ROBOT

TMcraft Node API Function Manual

Original Instructions

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Table of Content

Manual Revision History

Revision	Date	Revised Content
1.0	2024-11-01	Original release

API Revision History

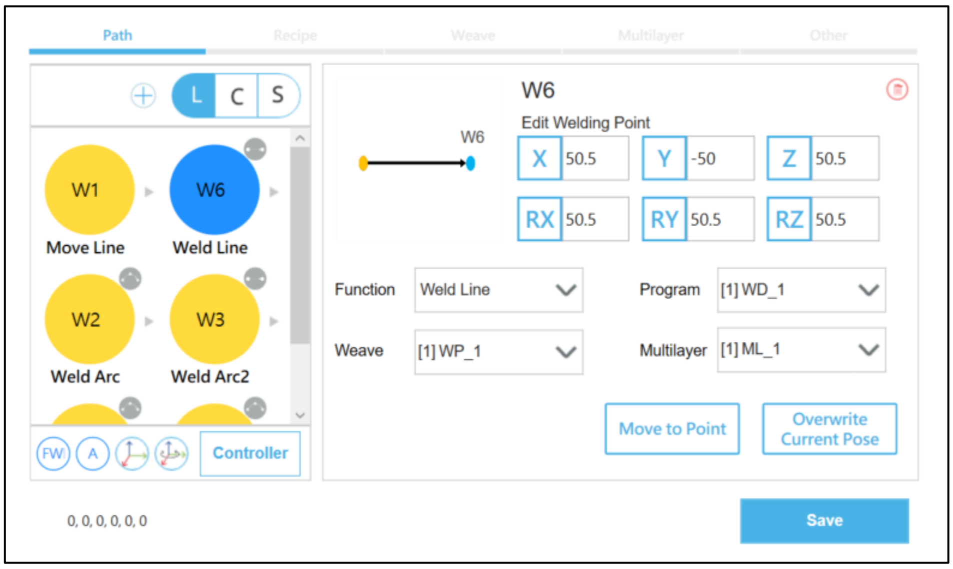
Version	Date	Change Note/History
1.14.1200	2023/8	● 1st release
1.16.1400	2024/2	● [Add] class TMcraftShellAPI ● [Add] class TMcraftToolbarAPI ● [Add] interface ITMcraftToolbarEntry ● [Add] class ErrorStatus ● [Add] FreeBotInfo.MoveMode ● [Add] class MoveMode ● [Add] class LogExportSetting ● [Add] RobotEventType.EndButtonFreeBotChanged
1.18.1400	2024/6	● [Add] class TMcraftSetupAPI ● [Add] class TMcraftNodeAPI.TextfileProvider ● [Add] class TMcraftShellAPI.TextfileProvider ● [Add] class TMcraftToolbarAPI.TextfileProvider ● [Add] TMcraftShellAPI.ProjectRunProvider.GetProjectList ● [Add] TMcraftShellAPI.RobotStatusProvider.GetRobotName ● [Add] TMcraftNodeAPI.RobotStatusProvider.GetRobotModelType ● [Add] TMcraftNodeAPI.RobotStatusProvider.GetFlowVersion
1.20.1100	2024/11	● [Add] TMcraftNodeType.dll ● [Add] class TMcraftNodeAPI.FreeBotProvider ● [Add] class TMcraftNodeAPI.EndButtonEventProvider ● [Deprecated] TMcraftNodeAPI.RobotStatusProvider.GetFreeBot ● [Deprecated] TMcraftNodeAPI.RobotStatusProvider.SetFreeBot ● [Deprecated] TMcraftNodeAPI.RobotStatusProvider.EndButtonClickEvent ● [Add] class TMcraftShellAPI.FreeBotProvider ● [Add] class TMcraftShellAPI.EndButtonEventProvider ● [Deprecated] TMcraftShellAPI.RobotStatusProvider.GetFreeBot ● [Deprecated] TMcraftShellAPI.RobotStatusProvider.SetFreeBot ● [Deprecated] TMcraftShellAPI.RobotStatusProvider.EndButtonClickEvent ● [Add] class TMcraftToolbarAPI.FreeBotProvider ● [Add] class TMcraftToolbarAPI.EndButtonEventProvider ● [Deprecated] TMcraftToolbarAPI.RobotStatusProvider.GetFreeBot ● [Deprecated] TMcraftToolbarAPI.RobotStatusProvider.SetFreeBot

		● [Deprecated] TMcraftToolbarAPI.RobotStatusProvider.EndButton-ClickEvent ● [Add] class TMcraftSetupAPI.FreeBotProvider ● [Add] class TMcraftSetupAPI.EndButtonEventProvider ● [Deprecated] TMcraftSetupAPI.RobotStatusProvider.GetFreeBot ● [Deprecated] TMcraftSetupAPI.RobotStatusProvider.SetFreeBot ● [Deprecated] TMcraftSetupAPI.RobotStatusProvider.EndButtonClickEvent

1. Overview

TMcraft Node is a customized Node developed based on C#/WPF for use in flow projects. Users can use TMcraft Node in the following scenarios:

1. Device Node: to set up the 3rd party device and manipulate it during the project run.
2. Application Node: to set up an application (such as palletizing, machine tending, etc.) and carry out the process during the project run. Here is an example of a TMcraft Node customized for welding:



W6

Edit Welding Point

X 50.5 Y -50 Z 50.5

RX 50.5 RY 50.5 RZ 50.5

Function Weld Line Program [1] WD_1

Weave [1] WP_1 Multilayer [1] ML_1

0, 0, 0, 0, 0, 0

Figure 1: A Sample of TMcraft Node for welding

Like using other nodes, users can drag the TMcraft Node onto the flow and edit the settings through its custom GUI. When closing the Node editing UI, the TMcraft Node should be programmed to gather the settings, generate the correspond TMscript and add it to the project. As the project runs and reaches the TMcraft Node, the robot should runs that TMscript. Using the TMcraft API, the TMcraft Node program can interact with TMflow, performing tasks like creating variables, jogging the robot, generating TMscript, and more.

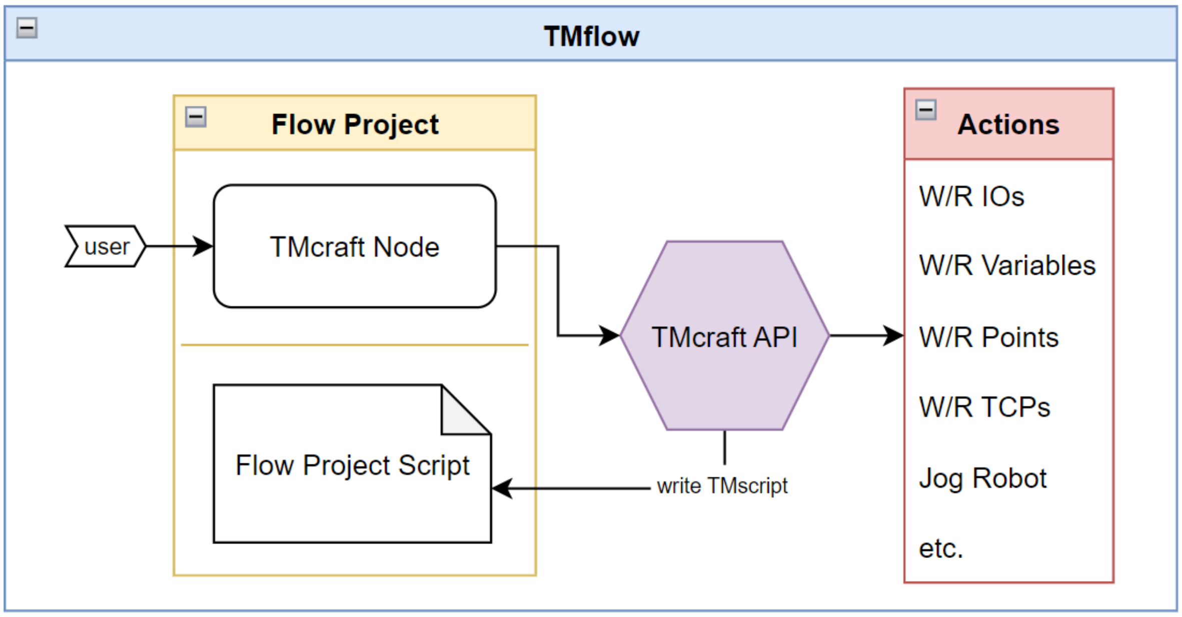


Figure 2: System architecture of TMcraft Node within TMflow

Plugins capabilities	Node	Shell	Toolbar	Setup
Base (Add/Edit/Delete)	✓			✓
Point (Add/Edit/Delete)	✓			✓
Tool (Add/Edit/Delete)	✓	✓	✓	✓
Digital IO (Read/Write)	✓	✓	✓	✓
Analog IO (Read/Write)	✓	✓	✓	✓
Project Variables (New/Edit)	✓	✓	✓	✓
Global Variables (New/Edit)	✓	✓	✓	✓
Vision Job (Add/Open/Delete)	✓			
Jog the robot	✓	✓	✓	
Freebot (Set/Get)	✓	✓	✓	✓
End Button Event	✓	✓	✓	✓
Get Current Language	✓	✓	✓	✓
Get TMflow Type	✓	✓	✓	✓
Text file (Read/Write)	✓	✓	✓	✓
TMscript on flow project (Read/Write)	✓			✓
Login/Logout/Get Control		✓		
script Project (Add/Edit/Delete)		✓		
Robot status (Error, Run, etc.)		✓	✓	
Error Event		✓	✓	
Virtual Robot Stick		✓		
Export/Import		✓		
Variables Runtime Value (Read/Write)		✓	Read only	

Table 1: A brief overview of the capabilities of various TMcraft plugin APIs

To develop and implement a TMcraft Node, developers should firstly build it as a User Control Library (dll file, not exe file). Next, generate a TMcraft Node zip with the TMcraft Packer from the TMcraft Development Kit;

during the process, the TMcraft Packer complie compile the User Control Library into an execution file and zip it with the resource files within the source folder. Finally , import the TMcraft Node zip to TMflow.

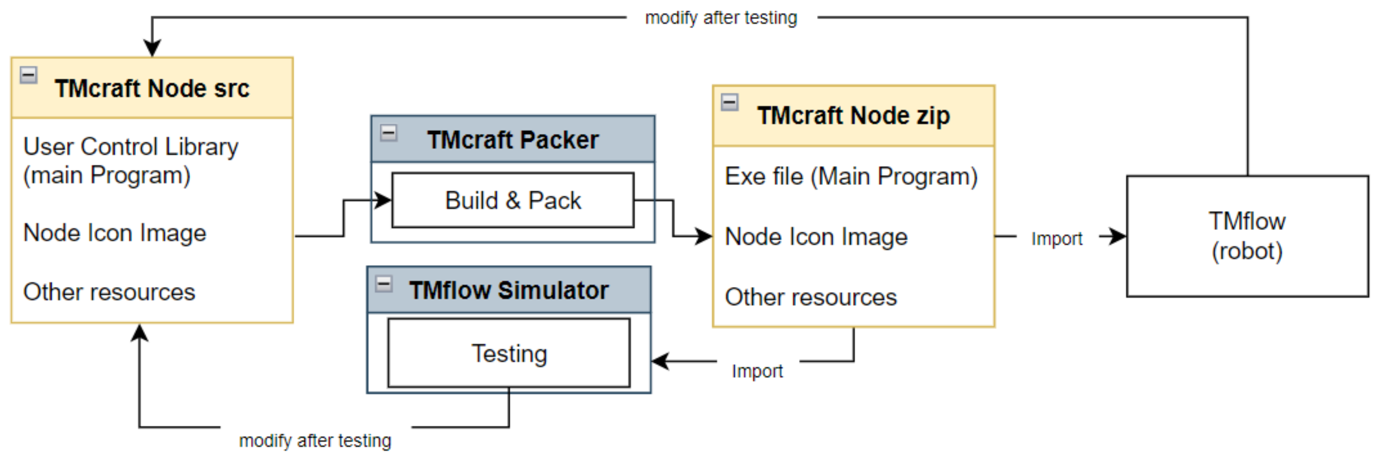


Figure 3: Development Process of a TMcraft Node

This manual briefly explains the framework of a TMcraft Node Program and outlines all TMcraft Node API functions. Note that this manual does not cover all enums and additional classes of TMcraft API, but the most relevant to TMcraft Node.

2. Programming with TMcraft API

To understand the TMcraft Node program structure, refer the sample code below.

```
using TMcraft;

namespace TMcraftSample
{
        public partial class UserControl1 : UserControl, ITMcraftNodeEntry
        {
                TMcraftNodeAPI NodeUI;
                string _TMscript = string.Empty;
                bool fgSave = false;

                public MainPage()
                {
                        InitializeComponent();
                }

                public void InitializeNode(TMcraftNodeAPI _NodeUI) //executed when the node is opened
                {
                        NodeUI = _NodeUI; //connect TMflow
                }

                public void InscribeScript(ScriptWriteProvider scriptWriter) //executed when the node is closed
                {
                        if(fgSave)
                        {
                                scriptWriter.AppendScript(_TMscript); //_TMscript can be modified elsewhere
                        }
                }
}
```

First, TMcraft.dll should be included as reference (using TMcraft). Secondly, implement the Interface ITMcraftNodeEntry to the User Control class. This interface has two members that require implementation: InitializeNode() and InscribeScript().

1. InitializeNode() is activated once opened the Node UI, which connects the Node with TMflow (technically, this makes the User Control member NodeUI (a TMcraftNodeAPI object) available for calling all sorts of TMcraft functions, such as DataStorageProvider.SaveData()).
2. InscribeScript() is activated when the Node UI is closed. Developers should define what TMscript to implement to a flow project by using ScriptWriteProvider functions.

The rest of the Program should be all sorts of event functions that can interact with TMflow through TMcraft functions.

In addition, the TMcraft Node API includes an additional file: TMcraftNodeType.dll. This file contains API functions that allow developers to specify and define the output type of the TMcraft Node, providing greater flexible usage on a flow project.

3. TMcraft API functions (Node related)

3.1 TMcraftNodeAPI

TMcraft.dll is a combination of the APIs of all sort of TMcraft items; for TMcraft Node, please declare an object of the class *TMcraftNodeAPI* and use the function within. Like other TMcraft API, *TMcraftNodelAPI* contains different members (or providers) functions in order to interact with TMflow, such as creating Project variables or jogging the robot, etc.

IMPORTANT:
TM AI + AOI Edge comes without any robot-related functionality, so it does not support some TMcraft API functions. For TMcraft Node, the unsupported functions include:

- BaseProvider: all functions
- PointProvider: all functions
- RobotJogProvider: all functions
- RobotStatusProvider: all functions
- TCPProvider: all functions
- Enumeration types: FreeBotMode, MoveMode, RobotEventType
- Additional class: BaseInfo, FreebotInfo, PointInfo, TCPInfo

3.1.1 Version

Syntax

string TMcraftNodeAPI.Version

Description

A member of the TMcraftNodeAPI class. Returns a string represents the version of the current TMcraft.dll and is read-only.

Return

string	Version of the current TMcraft API

3.1.2 Close

Syntax

TMcraft.TMcraftErr Close()

Description

Closes the current TMcraft node.

Parameters

No parameters are required.

Return

TMcraft.TMcraftErr	Returns TMcraftErr.OK if the function works properly; otherwise, returns the corresponding TMcraftErr. For more detail, please check enum TMcraft.TMcraftErr.

3.1.3 GetErrMsg

Syntax

```
TMcraft.TMcraftErr GetErrMsg(
    unit errorCode,
    out string ErrorMessage
)
```

Description

Output the error message according to the error code input. This function is used for checking the result of calling Provider functions.

Parameters

errorCode	The unit error code returned by most Provider functions.
errorMessage	Response the associated error message by the input error code.

Return

TMcraft.TMcraftErr	Returns TMcraftErr.OK if the function works properly; otherwise, returns the corresponding TMcraftErr. For more detail, please check enum TMcraft.TMcraftErr.

3.2 ITMcraftNodeEntry

ITMcraftNodeEntry is an Interface provided by TMcraft API which defines a contract of being a TMcraft Node. Any class that implements this contract must provide an implementation of two members defined in the Interface: InitializeNode() and InscribeScript().

3.2.1 InitializeNode

Syntax

```
void InitializeNode(
    TMcraftNodeAPI tMNodeEditer
)
```

Description

Initializes the Node with user-defined actions.

Parameters

tMNodeEditor	The TMcraftNodeAPI object connects the TMcraft Node with TMflow.

Return

None.

3.2.2 InscribeScript

Syntax

```
void InscribeScript(
    ScriptWriteProvider scriptwriter
)
```

Description

This function executes when TMcraft Node is about to close and actions can be defined within it. Usually, the major action is using ScriptWriteProvider functions to define the script to execute during project run. Please note that, if AppendScript or AppendLine is used within this function, the previously saved script will be cleared and replaced by the script on the buffer.

Parameters

scriptWriter	A ScriptWriteProvider Object, which is used for calling AppendLine() or AppendScript().

Return

None.

3.3 ITMcraftNodeOutputTypeEntry

ITMcraftNodeOutputTypeEntry is an Interface within TMcraftNodeType.dll. Through this interface, developers can further define the output type of the TMcraft Node.

3.3.1 InitializeNodeOutputType

Syntax

```
void InitializeNodeOutputType()
```

Description

Member function of the interface ITMcraftNodeOutputTypeEntry. In this function, other members of ITMcraftNodeOutputTypeEntry should be assigned in order to define the output type.

Parameters

None.

Return

None.

3.3.2 DefineNodeOutputType

Syntax

```
NodeOutputTypeTemplate DefineNodeOutputType { get; set; }
```

Description

Member of the interface ITMcraftNodeOutputTypeEntry that defines the output type of the TMcraft Node. Assign this member with enum NodeOutputTypeTemplate within the function InitializeNodeOutputType().

3.3.3 DefineBinaryNodeTemplate

Syntax

```
BinaryNodeTemplate DefineBinaryNodeTemplate { get; set; }
```

Description

Member of the interface ITMcraftNodeOutputTypeEntry that defines the binary node template. Assigns this member with enum BinaryNodeTemplate inside the function InitializeNodeOutputType(). Note that this member is significant if and only if the output type is already defined as Binary, i.e., DefineNodeOutputType = NodeOutputTypeTemplate.Binary.

3.3.4 DefineCaseNodes

Syntax

```
List<string> DefineCaseNodes { get; set; }
```

Description

Member of the interface ITMcraftNodeOutputTypeEntry that defines the cases nodes of the TMcraft Node. Assigns this member with a list of strings (i.e. List<string>) inside the function InitializeNodeOutputType(); the numbers of items within the list defines how much cases nodes the TMcraft Node has, and each string defines the name of each case nodes. Note that this member is significant if and only if the output type is already defined as Muliple, i.e., DefineNodeOutputType = NodeOutputTypeTemplate.Multi.

3.4 BaseProvider

BaseProvider provides functions for TMcraft Node to access or modify the base value of the current Project.

3.4.1 ChangeBaseValue

Syntax

```
uint ChangeBaseValue(
    string baseName,
    float[] baseData
)
```

Description

Modifies a specific Base.

Parameters

baseName	Name of the target Base.
baseData	A 6×1 float array, {x, y, z, rx, ry, rz}, that can be the new value of the target Base.

Return

uint	The error code that represents the result of the function calling.

3.4.2 CreateNewBase

Syntax

```
uint CreateNewBase(
            string baseName,
            float[] baseData
)
```

Description

Creates a new Base.

Parameters

baseName	Name of the base being created
baseData	A 6×1 float array, {x, y, z, rx, ry, rz}, that defines the newly created base.

Return

uint	The error code that represents the result of the function calling.

3.4.3 DeleteBase

Syntax

```
uint DeleteBase(
    string baseName
)
```

Description

Deletes a specific Base.

Parameters

baseName	Name of the Base being deleted.

Return

uint	The error code that represents the result of the function calling.

3.4.4 GetBaseList

Syntax

```
uint GetBaseList(
            ref List<BaseInfo> bases
)
```

Description

Gets the Base list of the current project.

Parameters

bases	A List of BaseInfo objects.

Return

uint	The error code that represents the result of the function calling.

3.4.5 IsBaseExist

Syntax

```
bool IsBaseExist(
     string baseName
)
```

Description

Check if a specific Base exists or not.

Parameters

baseName	Name of the Base being checked.

Return

bool	True if the base exists, false if not.

3.5 DataStorageProvider

DataStorageProvider provides functions for TMcraft Node to access its own temporarily stored data (for configuration purposes, for example). Please note that a TMflow project can contain a single TMcraft Node in duplicate, and these nodes do not share their own data with each another. TMcraft API ensures each node accesses its own temporarily stored data, depending on the identity/location of the node.

3.5.1 GetAllData

Syntax

```
uint GetAllData(
     out Dictionary<string, object> dataSet
)
```

Description

Gets all data (Dictionary Type) from the current TMcraft Node data storage.

Parameters

dataSet	A Dictionary type of all data stored within the current node.

Return

Unit	The error code that represents the result of the function calling.

3.5.2 GetData

Syntax 1

```
uint GetData(
     string key,
     out BaseInfo data
)
```

Description

Gets a specific BaseInfo type data from the current TMcraft Node data storage by to the string key.

Parameters

key	A string key that provides access to the data.
data	BaseInfo type data being output.

Return

uint	The error code that represents the result of the function calling.

Syntax 2

```
uint GetData(
      string key,
      out PointInfo data
)
```

Description

Gets a specific PointInfo type data from the current TMcraft Node data storage by the string key.

Parameters

key	A string key that provides access to the data.
data	PointInfo type data being output.

Return

uint	The error code that represents the result of the function calling.

Syntax 3

```
uint GetData(
      string key,
      out string data
)
```

Description

Gets a string data, along with its corresponding string key. Please note that this data belongs to the current TMcraft Node only.

Parameters

key	A string key that provides access to its corresponding data.
data	String type data being output.

Return

uint	The error code that represents the result of the function calling.

Syntax 4

```
uint GetData(
      List<string> keys,
      out Dictionary<string,object> dataSet
)
```

Description

Gets a Dictionary Type of data set, which corresponds to a certain List of string keys, from the current TMcraft Node.

Parameters

keys	A List of string keys that can provide access to corresponding data stored within the current node.
dataSet	Dictionary<string, object> being output.

Return

uint	The error code that represents the result of the function calling.

3.5.3 SaveData

Syntax 1

```
SaveData(
        string key,
        string data
)
```

Description

Saves a string data, along with its string key. Please note that this data belongs to the current TMcraft Node only.

Parameters

key	A string key that provides access to its corresponding data.
data	String data being stored.

Return

uint	The error code that represents the result of the function calling.

Syntax 2

```
SaveData(
        Dictionary<string, string> dataSet
)
```

Description

Saves a DictionaryType (a collection of string keys and string data). Please note that this dictionary of data belongs to the current TMcraft Node only.

Parameters

dataSet	A Dictionary Type of data stored within the current node.

Return

uint	The error code that represents the result of the function calling.

Syntax 3

```
uint SaveData(
    string key,
    BaseInfo data
)
```

Description

Saves a BaseInfo type data, along with its corresponding string key. Please note that this data belongs to the current TMcraft Node only.

Parameters

key	A string key that provides access to its corresponding data.
data	BaseInfo data being stored.

Return

uint	The error code that represents the result of the function calling.

Syntax 4

```
uint SaveData(
    Dictionary<string, BaseInfo> dataSet
)
```

Description

Saves a Dictionary Type, along with string keys and BaseInfo data it contains. Please note that this dictionary of data belongs to the current TMcraft Node only.

Parameters

dataSet	A Dictionary type of data stored within the current node.

Return

uint	The error code that represents the result of the function calling.

Syntax 5

```
uint SaveData(
    string key,
    PointInfo data
)
```

Description

Save a PointInfo type data, along with its corresponding string key. Please note that this data belongs to the current TMcraft Node only.

Parameters

key	A string key that provides access to its corresponding data.
data	PointInfo type data being stored.

Return

uint	The error code that represents the result of the function calling.

Syntax 6

```
uint SaveData(
    Dictionary<string, PointInfo> dataSet
)
```

Description

Saves a Dictionary Type that is defined by string keys and PointInfo data. Please note that this dictionary of data belongs to the current TMcraft Node only.

Parameters

dataSet	A Dictionary type of data stored within the current node.

Return

uint	The error code that represents the result of the function calling.

3.6 EndButtonEventProvider

EndButtonEventProvider contains functions related to the end button event.

3.6.1 HasEndButtonEventOwnership

Syntax

uint HasEndButtonEventOwnership()

Description

TMcraft plugin can call this function to check if it has the end button event ownership or not. If yes, this TMcraft plugin is the only one who can recieve the end button event signal.

Parameters

None

Return

bool	Returns True if the TMcraft plugin has the end button event ownership; otherwise, returns Fail.

3.6.2 IsEndButtonBoardcastMode

Syntax

uint IsEndButtonBoardcastMode()

Description

TMcraft plugin can call this function to check if the end button event is currently in boardcast mode. If yes, that means all TMcraft plugins can recieve the event signal; otherwise, one of the TMcraft plugin has the ownership. i.e. other plugins recieve no signal from the event.

Parameters

None

Return

bool	Returns True if the end button event is currenly in boardcast mode; otherwise, returns Fail.

3.6.3 ReleaseEndButtonEventOwnership

Syntax

uint ReleaseEndButtonEventOwnership()

Description

TMcraft plugin can call this function to release the button event ownership.

Parameters

None

Return

uint	The error code that represents the result of the function calling.

3.6.4 SetEndButtonEventOwnership

Syntax

```
uint SetEndButtonEventOwnership()
```

Description

TMcraft plugin can call this function to get the end button event ownership.

Parameters

None

Return

uint	The error code that represents the result of the function calling.

3.6.5 EndButtonClickEvent

Description

An event type denotes to the click event occurred on the buttons of the End Module. Function can be linked to this event so that it will be activated once the event is triggered.

3.7 FreebotProvider

FreeBotProvider provides functions related to freebot.

3.7.1 GetFreeBot

Syntax

```
uint GetFreeBot(
    out FreeBotInfo freeBot
)
```

Description

Gets the value of the current FreeBot settings.

Parameters

freeBot	Value of the current FreeBot settings defined by FreeBotInfo.

Return

uint	The error code that represents the result of the function calling.

3.7.2 HoldFreeBotKeyToHandGuide

Syntax

```
uint HoldFreeBotKeyToHandGuide(
    bool holdKey
```

)

Description

Mimics holding the freebot button to enter hand guide mode. Note that, calling this function alone is not enough, another function KeepFreeBot should be running at the same time.

Parameters

holdKey	True means to activate the hand guide mode; false means to deactivate.

Return

uint	The error code that represents the result of the function calling.

3.7.3 KeepFreeBot

Syntax

```
uint KeepFreeBot()
```

Description

Keep the current hand guide mode. After sending HoldFreeBotKeyToHandGuide, this function should be keep sending every 100 - 500 ms until the hand guiding ends, otherwise, the robot will leave hand guide mode.

Parameters

None

Return

uint	The error code that represents the result of the function calling.

3.7.4 SetFreeBot

Syntax

```
uint SetFreeBot(
    FreeBotInfo freeBot
)
```

Description

Sets FreeBot settings.

Parameters

freeBot	A FreeBotInfo being assigned as FreeBot settings.

Return

uint	The error code that represents the result of the function calling.

3.8 IOProvider

IOProvider provides functions for TMcraft Node to interact with system I/O.

3.8.1 GetAllIOData

Syntax

```
uint GetAllIOData(
        out List<DeviceIOInfo> ioData
    )
```

Description

Gets all IO status.

Parameters

ioData	A List of DeviceIOInfo objects that denotes all IO status data.

Return

uint	The error code that represents the result of the function calling.

3.8.2 ReadAnalogInput

Syntax

```
uint ReadAnalogInput(
    IO_TYPE type,
    int deviceSerialNum,
    int channelNum,
    out float value
)
```

Description

Read the status of a specific Analog Input.

Parameters

type	The IO_TYPE enum that defines which device the target Analog Input belongs to.
deviceSerialNum	Device serial number, which always starts from 0 and is more meaningful if the target device is an external IO module because there might be multiple external IO module devices within the system. The number is 0 if the target device is the Control box IO board or end module IO board because there are only one Control box IO board and one end module IO board.
channelNum	Channel number.
value	Analog Input value, ranged from -10V to 10V.

Return

uint	The error code that represents the result of the function calling.

3.8.3 ReadAnalogOutput

Syntax

```
uint ReadAnalogOutput(
    IO_TYPE type,
    int deviceSerialNum,
    int channelNum,
    out float value
```

)

Description

Read the status of a specific Analog Output.

Parameters

type	The IO_TYPE enum that defines which device the target Analog Output belongs to.
deviceSerialNum	Device serial number, which always starts from 0 and is more meaningful if the target device is an external IO module because there might be multiple external IO module devices within the system. The number is 0 if the target device is the Control box IO board or end module IO board because there are only one Control box IO board and one end module IO board.
channelNum	Channel number.
value	Analog Output value, ranged from -10V to 10V.

Return

uint	The error code that represents the result of the function calling.

3.8.4 ReadDigitInput

Syntax

```
uint ReadDigitInput(
    IO_TYPE type,
    int deviceSerialNum,
    int channelNum,
    out bool status
)
```

Description

Read the status of a specific Digital Input.

Parameters

type	The IO_TYPE enum that defines which device the target Digital Input belongs to.
deviceSerialNum	Device serial number, which always starts from 0 and is more meaningful if the target device is an external IO module because there might be multiple external IO module devices within the system. The number is 0 if the target device is the Control box IO board or end module IO board because there are only one Control box IO board and one end module IO board.
channelNum	Channel number.
status	Digital Input status, where bool true is HIGH and bool false is LOW.

Return

uint	The error code that represents the result of the function calling.

3.8.5 ReadDigitOutput

Syntax

```
uint ReadDigitOutput(
    IO_TYPE type,
    int deviceSerialNum,
    int channelNum,
    out bool status
)
```

Description

Read the status of a specific Digital Output.

Parameters

type	The IO_TYPE enum that defines which device the target Digital Output belongs to.
deviceSerialNum	Device serial number, which always starts from 0 and is more meaningful if the target device is an external IO module because there might be multiple external IO module devices within the system. The number is 0 if the target device is the Control box IO board or end module IO board because there are only one Control box IO board and one end module IO board.
channelNum	Channel number.
status	Digital Output status, where bool true is HIGH and bool false is LOW.

Return

uint	The error code that represents the result of the function calling.

3.8.6 SetCameraLight

Syntax

```
uint SetCameraLight(
    bool status
)
```

Description

Switch the Eye-In-Hand camera light to the ON or OFF status.

Parameters

status	bool true denotes turning the light ON, bool false denotes turning the light OFF

Return

uint	The error code that represents the result of the function calling.

3.8.7 WriteAnalogOutput

Syntax

```
uint WriteAnalogOutput(
    IO_TYPE type,
    int deviceSerialNum,
    int channelNum,
    float value
)
```

Description

Set the value of a specific Analog Output.

Parameters

type	The IO_TYPE enum that defines which device the target Analog Output belongs to.
deviceSerialNum	Device serial number, which always starts from 0 and is more meaningful if the target device is an external IO module because there might be multiple external IO module devices within the system. The number is 0 if the target device is the Control box IO board or end module IO board because there are only one Control box IO board and one end module IO board.
channelNum	Channel number.
value	Analog Output value, ranged from -10V to 10V.

Return

uint	The error code that represents the result of the function calling.

3.8.8 WriteDigitOutput

Syntax

```
uint WriteDigitOutput(
    IO_TYPE type,
    int deviceSerialNum,
    int channelNum,
    bool status
)
```

Description

Change the status of a specific Digital Output.

Parameters

type	The IO_TYPE enum that defines which device the target Digital Output belongs to.
deviceSerialNum	Device serial number, which always starts from 0 and is more meaningful if the target device is an external IO module because there might be multiple external IO module devices within the system. The number is always 0 if the target device is the Control box

	IO board or end module IO board because there are only one Control box IO board and one end module IO board.
channelNum	Signal channel number.
status	Digital Output status, where bool true is HIGH and bool false is LOW.

Return

uint	The error code that represents the result of the function calling.

3.9 PointProvider

PointProvider provides functions for TMcraft Node to access or modify Point values within the current project.

3.9.1 ChangePointBase

Syntax

```
uint ChangePointBase(
    string pointName,
    string baseName
)
```

Description

Changes the base of a specific Point.

Parameters

pointName	Name of the target point.
baseName	Name of the Base being switched to.

Return

uint	The error code that represents the result of the function calling.

3.9.2 ChangePointRobotConfigs

Syntax

```
uint ChangePointRobotConfigs(
    string pointName,
    int[] robotConfigs
)
```

Description

Sets the Robot Configs of the specific Point.

Parameters

pointName	Name of the target point.
robotConfigs	A 3×1 interger array representing the robot configurations of the target point. Here is the definition: int[0]: 0 – Right Arm, 1 – Left Arm int[1]: 2 – Above Elbow, 3 – Below Elbow

	int[2]: 4 – Up Wrist, 5 – Down Wrist

Return

uint	The error code that represents the result of the function calling.

3.9.3 ChangePointToolCoordinates

Syntax

```
uint ChangePointToolCoordinates(
    string pointName,
    float[] toolCoordinates
)
```

Description

Changes the Tool Coordinates of a specific Point.

Parameters

pointName	Name of the target point.
endToolCoordinate	A 6×1 float array {x, y,z, rx, ry, rz} which represents the new Tool Coordinates.

Return

uint	The error code that represents the result of the function calling.

3.9.4 CreatePointByFlangeCoordinates

Syntax

```
uint CreatePointByFlangeCoordinates(
    string pointName,
    float [] flangeCoordinate,
    int[] robotConfigs,
    string baseName,
    string toolName
)
```

Description

Create a new Point defined by Flange Coordinates (and by Point Name, Robot Configs, Base Name, and Tool Name).

Parameters

pointName	Name of the Point being created.
flangeCoordinate	A 6×1 float array {x, y, z, rx, ry, rz}, represents the Flange Coordinates defining the new point.
robotConfigs	A 3×1 interger array denoting the robot configurations of the target point. Here is the definition: int[0]: 0 – Right Arm, 1 – Left Arm int[1]: 2 – Above Elbow, 3 – Below Elbow int[2]: 4 – Up Wrist, 5 – Down Wrist

baseName	The base, which defines the flange, coordinates.
toolName	The tool, which defines the point.

Return

uint	The error code that represents the result of the function calling.

3.9.5 CreatePointByJointAngles

Syntax

```
uint CreatePointByJointAngles(
    string pointName,
    float[] JointAngles,
    string baseName,
    string toolName
)
```

Description

Creates a new Point defined by 6 Joint Angles (and by Point Name, Base Name, and Tool Name).

Parameters

pointName	Name of the point being created.
JointAngles	A 6×1 float array {x, y, z, rx, ry, rz}, represents the Joint Angles defining the new point.
baseName	The base which defines the point.
toolName	The tool which defines the point.

Return

uint	The error code that represents the result of the function calling.

3.9.6 CreatePointByToolCoordinates

Syntax

```
uint CreatePointByToolCoordinates(
    string pointName,
    float[] endToolCoordinate,
    int[] robotConfigs,
    string baseName,
    string toolName
)
```

Description

Creates a new Point defined by end-effector Coordinates (and by Point Name, Robot Configs, Base Name, and Tool Name).

Parameters

pointName	Name of the point created.

endToolCoordinate	A 6×1 float array {x, y, z, rx, ry, rz}, represents the end-effector Coordinates defining the new point.
robotConfigs	A 3×1 interger array denoting the robot configurations of the target point. Here is the definition: int[0]: 0 – Right Arm, 1 – Left Arm int[1]: 2 – Above Elbow, 3 – Below Elbow int[2]: 4 – Up Wrist, 5 – Down Wrist
baseName	The base which defines the end-effector coordinates.
toolName	The tool which defines the end-effector coordinates.

Return

uint	The error code that represents the result of the function calling.

3.9.7 GetPointList

Syntax

```
uint GetPointList(
    ref List<PointInfo> points
)
```

Description

Gets the Point list of the current Project.

Parameters

points	A List of PointInfo objects that denotes the list of points of the current Project.

Return

uint	The error code that represents the result of the function calling.

3.9.8 GetPointRobotConfigs

Syntax

```
uint GetPointRobotConfigs(
    string pointName,
    ref int[] robotConfigs
)
```

Description

Gets the Robot Configs of a specific Point.

Parameters

pointName	Name of the target point.
robotConfigs	A 3×1 interger array representing the robot configurations of the target point. Here is the definition: int[0]: 0 – Right Arm, 1 – Left Arm

int[1]: 2 – Above Elbow, 3 – Below Elbow

int[2]: 4 – Up Wrist, 5 – Down Wrist

Return

uint	The error code that represents the result of the function calling.

3.9.9 IsPointExist

Syntax

```
bool IsPointExist(
    string pointName
)
```

Description

Check if a specific Point exists or not.

Parameters

pointName	Name of the point being checked.

Return

bool	True if exists, false if not.

3.10 RobotJogProvider

RobotJogProvider provides functions for TMcraft Node to jog the robot, either by commands or the Controller Interface.

IMPORTANT

IMPORTANT:
If the TMcraft node uses any RobotJogProvider functions for motion control, it is the responsibility of the developer to make sure single point of control within ISO 10218-1.

3.10.1 JogByBase

Syntax

```
uint JogByBase(
    float speedPercentage,
    float [] targetCoordinates
)
```

Description

Jogs the robot towards the target's Coordinates (relative to current base and tool) with a 6×1 float array {x, y, z, rx, ry ,rz}.

Parameters

speedPercentage	Speed percentage is equivalent to the speed (in percentage) setting on the TMflow Controller, where the current jogging speed should match the max joint speed. The max joint speed of the robot model is multiplied by the speed percentage, and the product (TCP speed) of this multiplication should always be lower than Manual Control mode speed limit (250 ㎜/s). speedPercentage is expressed in decimals (e.g., 1.5 for 1.5%)..
targetMovementValue	A 6×1 float array {x, y, z, rx, ry ,rz} of target movement value.

Return

uint	The error code that represents the result of the function calling.

3.10.2 JogByJoint

Syntax

```
uint JogByJoint(
    float speedPercentage,
    float[] targetJointAngles
)
```

Description

Jogs the robot towards the targets Joint Angles. Please note that like using TMflow Controller, users need to use the Robot Stick (e.g., by pressing the Enabling Switch and the PLAY button) to start the motion.

Parameters

speedPercentage	Speed percentage is equivalent to the speed (in percentage) setting on the TMflow Controller, where the current jogging speed should match the max joint speed. The max joint speed of the robot model is multiplied by the speed percentage, and the product (TCP speed) of this multiplication should always be lower than Manual Control mode speed limit (250 ㎜/s). speedPercentage is expressed in decimals (e.g., 1.5 for 1.5%).
targetJointAngles	A 6×1 float array {J1, J2, J3, J4, J5, J6} which represents the target Joint Angle.

Return

uint	The error code that represents the result of the function calling.

3.10.3 JogRelativeByTool

Syntax

```
uint JogLineByTool(
    float speedPercentage,
    float [] targetMovementValue
)
```

Description

Jogs the robot along with Tool Axes. Remind that, like using TMflow Controller, users need to use the robot stick (e.g. Enabling Device + PLAY) to start the motion.

Parameters

speedPercentage	Speed percentage is equivalent to the speed (in percentage) setting on the TMflow Controller, where the current jogging speed should match the max joint speed. The max joint speed of the robot model is multiplied by the speed percentage, and the product (TCP speed) of this multiplication should always be lower than Manual Control mode speed limit (250 ㎜/s). speedPercentage is expressed in decimals (e.g., 1.5 for 1.5%).
targetMovementValue	A 6×1 float array {x, y, z, rx, ry ,rz} of target movement value.

Return

uint	The error code that represents the result of the function calling.

3.10.4 OpenControllerPanel

Syntax

```
uint OpenControllerPanel()
```

Description

Opens TMflow Controller Interface.

Parameters

No parameters are not required.

Return

uint	The error code that represents the result of the function calling.

3.10.5 StopJog

Syntax

```
uint StopJog()
```

Description

Stops all Jog motion immediately. It is also recommended to call this function before calling Jog motion functions in order to clear the motion buffer

Parameters

No parameters are not required.

Return

uint	The error code that represents the result of the function calling.

3.11 RobotStatusProvider

RobotStatusProvider provides functions for TMcraft Node to access different robot status information.

3.11.1 GetCurrentBaseName

Syntax

```
uint GetCurrentBaseName(
    out string baseName
)
```

Description

Gets the name of the current Base.

Parameters

baseName	Current Base name.

Return

uint	The error code that represents the result of the function calling.

3.11.2 GetCurrentPayload

Syntax

```
uint GetCurrentPayload(
    out float payload
)
```

Description

Gets the current payload value set to the robot (end-effector).

Parameters

payload	Payload value being assigned.

Return

uint	The error code that represents the result of the function calling.

3.11.3 GetCurrentPoseByCurrentBase

Syntax

```
uint GetCurrentPoseByCurrentBase(
    out float[] currentPose
)
```

Description

Gets robot current TCP position defined by the Current Base.

Parameters

currentPose	A 6×1 float array {x, y, z, rx, ry, rz} that denotes the current robot pose.

Return

uint	The error code that represents the result of the function calling.

3.11.4 GetCurrentPoseByJointAngle

Syntax

```
uint GetCurrentPoseByJointAngle(
    out float[] jointAngles
)
```

Description

Gets all robot current Joint Angles.

Parameters

jointAngles	A 6×1 float array {j1, j2, j3, j4, j5, j6} that denotes the current robot pose.

Return

uint	The error code that represents the result of the function calling.

3.11.5 GetCurrentPoseByRobotBase

Syntax

```
uint GetCurrentPoseByRobotBase(
    out float[] currentPose
)
```

Description

Gets robot current TCP position defined by the Robot Base.

Parameters

currentPose	A 6×1 float array {x, y, z, rx, ry, rz} that denotes the current robot pose.

Return

uint	The error code that represents the result of the function calling.

3.11.6 GetCurrentRobotConfigs

Syntax

```
uint GetCurrentRobotConfigs(
    out int[] robotConfigs
)
```

Description

Gets current Robot Config.

Parameters

robotConfigs	A 3×1 interger array denoting the robot configurations of the point; here is the definition: int[0]: 0 – Right Arm, 1 – Left Arm int[1]: 2 – Above Elbow, 3 – Below Elbow

	int[2]: 4 – Up Wrist, 5 – Down Wrist

Return

uint	The error code that represents the result of the function calling.

3.11.7 GetCurrentTcp

Syntax

```
uint GetCurrentTcp(
    out string tcpName
)
```

Description

Gets the name of current TCP.

Parameters

tcpName	Current TCP name.

Return

uint	The error code that represents the result of the function calling.

3.11.8 GetFlowVersion

Syntax

```
uint GetFlowVersion (
    out string result
)
```

Description

Gets the version of TMflow.

Parameters

result	TMflow version.

Return

uint	The error code that represents the result of the function calling.

3.11.9 GetRobotModelType

Syntax

```
uint GetRobotModelType (
    out string result
)
```

Description

Gets the model type of the robot.

Parameters

result	Model Type of the robot.

Return

uint	The error code that represents the result of the function calling.

3.11.10 SetCurrentBase

Syntax

```
uint SetCurrentBase(
      string baseName
)
```

Description

Assigns a specific Base as the current base.

Parameters

baseName	Name of the base being assigned.

Return

uint	The error code that represents the result of the function calling.

3.11.11 SetCurrentPayload

Syntax

```
uint SetCurrentPayload(
      float payload
)
```

Description

Sets a payload value to the robot (end-effector).

Parameters

payload	Payload value being assigned.

Return

uint	The error code that represents the result of the function calling.

3.11.12 SetCurrentTcp

Syntax

```
uint SetCurrentTcp(
      string tcpName
)
```

Description

Assigns a specific TCP as the current TCP.

Parameters

tcpName	Name of the TCP being assigned.

Return

uint	The error code that represents the result of the function calling.

3.12 ScriptWriteProvider

ScriptWriteProvider offers the functionality for managing the scripts of the TMcraft Node within the flow project. Note that the ScriptWriteProvider can only be used within the member function TMcraftNodeEntry.InscribeScript (), i.e., TMcraft Node can only read or write the script when the

Node is about to close.

3.12.1 AppendLine

Syntax

```
uint AppendLine(
    string scriptLine
)
```

Description

Activates the script buffer of the TMcraft Node and appends a script to it with auto-indentation (*i.e.*, a newline followed by a scriptLine). Note that the script buffer will then overwrite the original script once function TMcraftNodeEntry.InscribeScript() is finished.

Parameters

scriptLine	Script being added with line wrapping.

Return

uint	The error code that represents the result of the function calling.

3.12.2 AppendScript

Syntax

```
uint AppendScript(
    string script
)
```

Description

Activates the script buffer of the TMcraft Node and appends a script to it without auto-indentation (i.e.,no newline followed by a scriptLine). Note that the script buffer will then overwrite the original script once function TMcraftNodeEntry.InscribeScript() is finished.

Parameters

script	Script being added without auto-indentation.

Return

uint	The error code that represents the result of the function calling.

3.12.3 GetScript

Syntax

```
string GetScript()
```

Description

Gets the script of the TMcraft Node with the flow project.

Parameters

No parameters are required.

Return

string	Script from the ScriptWriteProvider object.

3.13 SystemProvider

SystemProvider provides functions for TMcraft Node to interact with TMflow System Settings.

3.13.1 GetCurrentLanguageCulture

Syntax

```
uint GetCurrentLanguageCulture(
    out string language
)
```

Description

Gets the current language setting of the system.

Parameters

language	Current System language, *e.g.*, en-US, zh-TW, zh-CN, ja-JP, de-DE, ko-KR

Return

uint	The error code that represents the result of the function calling.

3.13.2 GetTMflowType

Syntax

```
uint GetTMflowType(
    out TMflowType type
)
```

Description

Gets the current TMflow type of the system.

Parameters

type	Represent the TMflow type (e.g. Robot, AOIEdge, etc.) of the current system. For more detail, check the description of enum TMflowType.

Return

uint	The error code that represents the result of the function calling.

3.14 TCPProvider

TCPProvider provides functions for TMcraft to access or modify TCPs with the robot.

3.14.1 ChangeTcpInertia

Syntax

```
Uint ChangeTcpInertia(
    string tcpName,
    float[] inertiaValue
)
```

Description

Modifies the inertia value of a specific TCP.

Parameters

tcpName	Name of the target TCP.
inertiaValue	A 3×1 float array {Ixx, Iyy, Izz} of inertia value being assigned.

Return

Uint	The error code that represents the result of the function calling.

3.14.2 ChangeTcpMass

Syntax

```
Uint ChangeTcpMass(
    string tcpName,
    float mass
)
```

Description

Modifies the mass value (kg) of a specific TCP.

Parameters

tcpName	Name of the target TCP.
mass	Mass value (kg) to be assigned.

Return

Uint	The error code that represents the result of the function calling.

3.14.3 ChangeTcpMassCenter

Syntax

```
Uint ChangeTcpMassCenter(
    string tcpName,
    float[] massCenter
)
```

Description

Modifies the Mass Center value of a specific TCP.

Parameters

tcpName	Name of the target TCP.
massCenter	A 6×1 float array {x, y, z, rx, ry, rz} that denotes the location of the mass center of the TCP.

Return

Uint	The error code that represents the result of the function calling.

3.14.4 ChangeTcpPose

Syntax

```
Uint ChangeTcpPose(
```

string tcpName,
float[] toolCenterPoint
)

Description

Modifies the tool center point of a specific TCP by a 6×1 float array {x, y, z, rx, ry, rz} referring to Flange Base.

Paramters

tcpName	Name of the target TCP being modified.
toolCenterPoint	A 6×1 float array[6] {x, y, z, rx, ry, rz} of new Pose value referring to Flange Base.

Return

Uint	The error code that represents the result of the function calling.

3.14.5 CreateNewTcp

Syntax

```
Uint CreateNewTcp(
    TCPInfo tcpData
)
```

Description

Create a new TCP by using a TCPInfo Type as input.

Parameters

tcpData	TCPInfo type assigned for the new TCP.

Return

Uint	The error code that represents the result of the function calling.

3.14.6 DeleteTcp

Syntax

```
Uint DeleteTcp(
    string tcpName
)
```

Description

Delete a specific TCP file.

Parameters

tcpName	Name of the TCP being deleted.

Return

Uint	The error code that represents the result of the function calling.

3.14.7 GetProjectVisionTcpList

Syntax

```
Uint GetProjectVisionTcpList(
        out List<string> visionTcpList
    )
```

Description

Gets the list of Vision TCP Names from the current Project.

Paramters

visionTcpList	A List of vision TCP names.

Return

Uint	The error code that represents the result of the function calling.

3.14.8 GetTcpInertia

Syntax

```
    Uint GetTcpInertia(
        string tcpName,
        out float[] inertiaValue
    )
```

Description

Gets the inertia value of a specific TCP.

Parameters

tcpName	Name of the target TCP.
inertiaValue	A 3×1 float array {Ixx, Iyy, Izz} that denotes the inertia value of the target TCP.

Return

Uint	The error code that represents the result of the function calling.

3.14.9 GetTcpList

Syntax

```
    Uint GetTcpList(
        out List<TCPInfo> tcpList
    )
```

Description

Gets the list of all TCPs (with data) within the robot.

Parameters

tcpList	A List of TCPInfo type that denotes all TCPs within the robot.

Return

Uint	The error code that represents the result of the function calling.

3.14.10 GetTcpMass

Syntax

```
Uint GetTcpMass(
    string tcpName,
    out float mass
)
```

Description

Gets the value of mass (kg) from a specific TCP.

Parameters

tcpName	Name of the target TCP.
mass	Mass value (kg) of the target TCP.

Return

Uint	The error code that represents the result of the function calling.

3.14.11 GetTcpMassCenter

Syntax

```
Uint GetTcpMassCenter(
    string tcpName,
    out float[] massCenter
)
```

Description

Gets the Mass Center value of a specific TCP.

Parameters

tcpName	Name of the target TCP.
massCenter	A 6×1 float array {x, y, z, rx, ry, rz} that denotes the location of the mass center of the TCP.

Return

Uint	The error code that represents the result of the function calling.

3.14.12 IsTcpExist

Syntax

```
bool IsTcpExist(
    string tcpName
)
```

Description

Checks if a specific tcp exists or not.

Parameters

tcpName	Name of the tcp being checked.

Return

bool	True if exists, false if not.

3.15 TextFileProvider

TextFileProvider provides functions for TMcraft plugin to manipulate Textfiles within TMflow.

3.15.1 DeleteTextFile

Syntax

```
uint DeleteTextFile (
        string fileName
)
```

Description

Deletes a specific Textfile.

Parameters

fileName	Name of the file being deleted.

Return

uint	The error code that represents the result of the function calling.

3.15.2 ExportTextFile

Syntax

```
uint ExportTextFile (
        string fileName
)
```

Description

Exports a specific Textfile to the USB.

Parameters

fileName	Name of the file being exported.

Return

uint	The error code that represents the result of the function calling.

3.15.3 GetTextFileList

Syntax

```
uint GetTextFileList (
        out string list
)
```

Description

Gets the list of Textfile names within the current system.

Parameters

list	A list of Textfile names within the current system

Return

uint	The error code that represents the result of the function calling.

3.15.4 ImportTextFile

Syntax

```
uint ImportTextFile (
        string robotName,
        string fileName
)
```

Description

Import a Textfile to the robot.

Parameters

robotName	Name of the folder where the system can find the item to be imported.
fileName	Name of the file being imported.

Return

uint	The error code that represents the result of the function calling.

3.15.5 NewTextFile

Syntax

```
uint NewTextFile (
        string filename,
        string fileContent
)
```

Description

Create a new Textfile.

Parameters

fileName	Name of the file being created.
fileContent	Content of the Textfile to be assigned.

Return

uint	The error code that represents the result of the function calling.

3.15.6 ReadTextFile

Syntax

```
uint ReadTextFile (
        string filename,
        out string fileContent
)
```

Description

Read the content of a specific Textfile.

Parameters

fileName	Name of the file being read.
fileContent	Content of the Textfile to be read.

Return

uint	The error code that represents the result of the function calling.

3.15.7 WriteTextFile

Syntax

```
uint WriteTextFile (
      string filename,
      string fileContent
)
```

Description

Write content to a specific Textfile.

Parameters

fileName	Name of the file being written.
fileContent	Content of the Textfile to be written.

Return

uint	The error code that represents the result of the function calling.

3.16 VariableProvider

VariableProvider provides functions for TMcraft to access or modify the variables of the robot.

3.16.1 ChangeGlobalVariableValue

Syntax

```
uint ChangeGlobalVariableValue(
List<string[]> value
)
```

Description

Sets the value of a specific Global Variables.

Parameters

value	A list of global variables being modified; each element within this list should be a 2×1 string array {varName, varValue}, where varName is the name of the target variable and varValue is the value being assigned.

Return

uint	The error code that represents the result of the function calling.

3.16.2 ChangeProjectVariableValue

Syntax

```
uint ChangeProjectVariableValue(
      List<string[]> value
)
```

Description

Sets the initial value of a specific project variable.

Parameters

value	A list of Project Variables being modified; each element within this list should be a 2×1 string array {varName, varValue}, where var-Name is the name of the target variable while varValue is the value being assigned.

Return

uint	The error code that represents the result of the function calling.

3.16.3 CreateGlobalVariable

Syntax

```
uint CreateGlobalVariable(
    string name,
    VariableType type,
    string value
)
```

Description

Creates a new global variable by the input parameters.

Parameters

name	Name of the variable being created.
type	Type of variable being created.
value	Value being assigned to the new variable.

Return

uint	The error code that represents the result of the function calling.

3.16.4 CreateProjectVariable

Syntax

```
uint CreateProjectVariable(
    string name,
    VariableType type,
    string value
)
```

Description

Creates a new Project Variable to the current project by the input parameters.

Parameters

name	Name of the variable being created.
type	Type of variable being created.
value	Value being assigned to the new variable.

Return

uint	The error code that represents the result of the function calling.

3.16.5 DeleteGlobalVariable

Syntax

```
uint DeleteGlobalVariable(
    string name
)
```

Description

Deletes a specific global variable from the robot.

Parameters

name	Name of the global variable being deleted.

Return

uint	The error code that represents the result of the function calling.

3.16.6 DeleteProjectVariable

Syntax

```
uint DeleteProjectVariable(
    string name
)
```

Description

Deletes a specific Project Variable from the current tmflow project.

Parameters

name	Name of the Project Variable being deleted.

Return

uint	The error code that represents the result of the function calling.

3.16.7 GetGlobalVariableList

Syntax

```
uint GetGlobalVariableList(
    ref List<VariableInfo>variables
)
```

Description

Gets all Global Variables (VariableInfo Type) from the robot and overwrites the input List.

Parameters

variables	A List of Variable Info type that contains all global variables within the robot.

Return

uint	The error code that represents the result of the function calling.

3.16.8 GetProjectVariableList

Syntax

```
uint GetProjectVariableList(
    ref List<VariableInfo> variables
)
```

Description

Gets all Project Variables (VariableInfo Type) from the current TMflow Project and overwrites the input List.

Parameters

variables	A List of VariableInfo type that contains all Project Variables within the current Project.

Return

uint	The error code that represents the result of the function calling.

3.16.9 IsGlobalVariableExist

Syntax

```
bool IsGlobalVariableExist(
    string varName
)
```

Description

Check if a specific Global Variable exists or not.

Parameters

varName	Name of the Global Variable being checked.

Return

bool	True if exists, false if not.

3.16.10 IsProjectVariableExist

Syntax

```
bool IsProjectVariableExist(
    string varName
)
```

Description

Check if a specific Project Variable exists or not.

Parameters

varName	Name of the Project Variable being checked.

Return

bool	True if exists, false if not.

3.17 VisionProvider

VisionProvider provides functions for TMcraft node to access or interact with the vision jobs of the current Project.

3.17.1 CreateVisionJob

Syntax

```
uint CreateVisionJob(
    string visionJobName
)
```

Description

Creates a new vision job and opens it with the vision designer interface.

Parameters

visionJobName	Name of the target vision job being created.

Return

uint	The error code that represents the result of the function calling.

3.17.2 DeleteVisionJob

Syntax

```
uint DeleteVisionJob(
    string visionJobName
)
```

Description

Deletes a specific vision job.

Parameters

visionJobName	Name of the target vision job being deleted.

Return

uint	The error code that represents the result of the function calling.

3.17.3 GetVisionJobInitialBase

Syntax

```
uint GetVisionJobInitialBase(
    string visionJobName,
    out string baseName
)
```

Description

Gets the name of the initial Base of a specific vision Job.

Parameters

visionJobName	Name of the target vision job.
baseName	Name of the initial base of the target vision Job.

Return

uint	The error code that represents the result of the function calling.

3.17.4 GetVisionJobInitialPoint

Syntax

```
uint GetVisionJobInitialPoint(
    string visionJobName,
    out float[] initialPoint
)
```

Description

Gets the initial Point coordinates of a specific Vision Job.

Parameters

visionJobName	Name of the target vision job.
initialPoint	A 6×1 float array {x, y, z, rx, ry, rz} that denotes the initial point co-ordinates of the target Vision Job.

Return

uint	The error code that represents the result of the function calling.

3.17.5 GetVisionJobList

Syntax

```
uint GetVisionJobList(
    out List<string> visionJobNames
)
```

Description

Gets the list of Vision Job from the current project.

Parameters

visionJobNames	List of vision jobs.

Return

uint	The error code that represents the result of the function calling.

3.17.6 OpenVisionJob

Syntax

```
uint OpenVisionJob(
    string visionJobName
)
```

Description

Opens a specific vision job with the vision designer interface.

Parameters

visionJobName	Name of the target vision job being opened.

Return

uint	The error code that represents the result of the function calling.

4. Enumeration types

4.1 FreeBotMode

```
public enum FreeBotMode
{
    All_Joints,
    Custom,
    RXYZ,
    SCARA_Like,
    XYZ
}
```

Description

Enum FreeBotMode, which is used as a member of the class FreeBotInfo and represents the FreeBot mode setting.

Items

FreeBotMode.All_Joints	Represents free all joints mode.
FreeBotMode.Custom	Represents custom FreeBot mode.
FreeBotMode.RXYZ	Represents free RXYZ (Rx, Ry, Rz) mode.
FreeBotMode.SCARA_Like	Represents SCARA-like FreeBot mode.
FreeBotMode.XYZ	Represents free XYZ mode.

4.2 IO_TYPE

```
public enum IO_TYPE
{
    UNKNOWN,
    CONTROL_BOX,
    END_MODULE,
    EXT_MODULE
}
```

Description

Enum IO_TYPE, paired with IOProvider functions such as WriteDigitOutput(), defines the IO device within TM robot.

Items

IO_TYPE. UNKNOWN	Represents an unknown device detected. When using IOProvider.GetAllIOData(), if there is any unknown device detected, IO_TYPE.UNKNOWN will be found within the DeviceIOInfo data
IO_TYPE.CONTROL_BOX	Control Box I/O.
IO_TYPE. END_MODULE	End Module I/O (Tool End I/O Interface).
IO_TYPE. EXT_MODULE	External I/O Device(s) connected to the robot.

4.3 MoveMode

```
public enum MoveMode
{
    Accurate,
    Fast,
    Nromal
}
```

Description

Enum MoveMode,which is used as one of the parameter of the class FreeBotInfo. Move Mode is for users to adjust the initial damping of joints with modes of Accurate, Normal, and Fast. Damping increases the hand guide weight allowing faster stoppage while releasing the FREE button. For easier dragging, joint damping decreases proportionally as TCP speed increases during the hand guide. Once damping drops to zero, it stays at zero until the FREE button is released

Items

MoveMode.Accurate	The highest joint damping. For the high initial force requirement with fast stoppage while releasing the FREE button.
MoveMode.Fast	The zero joint damping. For the low initial force requirement for dragging.
MoveMode.Normal	The low joint damping. For the medium initial force requirement with reasonable accuracy while stopping.

4.4 RobotEventType

```
public enum RobotEventType
{
    EndButtonFreeBotChanged,
    EndButtonGripperChanged,
    EndButtonPointChanged,
    EndButtonVisionChanged
}
```

Description

Enum RobotEventType, paired with RobotStatusProvider's event EndButtonClickEvent, defines the click event occurred on the buttons of the End Module.

Items

EndButtonFreeBotChanged	Represents the click event of the Free Button on the End Module. True denotes FreeBot is triggered while False denotes that the Free Button is either released or over-pressed.
EndButtonGripperChanged	Represents the click event of the Gripper Button on the End Module. True denotes the button is pressed while False denotes that pressing is released.
EndButtonPointChanged	Represents the click event of the Point Button on the End

	Module. True denotes the button is pressed while False denotes that pressing is released.
EndButtonVisionChanged	Represents the click event of the Vision Button on the End Module. True denotes the button is pressed while False denotes that pressing is released.

4.5 TMcraftErr

```
public enum TMcraftErr
{
    ConnectionFail,
    DevResponseError,
    ExceptionError
    InvalidParameter,
    NodeCloseFail,
    OK
}
```

Description

Enum TMcraftErr represents the possible error that may occurred not from TMflow, but TMcraft API itself. TMcraftErr is used as the object type returned by the functions TMcraftNodeAPI.GetErrMsg and TMcraftNodeAPI.InitialTMcraftNode.

Items

TMcraftErr.ConnectionFail	TMcraft API failed to connect with TMflow.
TMcraftErr.DevResponseError	Unexpected error on TMcraft API. Please contact Techman Inc. for further analysis.
TMcraftErr.ExceptionError	Exception happended on TMCraft API. Please contact Techman Inc. for further analysis.
TMcraftErr.InvalidParameter	TMcraft API detects invalid parameters when calling provider functions. For example, empty string or incorrect array size.
TMcraftErr.NodeCloseFail	Failure happened when closing TMcraft Node on TMflow.
TMcraftErr.OK	No error.

4.6 TMflowType

```
public enum TMflowType
{
    AOIEdge,
    Client,
    OLP,
    Robot,
    Unknown
}
```

Description

Enum TMflowType, which is the Outputs of SystemProvider.GetTMflowType, represents the TMflow type of the current system, or more specifically, of where the GetTMflowType function is called.

Items

TMflowType.AOIEdge	Represents that the current system is AOI Edge.
TMflowType.Client	Represents that the current system is client TMflow.
TMflowType.OLP	Represents that the current system is TMstudio Pro.
TMflowType.Robot	Represents that the current system is on the robot.
TMflowType.Unknown	Represents that the current system is not recognizable as one of the TMflow type.

4.7 VariableType

```
public enum VariableType
{
    Integer,
    Float,
    Double,
    String,
    Byte,
    Boolean,
    IntegrArray,
    FloatArray,
    DoubleArray,
    StringArray,
    ByteArray,
    BooleanArray,
    Null
}
```

Description

Enum VariableType, paired with VariableProvider function CreateGlobalVariable(), defines variable types on TMflow.

4.8 NodeOutputTypeTemplate

```
public enum NodeOutputTypeTemplate
{
    Single,
    Binary,
    Multi
}
```

Description

Enum NodeOutputTypeTemplate belongs to the TMcraftNodeType, which is used to assign ITMcraftNodeOutputTypeEntry member, DefineNodeOutputType, and to define the output type of the TMcraft Node.

Items

NodeOutputTypeTemplate.Single	Represents single output type. That means the TMcraft Node would have one output only.
NodeOutputTypeTemplate.Binary	Represents binary outputs type. That means the TMcraft Node would have 2 outputs.
NodeOutputTypeTemplate.Multi	Represents multiple outputs type. That means the TMcraft Node would have one or more outputs, which looks like a Gateway node.

4.9 BinaryNodeTemplate

```
public enum BinaryNodeTemplate
{
    OK_NG,
    Pass_Fail,
    Yes_No
}
```

Description

Enum BinaryNodeTemplate belongs to the TMcraftNodeType, which is used to assign ITMcraft-NodeOutputTypeEntry member, DefineBinaryNodeTemplate, and to define the template of the TMcraft Node if its outpyt is binary.

Items

BinaryNodeTemplate.OK_NG	Represents the “OK or NG” template.
BinaryNodeTemplate.Pass_Fail	Represents the “Pass or Fail” template.
BinaryNodeTemplate.Yes_No	Represents the “Yes or No” template.

5. Additional class

5.1 BaseInfo

```
public class BaseInfo
{
    public string baseData;
    public string baseName;
    public string number;
    public string baseType;
}
```

Description

BaseInfo, which describes the information of a base, is the element typeof the output List of BaseProvider.GetBaseList().

Members

baseData	A 6×1 float array, {x, y, z, rx, ry, rz} that defines the base.
baseName	Name of the base.
number	The serial number of the base within its base type; the robot base is always 0, while the other base types always start from 1.
baseType	Type of the base, such as R (Robot Base), C (Custom Base) and V (Vision Base).

5.2 DeviceIOInfo

```
public class DeviceIOInfo
{
    public IO_TYPE type;
    public int deviceSerialNum;
    public List<DigitIOInfo> DICollection;
    public List<DigitIOInfo> DOCollection;
    public List<float> AOCollection;
    public List<float> AICollection;
}
```

Description

The DeviceIOInfo describes all sorts of information related to a specific IO Device of the robot.

Members

Type	IO device that this information describes.
deviceSerialNum	Device serial number, which always starts from 0 and is more meaningful if the target device is an external IO module because there might be multiple external IO module devices within the system. The number is 0 if the target device is the Control box IO board or end module IO board because there is always one Control box IO board and one end module IO board.

DICollection	A List of DigitIOInfo Type, which represents all Digital Inputs within the IO Device and should be empty if there are no Digital Inputs. Please note that the index of the list represents the channel number.
DOCollection	A List of DigitIOInfo Type that represents all Digital Outputs within the IO Device and should be empty if there are no Digital Ouputs. Please note that the index of the list represents the channel number.
AOCollection	A List of float Type that represents all Analog Outputs within the IO Device and should be empty if there are no Analog Ouputs. Please note that the index of the list represents the channel number.
AICollection	A List of float Typethat represents all Analog Inputs within the IO Device and should be empty if there are no Analog Inputs. Please note that the index of the list represents the channel number.

5.3 DigitIOInfo

```
public class DigitIOInfo
{
    public bool value;
    public bool isUserDefined;
}
```

Description

DigitIOInfo describes the information of a Digital I/O channel which is used as the List data type of DeviceIOinfo.DICollection and DeviceIOInfo.DOCollection.

Members

value	True denotes HIGH while false denotes LOW.
isUserDefined	True denotes this Digital Channel is set as a User-Defined IO (that triggers a signal to a button of the Robot Stick, reads the signal from a stick button, or detects if an error occurs in the system).

5.4 ErrorStatus

```
public class ErrorStatus
{
    public uint Error_Code;
    public uint[] Error_Codes;
    public string Error_Time;
    public uint Last_Error_Code;
    public uint[] Last_Error_Codes;
    public uint Last_Error_Time;
}
```

Description

ErrorStatus denotes the structure of the data return by RobotStatusProvider.ErrorEvent. Note that the ErrorEvent does not return this object type directly, but a json string instead that can be conveted to the ErrorStatus type.

Members

Error_Code	The major error code of the current error event, which should be the first item of Error_Codes, i.e. Error_Codes[0]. Note that Error_Code would be cleared after reset.
Error_Codes	All error codes related to the current error event. Note that Error_Codes would be cleared after reset.
Error_Time	Time stamp of Error_Code.
Last_Error_Code	The major error code of the last error event recorded, which should be the first item of Last_Error_Codes, i.e. Last_Error_Codes[0]. Note that Last_Error_Code would not be cleared after reset, but would be refreshed when another error event happens.
Last_Error_Codes	All error codes related to the last error event. Note that Last_Error_Codes would not be cleared after reset, but would be refreshed when another error event happens.
Last_Error_Time	Time stamp of Last_Error_Code.

5.5 FreeBotInfo

```
public class FreeBotInfo
{
    public FreeBotMode Mode;
    public bool isBaseMode;
    public bool isFreeX;
    public bool isFreeY;
    public bool isFreeZ;
    public bool isFreeRX;
    public bool isFreeRY;
    public bool isFreeRZ;
}
```

Description

FreeBotInfo describes the information of FreeRobot Configuration PointInfo and applies to 2 of the RobotStatusProvider functions, GetFreeBot() and SetFreeBot. Note that if the Mode is not Custom, the rest of the members is meaningless.

Members

Mode	Represents the current Freebot mode.
isBaseMode	True means FreeBot Custom settings being defined by the current base; false means FreeBot Custom settings being defined by the current tool base.
isFreeX	Represents if the current FreeBot Custom Setting has freed X axis or not.
isFreeY	Represents if the current FreeBot Custom Setting has freed Y axis or not.
isFreeZ	Represents if the current FreeBot Custom Setting has freed Z axis or not.

isFreeRX	Represents if the current FreeBot Custom Setting has freed Rx axis or not.
isFreeRY	Represents if the current FreeBot Custom Setting has freed Ry axis or not.
isFreeRZ	Represents if the current FreeBot Custom Setting has freed Rz axis or not.

5.6 PointInfo

```
public class PointInfo
{
    public string baseName;
    public string flangeCoordinate;
    public string jointAngles;
    public string pointName;
    public string toolName;
    public string endToolCoordinate;
    public string pointType;
}
```

Description

PointInfo, which describes the information of a Point (robot pose) within the current Project, is the element type of the output List of PointProvider.GetBaseList(). Note that a robot pose can be defined by three kinds of coordinates: flange coordinates, joint angles and tool coordinates.

Members

baseName	The base that defines this point (robot pose).
flangeCoordinate	Flange Coordinates that defines this point (robot pose).
jointAngles	Joint Angles that defines this point (robot pose).
pointName	Name of the point.
robotModel	Robot Model of the robot, from which this point is built.
toolName	Tool that defines the tool coordinates of this point.
endToolCoordinate	Tool coordinates of this robot pose.
pointType	There are two possible point types, R (Regular) and D (Dynamic). The Regular point generates with the Point node, and the Dynamic point, with the Touch Stop node.

5.7 TCPInfo

```
public class TCPInfo
{
    public float[] data;
    public string name;
}
```

Description

TCPInfo, which describes the basic information of a TCP, is the element type of the output List of TCPProvider.GetTcpList.().

Members

data	Tool Center Point, which defines a float[6] {x, y, z, Rx, Ry, Rz} relative to the Flange base.
name	Name of the TCP.

5.8 VariableInfo

```
public class VariableInfo
{
    public string varName;
    public VariableType varType;
    public string value;
    public bool isGlobal;
}
```

Description

VariableInfo, paired with VariableProvider functions such as GetGlobalVariableList(), describes all the information of a variable.

Members

varName	Name of the variable.
varType	Data type of the variable.
value	Value of the variable.
isGlobal	True if it is a global variable; false if it is a Project Variable.

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