C-Bus Connectivity Kit

New Features and Tuning Tips for driver release 4.x

Starting with version 4.x the Niagara driver for the C-Bus Intelligent External Converter (IEC) is better integrated into the Niagara framework and provides more tuning options to optimize the traffic on the C-Bus. This document describes some of the driver internals and tuning tips.

1. Driver Installation

The driver release 4.x is fully compatible with release 3.x . Use the Platform Software Manager to install or update the driver modules *softYonDriver*, *softYonTcpDriver* and/or *softYonSerialDriver*, depending on your installed hardware. Option Card users have to install the *softYonDriver* and *softYonSerialDriver* modules. You can install the driver over the old 3.x version.

2. IEC Monitor

The driver communicates with the IEC over a serial port or over the local network. The TCP/IP connection uses Lantronix Cobox technology.
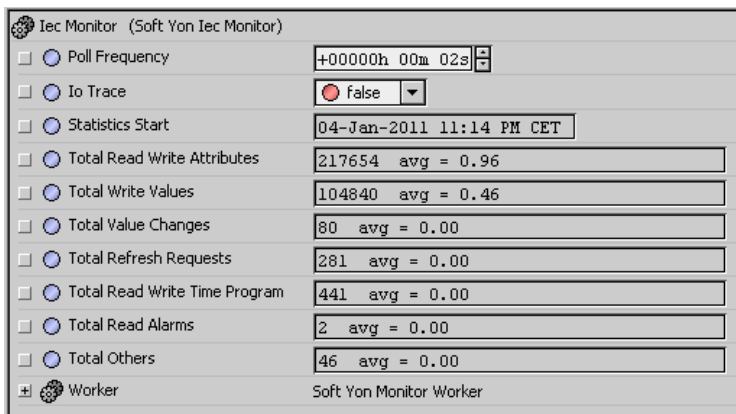

Figure 1. IEC Monitor Property Sheet

The key component responsible for the communication between the driver and the IEC is the **IEC Monitor**. The monitor polls the IEC for new data with a short period, default 2 seconds. The period is defined in the property **Poll Frequency.** When solving problems, support may ask you to switch on the protocol tracing. To start the trace modify the property **IO Trace**. You then find the trace output in the station's log.

The driver collects statistical data about sent and received messages. In the monitor property sheet you will find information about the number of messages and the average communication rate (messages per second). This can help you to tune the driver (see Figure 1. and Table 1.).

Table 1. IEC Monitor Properties Description

Property	Description
Total Read Write Attributes	Number of messages sent to the C-Bus to read or write point attributes. This number increases when control points are running in Polling mode
Total Write Values	Number of messages sent to the C-Bus to write a point value. Note that the write value operation generates additional read/write attribute messages which are logged in the property Total Read Write Attributes
Total Value Changes	Number of Change Of Value messages received from the C-Bus. This number increases when control points are running in Auto mode

Property	Description
Total Refresh Requests	Number of messages sent to move the point into InRefresh (CoV) mode or to remove the point from InRefresh (CoV) mode.
Total Read Write Time Programs	Number of messages associated with reading/writing time schedules
Total Read Alarms	Number of messages associated with reading alarm data
Total Others	Number of other messages that do not match any of the above categories.

Use the action **Reset Statistics** on the IEC Monitor to reset the statistics counters.

3. Point Communication Mode

C-Bus Control Points run in one of the following communication modes

Table 2. C-Bus Communication Modes

| Comm Mode	Description
Auto	When a control point is subscribed in Niagara, the InRefresh mode, sometimes called Change Of Value (CoV) mode, is activated in the XL5000 controller. Only value changes are reported to the IEC.
Polling	When a control point is subscribed, the driver periodically polls the XL5000 controller for point the value. The slow, normal and fast polling periods are defined in the Network Poll Scheduler. This mode is known from other Niagara drivers.
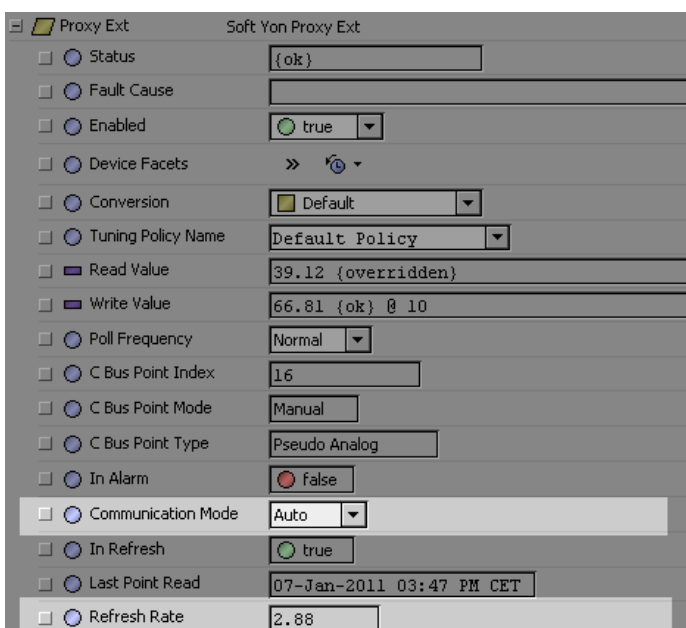
Figure 2. Communication Properties

For points in the Auto mode, individual **Refresh Rate** statistics are collected. When the number of value changes exceeds a predefined threshold, the communication mode changes from *Auto* to *Polling*. This behavior is similar to the Autotuning option in the Honeywell stations. To move the mode back into Auto, you have to change the property **Communication Mode** in the Point Proxy Extension (see Figure 2.).

You find the threshold in the property **Auto Tuning Rate** in the **Network Tuning Policy** component. The default value is 10 changes per minute. Another Tuning Policy property - *Communication Mode* - changes the communication mode globally for all points controlled by this policy. Note that you can only force all points to run in Polling mode. Setting Communication Mode in the Tuning Policy to Auto moves all individual point communication modes back the their previous values.

The Communication Mode and the Refresh Rate are Proxy Extension properties. Communication Mode is a writable property and you can change it individually. However a better idea is to define point groups and assign a Tuning Policy to each group. Then you can control the communication mode globally using Tuning Policy properties (see Section 5. Tuning Policy).

Figure 3. Point Manager Columns

Another place where you can check the Communication Mode and the Refresh Rate is the **Soft Yon Point Manager**. Make sure to set both columns as visible first, they are initially hidden (see Figure 3).

Moving a control point from Auto mode into Polling mode is a protection against overloading the C-Bus. The number of generated CoV messages depends on the definition of the point attribute **Trend Hysteresis**. Poorly designed XL5000 applications can generate too many changes due to a low Trend Hysteresis threshold. If any control point moves from the Auto mode into the Polling mode, you should adjust the value of Trend Hysteresis attribute before you return the control point back into Auto mode! Use the view **Soft Yon Point Property Sheet**, which is the default Workbench PxView on the control point, to change the Trend Hysteresis value. Check the original Honeywell documentation for hints how to tune the Trend Hysteresis attribute.

4. Point Subscription

One of the most important changes in the driver release 4.x is the tight integration into the Niagara subscribe/unsubscribe mechanism. Regardless of the communication mode, the driver communicates with the XL5000 controller only when the control point is subscribed in Niagara. For control points in Auto mode, the *InRefresh (CoV)* mode in the XL5000 controller is activated and the controller starts to report values by exception. Each CoV message contains information about PointValue, PointMode and InAlarm status. For points in Polling mode the driver periodically reads the attributes PointValue, PointMode and InAlarm. The polling period is defined in Network Poll Scheduler.

For easier poll rate maintenance the Poll Scheduler rate properties are accessible in the **Soft Yon IEC Manager View**. Open this view by double clicking the Network component and modify the *fast*, *normal* and *slow* polling rates. You should define some reasonable values here even if all your points are running in Auto mode. Remember - any control point can move into the Polling mode in case of high Refresh Rate[1]. Keep in mind that the polling speed is approx. 2 points/

Figure 4. IEC Manager View

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[1] For customers migrating from driver release 3.x - forget the formula (NumberOfPoints/2)+10% for normal rate calculation. Change the poll rates to values matching your application.

second on the C-Bus running at 9'600 baud! To get the **minimal poll rate** you can calculate (for 9'600 baud).

```
Max. Number of Simultaneously Subscribed Polling Points / 2
```

Do not set the poll rate lower than the calculated value.

When a control point is unsubscribed in Niagara, the communication between the XL5000 controller and the driver stops. There is an important difference between control points running in Auto mode and in Polling mode. Polling stops immediately. Because removing point from the InRefresh (CoV) mode is a time consuming transaction, there is a small time delay when the XL5000 controller is allowed to continue to send the changes. This saves a lot of traffic on the C-Bus if the user leaves a view and returns back after a short time. The delay is defined in the Tuning Policy in the property **In Refresh Unsubscribe Delay** (default 1 minute). If this time period elapses, the control point is flagged as candidate for removal from InRefresh (CoV) mode. A flagged control point is removed from InRefresh (CoV) mode in the XL5000 controller only after the next CoV messsage has been received by Niagara. This algorithm generates less traffic on the C-Bus because the points are removed from InRefresh (CoV) mode step by step depending on their activity. Inactive points (typically digital points) even remain in the InRefresh (CoV) mode for a very long time without any impact on the C-Bus traffic.
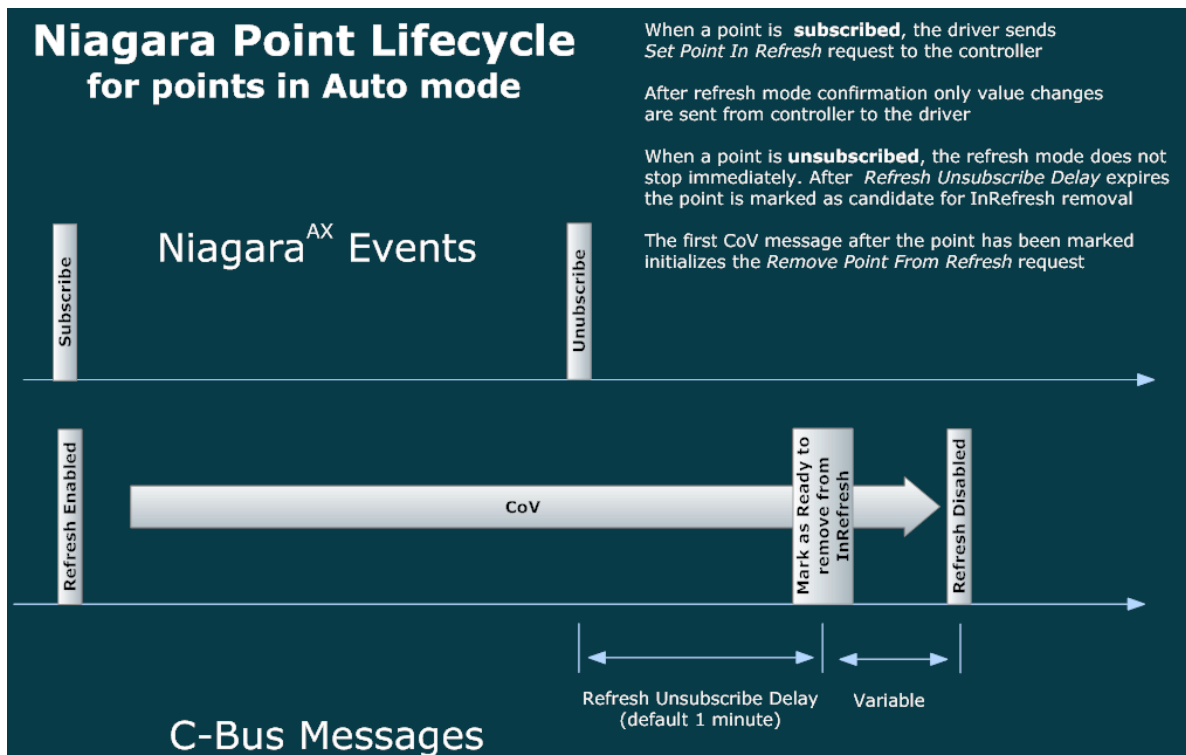

Figure 5. Niagara Point Lifecycle

5. Tuning Policy

Tuning Policy is now the main tool for C-Bus load tuning. The driver provides a customized version of the Tuning Policy component. The number of Tuning Policies you can create is not limited.

Hint: to create a new Tuning Policy use the action *Duplicate* in the component context menu.
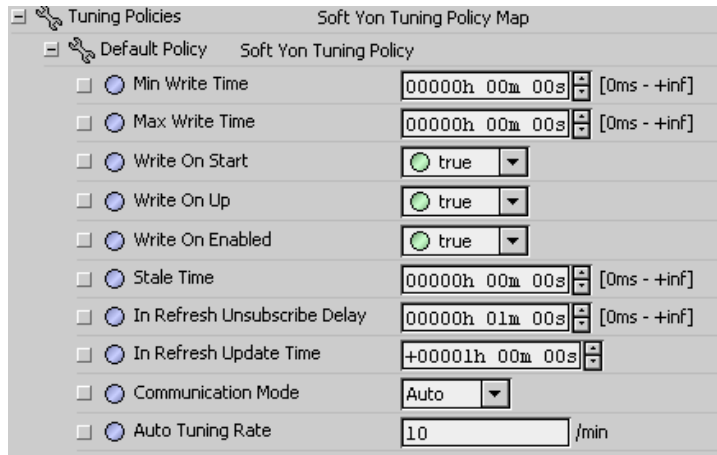
Figure 6. Tuning Policy Properties

The properties **Min Write Time**, **Max Write Time**, **Write On Start**, **Write On Up** and **Write On Enabled** are described in the original Niagara documentation. The property **Stale Time** has a slightly different scope in the driver - it applies only to points in Polling mode. All other properties are C-Bus specific.

Table 3. C-Bus Specific Tuning Policy Properties

Property	Description
Stale Time	**This property applies only to points in Polling mode** If set to a non-zero value, control points become {stale} if the configured time elapses without a successful read, indicated by Read Status {ok}. If set to zero, the stale timer is disabled, and control points become stale immediately when unsubscribed. Default: 0 (zero)
In Refresh Unsubscribe Delay	**This property applies only to points in Auto mode** If the configured time elapses after the control point has been unsubscribed, the control point is flagged as *Ready for removal from InRefresh mode*. The message *Remove Point From InRefresh Mode* will be sent to the XL5000 controller when the first CoV message is received for flagged control point. When the point in the XL5000 controller is removed from InRefresh (CoV) mode, the control point state becomes {stale} Default: 1 minute

Property	Description
In Refresh Update Time	**This property applies only to points in Auto mode** If the time elapses and no CoV message has been received from the XL5000 for the control point, the message *Set Point Into InRefresh Mode* will be sent to the XL5000 controller. Every CoV message resets the counter to zero. Default: 1 hour
Communication Mode	**This property applies for all points** If set to Polling, all control points will move to Polling mode. If set to Auto, all control points will move to their individual communication mode settings. See the Table 4. Default: Auto
Auto Tuning Rate	**This property applies only to points in Auto mode** Specifies the threshold in messages per minute when the point move from Auto mode into the Polling mode. Default: 10 messages per minute

Table 4. Communication Mode Overview

Control Point	Tuning Policy	Communication Mode
Auto	Auto	Auto
Poll	Auto	Poll
Any	Poll	Poll