Okuma America Corporation

Okuma MTConnect Adapter Software User Manual

Document No.: S5053-03-00

Revision History

Date	Version	Description	Author
7/25/2011	S5053-03-00	Initial Release	Linh Huynh

OKUMA MTConnect Adapter
User Manual

1. Introduction

1.1 Purpose

The purpose of this document is to provide the instruction of installing and operating Okuma MTConnect Adapter. It also provides information on how to repair, and uninstall this software.

1.2 Scope

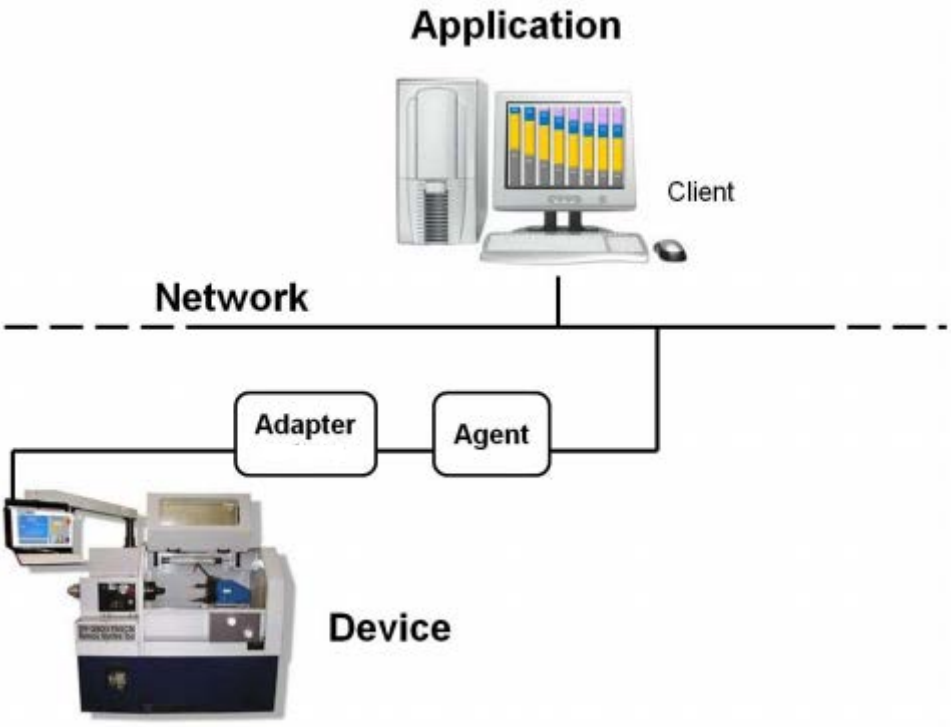
This manual will cover the installation, operation and trouble shooting for Okuma MTConnect Adapter running on OSP P100II/P200/P300 controls and on Windows XP x86 SP3, and Windows 7 x86 SP1 only.

1.3 Definitions, Acronyms and Abbreviations

None

1.4 Overview

The Okuma MTConnect Adapter is an application that is specifically designed to support the communication interfaces between MTConnect Agent and Okuma OSP P100II/P200/P300 controls.



For OKUMA controls, Adapter and Agent are installed on the control by default. An application resided on the control or on the network can consume information from an agent to perform tasks. Okuma MTConnect Adapter uses THINC-

API to obtain machine data as defined in Devices.xml file and sends changed data to connected MTConnect agent.

1.5 Functions and Configuration

1.5.1 *Function*

- This application will start after NC is started up using Startup service.
- This application allows MTConnect Agent provided by MTConnect.org to collect machine data.
- The system performs the following tasks routinely:
  - ❖ Send changed data to connected Agents
- Support MTConnect 1.2 spec only.

1.6 Scope

Current version of OKUMA MTConnect Adapter only supports OKUMA P100II/P200/P300 controls or higher. This adapter must be used with an agent developed by MTConnect.org and can be download at https://github.com/mtconnect/cppagent

Specific version of MTConnect Agent must be met per release of MTConnect Adapter – See Release Note

1.7 References

[1] Installation Manual for THINC-API

[2] Installation Manual for Startup Service

[3] MTConnect Agent - https://github.com/mtconnect/cppagent

2. Installation

The following steps in section 2.0 need to be performed in the same order:

- Installation of THINC API
- Installation of THINC Startup Service
- Installation of OKUMA MTConnect Adapter Software
- Installation of MTConnect Schemas (optional)

Note: All installation must be either installed directly from CD/DVD disks or copied to the local hard drive.

All security must be handled by end-user to allow the communications between client application, MTConnect agent, and OKUMA MTConnect Adapter.

2.1 Installation of THINC-API

This application requires THINC-API having the same version or greater to be installed on machine as specified in the Release Note of MTConnect Adapter.

Refer to THINC-API 'InstallationManual.pdf' provided on THINC-API Installation disk for instructions.

Tip: Try to run THINC-API Demo Application and see if it runs normally to make sure THINC-API is properly installed.

It is always best to install the latest version of THINC-API on the machine if possible.

2.2 Installation of THINC Startup Service

This application requires Startup Service version 3.1.0.0 to be installed on target machine.

Refer to installation manual of Startup Service provided on Installation disk for instructions.

2.3 Installation of Okuma MTConnect Adapter Software

In Windows mode (press ESC and Cancel button during NC Startup screen to prevent NC from running), Run the 'Setup.exe' program from the Okuma MTConnect Adapter DVD to install Okuma MTConnect Adapter software. The setup program automatically checks if Microsoft .NET framework 4.0 is installed. If it is not installed, continue to section 2.3.1, otherwise refer to section 2.3.2.

OSP software should not be running during the installation of Okuma MTConnect Adapter or .NET Framework 4.0. During the .NET installation, it will be necessary to reboot multiple times. OSP software launch should be cancelled and the installation media should remain connected during the reboot.

For Windows XP, it must have Service Pack 3 installed in order to support .NET Framework 4.0

This installation can only be installed on 32-bit Windows XP or Windows 7.

Note: This setup will check to see if the required version of THINC-API, and Startup Service installed on target machine before installing OKUMA MTConnect Adapter.

2.3.1 *Installation of Microsoft .NET Framework 4.0*

The next dialog will be displayed if Microsoft .NET framework 4.0 is not installed.

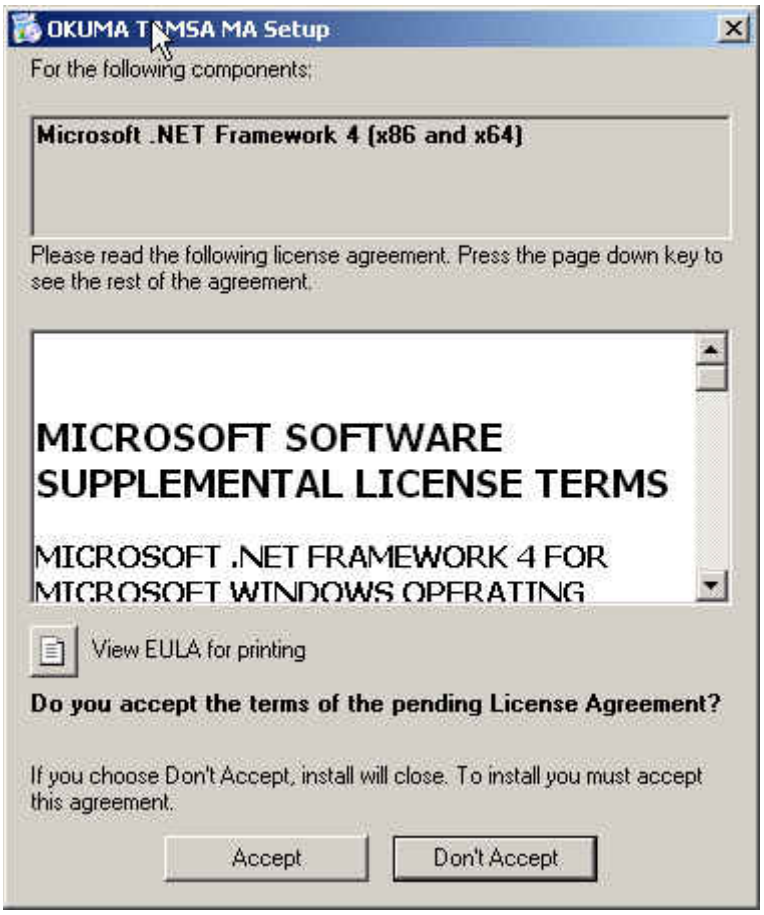


Figure: .NET framework 4.0 license agreement dialog

Click 'Accept' to install .NET framework 4.0.

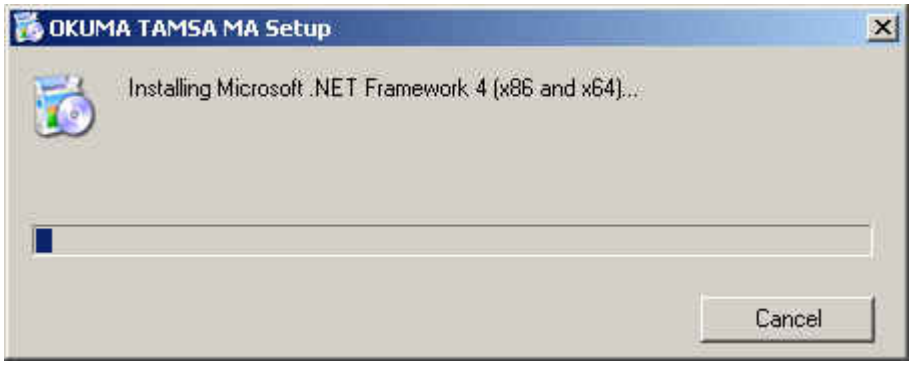


Figure: .NET framework 4.0 installation dialog

If the .NET installation requires rebooting then it needs to reboot the machine to continue the installation again.

2.3.2 *Installation of Okuma MTConnect Adapter Software*

The following dialog will be displayed once all of the required .NET frameworks are installed.

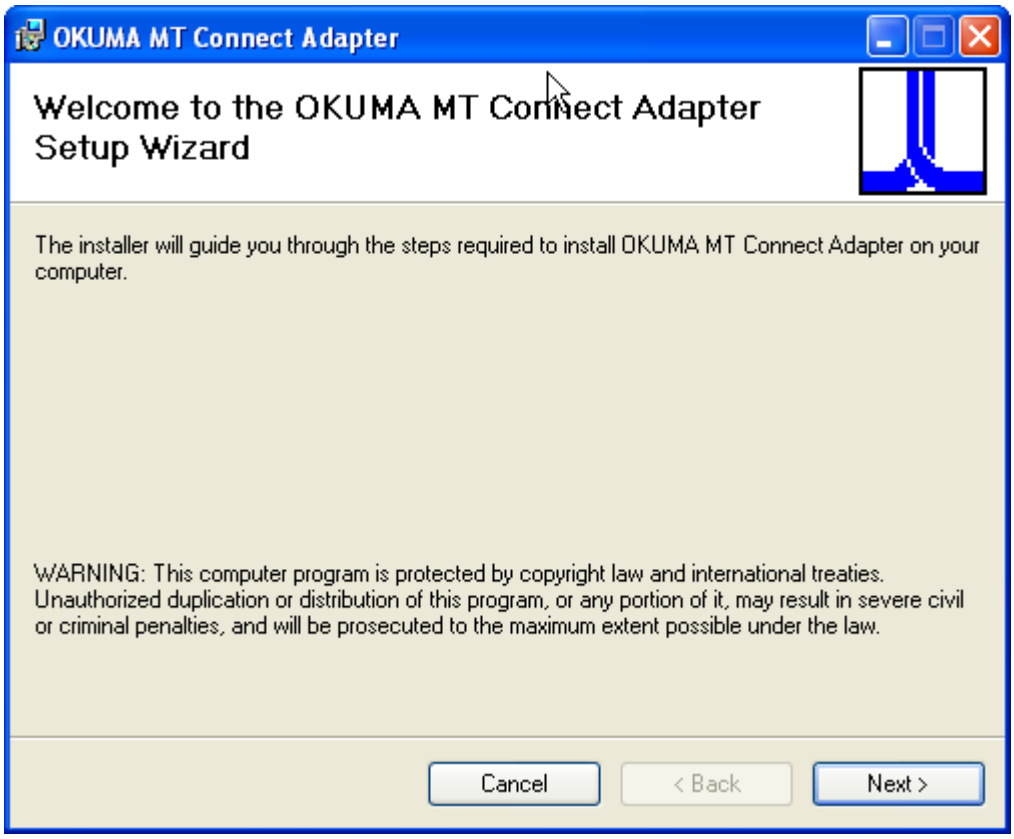


Figure: Installation welcome dialog

Click ‘Next’ to continue.

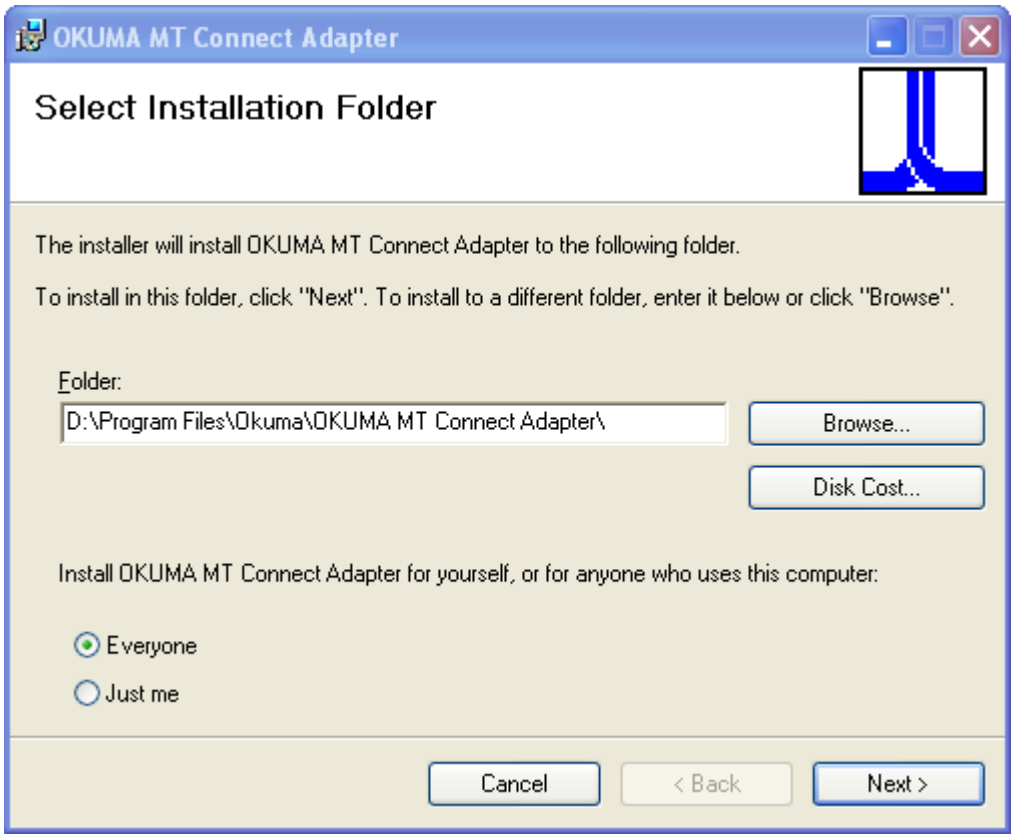


Figure: Installing Application folder

Click 'Next' to continue. User can also select a different folder other than the default one to install Okuma MTConnect Adapter Software.

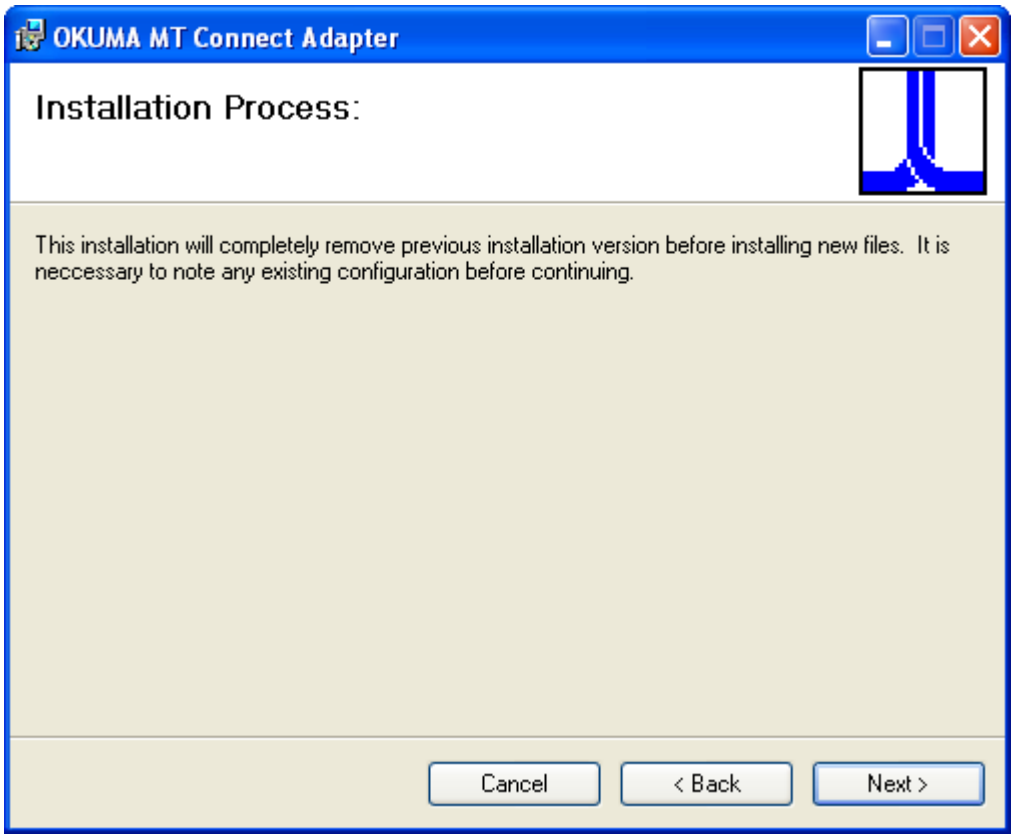


Figure: Installing Process

This dialog to inform user that the installation will completely remove any previous installation version before installing new version. It is necessary to note any custom agent/adapter information such as Adapter Device Name, Port, and Agent port number before proceeding the installation.

Click Next to continue

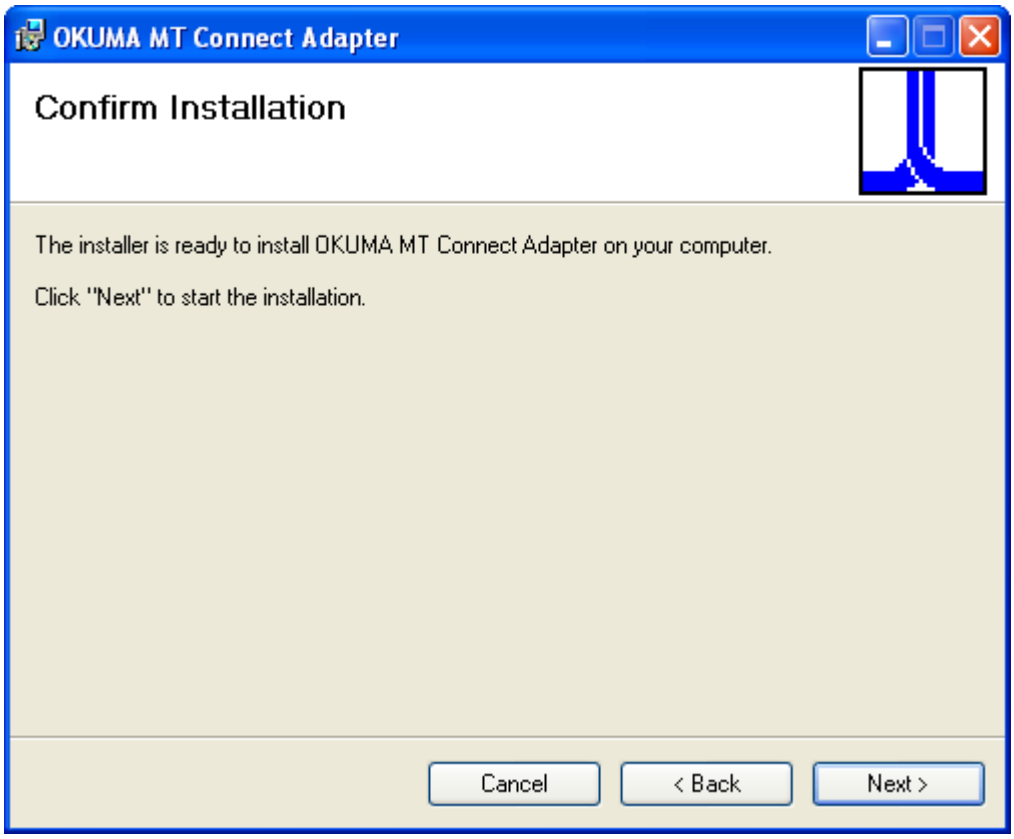


Figure: Confirm Installation

Click ‘Next’ to continue.

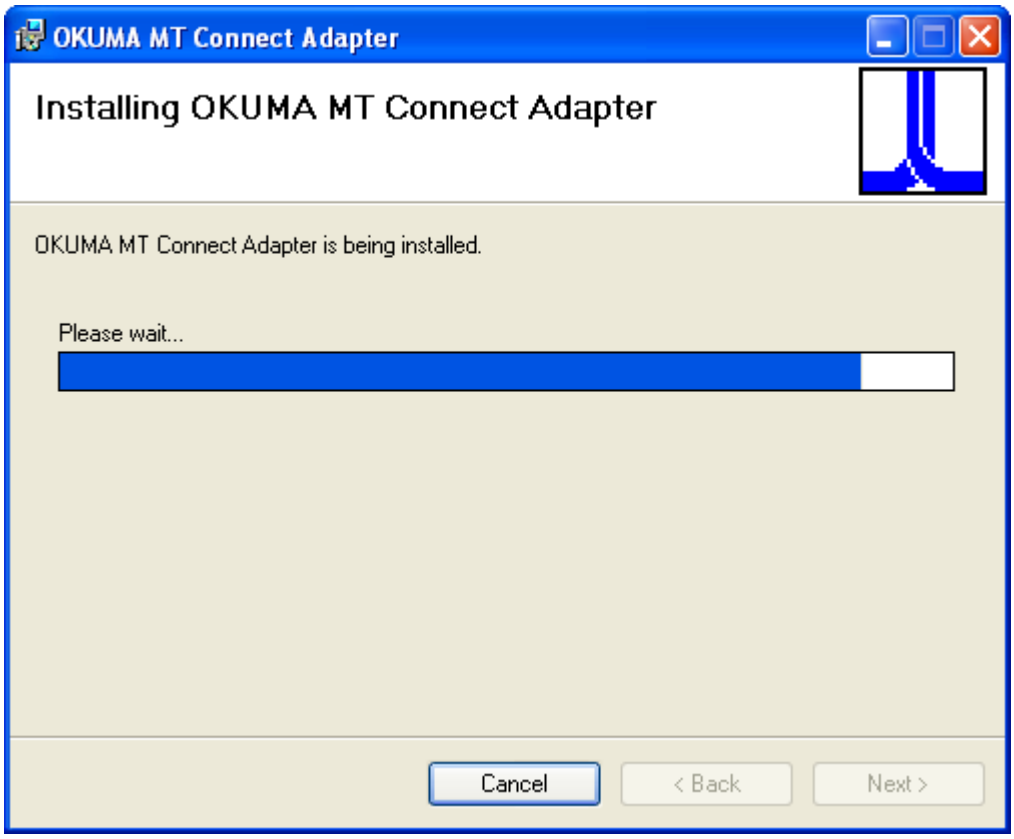


Figure: Installing OKUMA MTConnect Adapter

Application is installing.

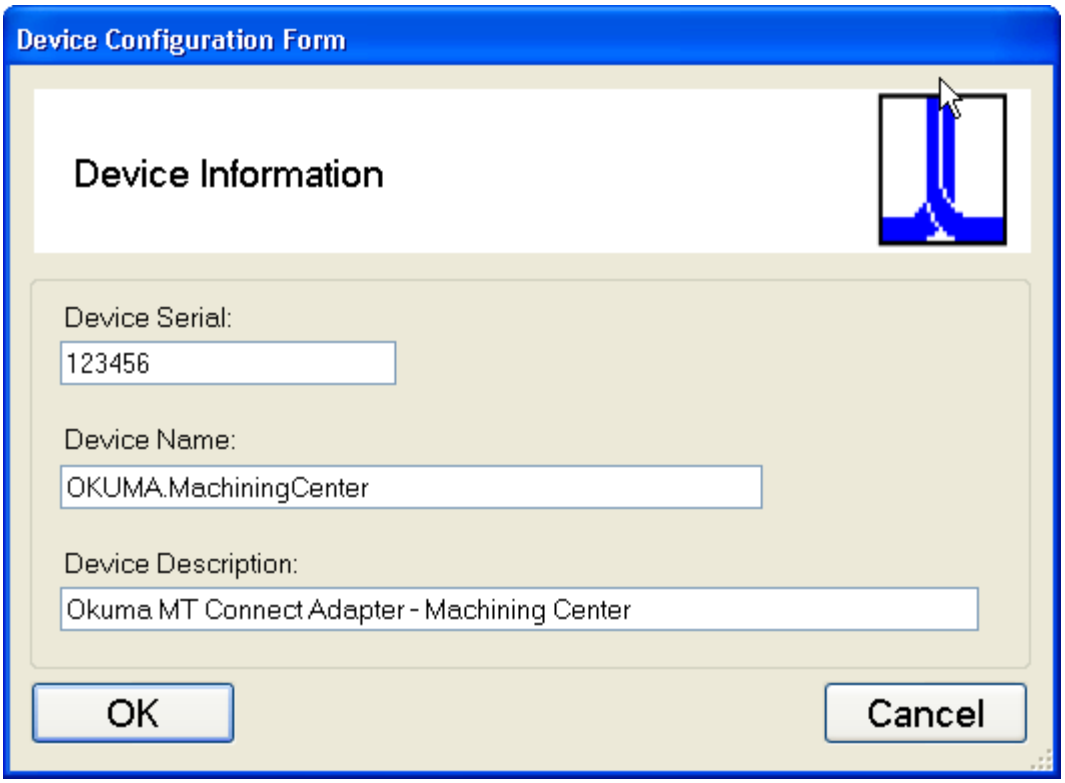


Figure: Device Information

This dialog provides custom setup for Okuma MTConnect Adapter.

1/ Device Information:

- Device Name: Name of machine as specified in Devices.xml once it is configured per machine type
- Device Serial Number: Unique machine number
- Device Description: A description of this machine

2/ OK button:

The system will save current setting and update device configuration file accordingly.

3/ Cancel Button:

This will cancel current installation.

Click OK to move to next step

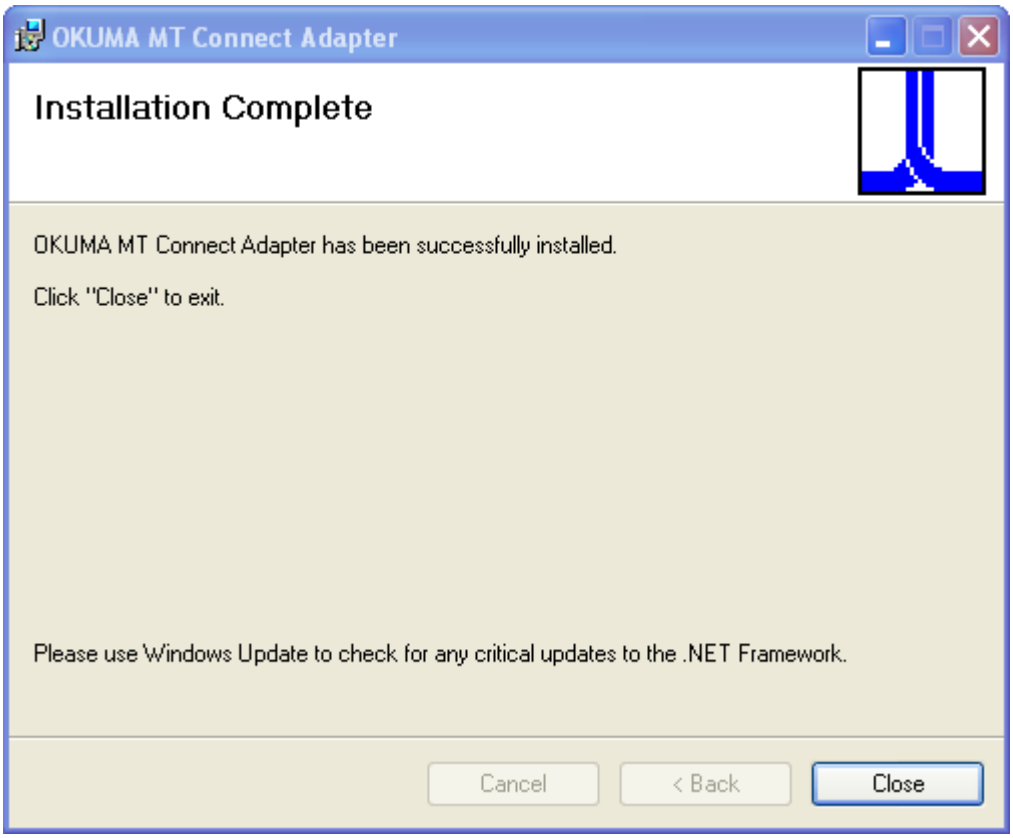


Figure: Installation completed dialog

Click ‘Close’ to complete the installation.

It is necessary to reboot the machine after this step to complete the installation process.

OKUMA MTConnect Adapter application will be started automatically by THINC Startup Service after NC is completely started. By default, OKUMA MTConnect Adapter will be minimized to system tray after it runs without any error. The application can be shown up by double clicking the OKUMA icon  located in the lower left corner of screen.

2.4 Installation of MTConnect Schemas (Optional)

There are custom tags defined specifically for OKUMA controls. An extended schema, OkumaStreams_1.3.xsd, for streaming data is included with the setup under Schemas folder where application is installed on target machine.

If stream data output from Agent needs to be validated then the standard and extended schemas need to be copied to target location where client application needs to check if needed.

3. Repair/Uninstall Okuma MTConnect Adapter Software

3.1 Un-install Okuma MTConnect Adapter Software

Start the machine in Windows only mode. Click 'Start' → Settings → 'Control Panel' to launch control panel. Double click 'Add or Remove Programs' in control panel, find the item 'Okuma MTConnect Adapter' and click 'Remove' to uninstall Okuma MTConnect Adapter Software.

Note: Before performing un-installing Okuma MTConnect Adapter application, please shutdown the Okuma MTConnect Adapter application if it is running.

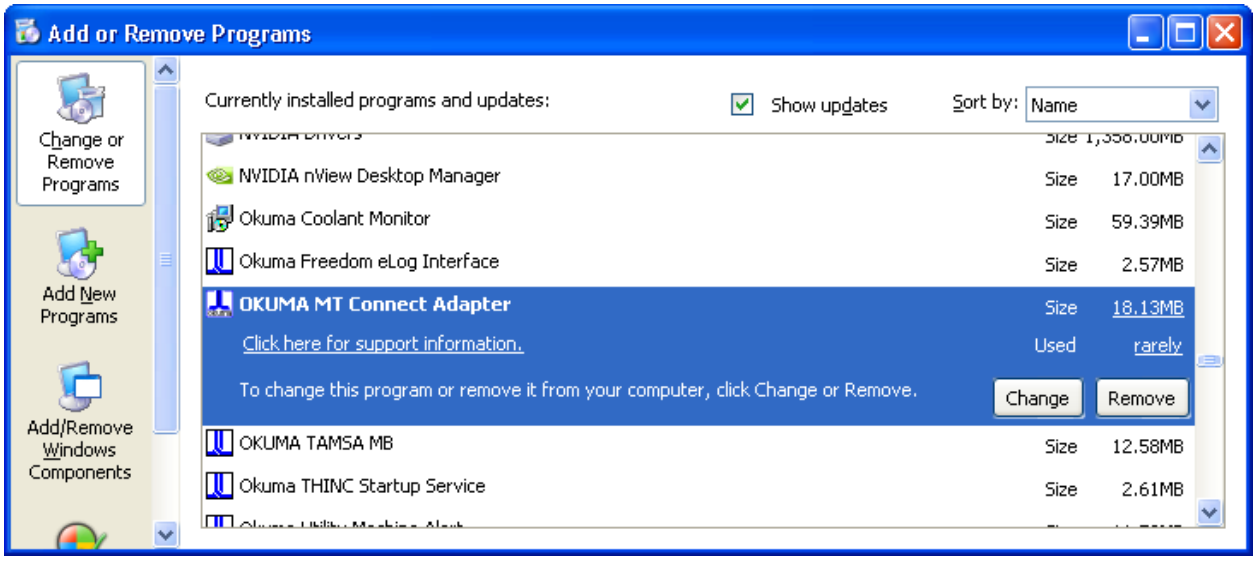


Figure: Uninstall Okuma MTConnect Adapter software dialog

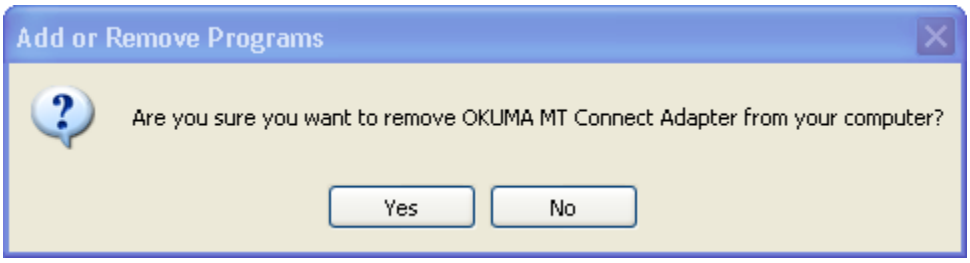


Figure: Uninstall Okuma MTConnect Adapter software confirmation dialog

Click 'Yes' to confirm uninstalling Okuma MTConnect Adapter Software.

4. Installation Files

4.1 Okuma MTConnect Adapter Software

All the files are installed in the installation folder unless otherwise noted, by default, which is 'D:\Program Files\Okuma\Okuma MT Connect Adapter'.

The devices.xml configuration file will be configured per machine type and specification by OKUMA MTConnect Adapter. Once it is configured the device is available for communicating with an agent running on local machine only.

Note: In case of agent running on remote PC, the devices.xml must be manually copied to the target location where agent is running.

5. Usage

5.1 Start Okuma MTConnect Adapter Application

The Okuma MTConnect Adapter Software will be launched automatically by the Start-Up service after NC is started completely.

If user exits the software and wants to launch it again, press 'Ctrl + ' on the operation panel to pop up Start Menu, then click 'Programs' → 'Okuma' → 'Okuma MTConnect Adapter' → 'Okuma MTConnect Adapter Application' to run.

After the application is launched without error, it will be minimized in the system tray and shown as an icon . If user performs a double click on the icon or select 'Show' from the pop-up menu, the main user interface will be displayed.

Note: The detail messages displayed in the main user interface does depend on each machine configuration.

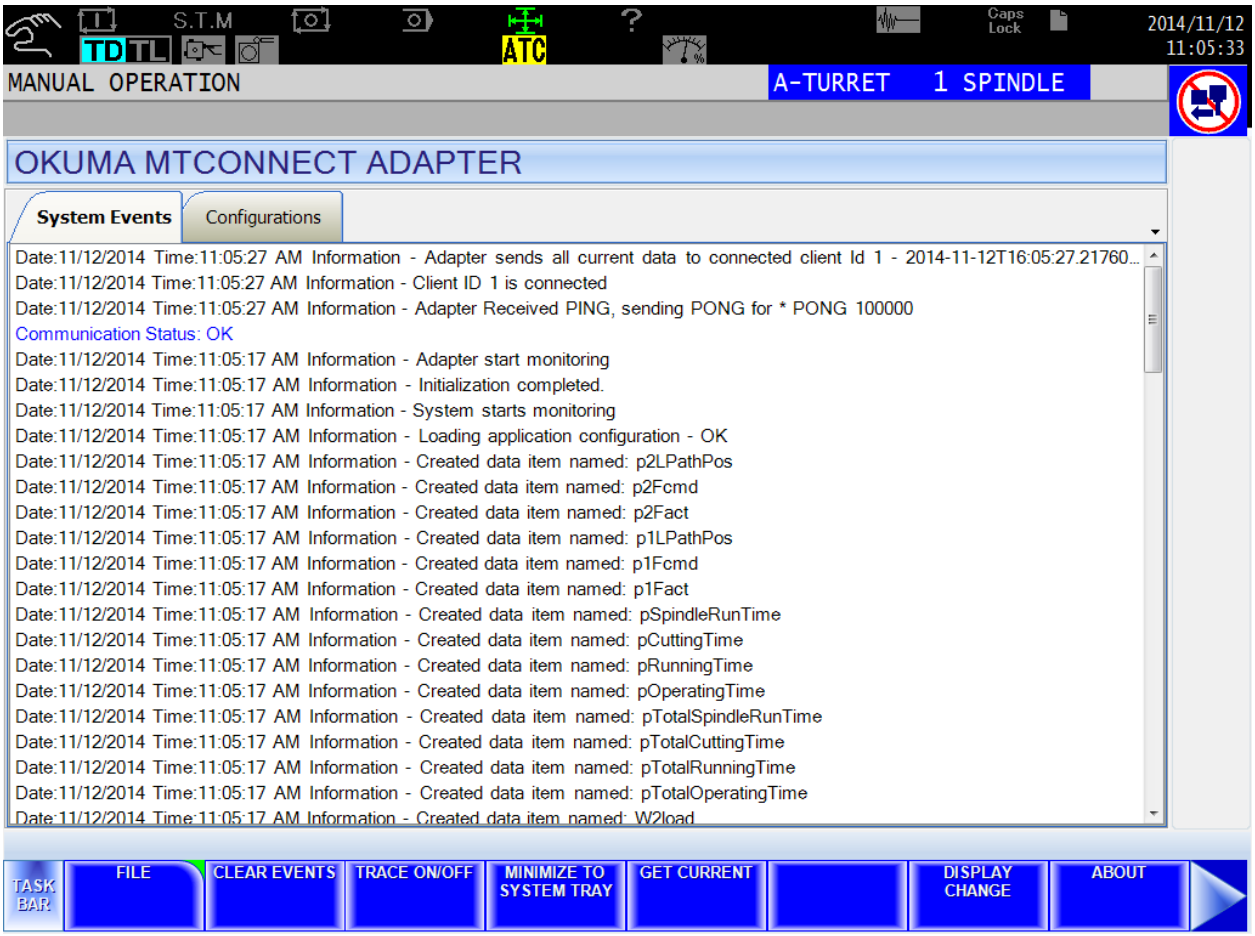


Figure: Okuma MTConnect Adapter Software main user interface

5.2 Exit Okuma MTConnect Adapter Application

When user shuts down the machine, the software will be terminated automatically without user interaction.

Click the button File/Exit will also terminate the software.

In normal operation, only user with administrative right can perform this operation.

5.3 Main User Interface

The main interface mainly contains 2 tabs:

System Events
Configurations

5.3.1 *System Events*

It contains a menu bar as shown below. The menu item can be activated by clicking on it or pressing the correspond F Key from F1 to F9 if applicable.

5.3.1.1 File Menu

The ‘File’ menu has one submenu item, which is ‘Exit’.

When the ‘Exit’ menu item is activated, the application will be closed.
In normal operation, only user with administrative right can perform this operation.

5.3.1.2 Clear Events Menu

When the ‘Clear Events’ menu item is activated, all the messages displayed in the client area of the main user interface are cleared.

5.3.1.3 Trace ON/OFF Menu

When the Trace menu is activated it will toggle the TRACE mode. If Trace is ON tracing message is displayed when data item is changed.

5.3.1.4 System Tray Menu

When the ‘System Tray’ is activated, the main user interface is hidden and the icon for this application is shown in the system tray of windows task bar.

5.3.1.5 Get Current Menu

When the ‘Get Current’ menu is activated, the system will display a message in the System Events tab. The message contains all current values of all data items currently supported by the device.

Note: Data item might be UNAVAILBLE if it is not configured for monitoring in the Configuration tab.

5.3.1.6 Help Menu

When the ‘About’ menu item is activated, a dialog is displayed to show the information about this application.

Figure: Okuma MTConnect Adapter About box

By default, the system will write event messages to the System Events tab in the descending order such that newest event message will be displayed on the top of the list. If the 'Trace On' menu is checked, all messages will be displayed on the main user interface, otherwise only pre-selected event messages by the system will be displayed.

Event messages are categorized into different event types as following:

- Information – Indicate normal event messages. It is in black color.
- Tracing – Indicate tracing event messages when Trace On mode is enabled from menu. It is in blue color.
- Warning – Indicate warning event message. It is in orange color.
- Error – Indicate error event messages when system encounters. Error messages will be forced to display to main GUI and logged. It is in red color.
- Fatal – Indicate critical error event messages when system encounters. Error messages will be forced to display to main GUI and logged. It is in violet color.

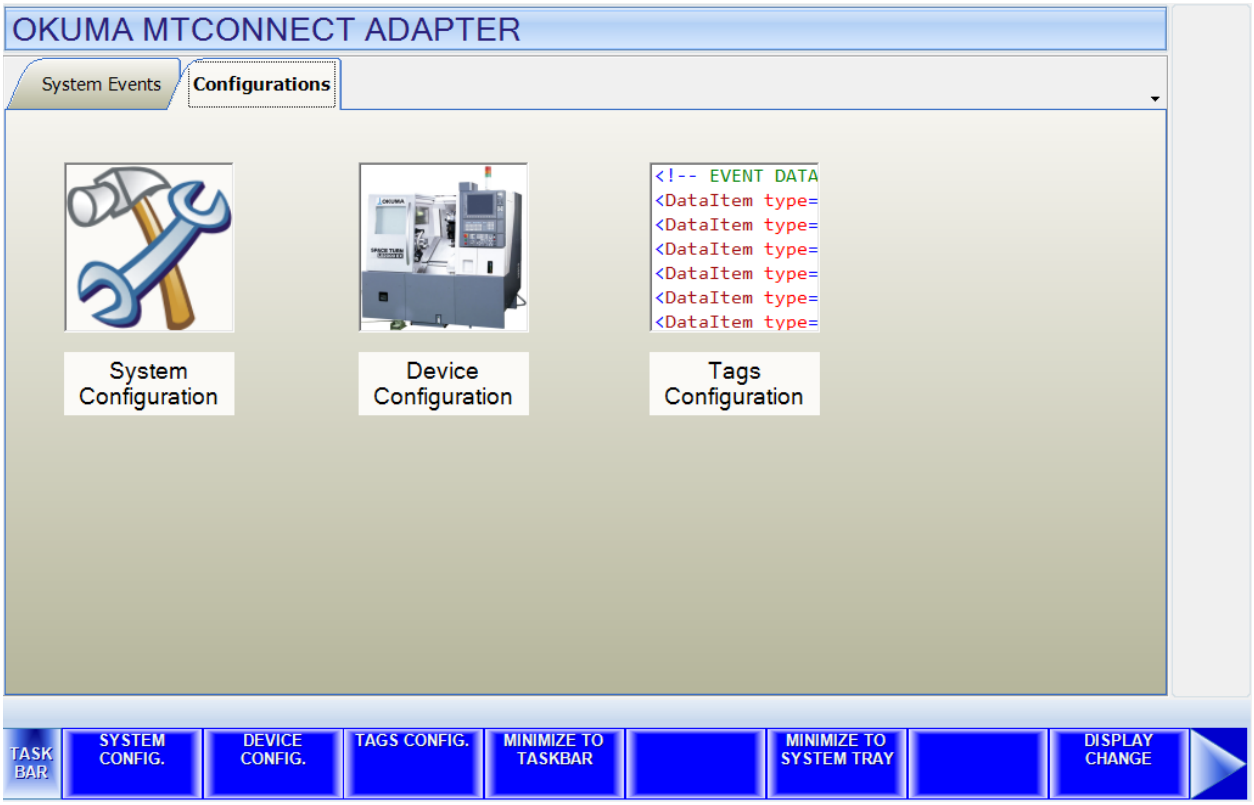
By double clicking on the event message in each row, a message box will be displayed contained the message in the current selected row.

Note: Error happened during initializing or applying new system configuration must be resolved in System Configuration.

5.3.2 *Configurations*

This tab provides configurations for the application.

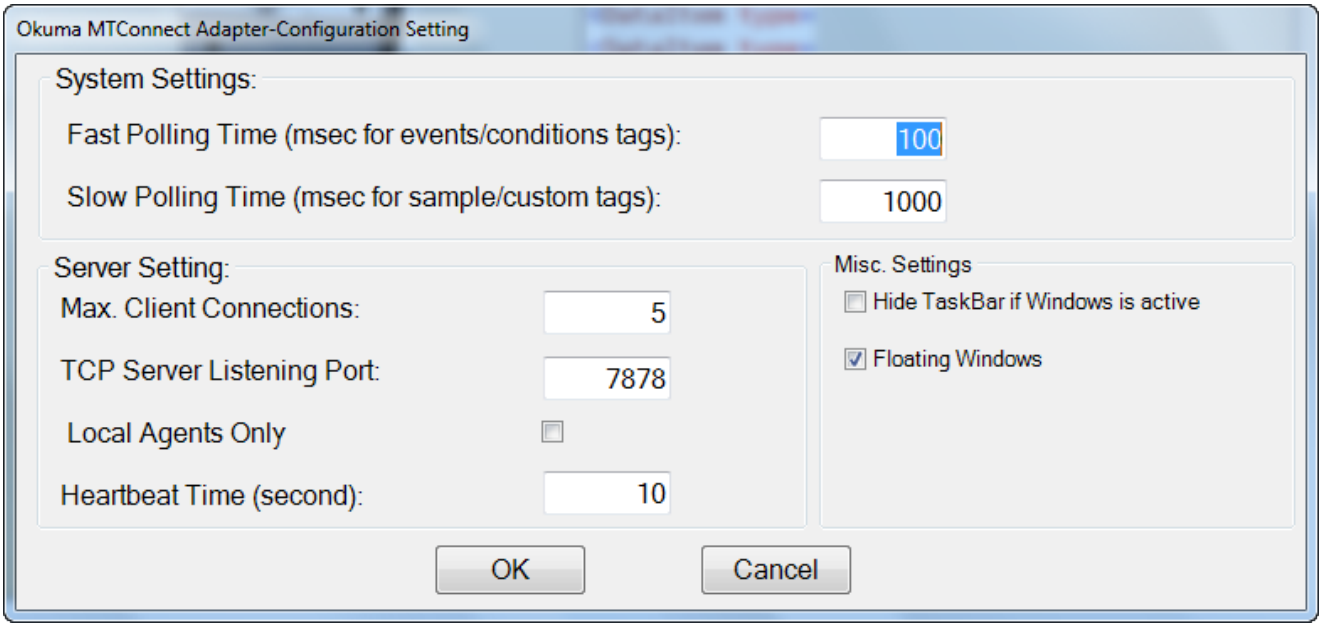
Notes: Any change in the System or Device Configuration might update the Devices.xml file, accordingly and requires updating agent configuration file.



It contains a menu bar as shown. The menu item can be activated by clicking on it or pressing the correspond F Key.

5.3.2.1 System Config. Menu

This configuration allows user to configure different settings for the application. Upon completion of configuration, the system will try to re-initialize completely with new configuration. It requires an administrative level to perform. The system will verify the input user name and password before allowing user to save the configuration.



- Fast Polling Time: The default value is 100 msec for fast polling interval. All event and conditional data items are monitored using fast polling time.
- Slow Polling Time: The default value is 1000 msec for slow polling interval. All sample and custom data items are monitored using slow polling time.
- Max. Client Connections: Number of agents can connect to this Adapter. Default value is 5 agents.
- TCP Server Listening Port: The port number where it is listening for incoming connection of agents. Default value is 7878.
- Local Agents Only: By checking, it only accepts agents running on local machine.
- Heartbeat Time: The numbers of seconds the adapter will send a message back to the connected agent when it received a ping from the connected server.
- Hide Taskbar if Windows is active: If it is enabled it will hide Windows Taskbar when application is active.
- Floating Windows: If it is enabled it will allow the application to freely move around.

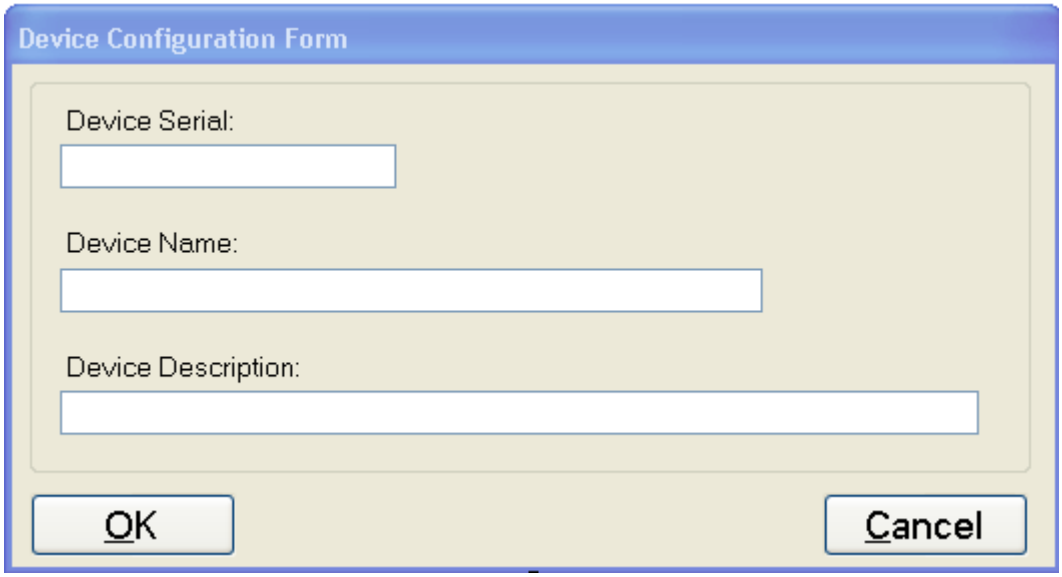
In normal operation, only user with administrative right can perform this operation.

Note: All current agents must connect to the OKUMA MTConnect Adapter again after system configuration is changed.

5.3.2.2 Device Config. Menu

This configuration allows user to set MTConnect device configuration for the application. Upon completion of device configuration, the system will try to re-initialize completely with new configuration. It requires an administrative level to perform. The system will verify the input user name and password before allowing user to save the configuration.

Note: The system configuration must have been configured first before Device Configuration is allowed. It is based the current Devices.xml configuration file of current machine specification.



This dialog provides custom setup for Okuma MTConnect Adapter.

1/ Device Information:

- Device Name: Name of machine or device name as specified in device.xml.
- Device Serial Number: Unique machine number
- Device Description: A description of this machine

2/ OK button:

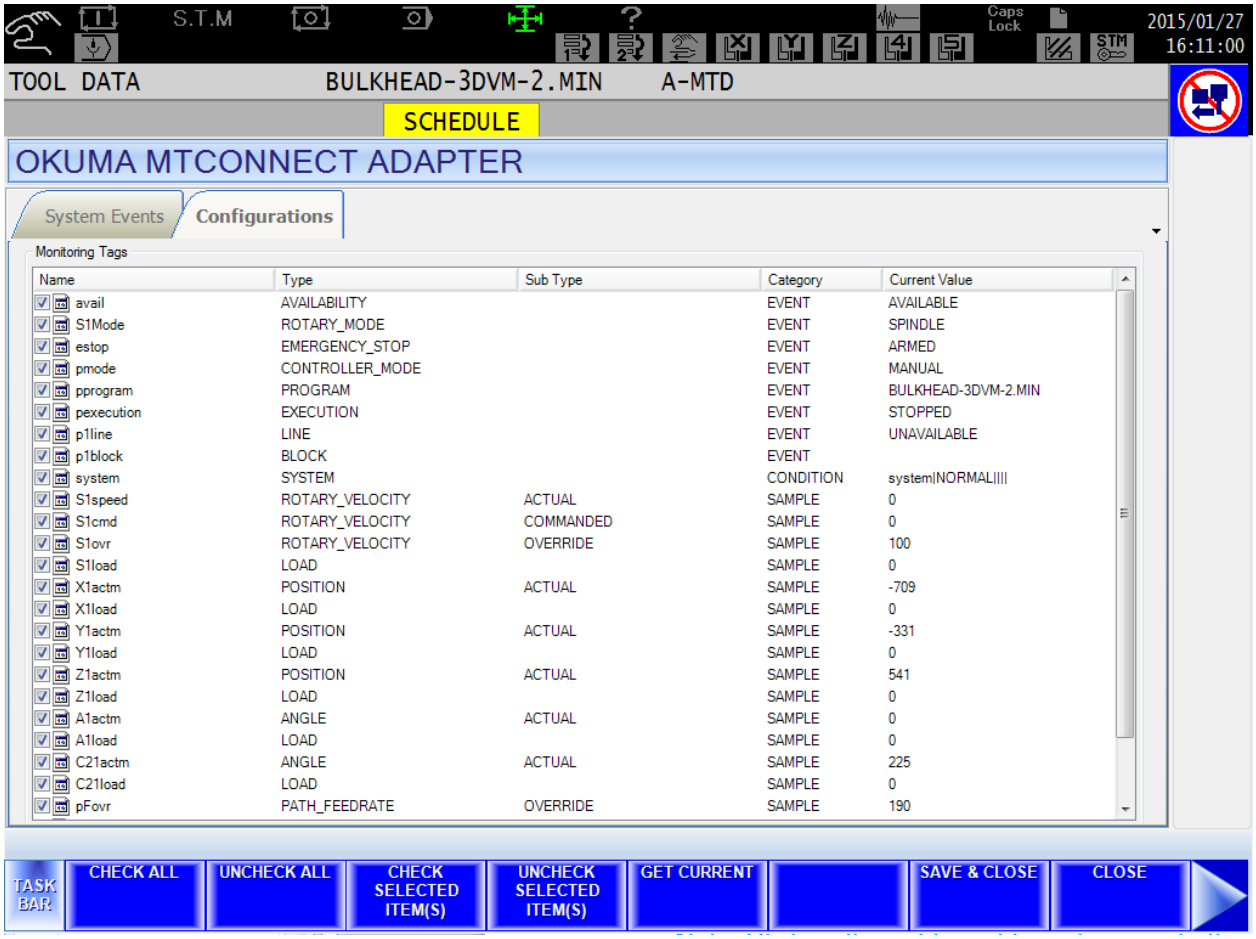
The system will save current setting and update Devices.xml accordingly.
In normal operation, only user with administrative right can perform this operation.

3/ Cancel Button:

This will cancel current installation.

Note: All current agents must connect to the OKUMA MTConnect Adapter again after system configuration.

5.3.2.3 Tags Config. Menu



5.3.2.3.1 Monitoring Tags Configuration

This configuration allows user to specify which data items to be monitored or not. By default, all data items are selected or enabled for monitoring.

Any tag is not checked or not monitored will be reported as UNAVAILABLE from agent.

5.3.2.3.1.1 Check All

Check all data items in the list

5.3.2.3.1.2 UnCheck All

UnCheck all data items in the list

5.3.2.3.1.3 Check Selected Item(s)

Check selected data items in the list

5.3.2.3.1.4 UnCheck Selected Item(s)

UnCheck selected data items in the list

5.3.2.3.1.5 Get Current

Update value of all data items in the list that are currently monitoring in the system

5.3.2.3.1.6 Save & Close

Save current setting and apply the new setting

5.3.2.3.1.7 Close

Close dialog without saving current setting

5.3.2.4 Minimize To Taskbar Menu

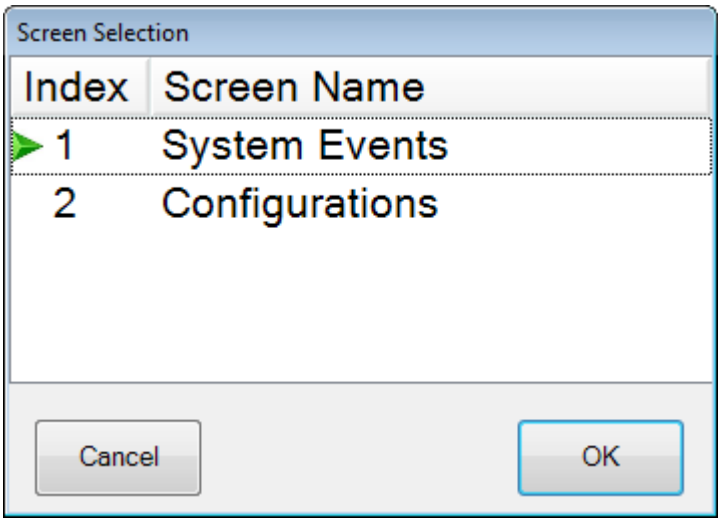
When this menu item is activated, the main user interface is hidden and the icon for this application is immunized to system task bar.

5.3.2.5 System Tray Menu

When this menu item is activated, the main user interface is hidden and the icon for this application is shown in the system tray of windows task bar.

5.3.2.6 Display Change Menu

When this menu is activated, the system will display a dialog that allows user to switch to other tabs



5.3.3 *Components/Data Items*

The components and data items that can be supported by this adapter are described in the Devices.xml configuration file.

Note: This file is only created once OKUMA MTConnect Adapter runs without error.
Refer to section MTConnect Tags for more information

5.3.3.1 Data Items

The system will monitor all data items listed in Devices.xml per machine configuration and sends out only the data items having value being changed and being configured for monitoring to the connected agents.

Any agent first connects to the system will receive all data items values.

5.3.4 *Agent & Adapter Communication*

This adapter will send data to the connected MTConnect agents using socket in a pipe (|) delimited stream according to the descriptions given in the adapter guide by MTConnect.

The agent can be configured to run on the same PC where the adapter running or on a remote PC.

It is up to the end user to configure the agent configuration file and adapter communication channel for local or network connection.

Each time an agent is connected or disconnected a message will be displayed in the system event.

There are schemas of MTConnect included in the installation folder if needed by client applications. The OSP-P control does not natively include a compatible HTTP application for capturing the agent xml stream.
Any web browser can be used to obtain data outputted from agent.

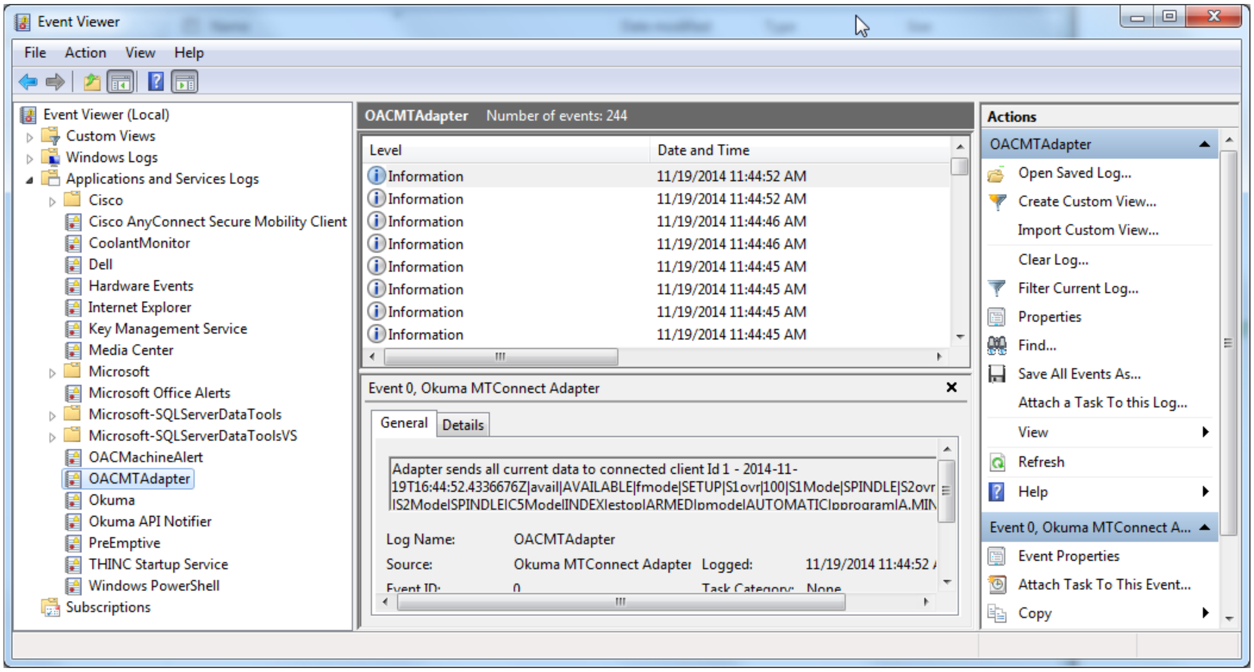
6. Event Log

6.1 Error Event Log

The error information for the application is logged in the Windows event log which user can read from windows system 'Event Viewer'. The source for this event log is 'Okuma MT Connect Adapter'.

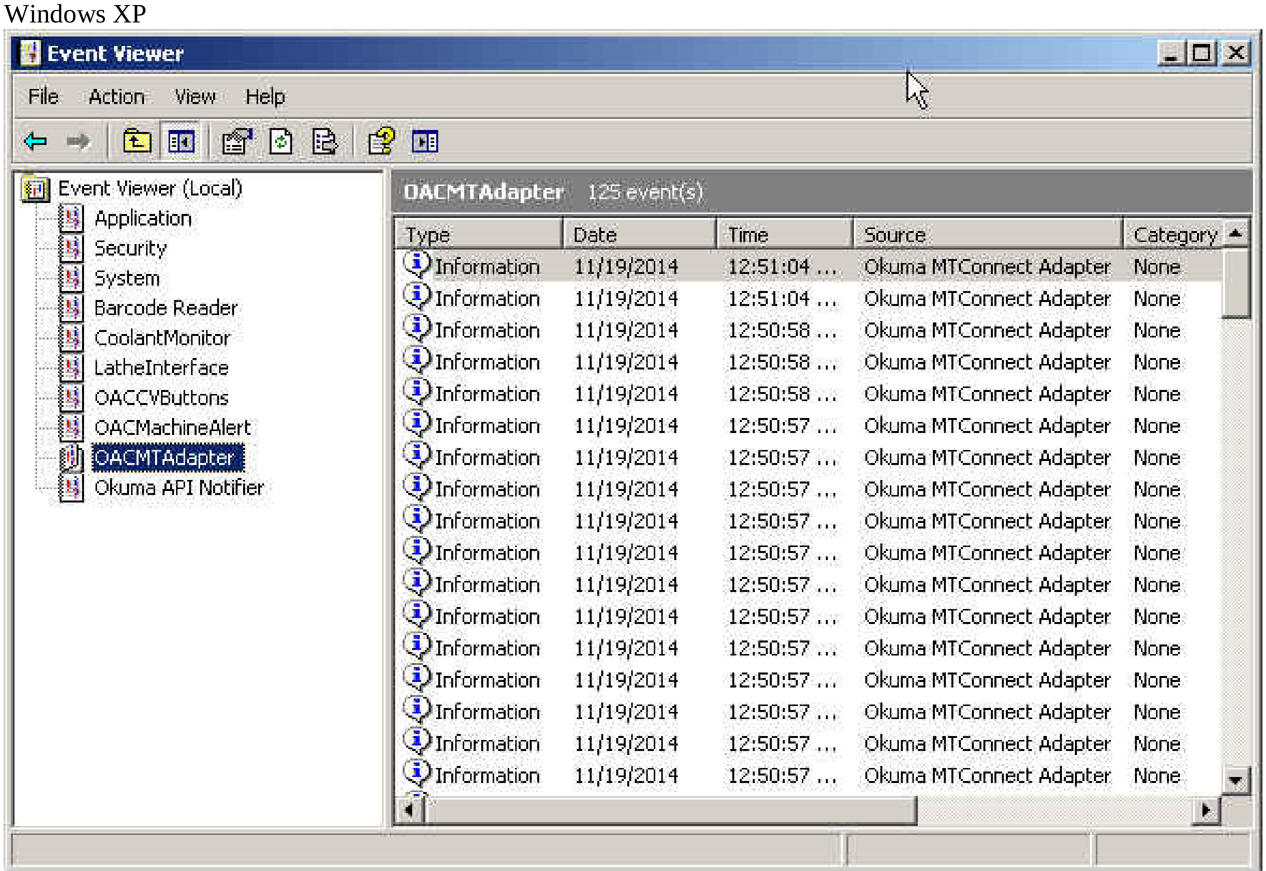
To view the event log, press 'Ctrl + ' on the operation panel to pop up Start Menu, then click 'Settings' → 'Control Panel' → 'Administrative Tools' → 'Event Viewer' to launch windows event viewer, click 'OACMTAdapter' under 'Event Viewer (Local)' to see a list of events logged for Okuma MTConnect Adapter application. To see the detail of each event, double click the event item.

Windows 7



Event Viewer
Event Viewer (Local)
Custom Views
Windows Logs
Applications and Services Logs
OACMTAdapter
OACMTAdapter Number of events: 244
Level
Date and Time
Information
11/19/2014 11:44:52 AM
Event 0, Okuma MTConnect Adapter
Adapter sends all current data to connected client Id 1 - 2014-11-
19T16:44:52.4336676Z|avail|AVAILABLE|fmode|SETUP|S1ovr|100|S1Mode|SPINDLE|S2ovr
Log Name: OACMTAdapter
Source: Okuma MTConnect Adapter
Actions

Windows XP

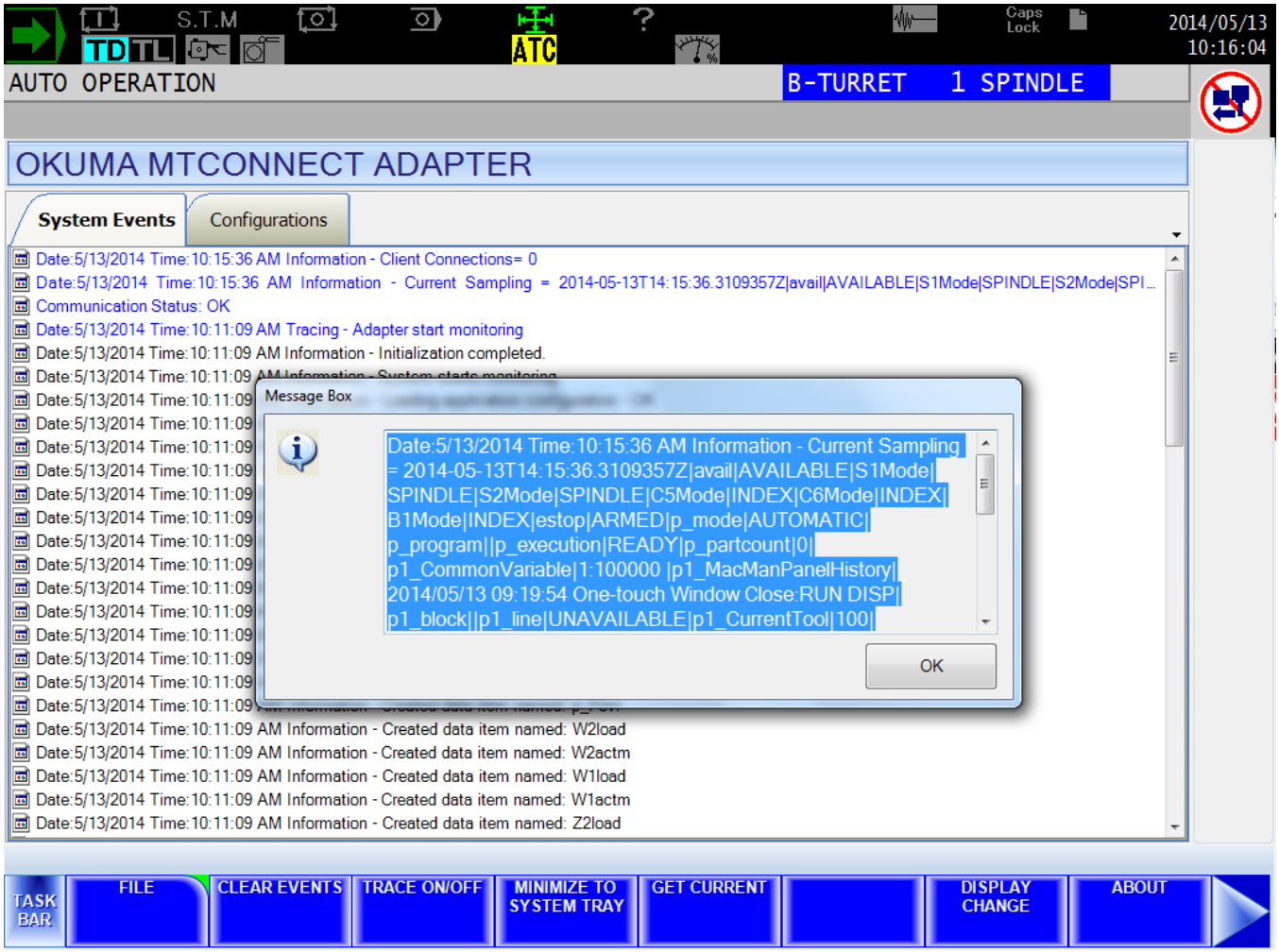


Event Viewer
Event Viewer (Local)
Application
Security
System
Barcode Reader
CoolantMonitor
LatheInterface
OACCVButtons
OACMachineAlert
OACMTAdapter
Okuma API Notifier
OACMTAdapter 125 event(s)
Type
Date
Time
Source
Category
Information
11/19/2014
Okuma MTConnect Adapter
None

7. Trouble Shooting

By default, the system will write event messages to the main user interface. If the 'Trace On' menu is checked, all messages will be displayed on the main user interface, otherwise only pre-selected event messages by the system will be displayed.

Note: When the Trace On menu is enabled, all process states monitored in the system will be displayed on the event message tab when the states are changed as shown:



7.1 Common Errors

7.1.1 *OKUMA MTConnect Adapter application failed to start correctly*

OKUMA MTConnect Adapter does use THINC-API libraries to collect machine data.

Probable faulty locations:

- Older version of THINC-API is installed on control
- Invalid THINC-API license file for this particular machine serial number
- THINC-API License is expired
- NC is not started or not fully started yet
- OKUMA MTConnect Adapter started before THINC-API is ready

Measure to take:

- Install the required or higher version of THINC-API on control
- Install the correct THINC-API disk per machine serial
- Ensure that OKUMA MTConnect Adapter is registered with Startup Service so it can be started after THINC-API is ready.

Please refer to section THINC-API and Setup Okuma MTConnect Adapter Software to Startup Automatically for more information

7.1.2 *MTConnect client applications cannot get machine data from running Agent*

7.1.2.1 Incorrect Device Name

Probable faulty locations:

- MTConnect device name is case-sensitive.
- MTConnect device name have been changed in the devices.xml file

Measure to take:

- Check Devices.xml file for correct device name

Refer to section Verifying Agent and Adapter Connectivity for more information

7.1.2.2 Incorrect Port Number

Probable faulty locations:

- By default, agent is running on port 5000
- Agent port number has been changed in agent.cfg file

Measure to take:

- Ensure that client application uses the port number specified in agent.cfg file
- Check network configuration for allowing connection with current setting port number in agent configuration file

Refer to section Installation and Configuration of MTConnect Adapter for more information

7.1.2.3 Network issues

Probable faulty locations:

- Firewall is enabled on remote PC where agent is running

Measure to take:

- Disable Firewall on remote PC

Note: End-user is responsible for setting proper network connection and security to allow exchanging data between entities according to MTConnect specification.

7.1.3 *Unable to perform Device Configuration/Tag Configuration*

In order to perform these configurations, the application must be able to connect to NC. The adapter will create and configure the Devices.xml once it can connect to NC without error on its first run.

Probable faulty locations:

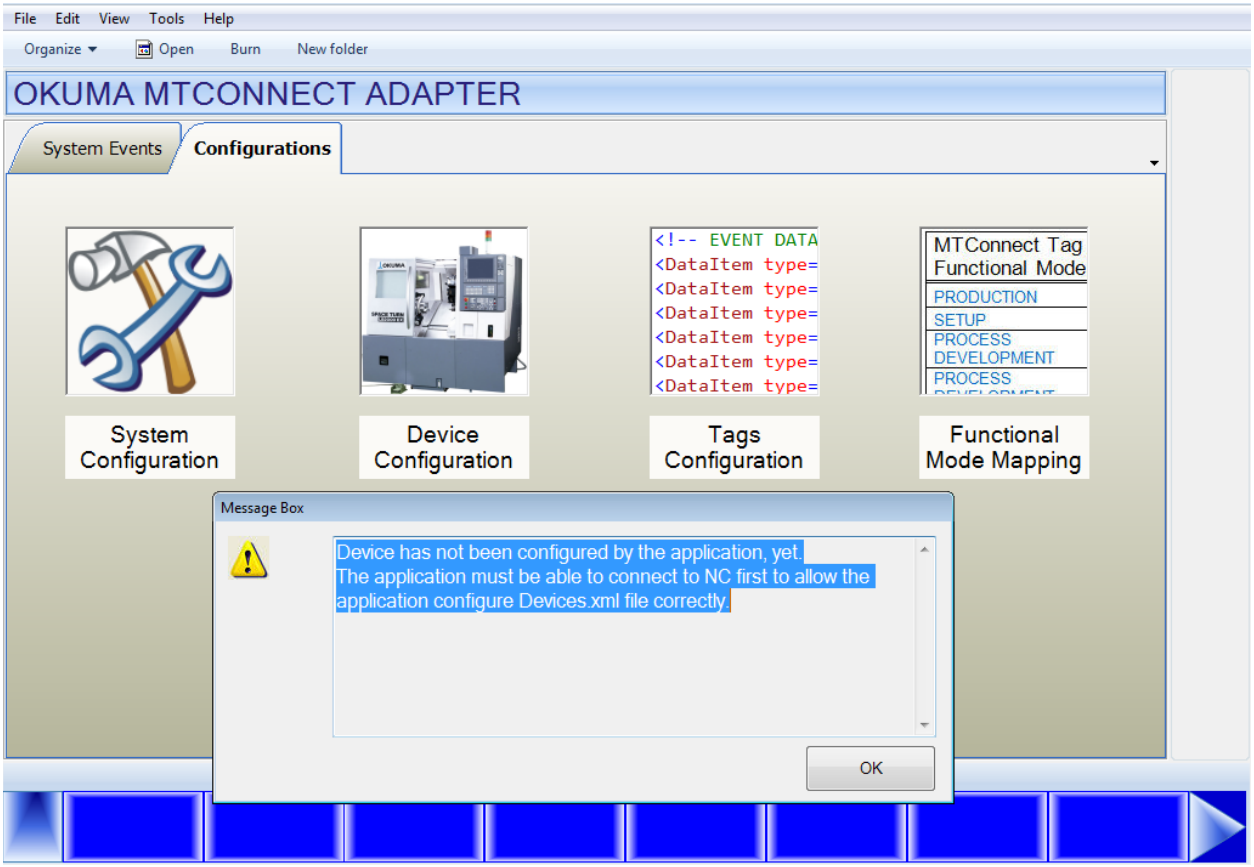
- Devices.xml file is not available yet due to NC is not running yet
- THINC-API is not installed on target machine or does not run correctly

- NC is not started yet

Measure to take:

- Ensure the required version or higher version of THINC-API is installed on target machine
- Ensure that Startup Service is installed on target machine
- Registered Okuma MTConnect Adapter with Startup Service to allow the adapter to start after NC is fully
- Ensure that adapter runs without error.

Please refer to section THINC-API and Setup Okuma MTConnect Adapter Software to Startup Automatically for more information



7.1.4 *Unable to install MTConnect Agent as Windows Service*

Installing agent as Windows service requires 2 files to be existed. One is agent.cfg for MTConnect Agent application, the other is Devices.xml which is specified in agent.cfg file.
Devices.xml is generated automatically when OKUMA MTConnect Adapter first runs on target machine without error.

Probable faulty locations:

- Devices.xml file does not exist
- Agent.cfg file does not exist
- Required administrator privilege in Windows 7

Measure to take:

- Registered Okuma MTConnect Adapter with Startup Service to allow the adapter to start after NC is fully started so it can generated and configure Devices.xml file correctly.
- Verify if agent configuration has correct device file name such as Devices.xml
- If installing agent in Windows 7, it is necessary to run the bat file named RunAgentAsService.bat under administrator account.

Refer to section Installation and Configuration of MTConnect Agent for more information

7.1.5 *No communication between running MTConnect agent and OKUMA MTConnect adapter*

Once adapter is running it will listen for incoming connection from agent. Once an agent is connected the adapter will send first initial message to agent and display a message on System Event screen.
If both agent and adapter are running but no data is sending then it probably is the setting in the configuration of agent and adapter is not matched.

Probable faulty locations:

- Adapter port number specified Adapter System configuration
- Adapter port number specified Agent configuration file, agent.cfg

Measure to take:

- Check port number in adapter and agent configuration. Default port number is 7878
- Re-start agent service from Windows Services
- Ensure that adapter is running without error

Refer to section Installation and Configuration of MTConnect Adapter for more information

7.1.6 *OKUMA MTConnect Adapter Not Running*

In order for adapter to run automatically after NC is fully started, it is necessary to register the application with Startup Service.
By default, it is registered with Startup Service during setup.

Probable faulty locations:

- Startup Service is not running
- Adapter is not registered with Startup Service

Measure to take:

- Ensure that THINC-API is running without error.
- Re-start Startup Service from Windows Service
- Register MTConnect Adapter with Startup Service

Refer to section Setup Okuma MTConnect Adapter Software to Startup Automatically for more information

7.1.7 *MTConnect Agent Not Running*

Agent is installed as Windows service by default. It is necessary to re-start the machine to allow agent service to run automatically when Windows is started.
When agent is started the following files must be available:

Devices.xml
Agent.cfg

Probable faulty locations:

- Agent.exe is missing
- Agent.exe is note registered as Windows Service yet
- Devices.xml is missing
- Agent.cfg is missing
- Machine has not been rebooted yet
- Invalid devices.xml file
- Invalid agent.cfg file

Measure to take:

- Ensure that devices.xml can be opened in any web browser without error
- Ensure that agent.cfg is configured with correct syntax. Please see README.pdf for detail information
- Ensure that agent service is configured to start automatically
- Re-install MTConnect Adapter on target machine

Refer to section Installation and Configuration of MTConnect Agent for more information

7.1.8 *Agent reports UNAVAILABLE in all tags*

Initially, agent will report UNAVAILABLE to all tags when it first started. Once agent is running it will try to connect with adapter at the specified host and port number. If adapter is running and agent can connect with it adapter will first send current value of all tags to the connected agent.

Probable faulty locations:

- Mismatch adapter port number specified in agent.cfg and adapter's system configuration
- Adapter is not running
- Adapter is running but in error state
- Tags are not configured for monitoring by adapter

Measure to take:

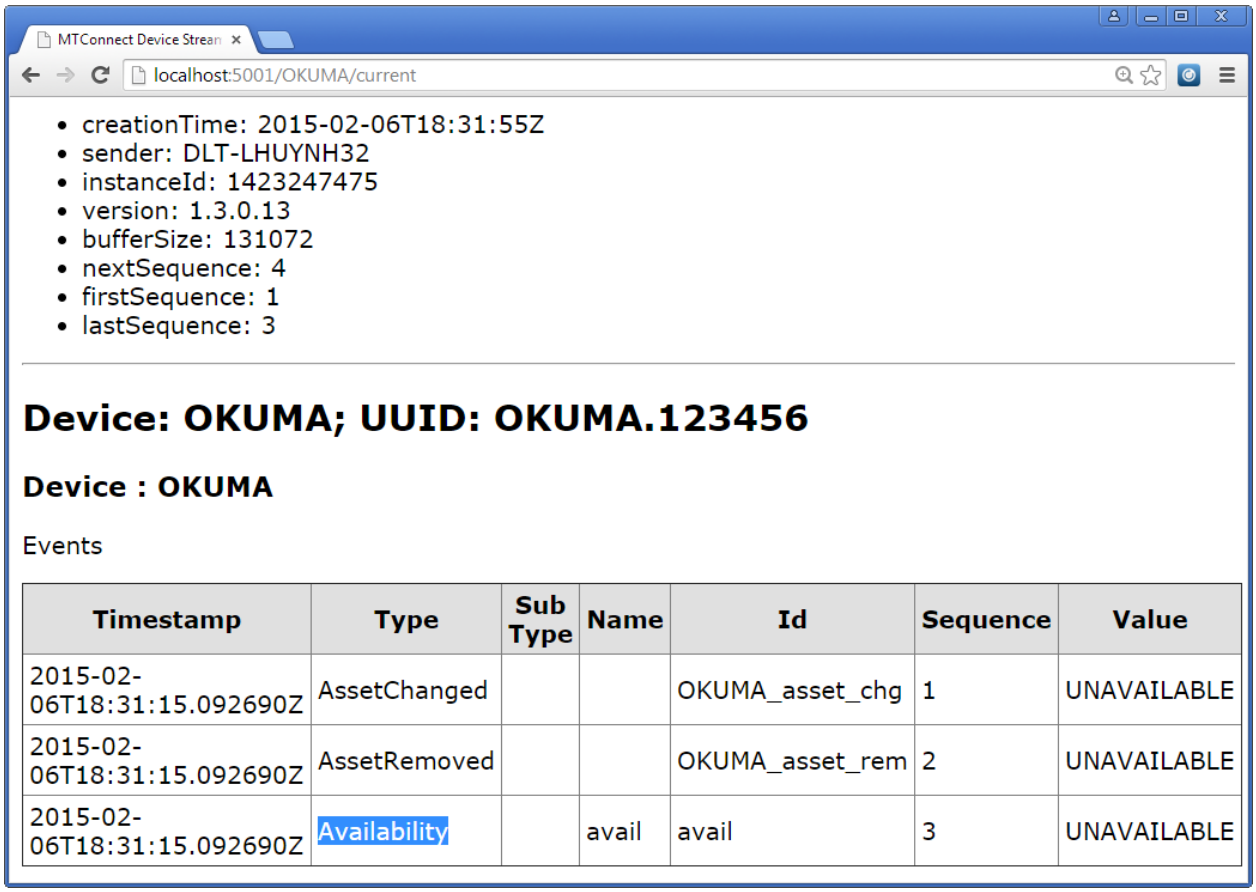
- Check port number in adapter and agent configuration. Default port number is 7878
- Ensure that adapter is running without error
- Ensure tags are configured for monitoring by adapter. Tags are not monitoring will report as UNAVAILABLE.

Refer to section Tags Config. Menu, Installation and Configuration of MTConnect Adapter, and Verifying Agent and Adapter Connectivity for more information

7.1.9 *Agent reports only **Availability** tag*

After installing adapter and agent, agent service will run automatically when machine is rebooted. Agent reports tags defined in devices.xml file. Initially, the devices.xml will have default tags only and will be configured per machine specification after adapter is running without error. As a result, agent can report default tags only before adapter is running as shown below:

Note: By default, agent will wait for about 5 seconds or so before reloading the devices.xml or agent.cfg file if they are changed.



Probable faulty locations:

- Devices.xml file has not been configured by adapter yet

Measure to take:

- Ensure that adapter is running without error

Refer to section Installation and Configuration of MTConnect Adapter and Verifying Agent and Adapter Connectivity for more information

7.1.10 *Agent reports UNAVAILABLE in some tags*

Probable faulty locations:

- Name of tags defined in Devices.xml has been changed
- Tags have been unchecked in the Tags Configuration dialog

Measure to take:

- Ensure tags have been checked in Tags Configuration dialog
- Ensure name of tags displayed int Tags Configuration dialog are the same in devices.xml

Refer to section Tags Config. Menu for more information
Note: Devices.xml file should not be modified by any application.

8. MTConnect Tags

All standard and custom tags are listed in the following files per machine type:

Standard Lathe: LatheDevices.xml
Dual Side Lathe: Lathe2SPDevices.xml
Machining Center: MCDevices.xml

At run time the actual number of tags can be supported per machine specification will be changed and will be stored in Devices.xml file to be consumed by MTConnect agent.

Note: MTConnect Adapter does use tags information defined in Devices.xml file. By no means, the Devices.xml is modified directly by any other applications.

8.1 Standard Lathe Tags

```
<?xml version='1.0' encoding='UTF-8'?>
<MTConnectDevices
xmlns:mt='urn:mtconnect.org:MTConnectDevices:1.2'
xmlns:xsi='http://www.w3.org/2001/XMLSchema-instance'
xmlns='urn:mtconnect.org:MTConnectDevices:1.2'
xsi:schemaLocation='urn:mtconnect.org:MTConnectDevices:1.2 ./schemas/MTConnectDevices_1.2.xsd'>
  <Header creationTime='2013-04-02T03:40:04Z' assetBufferSize='1024' sender='localhost' assetCount='0'
version='1.2' instanceId='1' bufferSize='131072'/>
  <Devices>
    <Device  uuid="OKUMA.Lathe.123456" name="OKUMA.Lathe" sampleInterval="100.0" id="Ldev1">
      <Description manufacturer="OKUMA" serialNumber="123456">
        Okuma MTConnect Adapter - Lathe
      </Description>
      <DataItems>
        <DataItem category="EVENT" id="Lavail" name ="avail" type="AVAILABILITY" />
      </DataItems>
      <Components>
        <Axes  name="Axes" id="Laxes1">
          <Components>
            <!-- Main Spindle-->
            <Rotary name="C1" nativeName="S1" id="Lc1" >
              <DataItems>
                <DataItem type="ROTARY_VELOCITY" category="SAMPLE" name="S1speed"
                subType="ACTUAL" units="REVOLUTION/MINUTE" nativeUnits="REVOLUTION/MINUTE" id="LS1speed"/>
                <DataItem type="ROTARY_VELOCITY" category="SAMPLE" name="S1cmd"
                subType="COMMANDED" units="REVOLUTION/MINUTE" nativeUnits="REVOLUTION/MINUTE" id="LS1cmd"/>
                <DataItem type="LOAD" category="SAMPLE" name="S1load"
                        units="PERCENT" nativeUnits="PERCENT" id="LS1load"/>
                <DataItem category="EVENT" id="LS1Mode" name="S1Mode" type="ROTARY_MODE">
                  <Constraints>
                    <Value>SPINDLE</Value>
                  </Constraints>
                </DataItem>
              </DataItems>
            </Rotary>
            <!-- Second Spindle - no spindle load-->
            <Rotary name="C2" nativeName="S2" id="Lc2" >
              <DataItems>
                <DataItem type="ROTARY_VELOCITY" category="SAMPLE" name="S2speed"
                subType="ACTUAL" units="REVOLUTION/MINUTE" nativeUnits="REVOLUTION/MINUTE" id="LS2speed"/>
                <DataItem type="ROTARY_VELOCITY" category="SAMPLE" name="S2cmd"
                subType="COMMANDED" units="REVOLUTION/MINUTE" nativeUnits="REVOLUTION/MINUTE" id="LS2cmd"/>
                <DataItem category="EVENT" id="LS2Mode" name="S2Mode" type="ROTARY_MODE">
                  <Constraints>
                    <Value>SPINDLE</Value>
                  </Constraints>
                </DataItem>
```

```
            </DataItems>
          </Rotary>
          <!-- Main Spindle function as C/CA-axis-->
          <Rotary name="C5" nativeName="CA" id="Lc5" >
            <DataItems>
              <DataItem type="ANGLE" subType="ACTUAL"  category="SAMPLE"
                name="C5actm" units="DEGREE" nativeUnits="DEGREE" coordinateSystem="MACHINE" id="LC5actm"/>
              <DataItem type="LOAD"  category="SAMPLE" name="C5load"
               units="PERCENT" nativeUnits="PERCENT" id="LC5load"/>
              <DataItem category="EVENT" id="LC5Mode" name="C5Mode" type="ROTARY_MODE">
                <Constraints>
                  <Value>INDEX</Value>
                </Constraints>
              </DataItem>
            </DataItems>
          </Rotary>
          <!-- Main Spindle function as CB-axis-->
          <Rotary name="C6" nativeName="CB" id="Lc6" >
            <DataItems>
              <DataItem type="ANGLE" subType="ACTUAL"  category="SAMPLE"
                name="C6actm" units="DEGREE" nativeUnits="DEGREE" coordinateSystem="MACHINE" id="LC6actm"/>
              <DataItem type="LOAD"  category="SAMPLE" name="C6load"
               units="PERCENT" nativeUnits="PERCENT" id="LC6load"/>
              <DataItem category="EVENT" id="LC6Mode" name="C6Mode" type="ROTARY_MODE">
                <Constraints>
                  <Value>INDEX</Value>
                </Constraints>
              </DataItem>
            </DataItems>
          </Rotary>
          <!-- B Axis -->
          <Rotary name="B1" nativeName="BA" id="Lb1" >
            <DataItems>
              <DataItem type="ANGLE" subType="ACTUAL"  category="SAMPLE"
                name="B1actm" units="DEGREE" nativeUnits="DEGREE" coordinateSystem="WORK" id="LB1actm"/>
              <DataItem type="LOAD"  category="SAMPLE" name="B1load"
               units="PERCENT" nativeUnits="PERCENT" id="LB1load"/>
              <DataItem category="EVENT" id="LB1Mode" name="B1Mode" type="ROTARY_MODE">
                <Constraints>
                  <Value>INDEX</Value>
                </Constraints>
              </DataItem>
            </DataItems>
          </Rotary>
          <!-- Standard Linear X axis respect to A turret-->
          <Linear name="X1" nativeName="XA" id="Lx1" >
            <DataItems>
              <DataItem type="POSITION" subType="ACTUAL"  category="SAMPLE"
                name="X1actm" units="MILLIMETER" nativeUnits="MILLIMETER" coordinateSystem="MACHINE"
id="LX1actm"/>
              <DataItem type="LOAD"  category="SAMPLE" name="X1load"
               units="PERCENT" nativeUnits="PERCENT" id="LX1load"/>
            </DataItems>
          </Linear>
          <!-- Standard Linear X axis respect to B turret-->
          <Linear name="X2" nativeName="XB" id="Lx2" >
            <DataItems>
              <DataItem type="POSITION" subType="ACTUAL"  category="SAMPLE"
                name="X2actm" units="MILLIMETER" nativeUnits="MILLIMETER" coordinateSystem="MACHINE"
id="LX2actm"/>
              <DataItem type="LOAD"  category="SAMPLE" name="X2load"
               units="PERCENT" nativeUnits="PERCENT" id="LX2load"/>
            </DataItems>
          </Linear>
          <!-- Standard Linear Z axis respect to A turret-->
          <Linear  name="Z1" nativeName="ZA"  id="Lz1">
            <DataItems>
              <DataItem type="POSITION" subType="ACTUAL" category="SAMPLE"
                name="Z1actm" units="MILLIMETER" nativeUnits="MILLIMETER" coordinateSystem="MACHINE"
id="LZ1actm" />
```

```
                <DataItem type="LOAD"  category="SAMPLE" name="Z1load"
                units="PERCENT" nativeUnits="PERCENT" id="LZ1load"/>
              </DataItems>
            </Linear>
            <!-- Standard Linear Z axis respect to B turret-->
            <Linear  name="Z2" nativeName="ZB" id="Lz2">
              <DataItems>
                <DataItem type="POSITION" subType="ACTUAL" category="SAMPLE"
                  name="Z2actm" units="MILLIMETER" nativeUnits="MILLIMETER" coordinateSystem="MACHINE"
id="LZ2actm" />
                <DataItem type="LOAD"  category="SAMPLE" name="Z2load"
                units="PERCENT" nativeUnits="PERCENT" id="LZ2load"/>
              </DataItems>
            </Linear>
            <!-- Optional Linear W axis respect to A Turret-->
            <Linear  name="Z4" nativeName="WA" id="Lz4">
              <DataItems>
                <DataItem type="POSITION" subType="ACTUAL" category="SAMPLE"
                  name="Z4actm" units="MILLIMETER" nativeUnits="MILLIMETER" coordinateSystem="MACHINE"
id="LZ4actm" />
                <DataItem type="LOAD"  category="SAMPLE" name="Z4load"
                units="PERCENT" nativeUnits="PERCENT" id="LZ4load"/>
              </DataItems>
            </Linear>
            <!-- Optional Linear W axis respect to B Turret-->
            <Linear  name="Z5" nativeName="WB" id="Lz5">
              <DataItems>
                <DataItem type="POSITION" subType="ACTUAL" category="SAMPLE"
                  name="Z5actm" units="MILLIMETER" nativeUnits="MILLIMETER" coordinateSystem="MACHINE"
id="LZ5actm" />
                <DataItem type="LOAD"  category="SAMPLE" name="Z5load"
                units="PERCENT" nativeUnits="PERCENT" id="LZ5load"/>
              </DataItems>
            </Linear>
          </Components>
        </Axes>
        <Controller  name="Controller" id="Lct1">
            <DataItems>
              <DataItem type="EMERGENCY_STOP" name="estop" category="EVENT" id="Lestop" />
              <DataItem type="SYSTEM" category="CONDITION" id="Lsystem" name="system" />

              <DataItem type="CONTROLLER_MODE" name="pmode" category="EVENT" id="Lpmode"/>
              <DataItem freq="10" type="PROGRAM" name="pprogram" category="EVENT" id="Lpprogram"/>
              <DataItem type="EXECUTION" name="pexecution" category="EVENT" id="Lpexecution"/>
              <DataItem type="PATH_FEEDRATE"  subType="OVERRIDE" name="pFovr" category="SAMPLE"
                        units="PERCENT"  nativeUnits="PERCENT" id="LpFovr" />
            </DataItems>

          <Components>
              <!-- Path 1 related to upper A turret-->
              <Path id="Lp1" name="path">
                <DataItems>
                  <DataItem type="PATH_FEEDRATE" subType="ACTUAL" name="p1Fact" category="SAMPLE" id="Lp1Fact"
units="MILLIMETER/SECOND" nativeUnits="MILLIMETER/MINUTE" />
                  <DataItem type="BLOCK" name="p1block"  category="EVENT" id="Lp1block"/>
                <DataItem type="LINE" name="p1line" category="EVENT" id="Lp1line"/>
                <DataItem type="PATH_FEEDRATE" subType="COMMANDED" name="p1Fcmd" category="SAMPLE" id="Lp1Fcmd"
                          units="MILLIMETER/SECOND" nativeUnits="MILLIMETER/MINUTE" />
                  <DataItem type="PATH_POSITION" name="p1LPathPos" category="SAMPLE" units="MILLIMETER_3D"
nativeUnits="MILLIMETER_3D" coordinateSystem="WORK" id="Lp1LPathPos" />
                </DataItems>
              </Path>
              <!-- Path 2 related to lower B turret-->
              <Path id="Lp2" name="path2">
                <DataItems>
                  <DataItem type="PATH_FEEDRATE" subType="ACTUAL" name="p2Fact" category="SAMPLE" id="Lp2Fact"
units="MILLIMETER/SECOND" nativeUnits="MILLIMETER/MINUTE" />
                  <DataItem type="BLOCK" name="p2block"  category="EVENT" id="Lp2block"/>
                   <DataItem type="LINE" name="p2line" category="EVENT" id="Lp2line"/>
                  <DataItem type="PATH_FEEDRATE" subType="COMMANDED" name="p2Fcmd" category="SAMPLE" id="Lp2Fcmd"
```

```
                        units="MILLIMETER/SECOND" nativeUnits="MILLIMETER/MINUTE" />
                    <DataItem type="PATH_POSITION" name="p2LPathPos" category="SAMPLE" units="MILLIMETER_3D"
nativeUnits="MILLIMETER_3D" coordinateSystem="WORK" id="Lp2LPathPos" />
                  </DataItems>
                </Path>
              </Components>
            </Controller>
          </Components>
        </Device>
      </Devices>
</MTConnectDevices>
```

8.2 Two Sides Lathe Tags

```
<?xml version='1.0' encoding='UTF-8'?>
<MTConnectDevices
  xmlns:mt='urn:mtconnect.org:MTConnectDevices:1.2'
  xmlns:xsi='http://www.w3.org/2001/XMLSchema-instance'
  xmlns='urn:mtconnect.org:MTConnectDevices:1.2'
  xsi:schemaLocation='urn:mtconnect.org:MTConnectDevices:1.2 ./schemas/MTConnectDevices_1.2.xsd'>
  <Header creationTime='2013-04-02T03:40:04Z' assetBufferSize='1024' sender='localhost' assetCount='0'
version='1.2' instanceId='1' bufferSize='131072'/>
  <Devices>
    <Device  uuid="OKUMA.Lathe.123456" name="OKUMA.Lathe" sampleInterval="100.0" id="L2dev1">
      <Description manufacturer="OKUMA" serialNumber="123456">
        Okuma MTConnect Adapter - Lathe
      </Description>
      <DataItems>
        <DataItem category="EVENT" id="L2avail" name ="avail" type="AVAILABILITY" />
        <DataItem type="EMERGENCY_STOP" name="estop" category="EVENT" id="L2estop" />
      </DataItems>
      <Components>
        <Axes  name="Axes" id="L2axes1">
          <Components>
            <!-- R Spindle-->
            <Rotary name="C1" nativeName="S" id="L2c1" >
              <DataItems>
                <DataItem type="ROTARY_VELOCITY" category="SAMPLE" name="S1speed"
                subType="ACTUAL" units="REVOLUTION/MINUTE" nativeUnits="REVOLUTION/MINUTE" id="L2S1speed"/>
                <DataItem type="ROTARY_VELOCITY" category="SAMPLE" name="S1cmd"
                subType="COMMANDED" units="REVOLUTION/MINUTE" nativeUnits="REVOLUTION/MINUTE" id="L2S1cmd"/>
                <DataItem type="LOAD" category="SAMPLE" name="S1load"
                        units="PERCENT" nativeUnits="PERCENT" id="L2S1load"/>
                <DataItem category="EVENT" id="L2S1Mode" name="S1Mode" type="ROTARY_MODE">
                  <Constraints>
                    <Value>SPINDLE</Value>
                  </Constraints>
                </DataItem>
              </DataItems>
            </Rotary>
            <!-- L Spindle -->
            <Rotary name="C2" nativeName="S" id="L2c2" >
              <DataItems>
                <DataItem type="ROTARY_VELOCITY" category="SAMPLE" name="S2speed"
                subType="ACTUAL" units="REVOLUTION/MINUTE" nativeUnits="REVOLUTION/MINUTE" id="L2S2speed"/>
                <DataItem type="ROTARY_VELOCITY" category="SAMPLE" name="S2cmd"
                subType="COMMANDED" units="REVOLUTION/MINUTE" nativeUnits="REVOLUTION/MINUTE" id="L2S2cmd"/>
                <DataItem type="LOAD" category="SAMPLE" name="S2load"
        units="PERCENT" nativeUnits="PERCENT" id="L2S2load"/>
                <DataItem category="EVENT" id="L2S2Mode" name="S2Mode" type="ROTARY_MODE">
                  <Constraints>
                    <Value>SPINDLE</Value>
                  </Constraints>
                </DataItem>
              </DataItems>
            </Rotary>

            <!-- R Spindle function as C axis-->
            <Rotary name="C5" id="L2c5" >
              <DataItems>
```

```
                <DataItem type="ANGLE" subType="ACTUAL"  category="SAMPLE"
                  name="C5actm" units="DEGREE" nativeUnits="DEGREE" coordinateSystem="MACHINE" id="L2C5actm"/>
                <DataItem type="LOAD"  category="SAMPLE" name="C5load"
                 units="PERCENT" nativeUnits="PERCENT" id="L2C5load"/>
                <DataItem category="EVENT" id="L2C5Mode" name="C5Mode" type="ROTARY_MODE">
                  <Constraints>
                    <Value>INDEX</Value>
                  </Constraints>
                </DataItem>
              </DataItems>
            </Rotary>
            <!-- L Spindle function as C axis-->
            <Rotary name="C6" id="L2c6" >
              <DataItems>
                <DataItem type="ANGLE" subType="ACTUAL"  category="SAMPLE"
                  name="C6actm" units="DEGREE" nativeUnits="DEGREE" coordinateSystem="MACHINE" id="L2C6actm"/>
                <DataItem type="LOAD"  category="SAMPLE" name="C6load"
                 units="PERCENT" nativeUnits="PERCENT" id="L2C6load"/>
                <DataItem category="EVENT" id="L2C6Mode" name="C6Mode" type="ROTARY_MODE">
                  <Constraints>
                    <Value>INDEX</Value>
                  </Constraints>
                </DataItem>
              </DataItems>
            </Rotary>

            <!-- Standard Linear X axis respect to R side of machine-->
            <Linear name="X1" id="L2x1" >
              <DataItems>
                <DataItem type="POSITION" subType="ACTUAL"  category="SAMPLE"
                  name="X1actm" units="MILLIMETER" nativeUnits="MILLIMETER" coordinateSystem="MACHINE"
id="L2X1actm"/>
                <DataItem type="LOAD"  category="SAMPLE" name="X1load"
                 units="PERCENT" nativeUnits="PERCENT" id="L2X1load"/>
              </DataItems>
            </Linear>
            <!-- Standard Linear X axis respect  to L side of machine-->
            <Linear name="X2" id="L2x2" >
              <DataItems>
                <DataItem type="POSITION" subType="ACTUAL"  category="SAMPLE"
                  name="X2actm" units="MILLIMETER" nativeUnits="MILLIMETER" coordinateSystem="MACHINE"
id="L2X2actm"/>
                <DataItem type="LOAD"  category="SAMPLE" name="X2load"
                 units="PERCENT" nativeUnits="PERCENT" id="L2X2load"/>
              </DataItems>
            </Linear>
            <!-- Standard Linear Z axis respect to R side of machine-->
            <Linear  name="Z1" id="L2z1">
              <DataItems>
                <DataItem type="POSITION" subType="ACTUAL" category="SAMPLE"
                  name="Z1actm" units="MILLIMETER" nativeUnits="MILLIMETER" coordinateSystem="MACHINE"
id="L2Z1actm" />
                <DataItem type="LOAD"  category="SAMPLE" name="Z1load"
                units="PERCENT" nativeUnits="PERCENT" id="L2Z1load"/>
              </DataItems>
            </Linear>
            <!-- Standard Linear Z axis respect to L side of machine-->
            <Linear  name="Z2" id="L2z2">
              <DataItems>
                <DataItem type="POSITION" subType="ACTUAL" category="SAMPLE"
                  name="Z2actm" units="MILLIMETER" nativeUnits="MILLIMETER" coordinateSystem="MACHINE"
id="L2Z2actm" />
                <DataItem type="LOAD"  category="SAMPLE" name="Z2load"
                units="PERCENT" nativeUnits="PERCENT" id="L2Z2load"/>
              </DataItems>
            </Linear>
          </Components>
        </Axes>
        <Controller  name="Controller" id="L2ct1">
          <Components>
```

```
            <!-- Path 1 related to first machine side or R side-->
            <Path id="L2p1" name="path">
              <DataItems>
                <DataItem type="SYSTEM" category="CONDITION" id="L2p1system" name="p1system" />

                <DataItem type="CONTROLLER_MODE" name="p1mode" category="EVENT" id="L2p1mode"/>
                <DataItem type="EXECUTION" name="p1execution" category="EVENT" id="L2p1execution"/>
                <DataItem type="PATH_FEEDRATE"  subType="OVERRIDE" name="p1Fovr" category="SAMPLE"
                          units="PERCENT"  nativeUnits="PERCENT" id="L2p1Fovr" />
                <DataItem type="PATH_FEEDRATE" subType="ACTUAL" name="p1Fact" category="SAMPLE" id="L2p1Fact"
units="MILLIMETER/SECOND" nativeUnits="MILLIMETER/MINUTE" />
                <DataItem type="BLOCK" name="p1block"  category="EVENT" id="L2p1block"/>
                <DataItem type="PATH_FEEDRATE" subType="COMMANDED" name="p1Fcmd" category="SAMPLE" id="L2p1Fcmd"
                          units="MILLIMETER/SECOND" nativeUnits="MILLIMETER/MINUTE" />
                <DataItem type="PATH_POSITION" name="p1LPathPos" category="SAMPLE" units="MILLIMETER_3D"
nativeUnits="MILLIMETER_3D" coordinateSystem="WORK" id="L2p1LPathPos" />

              </DataItems>
            </Path>
            <!-- Path 2 on second machine side or L side-->
            <Path id="L2p2" name="path2">
              <DataItems>
                <DataItem type="SYSTEM" category="CONDITION" id="L2p2system" name="p2system" />

                <DataItem type="CONTROLLER_MODE" name="p2mode" category="EVENT" id="L2p2mode"/>
                <DataItem type="EXECUTION" name="p2execution" category="EVENT" id="L2p2execution"/>
                <DataItem type="PATH_FEEDRATE"  subType="OVERRIDE" name="p2Fovr" category="SAMPLE"
                          units="PERCENT"  nativeUnits="PERCENT" id="L2p2Fovr" />

                <DataItem type="PATH_FEEDRATE" subType="ACTUAL" name="p2Fact" category="SAMPLE" id="L2p2Fact"
units="MILLIMETER/SECOND" nativeUnits="MILLIMETER/MINUTE" />
                <DataItem type="BLOCK" name="p2block"  category="EVENT" id="L2p2block"/>
                <DataItem type="PATH_FEEDRATE" subType="COMMANDED" name="p2Fcmd" category="SAMPLE" id="L2p2Fcmd"
                          units="MILLIMETER/SECOND" nativeUnits="MILLIMETER/MINUTE" />
                <DataItem type="PATH_POSITION" name="p2LPathPos" category="SAMPLE" units="MILLIMETER_3D"
nativeUnits="MILLIMETER_3D" coordinateSystem="WORK" id="L2p2LPathPos" />

              </DataItems>
            </Path>
          </Components>
        </Controller>
      </Components>
    </Device>
  </Devices>
</MTConnectDevices>
```

8.3 Machining Center Tags

```
<?xml version='1.0' encoding='UTF-8'?>
<MTConnectDevices
  xmlns:mt='urn:mtconnect.org:MTConnectDevices:1.2'
  xmlns:xsi='http://www.w3.org/2001/XMLSchema-instance'
  xmlns='urn:mtconnect.org:MTConnectDevices:1.2'
  xsi:schemaLocation='urn:mtconnect.org:MTConnectDevices:1.2 ./schemas/MTConnectDevices_1.2.xsd'>
  <Header creationTime='2013-04-02T03:40:04Z' assetBufferSize='1024' sender='localhost' assetCount='0'
version='1.2' instanceId='1' bufferSize='131072'/>
  <Devices>
    <Device  uuid="OKUMA.MachiningCenter.123456" name="OKUMA.MachiningCenter" sampleInterval="100.0" id="Mdev1">
      <Description manufacturer="OKUMA" serialNumber="123456">
        Okuma MTConnect Adapter - Machining Center
      </Description>
          <DataItems>
        <DataItem category="EVENT" id="Mavail" name="avail" type="AVAILABILITY" />
      </DataItems>
      <Components>
        <Axes  name="Axes" id="Maxes1">
          <Components>
            <Rotary name="C1" nativeName="S" id="Mc1" >
              <DataItems>
                <DataItem type="ROTARY_VELOCITY" category="SAMPLE" name="S1speed"
```

```
                subType="ACTUAL" units="REVOLUTION/MINUTE" nativeUnits="REVOLUTION/MINUTE" id="MS1speed"/>
                <DataItem type="ROTARY_VELOCITY" category="SAMPLE" name="S1cmd"
                subType="COMMANDED" units="REVOLUTION/MINUTE" nativeUnits="REVOLUTION/MINUTE" id="MS1cmd"/>
                <DataItem type="ROTARY_VELOCITY"  category="SAMPLE" name="S1ovr"
                        subType="OVERRIDE" units="PERCENT" nativeUnits="PERCENT" id="MS1ovr"/>
                <DataItem type="LOAD" category="SAMPLE" name="S1load"
                        units="PERCENT" nativeUnits="PERCENT" id="MS1load"/>
                <DataItem category="EVENT" id="MS1Mode" name="S1Mode" type="ROTARY_MODE">
                  <Constraints>
                    <Value>SPINDLE</Value>
                  </Constraints>
                </DataItem>
              </DataItems>
            </Rotary>
            <Linear name="X1" id="Mx1" >
              <DataItems>
                <DataItem type="POSITION" subType="ACTUAL"  category="SAMPLE"
                  name="X1actm" units="MILLIMETER" nativeUnits="MILLIMETER" coordinateSystem="MACHINE"
id="MX1actm"/>
                <DataItem type="LOAD"  category="SAMPLE" name="X1load"
                 units="PERCENT" nativeUnits="PERCENT" id="MX1load"/>
              </DataItems>
            </Linear>
            <Linear name="Y1" id="My1" >
              <DataItems>
                <DataItem type="POSITION" subType="ACTUAL"  category="SAMPLE"
                  name="Y1actm" units="MILLIMETER" nativeUnits="MILLIMETER" coordinateSystem="MACHINE"
id="MY1actm"/>
                <DataItem type="LOAD"  category="SAMPLE" name="Y1load"
                units="PERCENT" nativeUnits="PERCENT" id="MY1load" />
              </DataItems>
            </Linear>
            <Linear  name="Z1" id="Mz1">
              <DataItems>
                <DataItem type="POSITION" subType="ACTUAL" category="SAMPLE"
                  name="Z1actm" units="MILLIMETER" nativeUnits="MILLIMETER" coordinateSystem="MACHINE"
id="MZ1actm" />
                <DataItem type="LOAD"  category="SAMPLE" name="Z1load"
                units="PERCENT" nativeUnits="PERCENT" id="MZ1load"/>
              </DataItems>
            </Linear>
          </Components>
        </Axes>
        <Controller  name="Controller" id="Mct1">
            <DataItems>
              <DataItem type="EMERGENCY_STOP" name="estop" category="EVENT" id="Mestop" />
              <DataItem type="SYSTEM" category="CONDITION" id="Msystem" name="system" />
            </DataItems>
            <Components>
              <Path id="Mp1" name="path">
                <DataItems>
                  <!-- EVENT DATA ITEMS-->
                  <DataItem type="CONTROLLER_MODE" name="pmode" category="EVENT" id="Mpmode"/>
                  <DataItem freq="10" type="PROGRAM" name="pprogram" category="EVENT" id="Mpprogram"/>
                  <DataItem type="EXECUTION" name="pexecution" category="EVENT" id="Mpexecution"/>
                  <DataItem type="LINE" name="p1line" category="EVENT" id="Mp1line"/>
                  <DataItem type="BLOCK" name="p1block"  category="EVENT" id="Mp1block"/>

                  <!-- SAMPLE DATA ITEMS-->
                  <DataItem type="PATH_FEEDRATE"  subType="OVERRIDE" name="pFovr" category="SAMPLE"
                         units="PERCENT"  nativeUnits="PERCENT" id="MpFovr" />
                  <DataItem type="PATH_FEEDRATE" subType="ACTUAL" name="p1Fact" category="SAMPLE" id="Mp1Fact"
          units="MILLIMETER/SECOND" nativeUnits="MILLIMETER/MINUTE"/>

                  <DataItem type="PATH_POSITION" name="p1LPathPos" category="SAMPLE"
                            units="MILLIMETER_3D" nativeUnits="MILLIMETER_3D" coordinateSystem="WORK"
id="Mp1LPathPos"/>

                  <DataItem type="PATH_FEEDRATE" subType="COMMANDED" name="p1Fcmd" category="SAMPLE" id="Mp1Fcmd"
                            units="MILLIMETER/SECOND" nativeUnits="MILLIMETER/MINUTE"/>
```

```
                </DataItems>
              </Path>
            </Components>
            </Controller>
          </Components>
        </Device>
      </Devices>
    </MTConnectDevices>
```

9. Installation and Configuration of MTConnect Agent

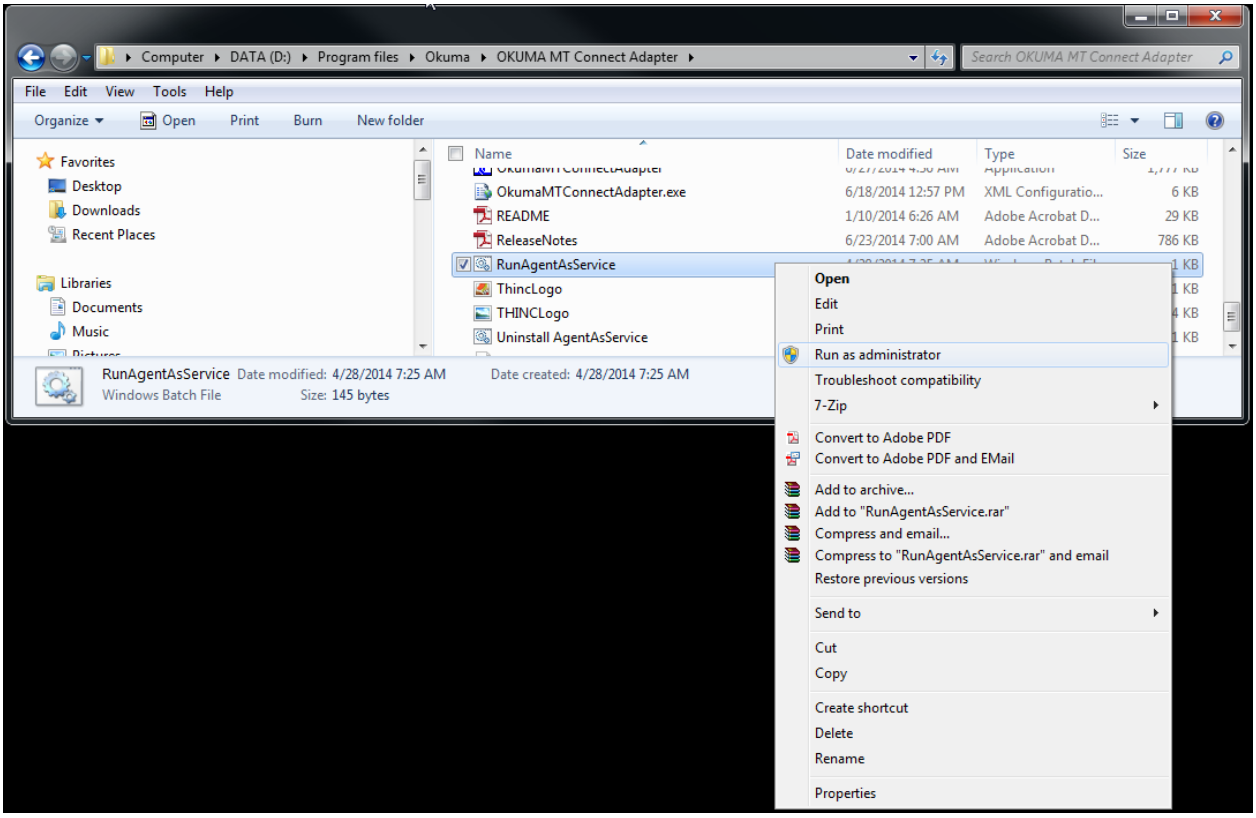
By default, MTConnect Agent is already installed and configured with default values during installation.

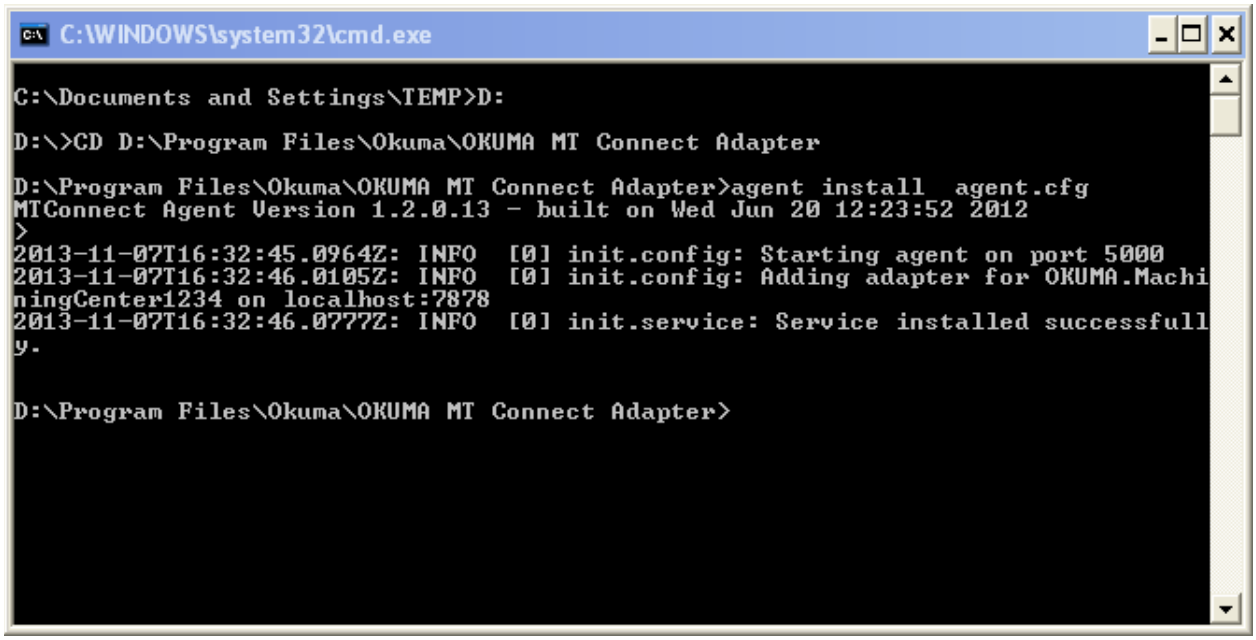
MTConnect Agent, agent.exe, is installed into the same location of OKUMA MTConnect Adapter. It is, however, up to user to decide to run agent on the same or different PC. On either case, the same configuration information in agent.cfg must be used.

9.1 Installation of MTConnect Agent as Service

Manually, it can be quickly installed as Windows Service by running the BAT file named RunAgentAsService.bat at the installation folder on the machine as shown in the captured image below:

Note: It is necessary to run the BAT file named RunAgentAsService.bat under administrator account by selecting the BAT file and running it as administrator as shown in the captured image below.





The agent now will run automatically when machine first boots up.

9.2 Un-installation of MTConnect Agent Service

Note: If needed current agent installed in Windows services can be removed by issuing the following command from command prompt or running the bat file named UninstallAgentAsService.bat:

```
agent remove
```

9.3 Configuration of MTConnect Agent

Please refer to the MTConnect Agent installation file named, README.pdf, for further instruction how to configure it to connect to adapter.

The default agent configuration file, named agent.cfg, is installed in the same folder with MTConnect Adapter and having default information as shown below:

```
Devices = Devices.xml
SchemaVersion = 1.2                 # using schema version 1.2
Port=5000                           # default port number for agent
UpcaseDataItemValue = false
MonitorConfigFiles = true           # True = reload devices.xml and agent.cfg if they are changed
MinimumConfigReloadAge = 1          # Number of seconds agent service will wait before performing reload config files
Adapters
{
    OKUMA.Machine.Adapter           # for reference OKUMA machine adapter
    {
        Host = localhost
        Port = 7878                 # default port number for OKUMA MTConnect Adapter
    }
```

```
    }
....
```

9.3.1 *Agent Running Port*

By default, agent is binding to port 5000 for accepting client requests and connecting to OKUMA MTConnect Adapter at port 7878.

The information can be changed by editing agent.cfg as shown below:

```
Port=5001                    # default port number for agent
```

Agent is now running on port 5001.

9.3.2 *Adapter Host*

In case of agent is configured to run on remote PC, Adapter 'Host' must be configured to where adapter is running.

For agent running on the same PC as adapter:

```
Host = localhost
```

For agent running on the remote PC:

```
Host = IPAddress
```

Where IPAddress is the IP address of the machine that adapter is running.

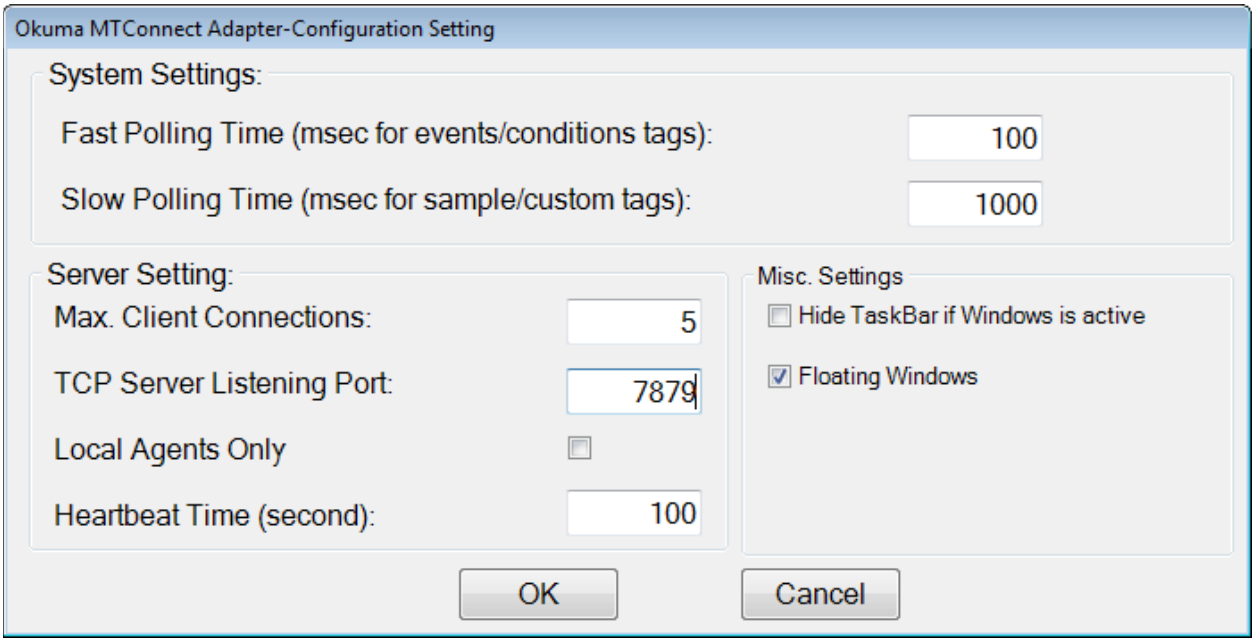
For example:

```
Host = 172.22.50.10
```

9.3.3 *Adapter Running Port*

By default, agent is communicating with adapter at port 7878. If adapter port is changed to different port number then it is necessary to change agent configuration file to the same port number such as port 7979 as shown below:

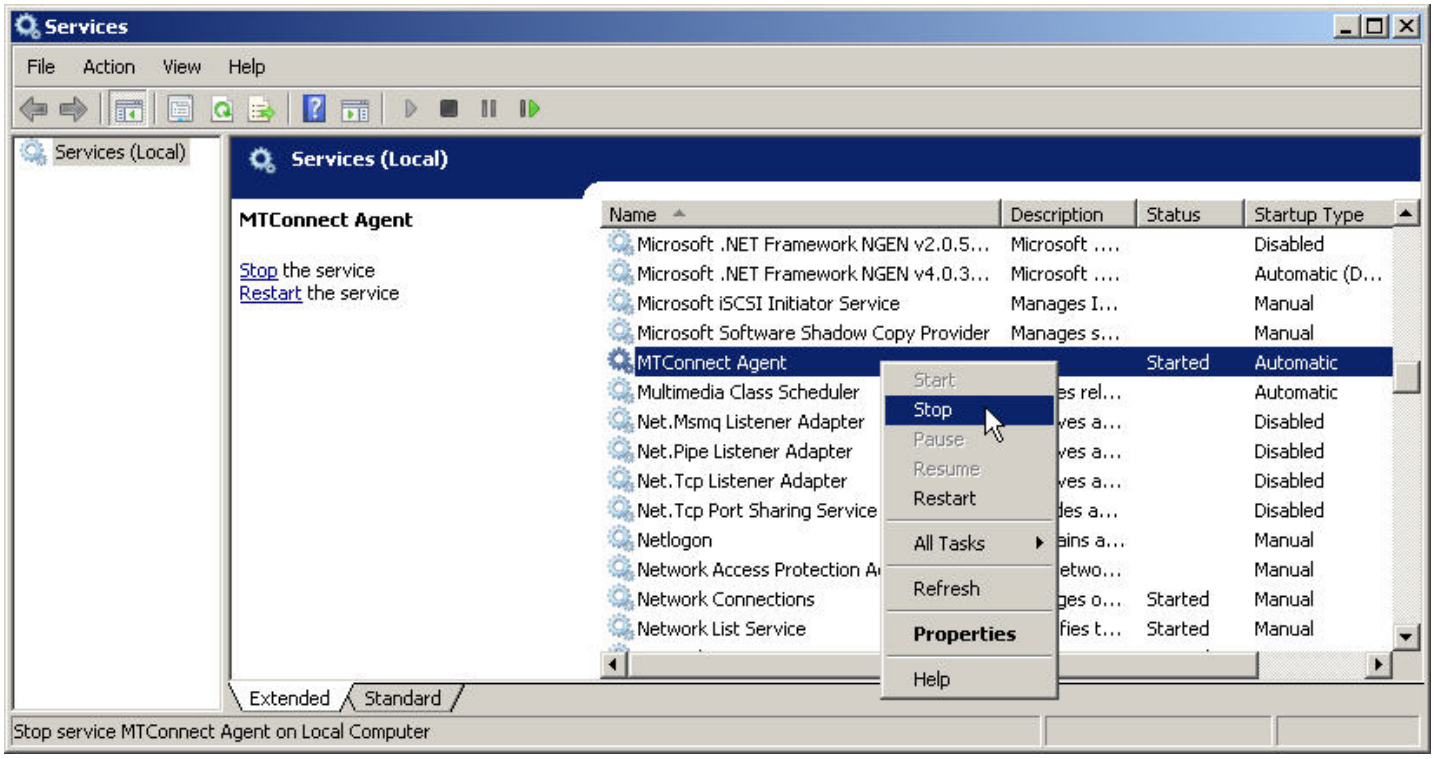
Adapter system configuration setting:

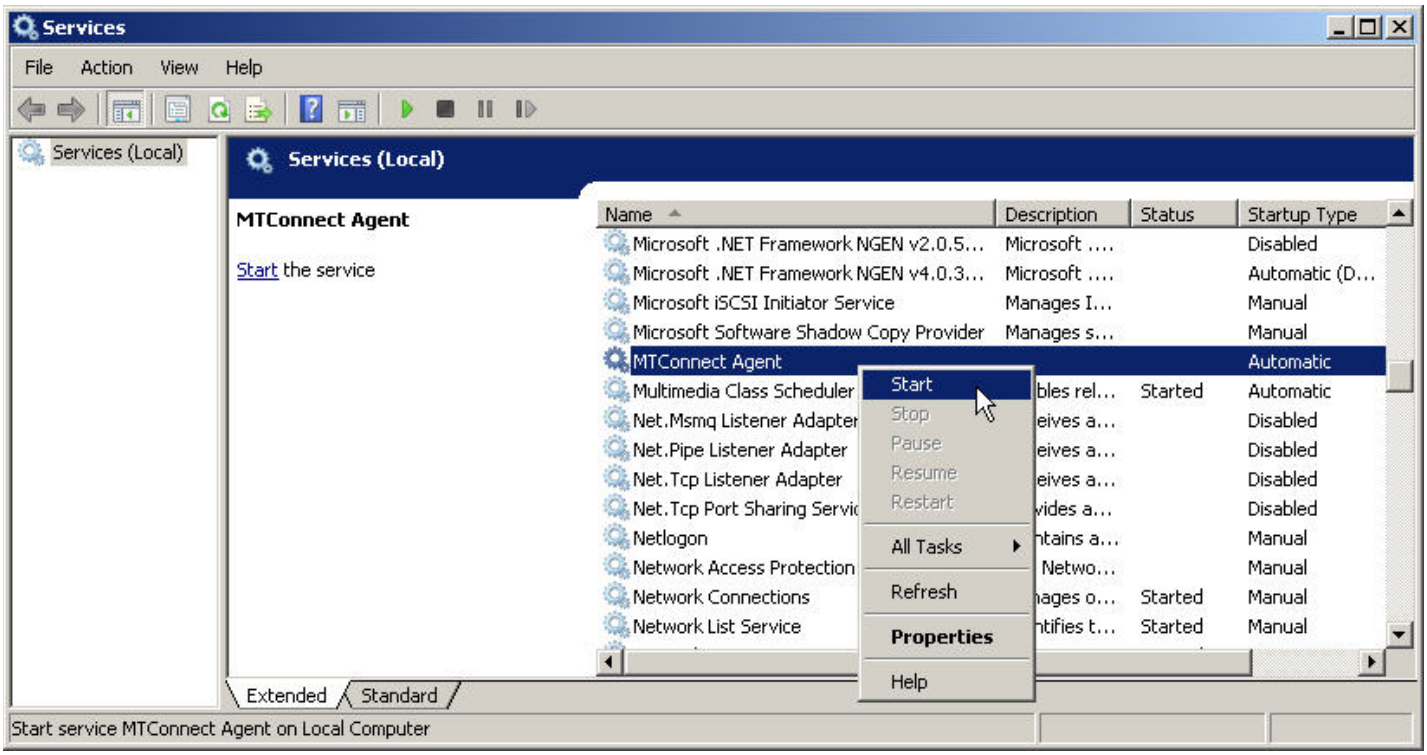


```
Port = 7879                # default port number for OKUMA MTConnect Adapter
```

9.3.4 *Start and Stop Agent Service*

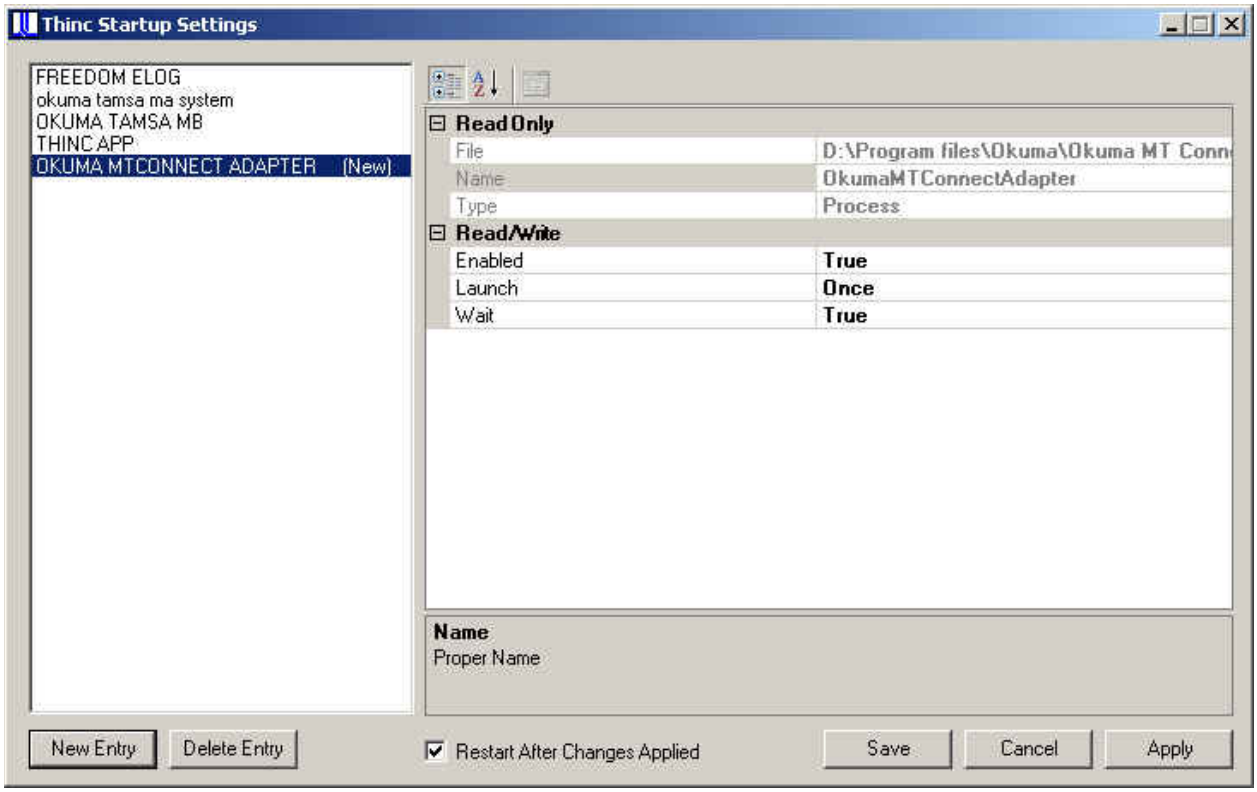
MTConnect Agent is a Windows service that can be started and stopped from Services dialog as shown below





10. Setup Okuma MTConnect Adapter Software to Startup Automatically

By default, OKUMA MTConnect Adapter is automatically registered with Startup Service so it will be run after NC is fully started.



The following steps are only needed if the registration of OKUMA MTConnect Adapter has been removed.

To enable the Okuma MTConnect Adapter Software run automatically when NC OSP system is started, user needs to setup THINC Startup Service properly. Click 'Start' → 'Programs' → 'Okuma' → 'THINC Startup Service' → 'THINC Start Settings' to activate the startup service setup dialog as follows.

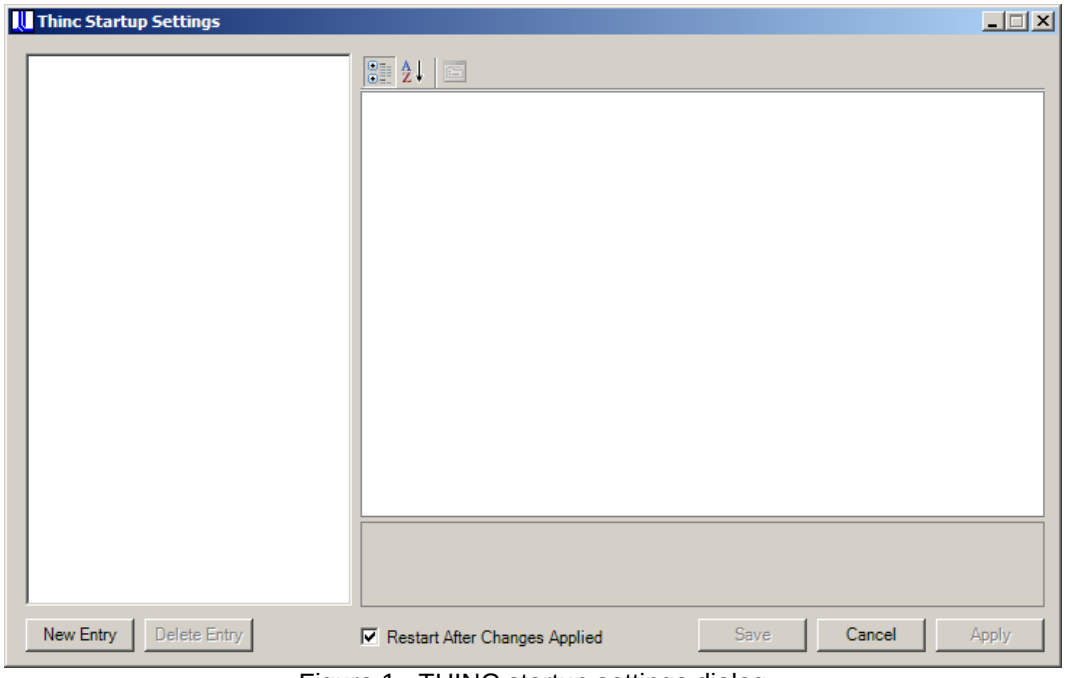


Figure 1 THINC startup settings dialog

Click ‘New Entry’ button at the lower left side of the dialog to add an entry for the Okuma MTConnect Adapter application.

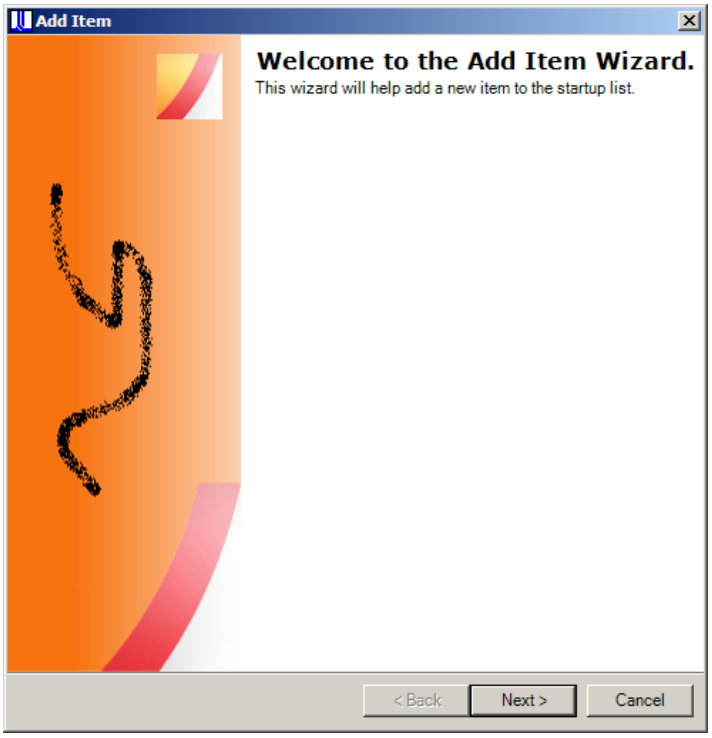


Figure: THINC startup settings add item welcome dialog

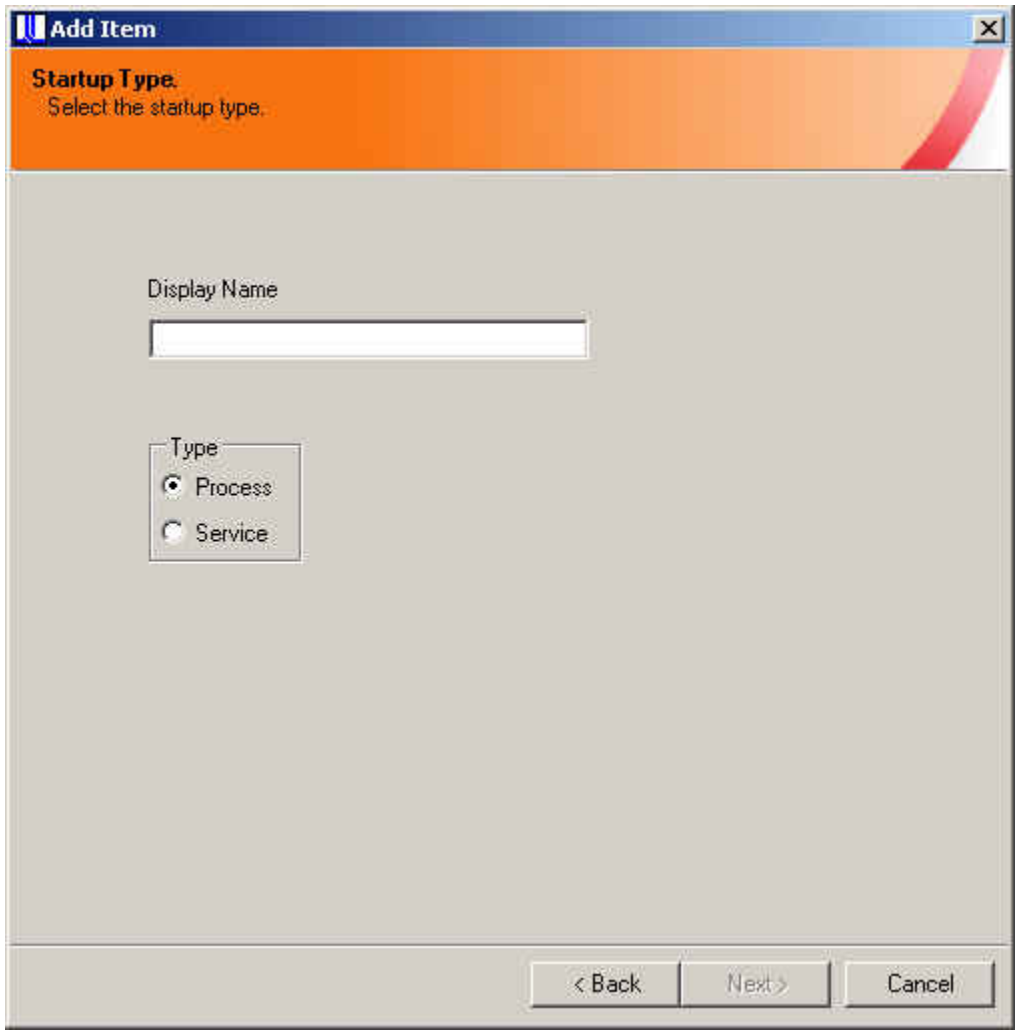


Figure: THINC startup settings add item name dialog

In the ‘Add Item’ welcome window, click ‘Next’ to enter the ‘Startup Type’ selection dialog, enter ‘Okuma MTConnect Adapter’ as display name and select ‘Process’ for the startup type, then click ‘Next’ button and a new dialog will pop up to allow user to browse which application to startup.

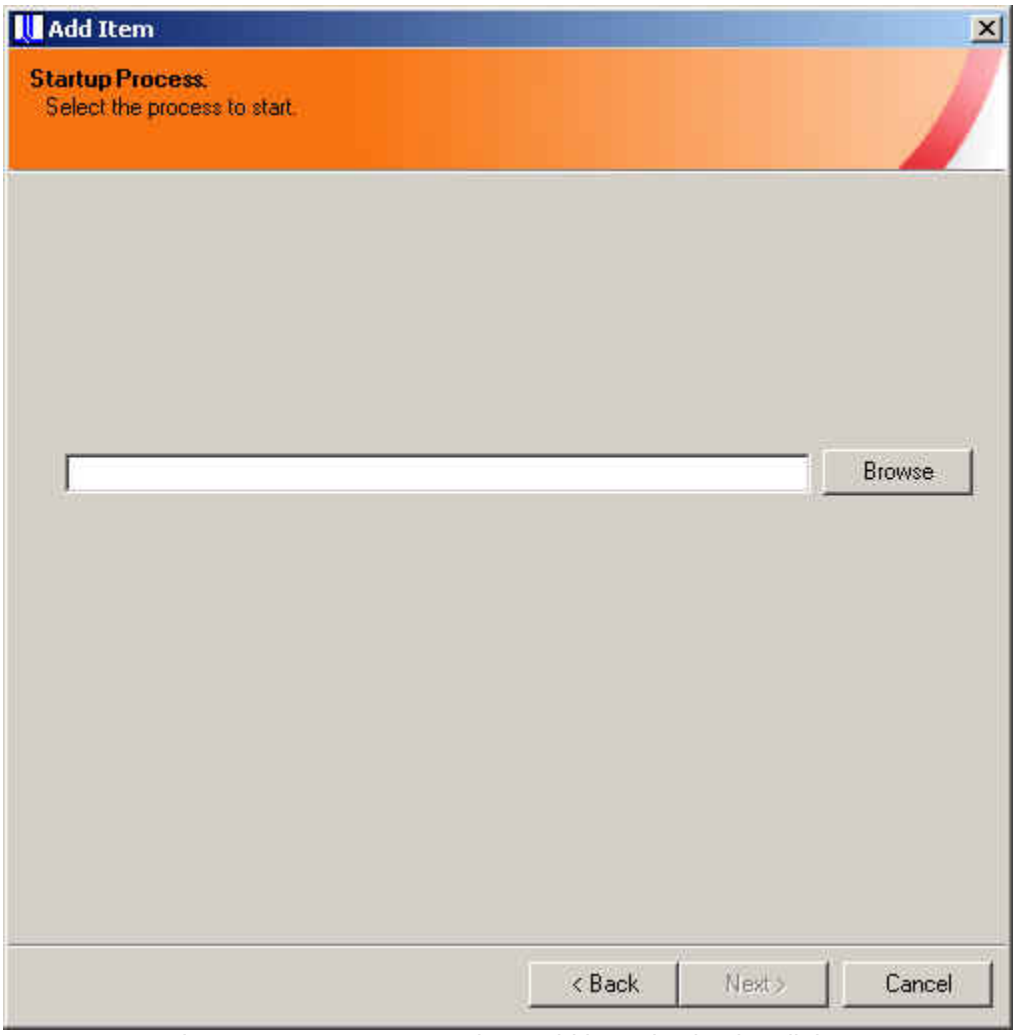


Figure: THINC startup settings add item destination dialog

Click the ‘Browse’ button to select file ‘OkumaMTConnectAdapter.exe’ in the Okuma MTConnect Adapter installation folder (By default, it is ‘D:\Program Files\Okuma\Okuma MT Connect Adapter\’.). Click ‘Next’ to proceed to next ‘Startup Options’ dialog.

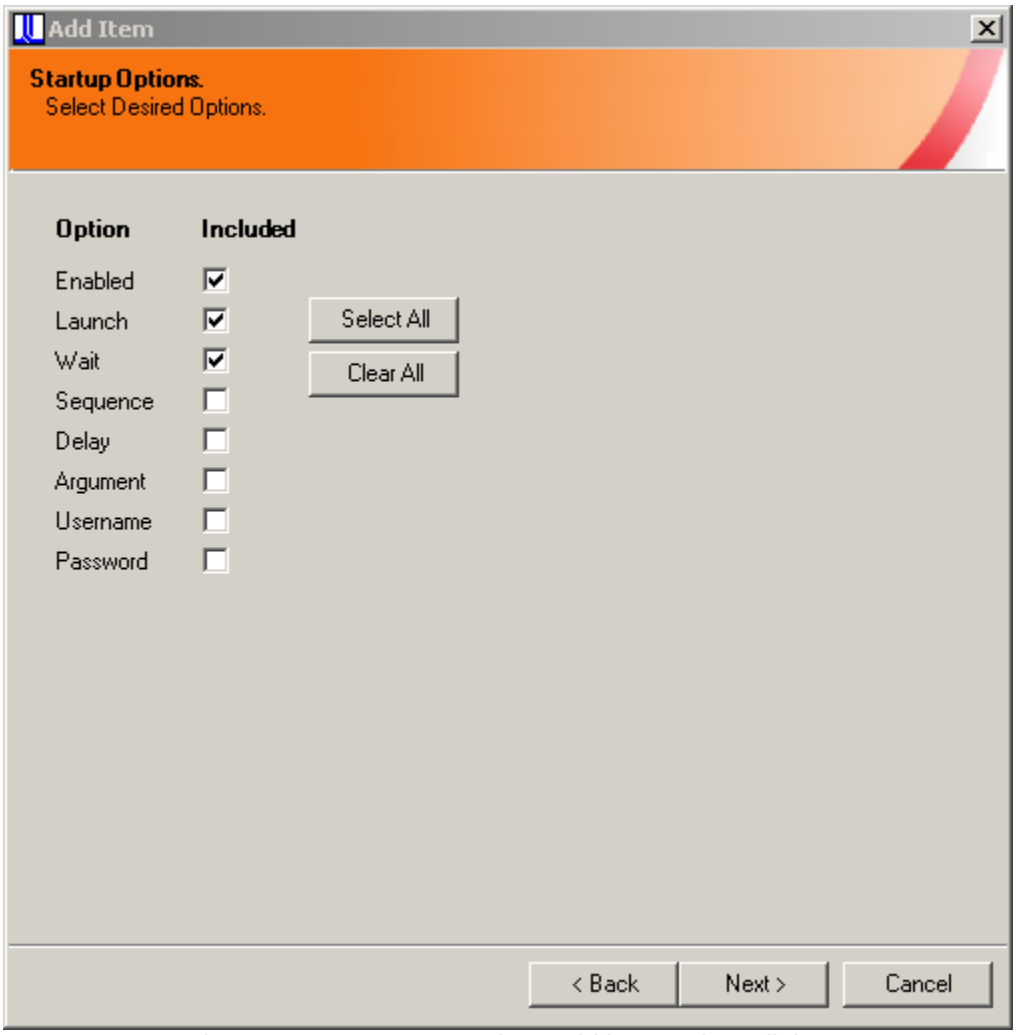
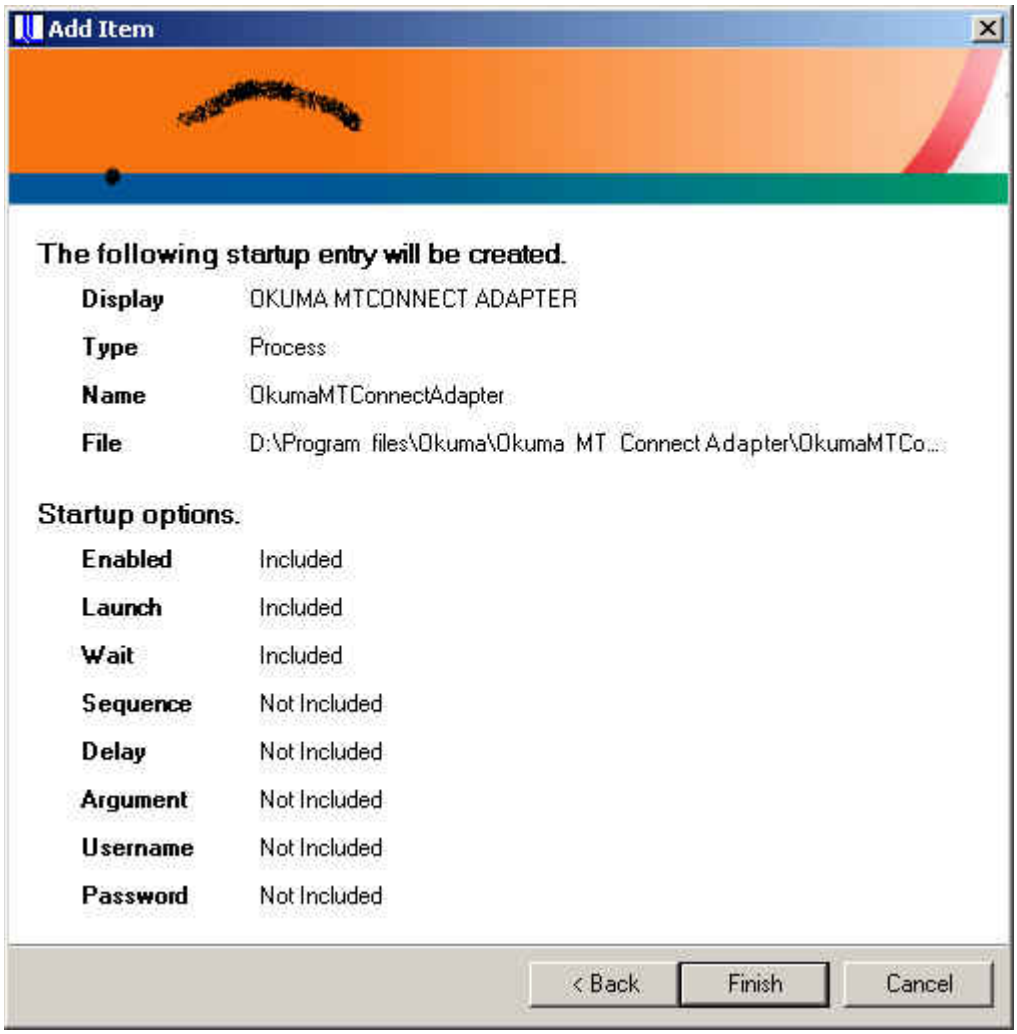


Figure: THINC startup settings add item options dialog

In the ‘Startup Options’ dialog, check ‘Enabled’, ‘Launch’ and ‘Wait’, then click ‘Next’ button to go to next step



Click ‘Finish’ button to finish the setup for Okuma MTConnect Adapter Software.

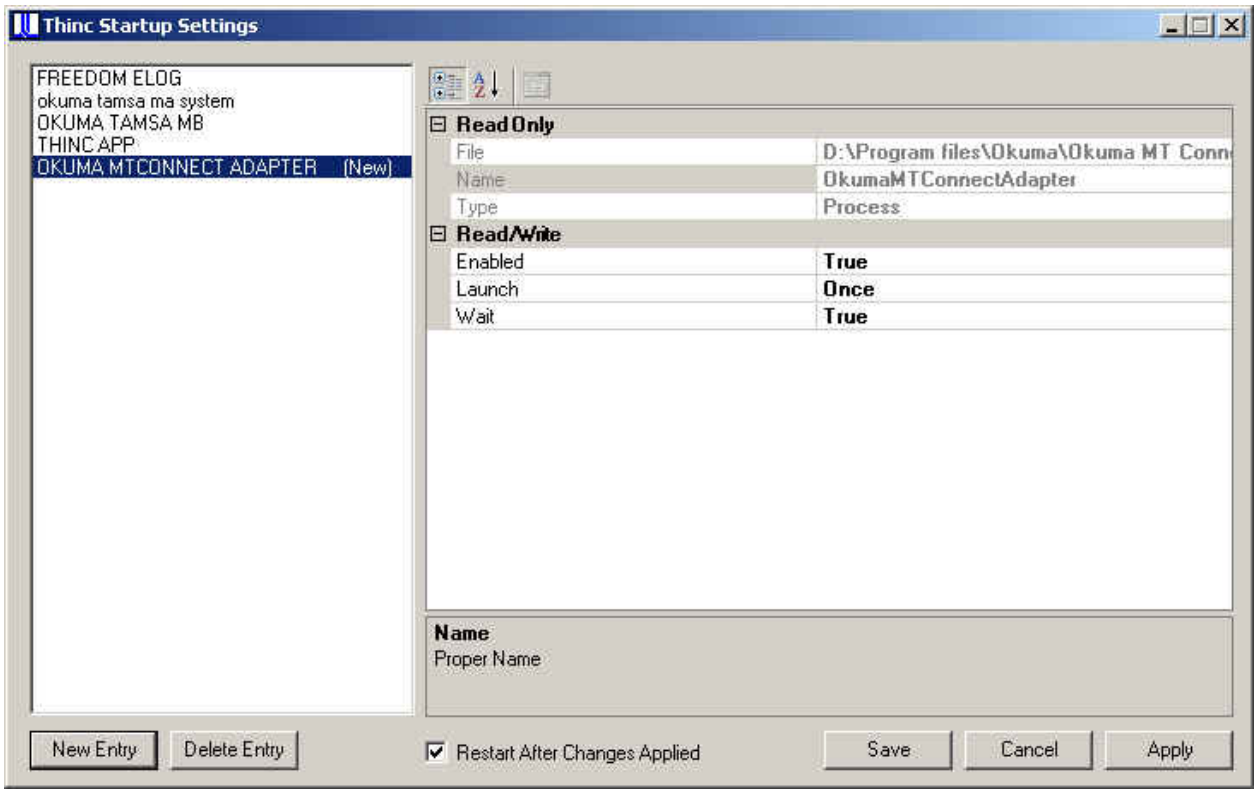


Figure: THINC startup settings add item completed dialog

Click 'Save' to save the settings and exit the setup process. The Okuma MTConnect Adapter Software should be launched automatically after the NC OSP system is started.

Note: User needs to restart the machine to ensure that the startup service works properly.

11. Verifying Agent and Adapter Connectivity

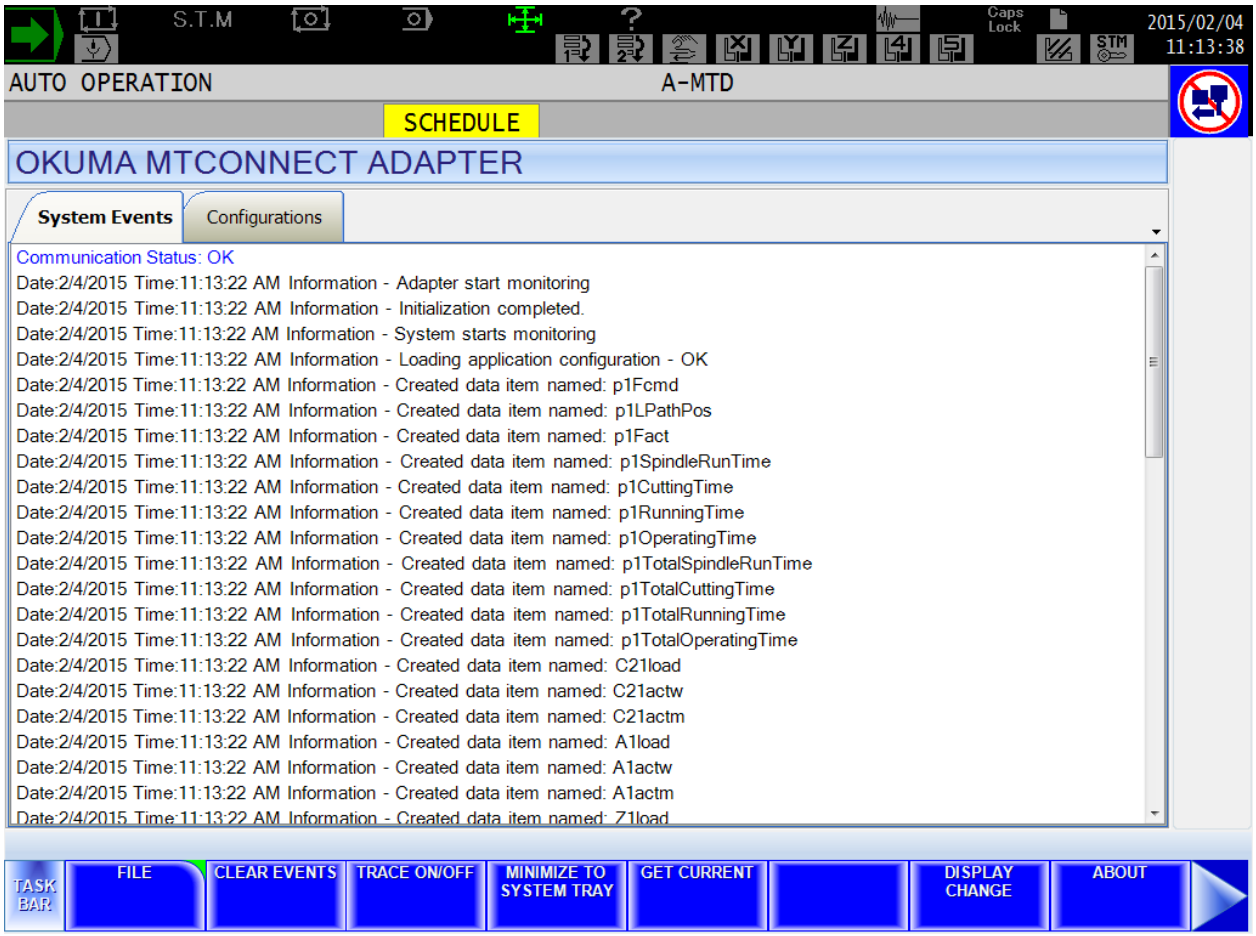
The following steps are to check if:

- Adapter runs without error.
- Adapter can get machine data
- Agent can communicate with adapter
- MTConnect data can be obtained from agent

11.1 OKUMA MTConnect Adapter

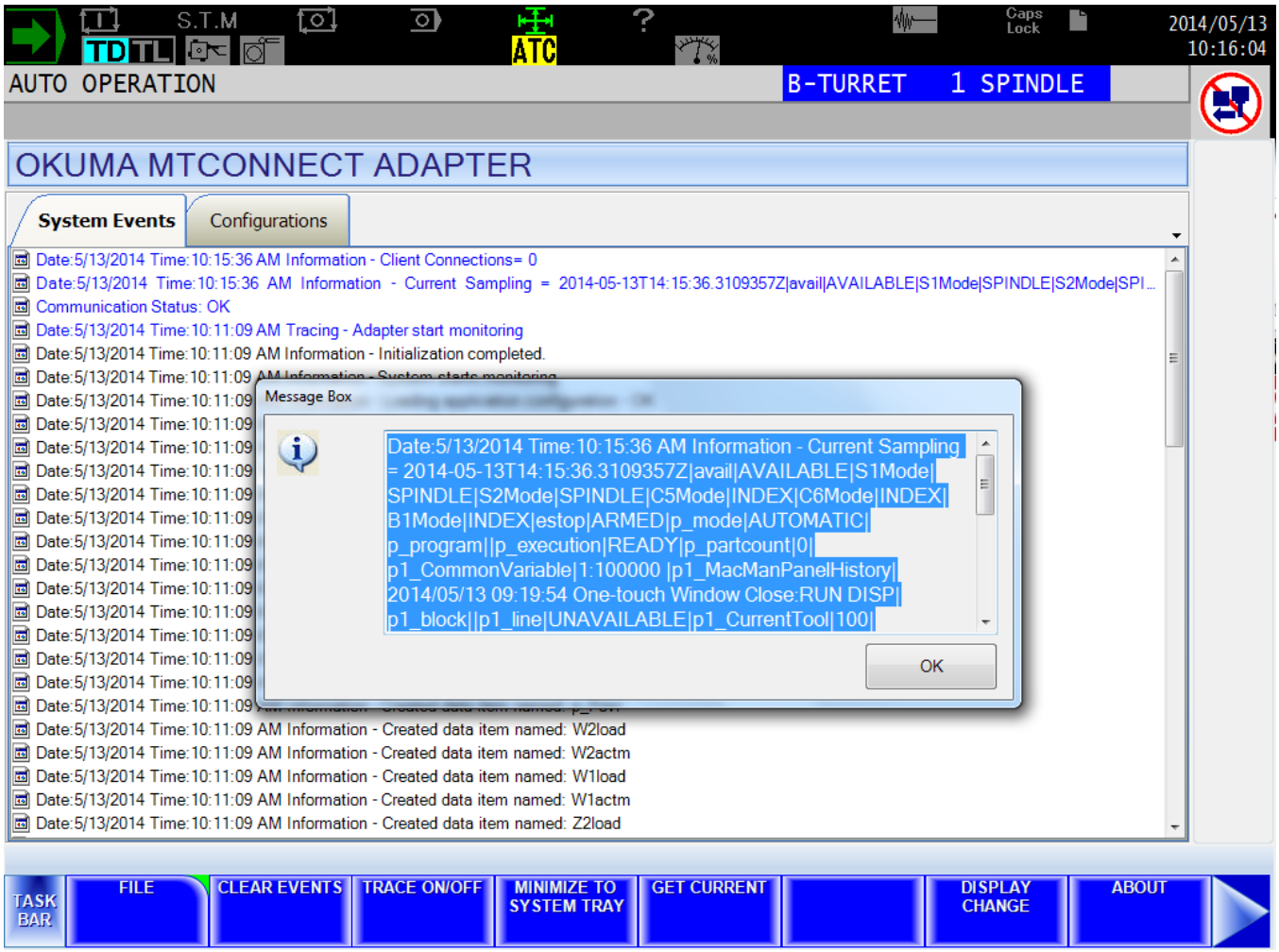
Once the adapter is running, it is normally minimized to system tray. It can be shown by double clicking the OKUMA icon  in the system tray located on the lower left corner of the screen. The main application will show as seen below.

If OKUMA MTConnect adapter is running without error, the system is ready for accepting agent connections.



11.2 Obtaining Current Monitoring Machine Data

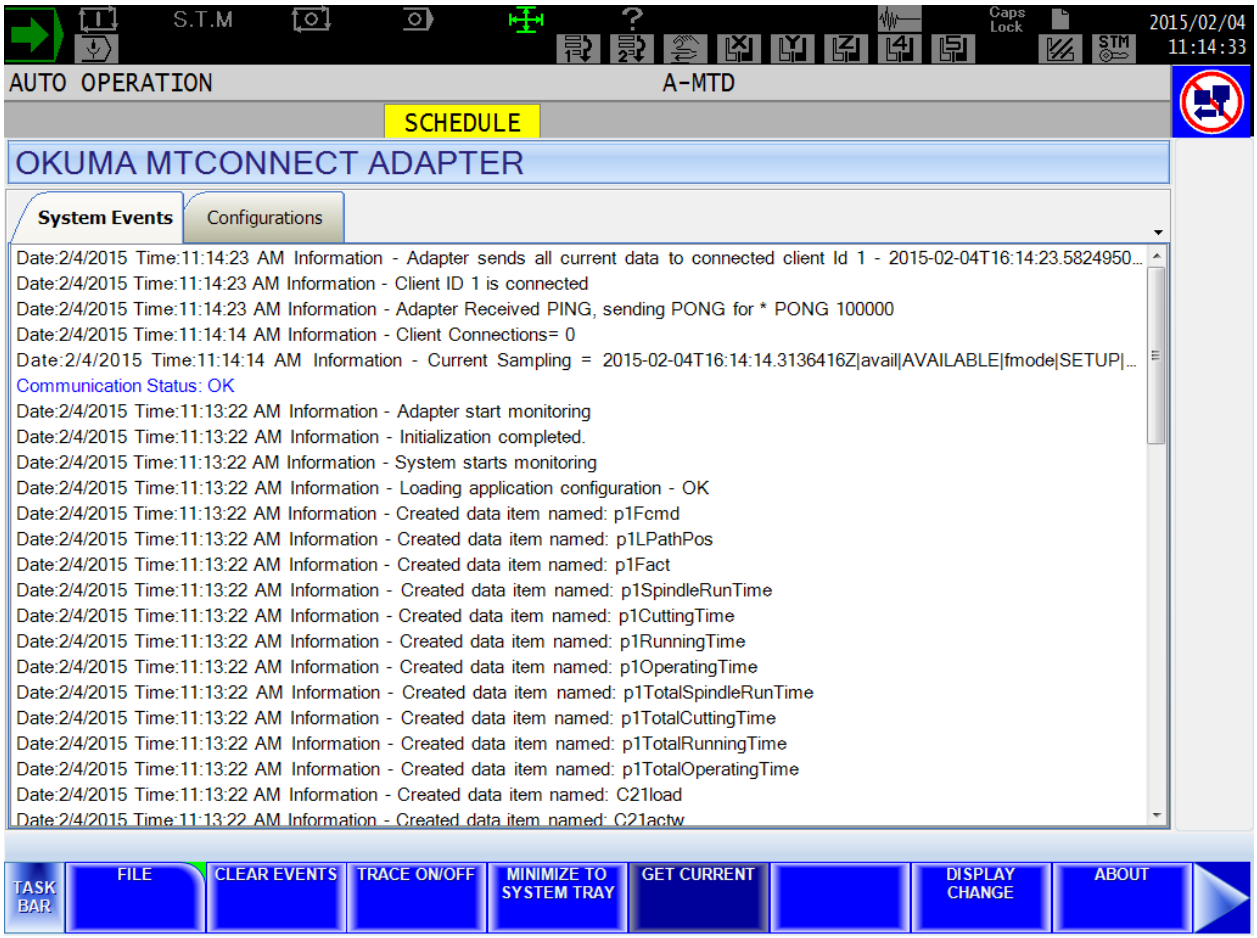
OKUMA MTConnect Adapter is using THINC-API to collection machine data. By clicking the 'Get Current' from menu bar, the system will get current monitoring data and display a message under System Events screen. A detail message is shown in the message box by double clicking on the 'Current Sampling' message in the System Events.



11.3 Agent and Adapter Connectivity

When an agent runs and first connects to adapter, a message will be displayed in the System Events. Adapter will sent an initial message of the current monitoring data to the connected agent.

Note: Double clicking on the System Event message to have a detail message displaying on a message box.
For more information on setting up agent to run on local machine please refer to section Installing MTConnect Agent



11.4 MTConnect Data

Once agent is running and connecting to adapter, current monitoring machine data can be getting by issuing the following command from a web browser for getting current data or device information in the following format:

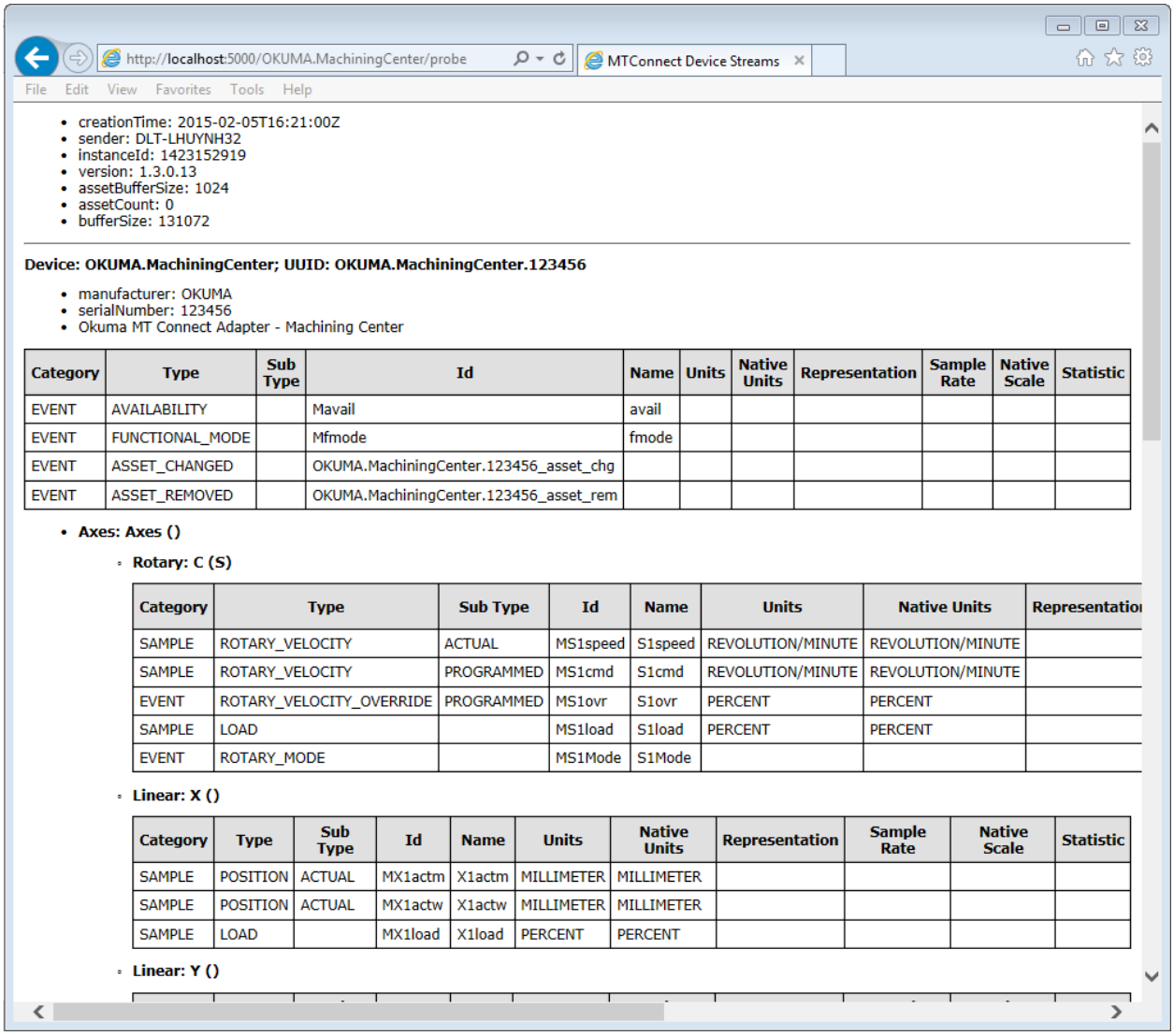
http://IPAddress:port/DeviceName/MTConnectCommand

- IPAddress: localhost or IP address of computer running agent
- Port: Default to port 5000 of running agent. It can be changed in agent.cfg configuration file.
- Device Name: *A case-sensitive of device name* specified in the Devices.xml file or adapter device information
- MTConnect Command: A valid MTConnect Command such as 'current' to get current monitoring machine data.

Examples:

http://localhost:5000/OKUMA.MachiningCenter/current for getting monitoring machine data
http://localhost:5000/OKUMA.MachiningCenter/probe for getting device information

Device information:

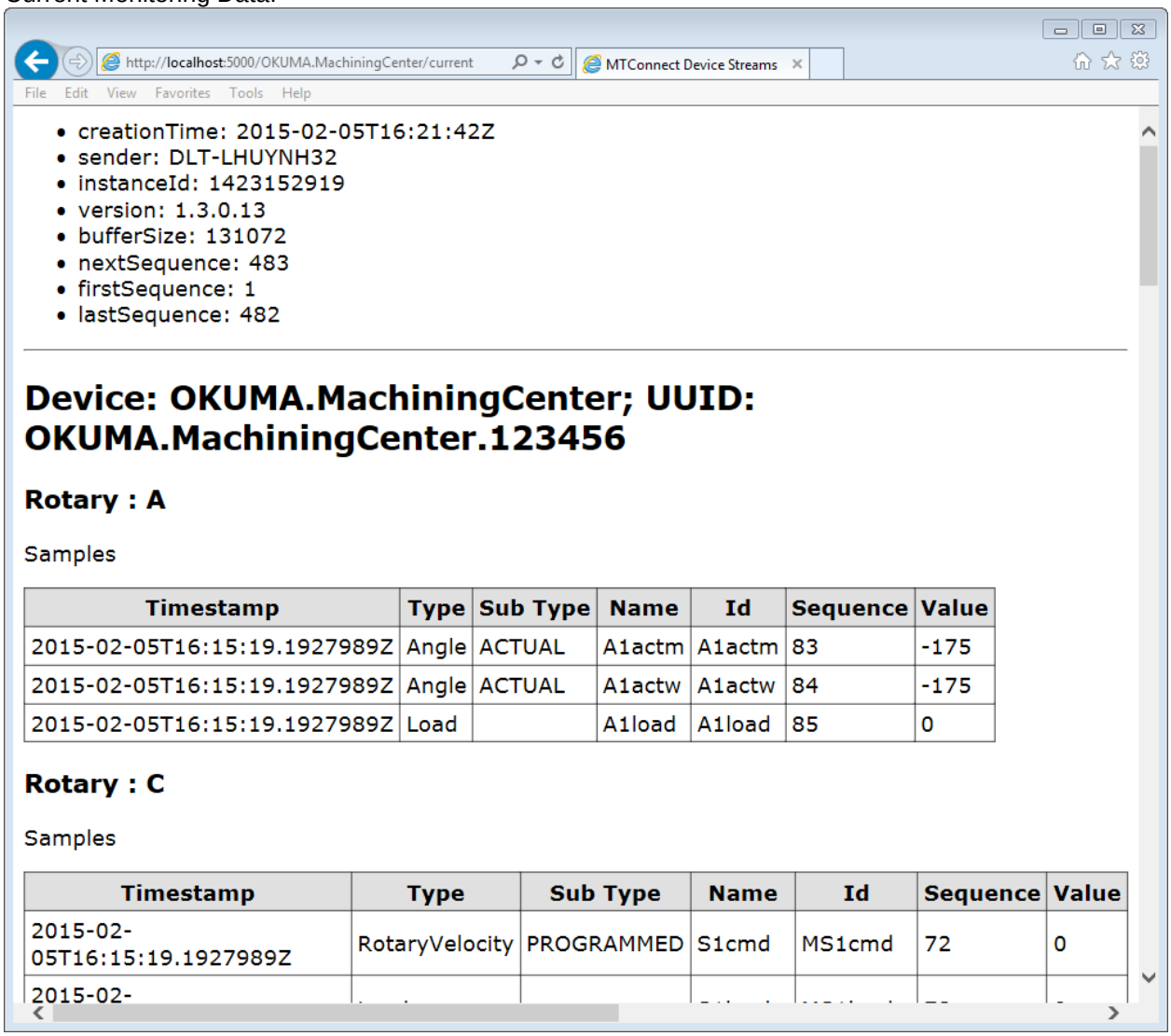


Category	Type	Sub Type	Id	Name	Units	Native Units	Representation	Sample Rate	Native Scale	Statistic
EVENT	AVAILABILITY		Mavail	avail						
EVENT	FUNCTIONAL_MODE		Mfmode	fmode						
EVENT	ASSET_CHANGED		OKUMA.MachiningCenter.123456_asset_chg							
EVENT	ASSET_REMOVED		OKUMA.MachiningCenter.123456_asset_rem							

Category	Type	Sub Type	Id	Name	Units	Native Units	Representation
SAMPLE	ROTARY_VELOCITY	ACTUAL	MS1speed	S1speed	REVOLUTION/MINUTE	REVOLUTION/MINUTE	
SAMPLE	ROTARY_VELOCITY	PROGRAMMED	MS1cmd	S1cmd	REVOLUTION/MINUTE	REVOLUTION/MINUTE	
EVENT	ROTARY_VELOCITY_OVERRIDE	PROGRAMMED	MS1ovr	S1ovr	PERCENT	PERCENT	
SAMPLE	LOAD		MS1load	S1load	PERCENT	PERCENT	
EVENT	ROTARY_MODE		MS1Mode	S1Mode			

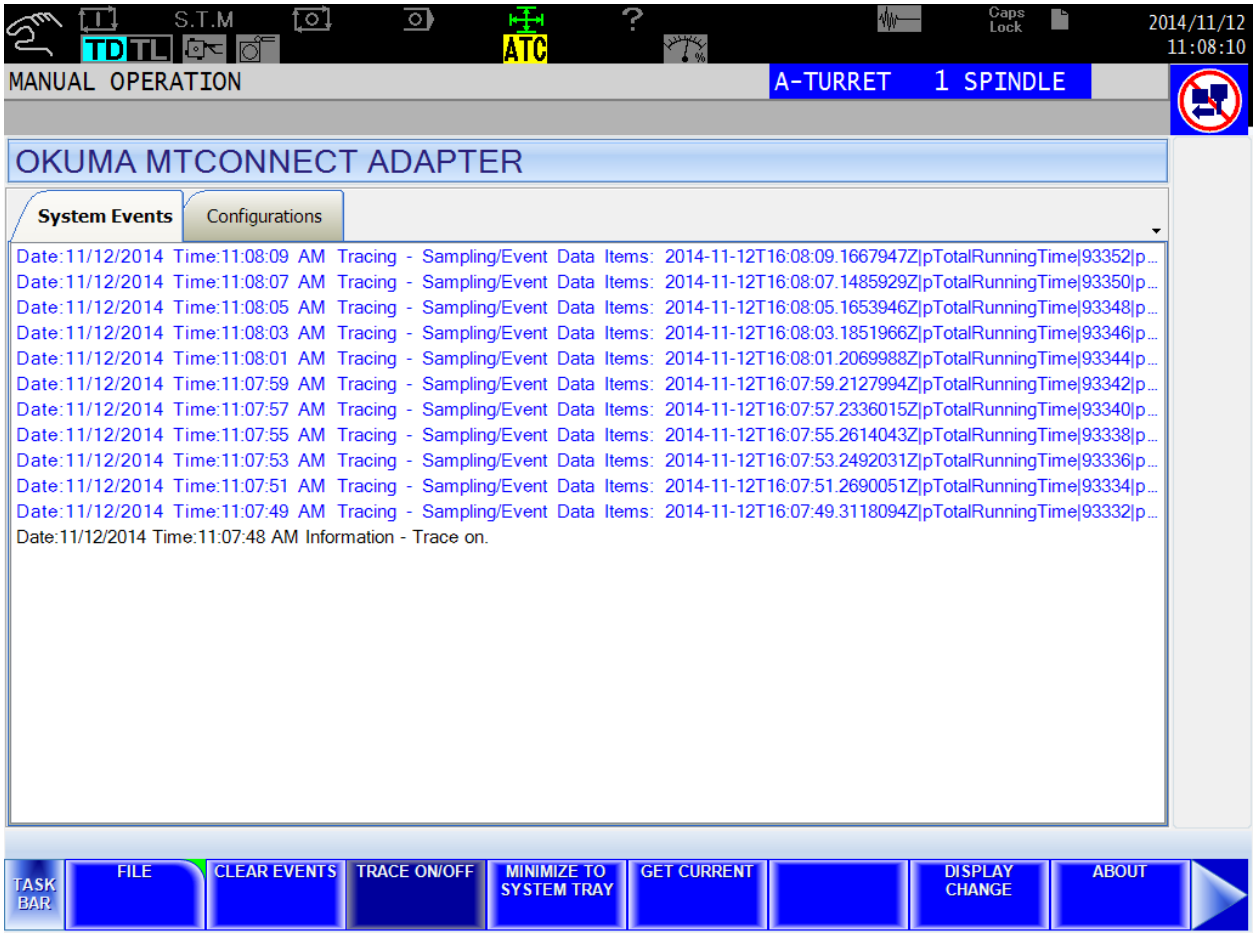
Category	Type	Sub Type	Id	Name	Units	Native Units	Representation	Sample Rate	Native Scale	Statistic
SAMPLE	POSITION	ACTUAL	MX1actm	X1actm	MILLIMETER	MILLIMETER				
SAMPLE	POSITION	ACTUAL	MX1actw	X1actw	MILLIMETER	MILLIMETER				
SAMPLE	LOAD		MX1load	X1load	PERCENT	PERCENT				

Current Monitoring Data:



By turning the Trace ON from menu bar, any change of current monitoring data by adapter will be displayed on

the System Events screen for verifying purpose. There is also a message displaying heartbeat (PING PONG message) to connected agents for every pre-determined number of seconds for checking connectivity.



12. THINC-API

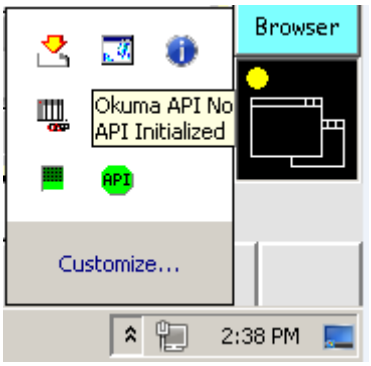
12.1 Running Statuses

After NC is fully started, THINC-API Notifier Status should have a green icon displayed at the lower left corner of the screen as shown below:

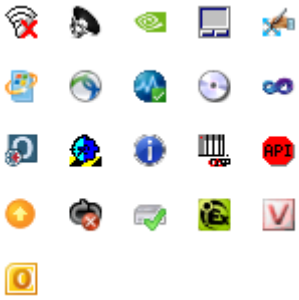
Windows XP:

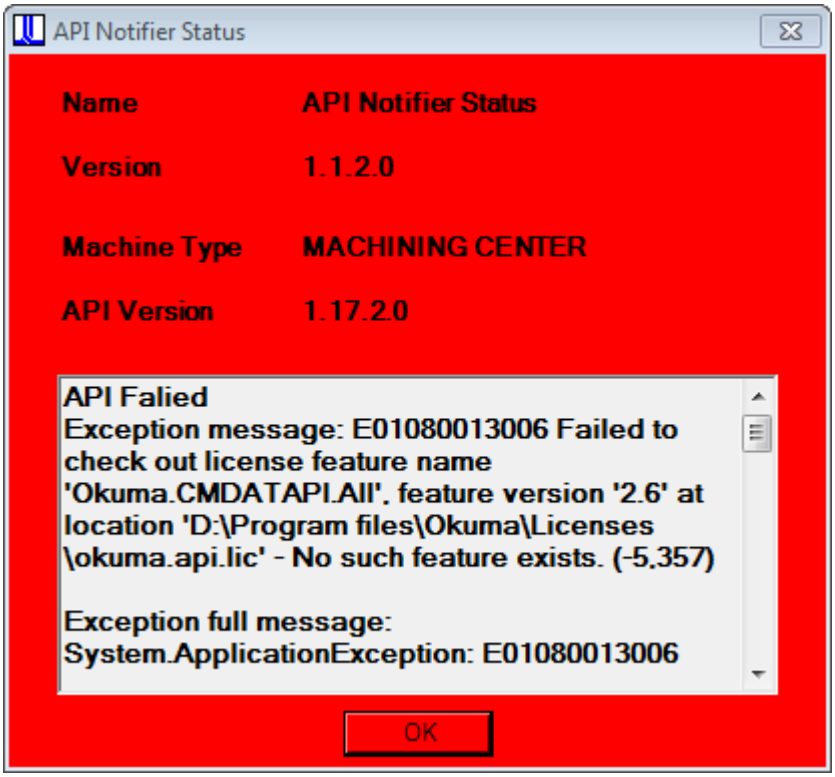
Windows 7:

Note: The API icon status can only be supported on Windows 7 if THINC-API installed on target has a version 1.17.1.0 or greater.



If the color of icon is red, THINC-API has encountered an error state. By clicking on the API icon, a dialog will display and show detail error message as shown in the captured image below:

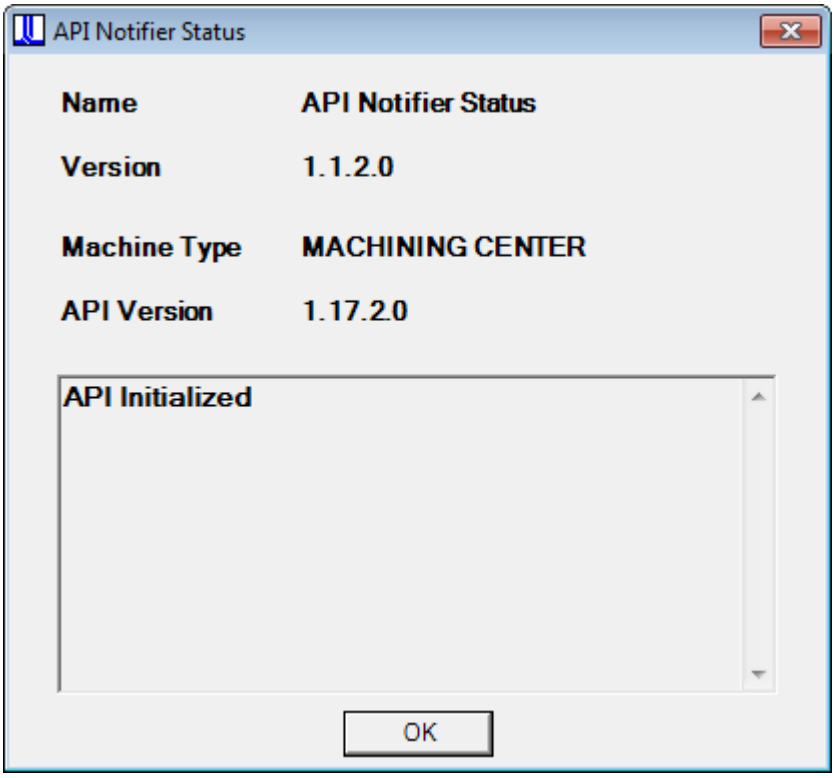




Please contact OKUMA distributor for further assistant on THINC-API error.

12.2 Version

The version of THINC-API can be checked by clicking on the API icon. A dialog will be displayed and showing API version number.



: