



Clone Network Clone Network Wizard



User Guide

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Chapter 1

Introduction

The Clone Network Utility wizard offers the function to create a Project structure on the Computer, including Network Folders, Instrument Folders and Strategy files, that correspond to the Network of devices that are already connected via an OPC Server Port.

It is used to create a Project or Network on the Computer, used to hold the configuration files for the instruments in the plant/system. The wizard initiates the polling of a selected Network, already configured with an OPC port name via the LINOPC Control Panel and the iTools Control Panel applets'. Each Port has access to a single Network, but a single Network can be accessed from more than one Port. Polling the Network locates all available devices, then creates and populates a structure of Folders on the Computer with the configuration files from the selected devices on the selected Network.

Once complete, the cloned Project structure will automatically initiate a Build operation. This is used to ensure all changes are correct when used in the instrument or by another application.

Tip: Have the Network Port name ready, to simplify the location of the required Network.

Chapter 2

Communications Protocols

Networks began as a simple idea to link a few computers together in order to exchange messages and to share files and peripheral equipment, such as printers and modems. These Local Area Networks (LANs) frequently consisted of one server and groups of independent workstations with similar operating systems and software, capable of operating with or without the network. Networks are now more complex and diverse, and have become an essential component of day-to-day business. Most LANs commonly support many different types of operating systems and hardware platforms and are often linked together to form Wide Area Networks (WANs).

The Project Networks supports the following communications protocols:

- "Local Instrument Network (LIN)
- Modbus
- Profibus
- EI-Bisynch

What is LIN?

LIN is a communications protocol providing a token-passing masterless network which allows peer-to-peer communications and file transfer. It is supported via Ethernet, Arcnet and Serial communications connection.

The LIN Database groups data into blocks of related data. For example, a function block can represent an input, an output, a controller, and so on. The LIN configuration tool (LINtools) and display packages recognise different types of function block, and handle them appropriately.

Communications between LIN and Modbus instruments require a Gateway. This involves the mapping of data from the LIN Database to the Modbus registers and digitals.

What is a LIN Database?

A LIN Database (.dbf) is a software program that runs in a instrument on the LIN. The running LIN Database takes in signals from sensors in an outside entity (e.g. an industrial plant), processes them in specified ways, and then outputs signals to actuators in the entity to control its behaviour in the required manner.

The cycle of signal input to the LIN Database, signal processing, and signal output to the entity is repeated continuously while the Strategy runs.

More than one LIN instrument can be involved in controlling a single entity, but only one LIN Database can run in a single LIN instrument at a time.

A LIN Database can work in conjunction with one or more LIN Sequences running in the LIN instrument. It can also make use of LIN Actions stored in action files in the LIN instrument.

In LINtools Engineering Studio, a LIN Database is represented and configured graphically as an arrangement of LIN function blocks interconnected by wires.

Note: The Strategy of an I/O Instrument is configured using the iTools Engineering Studio.

What is a LIN Function Block?

A LIN Database (.dbf) uses a block-structured approach to configuring a control strategy, where a variety of ready-made function blocks perform the processing required.

A function block is an instance of a reusable module of program code. All function blocks exist in specific categories in the template library. Each is dedicated to a particular type of processing operation, e.g. the ADD2 template adds two numbers. In general, function blocks take in analogue and/or digital signals via their inputs, process them in a variety of ways and then pass the results on via their outputs. By 'wiring' the function blocks together, the signals can flow between them to execute the control strategy.

What is Modbus?

Modbus is a communications protocol. Instruments that communicate via the Modbus communications protocol require a Gateway, that can be configured either as a Modbus master or a Modbus slave. It is supported via **Serial** and **TCP** communications interface.

The Modbus communication interface is built around messages. The format of these Modbus messages depends on the type of physical interface used. The same messages are used on both **RS232** and Modbus/TCP over Ethernet. The same protocol can be used regardless of the connection type. This permits a device to communicate with several Modbus nodes at once, even if they are connected with different interface types, without the need to use a different protocol for every connection.

When using more versatile network systems like TCP/IP over Ethernet, the Modbus messages are embedded in packets with the format necessary for the physical interface. In that case Modbus and other types of connections can co-exist at the same physical interface at the same time. Although the main Modbus message structure is peer-to-peer, Modbus is able to function on both point-to-point and multidrop networks.

Modbus Messages

Each Modbus message has the same structure. Four basic elements are present in each message.

- Device address
This is the address of the instrument receiving the data.
- Function code
This is a code number defining message type.
- Data
This is a block of data with additional information.
- Error check
This is a Numeric check value to test for communication errors.

The sequence of these elements is the same for all messages, to make it easy to parse the content of the Modbus message. The instrument configured to operate as the master in the Modbus network always initiates communications. It sends a message and, depending of the contents of the message, a slave takes action and responds to it. Addressing in the message header is used to define which device should respond to a message.

Note: All other nodes on the Modbus network ignore the message if the address field does not match their own address.

The instruments use Modbus registers and bits to structure the instrument data. The Modbus registers and bits are simply a list of data points. Generally, there is no pre-defined structuring of these points into blocks or loops, etc., and most implementations define the allocation of registers differently.

Communications between LIN and Modbus instruments require a Gateway. This involves the mapping of data from the LIN Database to the Modbus registers and digitals.

What is Profibus?

Profibus is a communications protocol. Instruments that communicate via this protocol allow the fast, cyclic, transfer of time critical data from intelligent devices such as temperature controllers, I/O units, drive, etc to a PLC or PC based controller, with a scan time of around 10mS.

Traditional PLC based control systems use a central processor unit fitted in a rack, connected to I/O modules via an internal PLC 'backplane'. Terminals on the I/O modules are connected to the real world using point to point cabling, ending at field terminal units. The PLC scans the input modules cyclically and places the values from them into registers in the central processor, where they are operated on by ladder logic. Similarly, values from PLC registers are provided to output modules and applied to physical outputs.

The simplicity of the wiring scheme makes for easier maintenance, and provides flexibility to add new devices when and where needed. Furthermore, instead of being tied to the offerings of a single vendor, 'best of breed', specialised, devices may be used, reducing the processing load on the PLC. With devices located close to their point of application, and closely coupled to it, they may be used to provide feedback on their operation, reducing the need for planned maintenance and allowing quality improvement using statistical process control techniques.

Profibus DP provides fieldbus product offerings because it has proven to be very easy to apply and understand, even for non specialists.

What is EI-Bisynch?

EI-Bisynch is a proprietary protocol based on the ANSI X3.28-2.5 A4 standard for message framing. Despite its name, it is an ASCII based asynchronous protocol. Data is transferred using 7 data bits, even parity, 1 stop bit.

Address

Each instrument has a configurable address consisting of two digits, the first being a 'group' number 0 to 9, and the second a 'unit' number 0 to 9. There are, in principle, therefore 100 different addresses that may be used, 00 to 99, although in some instruments, address 00 is reserved for use in configuration mode, leaving addresses 01 to 99 available.

Mnemonics

EI-Bisynch identifies parameters within an instrument using what are known as 'mnemonics'. These are usually two letter abbreviations for a given parameter, for example PV for Process Variable, OP for Output, SP for Setpoint, and so on.

Channels

EI-Bisynch provides for 'channel' data. This would be used, for example, when a single physical unit contains several independent control loops, each having their own Process Variable, Setpoint, and Output Power. In this case, the values for each loop are obtained by specifying different channel numbers: '1', '2', etc.

The channel number, if used, is encoded as a single ASCII character preceding the mnemonic, for example 1PV.

Chapter 3

OPC Servers

LINOPC Control Panel

The LINOPC Control Panel, provides a central environment to configure and manage each LIN Port of the Networks in the Project. This simplifies the ability to control and manage the LIN Port connections, according to the live LIN connections that are fitted, by allowing:

- the inspection of the LIN Ports from either a Network or Device perspective
- the generation of LIN Ports
- the editing of LIN Ports, including the Protocol name, LIN Node Address and IP Address, etc.

LINtools Engineering Studio

The LINtools Engineering Studio, provides a central environment to configure an instrument Strategy. This simplifies the ability the manage and control an instrument Strategy either offline or online by allowing:

- the inspection of the Instrument
- the manipulation of an Instrument Strategy, using LIN Databases, LIN Sequences and Actions
- the transfer of these configuration files for use in other Instruments
- the download and control of Strategy files for use by the Real-Time Instrument

Note: An existing Real-Time Instrument Strategy can be saved to a Computer to allow offline configuration.

iTools Control Panel

The iTools Control Panel, provides a central environment to configure and manage each Serial or TCP/IP Port of the Networks in the Project. This simplifies the ability to control and manage the Serial or TCP/IP Port connections, according to the live connections that are fitted, by allowing:

- the inspection of the Ports from either a Network or Device perspective
- the generation of Ports
- the editing of Ports, including the Protocol name, and Node Address, etc.

iTools Control Panel (Serial Ports page) is used to configure the Serial ports, i.e. Modbus, Profibus, EI-Bisynch or Modbus TCP/IP ports.

iTools Engineering Studio

The iTools Engineering Studio, provides a central environment to configure an I/O instrument Strategy. This simplifies the ability to manage and control an I/O instrument Strategy by allowing:

- the parameterisation and commissioning of the Instrument
- the cloning and monitoring of specific controllers and data acquisition and management recorders
- the editing, and storing of complete controller configurations
- the configuration of data logging, process monitoring, modbus/TCP (Ethernet) and modem connection

Note: iTools can be connected to a Modbus master and used configure I/O Instruments on a Modbus network using Transparent Modbus Access (TMA or TalkThru).

Chapter 4

Online Pages

Clone Network

This Utility is used to create a Network on the Computer corresponding to the selected Network, already configured with an OPC port name via the OPC Server applets'. This provides an environment used for archiving, editing, updating, monitoring and commissioning a set of instruments in any solution.

After all registered OPC Servers have been scanned, this dialog shows the name of each configured Port. Each icon provides access to a network of devices.

Select Network to Clone:

This shows the Network Ports that can be accessed by this Computer.

Select the Network Port name, to identify the Network that must be cloned and click **Next**.



This shows the Port name of a Local Instrument Network containing LIN Instruments located using the LINOPC Server.

Note: With more than one user setting up ELIN Networks on a shared Ethernet Network, a conflict of LIN Node numbers could occur if the Default Protocol name, NET, is used in a Network



This shows the Port name of a EuroMBus Network containing Modbus Instruments located using the Modbus server (iTools OPC Scope or EuroMBus). A EuroMBus Icon indicates that instruments found in this Network are communicating using a Modbus or EI-Bisynch protocol.

Note: This will also locate devices communicating via a Profibus Network connected to a LIN Node maste. These devices are exposed as Modbus slaves using the LIN Nodes upwards Modbus link.

Clone LIN nodes in this Network

This shows a list of all LIN Nodes communicating via the selected Network located by the LINOPC server.

Note: If a redundant pair of processors is located, only the Primary device will be displayed.

Each listed LIN Node, can be quickly identified by the parameters displayed, Instrument Name, Instrument Type, and LIN Node Address.

Note: Computer Port nodes, e.g. NTSE and PCALIN, will NOT be cloned.

What is the LINOPC server?

The LINOPC Server provides an OPC interface to the LIN Blocks of the Strategy files in the Instrument Folder, from any OPC Client.

Clone Instrument Files

Use these radio buttons define the group of files that will be included when cloning the selected Network.

Option	Operation
All files	Select this to copy ALL files, Configuration (.dbf, .uic), Batch Files (.uyb), Setpoint Programmer Files (.uys), etc. stored in the Instrument to a new Instrument Folder in the Project structure on the Computer when the Network is cloned.
The main strategy file(s)	Select this to copy files that match the LIN Database, .dbf, name, e.g. T2550_01.dbf, T2550_01.ofl, T2550_01.gwf, or T2550_01.uys.
No files - only create folders	Select this to create the Instrument Folder ONLY. Any files in the Instrument will NOT be copied to the new Instrument Folder on the Computer when the Network is cloned.
Overwrite Existing files	When this checkbox is set, files that currently exist in the Project structure on the Computer will NOT be replaced with the files in the Instrument currently connected to the Network in the live plant/system being cloned. Note: This only applies to cloning LIN Instrument Strategy files, and is automatically disabled when the No files - Only create folders option is selected.

Clone other nodes in his Network

This shows a list of Nodes communicating via the selected Network located by the Modbus server.

Note: This process can take up to 3 or 4 seconds per node address unless the Modbus Server is configured to start-up with a preset list of nodes.

Each listed Node, can be quickly identified by the parameters displayed, Instrument Name, Instrument Type, and Address.

Some TCP/IP devices may respond at multiple addresses, i.e. a Recorder responds at address 255, the only slave address (UnitID) located at an specific IP Address, but 'Hub' type devices may serve multiple slave addresses (UnitIDs) on a single IP Address.

Note: Any LIN Node with an IP Address located on this Port acts as a TCP/IP 'Hub' communicating with serially connected devices.

Stop Scan/Refresh button

Use this button to cancel the current search for addresses on the selected Network by the Modbus server, either when sufficient Nodes have been found or to completely restart the search.

When stopped, this button shows 'Refresh', which can be used to completely restart the search for addresses on the selected Network.

Note: Once the search is complete, use the 'Finish' button to copy and overwrite any existing Clone files, .uic, in the Project structure on the Computer.

Make Profibus folders checkbox

When this checkbox is set, Profibus Instrument Folders are automatically created in the Project structure on the Computer for devices communicating via the Profibus network connected to a LIN Node master.

Note: Devices communicating via the Profibus network connected to a LIN Node master are exposed as Modbus slaves using the LIN Nodes upwards Modbus link.

What is the Modbus Server?

The Modbus server, iTools OPC Scope or EuroMbus, provides an OPC interface to the pre-configured address space of one or more instruments, from any OPC Client.

Note: OPC clients are typically software packages such as Wonderware's InTouch, or Intellution's FIX32, but could be the iTools Series 2000 controls running in an OPC Client container application.

More?

This dialog confirms the required parameters have been added to the Project.

Press the **More** button to repeat the process, and create further Instruments Folders in the Project structure and copy Instrument Files from a Network in the system.

Eventually, when the appropriate Networks have been cloned, use the **Close** button to initiate the 'Build' process to ensure all changes can be used in the instrument or by another application.

Note: Additional Network Ports can be added at any time using the relevant Control Panel applets'. However, this Utility and the relevant Server must be shutdown and restarted after the Server has been configured.

International sales and service

Invensys Operations Management

5604 Granite Parkway, Suit 1000
Plano
Texas 75024
469-365-6400

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5050 South Service Road
Suite 200
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Canada
1-905-333-1311

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4 Lake Road
Dollard-des-Ormeaux
Quebec H9B 3H9
Canada
1-514-421-4210
Tel: +9714 8074700
Fax: +9714 807477

Latin America

Invensys Systems Argentina
Nuñez 4334
(1430) Buenos Aires
Argentina
Tel: +54-11-6345-2100

Middle East

Jebel Ali Free Zone
P.O. Box 61495
Dubai
United Arab Emirates
Tel: +9714 8074700
Fax: +9714 807477

Asia Pacific

IPS (S) Pte Ltd
15 Changi Business Park Central
Singapore 486057
Tel: +65 6829 8888
Fax: +65 6829 8401

Europe and Africa

Invensys Systems France
S.A.10
Avenue du Centaure B.P. 8255 Cergy
95801 Cergy Pontoise Cedex
France
Tel: +33 1 34 43 25 25
Fax: +33 1 34 43 25 00

United Kingdom - Worthing

Invensys Eurotherm Ltd
Tel: +44 1903 268500
Fax: +44 1903 265982
Email: info.uk@eurotherm.com
www.eurotherm.co.uk

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