LinkMaster Help

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kepware
LinkMaster
OPC BRIDGING SOFTWARE

Help version 1.025

Help Topics

Introduction to LinkMaster

The LinkMaster is a 32 bit Windows application that provides a means of linking data between OPC servers. As a bonus, it can also act as an OPC to DDE converter for DDE Client Access. LinkMaster has the capabilities of both a Server and a Client application. As a client, the LinkMaster can access data from one or more OPC server(s). As a server, the LinkMaster is able to collect, organize and link data from other OPC servers and offer that data to an OPC/DDE client. In certain situations, there may be a need to transfer data from one server component to another or from one OPC client to another, but the two components were not designed to communicate directly. The LinkMaster solves this problem by acting as a universal go-between for OPC server/client components.

Across many software disciplines and business segments it is very common to hear the term client/server application. In the industrial market, it usually refers to the sharing of manufacturing or production data between a variety of applications ranging from **human machine interface (HMI)** software and data historians, to large MES and ERP applications. Regardless of the business segment served, client/server applications have one thing in common, a standardized method of sharing data. In the industrial segment, many client/server technologies have been developed over the last ten years. Initially some of these technologies were proprietary. In many cases these proprietary client/server architectures were in wide use, but remained unavailable to third party applications. Early in the development of Windows, Microsoft provided a generic client server technology called **Dynamic Data Exchange (DDE)** . DDE did provide a basic architecture that would allow many Windows applications from a wide range of vendors to share data, but there was one problem. DDE was not designed for the industrial market; it lacked much of the speed and robustness desired in an industrial setting. However, this did not stop DDE from becoming dominant client/server architecture, largely due to its availability in most Windows applications. In time, variations on Microsoft's DDE were developed by some of the leading vendors in the market. These variations addressed some of the speed and reliability issues of DDE, but many people in the industrial segment agreed that a better system for sharing data was needed.

OPC (OLE for Process and Control)

In 1994 a group of vendors representing a broad spectrum of disciplines in the industrial segment formed what is now known as the **OPC Foundation**. The OPC Foundation put forth the goal of developing a single client/server specification that would allow any vendor to develop software and applications that could share data in a fast, robust fashion, and do it in a way that would eliminate the proprietary schemes that forced these same vendors to duplicate development efforts. The OPC Foundation developed the first specification called Data Access Specification 1.0a that was released in early 1996. Using this specification, vendors were able to quickly develop client server software.

A major goal of the OPC Foundation and the **Data Access specification** was to eliminate the need of client application vendor's to develop their own proprietary set of communications drivers. For many vendors, the effort required to develop numerous communications drivers outweighed the development effort involved in the client application itself. With the adoption of OPC technology a vendor could now focus their efforts almost exclusively on the development of the client application. The Data Access specification defines how both the client and the server application interface must be constructed. If the specification is followed properly, a client vendor knows that any OPC server that exists for an industrial device can provide the connectivity needed for data access. Issues like time to market or reliability no longer restrict applications to which any OPC compatible application can address. OPC has given the end user the additional benefit of being able to select the best of breed software to solve application problems. Historically, if the application software did not have the desired communication driver or if the available driver didn't perform adequately, the only solution was to try to persuade the application vendor to either develop the desired driver or repair an existing driver. The time required in either of these cases was usually never short. With OPC, the end user is no longer tied to the resource limitations of the client application vendor. The user can now choose from a variety of OPC server vendors to address a new driver requirement or remedy a performance issue. Equally, the client application vendor can now focus on the continued improvement of their core product without the disruptive effort required to address communication issues and needs. Kepware's goal within the OPC environment is to be a leading provider of the server component of the OPC equation and to do so by providing a product that is reliable and easy to use. LinkMaster is built upon four years of development efforts in communications driver development and OPC technology.

A lot has been said here about OPC, but how does the OPC specification work? The OPC Foundation has provided a good overview of OPC technology. With permission of the OPC Foundation, we have provided the following section of the Data Access specification.

OPC Data Access Fundamentals

This section introduces OPC Data Access and covers topics that are specific to OPC Data Access.

OPC Overview

This specification describes the OPC COM Objects and their interfaces implemented by OPC Servers. An OPC Client can connect to OPC Servers provided by one or more vendors.

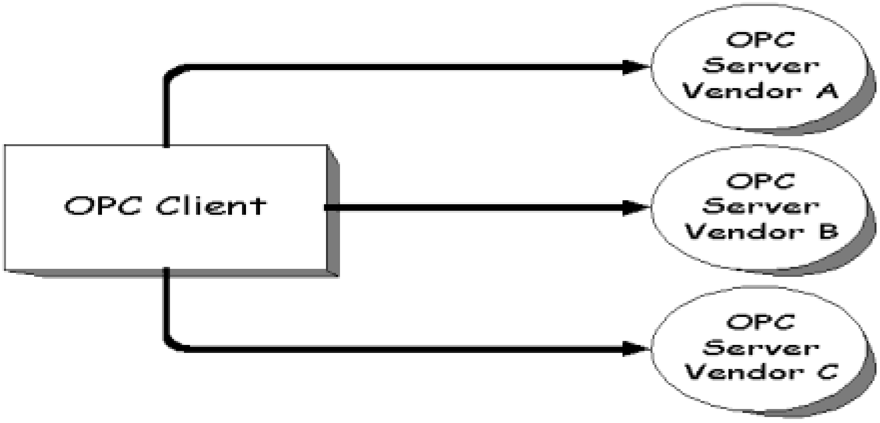


Figure 1.0 - OPC Client

Different vendors may provide OPC Servers. Vendor supplied code determines the devices and data to which each server has access, the data names and the details about how the server physically accesses that data. Specifics on naming conventions are supplied in a subsequent section.

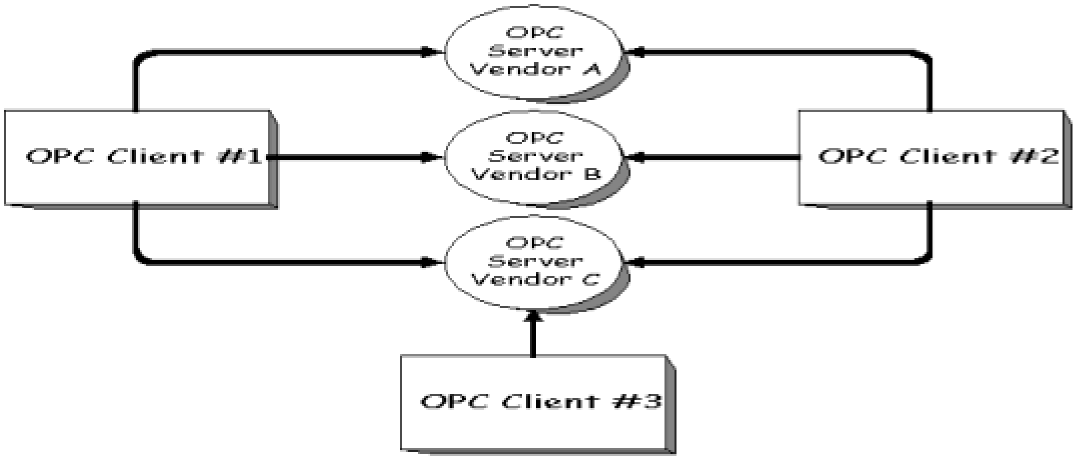


Figure 1.1 - OPC Client/Server Relationship

At a high level, an OPC server is comprised of several objects: the **server**, the **group**, and the **item**. The OPC server object maintains information about the server and serves as a container for OPC group objects. The OPC group object maintains information about itself and provides the mechanism for containing and logically organizing OPC items.

The OPC Groups provide a way for clients to organize data. For example, the group might represent items in a particular operator display or report. Data can be written and read. Exception based connections can also be created between the client and the items in the group and can be enabled and disabled as needed. An OPC client can configure the rate that an OPC server should provide the data changes to the OPC client.

There are two types of groups, **public** and **local** (or 'private'). Public is for sharing across multiple clients, local is localized to a client. Refer to the section on public groups for the intent, purpose, and functionality and for further details. There are also specific optional interfaces for the public groups. Within each group, the client can define one or more OPC Items.

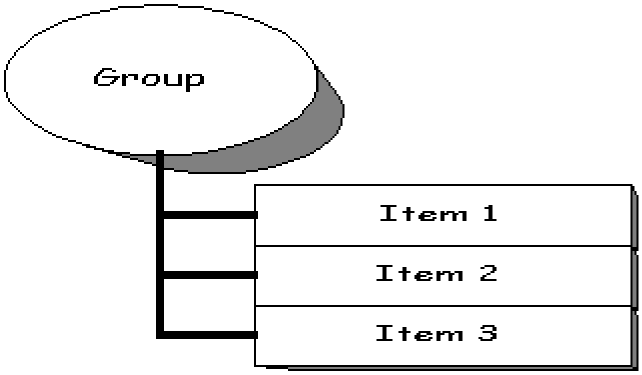


Figure1.2 - Group/Item Relationship

The OPC Items represent connections to data sources within the server. An OPC Item, from the custom interface perspective, is not accessible as an object by an OPC Client. Therefore, there is no external interface defined for an OPC Item. All access to OPC Items is via an OPC Group object that contains the OPC item or simply where the OPC Item is defined.

Associated with each item is a **Value**, **Quality** and **Time Stamp**. The value is in the form of a **Variant**, and the Quality is similar to that specified by **Fieldbus**.

Take note that the items are not the data sources; they are just connections to them. For example, the tags in a DCS system exist regardless of whether an OPC client is currently accessing them. The OPC Item should be thought of as simply specifying the address of the data, not as the actual physical source of the data that the address references.

Where OPC Fits

Although OPC is primarily designed for accessing data from a networked server, OPC interfaces can be used in many places within an application. At the lowest level they can get raw data from the physical devices into a SCADA or DCS, or from the SCADA or DCS system into the application. The architecture and design makes it possible to construct an OPC Server which allows a client application to access data from many OPC Servers provided by many different OPC vendors running on different nodes via a single object.

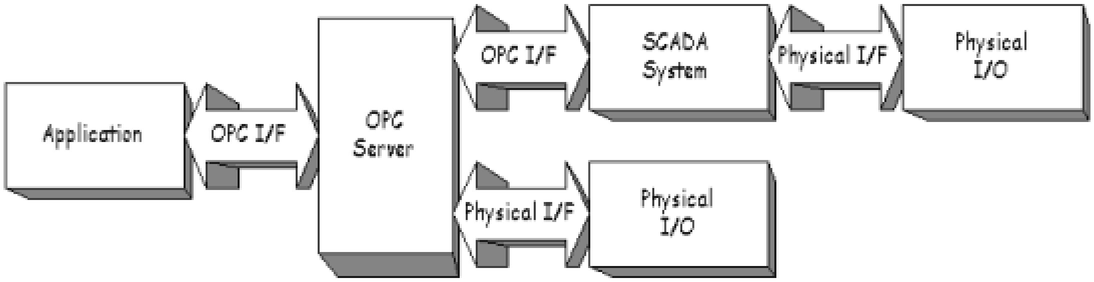


Figure 1.3 - OPC Client/Server Relationship

General OPC Architecture and Components

OPC is a specification for two sets of interfaces; the **OPC Custom Interfaces** and the **OPC Automation interfaces**. A revised automation interface will be provided with release 2.0 of the OPC specification.

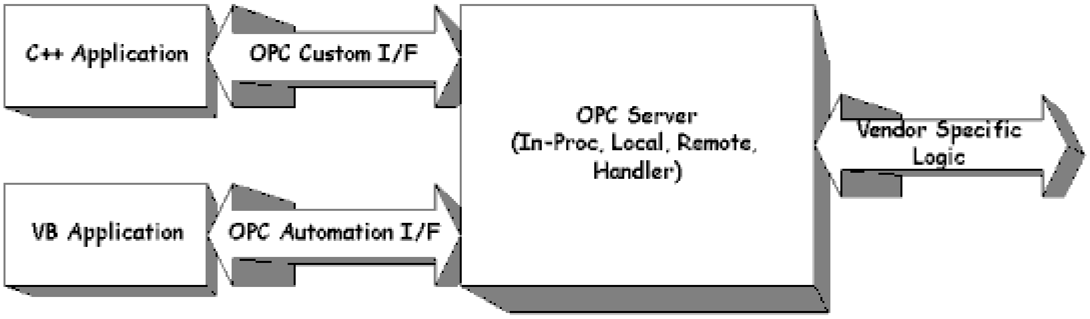


Figure 1.4 - OPC Interfaces

The OPC Specification identifies what the COM interfaces are, not the implementation of those interfaces. It explains the functionality that the interfaces are expected to provide to client applications that use them.

Included are descriptions of architectures and interfaces that seemed most appropriate for those architectures. Like all COM implementations, the architecture of OPC is a client-server model where the OPC Server component provides an interface to the OPC objects and manages them.

There are several unique considerations in implementing an OPC Server. The main issue is the frequency of data transfer over non-sharable communications paths to physical devices. Thus, we expect that the OPC Server will either be a local or remote EXE, which includes code that is responsible for efficient data collection from a physical device.

An OPC client application communicates to an OPC server through the specified OPC custom and automation interfaces. OPC servers must implement the custom interface, and optionally may implement the automation interface.

An **inproc**, or OPC handler, may be used to marshal the interface and provide the additional item level functionality of the OPC Automation Interface. Refer to the figure below.

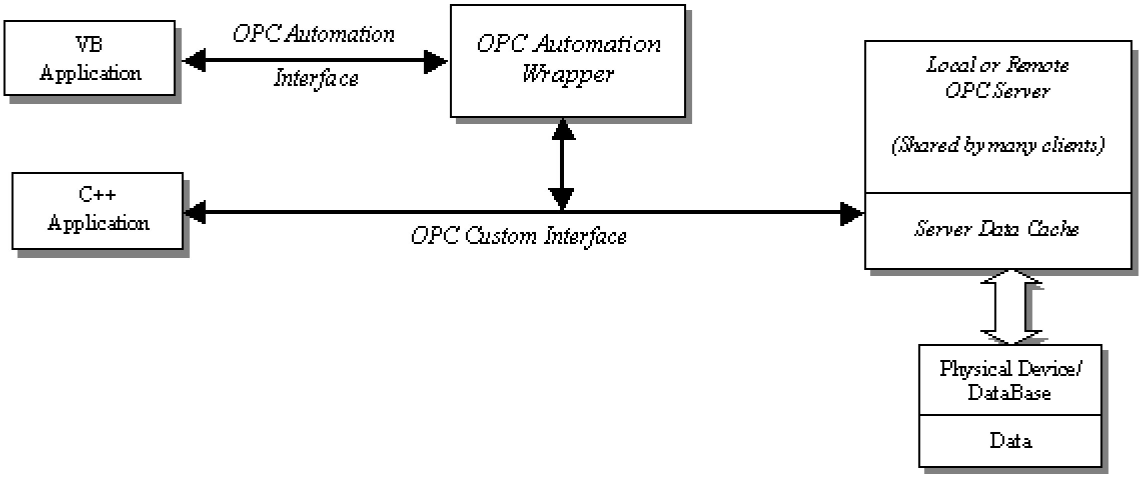


Figure 1.5 - Typical OPC Architecture

It is also expected that the server will consolidate and optimize data accesses requested by the various clients to promote efficient communications with the physical device. For **inputs** (reads), data is returned by the device is buffered for asynchronous distribution or synchronous collection by various OPC clients. For **outputs** (writes), the OPC Server updates the physical device data on behalf of OPC Clients.

DDE Fundamentals

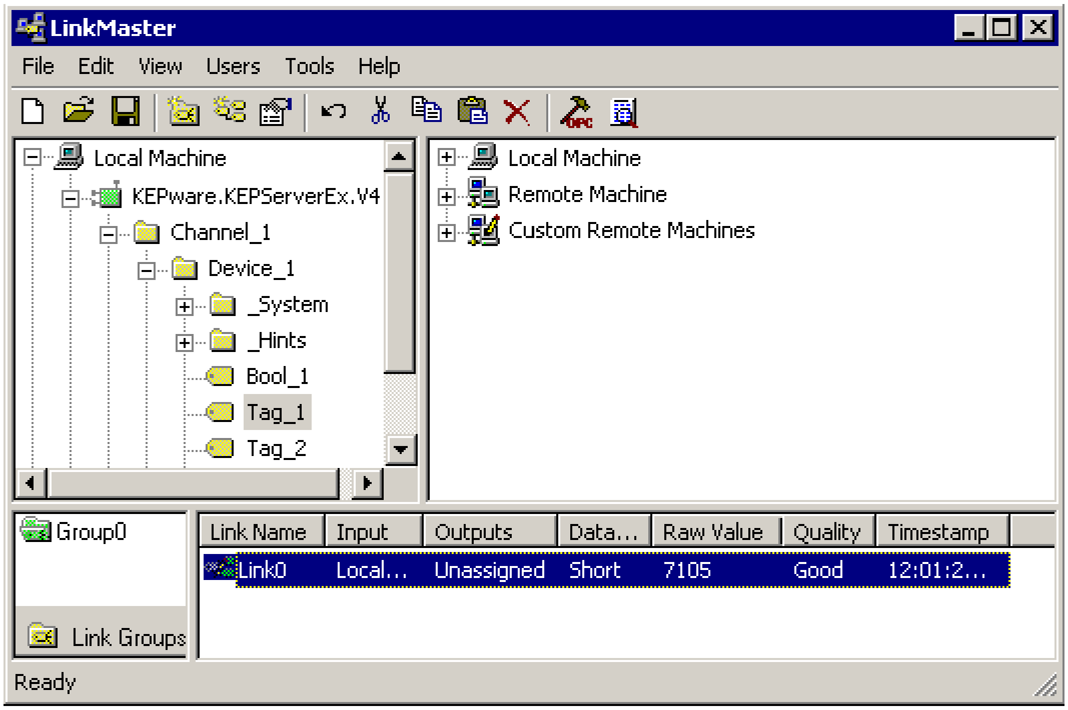
Kepware recognizes that a number of legacy applications still depend upon DDE for their underlying client server technology. To address these applications, LinkMaster has been designed to provide the same access to device data via DDE, as can be achieved using OPC.

Supported DDE Formats

- CF_Text
- XL_Table
- AdvancedDDE
- NetDDE

Basic LinkMaster Components

Click on any area of the figure below in order to learn more about LinkMaster.



Link Name	Input	Outputs	Data...	Raw Value	Quality	Timestamp
Link0	Local...	Unassigned	Short	7105	Good	12:01:2...

LinkMaster Features

LinkMaster has been designed with the goal of providing a fully featured data-bridging product that demonstrates unparalleled compatibility and performance. Built upon Kepware's OPC client/server technology, the LinkMaster has also incorporated all of the following features:

- Complies with OPC 1.0a and OPC 2.05a Data Access Specification.
- Supports both COM and DCOM.
- Runs as a Windows NT/2000/XP **service**.
- Provides full **scaling** capabilities.
- Transfers data fast and effectively.
- Access **remote machines** by entering either an IP or Machine name.
- Creates links on the fly with both **Drag and Drop** and Tag Browsing capabilities.
- Supports project import and export as a CSV (comma separated variable) text file.
- Tracks errors with a detail oriented Event Viewer log.

- Functions as an OPC to OPC/DDE client server.
- Provides **Write Optimizations** settings to refine writes to links.
- Supports **Redundancy**.

Summary of Feature List

LinkMaster supports the following client server technologies:

- OPC Data Access Version 1.0a
- OPC Data Access Version 2.05a
- DDE Format CF_Text
- DDE Format XL_Table
- DDE Format Advanced DDE

OPC Data Access 1.0a was the original specification the OPC Foundation developed back in 1996. Many of the OPC client applications in use today support this original specification. OPC Data Access 2.0 is the latest version of the OPC interface. The 2.05a version of the interface has been enhanced to make better use of the underlying Microsoft COM technology. Most OPC client applications are being converted to support version 2.05a of the OPC specification. The DDE format CF_Text is the standard DDE format as defined by Microsoft. All DDE aware applications support the **CF_Text format**. **AdvancedDDE** is a variation on the normal CF_Text format. Advanced DDE allows larger amounts of data to transfer between applications at higher rates of speed, and with better error handling than a normal **CF_Text DDE** link. In keeping with our goal, we created LinkMaster, a data bridging application that can access data from multiple servers and supports all client/server technologies listed above.

Supports COM and DCOM

Based on Microsoft's COM technology, OPC servers can share data with remote client applications using **DCOM** (Distributed COM). DCOM is used to use a single OPC server to provide data to client applications running both locally and on remote machines. DDE is not without its own means of allowing remote access. All of the DDE formats supported by LinkMaster can also be accessed remotely using what is known as **NETDDE**. NETDDE allows a remote DDE client application to use the machine name of a remote DDE server when specifying a DDE link. LinkMaster has been designed to allow both of these methods of remote server access. In terms of OPC connections, LinkMaster will properly configure the DCOM settings to allow remote OPC clients to access and browse LinkMaster. For DDE clients, LinkMaster will automatically start NETDDE services and register all of the required DDE shares, allowing remote DDE clients access to device data. Establishing DDE share names can be a time consuming process for the application; therefore, by default, NETDDE services are not enabled in LinkMaster.

Runs as NT Service

LinkMaster supports running as a service under Windows NT/2000. Service operation is completely user configurable from the **Tools | Options** menu, and can be changed at any time allowing users to move from normal, stand alone program operation to NT service mode. Running as a NT service is crucial for many applications where LinkMaster is providing data to OPC clients via DCOM. For these applications, loss of a DCOM connection cannot be tolerated. Normally, an OPC server that only supports stand alone program operation is forced to shut down when the host machine experiences a user log in or log out. While running as a service, LinkMaster can continue to supply OPC data across user log in sessions and can be configured to interact with the desktop, allowing users to make changes to the LinkMaster project. It can also be configured to have a non-visible presence while running.

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 can be forced outside of the range that the users desire. To prevent this, LinkMaster is used to clamp the scaled value to the engineering ranges. In most cases, it is always assumed that a scaled value results in a floating-point number. LinkMaster doesn't make this assumption and is used to 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 Tag Import and Export

LinkMaster can import and export project data in a CSV (comma separated variable) text file format. This allows for large projects to be created and modified quickly and easily. For example, if the servers linking data with do not contain browsed items, then users would have to enter each server item's access path manually into each link item property page. With the use of a simple text editor or with Microsoft Excel™ users can quickly create and manipulate Inputs, Outputs or any other project attributes existing in the LinkMaster project via the CSV file. **See Also:** **CSV Tag Import**

and Export.

Link Item Management

LinkMaster's link management system is used to create a Link database structure that fits the nature of the application. Multiple Link groups can be added and defined to segregate the Link items into meaningful groups. **Drag and drop editing** makes adding a large number of tags easy. Unique Link Management features allow new links to be created on the fly using convenient "Drag and Drop" and "Tag Browsing" methods. Additionally, **CSV import and export** is used to create and edit projects in any desired application.

User Management

In certain situations, managing what users can and cannot do in the OPC application can be a necessity. LinkMaster includes a built-in **User Manager** that allows complete control over what types of functionality each individual user can access. The default administrator account is used to add multiple users, each with their own set of rights for LinkMaster access. Any user log in/log out is recorded in LinkMaster's event logging system- the EventViewer. By default, all operations are available at all times until priveleges are set.

Event Viewer

Included with the LinkMaster package is a stand-alone event monitoring application called the EventViewer. The EventViewer is a 32 bit Windows application that monitors and displays events occurring on any running LinkMaster application, either remotely or locally, allowing multiple LinkMaster systems to be monitored concurrently.

Redundancy

LinkMaster supports operation of two LinkMaster machines as a redundant pair. One LinkMaster machine operates as the primary node actively performing the link transfers while the other node operates as the secondary node. If the primary node fails, the secondary node takes over the role of the primary and performs the link transfers. When the primary node comes back up again, the secondary node stops link transfers and lets the primary node perform its operations. For more information, refer to **Redundancy**.

Processing 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 **Advanced DDE** or **CF_TEXT** clipboard formats.

For client applications using Advanced DDE, the number of elements in the array is specified in the " **sPACKDDE_DATAHDR_TAG struct**". Only single dimensional arrays are supported by this protocol. This structure should be used when poking array data to the server.

For clients using CF_TEXT, one and two-dimensional arrays are supported. Data in each row is separated by a **TAB (0x09)** character and each row is terminated with a **CR (0x0d)** and a **LF (0x0a)** character. When a client wants to poke an array of data values, the text string written should have this delimiter format.

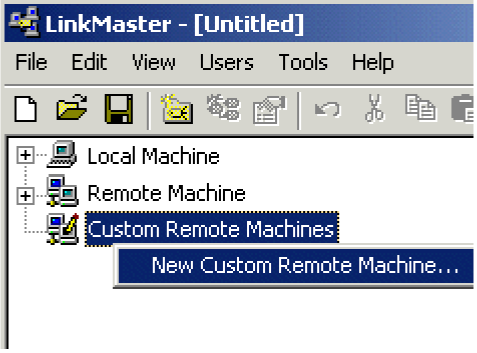
When poking to an array tag in either format, the entire array does not need to be written, but the starting location is fixed. If users attempt to poke data in an array format to a tag that was not declared as an array, only the first value in the array will be written. If users attempt to poke more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

Custom Remote Machine

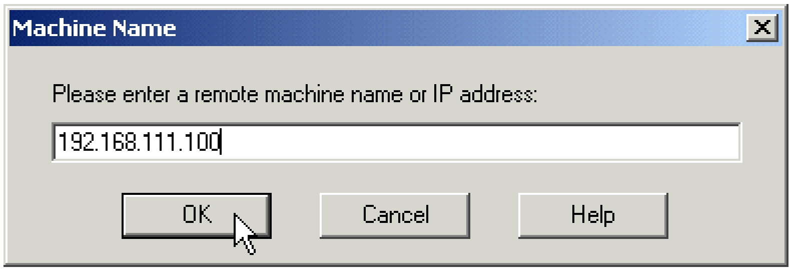
A custom remote machine is defined by name or IP address. Users can add these entries to the **Custom Remote Machines** branch in any of the child Windows to simplify the network browse hierarchy or for machines that are not available through Windows network browsing.

Creating a New Custom Remote Machine

1. Right-click on the **Custom Remote Machines** branch in any of the child windows. Select **New Custom Remote Machine** as illustrated below to invoke the **Machine Name** dialog.



2. Enter the name or IP address of the machine that is to be added to the **Custom Remote Machine** branch.



Please enter a remote machine name or IP address: 192.168.111.100

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

Deleting a Custom Remote Machine

Select the desired machine and press the DEL key. Alternatively, select **Edit** | **Delete** from the Edit menu or toolbar.

NETDDE

DDE provides a way to share data between Windows applications, as long as those applications exist on the same machine. Net DDE is used to share data from a DDE server on a local PC with client applications located on remote PCs. To do this, the PC must have a unique computer name. If a network is already installed and running, then all of the computers will already have unique names. Users can find the computer name by looking at the network settings from the Windows Control Panel. To do so, simply double-click on the network icon. The computer name should be in the first visible field. Once users have the computer name for the PC running LinkMaster, they can access that data from remote clients using the following format:

Use the following convention to establish a **Net DDE** link from a remote client application to LinkMaster:

<'\\JohnDoe\NDDE$'>|<'_LMDDEDATA$'>!<'LinkGroups.Group0.Link0'>

Where:

Application = \\JohnDoe\NDDE$
Topic =_LMDDEDATA$
Item =LinkGroups.Group0.Link0

Note 1: The <> characters above are for clarity only and are not a normal part of a DDE link reference.

Note 2: When making a NetDDE connection from a DDE application to the Server, each section of the formula must be enclosed in single quotes (' '). Some DDE applications do not recognize the dollar symbol $ as valid character in their DDE links.

Note 3: When overriding the default configuration of a dynamic tag from a DDE application, the entire item name will need to be enclosed in single quotes. Like the dollar symbol, the at @ symbol is not normally recognized as a valid character in a formula.

Client Configuration

To use Net DDE, users may be required to manually start the Net DDE services on the client computer before running the client application. From Windows NT, use the Services Applet from the Control Panel. From Windows95, run the program **NETDDE.EXE**.

LinkMaster Configuration

NetDDE must be enabled in LinkMaster before it is connected by a remote client. To enable Net DDE services, click on **Tools** and select **Options**. Then, click the **DDE** tab and select **Enable Net DDE**. For more information, refer to **DDE Options**.

Note: For optimum server performance under Windows 95 and Windows NT versions previous to 4.0, users should not enable Net DDE services unless needed.

DDE Shares

If Net DDE services are enabled, a DDE share is created each time a client application connects to the server. When the server is taken offline, these shares are removed.

If users recieve a warning message indicating failure to create a DDE share for a given device, it probably means that a share of that name already exists. If LinkMaster created the share then the message is harmless. If the share was created by another application, then the assigned device name cannot be used and must be renamed (or the existing DDE share should be removed).

To remove a DDE share under Windows NT, users would use the program DDESHARE.EXE. To remove a DDE share under Windows95, users must remove the share name from the registry under **HKEY_LOCAL_MACHINE\Software\Microsoft\Net DDE\DDE Shares**. Before attempting this operation, refer to the documentation for the appropriate operating system.

System Tags

The system tags are used to provide general error feedback to client applications and allow some control over when a Link Group and its Link Items are operating.

System Tags for Link Groups

_Enabled is the only tag that can be written to. It can be disabled in **OPC Settings** under **Tools**| **Options**. There are currently three built-in system tags available on each **Link Group**. They are as follows:

System Tag	Description
_Enabled (Read/Write)	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 this tag is set to TRUE, normal link functionality will continue within that Link Group.
_Status (Read Only)	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, the LinkMaster has detected an error within the Link Group.
_StatusString (Read Only)	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.

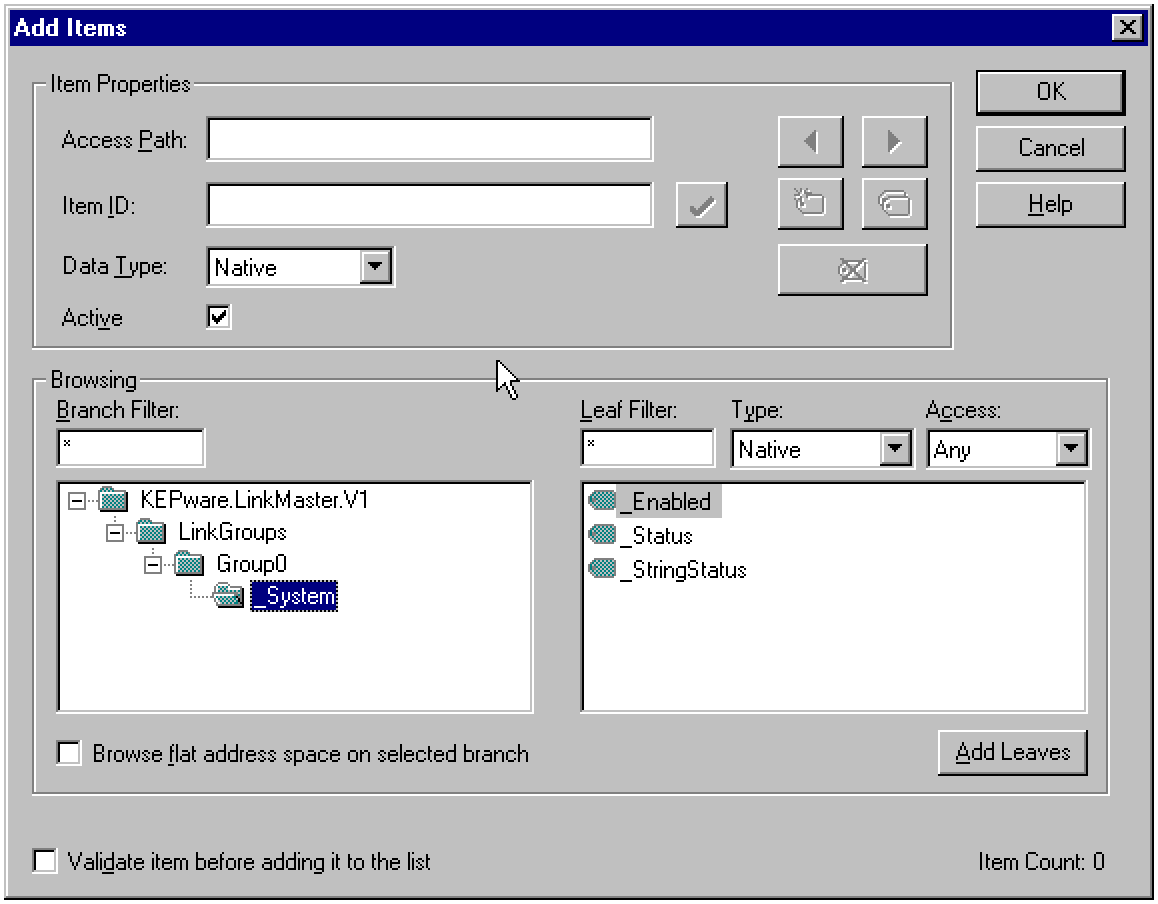
System Tags for Link Items

Link Item system tags can be browsed in an OPC client, but can also be disabled for browsing under the **OPC Settings**. There are currently two built-in system tags available for each **Link Item**. They are as follows:

System Tag	Description
_Status (Read Only)	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, the LinkMaster has detected an error within the Link Item.

_String (Read Only)	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.

When using an OPC client, the system tags will be found under the **_System branch** of the LinkMaster browse space, for a given Link Group. The following diagram is taken from the supplied OPC Quick Client. It shows how the system tags appear to an OPC client. This example only shows Link Group level status tags.



Item Properties

Access Path:

Item ID:

Data Type: Native

Active ☑

Browsing

Branch Filter: *

Leaf Filter: *

Type: Native

Access: Any

- KEPware.LinkMaster.V1
  - LinkGroups
    - Group0
      - _System

- _Enabled
- _Status
- _StringStatus

☐ Browse flat address space on selected branch

☐ Validate item before adding it to the list

Item Count: 0

The _System branch found under the Link Group branch is always available. In order to reference a system tag from a DDE application given the above example and the DDE defaults, the link would appear as follows:

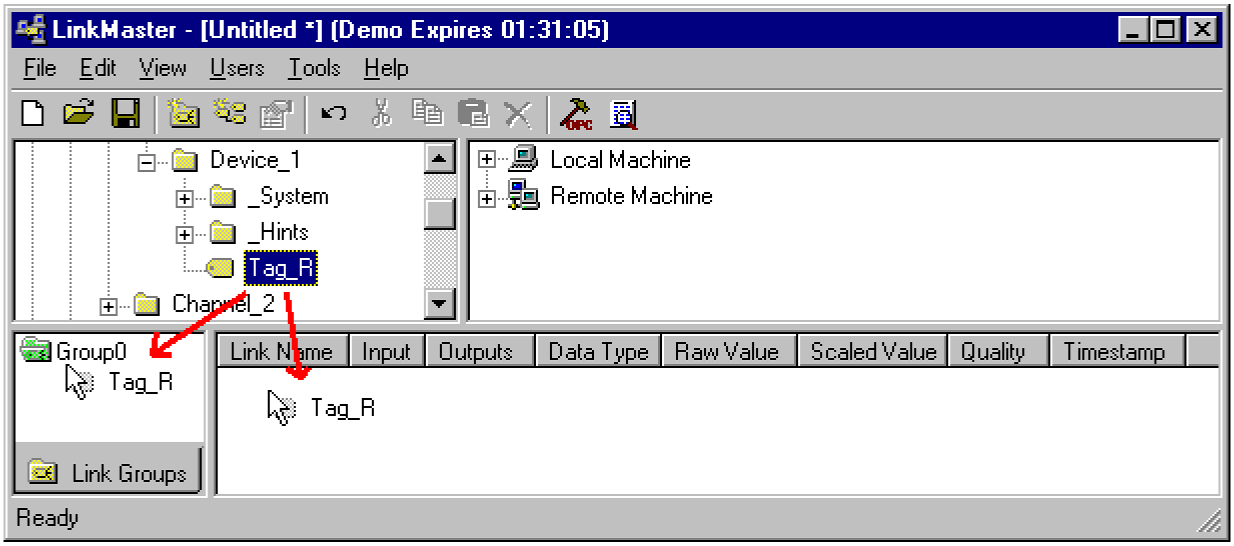
= linkmaster|_LMDDEDATA!LinkGroups**.**Group0**.**_System**.**_Enabled

The **_Enabled** tag provides a very flexible means of controlling the OPC applications. In some cases, it can be convenient to disable all Link Groups except the Link Group currently being accessed. Additionally, using the _Enable tag to allow the OPC or DDE application to turn a particular LinkMaster Link Group off while server sources are serviced can eliminate harmless but unwanted communications errors in the **Event Viewer** log.

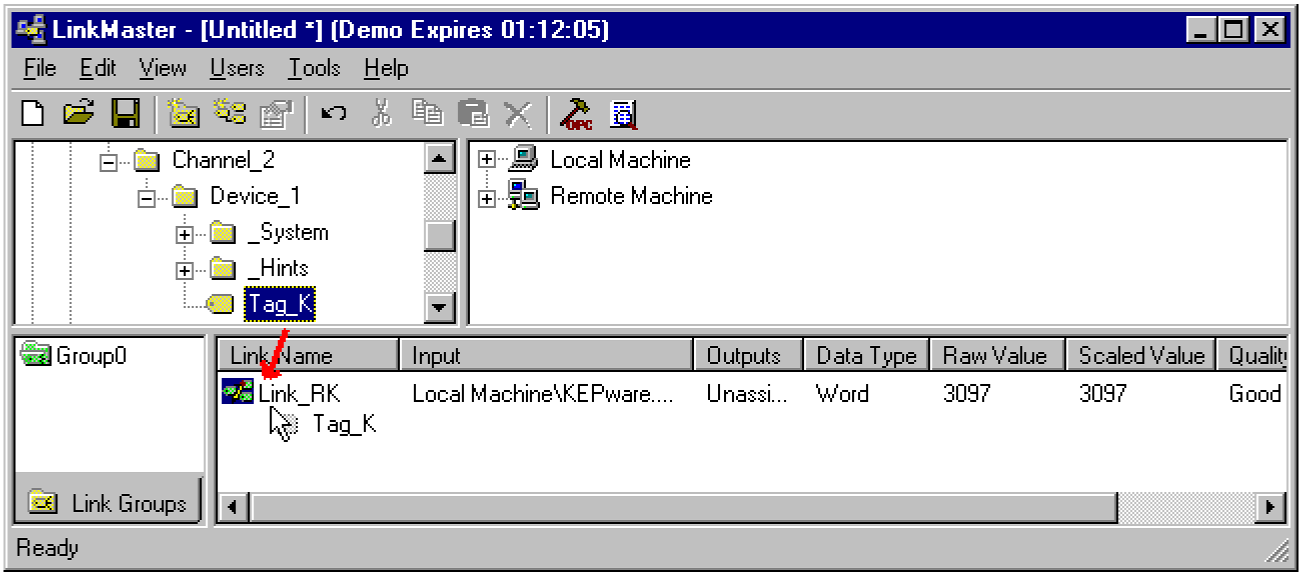
Important: The **_Status** and **_StringStatus** tags do not return TRUE when a device is set inactive via the _Enable tag.

Drag and Drop Items

For more convenient **Link** creation, users can also 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 example 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**.



The example below shows how to add a **Link Output** onto an existent highlighted Link item (input).



Link Name	Input	Outputs	Data Type	Raw Value	Scaled Value	Qualit
Link_RK	Local Machine\KEPware....	Unassi...	Word	3097	3097	Good
Tag_K						

CSV Import and Export

LinkMaster can import and export project data in a **CSV (comma separated variable)** text file format, thus allowing large projects to be created and modified quickly and easily. For example, if the servers that a user is linking data with do not contain browsed items, they would normally have to enter each server item's access path manually into each link item's property page. With the use of a simple text editor or with 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.

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 in CSV format by clicking **File** | **Export CSV**. This selection will create a template. The basic project should contain at least one link group, a link item and a link item output.

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

Exporting LinkMaster Projects

This generates a file that contains a record for each link group, link item and link item output defined in the project.

There are three blocks of records in a LinkMaster CSV file. They are as follows:

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

Note: Each block has a **Field Identification** or header record. A description of each is provided in the table 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 OPC server is running on	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", etc. (Data type 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", etc. (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

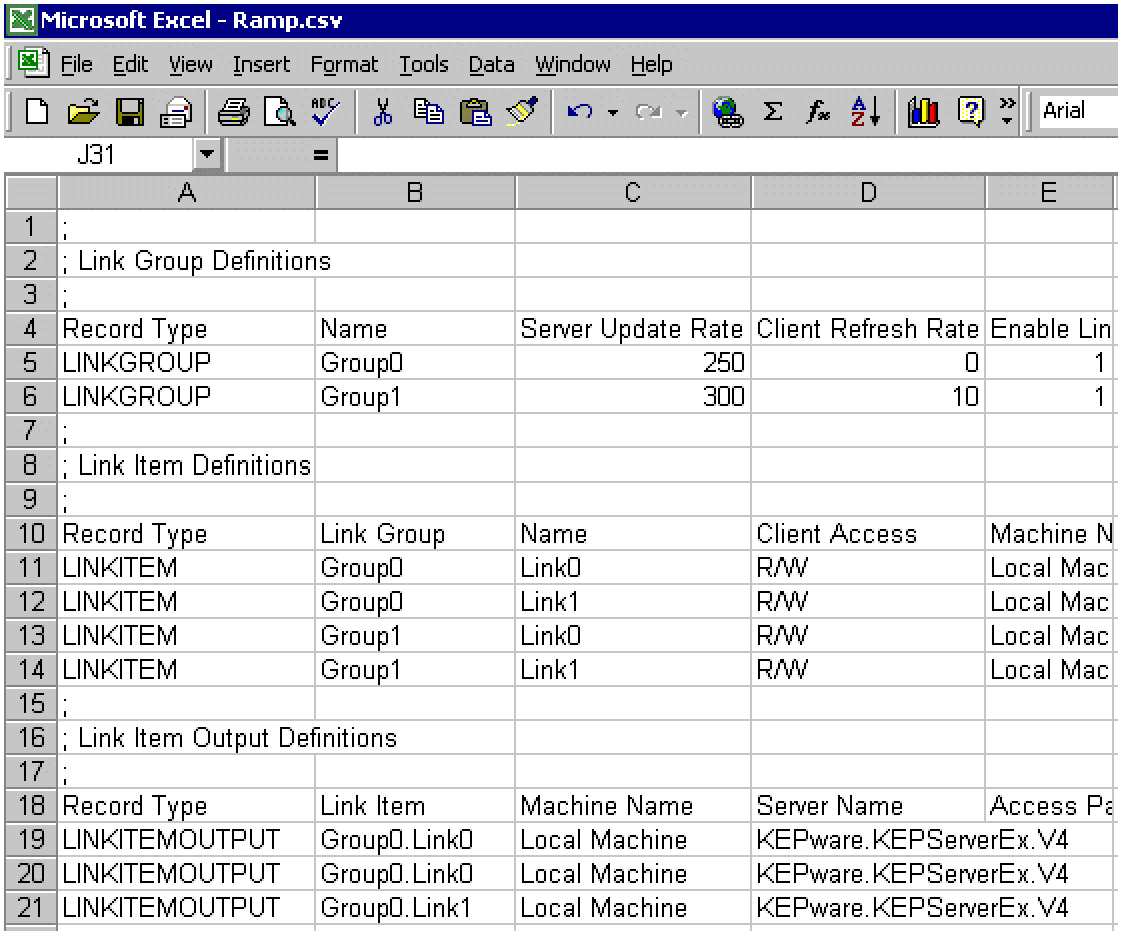
Link Item Output Fields

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	Yes - must be 2nd column

	item blocks <Group>.<Item>	
Machine Name	Name of machine OPC server is running on	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", etc. (data type that LinkMaster will use for link item output data)	No

Editing a LinkMaster CSV file

A LinkMaster CSV file is best edited by using a spreadsheet application such as Microsoft Excel™. A simple LinkMaster CSV file would appear in Excel as it does below.



	A	B	C	D	E
1	;				
2	; Link Group Definitions				
3	;				
4	Record Type	Name	Server Update Rate	Client Refresh Rate	Enable Lin
5	LINKGROUP	Group0	250	0	1
6	LINKGROUP	Group1	300	10	1
7	;				
8	; Link Item Definitions				
9	;				
10	Record Type	Link Group	Name	Client Access	Machine N
11	LINKITEM	Group0	Link0	R/W	Local Mac
12	LINKITEM	Group0	Link1	R/W	Local Mac
13	LINKITEM	Group1	Link0	R/W	Local Mac
14	LINKITEM	Group1	Link1	R/W	Local Mac
15	;				
16	; Link Item Output Definitions				
17	;				
18	Record Type	Link Item	Machine Name	Server Name	Access Pa
19	LINKITEMOUTPUT	Group0.Link0	Local Machine	KEPware.KEPServerEx.V4	
20	LINKITEMOUTPUT	Group0.Link0	Local Machine	KEPware.KEPServerEx.V4	
21	LINKITEMOUTPUT	Group0.Link1	Local Machine	KEPware.KEPServerEx.V4	

When editing a LinkMaster CSV file, note the following:

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

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

3. Except where noted above, 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 it belongs to. 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 ";". Blank lines are tolerated and can be added anywhere in the CSV file.
9. 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.

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 it has not already been done. LinkMaster will then create a new project that contains all of the groups and items defined in the CSV file.

Note 1: If an item identifier record is found to be invalid during import, LinkMaster will not attempt to read any additional records.

Note 2: Errors logged during CSV import can be seen with the Event Viewer application.

Note 3: When saving a file in CSV format, Microsoft Excel™ may issue a warning similar to "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, etc., will be lost. Answer **Yes**. Other applications may issue a similar warning.

Redundancy

LinkMaster gives users the option of running two LinkMaster machines as a redundant pair. The Redundancy feature increases the LinkMaster connections' reliability and the OPC data being transferred. When Redundancy is enabled:

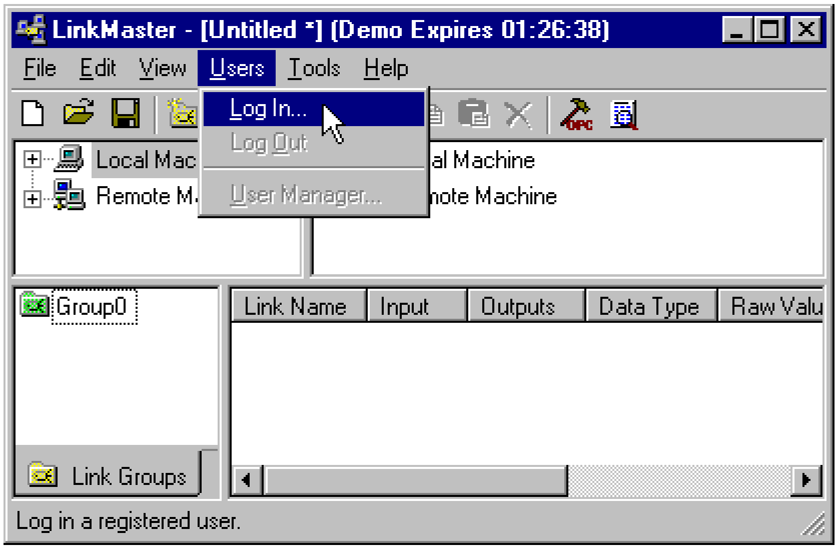
- One LinkMaster machine operates as the **primary node** actively performing link transfers.
- The other LinkMaster machine operates as the **secondary node**.

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 for a pre-configured amount of time, the secondary node automatically takes over the role of the primary node and performs the link transfers. When the primary node comes back up again, the secondary node stops performing link transfers and the primary node resumes its operations.

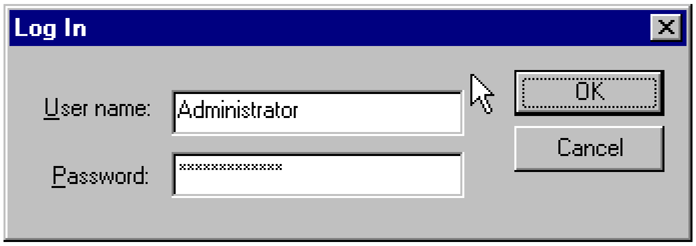
Note: For a more detailed description, including how to configure and enable LinkMaster redundancy, refer to **Redundancy Options**.

Using the User Manager

To gain access to the **User Manager** dialog box, click **Users** from the taskbar menu and select **Log**.



There are always two user accounts available by default: the **Administrator** account and the **Default User** account. Only the Administrator account can be used to add additional user accounts to the system or to change the settings of existing accounts. By default, the password for the Administrator account is **Administrator**. It should be changed immediately, if the user management system is to be used. The Administrator account cannot be deleted, but its name and password can be changed.



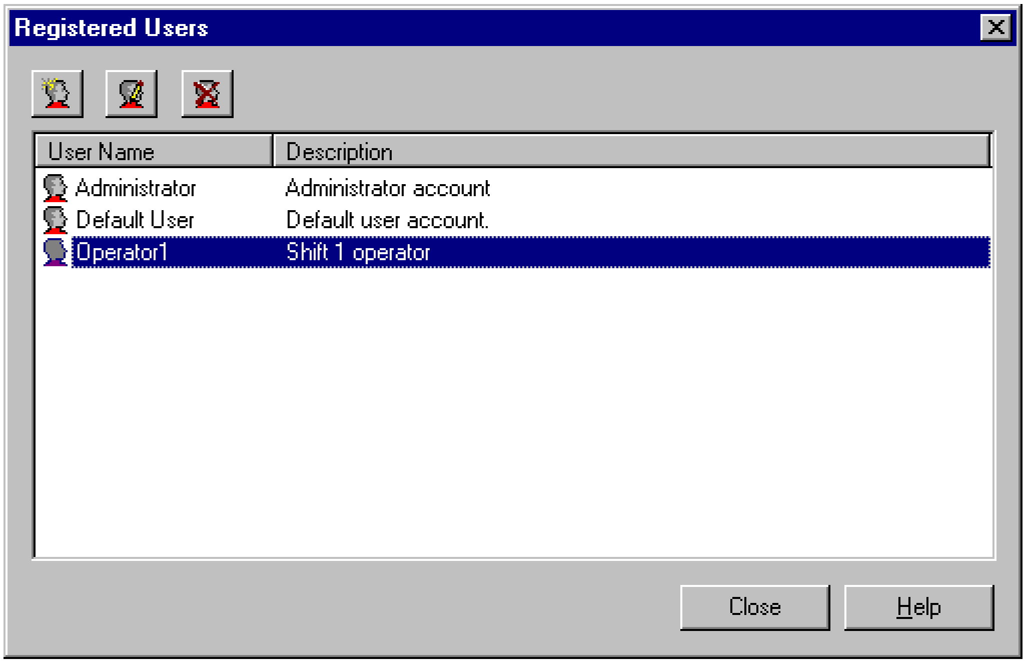
User name: Administrator

Password: *************

Note: For more information, refer to **User Manager**.

User Manager

The User Manager is used to control the actions operators can and cannot access in LinkMaster. The default user account grants full access to the features of LinkMaster. If limited access to the project is unnecessary, the User Manager system does not need to be edited.



User Name	Description
Administrator	Administrator account
Default User	Default user account.
Operator1	Shift 1 operator

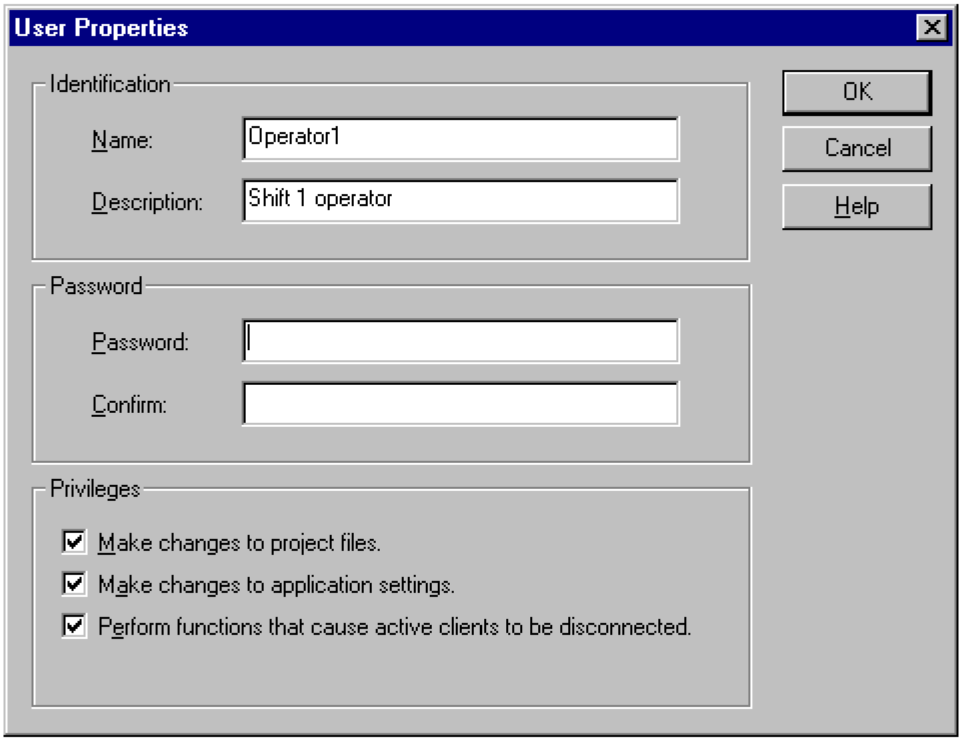
There are always two user accounts available by default: the **Administrator** account and the **Default User** account. Only the Administrator account can be used to add additional user accounts to the system or to change the settings of existing accounts. By default, the password for the Administrator account is **Administrator**. It should be changed immediately if the user management system is to be used. The Administrator account cannot be deleted, but its name and password can be changed. The administrator account can also be used to add additional user accounts. To do so, click on the new user icon to display the **User Properties** dialog. To edit an existing user account, select the account and double-click on the **Edit User** icon. To delete a user account, simply select the account and press the **Delete User** icon.

The **Default** user account is used when no other account is active. This is the normal condition of the LinkMaster. Although the Default User account is similar to the Administrator account in that it cannot be deleted, its name and password are fixed. The only way to disable the Default account is to deny all privileges to it. This can only be completed when logged in as the Administrator.

When the **User Management** system is used, LinkMaster will log the current account name to the event log for all server actions taken by the user. Thus, the **Reset Event Lot** should be disabled on all accounts to prevent the log from being lost.

User Properties

LinkMaster's **User Management** system controls what actions a user can take within a project. The **User Properties** dialog is used to configure the name, password and privileges available for the account.


User Properties

Identification

Name: Operator1

Description: Shift 1 operator

Password

Password:

Confirm:

Privileges

☑ Make changes to project files.

☑ Make changes to application settings.

☑ Perform functions that cause active clients to be disconnected.

Descriptions are as follows:

- The **Name** parameter is used to specify a name for the user. The name can be up to 31 characters in length.
- The **Description** parameter is used to give each user account a brief description. This can be used to help insure that operators are using the proper account when they log in.
- The **Password** parameter is used to specify the password the user must enter to log in to the system. The password can be up to 15 characters in length. For the change to be accepted, the password must be entered correctly in both the Password and Confirm fields. Each time a user account is edited, the password must be re-entered. If the password field is left blank, the password will be removed from the account.
- The **Privileges** selection is used to control what actions a given user account can access. When enabled, the **Make changes to project** selection will allow the user to modify the LinkMaster project freely. If disabled, the user will not be able to make any changes to the project. The **Make changes to application** selection will allow an operator to make changes to LinkMaster **Options**. When enabled, the **Disconnect Client** selection will allow the user to perform actions that may cause OPC and DDE clients to be disconnected from the server. When the **Disconnect Client** selection is disabled, the user will not be able to cause disruptions to currently active clients.

Designing a LinkMaster Project

When building a project, use LinkMaster's user interface to create Link Groups and Link Items. The following steps will provide instructions on building a project. Throughout the example, a number of additional help links will be presented to include other relevant pieces of information. With that in mind, use the **Back** button on the Help File's toolbar to return to the original example.

Note: The demonstration shown uses Kepware's KEPServerEX simulator driver. The Simulator driver is a memory-based driver that provides both static and changing data for demonstration purposes. The simulator driver supports three types of addresses: **R**, **K** and **S**. Numeric types are R and K addresses. S data is a string type. R data increases (ramps) one unit on every read. S and K data are constant and only change if data is written to them.

Project Demonstration

Running the LinkMaster (Step1
Starting a new Project (Step2)
Adding a new Link Group (Step3)
Adding a new Link Item (Step4)

Saving and Testing the Project (Step5)

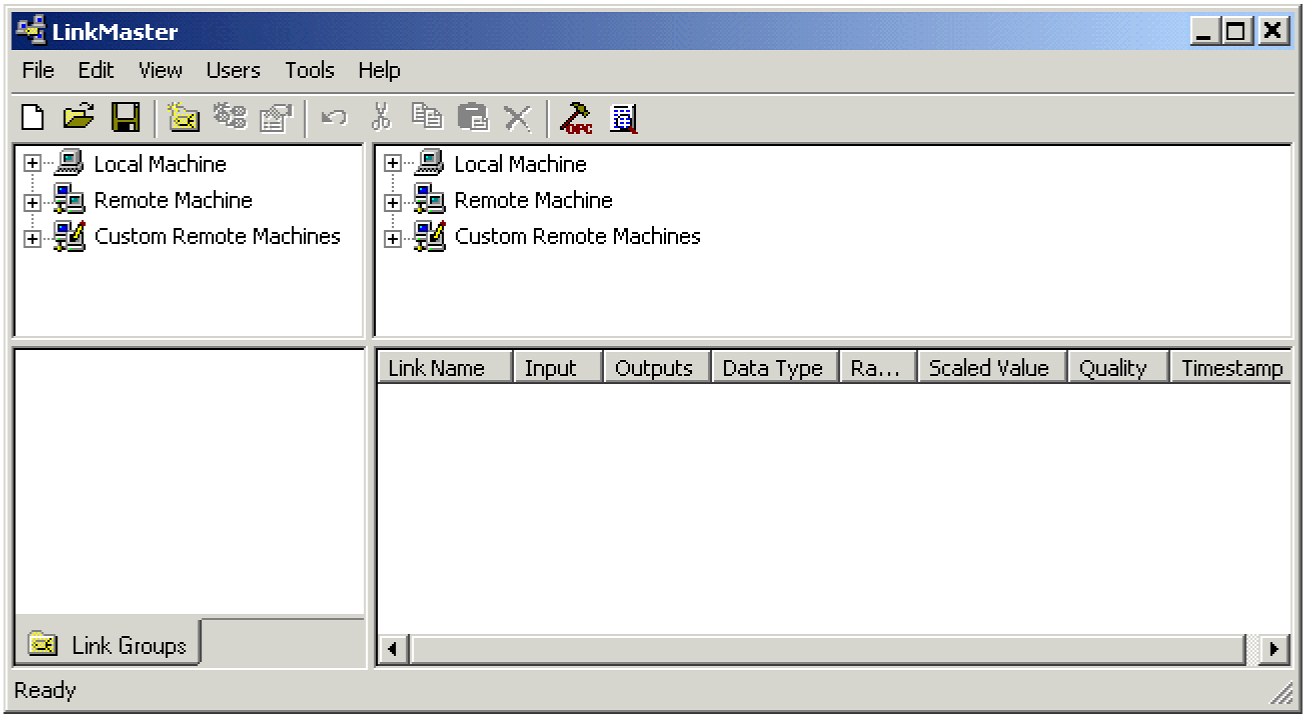
Topics of Interest

Processing array data in a DDE client
Configuring LinkMaster to run as a NT Service
Using NetDDE with LinkMaster
Scaling link items in LinkMaster
LinkMaster System Tags
Drag and Drop items
LinkMaster's General Settings
CSV Import and Export
Redundancy

Design a Project (Step 1) - Running the LinkMaster

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

To start, manually invoke LinkMaster using either the desktop icon or by selecting LinkMaster from the Windows Start menu. Depending on any changes that may have been made to the interface, LinkMaster should appear as shown below. For more information on the various elements of the user interface, refer to **Basic LinkMaster Components**.



Important: Refer to the system requirements discussed below before continuing.

Minimum System Requirements

200 Mhz Pentium
32 MB of Ram
10 MB of Hard Disk Space
Windows NT(SP5 or above)/2000/XP/Server2003
Available Serial Port or Ethernet Card

Recommended System Requirements

400 Mhz Pentium
64 MB of Ram
10 MB of Hard Disk Space
Available Serial Port or Ethernet Card

Note: Users may have to install Microsoft Internet Explorer version 4.0 or better. In the past, Microsoft has chosen to supply some system patches as part of the Internet Explorer install. Most notably, the common controls dialog DLLs have been patched in this way. If odd behavior is experienced while using the user interface of LinkMaster and Internet Explorer is not currently installed, users may be required to install it in order to remedy the issue.

Design a Project (Step2) - Starting A New Project

The overall concept of the LinkMaster is to choose input items from one OPC server and link them to one or more output items from any other OPC server, thus creating what is called a **Link Item**. Before link items are created, a **Link Group** must be specified. Link groups, links items and their inputs and outputs are the components the application provides for creating a project. The application also provides the ability to define multiple project files, save and load them as needed.

While most of the configuration done within Linkmaster is contained within a project file, there are also a number of configuration options that are global to LinkMaster and are applied to all projects. These global options are configured in the **Tools** | **Options** menu. The global options include **General**, **Event Logger**, **DDE**, **OPC Settings**, **Compliance**, **Service** **Communications**, **Links** and **Redundancy**. All global options are stored within a Windows INI file called "Linkmaster.INI". This file is located in the root directory of LinkMaster. While it is normal practice to store global options like these in the Windows registry, the use of the INI file is used to conveniently move these global settings from one machine to another.

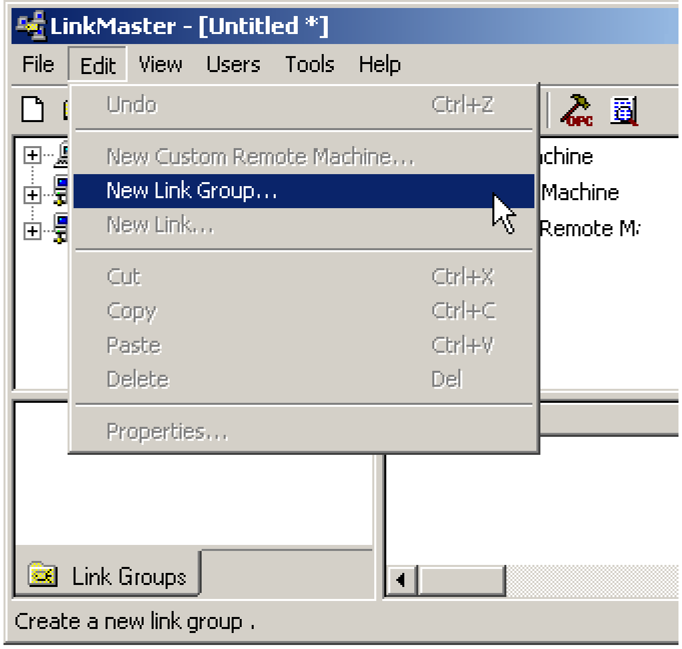
The following project will illustrate the operation of LinkMaster, which can be used to connect to multiple OPC servers on multiple local and remote machines. For simplicity, the demonstration project will access a single OPC server on the local machine and link a ramping input value to a non-ramping output address in order to demonstrate a successfully updating link. To properly follow the demonstration, install the server provided with LinkMaster.

Note: For more information, refer to **Adding a New Link Group**.

Design a Project (Step 3) - Adding A Link Group

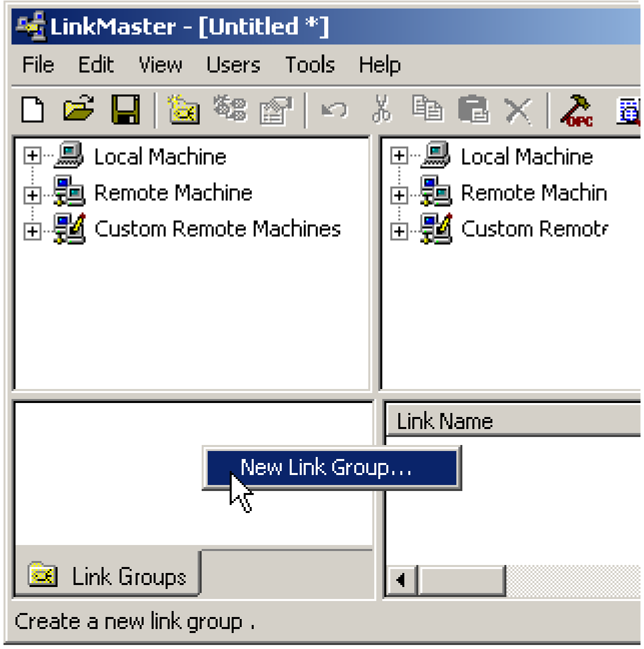
When starting a new project in LinkMaster, the first step is to define a new link group. As many link groups as needed can be defined within a single project.

1. A new link group can be added by using the **Edit** | **New Link Group** path on the taskbar, by right-clicking on the context menu or by clicking the **Toolbar New Link Group** icon. The following figures demonstrate two methods for adding new link groups.



Create a new link group .

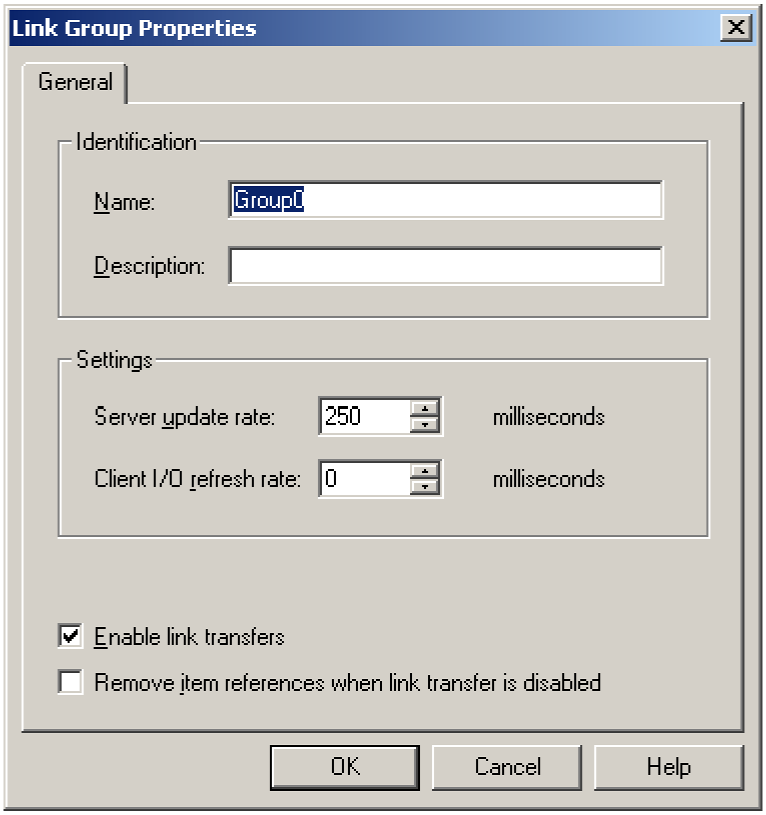
Figure 1.0 - New Link Group by the Taskbar Edit.



Create a new link group .

Figure 1.1 - New Link Group by Context menu.

2. In the invoked Properties dialog, users can name and describe the link group, as well as configure both the **Server Update Rate** and **Client IO Refresh Rate** for the links that will be contained within the group. For more information, refer to **Link Group Properties**. In this example, the groups is named **Group0**.



Identification

Name: Group0

Description:

Settings

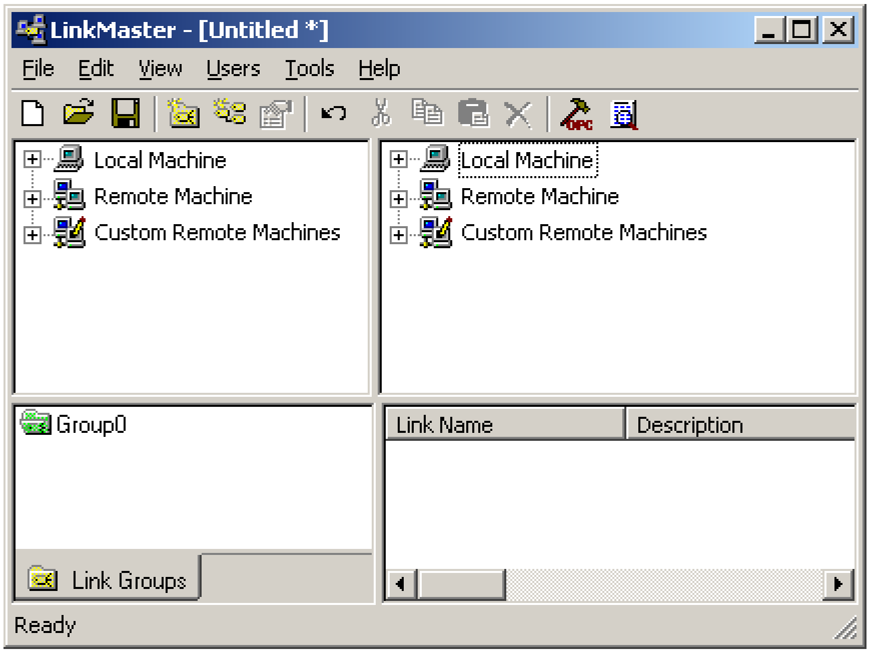
Server update rate: 250 milliseconds

Client I/O refresh rate: 0 milliseconds

☑ Enable link transfers

☐ Remove item references when link transfer is disabled

3. Click **OK** to complete the addition of the link group.



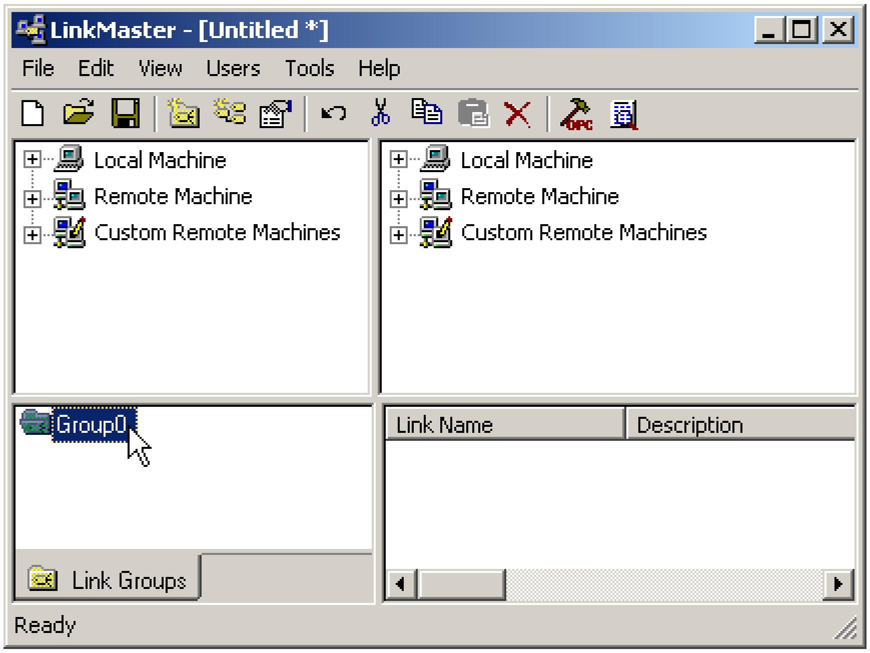
4. If the group was added correctly, the group icon 🟩 should be visible in the lower left hand window of LinkMaster. If the group icon turns gray ▨ at any point during the project run, there is mostly likely an item in the group that is in error. If so, consult the event log. If the group color is red 🟥, the link transfers for that group have been disabled.

Note: For more information, refer to **Adding a New Link Item**.

Design a Project (Step 4) - Adding A Link Item

The following example uses the KEPServerEX OPC simulator driver project called simdemo.opf, which can be found in the KEPServerEX projects folder. Make sure that the project has been loaded into the KEPServerEX before adding a link tag to the LinkMaster project.

1. To add a link item, first select the link group where the item will be contained. If the group has not yet been created, refer to **Adding A Link Group** for more information. If using the project created as part of this example, the view should appear as shown below. **Group0** is the currently selected Link group.



2. Next, either click **Edit** and select **New Link** or click on the Toolbar's **New Link** icon. There are two methods for adding new links to projects, as shown in Figure 1.2 and Figure 1.3 below.

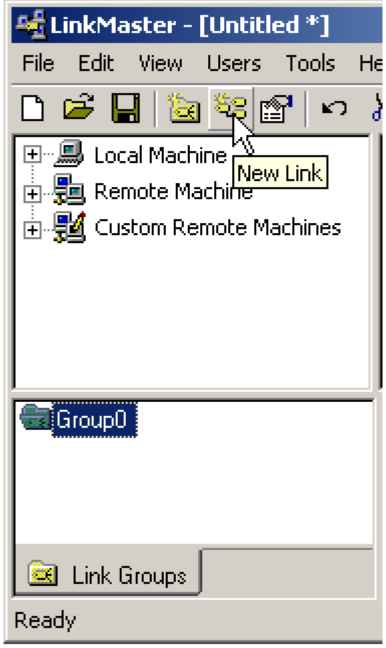


Figure 1.2 - Add Link by toolbar select New Link icon

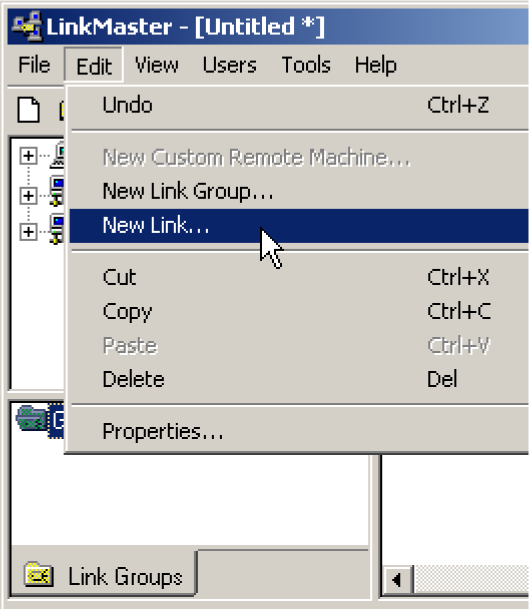
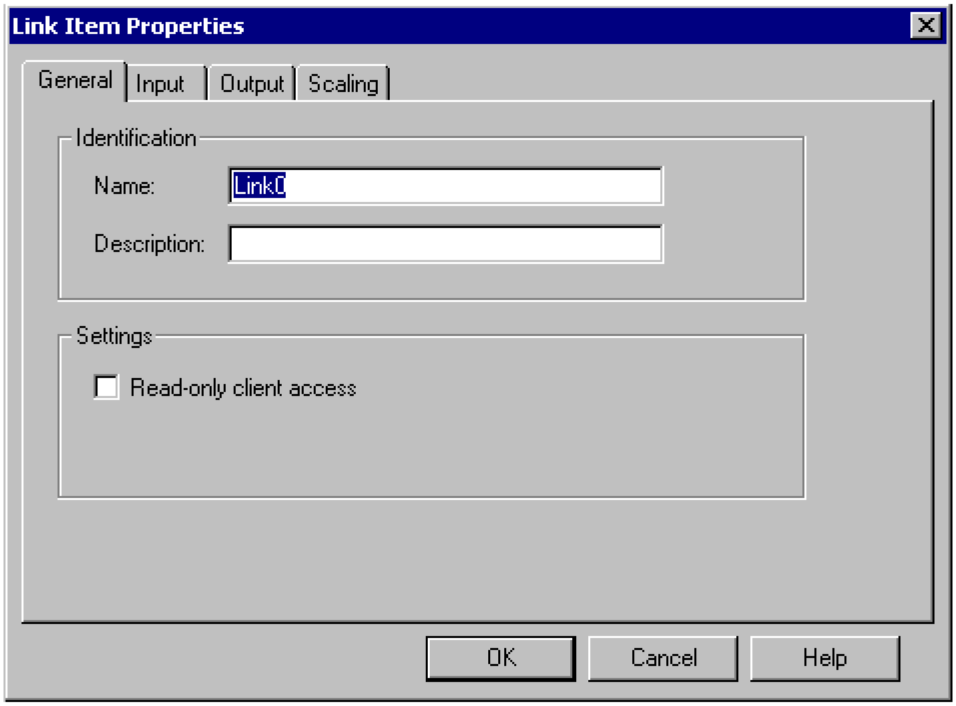


Figure 1.3 - Add New Link by Menu

3. The **New Link** properties dialog box controls the properties of the link item. As shown below, the **general dialog** can be used to name, describe and select Client Access for the link. In this example, the default link item name **Link0** is used. Click the **Input** tab to add an input to the link.

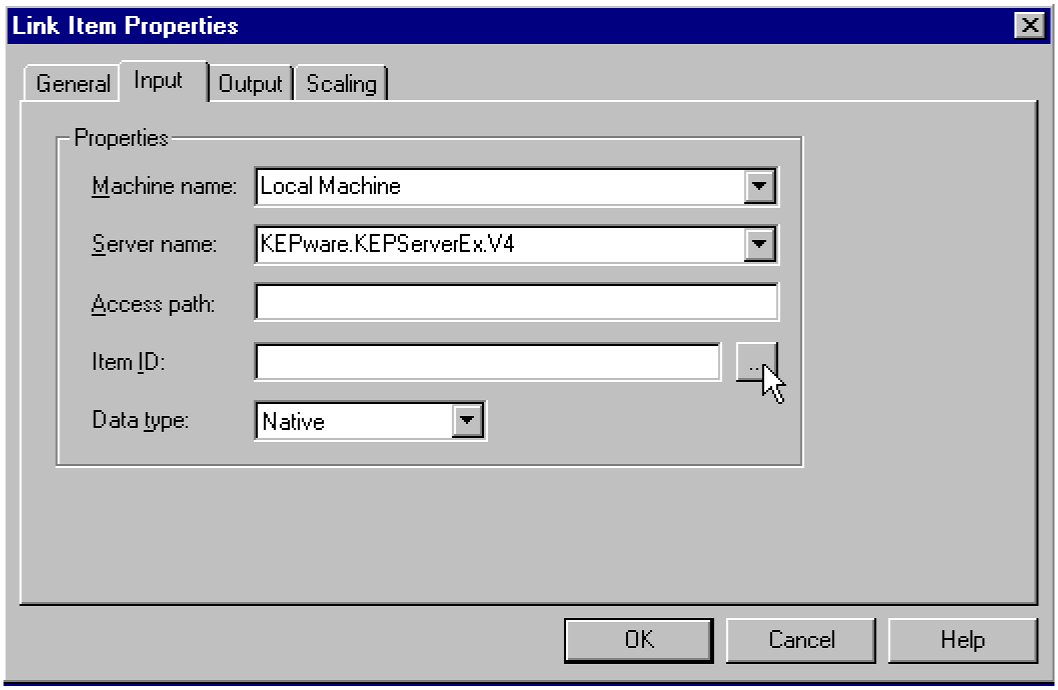


Name: Link0

Description:

□ Read-only client access

4. In the example below, the machine name is **Local Machine** and the server is Kepware's KEPServerEX. To define the **Input Item** for this link item, enter a path to the appropriate server and item. If the server supports tag browsing, simply click the browse box to the left of the **Item ID field** to search. If not, refer to the OPC server's documentation to determine valid item names for the location in question.



Properties

Machine name: Local Machine

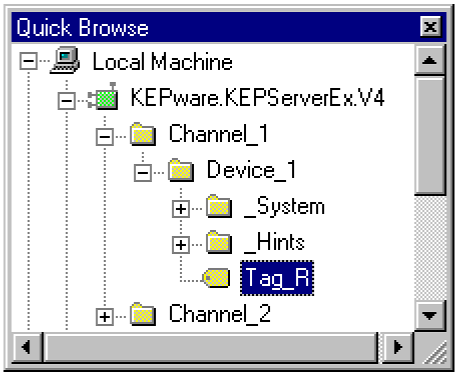
Server name: KEPware.KEPServerEx.V4

Access path:

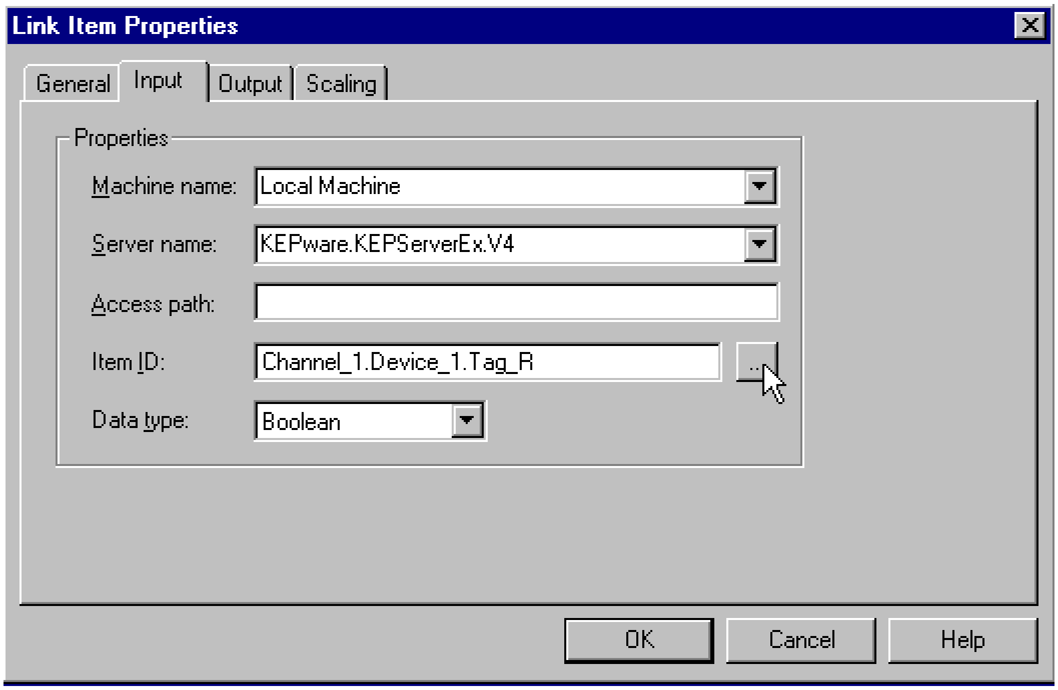
Item ID:

Data type: Native

5. Click on the browse box to arrive at the **Quick Browse** window, which can be used to expand the server tree and find the desired input tag. In the example below, the item is called **Tag_R**. This item, which happens to be a simulated ramping value from the simulator project, will be the input for **Link0**. Double-click to choose this item.



6. Close the browser window by clicking in the **Close** box in the upper-right corner. The new input path **Channel_1. Device_1.Tag_R** will appear in the **Item ID** field.



Machine name: Local Machine

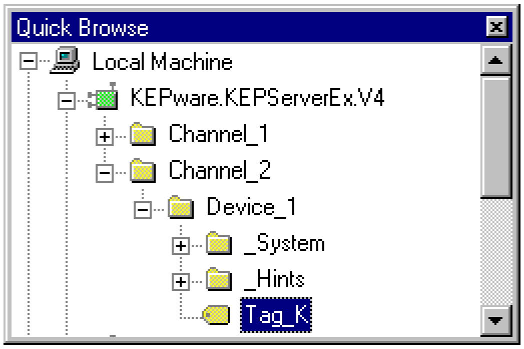
Server name: KEPware.KEPServerEx.V4

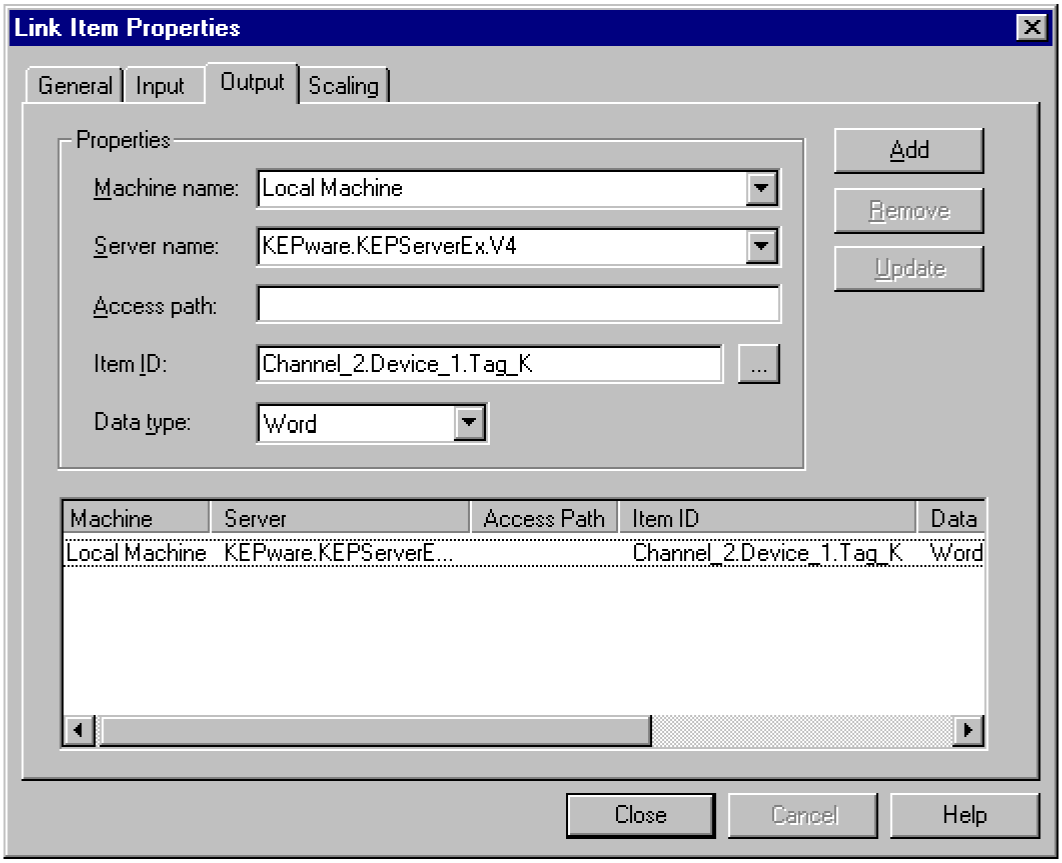
Access path:

Item ID: Channel_1.Device_1.Tag_R

Data type: Boolean

7. Next, select the **output item** by clicking on the output tab. Use the Quick Browse to quickly locate the correct server. Double-click on the item **Tag_K** on **Channel_2.Device_1**, located on the same server of the local machine, to add the output item. This instantly creates an active link from input **Tag_R** to output **Tag_K**.





Machine name: Local Machine

Server name: KEPware.KEPServerEx.V4

Access path:

Item ID: Channel_2.Device_1.Tag_K

Data type: Word

Machine	Server	Access Path	Item ID	Data
Local Machine	KEPware.KEPServerE...		Channel_2.Device_1.Tag_K	Word

Creating Link Items with the Drag and Drop Feature

Link items can also be created by dragging and dropping link inputs and outputs from the LinkMaster's main window. For more information, refer to **Drag and Drop**.

Link Item Icon

If the link item was correctly added, the link icon should be visible in the lower window of LinkMaster. If the link icon turns gray at any point during the project run, there is most ikely an incorrect input or output for that item. If the link item color is red , then the link transfers for that link, as well as its group, have been disabled.

The ramping Input item **Tag_R** has now been linked to a constant Output item **Tag_K**.

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 **Scaling**.

See Also: **Importing and Exporting Link Items from CVS**

Design a Project (Step 5) - Saving and Testing the Project

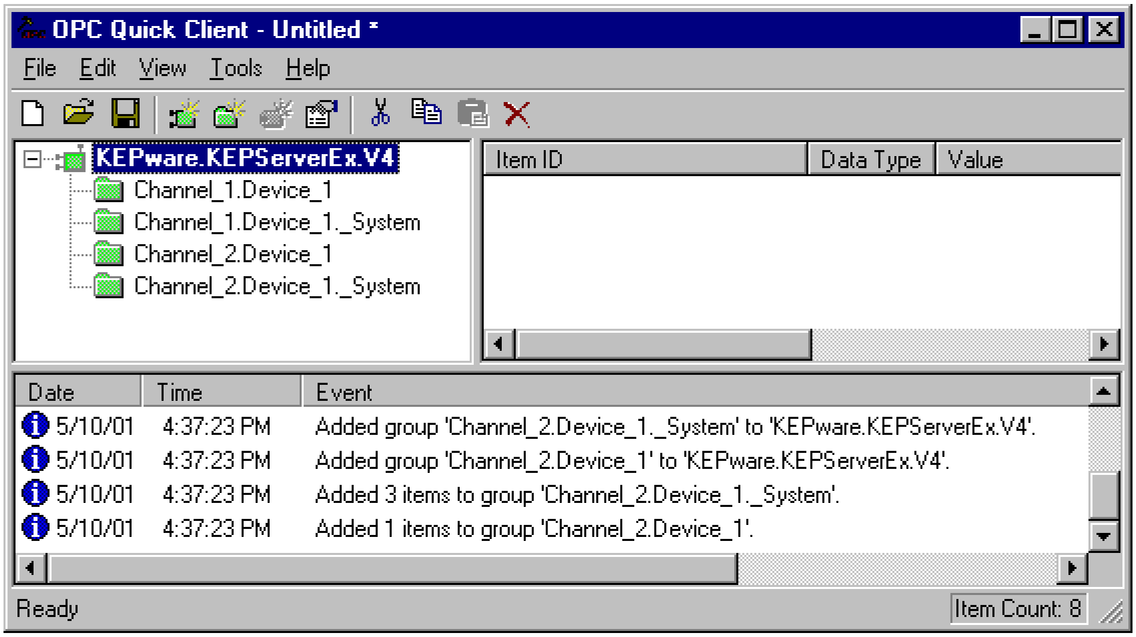
The LinkMaster project must be saved to disk. Like any Windows application, LinkMaster is saved by clicking **File**|**Save**. When the file save dialog is displayed, give the project the name "LinkExample1". Once this is done, the two KEPServerEX tags can be accessed from an OPC client to verify the link.

Note: OPC technology allows an OPC client application to automatically invoke any other OPC server when the client needs data. The OPC server however, needs to know what project to run when invoked in this fashion. A client will load the most recently configured or loaded project. To determine what server project will load, look at the first project file listed in the **Most Recently Used** file list found on the file menu in the server.

Testing the Project

A full featured OPC test client is included with LinkMaster and KEPServerEX. The **Quick Client** supports all of the operations available in any OPC client application. The Quick Client is used to access all of the data available in the server application. The Quick Client can be used to read and write data, perform structured test suites and test server performance. The Quick Client also provides detailed feedback regarding any OPC errors returned by the server.

1. To run the OPC Quick Client program, click the icon on the KEPServerEX taskbar. This will automatically run the OPC Quick Client and add the two KEPServerEX items: **Tag_R** and **Tag_K**. Expand the connection tree, as shown below.

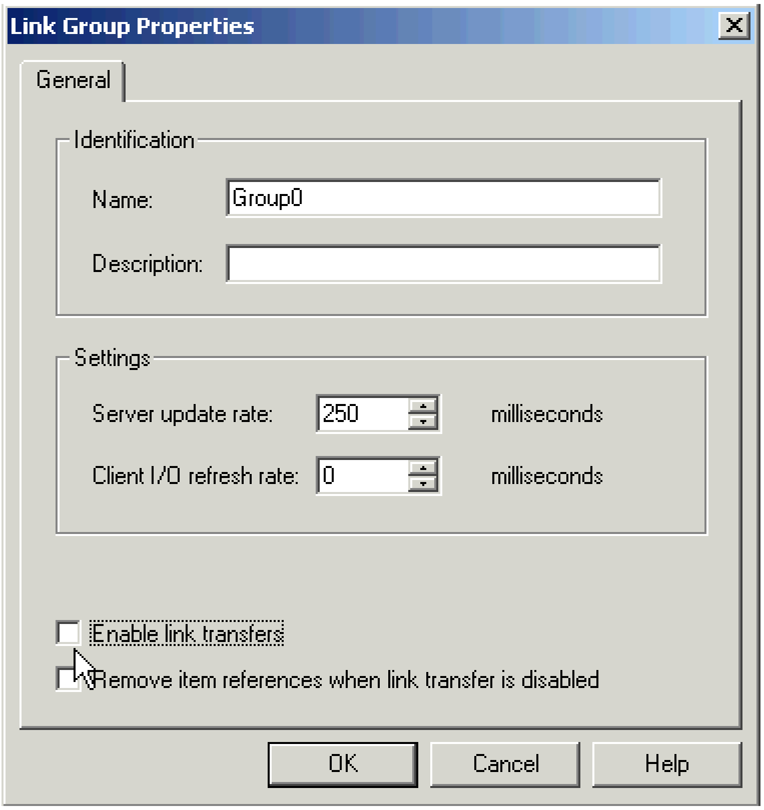


- KEPware.KEPServerEx.V4
  - Channel_1.Device_1
  - Channel_1.Device_1._System
  - Channel_2.Device_1
  - Channel_2.Device_1._System

Item ID	Data Type	Value

Date	Time	Event
5/10/01	4:37:23 PM	Added group 'Channel_2.Device_1._System' to 'KEPware.KEPServerEx.V4'.
5/10/01	4:37:23 PM	Added group 'Channel_2.Device_1' to 'KEPware.KEPServerEx.V4'.
5/10/01	4:37:23 PM	Added 3 items to group 'Channel_2.Device_1._System'.
5/10/01	4:37:23 PM	Added 1 items to group 'Channel_2.Device_1'.

2. Data should now be able to be accessed from KEPServerEX's project "simdemo.opf" which contains "Tag_R" on "Channel_1.Device_1" and "Tag_K" on "Channel_2.Device_1". Both tags will appear ramping. To test the link, view the link's group properties and disable the link transfer.



Identification

Name: Group0

Description:

Settings

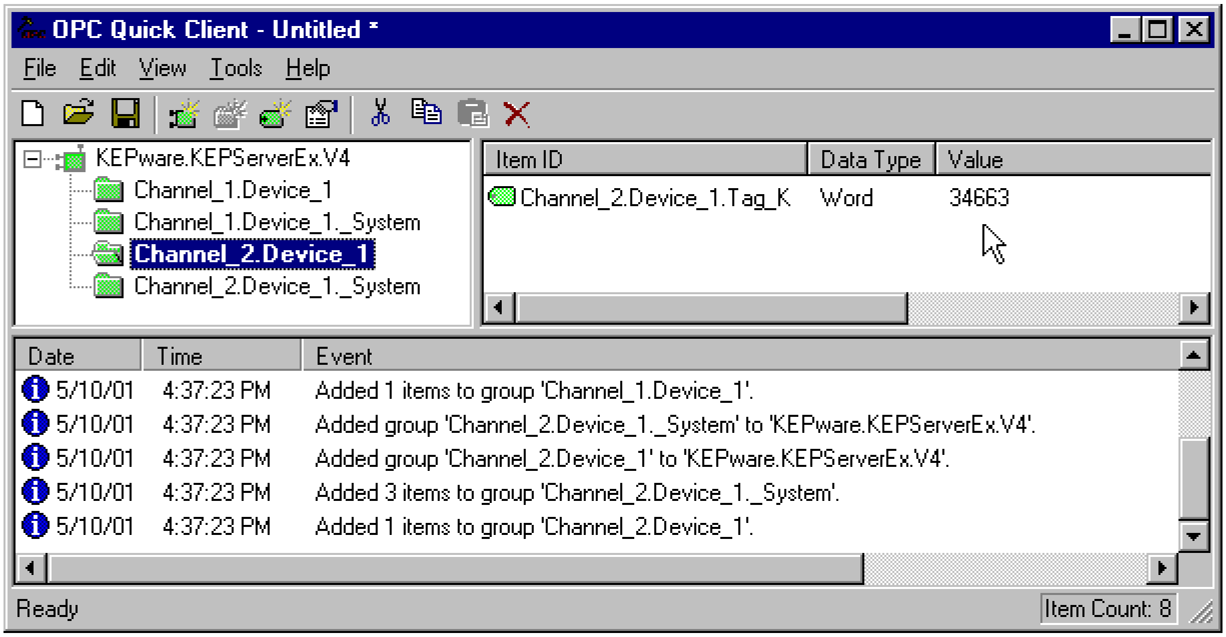
Server update rate: 250 milliseconds

Client I/O refresh rate: 0 milliseconds

☐ Enable link transfers

☐ Remove item references when link transfer is disabled

3. After disabling Link0, the output item Tag_K will stop ramping. Start the transfer back up by enabling the group's transfer setting and the tag will begin ramping again.



Item ID	Data Type	Value
Channel_2.Device_1.Tag_K	Word	34663

Date	Time	Event
5/10/01	4:37:23 PM	Added 1 items to group 'Channel_1.Device_1'.
5/10/01	4:37:23 PM	Added group 'Channel_2.Device_1._System' to 'KEPware.KEPServerEx.V4'.
5/10/01	4:37:23 PM	Added group 'Channel_2.Device_1' to 'KEPware.KEPServerEx.V4'.
5/10/01	4:37:23 PM	Added 3 items to group 'Channel_2.Device_1._System'.
5/10/01	4:37:23 PM	Added 1 items to group 'Channel_2.Device_1'.

Note 1: If using Visual Basic, remember to examine the supplied example projects. These two projects give both a simple and complex example of how OPC technology can be used directly in Visual Basic applications.

Note 2: The OPC Quick Client, as it is supplied, is designed and tested to connect with KEPServerEX and LinkMaster. Therefore, attempting to connect with servers other than Kepware's OPC components may generate unforeseen errors.

Creating Links

The first step required when defining a LinkMaster project is to establish a Link Group, which holds all link items. The link group must be added before defining the data items that will be linked together. The link group's Properties dialog is used to control and operate the link items, and can be used to adjust the rate of data transferred from the Link inputs to the Link outputs, as well as to enable and disable all of the transfers contained in the group. Users can utilize LinkMaster's system tags to access the link group's properties through the an OPC client application.

See Also:

[Design a Project (Step3) - Adding A Link Group]

[Design a Project (Step4) - Adding A Link Item]

[Link Group Properties]

[Link Item Properties - General]

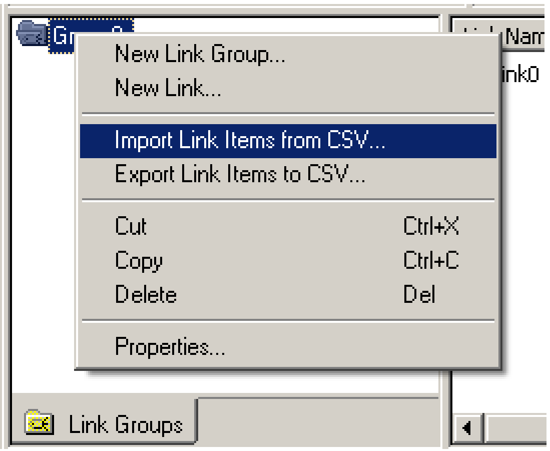
Importing and Exporting Link Items from CSV

Importing Link Items from CSV

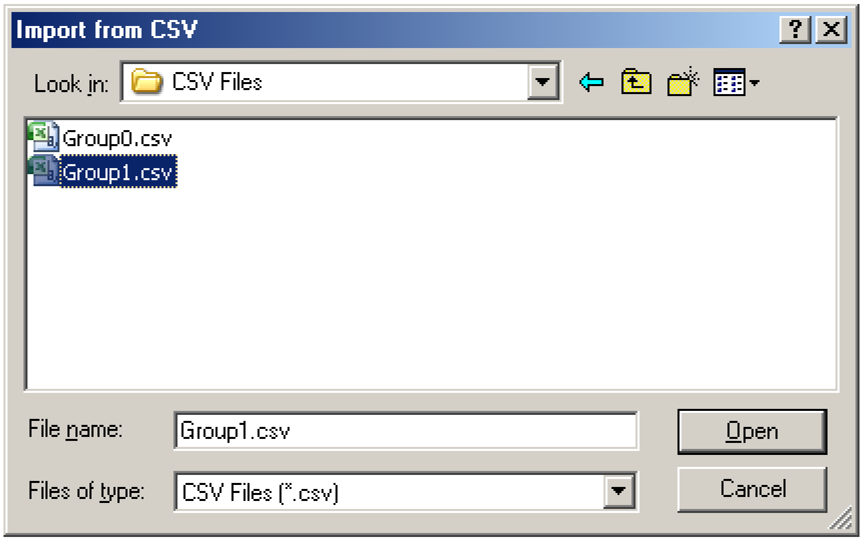
Users can import a single Link Group CSV from a selected Link Group. Doing so only utilizes items belonging to that selected Link Group: other Link Groups and their associated Link Items will be ignored. For more information, refer to the instructions below.

Note: An error will occur if the CSV file contains invalid input data.

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...**.

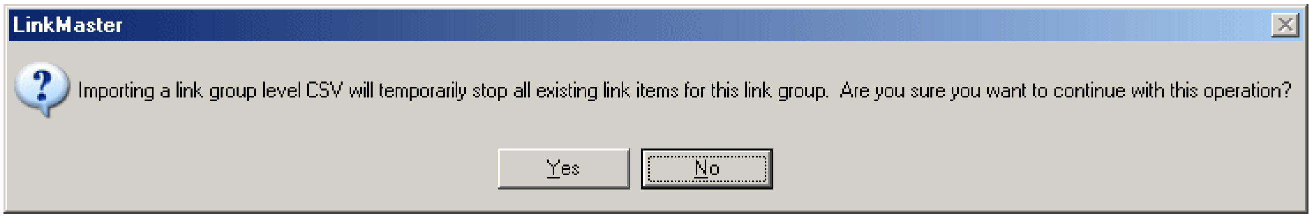


2. In **Import from CSV**, locate the appropriate CSV file. Then, click **Open**.



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:

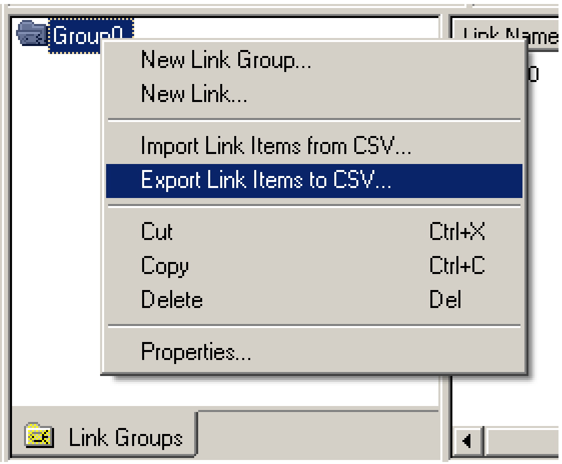

LinkMaster

Importing a link group level CSV will temporarily stop all existing link items for this link group. Are you sure you want to continue with this operation?

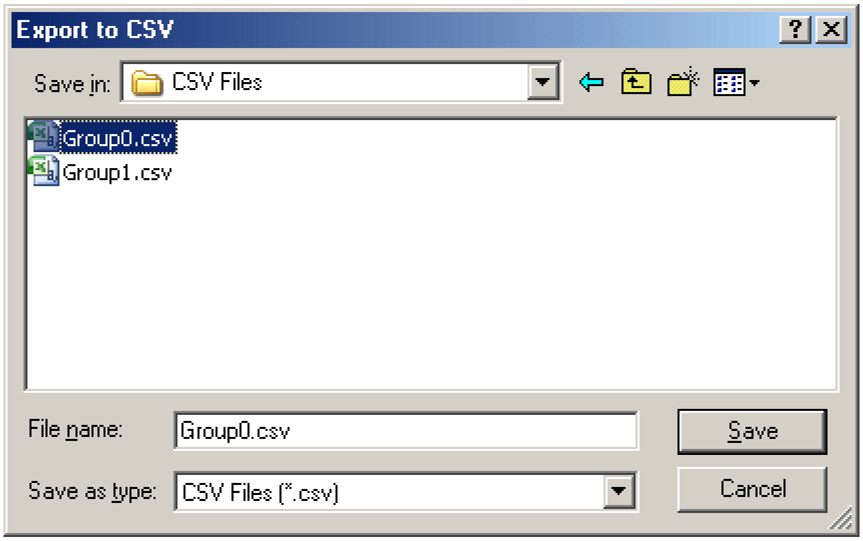
Exporting Link Items to CSV

Users can export a single Link Group CSV from a selected Link Group. Doing so only utilizes 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 **Open**.


Export to CSV

Save in: CSV Files

Group0.csv
Group1.csv

File name: Group0.csv

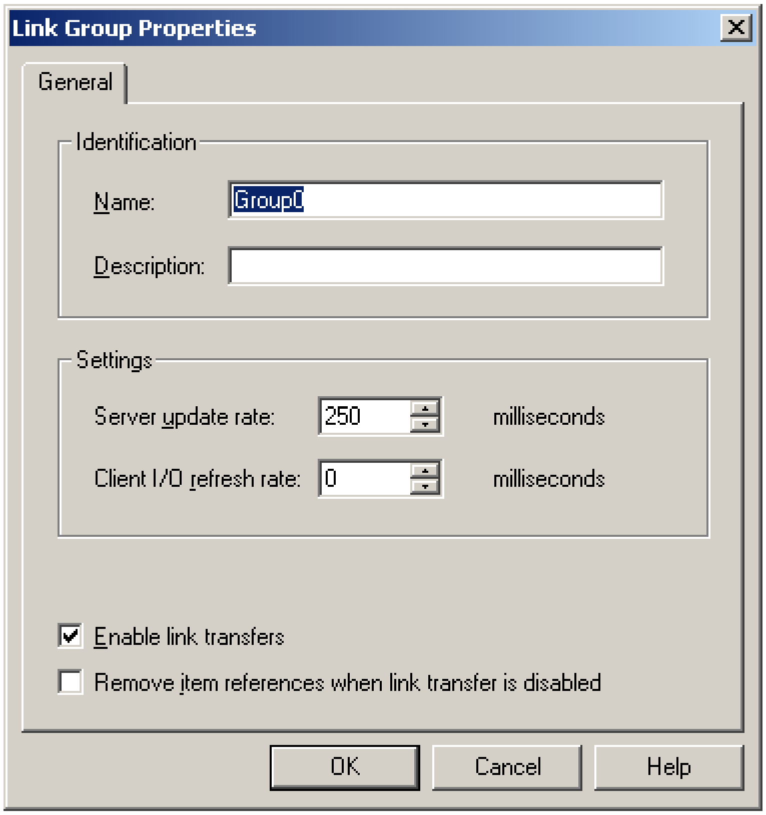
Save as type: CSV Files (*.csv)

Link Group Properties

When defining a LinkMaster project, the first step is to establish a link group, which holds the link items. The link group must be added before the data items that will be linked may be defined. The link group's Properties dialog may be used to control and operate the link items, adjust the rate of data transferred from the link inputs to the link outputs, enable and disable all of the transfers contained in the group and remove item references when link transfer is disabled. LinkMaster's system tags can be used to access the link groups from an OPC client application.

As mentioned above, link groups must be added to the project before adding any link items. Link groups allow users to tailor the layout of link items into logical groupings in order to fit the application's needs. From an OPC client standpoint, link groups allow users to segregate OPC data into smaller item lists. This makes searching for a specific link item easier when browsing the LinkMaster via an OPC client.

Note: For information on adding a new link group, refer to **Adding A Link Group**.



Name: Group0

Description:

Server update rate: 250 milliseconds

Client I/O refresh rate: 0 milliseconds

☑ Enable link transfers

□ Remove item references when link transfer is disabled

Name

Enter the string that will represent the data available from this group. Each link group name must be unique in a LinkMaster application. The link group name can be up to 80 characters long. While using long descriptive names is generally a good idea, some OPC client applications may have a limited display window when browsing the tag space of an OPC server such as LinkMaster. The link group name entered here will be part of the OPC browser information.

Description

A comment of up to 64 characters can be attached to the link group to serve as a description.

Server Update Rate

This specifies the rate at which LinkMaster will check the link's input item(s) for changing values and update the link's output item(s) if a change has occurred. This setting 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. For those familiar with OPC terminology, 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 default setting is 250 milliseconds. The valid range is 10 to 3,600,000 milliseconds.

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

Client I/O Refresh

This 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). It does not usually need to be enabled because the Server Update Rate interval dictates refresh writes according to changing input values from the server. Unnecessary writing to the input cache with a possibly non-changing item 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 continuous updates to outputs are required.

Note: Writing from a high-speed input to a low speed output can overload the write queue of the target OPC server. The Client I/O Refresh setting that exceeds the ability of the OPC server to write data will, in many cases, cause the OPC server to consume more system memory than normally required. Continued operation in this state may consume all available system memory. Use the slowest acceptable rate if this parameter must be used. Also, users can adjust the **Write Optimizations** settings done by LinkMaster to help reduce the number of writes sent to the OPC server.

Enable Link Transfers

This setting allows users to turn On/Off link writes within that group. This setting can also be set via a client by accessing that group's system tag called "_Enabled". For more information, refer to **System Tags**.

Remove Item References when Link Transfer is Disabled

This setting 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**.

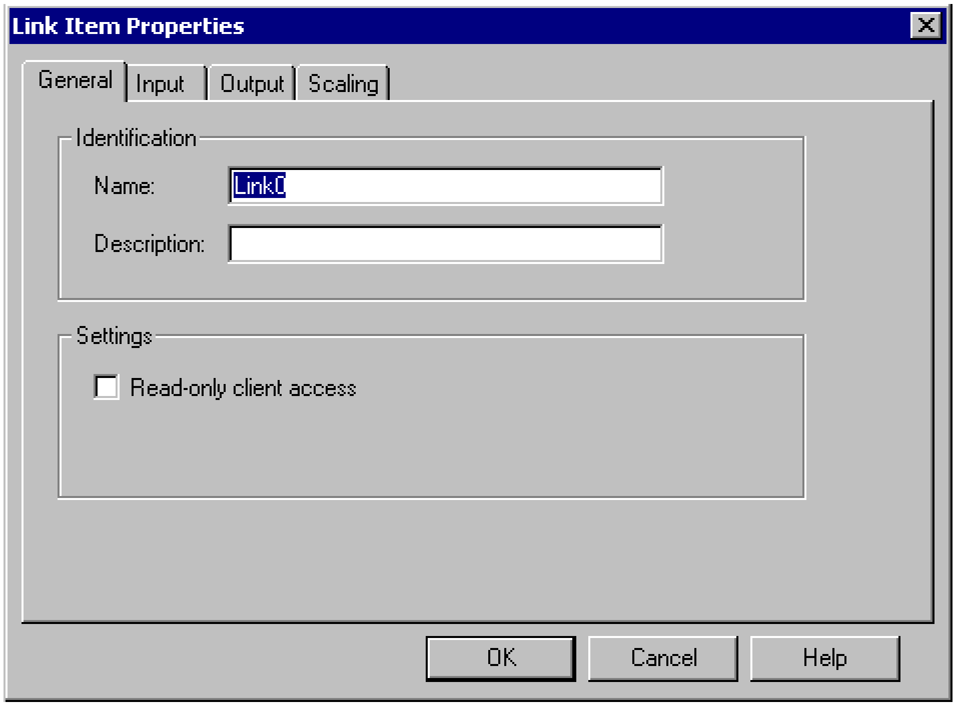
Group Icon

If a group is correctly added, the group icon 🟩 should be visible in the lower left hand window of LinkMaster. If the group icon turns gray ▨ at any point during the project run, there is most 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.

Note: These parameters can be changed at any time and will take effect immediately. If the name of a link group is changed, however, OPC clients that have already used that link group as part of an OPC item request will not be affected until they release the item and attempt to reacquire it. New link groups added to the project can immediately be viewed from an OPC client. To prevent operators from changing these parameters, implement the **User Manager** to restrict access rights to these and other LinkMaster features.

Link Item Properties - General

The link's General dialog is used to name the link, describe it, and select its Client Access. The link **Name** parameter is used to enter the string that will represent the data available from this link tag. The name 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. Also, while the use of long descriptive names is generally a good idea, keep in mind that some OPC client applications may have a limited display window when browsing the link tag space of an OPC server like LinkMaster (the link name is part of the OPC browse data).



Identification

Name: Link0

Description:

Settings

☐ Read-only client access

Description

This parameter is used to attach a comment to this tag. A string of up to 64 characters can be entered for the description. If an OPC client that supports Data Access 2.0 Tag Properties is being used, the description parameter will be accessible from the Item Description property of the tag.

Read Only Client Access

This selection is used to specify whether this link is Read Only or Read/Write. By selecting Read Only, client applications are prevented from changing the data contained in this tag. Leaving this setting unchecked will allow client applications to change this link tag's value as needed. The Client Access selection also affects how this tag will appear in the browse space of an OPC client. Many OPC client applications are used to filter tags based on their attributes. Changing the access method of this tag may change how and when the tag will appear in the browse space of the OPC client.

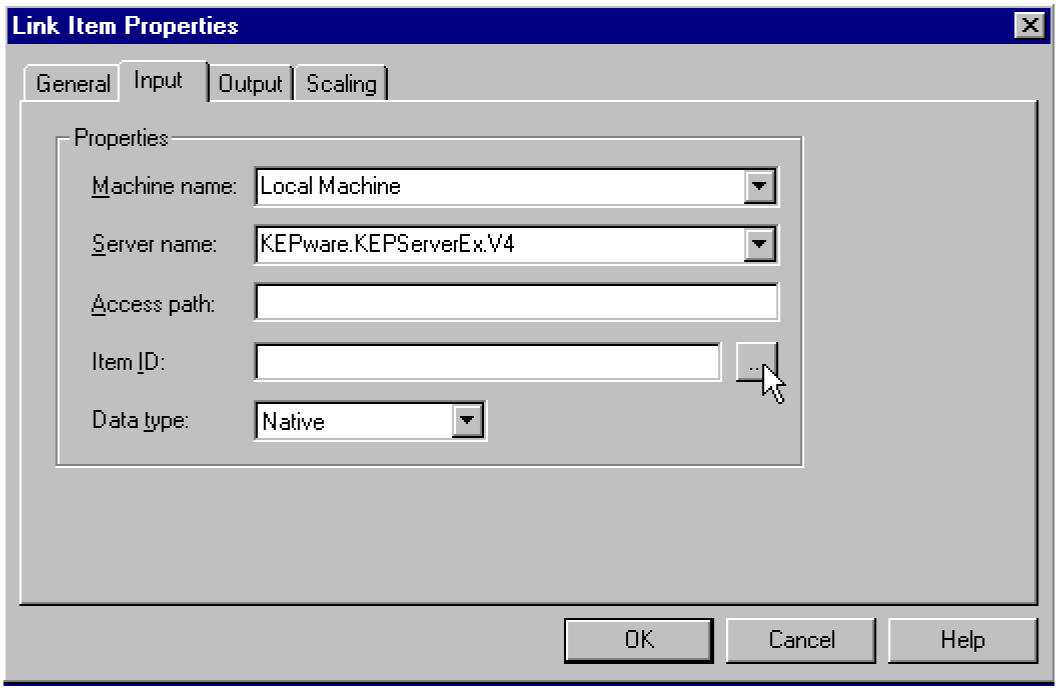
Link Item Icon

If a link item is added, the link icon should be visible in the lower window of LinkMaster. If the link icon turns gray at any point during the project run, the item most likely contains an incorrect input or output. If the link item color is red, then the link transfers and its group have been disabled.

Note: Again, these parameters can be changed at any time. Changes made to link tag properties will take effect immediately, however: OPC clients that have already connected to this link item will not be affected until they release and reacquire this tag. To prevent operators from changing these parameters, use the **User Manager** to restrict access rights to LinkMaster features.

Link Item Properties - Input

The **Link Item Input** is used to define the source of data that will be transferred to one or more output items. This value will be read from the source OPC server at the rate specified in the **Link Group** settings. The link item's Input dialog is used to browse and select an available local or remote machine, choose an OPC server on the selected machine, and then choose any of the tag items available on that server. In the main application view, users can also **drag and drop** items in the item view to create link item inputs and then drag items onto these links to add link outputs. For more information, refer to **Adding A Link Item**.



Machine name: Local Machine

Server name: KEPware.KEPServerEx.V4

Access path:

Item ID:

Data type: Native

Machine Name

Choose either the local machine or a machine located on the Ethernet network (if any are available). If the server is located on the same machine as the LinkMaster, the setting can be left as **Local Machine**.

Server Name

This field can be used to choose the OPC server from which users will receive source data. In this case, the Input data will be coming from KEPServerEX.

Access Path

This is required by some OPC servers to complete an item definition. Refer to the OPC server's documentation to determine whether or not users need to specify an access path.

Item ID

The OPC server item used to reference the data. Refer to the OPC server's documentation to determine valid item names for the location in question. If the server supports tag browsing, then an item can be selected by using the Browse feature.

Data Type

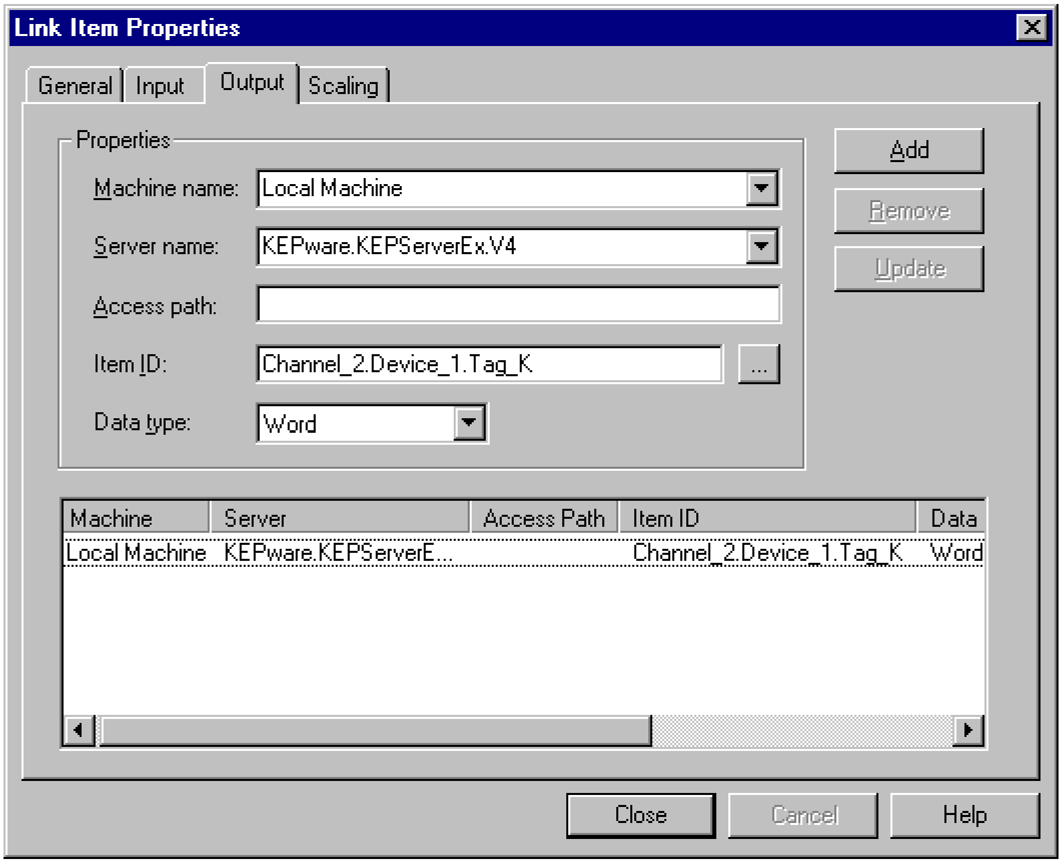
This is the requested data type that should be used when communicating between the OPC server and the OPC LinkMaster. This should be specified to agree with the size and type of the register or memory location that is being addressed. Supported data types are defined as follows.

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

Note: All of the above data types are available as **Array types** except for Boolean and String.

Link Item Properties - Output

The Link Item Output property is used to define OPC items available in the target OPC server that will be linked to the source OPC server input items. The link's Output dialog is used to browse and select an available local or remote machine, choose an OPC server on the selected machine, and then select any of the desired tag items located on that server, as outputs. Users are allowed to add as many outputs as needed in the link item output section. Enter the desired item in the Item ID and click **Add**. Similarly, any output item can be removed by highlighting the item in the output display and then clicking **Remove**. Any changes made to existing outputs can only be updated by pressing the **Update** button. In the main application view, users can also **drag and drop** items in the item view to create link item inputs, and then drag items onto these links to add link outputs. For more information, refer to **Adding A Link Item**.



Machine name: Local Machine

Server name: KEPware.KEPServerEx.V4

Access path:

Item ID: Channel_2.Device_1.Tag_K

Data type: Word

Machine	Server	Access Path	Item ID	Data
Local Machine	KEPware.KEPServerE...		Channel_2.Device_1.Tag_K	Word

Machine Name

Choose either the local machine or a machine located on the Ethernet network (if any are available). If the server is located on the same machine as LinkMaster, leave the setting as **Local Machine**.

Server Name

This field can be used to choose the OPC server to which the source data will be linked. In this case, the Output data going to KEPServerEX server.

Access Path

This is required by some OPC servers to complete an item definition. Refer to the OPC server's documentation to determine whether or not an access path is needed.

Item ID

The OPC server item used to reference the data. Refer to the OPC server's documentation to determine valid item names for the location in question. If the server supports tag browsing, then users can select an item by using the browse feature.

Data Type

This is the requested data type that should be used when communicating between the OPC server and the OPC LinkMaster. This should be specified to agree with the size and type of the register or memory location that is being addressed. Supported data types are defined as follows.

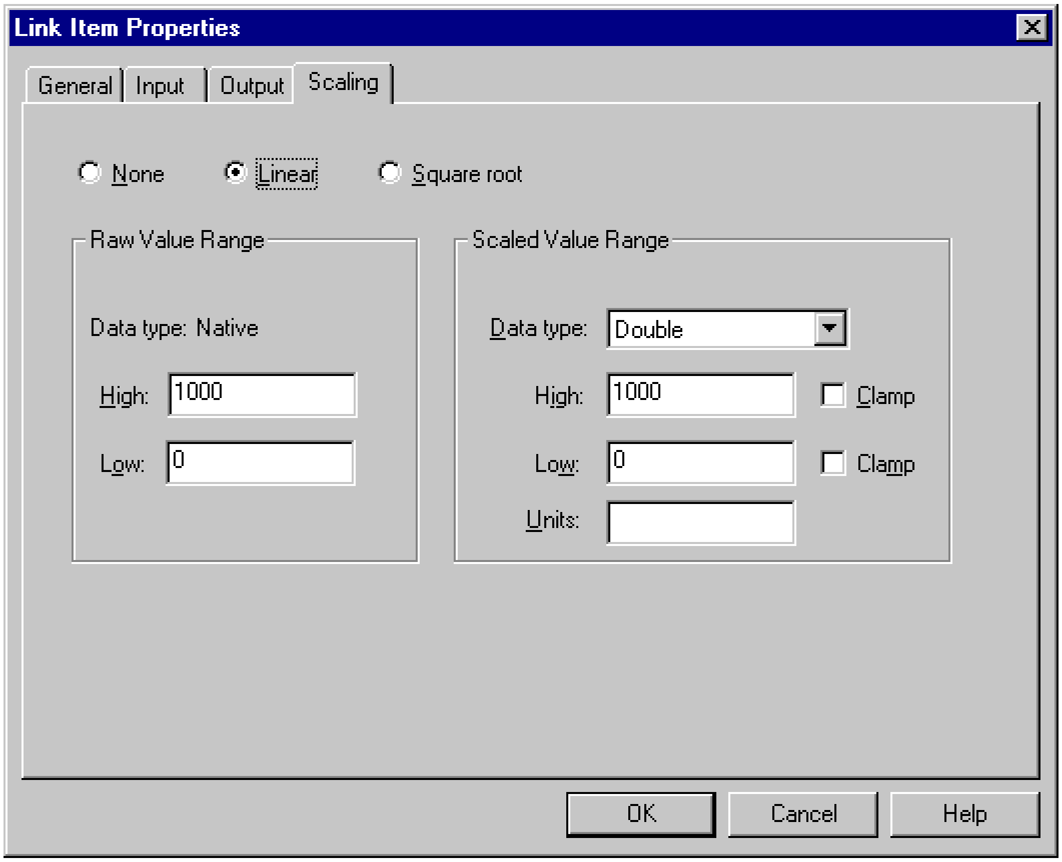
Data Type	Description
Native	Default as determined by the OPC server
Boolean	Single bit
Char	Signed 8-bit value
Byte	Unsigned 8-bit value
Short	Signed 16 bit value

Word	Unsigned 16 bit value
Long	Signed 32 bit value
DWord	Unsigned 32 bit value
Real	Single precision floating point value. (32 bit s)
Double	Double precision floating point value (64-bits)
String	Zero terminated character array

Note: All of the above data types are available as **Array types** except for **Boolean** and **String**.

Link Item Properties - Scaling

LinkMaster supports **Link Item Scaling**, which allows raw input data from the server to be scaled to a more appropriate range for the **Link Output** item or client application. There are two types of scaling: **Linear** and **Square Root**.



○ None ● Linear ○ Square root

Raw Value Range
Data type: Native
High: 1000
Low: 0

Scaled Value Range
Data type: Double
High: 1000 □ Clamp
Low: 0 □ Clamp
Units:

Selecting either Linear or Square Root scaling will enable scaling operations for the Link Item.

The raw data range is used to specify the range of raw data from the server. The valid range depends on the data type of the Link Item's raw value. If, for example, the raw value was set to Short, the valid range of the raw value would be -32768 to 32767. The raw high range must be greater than the raw low range.

Normally a scaled value is assumed to result in a floating-point value. LinkMaster does not make that assumption. The data type of the **Scaled Value** can be set to any valid OPC data type. This gives users the ability to scale from a raw data type, such as Short, to an engineering value with a data type of Long, if it is needed. The default scaled data type is **Double**.

The scaled data range is used to specify the range of the resulting scaled value. The valid range is dependent upon the data type of the scaled value. If, for example, the scaled data type is set to **Long** the valid range is -2147483648 to 2147483647. The scaled high range must be greater than the scaled low range.

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 is also forced outside of the established range. To prevent this, use the **High** and **Low clamps** to constrain the scaled value to the range specified.

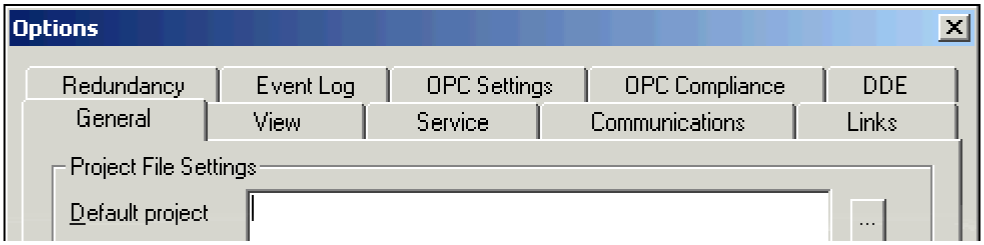
LinkMaster also allows a unit's string to be assigned to a scaled Link item. The unit's string can be up to 32 characters long.

LinkMaster supports the OPC tag properties available in the **2.0 Data Access** specifications. If the OPC client being used supports these properties, it can automatically configure the range of objects, like user input objects or displays, using the data entered here.

Note: These parameters can be changed at any time. Changes made to LinkMaster properties, such as scaling, will take effect immediately. 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, use the **User Manager** to restrict access rights to LinkMaster features.

LinkMaster Options

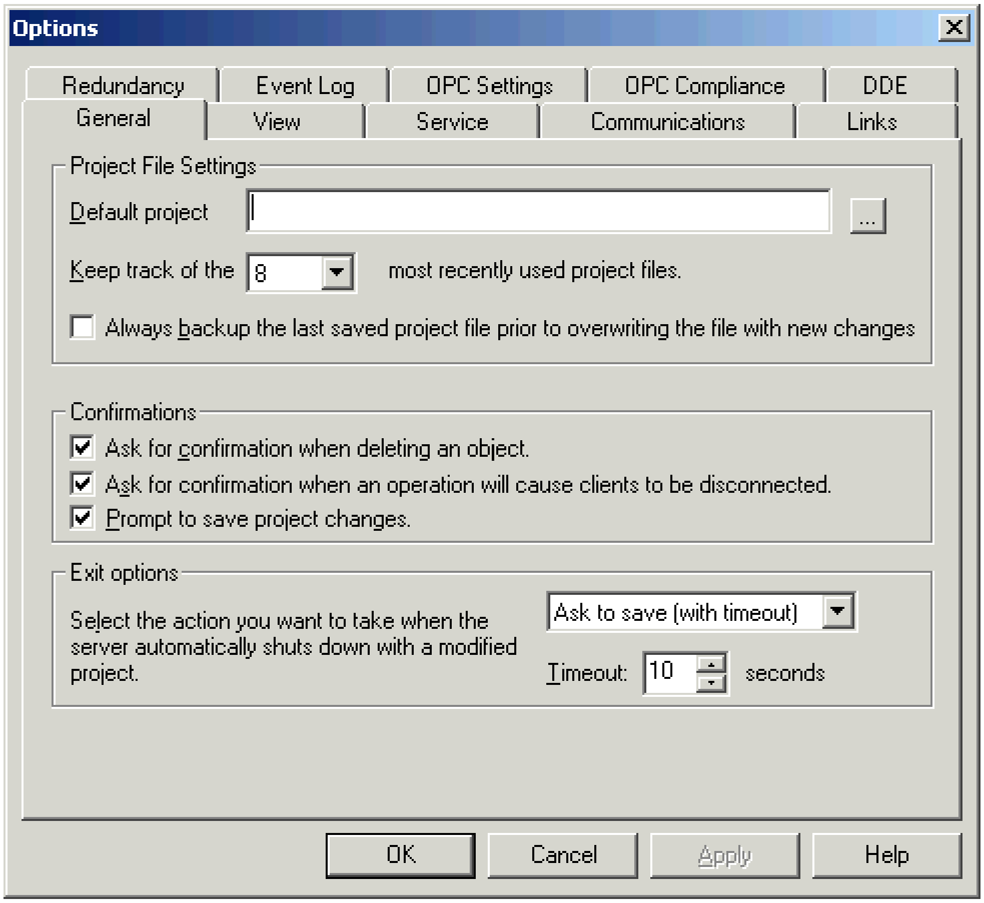
For most projects, LinkMaster's default settings are adequate. If looking for more application control options, refer to the following help topics that describe various LinkMaster options. To access the Options dialog, click **Tools** | **Options**. The dialog should appear as shown below. Click on a link for a description of the tab.



General Options
View Options
Service Options
Communications Options
Links Options
Event Log Options
OPC Settings Options
OPC Compliance Options
DDE Options
Redundancy Options

General Options

To access the General options, click on **Tools** | **Options**. The dialog will be displayed as shown below.



Project File Settings

Default project

Keep track of the 8 most recently used project files.

☐ Always backup the last saved project file prior to overwriting the file with new changes

Confirmations

☑ Ask for confirmation when deleting an object.

☑ Ask for confirmation when an operation will cause clients to be disconnected.

☑ Prompt to save project changes.

Exit options

Select the action you want to take when the server automatically shuts down with a modified project. Ask to save (with timeout)

Timeout: 10 seconds

Project File Settings

- The **Default Project** field stores the path and name of the project that will be opened when LinkMaster is started. Click the **...** button to the right in order to browse for the project to that is to be designated as the default. If the field is left blank, the most recent project (or the last project saved) will be opened when LinkMaster is started.
- The **Keep track of the __ most recently used project files** setting can be used to specify how many project files are presented on the **MRU list** found on the File menu. The valid range is 1 to 16.
- The **Always backup the last saved project prior to overwriting the file with new changes** setting can be used to always have the last saved LinkMaster project (*.lmf) automatically backed up before LinkMaster overwrites that file with a new one. The backup file will be named projectname.lmf.bak and stored in the **\Project Backups** folder.

Confirmations

To prevent unwanted changes from being implemented, LinkMaster can display warning messages whenever a changes is made that will affect active connections.

- Click to check **Ask for confirmation when deleting an object** to have a warning message displayed to the operator if a delete or cut operation is entered. The operator would have to confirm before the delete or cut operation is completed.
- Check **Ask for confirmation when an operation will cause clients to be disconnected** to have a warning message displayed if an operator invokes an operation that would disconnect it from the OPC server. The operator would have to confirm before the disconnect sequence was initiated.
- Check **Prompt to save project changes** to have a message displayed if LinkMaster is being shut down with outstanding changes in the project.

  OPC Note: LinkMaster supports the Data Access 2.0 server shutdown event. If an operator action will cause connections to OPC clients that are using the 2.0 Data Access specifications to be lost, LinkMaster will issue a server shut down event to these clients. If the clients are designed to utilize this event, they can properly disconnect their OPC resources. OPC clients that do not support the server shutdown event may have issues once LinkMaster shuts down. **See Also:** **OPC Settings**.

Exit Options

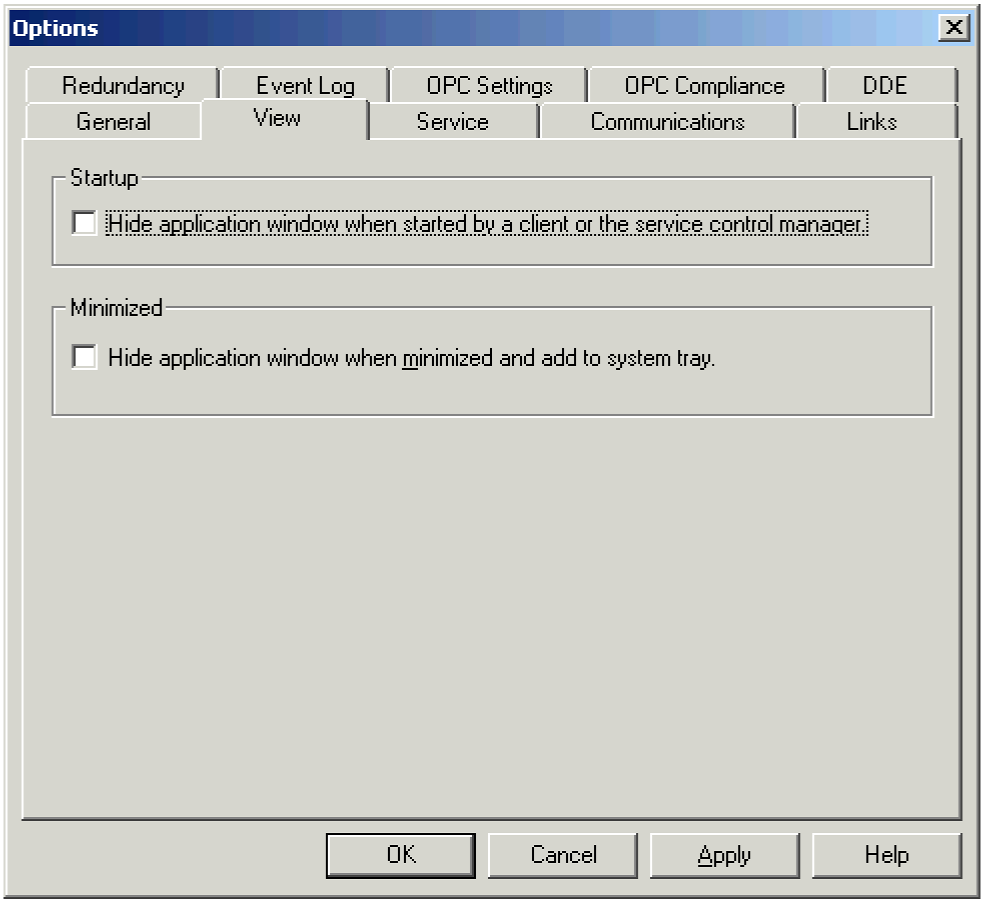
When LinkMaster is invoked from a client application, it automatically loads itself and begins running the last project used. LinkMaster may also automatically load any OPC server that was associated and connected to the project when it was last saved. Normally, when an OPC client is finished using LinkMaster and disconnects, LinkMaster will then exit; however, there may be situations when the operator may have made changes to the project while it was invoked by a client application. If LinkMaster were to shut down without warning, those changes could be lost. To prevent this from happening, LinkMaster has provided exit options. The **Exit Options** settings are used to configure LinkMaster's exit strategy.

- **Ask to save (with timeout)** will present a **Save Project** dialog to the operator. If the operator is present, they can decide to save the changes. If, however, the operator is not present, the option to save the project changes will expire by the time specified in the **Timeout** field. If the operator does not respond within the timeout period, the project changes will be lost and the OPC server will complete its exit.
- **Auto save (if possible)** automatically saves any changes made to the project, if a project file has already been established. With this method, the operator will not be prompted to save changes.
- **Discard changes** allows LinkMaster to exit, losing any changes that have been made to the project.
- **Keep running** prevents LinkMaster from automatically shutting down if changes have been made to the project.

View Options

The View tab is used to configure how LinkMaster's main window will be displayed to the user and whether or not LinkMaster appears on the window's taskbar. Normally, LinkMaster's main window is displayed to the user whenever it is either loaded manually or invoked automatically by an OPC client application. This mode of operation is the default condition and is selected by leaving the Startup and Minimized options unchecked. This is also how LinkMaster has operated historically. These two options can be used to configure how LinkMaster behaves when launched either manually or automatically.

To access the View options, click on **Tools** | **Options**. Then, select the **View** tab. The dialog will be displayed as shown below.



Startup

□ Hide application window when started by a client or the service control manager.

Minimized

□ Hide application window when minimized and add to system tray.

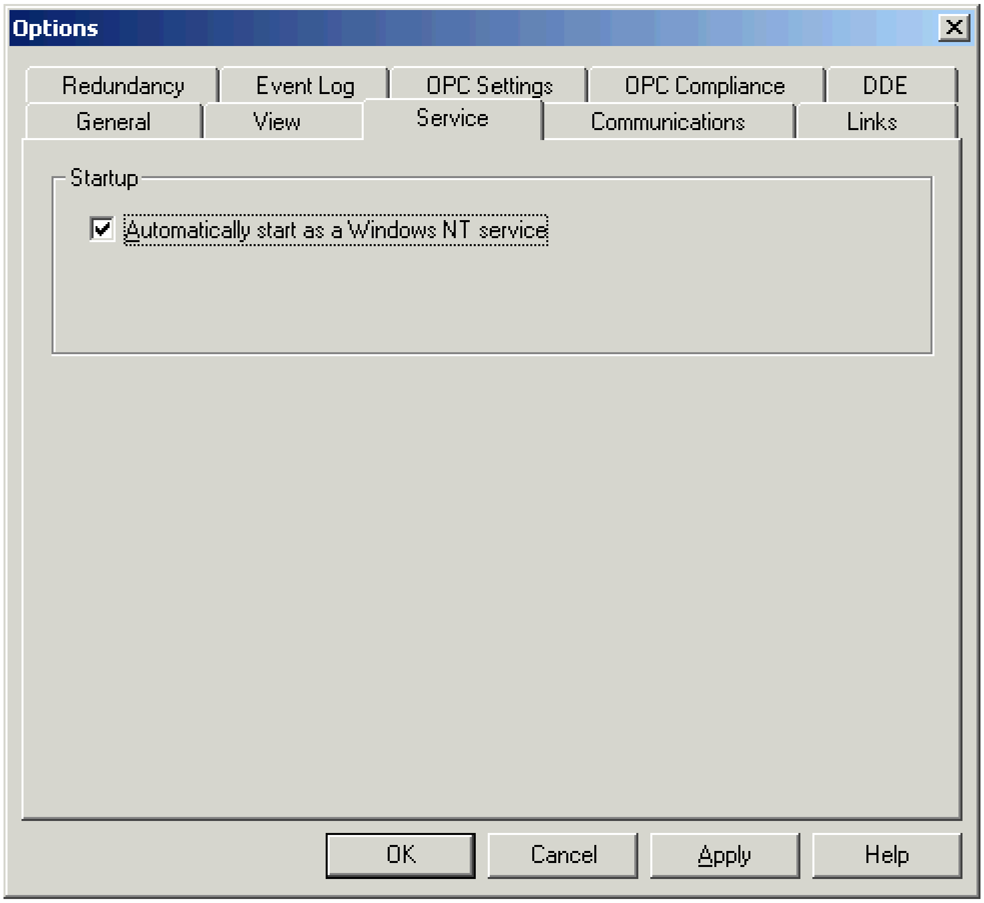
The **Startup** option configures how LinkMaster will respond when being launched automatically by an OPC client or through the NT service manager when configured to run as a service. If **Hide application window when started by a client or the service control manager** is checked, LinkMaster will not appear on the normal Windows taskbar. Instead, it will appear on the system tray as a server icon. With the LinkMaster icon in the system tray, simply click the icon to start up LinkMaster.

The **Minimized** option is used to configure how LinkMaster will respond when the main window is minimized. If **Hide application window when minimized and add to system tray** is left unchecked, the LinkMaster application will continue to appear on the window's taskbar when minimized. If this selection is checked, LinkMaster will only be displayed as an icon on the system tray when LinkMaster is minimized. This can remove clutter from the Windows environment and help prevent the user from unnecessarily interacting with the LinkMaster project.

Service Options

LinkMaster supports running as a service under Windows NT/2000. The ability to run as an NT service is crucial for many applications where LinkMaster must provide data to OPC clients via DCOM. For these applications, the loss of a DCOM connection cannot be tolerated. Normally, an OPC server that only supports stand alone program operations is forced to shut down when its host machine experiences a user log in or logout. While running as a service, LinkMaster can continue to supply OPC data across user log in sessions. Furthermore, LinkMaster can be configured to run with no visible presence and also to interact with the desktop (which is used to make changes to the server project).

To access the Service options, click on **Tools** | **Options**, then select the Service tab.



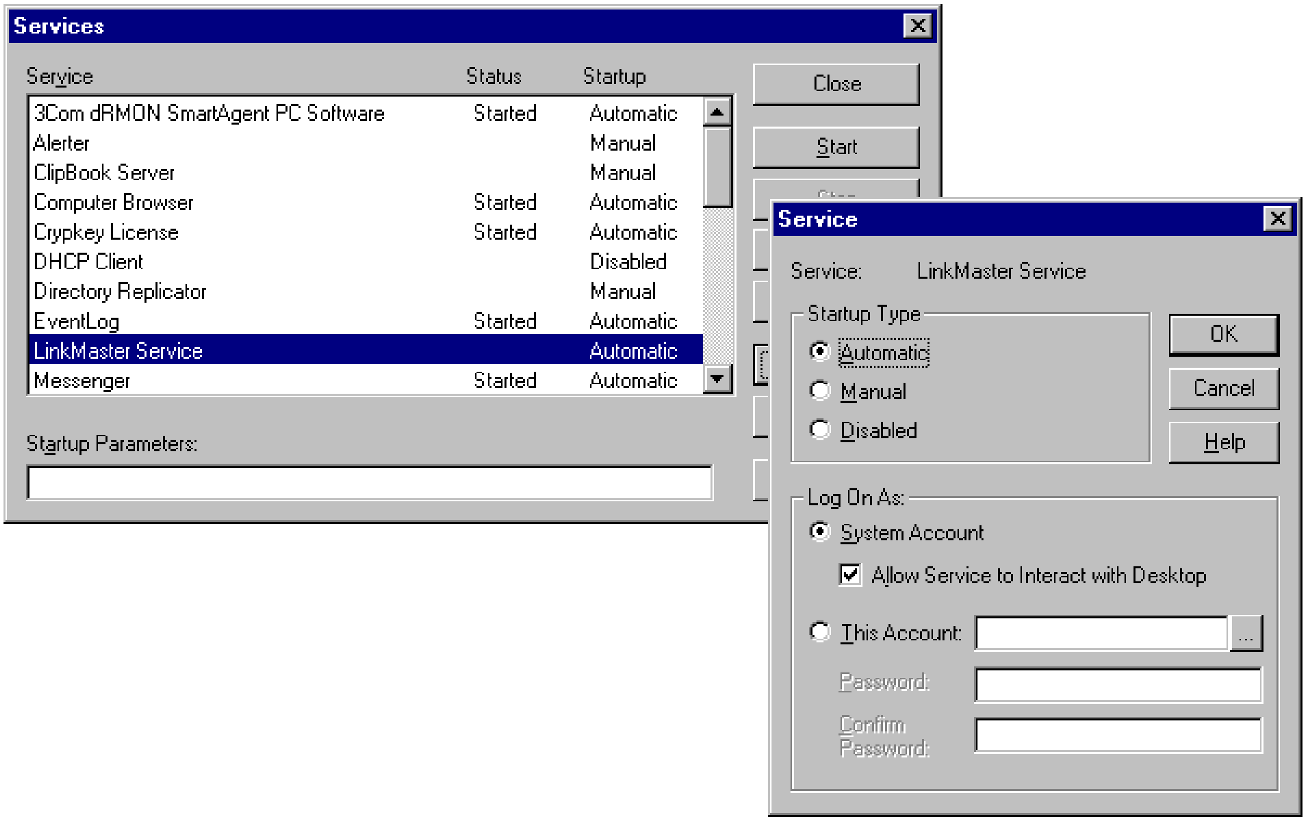
☑ Automatically start as a Windows NT service

Automatically start as a Windows NT service

This option can be used to configure LinkMaster for operation as a service under NT and Windows 2000. By default, this option is disabled (unchecked). When enabling the service option, a warning message dialog box will appear to inform users that this change will not take effect until the next time LinkMaster is run. Thus, for it to immediately become a service the program must be exited. Afterwards, it may be restarted from the Windows NT Service Manager found on the **Control Panel** or by allowing the OPC client to invoke LinkMaster when it connects.

Note: The **Service** option of LinkMaster can only be accessed when users are logged into Windows NT/2000 as an administrator. When logged in as a normal user, the **run as service** option will be disabled.

After the LinkMaster service option has been configured, the specific application may require that users modify the NT service options for the LinkMaster. The NT Service Manager's Properties dialog for LinkMaster's default properties will appear as shown below.



Services

Service	Status	Startup
3Com dRMON SmartAgent PC Software	Started	Automatic
Alerter		Manual
ClipBook Server		Manual
Computer Browser	Started	Automatic
Crypkey License	Started	Automatic
DHCP Client		Disabled
Directory Replicator		Manual
EventLog	Started	Automatic
LinkMaster Service		Automatic
Messenger	Started	Automatic

Startup Parameters:

Service

Service: LinkMaster Service

Startup Type

- ● Automatic
- ○ Manual
- ○ Disabled

Log On As:

- ● System Account
  - ☑ Allow Service to Interact with Desktop
- ○ This Account:

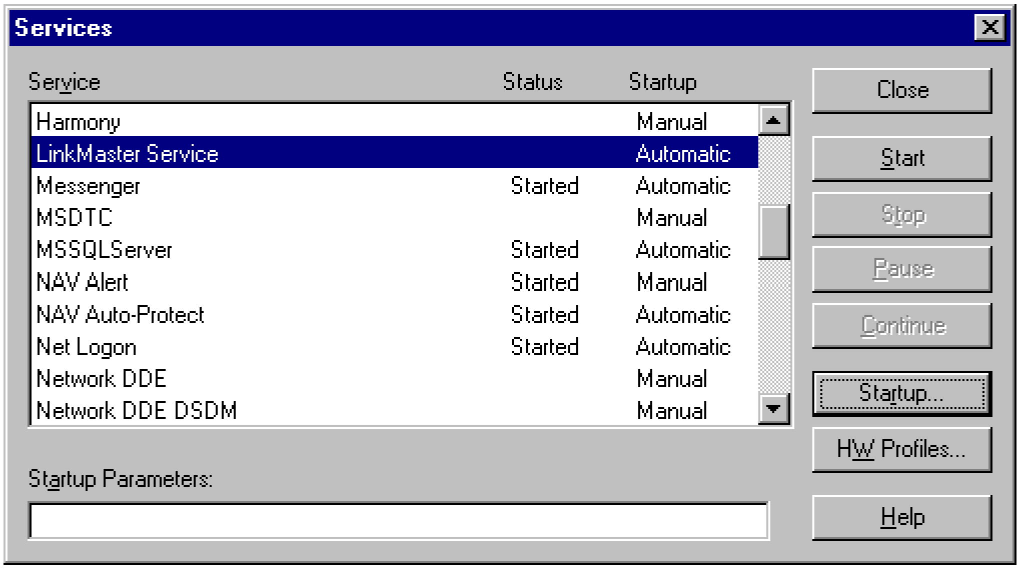
Password:

Confirm Password:

LinkMaster is configured for **automatic startup** and **interaction with the desktop** by default. Interaction with the Desktop means that not only will LinkMaster appear on the taskbar, but that users can make changes to the project even when it is running as a service. It also means that users will not be able to shut LinkMaster down from any of the normal menu exits or close functions. Allowing LinkMaster to interact with the desktop has no effect on its ability to supply OPC data across user logins. Once the LinkMaster project is completely configured, users may want to consider disabling LinkMaster's interaction with the desktop. This will prevent users from seeing the application on their taskbar and will further reduce unauthorized access to the server. To prevent LinkMaster from interacting with the desktop simply uncheck the **Allow Service to Interact with Desktop** check box. Once desktop interaction is disabled, LinkMaster will need to restart before it can be removed from the system taskbar.

Note: If running LinkMaster in a demo or evaluation mode, we strongly recommend that LinkMaster is allowed to **Interact with Desktop**. This will show any error messages that LinkMaster may generate, such as **Demo period has expired**. If this occurs, stop the LinkMaster service using the Service manager as shown below.

Once LinkMaster is configured to run as a service, use the NT Service manager to manually start and stop the application. The Service Manager menu is used to select the **LinkMaster Service** and either start or stop the service as shown in the dialog below.

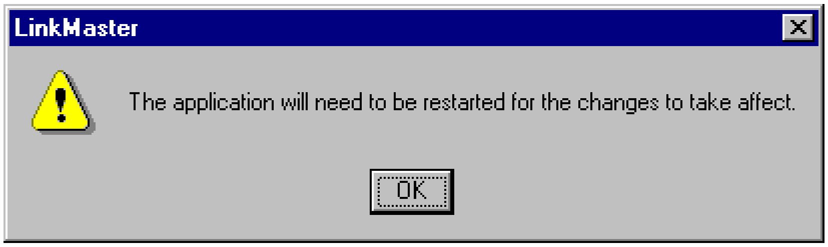


Service	Status	Startup
Harmony		Manual
LinkMaster Service		Automatic
Messenger	Started	Automatic
MSDTC		Manual
MSSQLServer	Started	Automatic
NAV Alert	Started	Manual
NAV Auto-Protect	Started	Automatic
Net Logon	Started	Automatic
Network DDE		Manual
Network DDE DSDM		Manual

Returning LinkMaster to Normal Program Mode

To return LinkMaster to normal stand-alone program operation, users must first be able to interact with the LinkMaster project. This requires that LinkMaster be able to interact with the desktop. If LinkMaster is not configured to interact with the desktop, the NT Services Manager can be used to enable desktop interaction and stop the LinkMaster service. Once the application has stopped, restart it using the Start button as shown above. LinkMaster should now appear on the system taskbar. Once LinkMaster can be seen on the desktop, changes can be made to the project. To return to normal program mode **uncheck** the **Automatically start as a Windows NT service** checkbox on the Service option dialog of LinkMaster. Next, stop the application using the Stop button of the Service manager. Now, LinkMaster can run from the normal desktop icon or start menu selection.

The following message may be received if LinkMaster is configured to run as a service but users attempt to run it from the desktop icon or the start menu.



The application will need to be restarted for the changes to take affect.

In order to make LinkMaster run as a normal program, review the steps in **Returning LinkMaster to Normal Program Mode** above.

Possible issues when running as a service

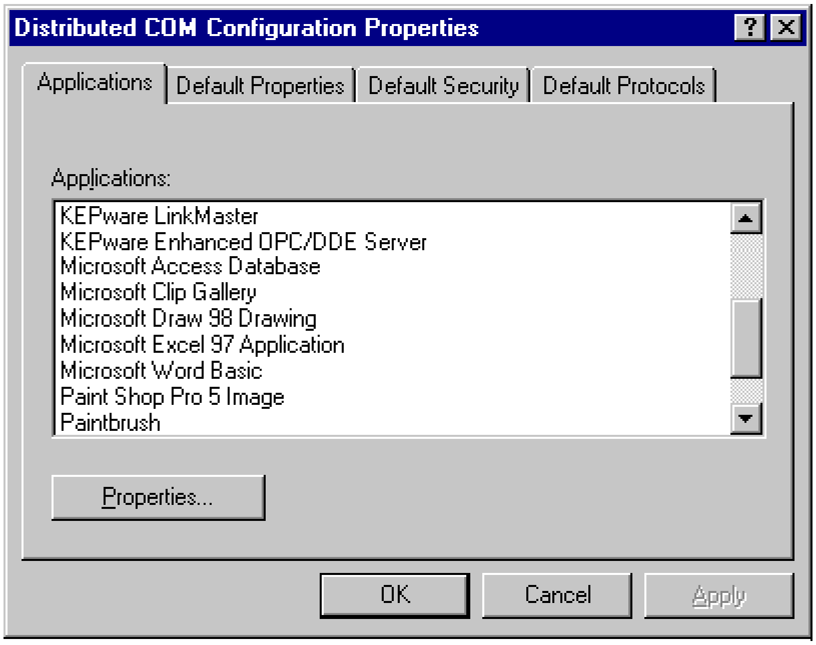
Under most circumstances users should be able to seamlessly switch between Service mode and Stand Alone mode. There is the possibility of a **DCOM (Distributed Component Object Model)** security issue that may prevent the OPC client from being able to connect to LinkMaster when it is running as a service.

If users experience an issue connecting the OPC client to LinkMaster when it is running as service, we suggest that LinkMaster be taken out of service mode and the OPC connection be confirmed in **Stand Alone mode**. Once the OPC client connection has been confirmed under normal circumstances, users can look at the DCOM settings using the following steps:

1. Place LinkMaster back into **Service mode**.

2. Run **DCOM Config**. This can be done from the Windows start menu using the **Run** command. Type "DCOMCNFG".

3. Once DCOMCNFG is running, the main dialog will appear as shown below.

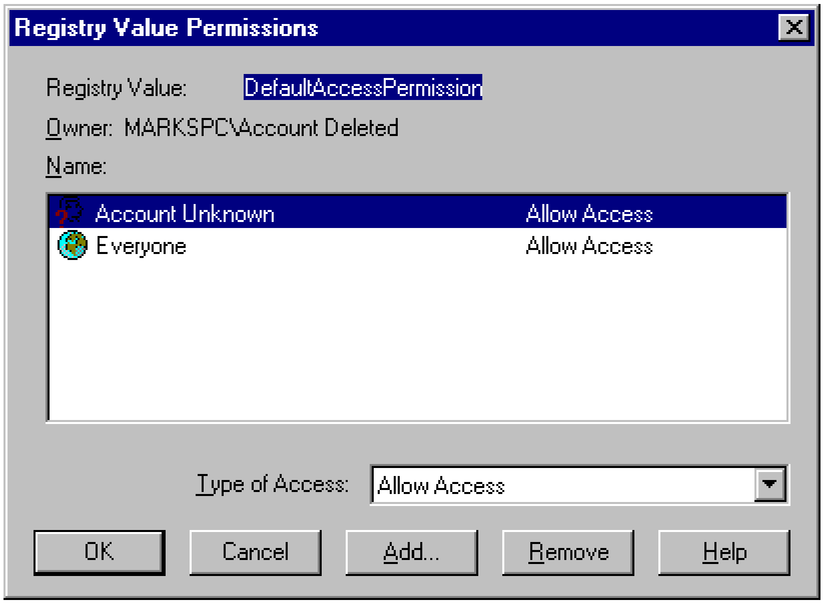


Applications:

KEPware LinkMaster
KEPware Enhanced OPC/DDE Server
Microsoft Access Database
Microsoft Clip Gallery
Microsoft Draw 98 Drawing
Microsoft Excel 97 Application
Microsoft Word Basic
Paint Shop Pro 5 Image
Paintbrush

4. In the **Default Security** tab, there are groups: default **Access**, **Launch** and **Configuration**.

5. In **Access**, click **Edit Default**. The dialog should appear as shown below.



Registry Value: DefaultAccessPermission

Owner: MARKSPC\Account Deleted

Name:

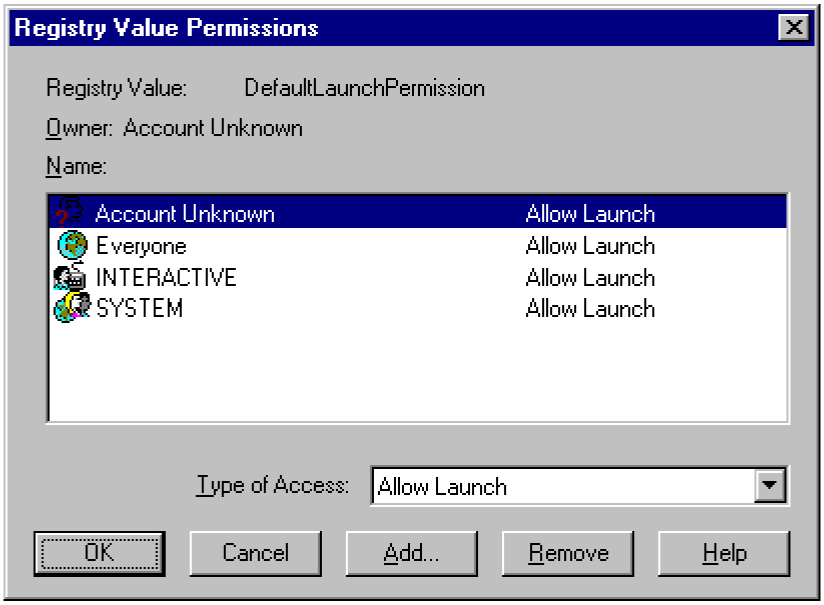
Account Unknown	Allow Access
Everyone	Allow Access

Type of Access: Allow Access

6. If **Everyone** is not already a member of the defaul access security group, click **Add** and select **Everyone** from the list. Make sure that the type of access is **Allow Access**.

7. Click **OK**.

8. In **Launch**, click **Edit Default**.



Registry Value Permissions

Registry Value: DefaultLaunchPermission

Owner: Account Unknown

Name:

Account Unknown	Allow Launch
Everyone	Allow Launch
INTERACTIVE	Allow Launch
SYSTEM	Allow Launch

Type of Access: Allow Launch

9. If **Everyone** name and **SYSTEM** name are not members of the group, click **Add** and select **Everyone** and **SYSTEM** from the list. Make sure that the type of access for both is **Allow Launch**.

10. Click **OK**.

11. In the **Service Control Manager**, stop and restart LinkMaster as a **service**.

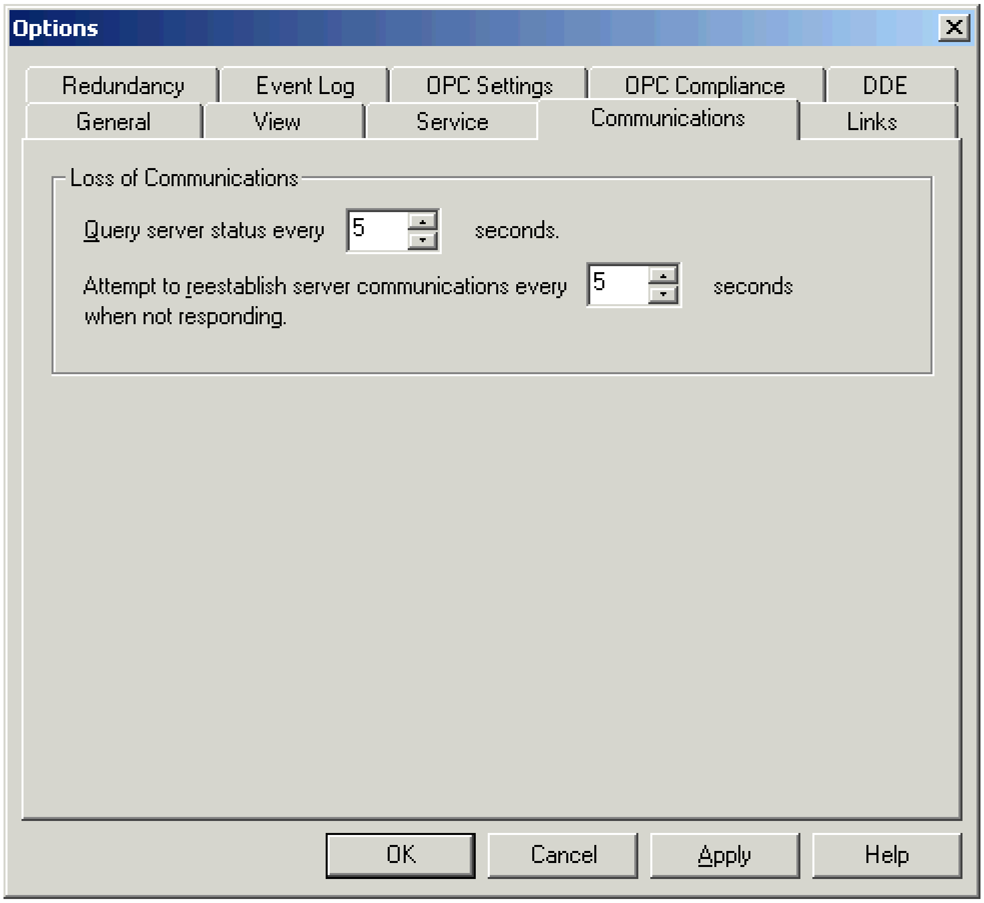
12. Attempt to reconnect to LinkMaster using the OPC client.

Note: If at this point users are still unable to connect, reboot the PC. In most cases, DCOM settings will take effect immediately.

Communications Options

LinkMaster users can adjust how often the LinkMaster queries connected servers for possible lost communications. In the event that a server is disconnected, LinkMaster will attempt to regain connection to the lost server(s) at a user-defined interval.

To access the Communications options, click **Tools** | **Options**. Then, select the **Communications** tab. The following dialog will be displayed.



Loss of Communications

Query server status every 5 seconds.

Attempt to reestablish server communications every 5 seconds when not responding.

Query server status every...

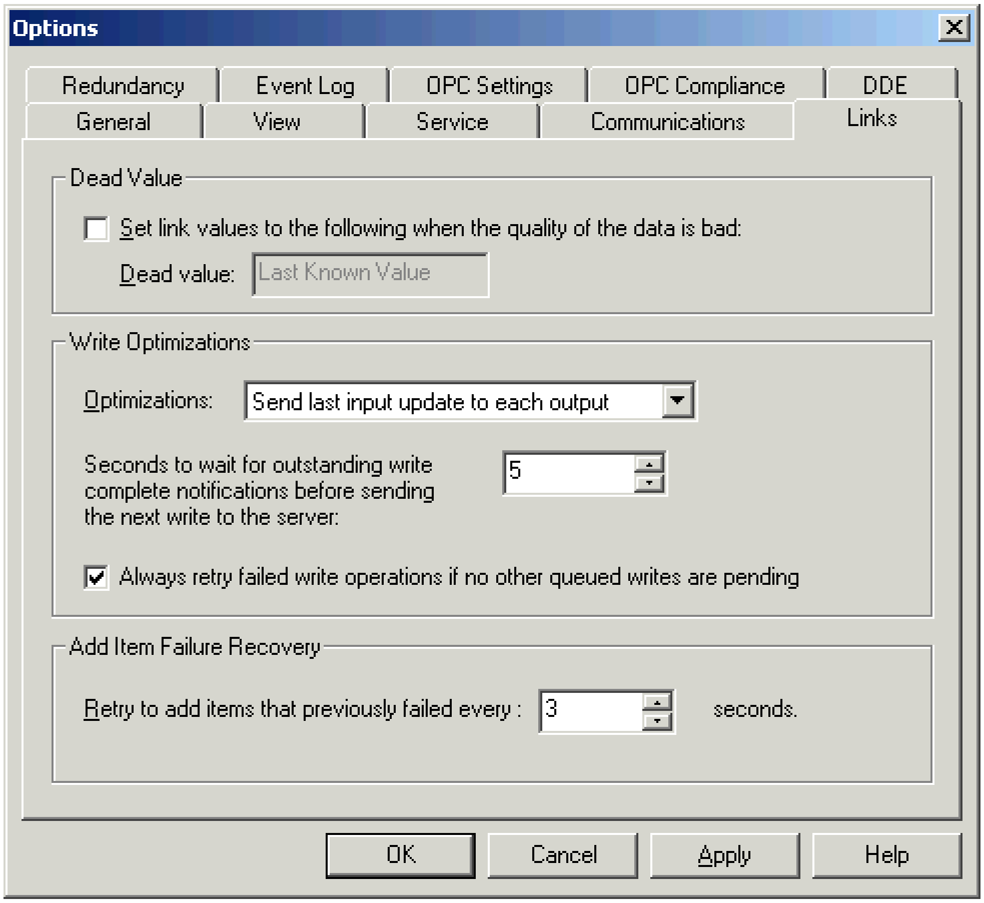
This selection can be used to specify how often LinkMaster will check to make sure the connected OPC server(s) have not been disconnected. The default is 5 seconds. The valid range is 5 to 30 seconds.

Attempt to re-establish server...

This selection can be used to configure how often the LinkMaster will attempt to reconnect with an OPC server once communications has been lost. The default is 5 seconds. The valid range is 5 to 30 seconds.

Links Options

To access the Links options, click on **Tools** | **Options**. Then, select the **Links** tab.



Dead Value

☐ Set link values to the following when the quality of the data is bad:

Dead value: Last Known Value

Write Optimizations

Optimizations: Send last input update to each output

Seconds to wait for outstanding write complete notifications before sending the next write to the server: 5

☑ Always retry failed write operations if no other queued writes are pending

Add Item Failure Recovery

Retry to add items that previously failed every : 3 seconds.

Dead Value

The Dead Value setting specifies what the link item values will be set to if the values become bad. By default, the link value will display either the last good value or no value at all (depending on whether the link has received an update). If the user-defined dead value is beyond the range of the link item's Output data type, then the dead value will not be transferred to the output item. Furthermore, that link item will be considered invalid in this state because of the mismatch between the dead value and the output data type.

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

Write Optimizations

For the Optimizations setting, the recommended choice is **Send last input update to each output**, which sends only the most recent input update to the corresponding output item. This option can minimize the load on the OPC server's write queue. The other optimizations option is **Send all input updates to each output**, which sends all write requests to the corresponding output(s).

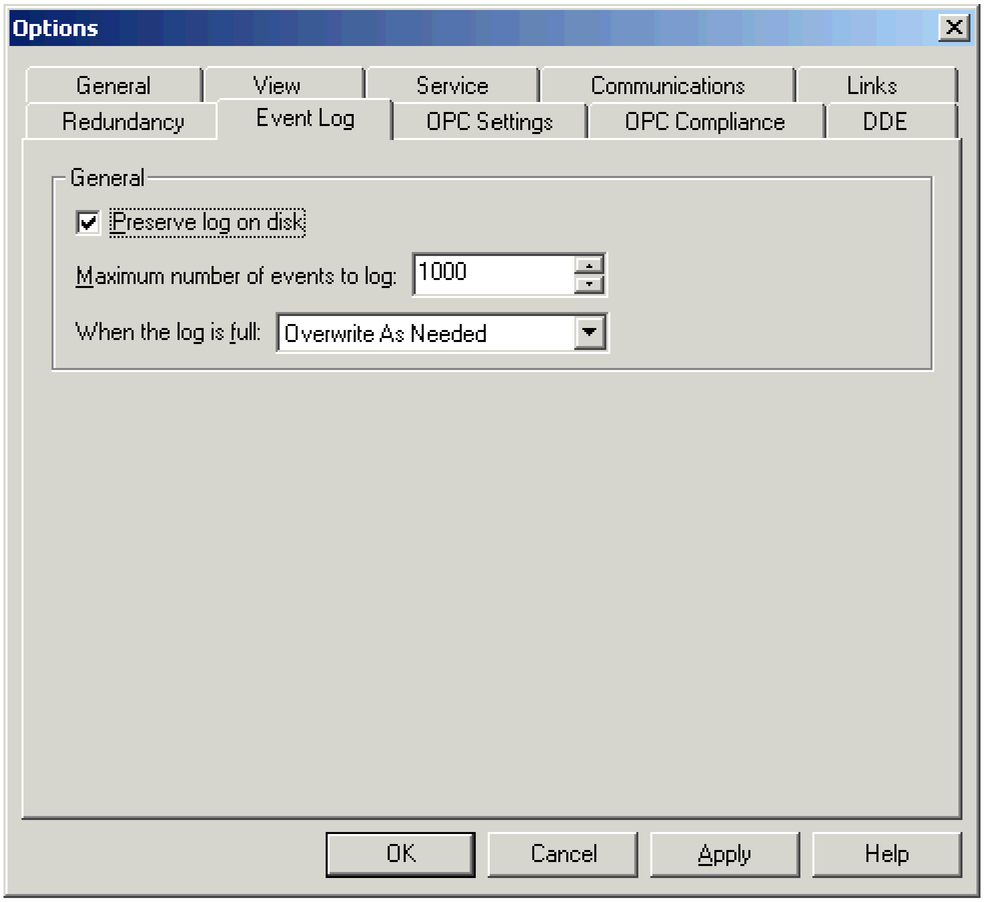
Caution: Selecting **Send all input updates** can lead to server overload if the **Seconds to wait for...** time interval is set too low. Write requests can build up in the cache, causing undue strain to the server. For this reason, the recommended choice for optimizations is **Send last input update to each output**. The **Seconds to wait for outstanding write complete notifications before sending the next write to the server** setting can be used to optimize write performance to servers that are slower or fail to notify LinkMaster of a write complete. The default value is 5 seconds. The allowable range is 0-60 seconds. Always retry failed write operations if no other queued writes are pending. When this option is selected, LinkMaster will attempt to retry writes that previously failed. The default setting is selected.

Add item failure recovery

Retry to add items that previously failed every X seconds: This setting is used to specify how often the application should re-attempt to add items that were previously rejected by an OPC server. This situation can occur for servers that allow incoming client connections prior to fully initializing its available item list.

Event Log Options

To access the Event Log options, click on **Tools** | **Options** and then select the **Event Log** tab. The following dialog will be displayed.



General

☑ Preserve log on disk

Maximum number of events to log: 1000

When the log is full: Overwrite As Needed

LinkMaster supports persistent event logging. Events that occur within LinkMaster can be stored to disk and viewed via the **Event Viewer**, which is a separate application. The data contained in the event log depends on the options selected. As seen in the following figure, there are a number of options that allow the Event Log operation to be tailored to the application's specific needs.

Preserve log on disk

This setting enables the use of a disk based log file. When enabled, all events in LinkMaster will be maintained on disk; from one run to the next. The log file, called "linkmaster.log" is found in LinkMaster's main Window's folder. If this setting is disabled, then the event logging system will be stored only in internal memory and not on disk. When **Preserve Log File** is disabled, the event log contents will be empty each time the server is run.

Maximum number of events to log

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 value is 1000 records. If attempting to change this parameter to a value that is less than the current number of records in the log, users will be given a warning that the log file truncation will occur.

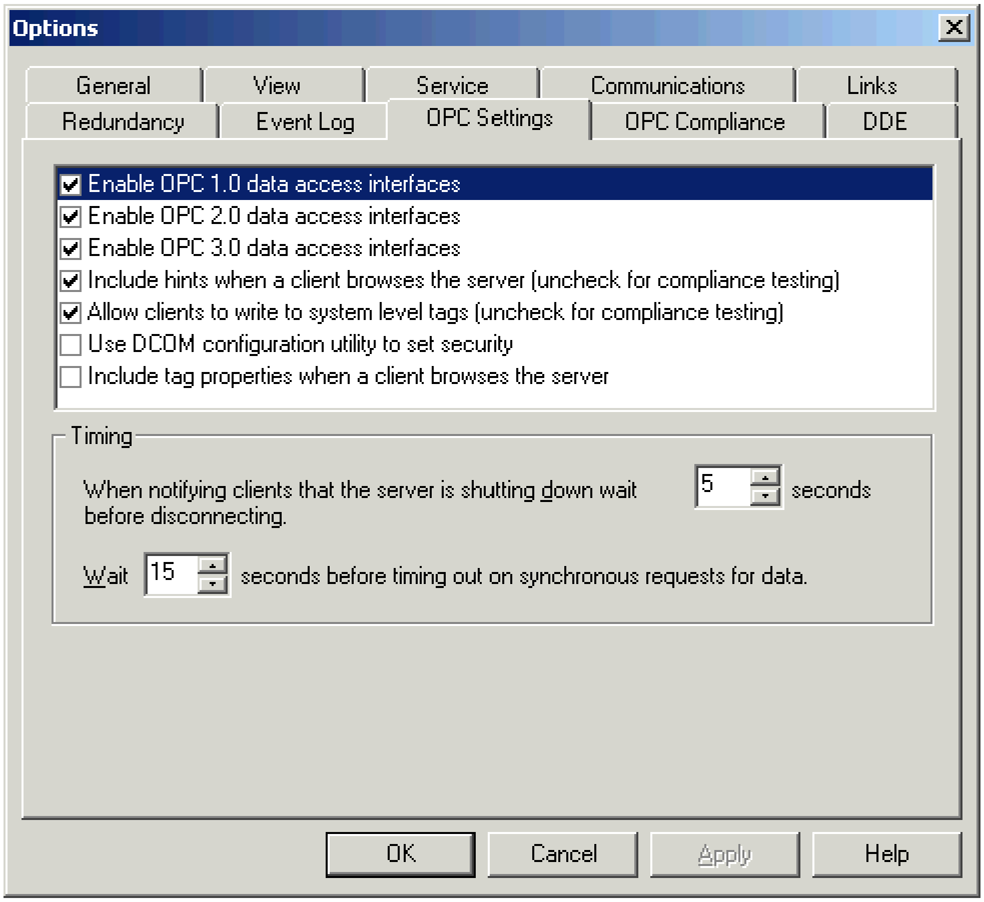
"When the log is full"

This parameter determines the course of action that should be taken when the event log reaches the maximum number of events. There are two possible options available: **Overwrite as Needed** and **Halt (Requires Manual Reset)**. When set to **Overwrite as Needed**, the event log acts as a circular buffer with each new event replacing the oldest event once the log is full. When set to **Halt**, the event log will stop accepting new events and maintain the current list of events until an operator manually resets the event log. This can be useful when trying to catch elusive error conditions.

The contents of the event log can be tailored to meet the application's reporting requirements. Currently, there are three types of messages that can be placed into the event log; General messages (such as server 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, use the **User Manager** to define permissions and limit what functions operators can access.

OPC Settings Options

LinkMaster supports both versions of the OPC Foundation's Data Access Specification 1.0 and 2.0, and both versions are supported simultaneously. While this provides the utmost level of compatibility, there may be times when forcing the LinkMaster to use one method over another may be necessary. The OPC Options dialog is used to make these selections. To access the OPC Settings options, click on **Tools** | **Options**, then select the OPC Settings tab. The following dialog will be displayed.



☑ Enable OPC 1.0 data access interfaces
☑ Enable OPC 2.0 data access interfaces
☑ Enable OPC 3.0 data access interfaces
☑ Include hints when a client browses the server (uncheck for compliance testing)
☑ Allow clients to write to system level tags (uncheck for compliance testing)
☐ Use DCOM configuration utility to set security
☐ Include tag properties when a client browses the server

Timing

When notifying clients that the server is shutting down wait 5 seconds before disconnecting.

Wait 15 seconds before timing out on synchronous requests for data.

Enable OPC 1.0

This setting will allow the LinkMaster to accept OPC client connections from OPC clients that support the 1.0 specification. By default 1.0 operation is enabled.

Enable OPC 2.0

This setting will allow the LinkMaster to accept OPC client connections from OPC clients that support the 2.0 specification. By default, 2.0 operations are enabled.

Enable OPC 3.0

This setting will allow the LinkMaster to accept OPC client connections from OPC clients that support the 3.0

specification. By default 3.0 operation is enabled.

Include hints when a client browses the server (uncheck for compliance testing)

This setting will allow OPC client applications to browse LinkMaster's Link item status tags, when enabled. These items can be useful when it is necessary to monitor link conditions from the OPC client. By default, this setting is enabled (On).

Note: When running the OPC Compliance test, this option should be turned (Off).

Allow clients to write to system level tags

This option controls write access to system tags, like the **Enable** tag for a **Link Group**. In some cases, users may not want a client application to have the ability to turn a Link Group on or off in the project. This setting applies to all system level tags.

Note: When running the OPC Compliance test, this option should be turned (Off). The default condition is (On).

Use DCOM configuration utility to set security

This option controls how LinkMaster will respond to DCOM security requests. When enabled, the DCOM configuration utility can be used to establish strong security on who can access the server. When this option is disabled, LinkMaster will automatically reduce the level of DCOM security, making it much easier for applications to connect to LinkMaster.

Note: If experiencing DCOM security issues, try disabling this option. For new applications, this option defaults to the (Off/disabled) state.

Include tag properties

This option enables OPC client applications to browse the tag properties available for each tag in the address space. By default this setting is disabled. Changing any of these options can be useful if the OPC client application has problems with a particular version of the specification.

When notifying clients that the server is shutting down wait __ seconds before disconnecting.

This timeout setting is used to configure how long LinkMaster will wait for an OPC client to return from the server shut down event. If the client application does not return within the timeout period, LinkMaster will complete its shutdown and exit. The valid range for this timeout is 1 to 30 seconds. The default is 5 seconds.

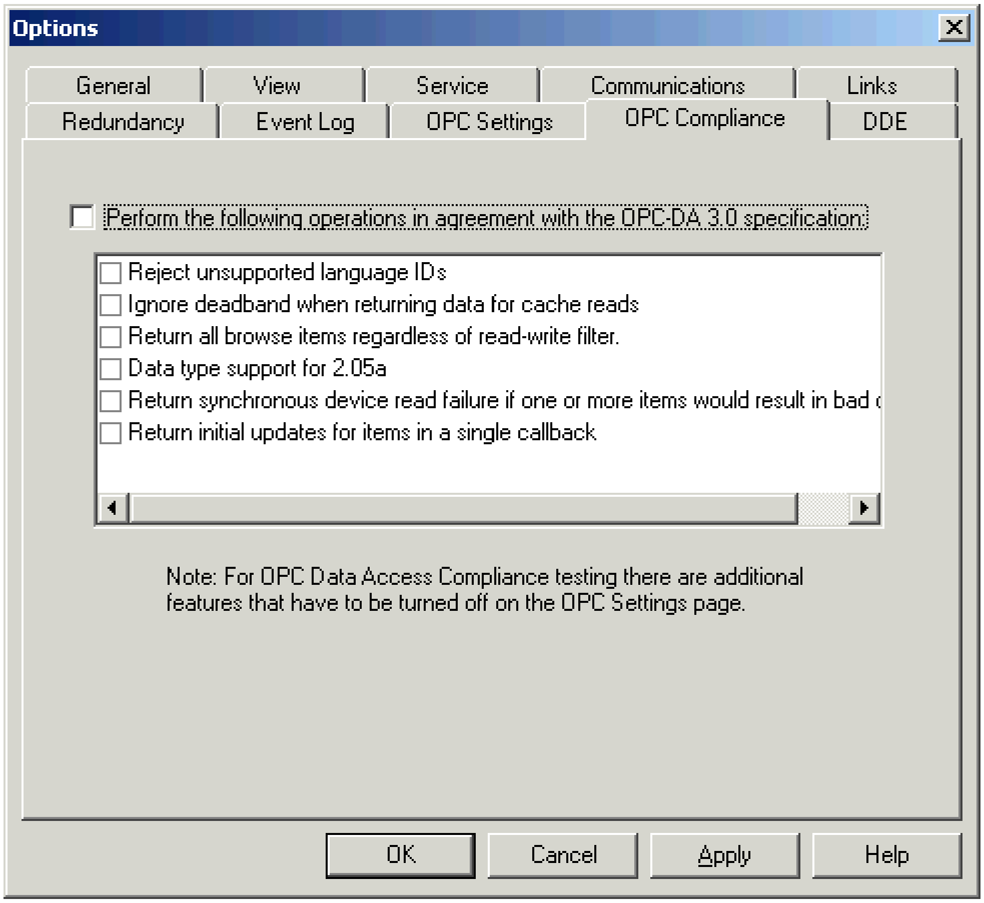
Wait __ seconds before timing out on synchronous requests for data.

This setting is used to configure how long LinkMaster will wait for a synchronous read or write operation to complete. If a synchronous operation is in progress and the timeout is exceeded, LinkMaster 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 synchronous operations. The valid range is 5 to 60 seconds, with 15 seconds as a default.

OPC Compliance Options

LinkMaster has been designed to provide the highest level of compatibility with the OPC Foundation's specifications. In testing, however, it has been found that being fully compatible with the specification and working with all OPC client applications is a different matter. The OPC Compliance option is used to tailor the operation of LinkMaster to better meet the needs of rare OPC clients. Normally these options will not need to be adjusted for the majority of OPC client applications that users will encounter.

To access the OPC Compliance options, click on **Tools** | **Options**. Then, select the **OPC Compliance** tab. The dialog will be displayed as shown below.



☐ Perform the following operations in agreement with the OPC-DA 3.0 specification:

☐ Reject unsupported language IDs
☐ Ignore deadband when returning data for cache reads
☐ Return all browse items regardless of read-write filter.
☐ Data type support for 2.05a
☐ Return synchronous device read failure if one or more items would result in bad c
☐ Return initial updates for items in a single callback

Note: For OPC Data Access Compliance testing there are additional features that have to be turned off on the OPC Settings page.

Perform the following operations in agreement with the OPC-DA 3.0 specification

This is the master enabling switch for the options presented in this list box. When enabled, LinkMaster will respect the settings for **Reject unsupported Language IDs**, **Data type support for 2.05a** and **Return initial updates for items in a single callback** for all OPC client connections.

Reject Language IDs

When selected, **Reject Language IDs** will enable LinkMaster to accept Language IDs that it does not natively support. If the OPC client application attempts to add an OPC group to LinkMaster and it receives a general failure, it is possible the client has given LinkMaster an invalid Language ID. If this occurs, LinkMaster will reject the group addition. This condition is rare and this selection should normally be left disabled.

Ignore dead band

When selected, **Ignore dead band** will enable LinkMaster to ignore the dead band setting on OPC groups added to the server. Some OPC clients have had problems passing the correct value for the dead band. This problem may manifest itself in the OPC client as having good data but the data does not appear to be updating frequently or at all. Like the Language ID issue, this condition is rare. As such, this selection should normally be left in its default state of disabled.

Return all browse items

When selected, **Return all browse items** will cause the LinkMaster 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.

Data type support for 2.05a

When selected, **Data type support for 2.05a** will cause the server to adhere to the data type requirements and expected behaviors for data type coercion that were added to the 2.05a specification.

Return synchronous device read failure

When selected, **Return synchronous device read failure** will cause 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.

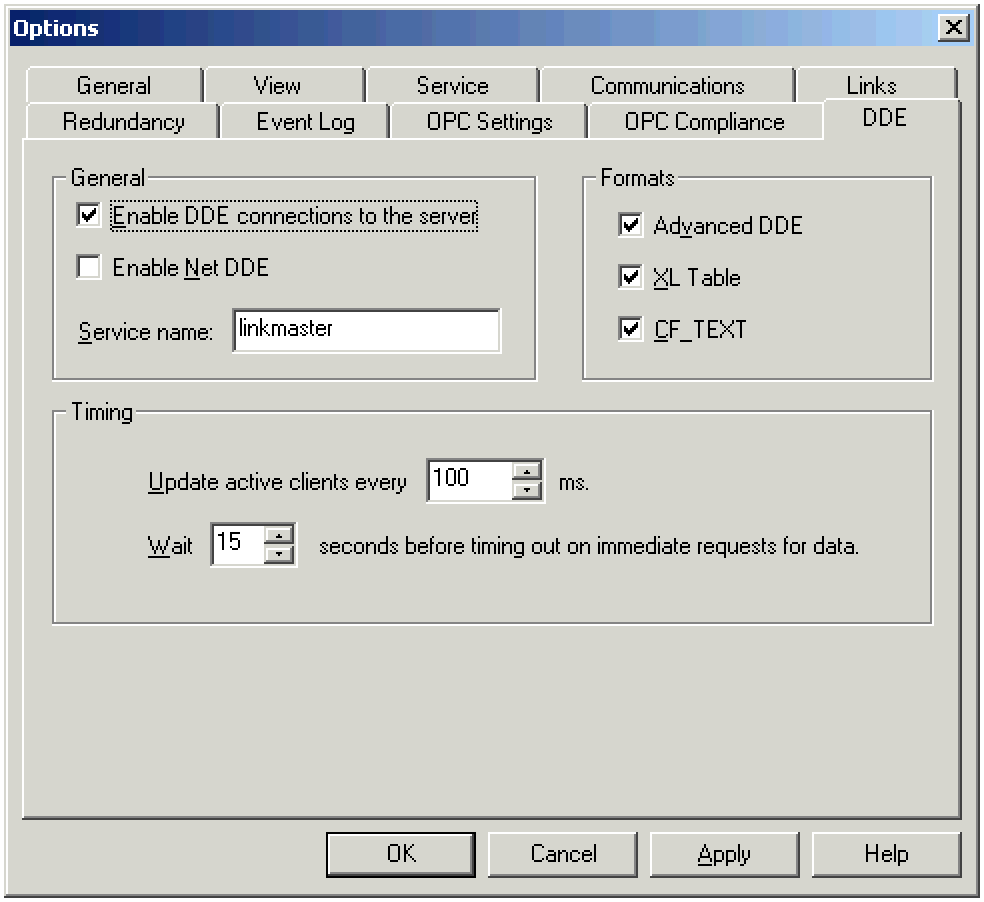
Return initial updates for items in a single callback

When selected, **Return initial updates for items in a single callback** will cause LinkMaster to return all outstanding initial item updates in a single callback. When not selected, LinkMaster will return initial updates as they are available which could result in multiple callbacks.

DDE Options

While LinkMaster is first and foremost an OPC component, there are still a number of applications that require the use of **DDE (Dynamic Data Exchange)** to share data. LinkMaster will provide access to DDE applications that support any of the following DDE formats: **CF_Text**, **XL_Table**, and **Advanced DDE**. Formats 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.

To access the DDE options, click **Tools** | **Options**. Then, select the **DDE** tab.



General
☑ Enable DDE connections to the server
☐ Enable Net DDE
Service name: linkmaster

Formats
☑ Advanced DDE
☑ XL Table
☑ CF_TEXT

Timing
Update active clients every 100 ms.
Wait 15 seconds before timing out on immediate requests for data.

The DDE Option dialog allows a great deal of control in determining how LinkMaster provides DDE data.

Enable DDE connections to the server

This parameter allows the DDE server portion of LinkMaster to be turned either on or off. If the DDE operation is turned off, LinkMaster will not respond to any requests for DDE data. If intending to use LinkMaster only as an OPC server, disable the DDE operation in order to increase the data's security and improve the overall performance of the server.

Enable Net DDE

This parameter allows the use of Microsoft's Net DDE services to be disabled. If intending to use LinkMaster with only local DDE client applications, Net DDE should be left disabled (the default setting). Starting the Net DDE services can be a time consuming process that can slow the startup of the LinkMaster. Enabling Net DDE when it does not need to be used will cause LinkMaster to automatically register its "share names" and start the Net DDE service manager. DDE shares will also be removed when the server shuts down.

Note: For more information, refer to **Using Net DDE**.

Service Name

Users can also determine how LinkMaster's service name appears as an application name to DDE clients. By default, the service name is "linkmaster". If users need to replace an existing DDE server with LinkMaster, they can change the service name of LinkMaster to match the DDE server being replaced. The service name allows a string of 1 to 32 characters to be entered.

DDE Formats

LinkMaster also allows users to configure what format of DDE the client applications will be provided. Although all three formats are enabled by default, each of the DDE formats can be disabled to allow testing of a specific format in isolation. Every DDE aware application must, at a minimum, support CF_Text.

Update active clients

This timer is used to allow DDE data to be bundled up for transfer to client applications. When using a DDE format, like Advanced DDE, 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 being sent to a client application. The valid range of the update timer is 20-60000 milliseconds. The default is 100 milliseconds.

Wait __ seconds before timing out on immediate requests for data

This timer allows a timeout to be configured for the completion of a DDE request. If a DDE client requests either a read or write operation on LinkMaster, and that request can not be completed within the specified timeout, an error will be returned to the DDE Client. The valid range is 1-30 seconds. The default is 15 seconds.

Note: Changes made to the DDE options will only take effect upon the next restart of LinkMaster.

Redundancy Options

Overview

LinkMaster supports the operation of two LinkMaster-enabled machines running as a redundant pair. When the Redundancy option is turned on, the following process occurs:

1. One LinkMaster machine operates as the **primary node**. It actively performs link transfers.

2. The other LinkMaster machine operates as the **secondary node**. Three types of secondary nodes are possible: Secondary-Hot, Secondary-Warm, and Secondary-Cold. **See Also:** **Descriptions**.

3. The primary node informs the secondary node that it is up and running by periodically sending a **ping** to the secondary node.

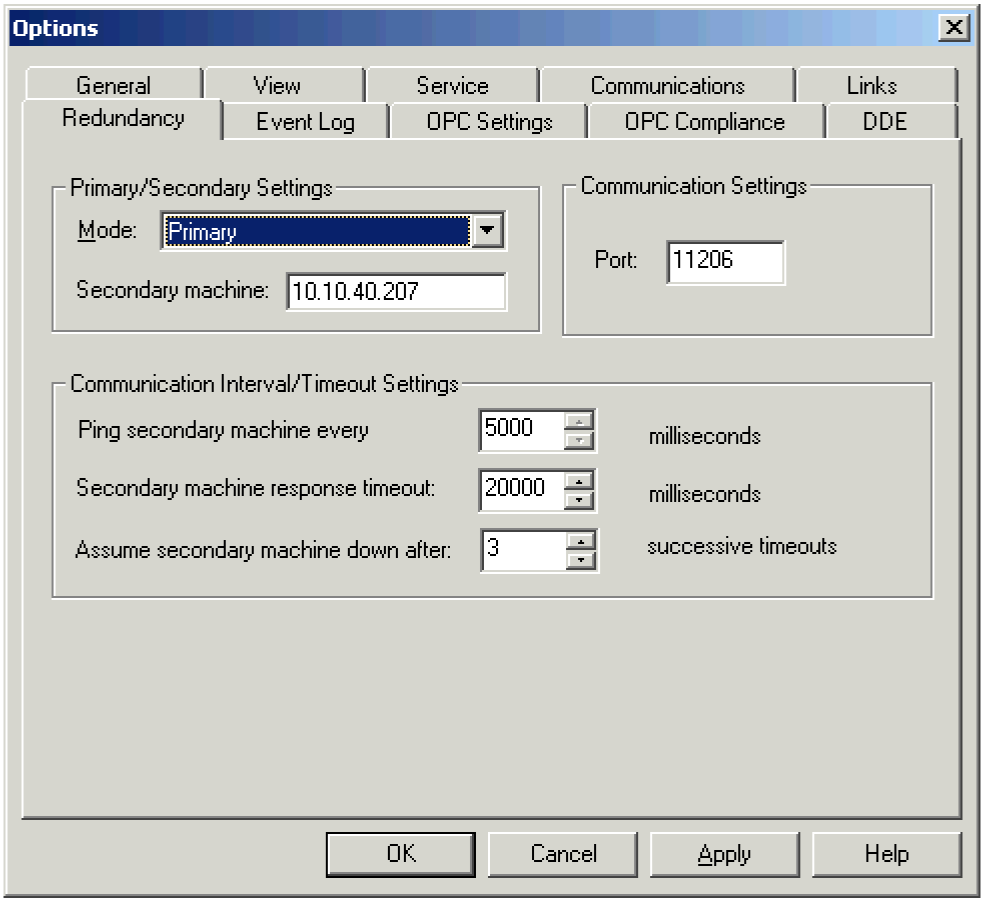
4. If the secondary node does not receive the ping from the primary node for a pre-configured amount of time, the secondary node assumes the primary node to be no longer functional and takes over the role of the primary node (i.e., the secondary node performs the link transfers as though it were the primary node).

5. When the primary node comes back up again, the secondary node stops performing link transfers and the primary node resumes its operations.

Note: If there is a failure in the connection between the primary and secondary nodes, then the secondary node will assume that the primary node is not functional and the secondary node will begin performing link transfers. If in fact 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.

Enabling Redundancy and Configuring Redundancy Options

To access the Redundancy options, click on **Tools** | **Options**, then select the **Redundancy** tab.



Primary/Secondary Settings

Mode: Primary

Secondary machine: 10.10.40.207

Communication Settings

Port: 11206

Communication Interval/Timeout Settings

Ping secondary machine every 5000 milliseconds

Secondary machine response timeout: 20000 milliseconds

Assume secondary machine down after: 3 successive timeouts

The **Mode** setting can be used to set the redundancy mode. Possible modes are displayed in the table below.

Mode	Description
Disabled	This setting disables redundancy. When this setting is selected, the current machine is the only active LinkMaster machine.
Primary	This setting configures the current LinkMaster machine to operate as the active bridge of the redundant pair. It performs the link transfers, and it periodically sends a ping to the secondary node to inform it that it is running.
Secondary (Hot)	This setting 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 setting 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 setting 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.

Primary Settings

The following settings are available when **Primary** is selected in the Mode field. Use the **Secondary Machine** field to specify the secondary machine. Users can enter either the IP address or the machine name (without the "\\") of the secondary machine.

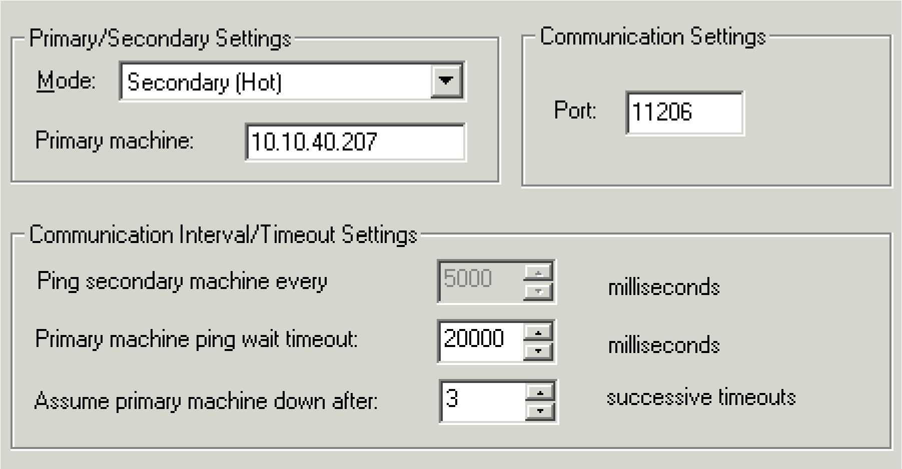
In the **Port** field, enter the port number for communications. This is the port to which responses will be sent by the secondary node. The default port number is 11206. The valid range for the Port field is 1 to 65535.

Note: The Port number must be the same for the primary and secondary LinkMaster machines. This is required for redundancy.

1. **Ping secondary machine every...** determines how often the primary node will send a ping to the secondary node to confirm that the primary node is running. The default is 5000 milliseconds. The valid range is 100 to 1200000 milliseconds. This field is enabled only when Mode=Primary.
2. The **Secondary machine response timeout** setting determines how long the primary node will wait for the secondary node to respond. The default is 20000 milliseconds. The valid range is 2000 to 1200000 milliseconds.
3. **Assume secondary machine down after...** determines how many response timeouts the primary node will allow before assuming the secondary node to be not functional. The default is 3 retries. The valid range is 1 to 100 retries.

Secondary Settings

The following settings are available when Secondary (**Hot, Warm, or Cold**) is selected in the **Mode** field.


Primary/Secondary Settings
Communication Settings
Communication Interval/Timeout Settings

Mode: Secondary (Hot)

Primary machine: 10.10.40.207

Port: 11206

Ping secondary machine every 5000 milliseconds

Primary machine ping wait timeout: 20000 milliseconds

Assume primary machine down after: 3 successive timeouts

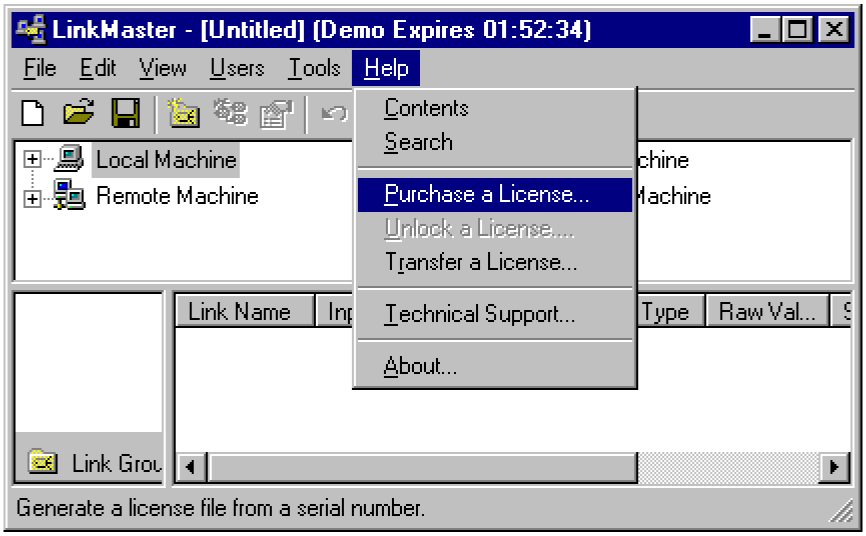
1. The **Primary Machine** field can be used to specify the primary machine. Users can enter either the IP address or the machine name (without the "\\") of the primary machine.
2. **Port** is the port number for communications. Redundancy requires that the port number is the same for the primary and secondary LinkMaster machines.
3. **Ping secondary machine every...** is grayed out because this setting is only enabled when Mode=Primary.

4. The **Primary machine ping wait timeout** setting determines how long the secondary node will wait for the primary node to send a ping. The default is 20000 milliseconds. The valid range is 2000 to 1200000 milliseconds.

5. **Assume primary machine down after...** determines how many ping timeouts the secondary node will allow before assuming the primary node to be not functional and taking over the role of the primary. The default is 3 retries. The valid range is 1 to 100 retries.

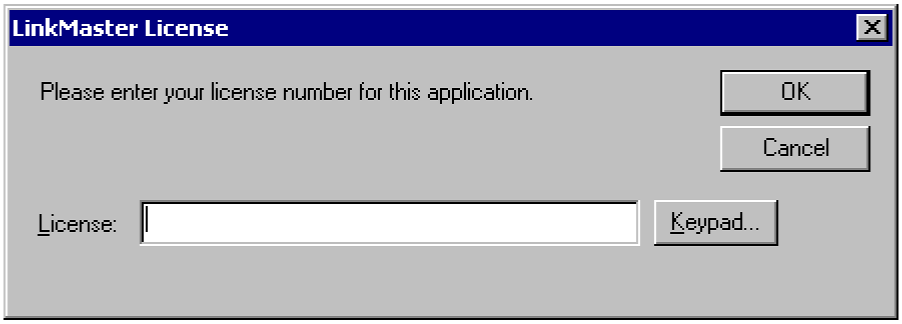
Purchase A LinkMaster License

To purchase a LinkMaster, simply select **Purchase a License...** from the **Help** drop down menu on LinkMaster's main taskbar.



Generate a license file from a serial number.

A dialog will appear as shown below.

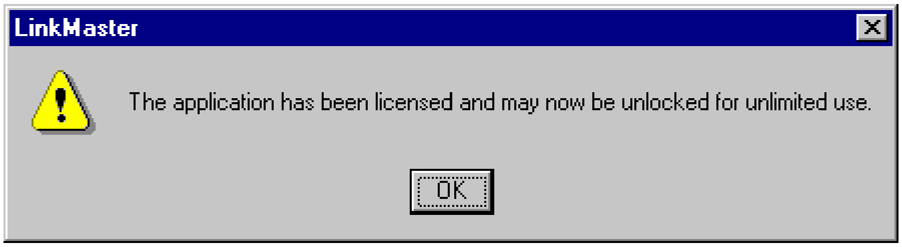


Please enter your license number for this application.

License:

A product license registration code can be obtained by contacting Kepware or an authorized distributor. Once a product registration code has been obtained, it may be entered here. If a keyboard is unavailable, use the on-screen keypad to enter the code.

When LinkMaster has been successfully purchased and pre-registered, the following dialog will be shown.

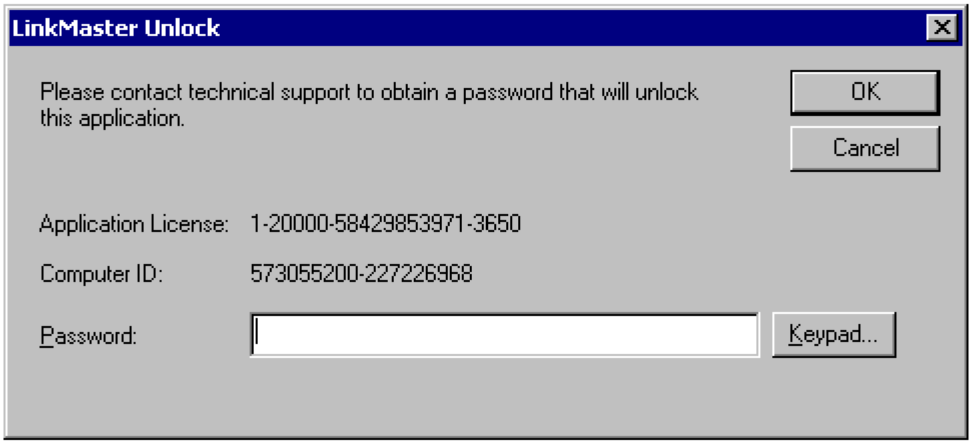


The application has been licensed and may now be unlocked for unlimited use.

Important: Once the product registration code has been entered, the license will only continue to run for a 10-day installation grace period. Users will still need to perform the **LinkMaster License Unlock** step to complete the licensing sequence. Users have up to 10 days to contact Kepware or an authorized distributor to fully unlock the LinkMaster for unrestricted use.

Unlock LinkMaster License

Once a license has been purchased and installed, the LinkMaster can then be unlocked for full-unlimited use on the target PC. The **Help** | **Unlock a License...** Menu option will only be enabled if a license is detected, but has not yet been fully unlocked. If the LinkMaster has not been unlocked, the following dialog will appear when the **Unlock a License...** menu option is selected.



Please contact technical support to obtain a password that will unlock this application.

Application License: 1-20000-58429853971-3650

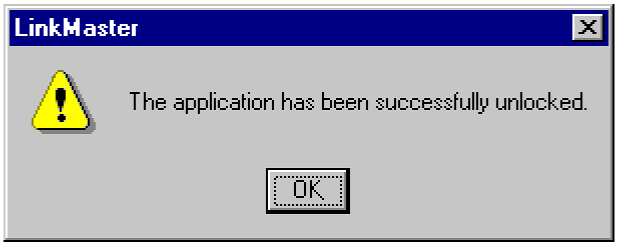
Computer ID: 573055200-227226968

Password:

At this point, users can contact Kepware by email, fax or phone. The data presented on this dialog must be provided to Kepware to receive a password. The **License Nunmber** and **Computer ID** must be returned accurately, to allow Kepware to generate the appropriate password. Once the password has been obtained from Kepware, it can be entered in this dialog to fully unlock the LinkMaster. If a keyboard is unavailable, use the on-screen keypad to enter the code.

If users cannot contact Kepware immediately, LinkMaster can be run in its initial 10-day licensed run mode. The 10-day installation mode is designed to allow users to contact Kepware when it is convenient. If users cannot contact Kepware immediately, hit the cancel button to start the 10-day installation grace period.When this occurs, a message will be placed in LinkMaster's event logger, EventViewer, which states that the 10-day installation grace period has begun.

When LinkMaster has been successfully unlocked, the following dialog will be shown.



The application has been successfully unlocked.

License Transfer Instructions

General Instructions

The following steps must be performed in order to transfer an existing license from one system to another.

Step 1: Read and accept the license agreement.
Step 2: Prepare a license disk for the target system.
Step 3: Transfer an existing license from the source system to the license disk. This will remove the license from the source system.
Step 4: Transfer an existing license from the license disk to the target system. This will move the license to the target system.

Requirements

The following is required to transfer a license:

- Access to both source (contains a valid license) and target systems.
- Each system should be equipped with a compatible removable media drive.
- Formatted removable media (e.g., Floppy disk, USB key).

See Also: **License Transfer - Step 1**

License Transfer - Step 1: Agreement

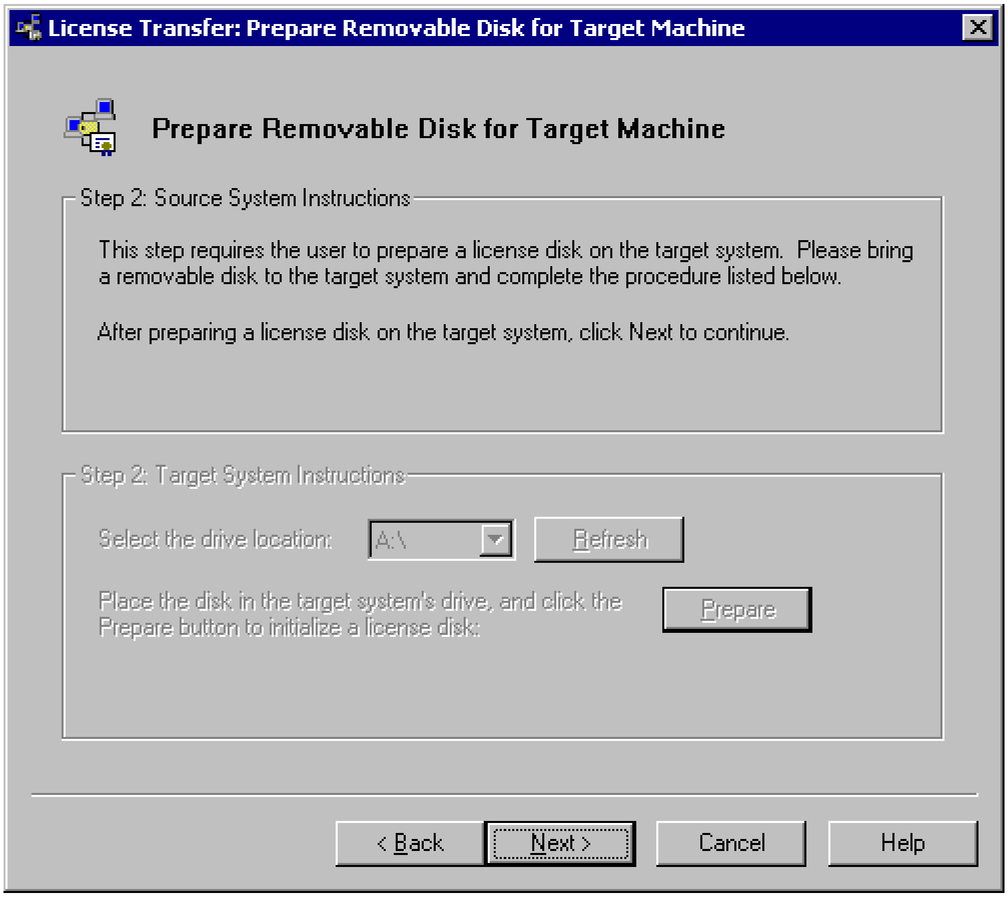
To move a LinkMaster license form one PC to another, select **Help** from the LinkMaster menu and select **Transfer a License...**.

When moving a LinkMaster license from one machine to another, be sure to reread the Kepware, Inc. software license agreement. If choosing to accept the agreement, select the radio button next to "**I accept the terms of this license agreement**". This will then allow access to **Step 2** of the transfer utility.

Caution: We suggest that users use a clean, newly formatted diskette before beginning the license transfer process. The process of transferring a license from one machine to another must be completed once the license has been removed from the source machine. If the license transfer process is cancelled after the license has been removed, it will become corrupt and cannot be installed on either the source or target PC.

License Transfer - Step 2: Prepare Diskette for License

Users will be presented with one of the following dialogs depending on whether the Target or Source PC is being used.



Prepare Removable Disk for Target Machine

Step 2: Source System Instructions

This step requires the user to prepare a license disk on the target system. Please bring a removable disk to the target system and complete the procedure listed below.

After preparing a license disk on the target system, click Next to continue.

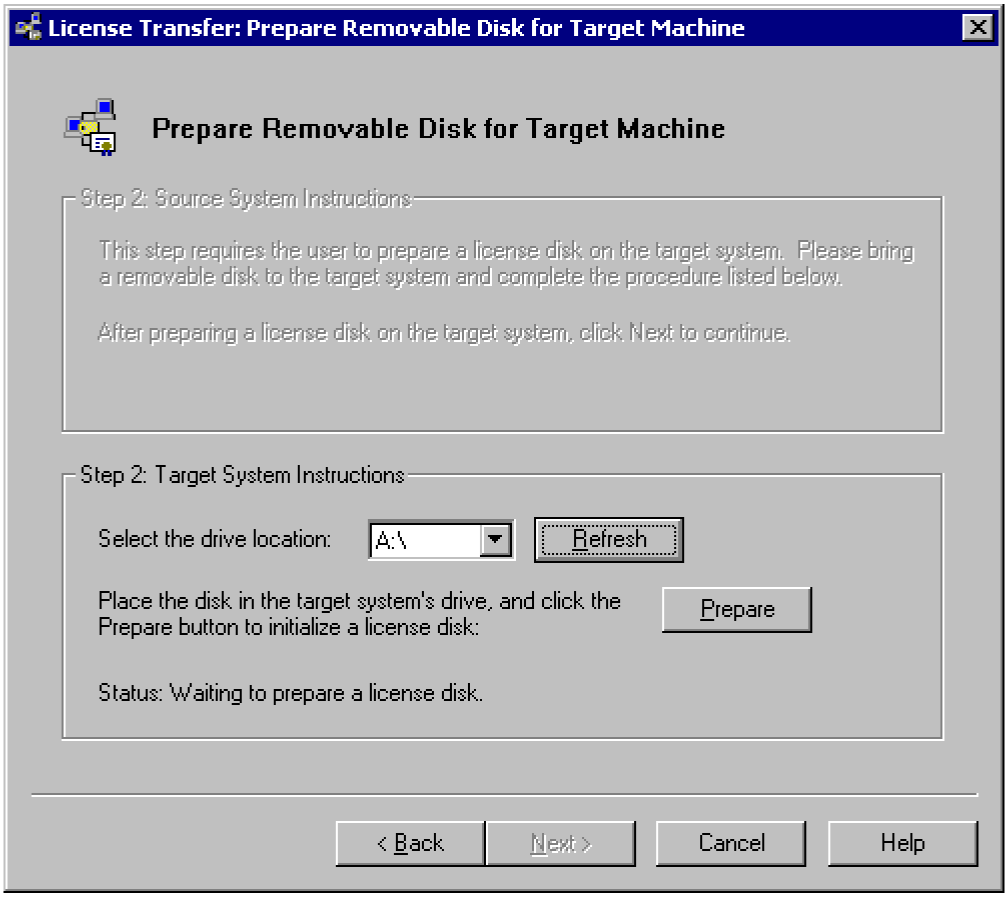
Step 2: Target System Instructions

Select the drive location: A:\

Place the disk in the target system's drive, and click the Prepare button to initialize a license disk:

Source PC

In this step, users are required to prepare a diskette for license transfer on the target PC (where they will be asked to insert a formatted floppy diskette). After doing so, select the Prepare button.


License Transfer: Prepare Removable Disk for Target Machine

Prepare Removable Disk for Target Machine

Step 2: Source System Instructions

This step requires the user to prepare a license disk on the target system. Please bring a removable disk to the target system and complete the procedure listed below.

After preparing a license disk on the target system, click Next to continue.

Step 2: Target System Instructions

Select the drive location: A:\

Place the disk in the target system's drive, and click the Prepare button to initialize a license disk:

Status: Waiting to prepare a license disk.

Target PC

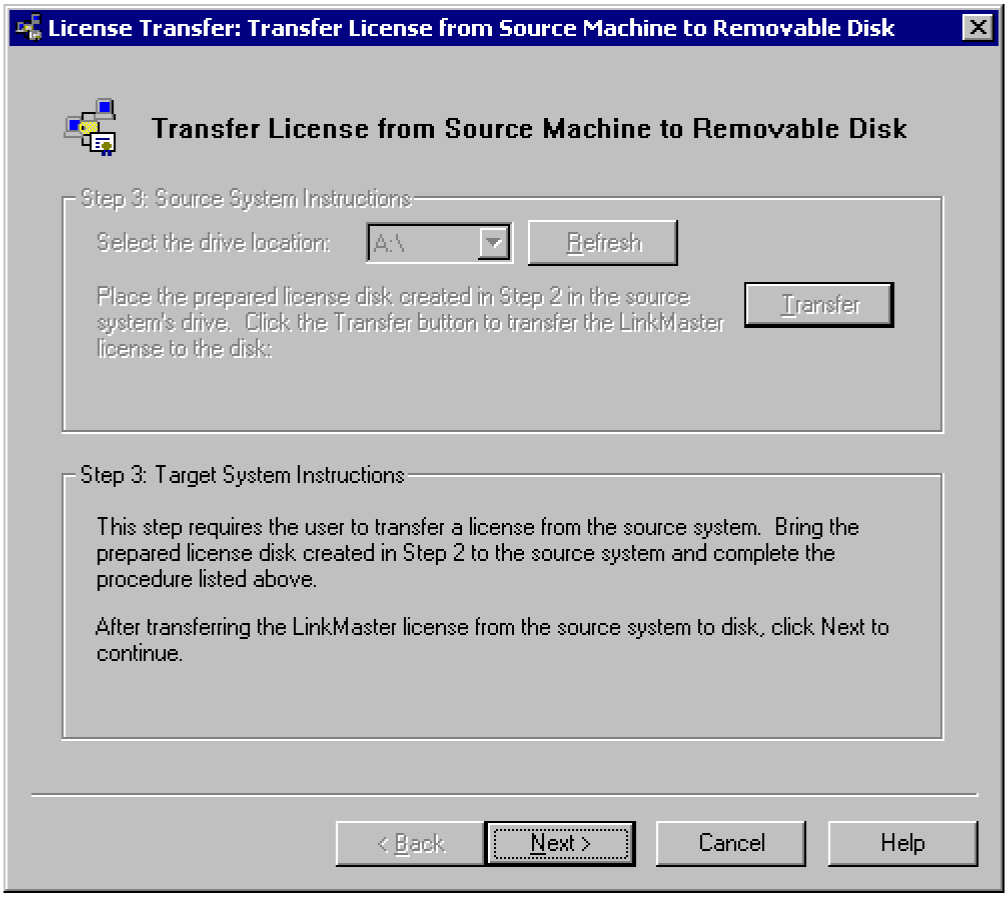
At this point, the diskette preparation done on the target PC produces the media required to move the license from the source machine. In other words, the target system is required to produce the diskette needed to move the LinkMaster license from the source machine. If the diskette preparation is interrupted, the license will fail to transfer from the source machine.

Once the diskette is prepared by the target PC, users may proceed to **Step 3**.

Caution: We suggest that users use a clean, newly formatted diskette before beginning the license transfer process. The process of transferring a license from one machine to another must be completed once the license has been removed from the source machine. If the license transfer process is cancelled after the license has been removed, it will become corrupt and cannot be installed on either the source or target PC. With this in mind, insure that the steps described above can be completed before the license transfer process begins.

License Transfer - Step 3: Transfer License from Source PC to Diskette

The following dialog shows what users should see after the Target PC has prepared the license diskette.



License Transfer: Transfer License from Source Machine to Removable Disk

Transfer License from Source Machine to Removable Disk

Step 3: Source System Instructions

Select the drive location: A:\ Refresh

Place the prepared license disk created in Step 2 in the source system's drive. Click the Transfer button to transfer the LinkMaster license to the disk:

Transfer

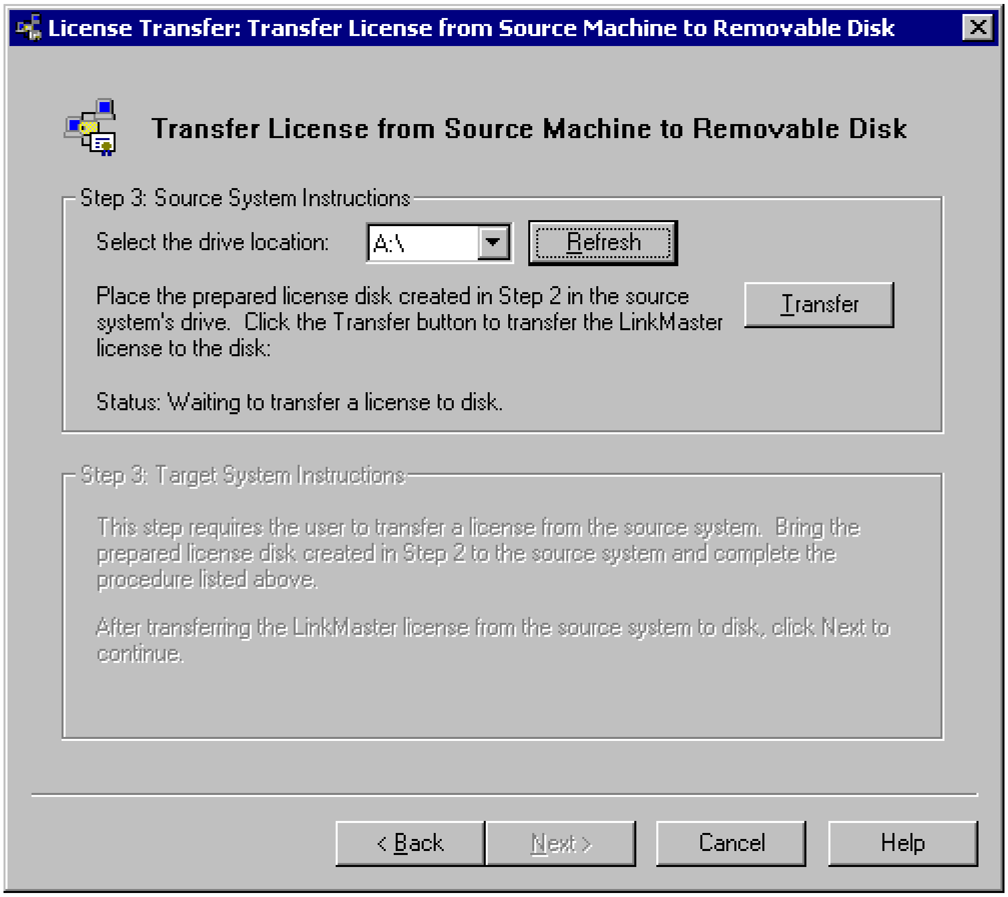
Step 3: Target System Instructions

This step requires the user to transfer a license from the source system. Bring the prepared license disk created in Step 2 to the source system and complete the procedure listed above.

After transferring the LinkMaster license from the source system to disk, click Next to continue.

Target PC

At this point, users need to take the diskette that was prepared in Step 2 over to the source machine. The dialog on the source machine should appear as follows:



License Transfer: Transfer License from Source Machine to Removable Disk

Transfer License from Source Machine to Removable Disk

Step 3: Source System Instructions

Select the drive location: A:\

Place the prepared license disk created in Step 2 in the source system's drive. Click the Transfer button to transfer the LinkMaster license to the disk:

Status: Waiting to transfer a license to disk.

Step 3: Target System Instructions

This step requires the user to transfer a license from the source system. Bring the prepared license disk created in Step 2 to the source system and complete the procedure listed above.

After transferring the LinkMaster license from the source system to disk, click Next to continue.

Source PC

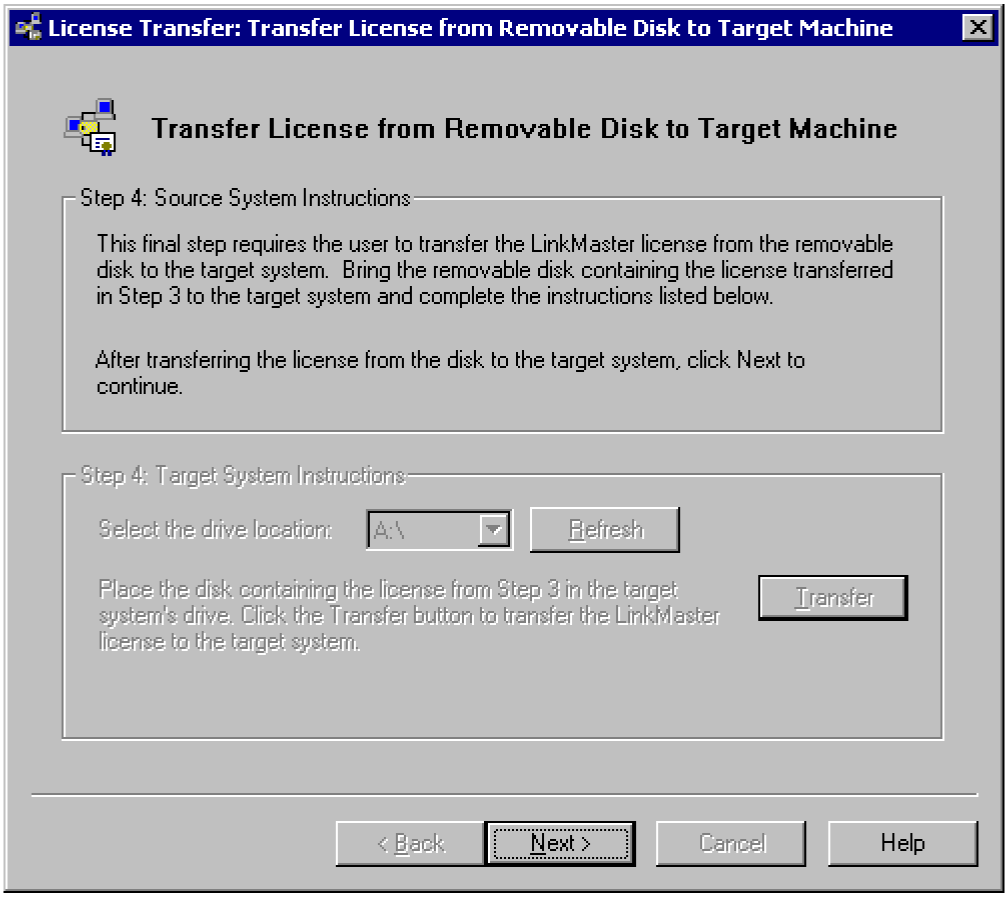
Now place the diskette prepared by the target PC into the floppy drive of the source machine and press **Transfer**. The transfer utility will now transfer the LinkMaster license to the floppy diskette. Now proceed to **Step 4**.

Important: Removing the diskette from the floppy drive before the disk light has been turned off may result in the loss of of license information. Allow all disk operations to complete before attempting to remove any diskettes from the PC.

Caution: We suggest that users use a clean, newly formatted diskette before beginning the license transfer process. The process of transferring a license from one machine to another must be completed once the license has been removed from the source machine. If the license transfer process is cancelled after the license has been removed, it will become corrupt and cannot be installed on either the source or target PC. With this in mind, insure that the steps described above can be completed before the license transfer process begins.

License Transfer - Step 4: Transfer License from Diskette to Target PC

Once the license has been transferred to the floppy diskette from the Source PC, users should see the following dialog.


License Transfer: Transfer License from Removable Disk to Target Machine

Transfer License from Removable Disk to Target Machine

Step 4: Source System Instructions

This final step requires the user to transfer the LinkMaster license from the removable disk to the target system. Bring the removable disk containing the license transferred in Step 3 to the target system and complete the instructions listed below.

After transferring the license from the disk to the target system, click Next to continue.

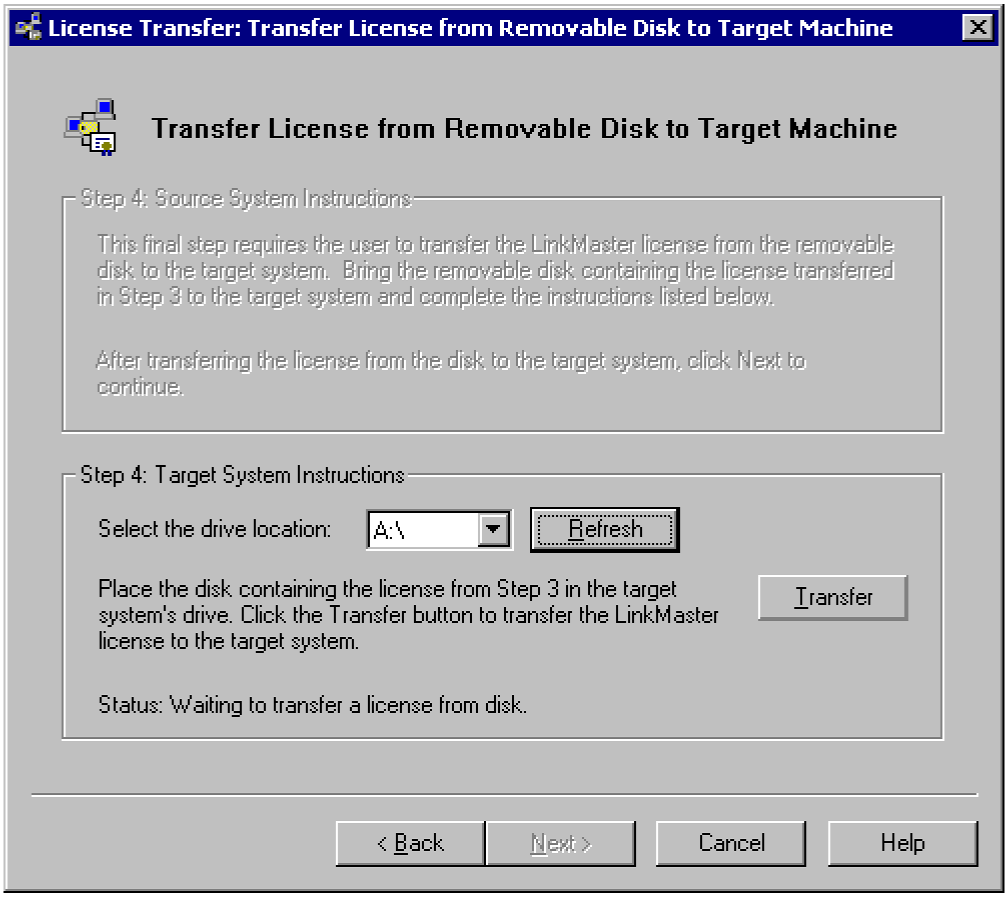
Step 4: Target System Instructions

Select the drive location: A:\

Place the disk containing the license from Step 3 in the target system's drive. Click the Transfer button to transfer the LinkMaster license to the target system.

Source PC

Users should now have a floppy disk that contains a license to be installed on the target system. Place the floppy diskette in the target system's selected drive and then press **Transfer**. Once the Transfer button has been pressed, do not attempt to remove the diskette from the floppy drive, as this may cause an error that will result in the loss of license information.



License Transfer: Transfer License from Removable Disk to Target Machine

Transfer License from Removable Disk to Target Machine

Step 4: Source System Instructions

This final step requires the user to transfer the LinkMaster license from the removable disk to the target system. Bring the removable disk containing the license transferred in Step 3 to the target system and complete the instructions listed below.

After transferring the license from the disk to the target system, click Next to continue.

Step 4: Target System Instructions

Select the drive location: A:\

Place the disk containing the license from Step 3 in the target system's drive. Click the Transfer button to transfer the LinkMaster license to the target system.

Status: Waiting to transfer a license from disk.

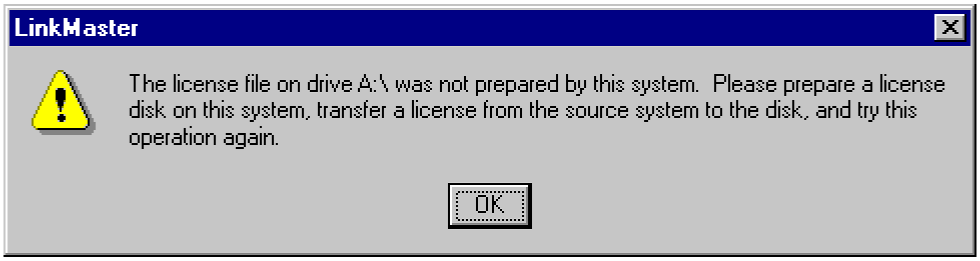
Target PC

Once the transfer of license information is complete, select the **Next>** button to proceed to the **completion screen**. If all was completed correctly, a LinkMaster license has been successfully transferred to the target machine.

TroubleShooting License Transfer

The most common error that may be encountered will be related to the floppy diskette. While it may be common nature to grab the nearest diskette, blow the dirt off, and stick it into the floppy drive, we suggest that a clean, newly formatted diskette be used before beginning the License transfer process. As has already been mentioned, removing the diskette from the floppy drive during either the target disk preparation or actual license transfer portion on the source machine may cause an error that will result in the loss of license information

The other possible error that may be encountered if users fail to actually transfer the license information from the source machine to the prepared diskette. If this occurs, the following dialog will be invoked:



LinkMaster

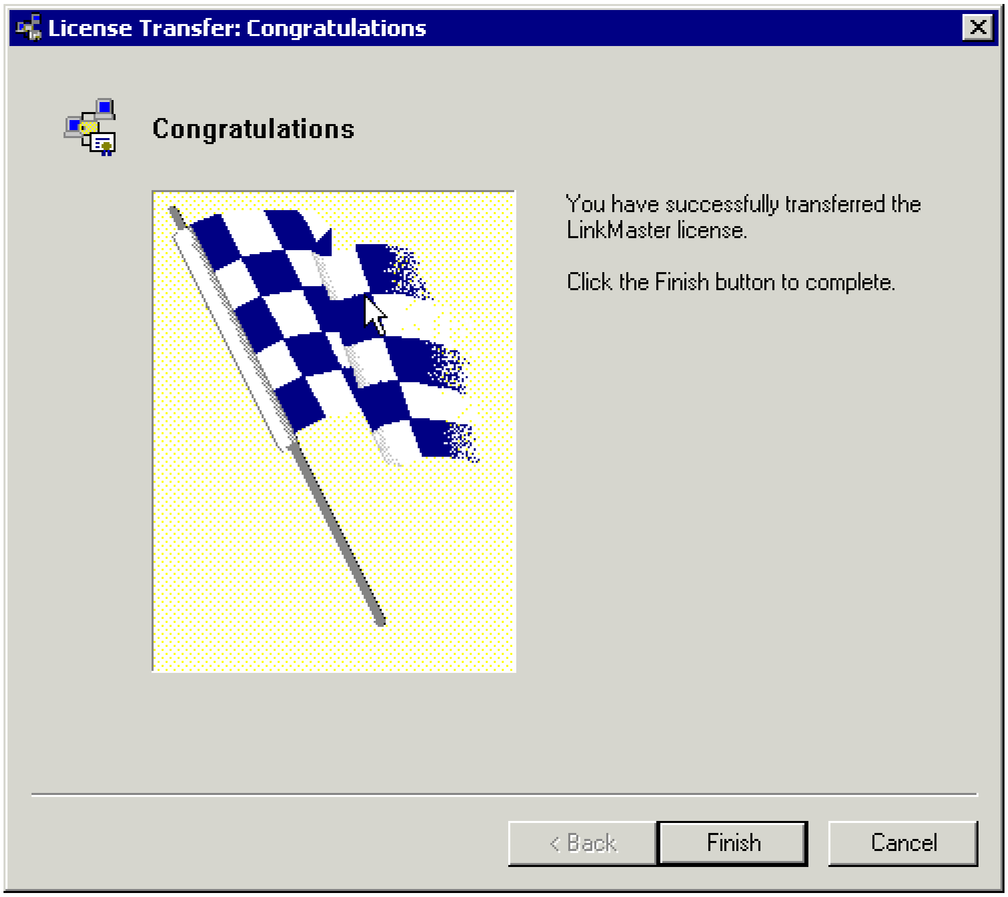
The license file on drive A:\ was not prepared by this system. Please prepare a license disk on this system, transfer a license from the source system to the disk, and try this operation again.

Once the transfer of a license has been completed successfully, the diskette will no longer contain any license information and does not need to be maintained.

Caution: The process of transferring a license from one machine to another must be completed once the license has been removed from the source machine. If the license transfer process is cancelled after the license has been removed, it will become corrupt and cannot be installed on either the source or target PC. With this in mind, insure that the steps described above can be completed before the license transfer process begins.

License Transfer - Step 5: Completion

If a LinkMaster license has been transferred successfully, the screen should appear as shown below.



You have successfully transferred the LinkMaster license.

Click the Finish button to complete.

How Do I...?

The following list contains a sample of common questions often posed by users.

Process array data in a DDE client
Configure LinkMaster to run as a NT Service
Use NetDDE with LinkMaster
Scale link items in LinkMaster
Use LinkMaster System Tags
Drag and Drop items
Use LinkMaster's General Settings
Import and Export tags using a CSV file
Configure Redundancy

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