





CHAPTER

3

# **CPwE Scalable Time Distribution Configuration**

# **Configuring IACS Devices**

## 1756-TIME

The 1756-TIME module is a reference clock that synchronizes to the GPS constellation. The module is capable of outputting time as an NTP server or PTP grandmaster and is configured using the Studio 5000 Logix Designer<sup>®</sup> Add-on Profile (AOP). The module must be owned by a PAC. Once the module is added to the I/O tree, the AOP can be opened to configure the module.

General Connection Module Info Configuration Ac	dvanced Time Sync Internet Protocol Port Configuration Network Vender	or
Source Settings Source: Internal GPS (Receiver) V	External Source Address: 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0	
Time Dutput CIP Sync (PTP) Network Time Protocol - NTP IRIG - B Post Lock-Lost Transmission	Coordinate System Time Enable CST Mastership Universal Time Reference Pre V16 Logix Controller Support (-2 years) Webserver Enable Webserver	
Advanced CIP Sync Settings Priority 1: 1 (Master Override) Priority 2: 1 (Tie Breaker)	Time To Live:     1       Sync Interval (s):     1	
Description Settings User Name: 1756-TIME User Location:		

#### Figure 3-1 1756-TIME Configuration

The module should be configured to use the internal GPS receiver as the source and output CIP Sync time. The priority1 and priority2 values should be set so the module becomes the primary or secondary grandmaster as desired. Optionally, the NTP server can be enabled so the module becomes a stratum 1 NTP server.

### Logix PAC

The Logix PAC<sup>®</sup> system is configured by editing the controller properties in Studio 5000 Logix Designer. On the **Date/Time** tab, the **Enable Time Synchronization** checkbox must be selected to configure the controller for time synchronization. If the controller will be used as the reference clock, the **Set Date, Time and Zone from Workstation** button can be used to set the controller's real-time clock based on the configuration of the computer running Studio 5000 Logix Designer.

Controller Prop	erties - L	85_CELL_40	882				- • ×
Nonvolatile Mer	nory	Capacity	Interne	et Protocol	Port Configuration	Security	Alarm Log
General	Major Fault	ts Mir	nor Faults	Date/Time	Advanced	SFC Execution	n Project
(i) The Date an Use these field Date and Time: Time Zone:	d Time disg elds to conf Set Date 2/18/20 (UTC-05) Adjust	played here figure Time a a, Time and 19 1:55:07 F :00) Eastern for Daylight	is Controller I attributes of the Zone from W PM Time (US & Saving (+01	ocal time, not wo ne Controller.	rkstation local time. hange Date and Time	e ¢	
Time Synchron  Enable Time  Is the system Is a synchron Duplicate CS CST Masters No CST mast	nize Synchroniz time maste ized time si T master d nip disable er	r ation lave etected d	<u>۸</u>	DANGER. If tim disabled online, controller in this synchronized dr unexpected mo Safety controlle master exists in	e synchronization is active axes in any chassis, or any othe evice, may experienc tion. rs may fault if no othe the local chassis. Advanced.	r ee er time 	
				ОК	Cancel	Apply	Help

#### Figure 3-2 PAC Date and Time Configuration

The **Advanced** button allows you to configure the priority1 and priority2 values of the controller. These values will vary depending on if the controller is designated to be a member of the grandmaster tier or controller tier.

UTC System Time:	chronization: Enabled 2/18/2019 06:56:57	РМ		
Grandmaster Cl	ock	Local Clock	Supermeters	
User Name:	^	Offset from Master:	-32	ns
User Location		Backplane State:	Master	(Port 1)
Physical Addre	555. • • • • • • • • • • • • • • • • • • •	Ethemet State:	Slave	(Port 2)
Identity:	006035FFFE29A2E6	Identity: Class:	001D9CFFF	ED8081C
Class:				
Class: Accuracy:	34	Accuracy:	49	
Class: Accuracy: Variance:	34 65535	Accuracy: Variance:	49 65535	
Class: Accuracy: Variance: Source:	34 65535 GPS	Accuracy: Variance: Source:	49 65535 Oscillator	
Class: Accuracy: Variance: Source: Priority 1:	34 65535 GPS 1	Accuracy: Variance: Source: Priority 1:	49 65535 Oscillator	(Master Ovenide)

#### Figure 3-3 PAC PTP Advanced Configuration

#### **Communication Adapters**

It is important to configure the communication adapters to support CIP Sync. Some Rockwell Automation platforms, such as the 5069-AEN2TR, have CIP Sync enabled by default. Other platforms, such as the 1756-EN2T family, require manual configuration to enable CIP Sync. Refer to vendor documentation for instructions on configuring your communications adapter.

### I/O Points

CIP Sync applications require configuring the individual I/O points for time stamping. The time stamping features of the module will vary from module to module. In addition, the configuration of the I/O points may vary depending on the module selected and the application. Refer to vendor documentation for instructions on configuring your I/O points.

# Industrial Ethernet Switches

There are three options for configuring PTP in the IES:

• Command line

- Device Manager
- Studio 5000 Logix Designer

The configuration choice will depend on the IES platform selected and preferences of the installer. The Allen-Bradley Stratix IES support all three configuration methods, while the Cisco IE IES only support command line and Device Manager. However, not all the PTP configuration options used in this CPwE Time solution are available in the Device Manager or Studio 5000 Logix Designer. These configuration options must be done via the command line interface.

Note

Use caution when setting the sync limit below 50,000. This setting should only be used in IACS applications where the grandmaster has a very high-precision clock and all the IES have hardware support for PTP enabled.

### Command Line

Step 1	Configure the IES for boundary clock mode:
Sten 2	IES (config) #ptp mode boundary
Step 2	IES(config) #ptp transfer feedforward
Step 3	Configure the time properties to persist infinitely: IES(config) <b>#ptp time-property persist infinite</b>
Step 4	Configure the priorityl value for the infrastructure tier: IES(config) <b>#ptp priority1 2</b>
Step 5	Configure the priority2 value for the infrastructure tier: IES(config) <b>#ptp priotiry2 10</b>
Step 6	Configure the interfaces to use a sync limit of 10,000: IES(config-if)# <b>ptp sync limit 10000</b>
	The sync limit should be configured on all boundary clock interfaces. This can either be done individually or with the <b>interface range</b> configuration command.

### Device Manager

PTP is configured in the Device Manager by selecting the PTP option under the Configure menu.

- Step 1 Configure the IES for boundary clock mode.
- Step 2 Configure the priority1 value for the infrastructure tier.
- Step 3 Configure the priority2 value for the infrastructure tier.

Figure 3-4 Stratix Device Manag	ger PTP Clock Configuration	
<i>€</i> 10.17.51.10 × □		
Allen-Bradley	Stratix 5400 Solution Device Manager - Switch	
S Network   PTP		
<b>N</b> _1	Davie Jacob	
Mode	Boundary	
Priority1	2	
Priority2	10	
Clock Identity:	0xF4:54:33:FF:FE:11:21:0	
Offset From Master(ns):	2	
Submit		05305

Step 4 Configure the interfaces to use a sync fault limit of 10,000.

#### Figure 3-5 Stratix Device Manager PTP Port Configuration

Device Clock Details												
Device Time	Source:	NTP										
Device Clock	ce Clock Time: 19:08:39.549 UTC Mon Feb 18 2019											
Port Name	State	Enable	Delay Request Interval	Announce Timeout	Announce Interval	Sync Interval	Sync Fault Limit	Vlan Id				
i1/1	SLAVE	$\checkmark$	5	3	1	0	10000	999				
i1/2	FAULTY	$\checkmark$	5	3	1	0	10000	999				
Gi1/3	FAULTY	$\checkmark$	5	3	1	0	10000	N/A				
6i1/4	FAULTY	$\checkmark$	5	3	1	0	10000	N/A				
i1/5	MASTER	$\checkmark$	5	3	1	0	10000	N/A				
i1/6	MASTER	$\checkmark$	5	3	1	0	10000	N/A				
i1/7	MASTER	~	5	3	1	0	10000	N/A				
/8	MASTER	$\checkmark$	5	3	1	0	10000	N/A				
1/9	MASTER	$\checkmark$	5	3	1	0	10000	N/A				
1/10	MASTER	$\checkmark$	5	3	1	0	10000	N/A				
1/11	FAULTY	$\checkmark$	5	3	1	0	10000	N/A				
/12	FAULTY	$\checkmark$	5	3	1	0	10000	N/A				
1/13	FAULTY	~	5	3	1	0	10000	N/A				
1/14	FAULTY	$\checkmark$	5	3	1	0	10000	N/A				
1/15	FAULTY	~	5	3	1	0	10000	N/A				
1/16	FAULTY	$\checkmark$	5	3	1	0	10000	N/A				
1/17	FAULTY	~	5	3	1	0	10000	N/A				
L/18	FAULTY	$\checkmark$	5	3	1	0	10000	N/A				
1/19	FAULTY	~	5	3	1	0	10000	N/A				
Gi1/20	FAULTY	$\checkmark$	5	3	1	0	10000	N/A				

Several of the configuration items required for this CPwE Time solution can only be configured using the command line interface.

Step 5 Configure the boundary clock to use the feedforward transfer function:

IES(config)#ptp transfer feedforward

Step 6 Configure the time properties to persist infinitely:

IES(config) #ptp time-property persist infinite

## Studio 5000 Logix Designer

PTP is configured in the Time Sync Configuration section of the Allen-Bradley Stratix AOP.

- Step 1 Configure the IES for boundary clock mode.
- Step 2 Configure the priority1 value for the infrastructure tier.
- Step 3 Configure the priority2 value for the infrastructure tier.
- Step 4 Configure the interfaces to use a sync fault limit of 10,000.



Module Properties: Local (1783-HMS16TG4CGR 4.001)										
General	Time Sy	/nc Config	guration							
Connection										
- Module Info	Clock Type: Boundary ~									
- Fault/Program Action		,,	Boundary							
- Switch Configuration	~	محاد العامية فقير	000	0.05.FF.FF.00.40		Grandmast	er Selection Prioritu	•		
- Switch Status	u	uck ruenility.	UXUU:6U:35:FF:FE:23:A2:E6 Citandinaster Selection Filology							
- Port Configuration						Grandmast	er Selection Priority :	2: 10		
Smartports and VLANs									لغار	
Port Security						Offset From	n Master:	18		
Port Status										
Pine 1		Time Sync	Time Sync	Delay	Announce	Announce	Sync	Sync Fault	^	
Bedundant Gateway C	Ροπ	Enable	State	Request	Timeout	Interval	Internal	Limit		
	Gi1/1		Slave	5	3	1	0	10000		
DHCP	Gi1/2		Faulty	5	3	1	0	10000		
Members	Gi1/3		Faulty	5	3	1	0	10000		
⊟- Ring 2	Gi1/4		Faulty	5	3	1	0	10000		
Redundant Gateway C	Gi1/5		Master	5	3	1	0	10000		
Statistics	Gi1/6		Master	5	3	1	0	10000		
DHCP	Gi1/7		Master	5	3	1	0	10000	_	
Members	Gi1/8		Master	5	3	1	0	10000	_	
E-Ring 3	GII/9		Master	5	3	1	0	10000	-	
Redundant Gateway C	GH/10		Master	5	3	1	U	10000	*	
···· Statistics										
DHCP										
Members										
- DHCP Pools										
- DHCP Address Assignment							Defrech Communics	ation C	a) <b>4</b>	
Time Sync Configuration							herresh Communica	ation	et	
NTP Client										
NAT										
SD Flash Sync										
Save/Bestore										
< >>										
Status: Running								ОК	Cancel	Apply Help
2										

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