

# RSSP RSSP\_I\_Server Driver

<b>File Name</b>	RSSP_I_Server.dll
<b>Manufacturer</b>	CRRC Zhuzhou Electric Locomotive Research Institute Co., Ltd. (CRRC Zhuzhou Institute)
<b>Devices</b>	Railway control devices
<b>Protocol</b>	RSSP-I (Railway Signal Safety Protocol - Type I)
<b>Version</b>	1.0.3
<b>Last Update</b>	05/22/2025
<b>Platform</b>	Win32
<b>Dependencies</b>	IOKit v2.00 or later
<b>Superblock Readings</b>	No
<b>Level</b>	0

## Introduction

This Driver implements the RSSP-I (Railway Signal Safety Protocol - Type I) protocol, based on **EN 50159** European Standard, to communicate with railway control devices, allowing to supervise a system using an **Elipse Software's** SCADA application.

## Preparing a Device

Railway control devices are accessed through an interlocking application, via UDP/IP Ethernet network.

## Driver Configuration

This Driver does not use **[P]** configuration parameters. All **IOKit** library configurations, and the ones specific to this Driver, must be performed on this Driver's configuration dialog box or on the **Extra Settings** option in **Elipse SCADA**.

In this properties dialog box, the **RSSP\_I\_Server** tab contains specific settings for this Driver. The other tabs refer to communication settings of **Elipse Software's** **IOKit** library.

For more information about the configuration of **IOKit** library, please check topic **Documentation of I/O Interfaces**.

## Configuring Properties

This topic contains information about the properties available on the **RSSP\_I\_Server** tab, already including the value of offline property **Strings**, which can be user-programmed when starting an application in **Offline** mode.

For **Elipse E3**, **Elipse Power**, or **Elipse Water** applications, the value of these settings can also be defined at run time. To do so, start this Driver in **Offline** mode by selecting the **Start driver OFFLINE** option on the **Setup** tab of the properties dialog box. The configuration options of this Driver are described on the next table.

**Configuration options for RSSP RSSP\_I\_Server Driver**

TAB	PARAMETER	OFFLINE STRING	DATA TYPE	DESCRIPTION
<b>Setup</b>	Physical Layer	IO.Type	Text	By default, use the <b>Ethernet</b> option

TAB	PARAMETER	OFFLINE STRING	DATA TYPE	DESCRIPTION
	Timeout	IO.TimeoutMs	Number	A time limit, in milliseconds, to receive data from a device's response. For example, the value 1000 defines a one-second limit
<b>Ethernet</b>	Transport	IO.Ethernet.Transport	Text	By default, use the <b>UDP</b> option
	Accept Connection	IO.Ethernet.AcceptCon nection	Number	Enables or disables the listening mode via Ethernet. The available options are <b>0</b> : Disabled or <b>1</b> : Enabled
	Listen IP	IO.Ethernet.ListenIP	Text	IP address for the listening mode, in the format <b>[0-255].[0-255].[0-255].[0-255]</b>
	Listen Port	IO.Ethernet.ListenPort	Number	Ethernet port for the listening mode
<b>RSSP_I_Server</b>	My ID	RSSP_I_Server.MyID	Number	Sets the source identifier for this Driver in the RSSP-I protocol
	Broadcast DC2	RSSP_I_Server.IpBroad cast	Number	Defines the UDP/IP network mask for broadcasting a <b>DC2</b> ( <i>Communication Request Frame</i> ) initialization message
	SDI Message timeout (ms)	RSSP_I_Server.SDIMess ageTimeout	Number	Defines the time interval, in milliseconds, that this Driver waits to receive <b>SDI</b> ( <i>Station Information Frame</i> ) messages. If this time expires, the protocol is restarted by the <b>DC2</b> ( <i>Communication Request Frame</i> ) message
	Semaphore Data items	RSSP_I_Server.Semaph oreDataItems	Number	Number of <b>Semaphore Data</b> -type data items delivered by an <b>SDI</b> ( <i>Station Information Frame</i> ) message

TAB	PARAMETER	OFFLINE STRING	DATA TYPE	DESCRIPTION
	Switch Data items	RSSP_I_Server.SwitchDataItems	Number	Number of <b>Switch Data</b> -type data items delivered by an <b>SDI</b> message
	Section Data items	RSSP_I_Server.SectionDataItems	Number	Number of <b>Section Data</b> -type data items delivered by an <b>SDI</b> message
	Light Data items	RSSP_I_Server.LightDataItems	Number	Number of <b>Light Data</b> -type data items, in bytes, delivered by an <b>SDI</b> message
	Flag Data items	RSSP_I_Server.FlagDataItems	Number	Number of <b>Flag Data</b> -type data items delivered by an <b>SDI</b> message
	Notify Data items	RSSP_I_Server.NotifyDataItems	Number	Number of <b>Notify Data</b> -type data items delivered by an <b>SDI</b> message
	Command Confirm	RSSP_I_Server.UseCommandConfirm	Number	Enables or disables the presence of <b>Command Confirm</b> -type items in an <b>SDI</b> message. Possible values are <b>0</b> : Disabled or <b>1</b> : Enabled
	Power-On Time Counter	RSSP_I_Server.PowerOnTimeCounterDataItems	Number	Number of <b>Power-On Time Counter</b> data items delivered by an <b>SDI</b> message

All offline properties must be configured via PLC Tags in **String** format using parameters *N1* equal to -1 (minus one), *N2* equal to 0 (zero), *N3* equal to 0 (zero), and *N4* equal to 3 (three). For more details and examples, please check topic **Documentation of I/O Interfaces**.

## Tag Reference

This section contains information about the configuration of this Driver's **[N/B]** Tags.

# Reading an SDI Message

## Read-Only

Use PLC or Block Tags to receive all data provided by an **SDI** (*Station Information Frame*) message, sent periodically by the system's Interlock application.

### General parameters of PLC or Block Tags

<b>N1/B1</b>	Destination address or identifier
<b>N2/B2</b>	Command code
<b>N3/B3</b>	Not used
<b>N4/B4</b>	Indicates the "Data Item" number, if applicable

The next table contains all PLC or Block Tags responsible for receiving data delivered using an **SDI** message.

### PLC or Block Tags to extract data from an SDI message

DATA TYPE	N2/B2	N4/B4	TAG TYPE	DESCRIPTION
<b>Semaphore Data</b>	8510	Indicates the respective <b>Semaphore Data</b> number	Block	Returns information about the respective <b>Semaphore Data</b> -type item indicated by the <b>B4</b> parameter of a Block Tag, with Elements <b>1</b> : Red light ( <b>0</b> : Off or <b>1</b> : On), <b>2</b> : Yellow light ( <b>0</b> : Off or <b>1</b> : On), <b>3</b> : Red and Yellow lights ( <b>0</b> : Off or <b>1</b> : On), <b>4</b> : Broken lamp filament 1 ( <b>0</b> : No or <b>1</b> : Yes), <b>5</b> : Broken lamp filament 2 ( <b>0</b> : No or <b>1</b> : Yes), <b>6</b> : Interdiction ( <b>0</b> : No or <b>1</b> : Yes), <b>7</b> : Automatic traffic routing ( <b>0</b> : No or <b>1</b> : Yes), <b>8</b> : Automatic route activation ( <b>0</b> : No or <b>1</b> : Yes), <b>9</b> : Approach lock ( <b>0</b> : No or <b>1</b> : Yes), and <b>10</b> : Latency time, in seconds

DATA TYPE	N2/B2	N4/B4	TAG TYPE	DESCRIPTION
<b>Switch Data</b>	8520	Indicates the respective <b>Switch Data</b> number	Block	Returns information about the respective <b>Switch Data</b> -type item indicated by the <b>B4</b> parameter of a Block Tag, with Elements <b>1</b> : Position ( <b>0</b> : No position, <b>1</b> : Left position, <b>2</b> : Right position, or <b>3</b> : Failure), <b>2</b> : Squeeze ( <b>0</b> : No or <b>1</b> : Yes), <b>3</b> : Individual lock ( <b>0</b> : No or <b>1</b> : Yes), <b>4</b> : Individual interdiction ( <b>0</b> : No or <b>1</b> : Yes), and <b>5</b> : Manual ( <b>0</b> : No or <b>1</b> : Yes)
<b>Section Data</b>	8530	Indicates the respective <b>Section Data</b> number	Block	Returns information about the respective <b>Section Data</b> -type item indicated by the <b>B4</b> parameter of a Block Tag, with Elements <b>1</b> : Occupied ( <b>0</b> : No or <b>1</b> : Yes), <b>2</b> : Locked ( <b>0</b> : No or <b>1</b> : Yes), <b>3</b> : Blockade ( <b>0</b> : No or <b>1</b> : Yes), <b>4</b> : Locked by failure ( <b>0</b> : No or <b>1</b> : Yes), and <b>5</b> : Latency time, in seconds
<b>Light Data</b>	8540	Indicates the respective <b>Light Data</b> number	PLC	Returns information about the respective <b>Light Data</b> -type item indicated by the <b>N4</b> parameter of a PLC Tag. The available values are 0 (zero) or 1 (one)

DATA TYPE	N2/B2	N4/B4	TAG TYPE	DESCRIPTION
<b>Flag Data</b>	8550	Indicates the respective <b>Flag Data</b> number	PLC	Returns information about the respective <b>Flag Data</b> -type item indicated by the <b>N4</b> parameter of a PLC Tag. The available values are <b>0</b> : Light has been turned on and unlocked or more than 8 (eight) minutes have passed, therefore the command to power on and unlock cannot be sent or <b>1</b> : Light is not turned on and unlocked, therefore the command to power on and unlock can be sent
<b>Notify Data</b>	8560	Indicates the respective <b>Notify Data</b> number	Block	Returns information about the respective <b>Notify Data</b> -type item indicated by the <b>B4</b> parameter of a Block Tag, with Elements <b>1</b> : Device type (number), <b>2</b> : Device code (number), and <b>3</b> : Message code (number). This Block Tag uses an internal buffer to stack all notification events transmitted. Read these notifications using this Block Tag's <b>OnRead</b> event, unstacking all events stored in this Driver's internal buffer when receiving all data as a list
<b>Command Confirm</b>	8570	Not used	Block	Returns data from the <b>Command Confirm</b> item via Block Tag, with Elements <b>1</b> : Confirmation status ( <b>1</b> : responses 0x7A or 0x9A or <b>2</b> : responses 0x7B or 0x9B), <b>2</b> : Command's sequence number, and <b>3</b> : Device's sequence number

DATA TYPE	N2/B2	N4/B4	TAG TYPE	DESCRIPTION
<b>Power-On Time Counter</b>	8580	Indicates the respective number of an application's <b>Domain</b>	PLC	Returns the time, in seconds, after the <b>Power-On Time Counter</b> item. The available values range between 0 (zero) and 480 seconds (eight minutes)

When using an **Elipse E3**, **Elipse Power**, or **Elipse Water** application, all these Tags are available in **Tag Browser**.

## Writing a BCC Message

### Write-Only

Use PLC Tags to write any type of data related to **BCC** (*Button and Control Command*) messages.

#### General parameters of PLC Tags

<b>N1</b>	Destination address or identifier
<b>N2</b>	Command code
<b>N3</b>	Depends on the command used
<b>N4</b>	Depends on the command used

The next table contains a list of all PLC Tags responsible for writing data using **BCC** messages.

#### PLC Tags for writing to a BCC message

COMMAND TYPE	N2/B2	N3/B3	N4/B4	DESCRIPTION
<b>Semaphore Command</b>	9510	Not used	Semaphore identifier	The available values are <b>1</b> : Signal restart, <b>2</b> : Route's general canceling, <b>3</b> : Blockade, <b>5</b> : Enables automatic pass, <b>6</b> : Disables automatic pass, <b>7</b> : Enables route's automatic triggering via <b>CI</b> ( <i>Command Information</i> ), or <b>8</b> : Disables route's automatic triggering via <b>CI</b>
<b>Switch Command</b>	9520	Not used	Switch identifier	The available values are <b>1</b> : Left position, <b>2</b> : Right position, <b>3</b> : Individual lock, or <b>4</b> : Individual interdiction

COMMAND TYPE	N2/B2	N3/B3	N4/B4	DESCRIPTION
<b>Section Command</b>	9530	Not used	Section identifier	The available value is <b>1</b> : Section blocking
<b>Route Command</b>	9540	Start route identifier	End route identifier	The available value is <b>0</b> (zero) if there is no change in the button
<b>Button Command</b>	9550	Not used	Button identifier	The available value is <b>3</b> : Canceling security command
<b>Device Command</b>	9560	Not used	Device identifier	The available values are <b>132</b> : Enables switchback mode or <b>133</b> : Disables switchback mode
<b>Acknowledgment</b>	9570	Not used	Item identifier	The available values are <b>1</b> : Switch unblocking, <b>2</b> : Section unblocking, <b>3</b> : Individual switch unblocking, <b>4</b> : Unblocking by failure in section, <b>5</b> : Unblocking during a power-on, <b>7</b> : Manual unblocking, <b>8</b> : Guiding route, or <b>11</b> : Semaphore unblocking

When using an **Elipse E3**, **Elipse Power**, or **Elipse Water** application, all these Tags are available in **Tag Browser**.

## Documentation of I/O Interfaces

This section contains the documentation of I/O Interfaces referring to **RSSP\_I\_Server** Driver.

## Configuration of a Driver

I/O Interface configuration is performed on a Driver's configuration dialog box. To access the configuration of this dialog box in **Eclipse E3** in version 1.0, follow these steps:

1. Right-click a Driver object (IODriver).
2. Select the **Properties** item on the contextual menu.
3. Select the **Driver** tab.
4. Click **Other parameters**.

In **Eclipse E3** version 2.0 or later, click **Configure driver**  on a Driver's toolbar. In **Eclipse SCADA**, follow these steps:

1. Open the Organizer.
2. Select a Driver on Organizer's tree.
3. Click **Extras** on the **Driver** tab.

Currently, an I/O Interface allows opening only one connection for each Driver. This means that, if users want to access two serial ports, they must add two Drivers to an application and then configure each one of these Drivers for each serial port.

## Configuration Dialog Box

The dialog box of I/O Interfaces allows configuring the I/O connection used by a Driver. This dialog box contains the **Setup**, **Serial**, **Ethernet**, **Modem**, and **RAS** tabs, described on the next topics. If a Driver does not implement a specific I/O connection, its corresponding tab is not available for configuration. Some Drivers may contain additional tabs, specific for that Driver, on the configuration dialog box.

## Setup Tab

The **Setup** tab contains general configurations of a Driver. This tab is divided into the following groups:

- **General configurations:** Configurations of a Driver's physical layer, time-out, and initialization mode
- **Connection management:** Configurations on how the I/O Interface keeps a connection and which recovery policy is used on failure
- **Logging options:** Controls the generation of log files

The screenshot shows the 'Setup' tab configuration window. It is divided into several sections:

- Physical Layer:** A dropdown menu set to 'Ethernet'. To the right is a checkbox labeled 'Start driver OFFLINE' which is currently unchecked.
- Timeout:** A text input field containing '1000' followed by 'ms'.
- Communication check time:** A text input field containing '5000' followed by 'ms'.
- Connection management:** A sub-section containing:
  - A dropdown menu for 'Mode' set to 'Automatic (managed by the driver)'.
  - A checked checkbox 'Retry failed connection every' followed by a text input '20' and 'seconds'.
  - An unchecked checkbox 'Give up after' followed by a text input '1' and 'failed retries'.
  - An unchecked checkbox 'Disconnect if non-responsive for' followed by a text input '0' and 'seconds'.
- Logging Options:** A sub-section containing:
  - An unchecked checkbox 'Log to File:' followed by a text input 'C:\eeLogs\MicrolokII\_%DATE%.log'.
  - A text input 'File size limit (MB):' followed by '0' and '(0 is unlimited)'.

Setup tab

### General options on the Setup tab

OPTION	DESCRIPTION
<b>Physical Layer</b>	Select the physical layer on a list. Available options are <b>Serial</b> , <b>Ethernet</b> , <b>Modem</b> , and <b>RAS</b> . The selected interface must be configured on its specific tab
<b>Timeout</b>	Configure a time-out, in milliseconds, for the physical layer. This is the amount of time an I/O interface waits to receive any byte from the reception's buffer
<b>Communication check time</b>	Set the time, in milliseconds, to define the interval at which communication is considered to be in an inactive state. As long as an I/O Driver receives valid data, its communication state is considered active. However, if during operation an I/O Driver does not receive valid data inside this period of time, the state is considered inactive. The communication state is shown in the <b>IO.CommunicationStatus</b> Tag

OPTION	DESCRIPTION
<b>Start driver OFFLINE</b>	Select this option so that a Driver starts in <b>Offline</b> mode or stopped. This means that the I/O interface is not created until this Driver is configured to <b>Online</b> mode by using a Tag in an application. This mode enables a dynamic configuration of an I/O interface at run time

#### Options on the Connection management group

OPTION	DESCRIPTION
<b>Mode</b>	Selects a management mode of a connection. Selecting the <b>Automatic</b> option allows a Driver to manage the connection automatically, as specified in the next options. Selecting the <b>Manual</b> option allows an application to fully manage a connection
<b>Retry failed connection every ... seconds</b>	Select this option to enable a Driver's connection retry in a certain interval, in seconds. If the <b>Give up after failed retries</b> option is not selected, this Driver keeps retrying until a connection is performed, or until the application is stopped
<b>Give up after ... failed retries</b>	Enable this option to define a maximum number of connection retries. When the specified number of consecutive connection retries is reached, a Driver goes to the <b>Offline</b> mode, assuming that a hardware problem was detected. If a Driver establishes a successful connection, the number of unsuccessful retries is cleared. If this new connection is lost, then the retry counter starts at zero
<b>Disconnect if non-responsive for ... seconds</b>	Enable this option to force a Driver to disconnect if no byte was received by the I/O interface during the specified time-out, in seconds. This time-out must be greater than the time-out configured in the <b>Timeout</b> option

#### Options on the Logging Options group

OPTION	DESCRIPTION
<p><b>Log to File</b></p>	<p>Enable this option and configure the name of a file to write a log. Log files can be large, so use this option for short periods of time, only for testing and debugging purposes. If the <b>%PROCESS%</b> macro is used in the log file name, it is replaced by the identifier of the current process. This option is particularly useful when using several instances of the same Driver in <b>Eclipse E3</b>, thus allowing each instance to generate a separate log file. For example, when configuring this option with value "c:\e3logs\drivers\sim_%PROCESS%.log", it generates a file named c:\e3logs\drivers\sim_00000FDA.log for process <b>OFDAh</b>. Users can also use the <b>%DATE%</b> macro in the file name. In this case a log file is generated every day, in the format <b>aaaa_mm_dd</b>. For example, when configuring this option with value "c:\e3logs\drivers\sim_%DATE%.log", it generates a file named c:\e3logs\drivers\sim_2005_12_31.log in 12/31/2005 and a file named c:\e3logs\drivers\sim_2006_01_01.log in 01/01/2006. Similarly, the <b>%DATE_HOUR%</b> macro generates one log file per hour, in the format <b>aaaa_mm_dd_hh</b></p>
<p><b>File size limit (MB)</b></p>	<p>Configure the log file size limit, in megabytes. A value equal to 0 (zero) means that there is no size limit for the log file</p>

## Ethernet Tab

Use this tab to configure parameters of an **Ethernet** Interface. These parameters, except port configurations, must also be configured for use in the **RAS** Interface.

Ethernet

Transport: TCP/IP v

PING before connecting  
 Timeout: 4000 ms  
 Retries: 1

Listen for connections on port: 0  
 Share listen port with other processes  
 Interface: (All Interfaces) v  
 Use IPv6  Use SSL SSL Settings  
 Enable 'ECHO' suppression  
 IP Filter:

Connect to

<input type="checkbox"/> Main IP: <span style="border: 1px solid gray; padding: 2px; width: 100px;"></span>	Port: <span style="border: 1px solid gray; padding: 2px;">502</span>	<input type="checkbox"/> Local port: <span style="border: 1px solid gray; padding: 2px;">0</span>
<input type="checkbox"/> Backup IP 1: <span style="border: 1px solid gray; padding: 2px; width: 100px;"></span>	Port: <span style="border: 1px solid gray; padding: 2px;">0</span>	<input type="checkbox"/> Local port: <span style="border: 1px solid gray; padding: 2px;">0</span>
<input type="checkbox"/> Backup IP 2: <span style="border: 1px solid gray; padding: 2px; width: 100px;"></span>	Port: <span style="border: 1px solid gray; padding: 2px;">0</span>	<input type="checkbox"/> Local port: <span style="border: 1px solid gray; padding: 2px;">0</span>
<input type="checkbox"/> Backup IP 3: <span style="border: 1px solid gray; padding: 2px; width: 100px;"></span>	Port: <span style="border: 1px solid gray; padding: 2px;">0</span>	<input type="checkbox"/> Local port: <span style="border: 1px solid gray; padding: 2px;">0</span>

**Ethernet tab**

### Available options on the Ethernet tab

OPTION	DESCRIPTION
<b>Transport</b>	Select the value <b>TCP/IP</b> for a TCP socket ( <i>stream</i> ) or select the value <b>UDP/IP</b> to use a UDP socket ( <i>connectionless datagram</i> )
<b>Listen for connections on port</b>	Use this option to wait for new connections in a specific IP port, common in Slave Drivers. If this option remains unselected, a Driver connects to the address and port specified in the <b>Connect to</b> option
<b>Share listen port with other processes</b>	Select this option to share the listening port with other Drivers and processes
<b>Interface</b>	Select the local network interface, identified by its IP address, that a Driver uses to establish and receive connections, or select the value <b>(All Interfaces)</b> to allow connection in any network interface
<b>Use IPv6</b>	Select this option to force a Driver to use addresses in <b>IPv6</b> format on all Ethernet connections. Leave this option deselected to use the <b>IPv4</b> format
<b>Enable 'ECHO' suppression</b>	Enable this option to remove the echo from received data. An echo is a copy of sent data, which can be returned before a reply message

OPTION	DESCRIPTION
<b>IP Filter</b>	List of restricted or allowed IP addresses from where a Driver accepts connections ( <i>Firewall</i> ). Please check the <b>IO.Ethernet.IPFilter</b> property for more information
<b>PING before connecting</b>	<p>Enable this option to execute a <b>ping</b> command, that is, to check whether a device can be reached on a network, for a device before trying a socket connection. This is a quick way of determining a successful connection before trying to open a socket with a device. The time-out of a connection with a socket can be very high. The available options are:</p> <ul style="list-style-type: none"> <li>• <b>Timeout:</b> Specify the number of milliseconds to wait for a reply from a <b>ping</b> command. Users must use a <b>ping</b> command to check the normal reply time, configuring this option for a value above that average. Usually this value can be configured between 1000 and 4000 milliseconds, that is, between 1 (one) and 4 (four) seconds</li> <li>• <b>Retries:</b> Number of retries of a <b>ping</b> command, not counting the first attempt. If all attempts fail, then the socket connection is aborted</li> </ul>

**Available options on the Connect to group**

OPTION	DESCRIPTION
<b>Main IP</b>	Type the IP address of a remote device. Users can use an IP address separated by dots, as well as a URL. In case of a URL, a Driver uses the available DNS service to map that URL to an IP address, such as "192.168.0.13" or "Server1"
<b>Port</b>	Type the IP port of a remote device, between 0 (zero) and 65535
<b>Local port</b>	Select this option to use a fixed local IP port when connecting to a remote device
<b>Backup IP 1, 2, and 3</b>	Indicate the IP address, the IP port, and the fixed local IP port of up to 3 (three) backup addresses of a remote device

## General Configurations

This section contains information about the configuration of general **I/O Tags** and **Properties** of I/O Interfaces.

### I/O Tags

#### General I/O Interfaces Tags (N2/B2 = 0)

The Tags described next are provided for all supported I/O Interfaces.

## IO.CommunicationStatus

<b>Type of Tag</b>	I/O Tag
<b>Type of Access</b>	Reading
<b>N1 Parameter</b>	-1 (minus one)
<b>N2 Parameter</b>	0 (zero)
<b>N3 Parameter</b>	0 (zero)
<b>N4 Parameter</b>	6 (six)
<b>String Configuration</b>	IO.CommunicationStatus

This Tag informs the communication status of a Driver. It indicates how communication works relative to receiving valid data within a time period arbitrated in the configuration. For more information, please check topic **Setup Tab**. Possible values are **0 - Inactive communication**: The Driver did not receive valid data or stopped receiving data after *n* milliseconds, as configured in the properties window, or **1 - Active communication**: The Driver is receiving valid data.

## IO.IOKitEvent

<b>Type of Tag</b>	Block Tag
<b>Type of Access</b>	Read-Only
<b>B1 Parameter</b>	-1 (minus one)
<b>B2 Parameter</b>	0 (zero)
<b>B3 Parameter</b>	0 (zero)
<b>B4 Parameter</b>	1 (one)
<b>Size Property</b>	4 (four)
<b>ParamItem Property</b>	IO.IOKitEvent

This Block returns Driver events generated by several sources in I/O Interfaces. The **TimeStamp** property of this Block represents the moment this event occurred. The Block Elements are the following:

- **Element 0**: Type of event. Possible values are **0**: Information, **1**: Warning, or **2**: Error
- **Element 1**: Source of an event. Possible values are **0**: Driver (specific of a Driver), **-1**: IOKit (generic events of I/O Interfaces), **-2**: **Serial** Interface, **-3**: **Modem** Interface, **-4**: **Ethernet** Interface, or **-5**: **RAS** Interface
- **Element 2**: Error number, specific for each source of event
- **Element 3**: Message of an event, a **String** specific for each event

### NOTE

A Driver keeps a maximum number of 100 events internally. If additional events are reported, older events are discarded.

## IO.PhysicalLayerStatus

<b>Type of Tag</b>	I/O Tag
<b>Type of Access</b>	Read-Only
<b>N1 Parameter</b>	-1 (minus one)
<b>N2 Parameter</b>	0 (zero)
<b>N3 Parameter</b>	0 (zero)
<b>N4 Parameter</b>	2 (two)
<b>String Configuration</b>	IO.PhysicalLayerStatus

This Tag indicates the status of a physical layer. Possible values are the following:

- **0:** Physical layer stopped, that is, a Driver is in **Offline** mode, the physical layer failed when initializing, or exceeded the maximum number of reconnection attempts
- **1:** Physical layer started but not connected, that is, a Driver is in **Online** mode but the physical layer is not connected. If the **Connection management** option is configured with the value **Automatic**, the physical layer can be connecting, disconnecting, or waiting for a reconnection attempt. If the **Connection management** option is configured with the value **Manual**, then the physical layer remains in this status until forced to connect
- **2:** Physical layer connected, that is, the physical layer is ready for use. This **DOES NOT** mean a device is connected, only that the access layer is working

## IO.SetConfigurationParameters

<b>Type of Tag</b>	Block Tag
<b>Type of Access</b>	Read-Only
<b>B1 Parameter</b>	-1 (minus one)
<b>B2 Parameter</b>	0 (zero)
<b>B3 Parameter</b>	0 (zero)
<b>B4 Parameter</b>	3 (three)
<b>Size Property</b>	2 (two)
<b>ParamItem Property</b>	IO.SetConfigurationParameters

Use this Tag to change any property of a Driver's configuration dialog box at run time.

This Tag works only while a Driver is in **Offline** mode. To start a Driver in **Offline** mode, select the **Start driver OFFLINE** option on that Driver's configuration dialog box. Users can write to a PLC Tag or to a Block Tag containing the parameters to change. Writing individual Block Elements is not supported, the whole Block must be written at once.

In **Eclipse SCADA**, users must use a Block Tag. Every parameter to configure uses two Block Elements. For example, if users want to configure 3 (three) parameters, then the size of the Block must be 6 (six,  $3 \times 2$ ). The first Element is the property's name, as a **String**, and the second Element is the property's value, according to the next example.

```
// 'Block' must be a Block Tag with automatic reading,
// scan reading, and automatic writings disabled.
// Configure all parameters
Block.element001 = "IO.Type" // Parameter 1
Block.element002 = "Serial"
Block.element003 = "IO.Serial.Port" // Parameter 2
Block.element004 = 1
Block.element005 = "IO.Serial.BaudRate" // Parameter 3
Block.element006 = 19200
// Writes the whole Block
Block.Write()
```

When using **Elipse E3**, the ability to create arrays at run time allows using an I/O Tag as well as a Block Tag. Users can use the **Write** method of a Driver to send the parameters directly to that Driver, without creating a Tag, according to the next example.

```
Dim arr(6)
' Configure all array elements
arr(1) = "IO.Type"
arr(2) = "Serial"
arr(3) = "IO.Serial.Port"
arr(4) = 1
arr(5) = "IO.Serial.BaudRate"
arr(6) = 19200
' There are two methods to send parameters
' Method 1: Using an I/O Tag
tag.WriteEx arr
' Method 2: Without using a Tag
Driver.Write -1, 0, 0, 3, arr
```

A variation of the previous example uses a bidimensional array.

```
Dim arr(10)
' Configure all array elements. Notice the array was resized
' to 10 elements. Empty array elements are ignored by a Driver
arr(1) = Array("IO.Type", "Serial")
arr(2) = Array("IO.Serial.Port", 1)
arr(3) = Array("IO.Serial.BaudRate", 19200)
Driver.Write -1, 0, 0, 3, arr
```

A Driver does not validate parameter names or passed values, therefore be careful when writing parameters and values. The **Write** method fails if the configuration array is incorrectly created. Users can check the log of a Driver or use the *writeStatus* parameter of the **WriteEx** method to find out the exact cause of an error.

```
Dim arr(10), strError
arr(1) = Array("IO.Type", "Serial")
arr(2) = Array("IO.Serial.Port", 1)
arr(3) = Array("IO.Serial.BaudRate", 19200)
If Not Driver.WriteEx -1, 0, 0, 3, arr, , , strError Then
    MsgBox "Failed configuring Driver parameters: " + strError
End If
```

## IO.WorkOnline

<b>Type of Tag</b>	I/O Tag
<b>Type of Access</b>	Reading or Writing
<b>N1 Parameter</b>	-1 (minus one)
<b>N2 Parameter</b>	0 (zero)
<b>N3 Parameter</b>	0 (zero)
<b>N4 Parameter</b>	4 (four)
<b>String Configuration</b>	IO.WorkOnline

This Tag informs the current status of a Driver and allows starting or stopping the physical layer. Possible values are the following:

- **0 - Driver Offline:** Physical layer is closed or stopped. This mode allows a dynamic configuration of a Driver's parameters using the **IO.SetConfigurationParameters** Tag
- **1 - Driver Online:** Physical layer is open or executing. While in **Online** mode, the physical layer can be connected or disconnected and its current status can be checked using the **IO.PhysicalLayerStatus** Tag

In the next example, using **Elipse E3**, a Driver is configured to **Offline** mode, its COM port is changed, and then configured to **Online** mode again.

```
'Configure to Offline mode
Driver.Write -1, 0, 0, 4, 0
'Change port to COM2
Driver.Write -1, 0, 0, 3, Array("IO.Serial.Port", 2)
'Configure to Online mode
Driver.Write -1, 0, 0, 4, 1
```

The **Write** method may fail when configuring a Driver to **Online** mode, that is, writing the value 1 (one). In this case, this Driver remains in **Offline** mode. The cause of failure can be:

- Type of physical layer incorrectly configured, probably an invalid value was configured in the **IO.Type** property
- This Driver may have run out of memory
- Physical layer probably did not create its working thread. Search the log file for a message "Failed to create physical layer thread!"
- Physical layer could not start. The cause of this failure depends on the type of physical layer. It can be an invalid serial port number, a failure when starting Windows Sockets, or a failure when starting TAPI (modem), among others. This cause is recorded on the log file

### IMPORTANT

Even if the configuration of a Driver to **Online** mode is successful, this does not necessarily mean the physical layer is ready to use, that is, ready to execute input and output operations with an external device. The **IO.PhysicalLayerStatus** Tag must be checked to ensure the physical layer is connected and ready for communication.

## Properties

These are general properties of all supported I/O Interfaces.

### IO.ConnectionMode

**9** Controls the management mode of a Connection. Possible values are **0**: Automatic mode, in which a Driver manages the connection or **1**: Manual mode, in which an application manages the connection.

### IO.GiveUpEnable

When configured to True, defines a maximum number of reconnection attempts. If all reconnection attempts fail, a Driver enters the **Offline** mode. When configured to False, a Driver tries until a reconnection is successful.

## IO.GiveUpTries

9 Number of reconnection attempts before this one is aborted. For example, if the value of this property is equal to 1 (one), a Driver tries only one reconnection when the connection is lost. If this one fails, this Driver enters the **Offline** mode.

## IO.InactivityEnable

☑ Configure to True to enable and to False to disable inactivity detection. The physical layer is disconnected if inactive for a certain period of time. The physical layer is considered inactive only if it is capable of sending data but not capable of receiving it back.

## IO.InactivityPeriodSec

9 Number of seconds to check for inactivity. If the physical layer is inactive for this period of time, it is then disconnected.

## IO.RecoverEnable

☑ Configure to True to enable a Driver to recover lost connections and to False to leave a Driver in **Offline** mode when a connection is lost.

## IO.RecoverPeriodSec

9 Delay time between two connection attempts, in seconds.

### NOTE

The first reconnection is executed immediately after a connection is lost.

## IO.StartOffline

☑ Configure to True to start a Driver in **Offline** mode and to False to start a Driver in **Online** mode.


### NOTE

It is pointless to change this property at run time, as it can only be changed when a Driver is already in **Offline** mode. To configure a Driver in **Online** mode at run time, write the value 1 (one) to the **IO.WorkOnline** Tag.

## IO.TimeoutMs

9 Defines a time-out for the physical layer, in milliseconds. One second is equal to 1000 milliseconds.

## IO.Type

 Defines the type of physical interface used by a Driver. Possible values are the following:

- **N or None:** Does not use a physical interface, that is, a Driver must provide a customized interface
- **S or Serial:** Uses a local serial port (COM $n$ )
- **M or Modem:** Uses a local modem, internal or external, accessed via TAPI (*Telephony Application Programming Interface*)
- **E or Ethernet:** Uses a TCP/IP or UDP/IP socket
- **R or RAS:** Uses a **RAS** (*Remote Access Server*) Interface. A Driver connects to a RAS device using the **Ethernet** Interface and then sends an **AT** (*dial*) command

## Statistical Configuration

This section contains information about the configuration of **I/O Tags** and **Properties** of I/O Interfaces statistics.

### I/O Tags

#### Tags of I/O Interface Statistics (N2/B2 = 0)

The Tags described next display statistics for all I/O Interfaces.

#### IO.Stats.Partial.BytesRecv

<b>Type of Tag</b>	I/O Tag
<b>Type of Access</b>	Read-Only
<b>N1 Parameter</b>	-1 (minus one)
<b>N2 Parameter</b>	0 (zero)
<b>N3 Parameter</b>	0 (zero)
<b>N4 Parameter</b>	1101
<b>Configuration by String</b>	IO.Stats.Partial.BytesRecv

This Tag returns the number of bytes received in the current connection.

#### IO.Stats.Partial.BytesSent

<b>Type of Tag</b>	I/O Tag
<b>Type of Access</b>	Read-Only
<b>N1 Parameter</b>	-1 (minus one)
<b>N2 Parameter</b>	0 (zero)
<b>N3 Parameter</b>	0 (zero)
<b>N4 Parameter</b>	1100
<b>Configuration by String</b>	IO.Stats.Partial.BytesSent

This Tag returns the number of bytes sent through the current connection.

## IO.Stats.Partial.TimeConnectedSeconds

<b>Type of Tag</b>	I/O Tag
<b>Type of Access</b>	Read-Only
<b>N1 Parameter</b>	-1 (minus one)
<b>N2 Parameter</b>	0 (zero)
<b>N3 Parameter</b>	0 (zero)
<b>N4 Parameter</b>	1102
<b>Configuration by String</b>	IO.Stats.Partial.TimeConnectedSeconds

This Tag returns the number of seconds a Driver is connected in the current connection or 0 (zero) if a Driver is disconnected.

## IO.Stats.Partial.TimeDisconnectedSeconds

<b>Type of Tag</b>	I/O Tag
<b>Type of Access</b>	Read-Only
<b>N1 Parameter</b>	-1 (minus one)
<b>N2 Parameter</b>	0 (zero)
<b>N3 Parameter</b>	0 (zero)
<b>N4 Parameter</b>	1103
<b>Configuration by String</b>	IO.Stats.Partial.TimeDisconnectedSeconds

This Tag returns the number of seconds a Driver is disconnected since the last connection ended or 0 (zero) if a Driver is connected.

## IO.Stats.Total.BytesRecv

<b>Type of Tag</b>	I/O Tag
<b>Type of Access</b>	Read-Only
<b>N1 Parameter</b>	-1 (minus one)
<b>N2 Parameter</b>	0 (zero)
<b>N3 Parameter</b>	0 (zero)
<b>N4 Parameter</b>	1001
<b>Configuration by String</b>	IO.Stats.Total.BytesRecv

This Tag returns the number of bytes received since a Driver was loaded.

## IO.Stats.Total.BytesSent

<b>Type of Tag</b>	I/O Tag
<b>Type of Access</b>	Read-Only
<b>N1 Parameter</b>	-1 (minus one)
<b>N2 Parameter</b>	0 (zero)
<b>N3 Parameter</b>	0 (zero)
<b>N4 Parameter</b>	1000
<b>Configuration by String</b>	IO.Stats.Total.BytesSent

This Tag returns the number of bytes sent since a Driver was loaded.

## IO.Stats.Total.ConnectionCount

<b>Type of Tag</b>	I/O Tag
<b>Type of Access</b>	Read-Only
<b>N1 Parameter</b>	-1 (minus one)
<b>N2 Parameter</b>	0 (zero)
<b>N3 Parameter</b>	0 (zero)
<b>N4 Parameter</b>	1004
<b>Configuration by String</b>	IO.Stats.Total.ConnectionCount

This Tag returns the number of connections a Driver already established, successfully, since it was loaded.

## IO.Stats.Total.TimeConnectedSeconds

<b>Type of Tag</b>	I/O Tag
<b>Type of Access</b>	Read-Only
<b>N1 Parameter</b>	-1 (minus one)
<b>N2 Parameter</b>	0 (zero)
<b>N3 Parameter</b>	0 (zero)
<b>N4 Parameter</b>	1002
<b>Configuration by String</b>	IO.Stats.Total.TimeConnectedSeconds

This Tag returns the number of seconds a Driver remained connected since it was loaded.

## IO.Stats.Total.TimeDisconnectedSeconds

Type of Tag	I/O Tag
Type of Access	Read-Only
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	0 (zero)
N4 Parameter	1003
Configuration by String	IO.Stats.Total.TimeDisconnectedSeconds

This Tag returns the number of seconds a Driver remained disconnected since it was loaded.

## Properties

Currently, there are no properties defined specifically to display I/O Interface statistics at run time.

## Ethernet Interface Configuration

This section contains information about the configuration of **I/O Tags** and **Properties** of an **Ethernet** Interface.

## I/O Tags

### Tags of an Ethernet Interface (N2/B2 = 4)

The Tags described next allow controlling and identifying an **Ethernet** Interface at run time and they are also valid when the **RAS** Interface is selected.

#### IMPORTANT

These Tags are available **ONLY** while a Driver is in **Online** mode.

## IO.Ethernet.IPSelect

Type of Tag	I/O Tag
Type of Access	Reading or Writing
N1 Parameter	-1 (minus one)
N2 Parameter	0 (zero)
N3 Parameter	4 (four)
N4 Parameter	0 (zero)
String Configuration	IO.Ethernet.IPSelect

Indicates the active IP address. Possible values are **0**: The main IP address is selected, **1**: The first alternative or backup IP address is selected, **2**: The second alternative or backup IP address is selected, or **3**: The third alternative or backup IP address is selected.

If the **Ethernet** or **RAS** Interface is connected, this Tag indicates which one of the four configured IP addresses is in use. If the Interface is disconnected, this Tag indicates which IP address is used first on the next attempt to connect.

During the connection process, if the active IP address is not available, the I/O Interface tries to connect using the other IP address. If the connection with the alternative IP address works, it is configured as the active IP address (automatic switchover).

To force a manual switchover, write values from 0 (zero) to 3 (three) to this Tag. This forces a reconnection with the specified IP address (**0**: Main address or **1, 2, 3**: Alternative address) if a Driver is currently connected. If a Driver is disconnected, this Tag configures the active IP address for the next attempt to connect.

## IO.Ethernet.IPSwitch

<b>Type of Tag</b>	I/O Tag
<b>Type of Access</b>	Write-Only
<b>N1 Parameter</b>	-1 (minus one)
<b>N2 Parameter</b>	0 (zero)
<b>N3 Parameter</b>	4 (four)
<b>N4 Parameter</b>	1 (one)
<b>String Configuration</b>	IO.Ethernet.IPSwitch

Any value written to this Tag forces a manual switchover. If the main IP address is active, then the first alternative or backup IP address is activated, and so on for all alternative IP addresses and returning to the main address until a connection is established.

If a Driver is disconnected, this Tag configures the active IP address for the next attempt to connect.

## IO.Ethernet.SocketState

<b>Type of Tag</b>	I/O Tag
<b>Type of Access</b>	Read-Only
<b>N1 Parameter</b>	-1 (minus one)
<b>N2 Parameter</b>	0 (zero)
<b>N3 Parameter</b>	4 (four)
<b>N4 Parameter</b>	2 (two)
<b>String Configuration</b>	IO.Ethernet.SocketState

The Value property of this Tag corresponds to socket states as a map of bits:

- **Bit 0**: 0 (zero, not listening) or 1 (one, listening)
- **Bit 1**: 0 (zero, disconnected) or 1 (one, connected)

## Properties

These properties control the configuration of an **Ethernet** Interface.

### NOTE

The **Ethernet** Interface is also used by the **RAS** Interface.

### **IO.Ethernet.AcceptConnection**

☑ Configure to False if a Driver must not accept external connections, that is, if a Driver behaves as a master, or configure to True to enable the reception of connections, that is, if a Driver behaves as a slave.

### **IO.Ethernet.BackupEnable[2,3]**

☑ Configure to True to enable an alternative or backup IP address. If the reconnection attempt with the main IP address fails, a Driver tries to use an alternative IP address. Configure to False to disable its usage.

### **IO.Ethernet.BackupIP[2,3]**

📌 Alternative or backup IP address of a remote device. Users can use a numerical address, as well as a device's host name, such as "192.168.0.7" or "SERVER2".

### **IO.Ethernet.BackupLocalPort[2,3]**

📌 Local port number to be used when connecting to an alternative IP address of a remote device. Used only if **IO.Ethernet.BackupLocalPortEnable** is equal to True.

### **IO.Ethernet.BackupLocalPortEnable[2,3]**

☑ Configure to True to force the use of a specific local port when connecting to an alternative or backup IP address or configure to False to use any available local port.

### **IO.Ethernet.BackupPort[2,3]**

📌 Port number of an alternative or backup IP address of a remote device, used with the **IO.Ethernet.BackupIP** property.

## IO.Ethernet.IPFilter

**A** List with a comma-separated IPv4 or IPv6 addresses, which defines from which addresses a Driver accepts or blocks connections. Users can use asterisks, such as "192.168.\*.\*", or intervals, such as "192.168.0.41-50", in any part of IP addresses. To block an IP address or a range of IP addresses, use the tilde ("~") character at the beginning of the address, according to the next examples:

- **192.168.0.24**: Accepts only connections from IPv4 address 192.168.0.24
- **192.168.0.41-50**: Accepts connections from IPv4 addresses in the interval between 192.168.0.41 and 192.168.0.50
- **192.168.0.\***: Accepts connections from IPv4 addresses in the interval between 192.168.0.0 and 192.168.0.255
- **fe80:3bf:877::\*\* (expands to fe80:03bf:0877:0000:0000:0000:0000:0000:\*\*\*\*)**: Accepts connections from IPv6 addresses in the interval between fe80:03bf:0877:0000:0000:0000:0000:0000 and fe80:03bf:0877:0000:0000:0000:ffff:ffff
- **192.168.0.10, 192.168.0.15, 192.168.0.20**: Accepts connections from IPv4 addresses 192.168.0.10, 192.168.0.15, and 192.168.0.20
- **~192.168.0.95, 192.168.0.\***: Accepts connections from IPv4 addresses in the interval between 192.168.0.0 and 192.168.0.255, except the IPv4 address 192.168.0.95

When a Driver receives a connection attempt, the list of filters is scanned sequentially from left to right, searching for a specific authorization or block for the IP address where the connection comes from. If no element on the list corresponds to the IP address, the authorization or block are dictated by the last element of that list:

- If the last element on the list is an authorization, such as "192.168.0.24", then all IP addresses not found on the list are blocked
- If the last element on the list is a block, such as "~192.168.0.24", then all IP addresses not found on the list are authorized

If an IP address appears on more than one filter on the list, the leftmost filter has precedence. For example, in case of "~192.168.0.95, 192.168.0.\*", the IP address 192.168.0.95 fits both rules, but the rule that wins is the leftmost one, "~192.168.0.95", and therefore this IP address is blocked.

When **IOKit** blocks a connection, it logs a message "Blocked incoming socket connection from {IP}!".

In case of UDP connections in broadcast listening mode, in which a Driver can receive packets from different IP addresses, blocks or permissions are performed at each packet received. If a packet is received from a blocked IP address, it logs a message "Blocked incoming packet from {IP} (discarding {N} bytes)!".

## IO.Ethernet.ListenIP

**A** IP address of the local network interface that a Driver uses to establish and accept connections. Leave this property empty to establish and accepts connections using any local network interface.

## IO.Ethernet.ListenPort

**9** Number of the IP port used by a Driver to listen to connections.

## IO.Ethernet.MainIP

**A** IP address of a remote device. Users can use a numerical address, as well as a device's host name, such as "192.168.0.7" or "SERVER2".

## IO.Ethernet.MainLocalPort

9 Local port number to use when connecting to the main IP address of a remote device. This value is only used if the **IO.Ethernet.MainLocalPortEnable** property is equal to True.

## IO.Ethernet.MainLocalPortEnable

☑ Configure to True to force the use of a specific local port when connecting to the main IP address of a remote device or configure to False to use any available local port.

## IO.Ethernet.MainPort

9 Number of the IP port of a remote device, used with the **IO.Ethernet.MainIP** property.

## IO.Ethernet.PingEnable

☑ Configure to True to enable sending a **ping** command to the IP address of a remote device, before trying to connect to the socket. This socket's connection time-out cannot be controlled, therefore sending a **ping** command before connecting is a fast way to detect if the connection is going to fail. Configure to False to disable a **ping** command.

## IO.Ethernet.PingTimeoutMs

9 Delay time to wait for a response from a **ping** command, in milliseconds.

## IO.Ethernet.PingTries

9 Maximum number of attempts of a **ping** command. Minimum value is 1 (one), including the first **ping** command.

## IO.Ethernet.ShareListenPort

☑ Configure to True to share a listening port with other Drivers and processes or False to open a listening port in exclusive mode. To successfully share a listening port, all Drivers and processes that use that port must open it in shared mode. When a listening port is shared, each incoming connection is distributed to one of the processes listening. This way, if a Slave Driver only supports one connection at a time, users can use several instances of this Driver listening on the same port, therefore simulating a Driver with support for multiple connections.

## IO.Ethernet.SuppressEcho

☑ Configure to True to eliminate echoes in communication. An echo is the unwanted reception of an exact copy of all data packets a Driver sent to a device.

## IO.Ethernet.Transport

A Defines a transport protocol. Possible values are **T or TCP**: Uses the TCP/IP protocol or **U or UDP**: Uses the UDP/IP protocol.

## IO.Ethernet.UseIPv6

☑ Configure to True to use IPv6 addresses on all Ethernet connections or configure to False to use IPv4 addresses (default).

# Driver Revision History

VERSION	DATE	AUTHOR	COMMENTS
1.0.3	05/22/2025	C. Mello	<ul style="list-style-type: none"><li>Added the <b>SDI Message timeout (ms)</b> option on this Driver's properties dialog box to adjust the time interval of <b>SDI (Station Information Frame)</b> messages (Case 37868).</li></ul>
1.0.2	05/14/2025	C. Mello	<ul style="list-style-type: none"><li>Added an indication of the <b>Domain</b> number by using the <i>N4</i> parameter in the <b>Power-On Time Counter</b> Tag (<i>N2</i> equal to 8580) (Case 37808).</li></ul>
1.0.1	03/13/2025	C. Mello	<ul style="list-style-type: none"><li>Initial version of this Driver (Case 33408).</li></ul>

**Headquarters**

**Rua Mostardeiro, 322/Cj. 902, 1001 e  
1002**

**90510-002 — Porto Alegre — RS**

**Phone: (+55 51) 3346-4699**

**Fax: (+55 51) 3222-6226**

**E-mail: [elipse-rs@elipse.com.br](mailto:elipse-rs@elipse.com.br)**

**Branch in Taiwan**

**9F., No.12, Beiping 2nd St., Sanmin Dist.**

**807 — Kaohsiung City — Taiwan**

**Phone: (+886 7) 323-8468**

**Fax: (+886 7) 323-9656**

**E-mail: [evan@elipse.com.br](mailto:evan@elipse.com.br)**

**Check our website for information about a representative in your country.**

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