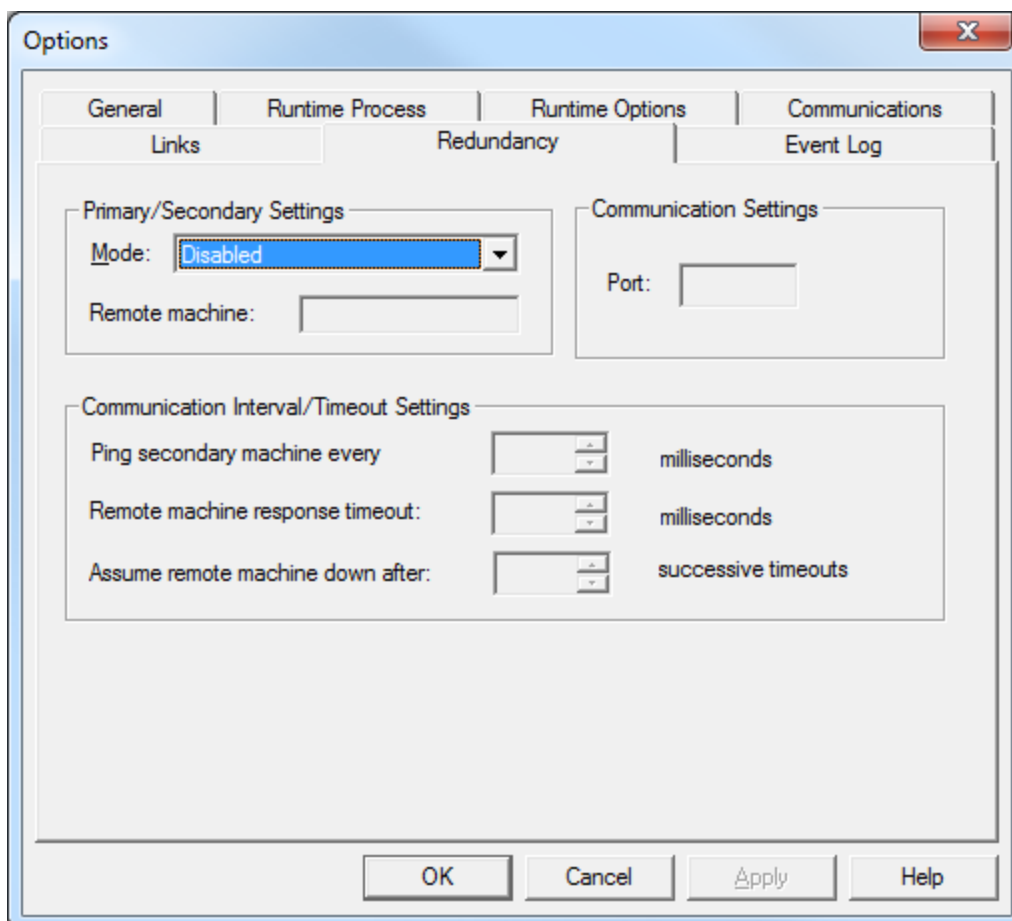
Shared Settings
Descriptions of the parameters are as follows:

- **Mode:** This parameter specifies the redundancy mode. Options include Disabled, Primary, Secondary (Hot), Secondary (Warm), and Secondary (Cold). The default setting is Disabled. Descriptions of the options are as follows:
    - **Disabled:** This option disables redundancy. When selected, the current machine is the only active LinkMaster machine.
    - **Primary:** This option configures the current LinkMaster machine to operate as the active bridge of the redundant pair. It performs the link transfers, and periodically sends a ping to the secondary node to inform it that it is running.
    - **Secondary (Hot):** This option configures the current LinkMaster machine to operate as the backup bridge of the redundant pair. In this mode, all the input items are active but link transfers are disabled. After a loss of communication with the primary machine, this node will assume the role of the active bridge by enabling link transfers.
    - **Secondary (Warm):** This option configures the current LinkMaster machine to operate as the backup node of the redundant pair. In this mode, all the input items are inactive and link transfers are disabled. After a loss of communication with the primary machine, this node will assume the role of the active bridge by setting all items to active and enabling link transfers.
    - **Secondary (Cold):** This option configures the current LinkMaster machine to operate as the backup node of the redundant pair. In this mode, input items are not added. After a loss of communication with the primary machine, this node will assume the role of the active bridge by adding items in an active state and enabling link transfers.
- **Port:** This parameter specifies the port number to use for communications. This is the port to which responses will be sent by the secondary node. The valid range is 1 to 65535. The default setting is 11206. This option is not available when Disabled is the chosen redundancy mode.

    Note: Redundancy requires that the port number be the same for both the primary and secondary Link-Master machines.

Communication Interval/Timeout Settings for Primary Mode
The following settings are available when Primary is the chosen redundancy mode. Descriptions of the parameters are as follows:

- **Secondary Machine:** This parameter specifies the secondary machine. Users can enter the IP Address or the secondary machine name (without the backslashes). This option is not available when Disabled is the chosen redundancy mode.
- **Ping secondary machine every *x* milliseconds:** This parameter specifies how often the primary node will send a ping to the secondary node to confirm that it is running. The valid range is 100 to 1200000 milliseconds. The default setting is 5000 milliseconds.
- **Secondary machine response timeout:** This parameter specifies how long the primary node will wait for the secondary node to respond. The valid range is 2000 to 1200000 milliseconds. The default setting is 20000 milliseconds.
- **Assume secondary machine down after *x* successive timeouts:** This parameter specifies how many response timeouts the primary node will allow before assuming the secondary node is not functional. The valid range is 1 to 100 retries. The default setting is 3 retries.

Communication Interval/Timeout Settings for Secondary Mode
The following parameters are available when Secondary (Hot, Warm, or Cold) is the chosen redundancy mode. Descriptions of the parameters are as follows:

- **Primary Machine:** This parameter specifies the primary machine. Users can enter the IP Address or the primary machine name (without the backslashes). This option is not available when Disabled is the chosen redundancy mode.
- **Ping secondary machine every *x* milliseconds:** This parameter is only available when Primary is the chosen redundancy mode.
- **Primary machine ping wait timeout:** This parameter specifies how long the secondary node will wait for the primary node to send a ping. The valid range is 2000 to 1200000 milliseconds. The default setting is 20000 milliseconds.
- **Assume primary machine down after *x* successive timeouts:** This parameter specifies how many ping timeouts the secondary node will allow before assuming the primary node is not functional and taking over the role of the primary. The valid range is 1 to 100 retries. The default setting is 3 retries.

Options - Event Log

LinkMaster supports persistent Event Logging. Events that occur within LinkMaster can be stored to disk and viewed with the Event Viewer. The data that is displayed in the Event Log depends on what is selected in the Event Log Options dialog.
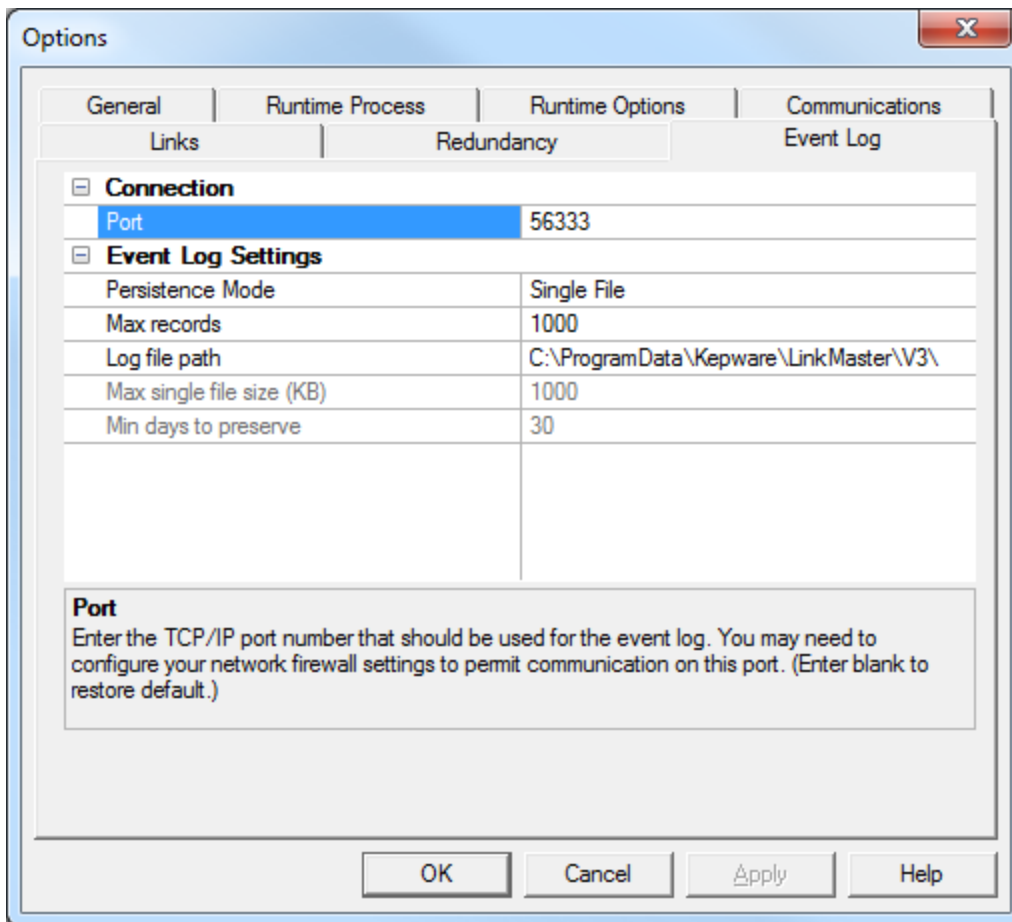
Descriptions of the parameters are as follows:

- **Port:** This parameter specifies the TCP/IP port number that will be used for the Event Log. The default setting is 56333.

  Note: The network's firewall settings may need to be configured to permit communications on this port.
- **Persistence Mode:** This parameter specifies the mode of Event Log persistence. Options include Memory, Single File, and Extended Data Store. The default setting is Single File. Descriptions of the options are as follows:

  - **Memory:** This options keeps all records in memory.
  - **Single File:** This option keeps all records to one file.
  - **Extended Data Store:** This options persists a potentially large number of records for an extended period.
- **Max records:** This parameter determines the number of records the log system will hold before the Log Full action comes into effect. The valid range is 100 to 30000 records. The default setting is 1000.

  Note: Users that attempt to change this parameter to a value that is less than the current number of records in the log will receive a warning that log file truncation will occur.
- **Log file path:** This parameter specifies where the log file will be stored.
- **Max single file size:** This parameter specifies the maximum size in KB that any one log file can contain. The default setting is 1000 KB.

- **Min days to preserve:** This parameter specifies the number of days after which log files will be deleted. The default setting is 30 days.

Note: Users can tailor the Event Log to meet the application's reporting requirements. There are currently three types of messages that can be placed into the Event Log: General messages (such as startup and shutdown), Warning messages (such as device not responding), and Error messages (such as the rejection of bad OPC item requests). To protect the log file's contents, define permissions and limit access through the **Users Menu**.

Basic LinkMaster Components

For more information on a specific LinkMaster component, select a link from the list below.

What is a Link Group?
What is a Link Item?

What is a Link Group?

Link groups hold link items. One must be added to the LinkMaster project before any data items that will be linked together can be defined. Multiple link groups can be added to a project. From an OPC client standpoint, link groups allow users to divide OPC data into smaller item lists (which makes searching for a specific link item easier when browsing with an OPC client). For more information, refer to **Adding a Link Group**.

Link Group Properties

The Link Group Properties specify the server update rate and client I/O refresh rate. It also controls whether to enable or disable link transfers and when to remove item references. To access the Link Group Properties through the Configuration, select the link group and then click **Edit | Properties**. To access the Link Group Properties through the OPC client application, utilize LinkMaster's System Tags. For more information, refer to **Link Group Properties**.

See Also: How Do I... Use LinkMaster System Tags

Link Group Properties

The Link Group Properties are used to control and operate the link items.

Descriptions of the parameters are as follows:

- **Name:** This parameter specifies the string that will represent the data available from this group. It can be up to 80 characters in length, and must be unique within the LinkMaster project.

    Note: Some OPC client applications have a limited display window when browsing an OPC server's link tag space. As such, names should be brief.
- **Description:** This parameter specifies a description of this link group. It can be up to 64 characters in length.
- **Server update rate:** This parameter specifies the rate at which LinkMaster will check the link's input items for changing values, and update the link's output items if a change has occurred. It does not regulate the changing input values from the server: data change events from the server will still be written to

the link outputs as they are received. This value equates to the server's group update rate and can dictate the rate that the OPC server will poll its connected devices. If the data that will be transferred to the outputs changes slowly, the setting should be set to a slow rate. The valid range is 10 to 3,600,000 milliseconds. The default setting is 250 milliseconds.

Note: If users have configured the Client I/O Refresh Rate faster than the Server Update Rate, it will take precedence over how often outputs are updated.

- **Client I/O refresh rate:** This parameter specifies the rate at which link input values will be written to link outputs, regardless of any change in input data. The default setting is zero (Off).

  Note 1: Because the Server Update Rate interval dictates refresh writes according to changing input values from the server, this setting usually does not need to be enabled. Unnecessary writing to the input cache can be expensive in terms of CPU resources; however, in certain situations it may be important to "correct" the link's output if other sources have written to it. This parameter should only be used when outputs require continuous updates.

  Note 2: Writing from a high-speed input to a low-speed output can overload the target OPC server's write queue. In most cases, a Client I/O Refresh setting that exceeds the ability of the OPC server to write data will cause it to consume more system memory than normally required. Continued operation in this state may consume all available system memory. If this parameter must be used, apply the slowest acceptable rate. For information on reducing the number of writes sent to the OPC server, refer to **Link Options**.

- **Enable Link Transfers:** When checked, this option will turn link writes within a group on. The default setting is checked.

  Note: This parameter can also be set via a client by accessing the group's _Enabled Tag. For more information, refer to **How Do I... Use LinkMaster System Tags**.

- **Remove item references when link transfer is disabled:** When checked, this option will remove input items from the source OPC server that are being referenced in the link group. This setting is used in conjunction with **Enable Link Transfers**. The default setting is unchecked.

Note: Changes to these parameters can be made at any time, but must be saved before they will take effect. For more information, refer to **Saving the Project**.

What is a Link Item?

A link item is created when an input item from one OPC server is linked to one or more output items from another OPC server. Link items may be created manually, through drag and drop, or via CSV import and export. For more information, refer to **How Do I... Drag and Drop Items** and **CSV Import and Export**.

Link Item Properties

The Link Item Properties specify the source of data that will be transferred, define the OPC items in the target OPC server that will be linked to the source, and determine whether to scale the raw input data to a more appropriate range for the Link Output item or client application. For more information, refer to **Link Item Properties - General**.

Link Item Properties - General

The General tab is used to specify the link's name, provide an optional description, and select its client access.
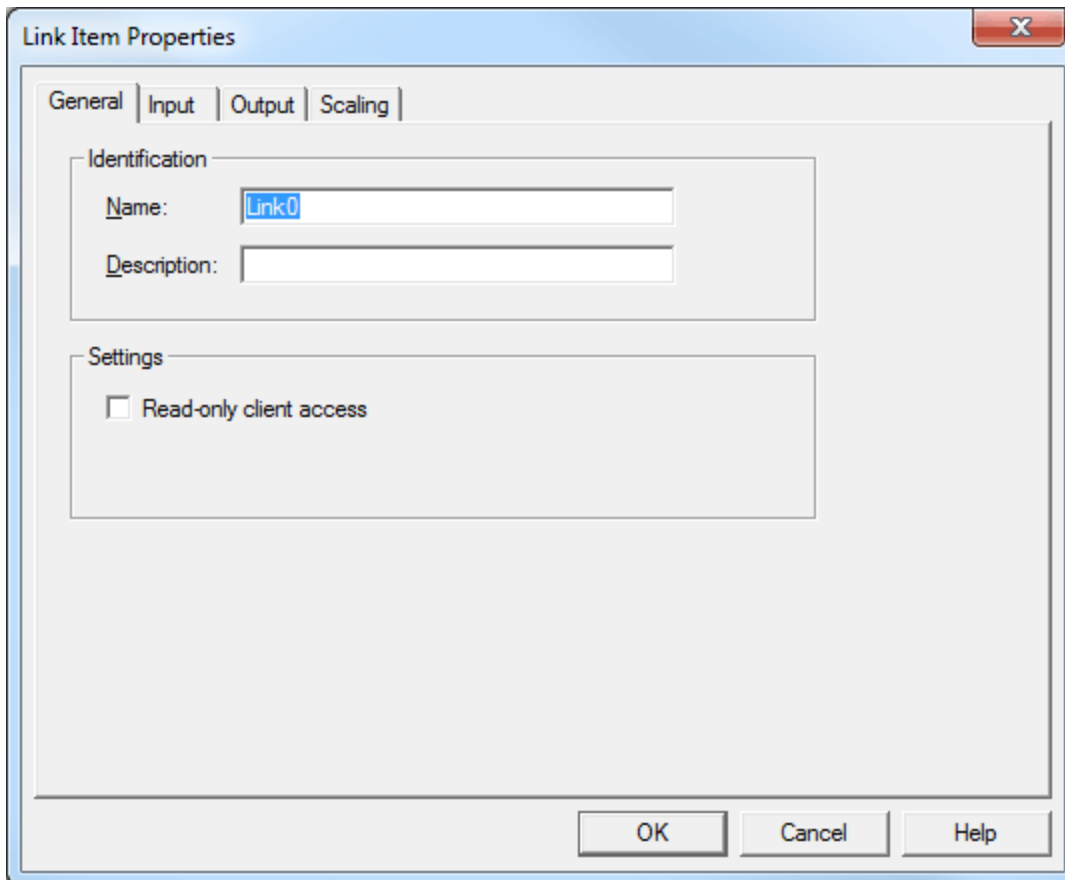
Descriptions of the parameters are as follows:

- **Name:** This parameter specifies the string that will represent the data available from this link tag. It can be up to 80 characters in length, and must be unique within any given link group. If the application is best suited using blocks of link items with the same names, use link groups to segregate the link item tags.

  Note: Some OPC client applications have a limited display window when browsing the link tag space of an OPC server. As such, users should keep names brief.
- **Description:** This parameter specifies a description of this tag. It may be up to 64 characters in length.

  Note: If an OPC client that supports Data Access 2.0 Tag Properties is being used, the description parameter will be accessible from the tag's Item Descriptions.
- **Read-Only Client Access:** This parameter specifies whether the link is Read Only or Read/Write. When enabled, client applications will be prevented from changing the data contained in this tag. When disabled, client applications can change the Link Tag's value as needed.

  Note: This selection affects how the tag will appear in an OPC client's browse space. Many OPC client applications filter tags based on their attributes; as such, changing this tag's access method may change how and when the tag will appear in the OPC client's browse space.

Note: Changes to these parameters can be made at any time, but must be saved before they will take effect. For more information, refer to **Saving the Project**.

Link Item Properties - Input

The Input tab is used to define the source of data that will be transferred to one or more output items, to browse and select an available local or remote machine, to choose an OPC server on the selected machine, and to choose tag items available on that server.

Note: Users can create link item inputs by dragging and dropping items in the Link Property View. For more information, refer to **How Do I... Drag and Drop Items**.
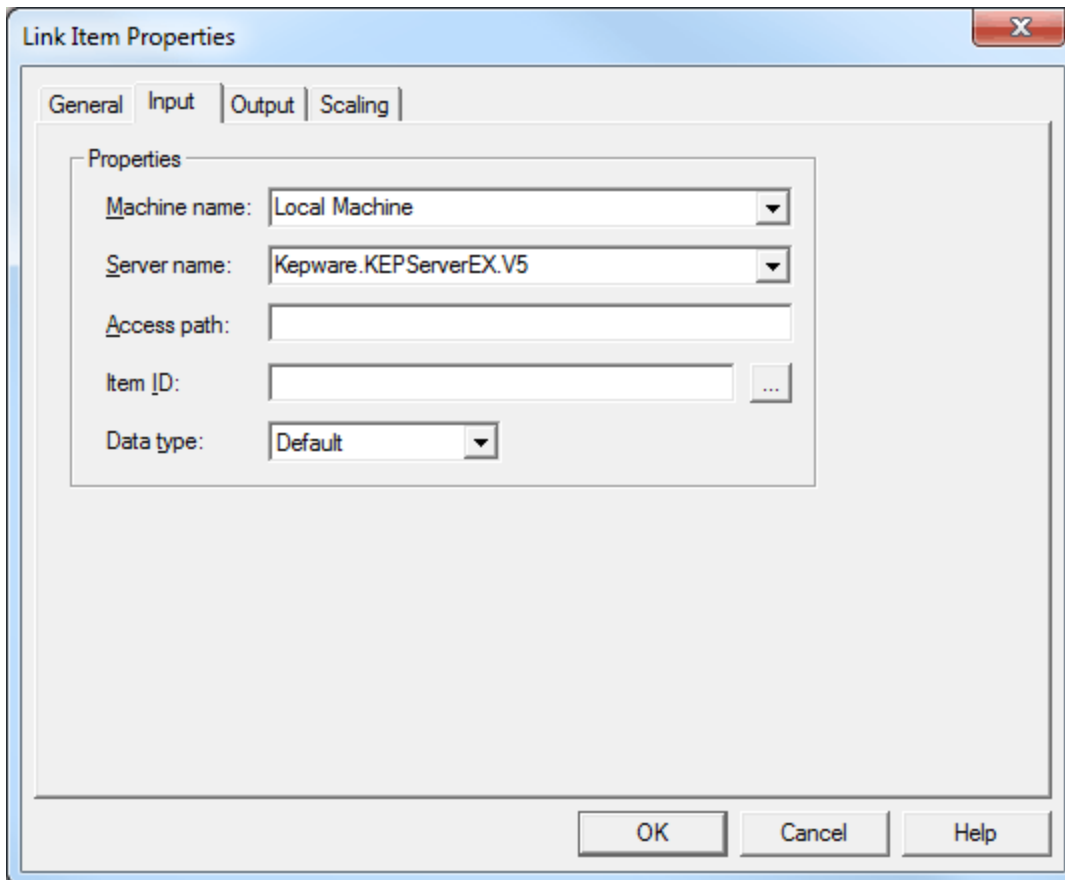
Descriptions of the parameters are as follows:

- **Machine Name:** This parameter specifies the local machine or a machine located on the Ethernet net-work (if any are available). The default setting is Local Machine.

  Note: The setting can be left as Local Machine if the server is located on the same machine as LinkMaster.
- **Server Name:** This parameter specifies the OPC server from which users will receive source data.
- **Access Path:** This parameter is required by some OPC servers to complete an item definition. For more information, refer to the OPC server's help documentation.
- **Item ID:** This parameter specifies the OPC server item that will be used to reference data. Items may be selected through the Browse feature if the server supports tag browsing. To determine valid item names for the location in question, refer to the OPC server's documentation.
- **Data Type:** This parameter specifies the requested data type that should be used for communications between the OPC server and LinkMaster. It should agree with the size and type of the register or memory location that is being addressed. For more information, refer to the "Supported Data Types" subtopic below.

Supported Data Types

All data types are available as Array types except for Boolean and String.

Data Type	Description
Native	Default as determined by the OPC server
Boolean	Single bit
Char	Signed 8 bit value
Byte	Unsigned 8 bit value
Short	Signed 16 bit value
Word	Unsigned 16 bit value
Long	Signed 32 bit value
DWord	Unsigned 32 bit value
Real	Single precision floating point value (32 bits)

Double	Double precision floating point value (64 bits)
String	Zero terminated character array

Link Item Properties - Output

The Output tab is used to define the OPC items available in the target OPC server that will be linked to the source OPC server input items, to browse and select a local or remote machine, to choose an OPC server, and to select any of the desired tag items located on that server as outputs.

Users can add as many outputs as needed. To do so, enter the desired item in the Item ID and then click **Add**. To remove an item, highlight it in the output display and then click **Remove**. To apply changes made to an existing output, press **Update**.

Note: Users can add link outputs by dragging and dropping items in the Link Property View. For more information, refer to **How Do I... Drag and Drop Items**.

Descriptions of the parameters are as follows:

- **Machine name:** This parameter specifies the local machine or a machine located on the Ethernet network (if any are available). The default setting is Local Machine.

  Note: The setting can be left as Local Machine if the server is located on the same machine as LinkMaster.
- **Server name:** This parameter specifies the OPC server to which the source data will be linked.
- **Access path:** This parameter is required by some OPC servers to complete an item definition. For more information, refer to the OPC server's help documentation.
- **Item ID:** This parameter specifies the OPC server item that will be used to reference data. Items may be selected through the Browse feature if the server supports tag browsing. To determine valid item names for the location in question, refer to the OPC server's documentation.
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Byte	Unsigned 8 bit value
Short	Signed 16 bit value
Word	Unsigned 16 bit value
Long	Signed 32 bit value
DWord	Unsigned 32 bit value
Real	Single precision floating point value (32 bits)
Double	Double precision floating point value (64 bits)
String	Zero terminated character array

Link Item Properties - Scaling

The Scaling tab allows raw input data from the server to be scaled to a more appropriate range for the Link Out-put item or client application. There are two types of scaling: **Linear** and **Square Root**. Both options will enable scaling operations for the link item. The default setting is None.

Raw Value Range

These parameters specify the range of raw data from the server. The valid range depends on the data type of the raw value. For example, if the raw value was set to Short, the valid range of the raw value would be -32768 to 32767. Descriptions of the parameters are as follows:

- **Data Type:** This parameter specifies the data type of the link item's raw value.
- **High:** This parameter specifies the highest value of the raw data type's range. It must be greater than the raw low range.
- **Low:** This parameter specifies the lowest value of the raw data type's range. It must be lesser than the raw high range.

Scaled Value Range

These parameters specify the range of the resulting scaled value. The valid range depends on the data type of the scaled value. For example, if the scaled data type is set to Long, the valid range would be -2147483648 to 2147483647. Descriptions of the parameters are as follows:

- **Data Type:** This parameter specifies the data type of the Link Item's scaled value. Although a scaled value normally results in a floating-point value, LinkMaster does not make this assumption. The data type can be set to any valid OPC data type, providing users the ability to scale from a raw data type (such as Short) to an engineering value with a data type of Long if needed. The default setting is Double.
- **High:** This parameter specifies the highest value of the scaled value data type's range. It must be greater than the scaled value low range.
- **Low:** This parameter specifies the lowest value of the scaled value data type's range. It must be lesser than the scaled value high range.
- **Units:** This parameter allows a unit's string to be assigned to a scaled link item. It can be up to 32 characters long.

Note: In many cases, the raw data from the device exceeds the range that has been specified for the raw data. When this occurs, the scaled value will be forced outside of the established range. To prevent this, use the **High Clamp** and **Low Clamp** to restrict the scaled value to the specified range.

Important: LinkMaster supports the OPC Tag Properties available in the 2.0 Data Access specifications. If the OPC client supports these properties, it can automatically configure the range of objects (such as user input objects or displays) using the data entered here.

Note: These parameters can be changed at any time and will take effect immediately; however, OPC clients that have already connected to this link item tag will not be affected until they release and reacquire this tag. To prevent operators from changing these parameters, restrict access rights through the **Users Menu**.

CSV Import and Export

LinkMaster can import and export project data in a CSV text file format, thus allowing quick creation and modification of large projects. For example, if the servers with which a user is linking data do not contain browsed items, each server item's access path would have to be manually entered into each link item's property page. With the use of a simple text editor (or Microsoft Excel™), however, users can quickly create and manipulate inputs, outputs, or any other project attributes existing in the LinkMaster project via the CSV file.

A LinkMaster CSV file defines a complete project. When LinkMaster imports a CSV file, it creates a new project that only contains those groups and items defined in the CSV file. To add items to an existing project, first export the project as a CSV file. Then, edit that file and import it back into LinkMaster.

Note: The easiest way to create a LinkMaster CSV file is to start with a template. To create a template, save a basic LinkMaster project (which should contain at least one link group, a link item, and a link item output) in CSV format by clicking **File** | **Export CSV**.

Exporting LinkMaster Projects

Exporting a LinkMaster project will generate a file that contains a record for each link group, link item, and link item output defined in the project. A LinkMaster CSV file contains the following three blocks of records:

- The first block contains records that define the link groups.
- The second block defines the link items that belong to the link groups defined in the first block.
- The third block defines the link item outputs that belong to the link items defined in the second block.

Each block has a Field Identification or header record. For more information, refer to the tables below.

Link Group Fields

Column Name	Values	Required
Record Type	"LINKGROUP"	Yes - must be 1st column.

Name	Any valid group name unique to project.	Yes
Server Update Rate	Decimal (ms)	No
Client Refresh Rate	Decimal (ms)	No
Enable Link Transfers	0: Not enabled. 1: Enabled.	No
Remove Item References	0: Remove item references when link transfer is disabled. 1: Do not remove item references when link transfer is disabled.	No
Description	Up to 64 characters.	No

Link Item Fields

Column Name	Values	Required
Record Type	"LINKITEM"	Yes - must be 1st column.
Link Group	Name of owner group as defined in link group block.	Yes - must be 2nd column.
Name	Yes	Any valid item name, unique to owner group.
Client Access	RO: Read Only. R/W: Read & Write.	No
Machine Name	Name of machine on which OPC server is running.	Yes
Server Name	Name of OPC server.	
Access Path	Access path as defined in OPC server.	No
Item ID	Item ID as defined in the OPC server.	Yes
Data Type	"Word" "Short", "Float", and so forth. This is the data type that LinkMaster will use for link item data.	No
Scaling	Linear Square Root Blank (no scaling)	No
Raw Low	Low raw value (float).	No
Raw High	High raw value (float).	No
Scaled Low	Scaled low value (float).	No
Scaled High	Scaled high value (float).	
Scaled Data Type	"Word", "Short", "Float", and so forth. This is the data type that LinkMaster will use for link item data after scaling is applied.	No
Clamp Low	0: Don't clamp. 1: Force resulting scaled value to stay within the limit of Scaled Low.	No
Clamp High	0: Don't clamp. 1: Force resulting scaled value to stay within the limit of Scaled High.	No
Eng Units	String denoting engineering units of scaled value.	No
Description	Up to 64 characters.	No

Link Item Output Fields

Column Name	Values	Required
Record Type	"LINKITEMOUTPUT"	Yes - must be 1st column.
Link Item	Name of owner link item as defined in link group and item blocks *<Group>.<Item>*.	Yes - must be 2nd column.
Machine Name	Name of machine on which OPC server is running.	Yes
Server Name	Name of OPC server.	Yes
Access Path	Access path as defined in OPC server.	No
Item ID	Item ID as defined in OPC server.	Yes
Data Type	"Word", "Short", "Float", and so forth. This is the data type that LinkMaster will use for link item output data.	No

Editing a LinkMaster CSV File

A LinkMaster CSV file should be edited using a spreadsheet application (such as Microsoft Excel™). A simple Link-Master CSV file would appear in Excel as shown below.

LinkMaster CSV File Notes

1. Data blocks must be defined in order: link groups, link items, and then link item outputs.

2. Column names must be exactly the same as those listed above.

3. Except where noted, columns may be in any order.

4. Columns for fields not required by LinkMaster are optional.

5. Parameters not explicitly defined in the CSV file will be assigned appropriate default values by LinkMaster.

6. All link items must reference the link group to which it belongs. If the parent link group is not added during import (due to omission from the CSV file or other referencing errors), the link item will not be added.

7. All link item outputs must reference the link item to which it belongs. If the parent link item is not added during import (due to omission from the CSV file or other referencing errors), the link item output will not be added.

8. Comments are allowed and must begin with a semicolon.

9. Blank lines are allowed and can be added anywhere in the CSV file.

10. Item identifier records may not have any blank fields, unless they are used to pad the end of the record. Some applications (such as Microsoft Excel™) will add additional commas at the end of rows.

11. When saving a file in CSV format, Microsoft Excel™ may issue a warning such as "File.csv may contain features that are not compatible with CSV (MS-DOS). Do you want to keep the workbook in this format?" This is simply a reminder that CSV is a pure text format, and any Excel specific formatting will be lost. Users should answer yes. Other applications may issue a similar warning.

Importing Link Group Data

Once the CSV file has been edited and saved, it can be imported back into LinkMaster by clicking **File** | **Import CSV**. Users will be prompted to save the current project if they haven't already done so. If an item identifier record is found to be invalid during import, LinkMaster will not attempt to read any additional records. LinkMaster will then create a new project that contains all of the groups and items defined in the CSV file.

Note: Any errors logged during CSV import can be viewed using the EventViewer application.

See Also: How Do I... Import and Export Link Items Using a CSV File

Designing a Project

LinkMaster's Configuration should be utilized when creating the project's link groups and link items. The following topics in this book contain an example project. The OPC server items referenced in the Link Properties' Input and Output tabs use the KEPServerEX Simulator Driver, which is a memory-based driver that provides both static and changing data. It supports three types of addresses: R, K, and S. R and K addresses are numeric types. S data is a String type.

Note: R data increases (ramps) one unit on every read. S and K data are constant and only change if data is written to them.

To jump to a specific step, select a link from the list below.

Running LinkMaster
Starting A New Project
Adding A Link Group
Adding A Link Item
Saving the Project

Running LinkMaster

One of the benefits of OPC technology is that the remote or local OPC client can conveniently invoke LinkMaster whenever it attempts to connect and collect data. LinkMaster then invokes all participating servers for that particular project. Before this automatic mode of operation can occur, however, a project must be created and configured. LinkMaster will then select and load the most recently used project when invoked by an OPC client.

To start, open LinkMaster by double-clicking the desktop icon. Alternatively, select LinkMaster from the Windows Start menu.
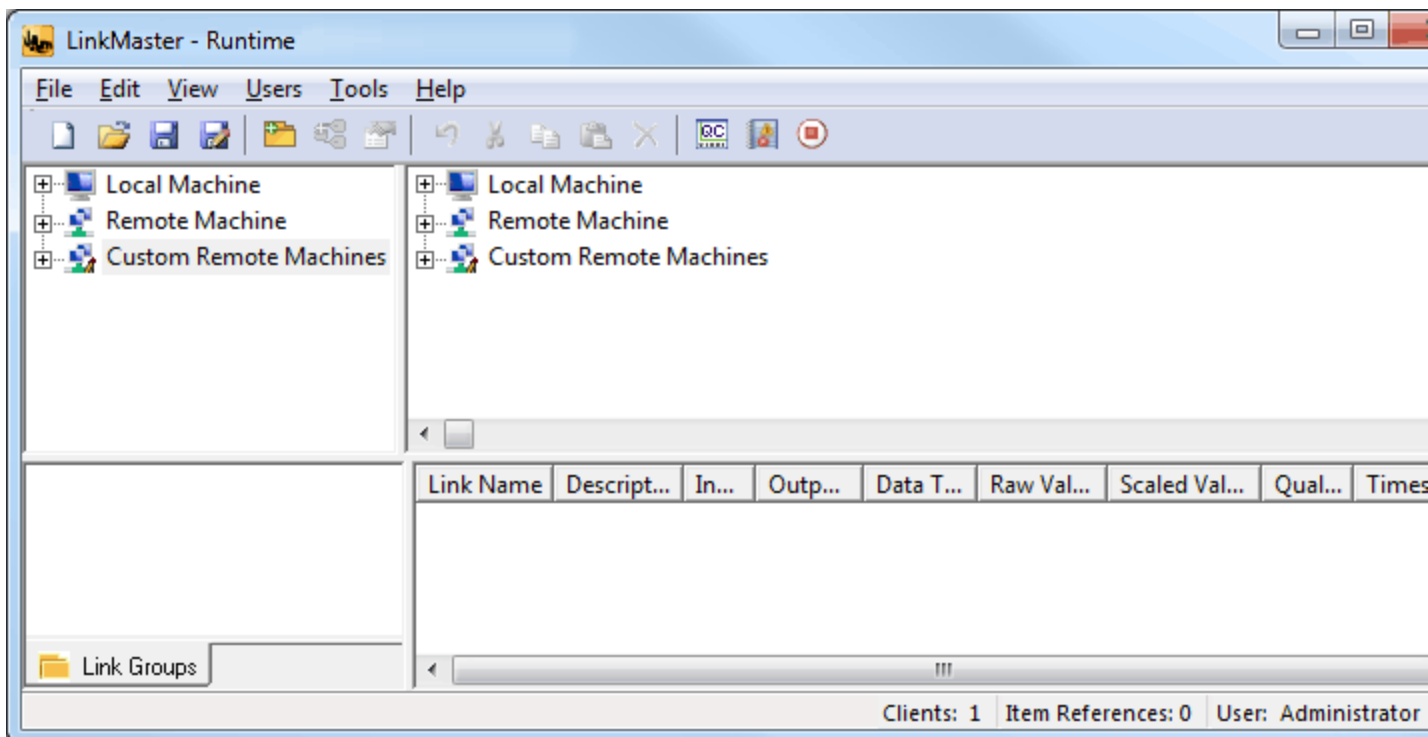
Starting A New Project

Users can choose input items from one OPC server and link them to one or more output items from another OPC server, thus creating a link item. Before link items are created, a link group must be specified. LinkMaster provides link groups, link items, and their inputs and outputs for creating a project.

Settings that are maintained the a project file that can be accessed from **File | Project Properties**. There are also a number of global configuration options that apply to all projects. These global options are configured in the **Tools | Options** menu, and will be stored in a Windows INI file called "settings.ini". This file is stored in the

Application Data directory selected during installation. While it is normal practice to store global options in the Windows registry, the INI file supports copying these global settings from one machine to another.

The following project demonstrates a successfully updating link by accessing a single OPC server on the local machine and linking a ramping input value to a non-ramping output address. To follow the demonstration properly, install the server that was provided with LinkMaster.

See Also: LinkMaster Options

Adding A Link Group

The first step is to define a new link group. Users can define as many link groups as needed in a single project.

1. To start, add a new link group by clicking **Edit | New Link Group**. Alternatively, click the **New Link Group** icon located on the toolbar.
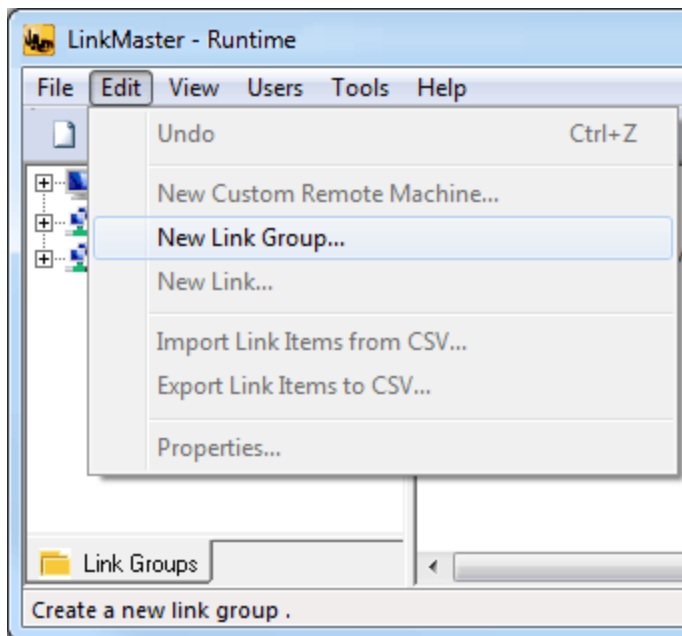
2. In **Link Group Properties**, specify the name and provide an optional description for the link group. Then, configure both the **Server Update Rate** and **Client IO Refresh Rate** for the links that will be contained within the group. In this example, the group is named "Group0".

    Note: For more information, refer to **Link Group Properties**.
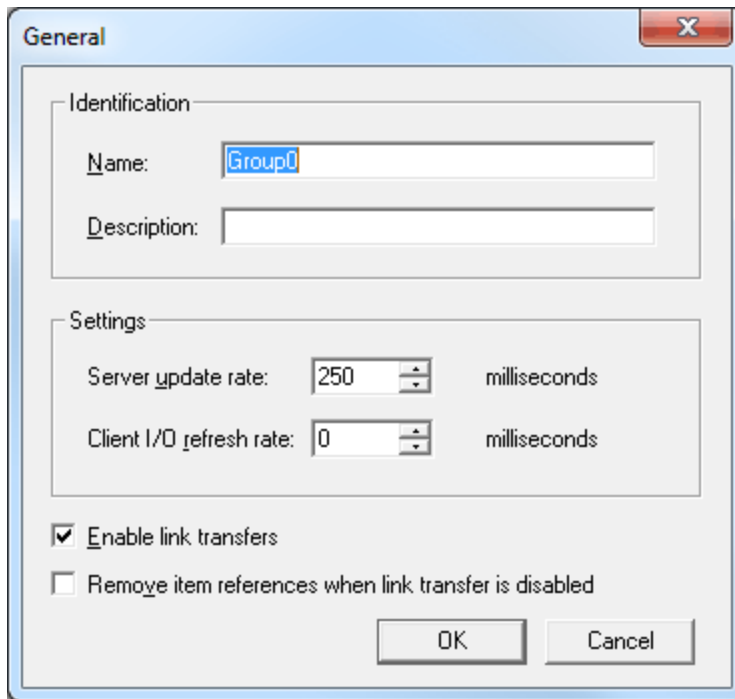
3. Once finished, click **OK**.

4. If the group was added correctly, the group icon 📂 should be visible in the lower left-hand window. If the group icon turns gray 📁 at any point during the project run, there is mostly likely an item in the group that is in error. If so, consult the Event Log. If the group color is red 📕, the link transfers for that group have been disabled.
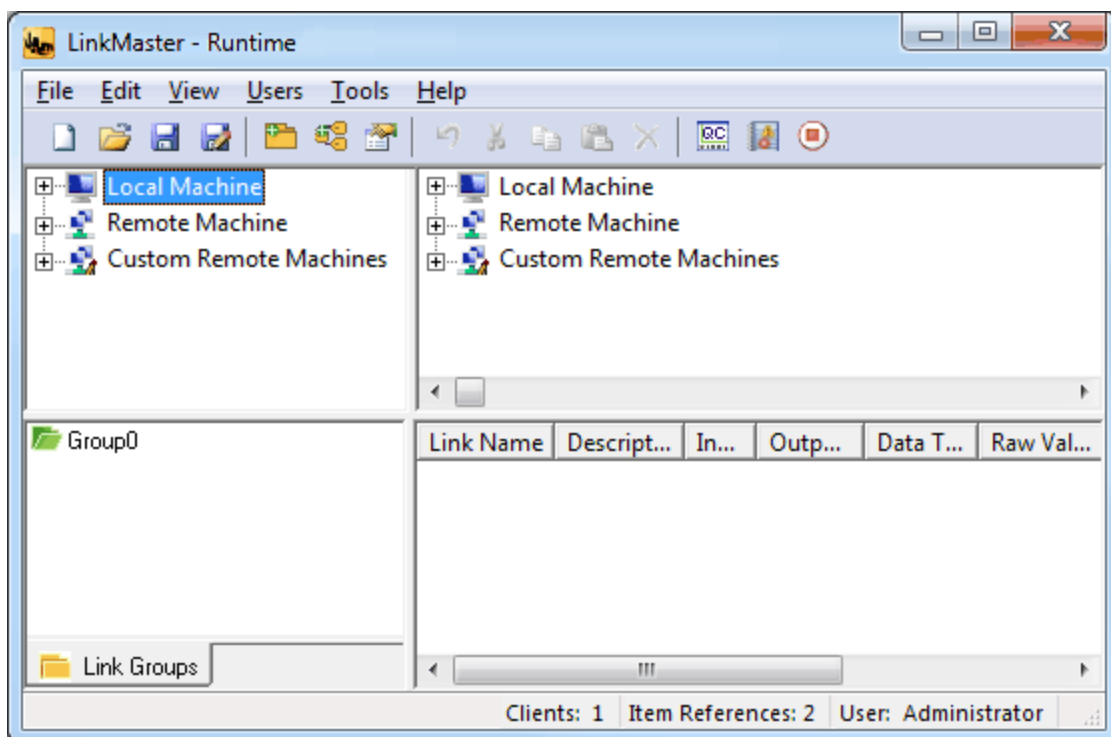
Adding A Link Item

The following example uses the KEPServerEX OPC Simulator Driver project called "simdemo.opf" (which is located in the KEPServerEX Projects folder). Before adding a link item to the LinkMaster project, ensure that the project has been loaded into the KEPServerEX.

1. To start, select the link group that will contain the item. In this example, the selected link group is "Group0".
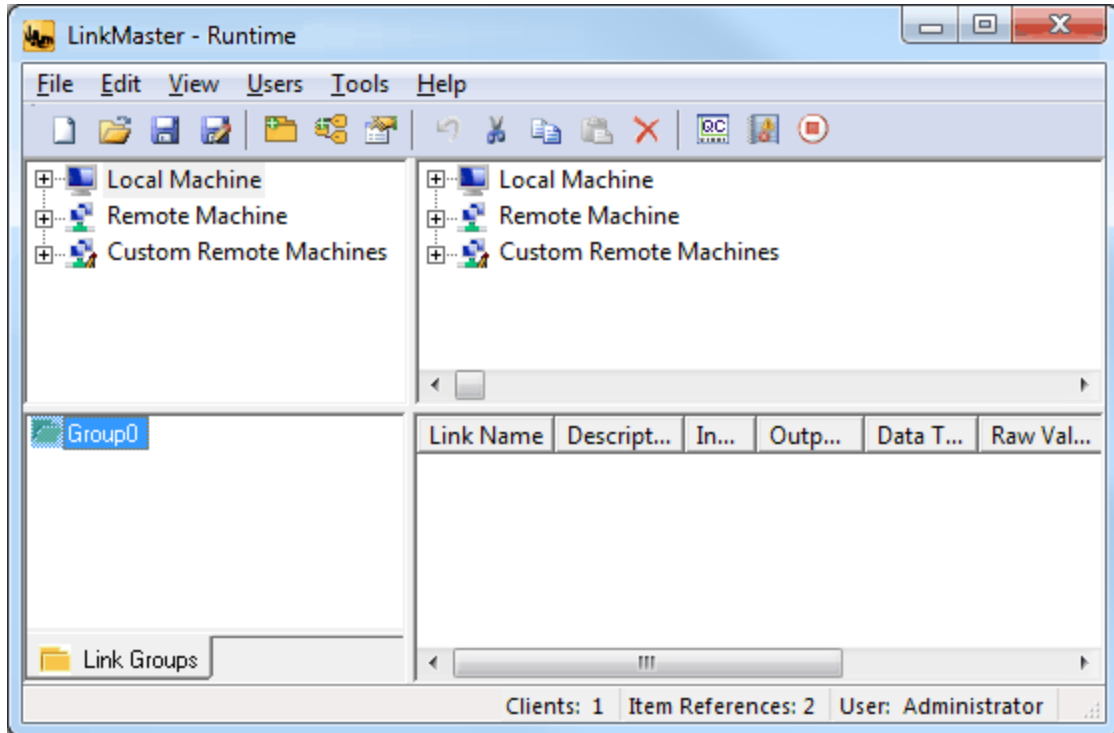
2. Next, click **Edit** and then select **New Link**. Alternatively, click the **New Link** icon located on the toolbar.
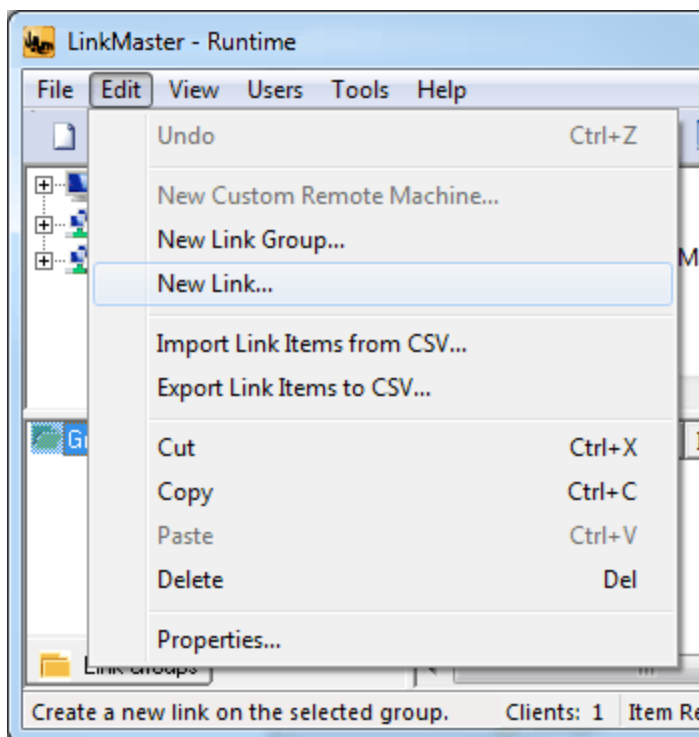
3. In **Link Item Properties**, specify the name and provide an optional description for the link. In this example, the link item is named "Link0".

4. In **Settings**, specify its client access.
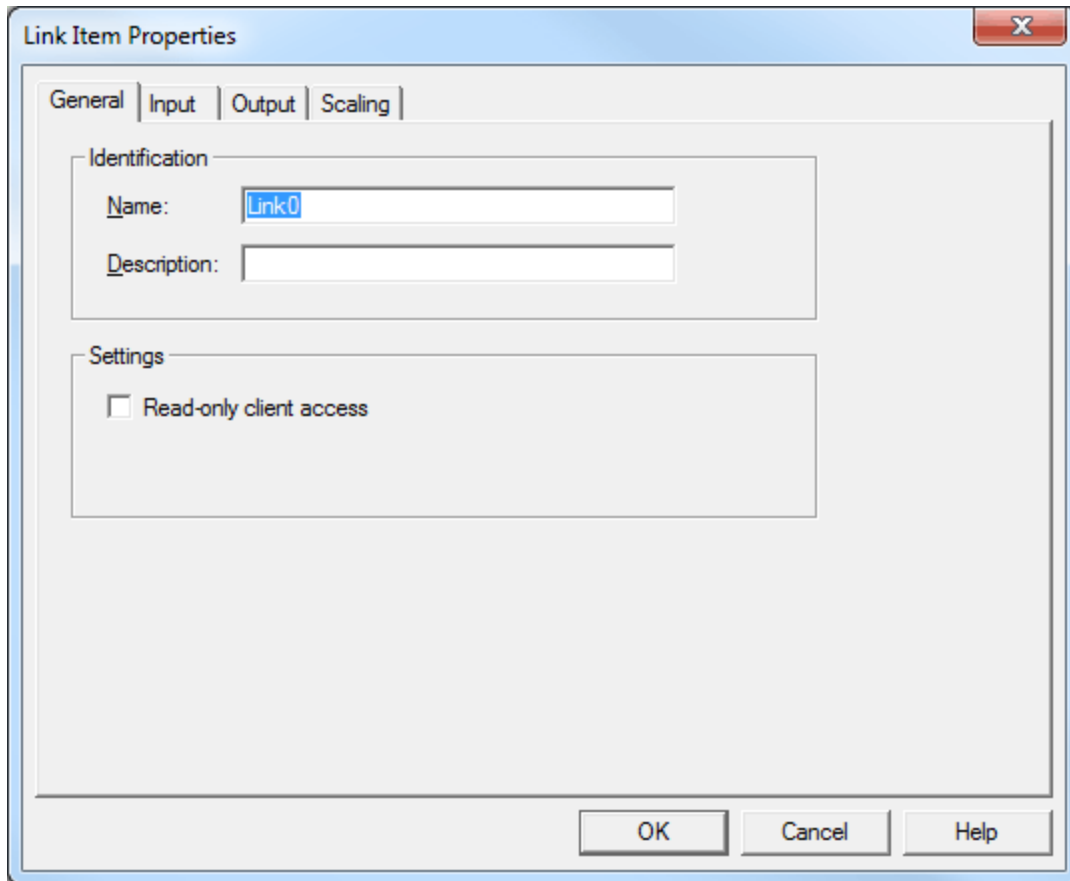
5. Next, open the **Input** tab.

> **Note:** In the example below, the machine name is "Local Machine" and the server is Kepware Technologies' KEPServerEX.

6. To define the input item for this link item, enter a path to the appropriate server and item.
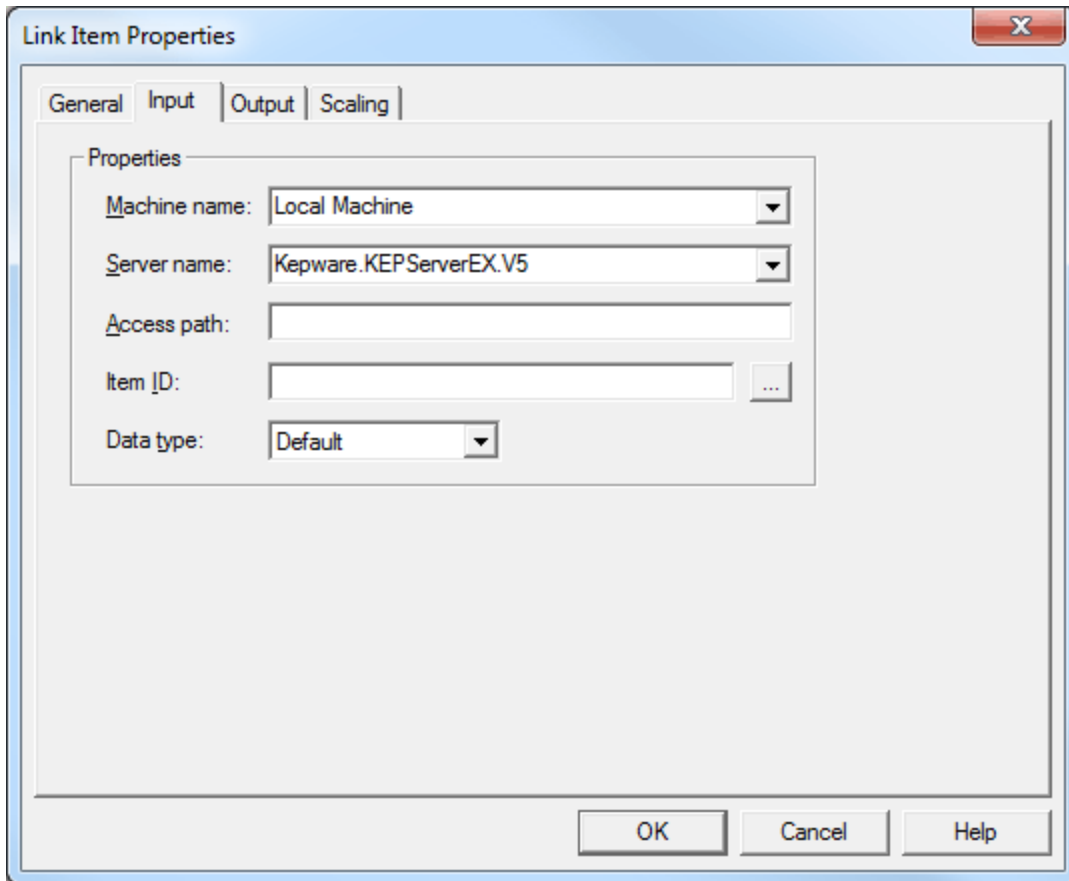
7. If the server supports tag browsing, simply click the browse box to the left of **Item ID** to search. If not, refer to the OPC server's documentation to determine valid item names for the location in question.

    Note: In the example below, the item is called "Tag_R". This item (which happens to be a simulated ramping value from the Simulator Driver project), will be the input for "Link0". To select this item, double-click on it.
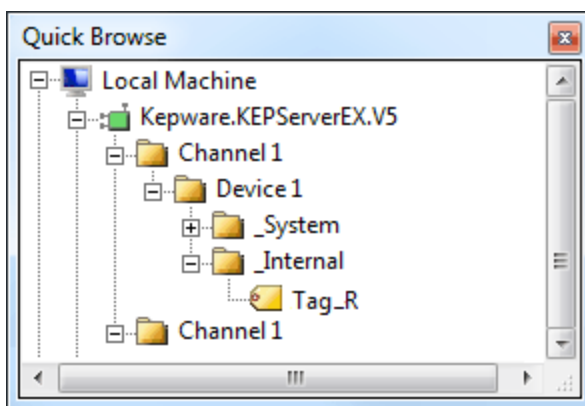
8. Next, close the browser window. The **Item ID** field should contain the new input path "Channel_ 1.Device_1.Tag_R".
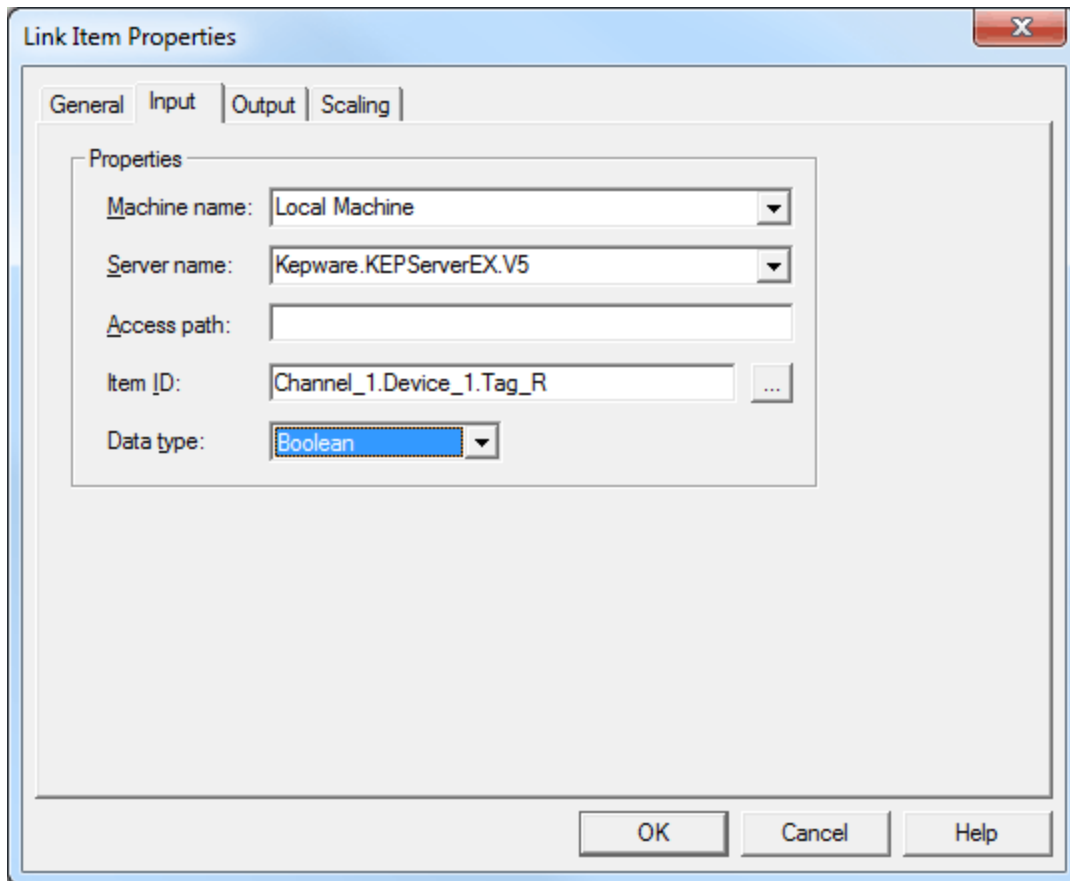
9. Next, open the **Output** tab.

10. Next, click the browse box to invoke the **Quick Browse** window, which can be used to expand the server tree and locate the correct server. To add the item "Tag_K" on "Channel_2.Device_1" (located on the same server of the local machine), simply double-click on it.
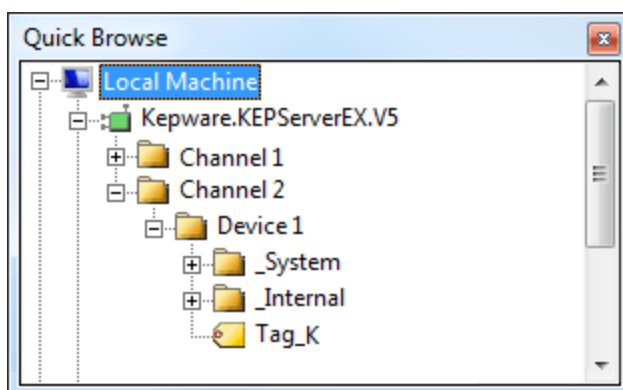
Note: This instantly creates an active link from ramping input item "Tag_R" to constant output item "Tag_K".
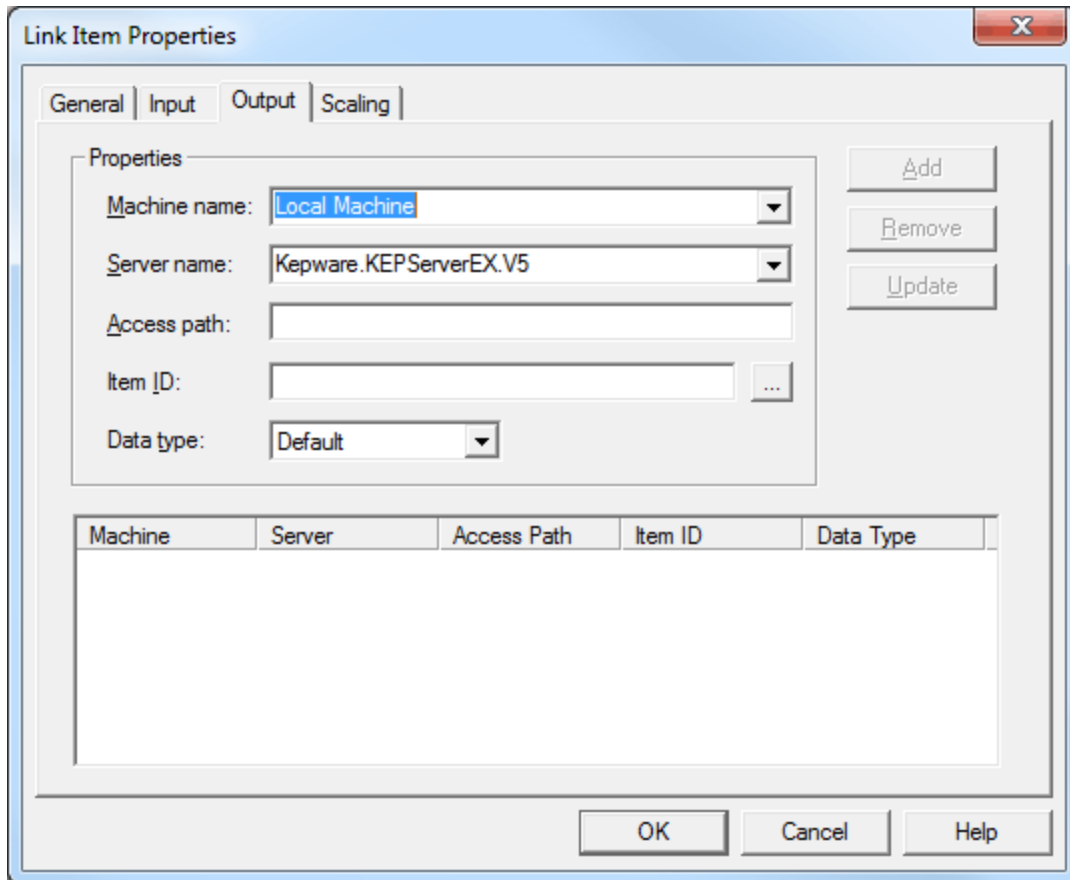
Note: Users can also create link items by dragging and dropping link inputs and outputs from the Link-Master's main window. For more information, refer to **How Do I... Drag and Drop**.

11. If the link item was correctly added, the link icon 🔗 should be visible in the lower left-hand window of LinkMaster. If the link icon turns gray 🔗 at any point during the project run, there is most likely an incorrect input or output for that item. If the link item color is clear 🔗, the group is out-of-sync with the Runtime. If the link item color is red 🔗, then the link transfers for that link (in addition to its group) have been disabled.

Note: If planning to link items that have two different data types, scale the link item's input to match the output's data type. For more information, refer to **Link Item Properties - Scaling**.

See Also: How Do I... Import and Export Link Items Using a CSV File

Saving the Project

After editing a project, users must save it in order to push the changes from the LinkMaster Configuration to the Runtime. To do so, click **File** | **Save**.
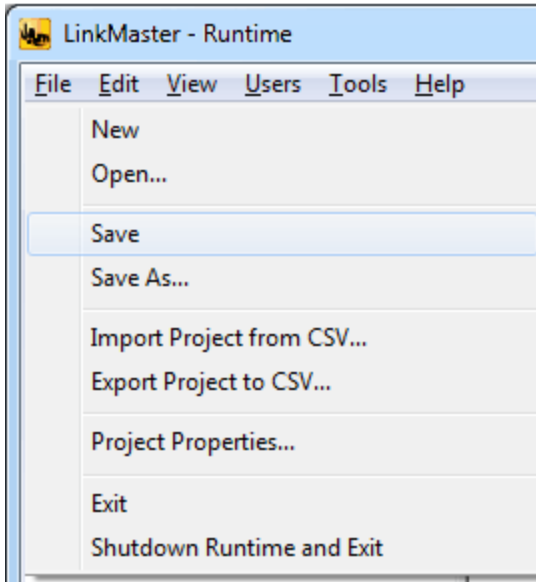
Note: Saving the project while client/server connections are active will interrupt the Runtime connection for a short period of time.

How Do I...?

For more information on a specific topic, select a link from the list below.

Configure Redundancy
Connect to a Custom Remote Machine
Drag and Drop Items
Import and Export Link Items Using a CSV File
Process Array Data in a DDE Client
Use LinkMaster System Tags
Use Net DDE with LinkMaster

How Do I... Configure Redundancy

LinkMaster's redundancy feature allows users to run two LinkMaster machines as a redundant pair, thus increasing the reliability of both the connections and the OPC data being transferred. When redundancy is enabled, one LinkMaster machine will operate as the primary node and actively perform link transfers. The second LinkMaster machine will operate as the secondary node. The primary node informs the secondary node that it is up and running by periodically sending a ping. If the secondary node does not receive the ping from the primary node during a specified amount of time, it will automatically take over the role of the primary node and start performing the link transfers. When the primary node returns, the secondary node will stop performing link transfers and the primary node will resume its operations.

Note: For more information, refer to **Options - Redundancy**.

How Do I... Connect to a Custom Remote Machine

A custom remote machine is defined by its name or IP address. Users can add entries to the Custom Remote Machines branch in any of the child Windows to simplify the network browse hierarchy or to add machines that are not available through Windows network browsing.

Creating a New Custom Remote Machine

1. To start, right-click on the **Custom Remote Machines** branch in any of the child windows. Then, select **New Custom Remote Machine**.
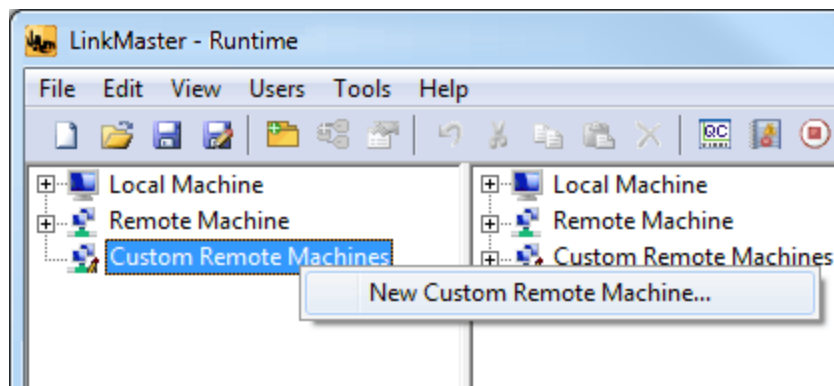
2. Next, enter the remote machine's name or IP address.
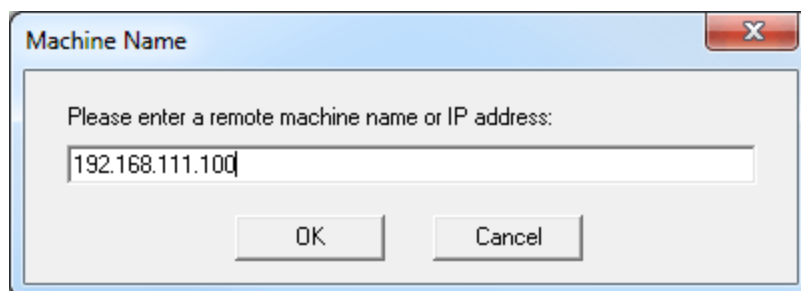
3. Once finished, click **OK**.

4. Expand the custom machine to connect to the server.

Note: To delete a custom remote machine, select the desired machine and then click **Edit | Delete**.

How Do I... Drag and Drop Items

For convenient link creation, users can drag items from an available server tree in LinkMaster's main window and then drop that item onto a highlighted link group icon, the link item display, or a link item itself (for outputs). The image below shows how to drag an item from the server tree to either the highlighted link group or link item display. This creates the link item input.
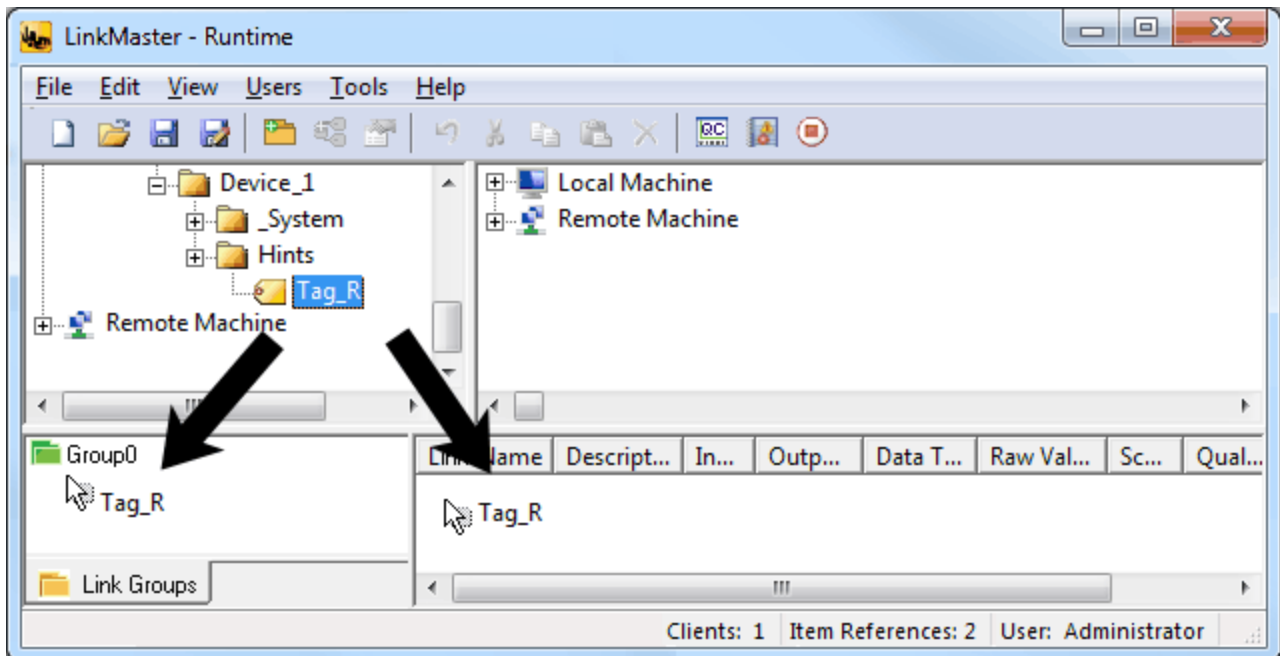
Note: The example below shows how to add a link output onto an existing highlighted link item (input).
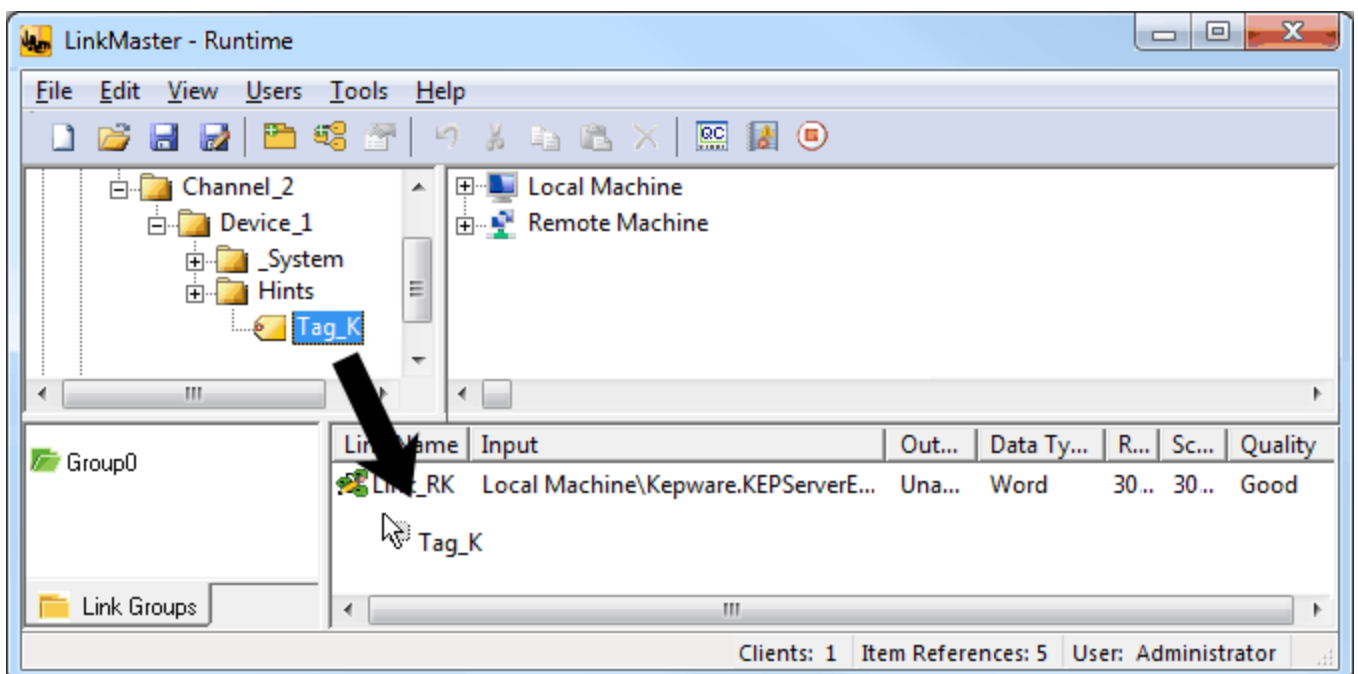
## How Do I... Import and Export Link Items Using a CSV File

Importing Link Items from a CSV File

A single link group CSV can be imported from a selected link group. This will only utilize the items belonging to that selected link group: other link groups and their associated link items will be ignored. For more information, refer to the instructions below.

Note: If the CSV file contains invalid input data, an error will occur.

1. To start, right-click on the selected group. Then, select **Import Link items from CSV**. Alternatively, click to select the desired group. Then, click **Edit | Import Link items from CSV**.
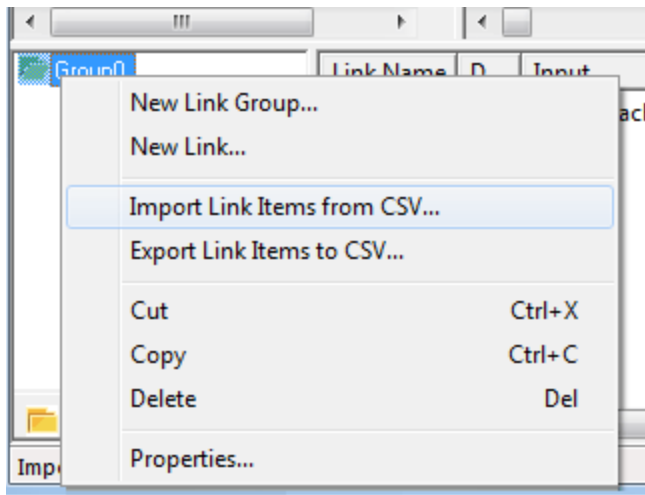
2. In **Import from CSV**, locate the appropriate CSV file. Then, click **Open**.
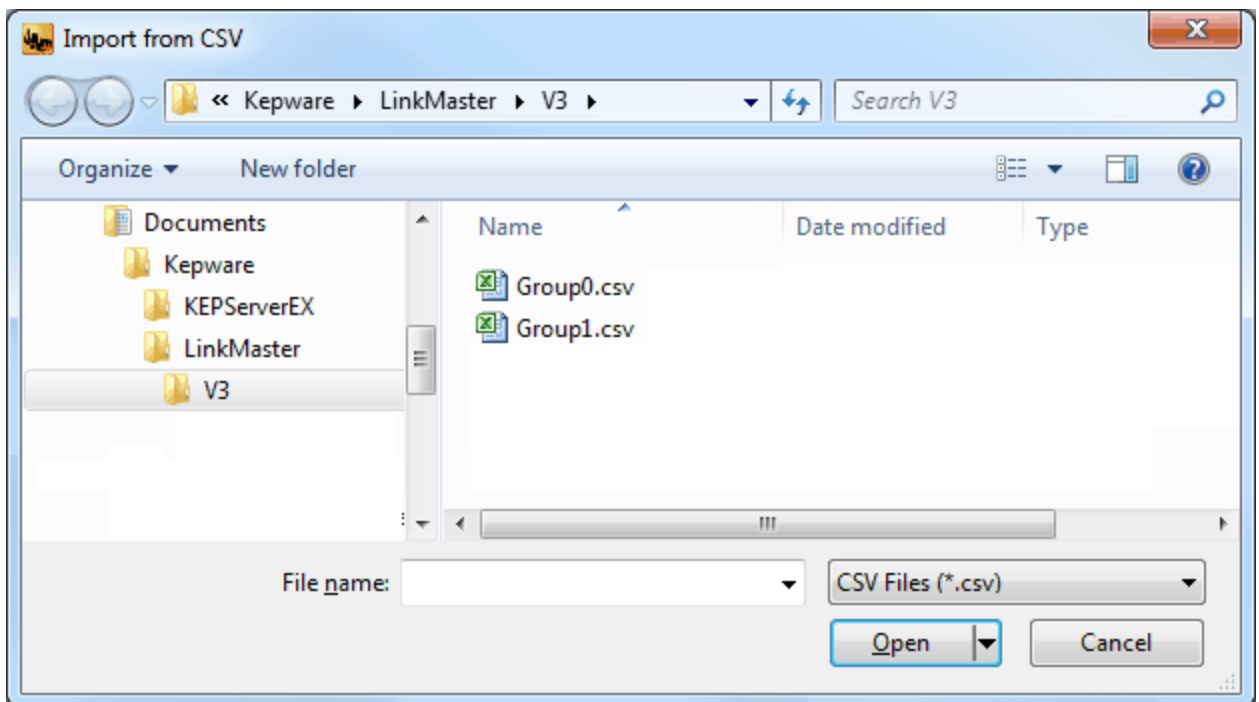
Note 1: When a project-level import is initiated, all existing link groups and their associated link items will be removed from the current active project and replaced with the link groups and link items associated with the CSV file.

Note 2: When a link group-level import is initiated, the link group and its associated link items will be stopped, updated, and restarted. Users will receive the following prompt:
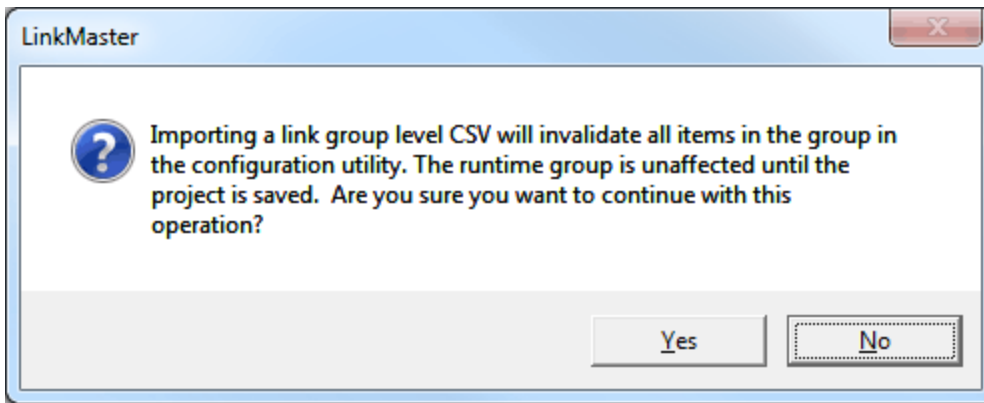
Exporting Link Items to a CSV File

A single link group CSV can be exported from a selected link group. This will only utilize items belonging to that selected link group and its associated link items. These items may be exported without disrupting the pre-existing link groups and link items. For more information, refer to the instructions below.

1. To start, right-click on the selected group. Then, select **Export Link items to CSV**. Alternatively, click to select the desired group. Then, click **Edit | Export Link items to CSV**.
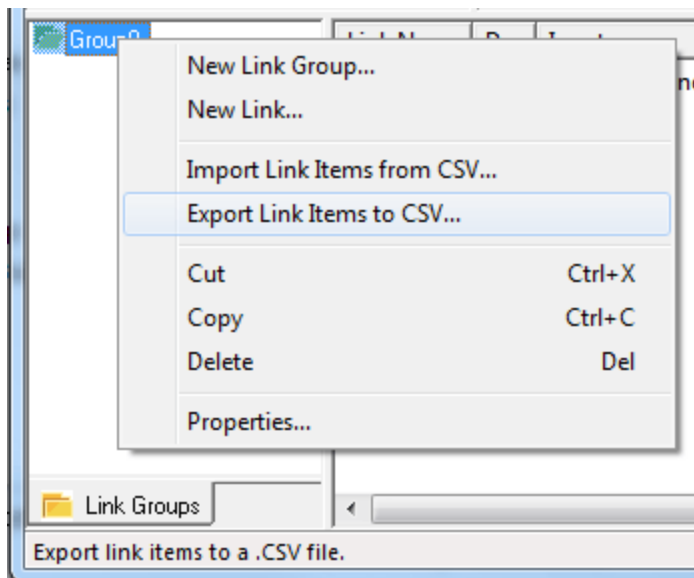
2. In **Export to CSV**, locate the appropriate CSV file. Then, click **Save**.
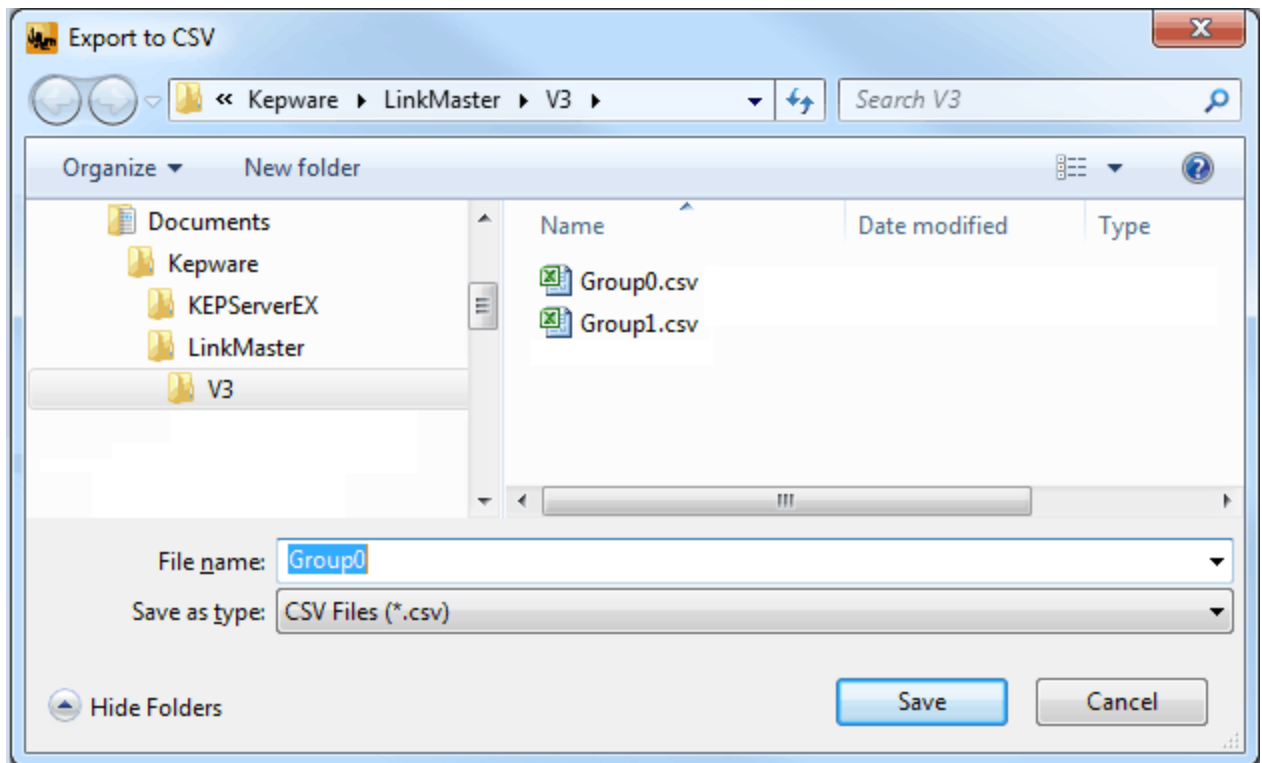
See Also: CSV Import and Export

How Do I... Process Array Data in a DDE Client

Many servers allow clients to access data in an array format; however, array data is only available to the client when using the Advanced DDE or CF_TEXT clipboard formats.

- For client applications using Advanced DDE, the number of elements in the array is specified in "sPACKDDE_DATAHDR_TAG struct". This structure should be used when poking array data to the server. This protocol only supports single dimensional arrays.
- For client applications using CF_TEXT, data in each row is separated by a "TAB (0x09)" character. Each row is terminated with a "CR(0x0d)" and a "LF (0x0a)" character. The text string should have this delimiter format when poking an array of data values. This protocol supports one and two-dimensional arrays.

Note: When poking to an array tag in either format, the entire array does not need to be written but the starting location is fixed. If users attempt to poke data in an array format to a tag that was not declared as an array, only the first value in the array will be written. If users attempt to poke more data than the tag's array size, only as much data as the tag's array size will be written.

See Also: DDE

How Do I... Use LinkMaster System Tags

System Tags are used to provide general error feedback to client applications, and to control when a link group and its link items are operating.

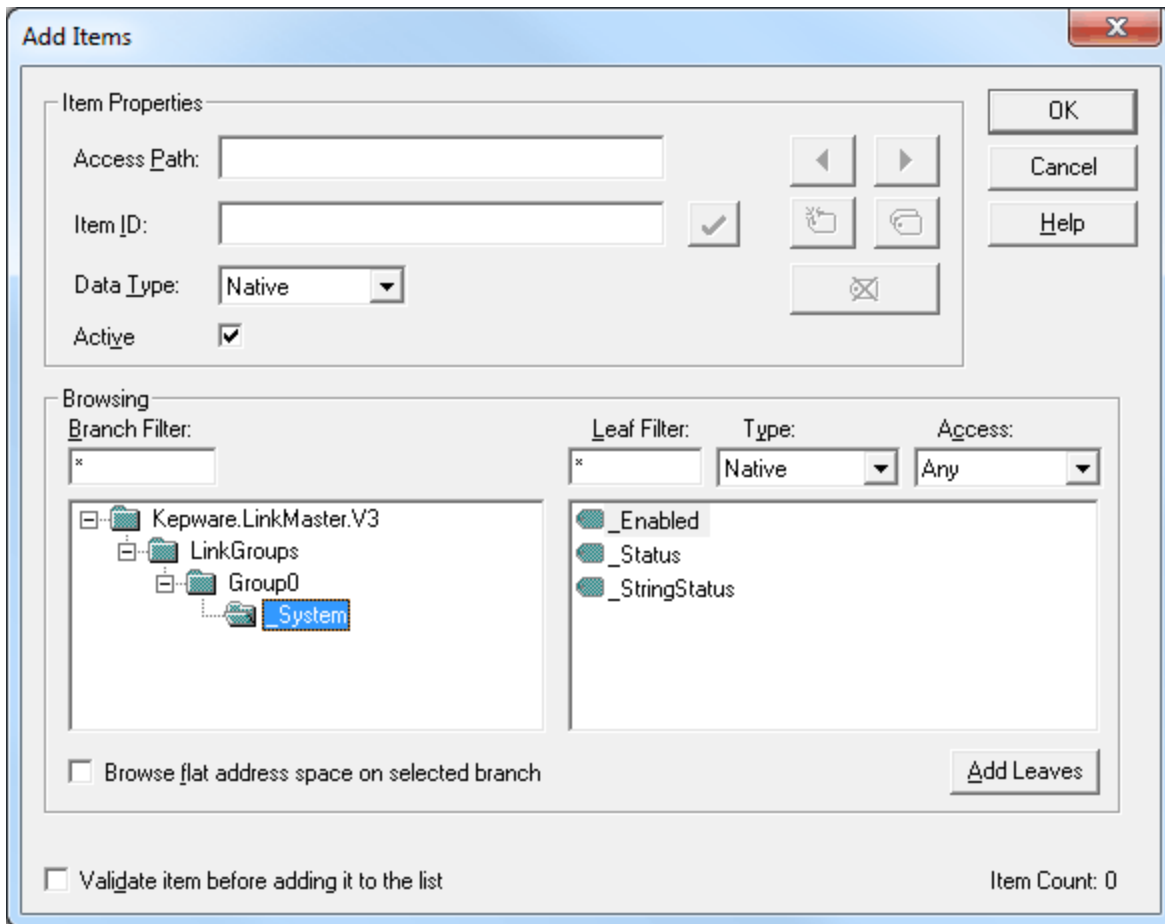### System Tags for Link Groups

There are currently three built-in System Tags available on each link group. For more information, refer to the table below.

System Tag	Description	Access
_Enabled	The _Enabled Tag is a Boolean tag that allows the active state of the link group to be turned On or Off. When this tag is set to FALSE, all user-defined link items in the link group will be marked as invalid and link writes will discontinue. When	Read/Write

	this tag is set to TRUE, normal link functionality will continue within that link group.	
_Status	The _Status Tag is a Short tag that returns the current error state of the link group. When displaying "0" (zero) the link group is operating properly. When displaying a value other than zero, LinkMaster has detected an error within the link group.	Read Only
_StatusString	The _StatusString tag is a string type tag that returns a description for the error state of the link group in string format. When the link group reads "Good", it is operating properly. Otherwise, the link group has detected an error.	Read Only

Note: The only tag that can be written to is _Enabled. This can be disabled through the **OPC Settings** tab in **Tools** | **Options**.

System Tags for Link Items

There are currently two built-in System Tags available for each link item. For more information, refer to the table below.

System Tag	Description	Access
_Status	The _Status Tag is a Short tag that returns the current error state of the Link Item. When displaying "0" (zero), the link item is operating properly. When displaying a value other than zero, LinkMaster has detected an error within the Link Item.	Read Only
_String	The _StatusString tag is a string type tag that returns a description for the error state of the Link Item in string format. When the Link Item reads "Good", it is operating properly; otherwise, LinkMaster has detected an error.	Read Only

Note: Link item System Tags can be browsed in an OPC client, and can be disabled through the **OPC Settings** tab in **Tools** | **Options**.

Locating System Tags

When using an OPC client, System Tags will be located beneath the _System branch of the LinkMaster browse space for a given link group. The following image is from the supplied OPC Quick Client, and shows how the System Tags appear to an OPC client. This example only shows link group level Status Tags.

Note: The _System branch will always be available. To reference a System Tag from a DDE application given the example above and the DDE defaults, the link would be as follows:

= *linkmaster|_LMDDEDATA!LinkGroups.Group0._System._Enabled*

The _Enabled Tag
The _Enabled Tag provides a flexible way to control the OPC applications. In some cases, it can be convenient to disable all link groups except for the link group currently being accessed. The _Enable Tag can also be used to allow the OPC or DDE application to turn a particular LinkMaster link group off while server sources are serviced (thus eliminating harmless but unwanted communications errors in the EventViewer).

Important: The _Status and StringStatus Tags do not return TRUE when a device is set inactive via the _Enable Tag.

See Also: [Link Group Properties](#)

How Do I... Use Net DDE with LinkMaster

Net DDE provides a way to share data between Windows applications as long as they exist on the same machine. Net DDE shares data from a DDE server located on a local PC with DDE client applications located on remote PCs. More information on how to configure a PC to support Net DDE is available online.

LinkMaster Configuration
Users must enable Net DDE in LinkMaster before it is connected by a remote client. For more information, refer to the instructions below.

1. To enable Net DDE services, click **File** | **Project Properties**.

2. Next, click the **DDE** tab.

3. Then, select **Enable Net DDE**.

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