MTConnect Provider

Version 1.1.0

User's Guide

April 11, 2022

[Remarks]

[Revision History]

Version	Date	Content
1.0.0	2016-03-23	First edition.
1.0.1	2020-02-28	Fixed the problem that local server could not be accessed and added error code. Added Error code. Bug fixed.
1.1.0	2020-03-02	Added variables. ・@PARTCOUNT . @TOOLNUMBER . @TOOLASSETID
	2020-07-20	Revised User's Guide.
	2022-04-11	Revised User's Guide.

[Protocol]

Protocol	Version	Notes
MTConnect	1.3.1	

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1. Introduction

This is a user's guide of MTConnect provider that obtains data from MTConnect-supporting devices with MTConnect communication protocol. This provider enables to obtain data from MTConnect-supporting devices (such as CNC machines).

This document describes the functions and the implemented methods of MTConnect provider.

For details about MTConnect, refer to MTConnect website (http://www.mtconnect.org/)

2. Outline of this provider

2.1. Outline

MTConnect provider obtains data from MTConnect-supporting devices and returns the data to clients.

The file format of MTConnect provider is DLL (Dynamic Link Library). Table 2-1 shows the details.

Table 2-1 MTConnect provider

File name	CaoProvDENSOMTConnect.dll
ProgID	CaoProv.DENSO.MTConnect
Registration	regsvr32 CaoProvDENSOMTConnect.dll
Deregistration	regsvr32 /u CaoProvDENSOMTConnect.dll

2.2. Method and Properties

2.2.1. CaoWorkspace::AddController method

MTConnect provider specifies a path to connect to an MTConnect-supporting device at the timing of a Controller object creation.

Syntax AddController(<bstrCtrlName:BSTR>,<bstrProvName:BSTR>,
<bstrPcName:BSTR > [,<bstrOption:BSTR>])

bstrCtrlName : [in] Controller name
bstrProvName : [in] Provider name. Fixed to ” CaoProv.DENSO.MTConnect”.
bstrPcName : [in] Computer name where provider runs
bstrOption : [in] Option string

The following shows the list of option strings.

Table 2-2 Option string of CaoWorkspace::AddController

Option	Description
Server=<URL or IP address>	Specify URL or IP address to connect.

Example) To connect to “http://agent.mtconnect.org”.
server=agent.mtconnect.org

Enter URL or IP address as above.

2.2.2. CaoController::AddVariable method

In MTConnect provider, CaoController::AddVariable method determines a value to be obtained from the connecting device by specifying a variable name.

For variable names, you can specify system variables only.

The following shows the specification of AddVariable.

Syntax AddVariable(<bstrName:BSTR > [,<bstrOption:BSTR>])

bstrName : [in] Variable name

bstrOption : [in] Option string

For about available variable names, refer to Table 2-3.

･2.2.3. CaoVariable:: get_Value property

Obtain data from a device by specifying a variable name.

For information about data type of obtained data, refer to Table 2-3.

2.3. Variable list

2.3.1. Controller class

Table 2-3 Controller class System variable list

Variable name	Data type	Description	Attribute	
			get	put
@ANGLE	VT_ARRAY | VT_R4	●Obtain the machine coordinate values (rotary axis) ●Return the coordinate value with a numerical value. ●Return 0 if the obtained value is “UNAVAILABLE”. Example) 100.00000 0(UNAVAILABLE)	✓	-
@ANGLESTRING	VT_ARRAY | VT_BSTR	●Obtain the machine coordinates values (rotary axis) ●Return with the format of “Axis name:coordinate values”. Example) A:100.00000 B:UNAVAILABLE	✓	-
@POSITION	VT_ARRAY | VT_R4	●Obtain the machine coordinate values (linear axis) ●Return the coordinate value with a numerical value. ●Return 0 if the obtained value is “UNAVAILABLE”. Example) -0.5675552487 0(UNAVAILABLE)	✓	-
@POSITIONSTRING	VT_ARRAY | VT_BSTR	●Obtain the machine coordinate values (linear axis) ●Return with the format of “Axis name:coordinate value”. Example) X:-0.5675552487 Y:UNAVAILABLE	✓	-
@LOAD	VT_ARRAY | VT_R4	●Obtain the load rate applied to each axis. ●Return the load rate with a numerical value. ●Return 0 if the obtained value is “UNAVAILABLE”. Example) 13 0(UNAVAILABLE) 24 73 0(UNAVAILABLE)	✓	-

@LOADSTRING	VT_ARRAY | VT_BSTR	●Obtain the load rate applied to each axis. ●Return with the format of “Axis name:load rate”. Example) C:13 Y:UNAVAILABLE A:24 Z:73 B:UNAVAILABLE	✓	-
@ROTARYVELOCITY	VT_ARRAY | VT_R4	●Obtain the rotation speed ●Return the obtained value with a numerical value. ●Return 0 if the obtained value is “UNAVAILABLE”. Example) 450.000000 0(UNAVAILABLE)	✓	-
@ROTARYVELOCITYSTRING	VT_ARRAY | VT_BSTR	●Obtain the rotation speed. ●Return with the format of “Axis name:speed” Example) A:450.000000 B:UNAVAILABLE	✓	-
@ROTARYMODE	VT_ARRAY | VT_I4	●Obtain the rotary axis state. ●Return the obtained value with a numerical value. ・UNAVAILABLE → 0 ・SPINDLE → 1 ・INDEX → 2 ・CONTOUR → 3 ・other than above → -1	✓	-
@ROTARYMODESTRING	VT_ARRAY | VT_BSTR	●Obtain the rotary axis state. ●Return with the format of “Axis name:axis state”. Example) C:SPINDLE A:CONTOUR B:UNAVAILABLE	✓	-
@PATHFEEDRATE	VT_ARRAY | VT_R4	●Obtain the composite feed speed. ●Return the obtained value with a numerical value. ●Return 0 if the obtained value is “UNAVAILABLE”. Example) 100.0000000000 0.4	✓	-

@SYSTEM	VT_ARRAY | VT_I4	●Obtain the system state. ●Return the obtained strings with a numerical value. ・Unavailable > 0 ・Normal > 1 ・Warning > 2 ・Fault > 3 ・other than above > -1	✓	-
@SYSTEMSTRING	VT_ARRAY | VT_BSTR	●Obtain the system state. ●Return with the format of “Axis name:axis state”. Example) C:Normal X:Unavailable Y:Normal Z:Normal path:Unavailable Controller:Warning	✓	-
@ALLSTATES	VT_ARRAY | VT_BSTR	● Obtain the machine coordinates (rotary axis), machine coordinates (linear axis), rotation speed, and the composite feed speed. ● Return with the format of “variable name@axis name:obtained value”. Example) ANGLE@A:100.00000;B:UNAVAILABLE POSITION@X:-0.5675552487 ROTARY_VELOCITY@B:UNAVAILABLE PATH_FEEDRATE@100.0000000000	✓	-
@PATHPOSITION	VT_BSTR	●Obtain the program coordinates. ●Return with the format of “Axis name:coordinate value”. Example) 7.02	✓	-
@AVAILABILITY	VT_BOOL	●Obtain the communication availability state with a device. ●Return True or False.	✓	-
@BLOCK	VT_BSTR	●Obtain the execution blocks. ●Return obtained value with String type. Example) X0.742756 Y0.151251	✓	-

@CONTROLLERMODE	VT_I4	●Obtain the operation mode. ●Convert the obtained value to a numerical value and then return it. ・UNAVAILABLE > 0 ・AUTOMATIC > 1 ・MANUAL > 2 ・MANUAL DATA INPUT > 3 ・SEMI_AUTOMATIC > 4 ・EDIT > 5 ・other than above > -1	✓	-
@EMERGENCYSTOP	VT_BOOL	●Obtain the emergency stop state ●Return True or False.	✓	-
@EXECUTION	VT_I4	●Obtain the program execution state. ●Convert the obtained strings to a corresponding numerical value and then return it. ・UNAVAILABLE > 0 ・READY > 1 ・ACTIVE > 2 ・FEED_HOLD > 3 ・STPPED > 4 ・OPTIONAL_STOP > 5 ・PROGRAM_STOPPED > 6 ・PROGRAM_COMPLETE > 7 ・other than above > -1	✓	-
@LINE	VT_I4	●Obtain the execution line number. ●Return the obtained value with a numerical value. ●Return 0 if the obtained value is “UNAVAILABLE”. Example) 134	✓	-
@PROGRAM	VT_BSTR	●Obtain the execution program name ●Return the obtained value with String type. Example) FLANGE_CAM.NGC	✓	-
@PARTCOUNT	VT_ARRAY| VT_I4	● Acquire the number of products. ● Returns the obtained value as a numeric type. ● If the acquired value is UNAVAILABLE, -1 is returned. Example) 10	✓	-

@TOOLNUMBER	VT_ARRAY| VT_BSTR	● Get the tool number. ● Returns the value obtained as a string.	✓	-
@TOOLASSETID	VT_ARRAY| VT_BSTR	● Get the tool identifier. ● Returns the value obtained as a string.	✓	-

Example) To obtain the value of machine coordinates (rotary axis).

AddVariable(“@ANGLE”,””);

Variable name is not case-sensitive.

AddVariable(“@angle”,””);

2.4. Error code

In MTConnect provider, the following original error codes are defined. (See Table 2-4)

For about ORiN2 common errors, refer to the error code section of ORiN2Programming guide.

Table 2-4 Original error code

Error name	Error number	Description
E_AGENT_PATH	0x80100001	Option strings “server=” is not specified.
E_VARIABLE_NAME	0x80100002	Variable name is incorrect. Use a predetermined variable name.
E_USER_VARIABLE	0x80100003	This does not support user variables. Add “@” on the top of variable name.
E_READ_XML	0x80100004	Failed to read data. IP address is incorrect or network is disconnected.
E_GET_TYPE	0x80100005	Failed to obtain values from the data. Corresponding device may not support specified variable name.
E_BOOL_TYPE	0x80100007	Could not convert from data to BOOL type. An unsupported character string may have been obtained. (Other than UNAVAILABLE, AVAILABLE, ARMED, TRIGGERED)

3. Sample program

This sample program shows how to obtain the value of "@POSITIONSTRING" from a corresponding device.

Address of the corresponding device : agent.mtconnect.org

List 3-1 Sample.frm

```
Dim eng As CaoEngine
Dim ctrl As CaoController
Dim var As CaoVariable

Private Sub Form_Load()
       Set eng = New CaoEngine
       'Connect with a server
       Set ctrl = eng.Workspaces(0).AddController("Sample", _
                                                  " CaoProv.DENSO.MTConnectProv ", _
                                                  "", _
                                                  "server=agent.mtconnect.org")
       Set var = ctrl.AddVariable("@POSITIONSTRING")
End Sub

'Obtain the value
Private Sub Command1_Click()
       Text1.Text = var
End Sub
```