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cMT-G04 with OPC UA Server and MQTT Sparkplug B

Introduction: To implement IIoT connectivity without changing existing HMI and controller hardware, as well as HMI and controller programs, Weintek has released two Gateway protocol converters, which are cMT-G03 (Serial bridge) and cMT-G04 (Ethernet bridge), to retrofit customers' systems. This document discusses how to utilize cMT-G04 to build the OPC UA server and transfer data via MQTT Sparkplug B specification, which is well supported by **Inductive Automation Ignition SCADA**.

cMT-G04 has a built-in Ethernet switch to act as an Ethernet bridge. To bridge a cMT-G04 to the device, users need to connect the existing HMI to SW1 port of cMT-G04 and connect the existing controller to SW2 port of cMT-G04. This architecture can ensure the communication between the HMI and the controller is not affected. The LAN port of cMT-G04 is used to connect to a company or factory network.

Equipment & software:

- 1. HMI
- 2. Allen Bradly MicroLogix 1100
- 3. cMT-G04

Note: Easybuilder pro version 6.01.02 and greater supports cMT-G04.

Wiring diagram:

Before configuration -



After configuration -



Hardware Configuration:

Ethernet ports of cMT-G04 -

121		
	Port Name	Connecting to
	SW1	HMI
	SW2	Controller
"⊡} +	LAN	Company or factory network

Software configuration:

Launch Easybuilder pro and select cMT-G04 Gateway(Ethernet Bridge).

Copen	New Pro	Jject MT8102iE (1024 x 600) XE Series MT8090XE/MT8091XE (1024 x 768) MT8092XE (1024 x 768) MT8121XE/MT8150XE (1024 x 768) CMT Series cMT3072 (1024 x 600) cMT3072 (1024 x 600) cMT3070 (1024 x 768) cMT3103 (1024 x 768) cMT-SVR (1024 x 768) cMT-SVR (1024 x 768) cMT-FUDMI (1920 x 1080) CMT-GO1 Gateway cMT-G02 Gateway (Built-in Wifi) cMT-G03 Gateway (Serial Bridge) cMT-G04 Gateway (Ethernet Bridge) mTV-F00 (1280 x 720)	cMT-G04 Gateway (Ethernet Bridge)
Lincompress Pro	V L	se template (template_G04.cmtp)	OK

The popup window will be displayed as shown. Click [New Device] to select a driver of the controller.

	Model	General	System Se	tting	Remote	Security	Time Sync	:./DST e-l	Mail	
evice	e list:									What's m
		Name	Location	Devid	се Туре			Interface	I/F Protocol	Station No.
Lo	cal HMI	Local HMI	Local	cMT-	-G04 Gate	way (Ether	net Bridge)	-	-	1

[Name]: Enter a name of the controller and HMI.

[Device type]: Select this driver "Rockwell EtherNet/IP(DF1)" for the communication of the AB Micrologix 1100.

[I/F]: Ethernet

[IP]: The IP address is the same as the IP address that I set up on the PLC.

Click [OK] to exit.

Device Settings		
Name :	AB MicroLogix 1100 with Profixxx HMI	
	Device	
Location :	Local V Settings	
* Select Local for a HMI.	device connected to this HMI, or Remote for a device connected through another	
Device type :	Rockwell EtherNet/IP (DF1)	
	Device ID : 132, V.2.90, ALLEN_BRADLEY_EIP_DF1.e30	
I/F:	Ethernet V Open Device Connection Guide	
10 .	102 168 1 10 Pert-44918	
IP :	192. 168. 1. 10, Port=44818 Settings	
Interv May rea	ral of block pack (words) : 5 V	
Max. rea	e-command size (words): 120	
	OK Cancel	

Page **4** of **15**

Double click [Local HMI] to change the name of cMT-G04.

System	Parar	neter	Setting	s										×
Devic	e Mo	odel	Genera	al	System	Setting	Remote	Security	Time Sy	nc./DST	e-Mail			
Devi	ice list:												<u>What</u>	s my IP?
				Na	me				Location	Device	Туре			Interfa
~	Local I	HMI		Loc	al HMI				Local	cMT-G0)4 Gatewa	y (Ethernet	Bridge)	-
	10	De	evice 4	ttin	gs	June 10	o with Pro		Local	NOCKWE	a culenve	yir (DEI)	×	Lueme
				N	ame : [ocal HMI) HMI								
				Loca	ation: L	ocal	\sim	Settings.						

Click [OK] to close [System Parameter Settings].

You can see the three main steps on the main screen to complete this project.

- Step 1. Add a driver into Device List in the project. (This step is completed)
- *Step 2.* Enable OPC UA server and MQTT. Designate PLC addresses.
- *Step 3.* Download this project to cMT-G04.



Step2. -

MQTT Sparkplug B Setup -

Click [MQTT] button on the main screen or go to [IIoT/Energy] » [MQTT] on the toolbar, and check [Enable] checkbox to enable MQTT functionality.

There are three tabs to configure communication parameters of the MQTT server.

[General] tab -

Cloud service: Select **Sparkplug B**.

Protocol: Supports MQTT v.3.1 or MQTT v.3.1.1.

Domain name: Use **test.mosquitto.org** as broker for testing purpose.

Port number: Enter MQTT port number **1883**.

Client ID: Enter the client/registeration ID.

Authentication: If enabled, subscribers will be required Username and Password when connecting MQTT Broker.

MQTT Server	×
General Address TLS/SSL	
Comment : Cloud service : Sparkplug B Protocol : MOIT v3 1 1]
Client ID: 20 words ÷	_
Domain name : test.mosquitto.org	
Port : 1883	
Client ID : weintek_usa	
%0 : HMI name %2 : Random %% : Character %	
Authentication	
Keep alive time : 10 second(s)	_

[Address] tab - Define registers of **Status address** and a register of **Control address** if enabled.

Note: Easybuilder pro version 6.02.01 supports Buffer functionality for Sparkplug B.

NQT1 Server				
General Addres	5 TLS/SSL			
Status address				
Device :	Local HMI		~ 5	Settings
Address :	LW ~ 10	0		
Status : LW-	100			
(0:	stopped, 1 : disconnected, 2 : connect	ted)		
Error : LW-	101			
(0:	none, 1 or more : error)			
Buffer usage	address			
Buffer usage	address			
□ Buffer usage ✓ Control addre Device :	address ss		~ 5	Settings
☐ Buffer usage ✓ Control addre Device : Address :	sddress ss Local HMI	2	~ 5	Settings
☐ Buffer usage ✓ Control addre Device : Address :	address ss Local HMI LW ~ 10.	2	~ <u>S</u>	Settings
Buffer usage	sddress ss Local HMI LW \checkmark 10, id : LW-102	2	× 2	Settings
Buffer usage Control addre Device : Address : Commar	sddress ss Local HMI LW \checkmark 10: rd : LW-102 (0 : none, 1 : start, 2 : stop, 3 : up	2 idate)	×	Settings
Buffer usage Control addre Device : Address : Commar Reserve	address ss Local HMI LW \checkmark 10: id : LW-102 (0 : none, 1 : start, 2 : stop, 3 : up id : LW-103 (4 words)	2 Idate)	~ <u> </u>	Settings
Buffer usage Control addre Device : Address : Commar Reserve	address ss Local HMI LW \checkmark 10: 10: 10: 10: 10: 10: 10: 10:	2 idate)	~ <u>c</u>	Settings
Buffer usage. Control addre Device : Address : Commar Reserve Client	address ss Local HMI LW \vee 102 (0: none, 1: start, 2: stop, 3: up d: LW-103 (4 words) rt: LW-107 D: LW-108 (20 words)	2date)	✓ ≤	Settings
Buffer usage Control addre Device : Address : Commar Reserve Po Client Authenticatio	Address ss Local HMI LW \[10; 10; 10; 10; 10; 10; 10; 10;	2	2 ~	iettings
Buffer usage Control addre Device : Address : Commar Reservy Pc Client Authenticatio	address ss Local HMI LW V 102 (0 : none, 1 : start, 2 : stop, 3 : up d: LW-103 (4 words) rt : LW-107 D : LW-108 (20 words) n: LW-128 (0 : none, 1 : account)	2	2 ~	Settings
Buffer usage. ✓ Control addre Device : Address : Commar Reserve Po Client Authenticatio Usernan	address ss Local HMI LW \checkmark 10: id : LW-102 (0: none, 1: start, 2: stop, 3: up id : LW-103 (4 words) rt : LW-107 D: LW-108 (20 words) wn: LW-128 (0: none, 1: account) ne : LW-129 (16 words)	2 Indate)	✓ <u>S</u>	Settings
■ Buffer usage. ✓ Control addres Device : Address : Comman Reserve Po Client Authenticatio Usernan Passwo	address ss Local HMI LW \vee 102 (0: none, 1: start, 2: stop, 3: up d: LW-103 (4 words) rt: LW-107 D: LW-108 (20 words) n: LW-128 (0: none, 1: account) te: LW-129 (16 words) rd: LW-145 (16 words)	2 idate)	✓ S	Settings

[TLS/SSL]tab - Disable TLS/SSL.

MQTT Server	×
General Address TLS/SSL	
Enable	

After completing Server setup, there are two tabs within Sparkplug B.

[General]tab - Enter Group ID and Edge node ID.

QTT X
] Enable
Server Settings Domain name : test.mosquitto.org, Port : 1883
Sparkplug B
General Device
Group ID : CMT Group
Edge node ID : CMT EoN
DDATA min. time : 0 ms 😫
* Minimal waiting time before sending a new DDATA (Deivice DATA) message (if data changes are detected)
QoS: 1 💌

			1	
Name	Address	Address Format	Address Element Count	Ne
AB MicroLog	ix 1100 with Profxxx HMI			
Local HMI				Ne

[[

Enter a tag name and select data type as well as a controller register.

рс (Bit	○ Word	
ddress			
Device :	Local HMI		 Settings
Address :	LB	~ 0	

The window as shown includes all tags created in the MQTT EoN node.

able				
er				
ettings Domain name : test mosquitto or	Port · 1883			
Domain name : test.mosquitto.org	g, FUIL. 1865			
kplug B				
eneral Device				
Name	Address	Address Format	Address Element Count	New Group
Name V D AB MicroLogix 1100 with Profxx HMI	Address	Address Format	Address Element Count	New Group
Name AB MicroLogix 1100 with Profxx HMI	Address B3-3	Address Format Bit	Address Element Count	New Group
Name AB MicroLogix 1100 with Profxx HMI B3:3 F8:0	Address B3-3 F8-0	Address Format Bit 32-bit Float	Address Element Count 1 1	New Group New Tag
Name AB MicroLogix 1100 with Profxx HMI B3:3 F8:0 N7:5	Address B3-3 F8-0 N7-5	Address Format Bit 32-bit Float 16-bit Unsigned	Address Element Count 1 1	New Group New Tag Delete
Name AB MicroLogix 1100 with Profxx HMI B3:3 F8:0 N7:5 Local HMI	Address B3-3 F8-0 N7-5	Address Format Bit 32-bit Float 16-bit Unsigned	Address Element Count 1 1 1	New Group New Tag Delete Settings
Name AB MicroLogix 1100 with Profxx HMI B3:3 F8:0 N7:5 Local HMI HOUR	Address B3-3 F8-0 N7-5 LW-9019	Address Format Bit 32-bit Float 16-bit Unsigned 16-bit Unsigned	Address Element Count 1 1 1 1 1	New Group New Tag Delete Settings
Name AB MicroLogix 1100 with Profxx HMI B3:3 F8:0 N7:5 Local HMI HOUR MINUTE	Address B3-3 F8-0 N7-5 LW-9019 LW-9018	Address Format Bit 32-bit Float 16-bit Unsigned 16-bit Unsigned 16-bit Unsigned	Address Element Count 1 1 1 1 1 1 1 1	New Group New Tag Delete Settings

MQTT Sparkplug B can transmit tags on the connection which can be clearly browsed on the **Tag Browser** of **Ignition**. Browse the tags data from the following path of **Tag** Browser.

[All Providers] » [MQTT Engine] » [cMT Group] (Group ID) » [cMT EoN] (Edge node ID) » [Local HMI] (Device name) » HOUR

[All Providers] » [MQTT Engine] » [cMT Group] (Group ID) » [cMT EoN] (Edge node ID) » [AB MicroLogix 1100 with Profxxx HMI] (Device name) » F8:0

OPC UA Server Setup

Click [OPC UA] button on the main screen or go to [IIoT/Energy] » [OPC UA Server] on the toolbar, and check [Enable] checkbox to enable OPC UA server functionality.

OPC UA Server	
Enable Server Settings	
Tag	
	New group
AB MicroLogix 1100 with Profxxx HMI	New Tag
Tags	Delete
	Settings
	Import
	Export

Click [Tags] within [AB MicroLogix..](Controller name) and then click [New Tag] to add OPC UA tags.

For example, add a tag for Internal bit memory of the PLC.

[Name]: Enter a tag name.[Type]: Data type is **Bit**.[Address]: Select **B3** and enter register number **3**.[Type]: data is readable and writable.

When completing setup, click [OK] to exit.

OPC UA Server	
✓ Enable	
Server	
Settings	
Tag	
	New group
Burt Tags BM AB MicroLogix 1100 with Profxxx HMI	New Tag
	Delete
Settings ×	Settings
Name : B3:3	Import
Type Bit O Word	Export
Address Device: AB MicroLogix 1100 with Profix HMI Settings	
Address : B3	
Type	
Readable Writable	
]
OK Cancer	Exit

The window as shown includes all tags created in the OPC UA server.

OPC UA Server	
Settings	
Тад	
	New group
Berley Tags Berley AB MicroLogix 1100 with Profxxx HMI	New Tag
	Delete
B3:3	Settings
N7:5	Setungs
	Import
	Export

Step3. -

Connect the **LAN** port of cMT-G04 and the PC to a router with an Ethernet cable. Click [Download] button on the main screen or go to [Project] » [Download] on the toolbar.

Find the cMT-G04 and click [Download].

Ethernet			Password/Port no. of download/upload : Settings
1 IP H	MI Name		4
HMI	cMT-4361	∽ Search	192.168.0.211 (cMT-4361)
		Search All	
	Search	and Change IP	
]Runtime *Nec	essary if updat	e runtime or execute do	wnload first time.
]Reset recipe (RI	W, RW_A)	⊡ Reset e	vent log ⊡Reset data sampling
]Reset recipe (R]Automatically us	W, RW_A)	⊠Reset e tings to download after	vent log ⊡Reset data sampling compling

You can change the **LAN** IP address of the cMT-G04 by going to [Search and Change IP].

Download (PC->HMI)	×
 Ethernet 	Password/Port no. of download/upload : Settings
4 IP HMI Name	4
Search and Change IP	×
HMI Name ^ IP HMI Model May	DHCP : On Off
	IP: 169 . 254 . 0 . 1
	Subnet mask : 255 . 255 . 0 . 0
	Password :
	Blink LED Apply
< >>	
Refresh	Exit

Disable DHCP and enter IP address as well as subnet mask according to the company/ factory network. Click on [Apply]. The popup window will show "Successfully updated Ethernet settings."

Search and	d Chan	ge IP										×
HMI Na CMT-43	ume ^ :61	IP 192.168.0.211	HMI Model cMT-G04 Ga	Ma 00:(DHCP :	On		● off	F		
						IP:	192	. 168	•	0	. :	211
						Subnet mask :	255	. 255	. 2	255	•	0
					_	Password :	••••	•				
	HmiS	earchWidget			×		Blin	k LED		Aj	pply	
	Succe	essfully updated	d Ethernet settin	gs !								
<			確定	E	1							
			Refresh							E	xit	

Changing the IP address of the SW1 & SW2

Connect the **LAN** port of the cMT-G04 and the PC to a router with an Ethernet cable. Open a web browser (IE, Chrome, or Firefox) on a PC, and make sure the IP address of the PC has a same subnet IP. Enter the IP address of cMT-G04. For example, 192.168.0.211.

Select an identity and enter its password. The default password is 111111.



Go to [Network] tab. The IP address of the Ethernet1 is the IP address of LAN port, and it is changed by the earlier step.

<u> </u>	identity: System Setting							
P Network	Network							
Date/Time								
🖉 HMI Name	Ethernet							
🕞 History	MAC address : 00:0c:26:14:43:61	MAC address : 00:0c:26:14:53:01						
船 Email								
🔊 Project Management	IP Address Ethernet							
System Password	Obtain IP address automatically	 Use static IP address below(Eth I) 						
Enhanced Security	IP: 192 · 168 · 0 · 211							
EasyAccess 2.0	Mask: 255 · 255 · 255 · 0							
OPCUA	Gateway: DNS: 8 · 8 · 8 · 8							
Communication								
	Save							

Click [Switch(LAN)] and enter IP address as well as mask for the communication of the machine network. SW1 and SW2 share the IP address of **Switch**.

<u> </u>	lentity: ystem Setting
P Network	Network
Date/Time	
🖉 HMI Name	Ethernet
History	MAC address : 00:0c:26:14:53:01
sa Email	
🖹 Project Management	IP Address Ethernet
System Password	Ose static in address below(switch)
Enhanced Security	IP: 192 · 168 · 1 · 189
EasyAccess 2.0	Mask: 255 · 255 · 255 · 0
OPCUA	
	Save

Testing:

Launch the OPC UA client software UAExpert on a PC to monitor OPC UA tags data.

Project	8×	Data Access View							
Project Servers Evers Documents Data Access View		Server Server	Node Id NS2[String]AB NS2[String]AB NS2[String]AB	Display Name 83:3 78:0 N7:5	Value false 33.4766 25	Datatype Boolean Float Uint16	Source Timestamp AM 09562.0557 AM 09562.873 AM 095624.750	Server Timestamp AM 055621073 AM 05590521 AM 0559052 AM 055825405	Statuscode Good Good Good
Addrew Space	# ×								
G No Highlight									

You can drag and drop tags configured in the OPC UA server to [Data Access View].



The data will be displayed as shown.

#	Server	Node Id	Display Name	Value	Datatype	Source Timestamp	Server Timestamp	Statuscode
1	UaServer@cM	NS2 String AB	B3:3	false	Boolean	AM 09:58:20.657	AM 09:58:21.079	Good
2	UaServer@cM	NS2 String AB	F8:0	33.4305	Float	AM 10:00:55.390	AM 10:00:55.390	Good
3	UaServer@cM	NS2 String AB	N7:5	25	Ulnt16	AM 09:58:24.790	AM 09:58:25.404	Good

Reference Link:

Weintek Labs website: http://www.weintek.com



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