如何实现 Basic Panel (精简系列面板)和 S7-400H PN 的工业以太网通信

How to connect Basic Panel to S7-400H PN via Industrial Ethernet

Getting-started

Edition (2012年12月)



摘要介绍了如何在WinCC V11(TIA Portal V11)中组态Basic Panel(精简系列面板)和
 S7-400H PN 的工业以太网连接,以及如何实现Basic Panel 的自动切换
 关键词WinCC,博途,精简系列面板,S7-400H PN,工业以太网,TCP/IP
 Key WordsWinCC,TIA Portal,Basic Panel,S7-400H PN,Industrial Ethernet,TCP/IP

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1 简介

西门子继推出了新一代的 SIMATIC 组态软件平台 TIA Portal (TIA 博途)之后,又推出 了新一代的带有 PROFINET 接口的 S7-400H PN(CPU 41x-5H),在 Basic Panel (精简系列 面板)和 S7-400H PN 之间建立以太网连接的配置过程中,较之传统操作面板和 S7-400H, 组态软件和方式都产生了变化。

注意:本文只描述 S7-400H PN 通过集成 PN 接口连接 Basic Panel, S7-400H PN 通过集成 MPI/DP 接口或 CP443-1(IP 地址)连接 Basic Panel,或连接不支持脚本功能的其它操作 面板(例如 xP177/OP7x 等)也可以参考本文。

本文中所使用的硬件和软件环境如下:

(A) S7-400H PN

CPU 416-5 H PN/DP (6ES7 416-5HS06-0AB0, Firmware V6.0)

IM153-4 PN HF (6ES7 153-4BA00-0XB0, Firmware V4.0)

SM 321/322 16DI/DO

(B) TP1500 Basic PN Panel (6AV6 647-0AG11-3AX0)

(C) TIA Portal ES 工程师站

Field PG M3 (6ES7 715-1BB20-0AA0)

Windows 7 Ultimate SP1(X64)

STEP7 Professional 2010 SR2 (STEP7 V5.5 SP2 HF1), TIA Portal V11 SP2 Upd4 (STEP7 Professional V11 SP2 Upd4, WinCC Professional V11 SP2 Upd4)

注意

由于 TIA Portal V11 SP2 尚未支持 S7-400H,所以仍需要经典 STEP7 V5.5 SP2 HF1 组态 S7-400H PN,可以参考以下链接:

http://support.automation.siemens.com/CN/view/zh/59216386

由于需要评估 S7-400H 的"Master/Standby"状态,可以从以下链接获得相应的功能块 FB523:

http://support.automation.siemens.com/CN/view/zh/19537149

而仅需要 WinCC Basic V11 SP2 组态 Basic Panel 即可。

2 组态Basic Panel和S7-400H PN的以太网连接

在 ES 站上的 STEP7 中组态 S7-400H PN,在 TIA Portal 中组态 Basic Panel 及其和 S7-400H PN 的以太网连接。

2.1 组态S7-400H PN项目

S7-400H PN 的典型配置如 1 图所示。



(A) 打开 STEP7,参照实际配置,创建 SIMATIC H Station,如图 2 所示。

(0) UR2A	LU-H	
	PS 407 10A	Properties - PN-30 (R0/53.5)
2	CPU 416-5 H PN/DP	Meda Redundancy Tene of Day Synchronization Options Properties - Ethernet Interface PN-80 (RU/S3.5)
7 1 2 5	MPL/DP H Sync module H Sync module	Shot description: PHHO Device name: PHHO
5 <i>P1 R</i> 5 <i>P2 R</i>	Pot 1 Pot 2 CP 443-1 PW-0	Support device replacement without exchangeable medum P address: TO-Station III Gateway Gateway Gateway
1 P1 R 1 P2 R	Pot 1 Pot 2 CP 443-5 Eu	Idendoe Subret mask: 256.256.250 0 C Monade Address: 266.256.250 0 C Address: 266.256.256.256.256.256.256.256.256.256.
(1) UR2AL	LU-H PS 407 10A	Address: 192.168.0.101 Networked: Yes Properties Binomit (1)
2	CPU 416-5 H PN/DP(1)	Comment: Bharmet(3) Delete
7	H Sync module	
5P1R 5P2R	Port 1 Port 2 5 CP 443-1(1)	
, 1 <i>P</i> 1 <i>R</i> 1 <i>P</i> 2 <i>R</i>	Port 7 Port 2 CP 443-5 Ed(1)	

(B) 设置 Rack0 上的 CPU 的 PN 接口地址为 192.168.0.101, Rack1 上的 CPU 的 PN 接口 地址为 192.168.0.102。

(C) 在 Rack0 上的 CPU 属性中选择 Clock memory,设置 Memory byte 为 MW10,如图 3 所示。

operties - CPU 416-5 H PN/DP - (R0/S3)	— X
Time-of-Day Interrupts Cyclic Interrupts	Diagnostics/Clock Protection H Parameters
General Startup Gyold about Holm	Netentive Memory Memory Interrupts
Update OB1 process image cyclically:	
Scan cycle monitoring time [ms]:	6000
Minimum scan cycle time [ms]:	0
Scan cycle load from communication [%]:	20
Prioritized 0.CM communication	,
Size of the process-image input area:	1024
Size of the process-image output area:	1024
OB85 - call up at I/O access error:	At each individual access
	·
Clock Memory	
Mamora la ta	10
Memory byte.	10
ок	Cancel Help



(D) 将下载的 H_Status.zip 解压缩,并在 STEP7 中打开 Library,将 FB523、SFB35、

SFC51 拷贝到 SIMATIC H Station 的 Blocks 中,如图 4 所示。



(E) 在 OB35/100/102 中编程调用 SFB523,并分配输出参数 R0_MSTR/R1_MSTR 为 M100.0/M102.0,如图 5 所示。



2.2 组态Basic Panel项目

(A) 打开 TIA Portal, 创建新项目, 添加 HMI 设备, 选择 Basic Panel, 如图 6 所示。



图 6

(B) 设置 Basic Panel 的以太网的 IP 地址为 192.168.0.2。

(C) 在 Connection 中添加用于监控 Rack0 的 CPU 的连接 Connection_PLC1,通信驱动选择"SIMATIC S7-300/400",设置 IP 地址为 192.168.0.101, Expansion slot 为 3, Rack 为 0,如图 7 所示。

VA	Siemens - For400HPN	
Pro	oject Edit View Insert Online O	ptions Tools Window Help
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tion	▼ 🔄 For400HPN	Name Communication driver Station Partner Node Online
izal	🌁 Add new device	Connection_PLC1 SIMATIC S7 300/400 🔍
ual	Devices & networks	🔽 Connection_PLC2 SIMATIC S7 300/400
Vis	HMI_1 [TP900 Comfort]	🔽 Connection_PLCX SIMATIC S7 300/400
	HMI_2 [TP900 Comfort]	x x x x x x x x x x
	▼ HMI_3 [TP1500 Basic PN]	Parameter Area asister
	III Device configuration	Area pointer
	鬼 Online & diagnostics	
	🍸 Runtime settings	TP1500 Basic PN Station
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	Screen management	
	HMI tags	
	2 Connections	
	HMI alarms	
	Recipes	HMI device PLC
	5 Scheduled tasks	
	Ext and graphic lists	Address: 192.168.0.2 Address: 192.168.0.101
	Viser administration	Access point: S7ONLINE Expansion slot: 3
	Common data	Rack: 0
	Languages & resources	Cyclic operation:
	 Canguages & resources Conline access 	
	Im Online access	

图 7

(D) 在 Connection 中添加用于监控 Rack1 的 CPU 的连接 Connection_PLC2,通信驱动选择"SIMATIC S7-300/400",设置 IP 地址为 192.168.0.102, Expansion slot 为 3, Rack 为 1, 如图 8 所示

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Project Edit View Insert Online (Dptions Tools Window Help		
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S HML 2 [TP000 Comfort]	Za Connection_FLCX SIMAIIC S7 500/400		~
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Screen management	Interface:		
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🕨 🥁 Common data			
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Languages & resources		Cyclic operation: 🗹	
Online access			

(E) 在 Connection 中添加用于创建过程变量的连接 Connection_PLCX,通信驱动选择"SIMATIC S7-300/400",设置 IP 地址为 192.168.0.101, Expansion slot 为 3, Rack 为 0
(F) 在 HMI tags 中添加如下外部过程变量,在变量 PLC1_Master 和 PLC2_Master 的
Properties-Range-Settings 中设置 Maximum 为 0,如图 9 所示。

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Devices & networks	PLC1_Master	Default tag table	 Byte 		Connection_PLC1		<undefined></undefined>	%MB100	<absolute access=""></absolute>	1 s 🔳
HMI_1 [TP900 Comfort]	PLC2_Master	Default tag table	Byte		Connection_PLC2		<undefined></undefined>	%MB102	<absolute access=""></absolute>	15
HMI_2 [TP900 Comfort]	<	1								>
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Device configuration					HMI tag par	ameter		(Provide State		
S Online & diagnostics	PLC1_Master						S Propertie	es 🛄 Info	🔒 🗓 Diagnosti	cs 📑 🗖 🗖 🗖
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The HMI tags	General							1		
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The fault tag table [3]	Linear scaling	Minimum:			0.					
Connections	Values									
HMI alarms	Comment									

图 9

(G) 在变量 PLC1_Master 的 Events-On exceeding 中添加系统函数 ChangeConnection,设置 Connection 为 Connection_PLCX, Address 为 192.168.0.101, Slot 为 3, Rack 为 0, 如图 10 所示。

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	Default tag table							
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HMI_3 [TP1500 Basic PN]							<u> </u>	
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Show all tags	On exceeding	 ChangeConnection 						
📑 Add new tag table	On falling bel	Connection		Connection PLCX				
💥 Default tag table [3]		Address		192 168 0 101				
2 Connections		Slot		3				
🖂 HMI alarms		Back		0				
		<add function=""></add>						

图 10

(G) 在变量 PLC2_Master 的 Events-On exceeding 中添加系统函数 ChangeConnection,设置 Connection 为 Connection_PLCX, Address 为 192.168.0.102, Slot 为 3, Rack 为 1, 如图 11 所示。

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	🕶 🔁 HMI tags	Value change									
	a Show all tags	On exceeding	 ChangeConnection 								
Image: Source				Connection PLCX							
	💥 Default tag table [3]		Address				192.168.0.102				
	2 Connections		Slot				3				
	MI alarms		Rack				1				
	🔁 Recipes		<add function=""></add>						ddress Access mode Acquisit MB10 absolute access> 10 ms MB100 absolute access> 1 s MB102 absolute access> 1 s		

图 11

(J) 在 Screen 中添加测试画面,显示所有变量和报警信息,如图 12 所示。



图 12

2.3 下载调试项目

将项目编译后下载到 Basic Panel 后,做以下调试:

(A) 初始时,变量 PLC1_Master 为 1,超出上限触发系统函数 ChangeConnection,连接 Connection_PLCX 指向 PLC1; PLC2_Master 为 0,如图 13 所示。

5		Sit	MATIC I
PLC1_Master	PLC2_Master	Clock Memory	
00000001	00000000	11001100	
11/5/2012 41:30:35 FM § 140000 Connection et 11/5/2012 4:30:35 FM § 140001 Connection et 11/5/2012 4:30:35 FM § 140000 Connection et 11/5/2012 4:30:35 FM § 140000 Connection et 11/5/2012 4:30:35 FM § 140000 Connection et 11/5/2012 4:30:35 FM § 110001 Charge to cp 11/5/2012 4:30:35 FM § 120005 Project modit	stabilished, Connection, PLCK, Station 192, 168 of scorrected: Connection, PLCK, Station 192, 166 stabilished: Connection, PLCI, Station 192, 166 stabilished: Connection, PLCI, Station 192, 166 of stabilished: Connection, PLCI, Station 192, 168 of erating mode 'online'.	N101, Rock 0, Stot 3 10.101, Rock 0, Stot 3 101, Rock 0, Stot 3 101, Rock 0, Stot 3 1012, Rock 1, Stot 3 ent alorm buffer.	ł
			•
			Ŧ



(B) 手动停止 PLC1,变量 PLC1_Master 仍为 1;而变量 PLC2_Master 变为 1,超出上限触 发系统函数 ChangeConnection,连接 Connection_PLCX 指向 PLC2,如图 14 所示。

ENS	2223 J		IMATIC
PLC1_Master	PLC2_Master	Clock Memory	
00000001 11/5/2012 4:31:25 PM \$ 140000 Connection et	00000001 tablished: Connection_PLCX, Station 192,168.0	01011000	
11/5/2012 4 31:34 PM § 14/0001 Convestion d 11/5/2012 4 30:35 PM § 14/0001 Convestion d 11/5/2012 4 30:35 PM § 14/0001 Convestion d 11/5/2012 4 30:35 PM § 14/0000 Convestion e 11/5/2012 4 30:35 PM § 14/0000 Convestion e 11/5/2012 4 30:35 PM § 11/0001 Change to go 11/5/2012 4 30:35 PM § 220006 Project modif	sconnettica Connection, PLCS, Station 192, 169 Valimited Connection, PLCS, Station 192, 169 sconnected, Connection, PLCS, Station 192, 169 Habilithet, Connection, PLCI, Station 192, 168, 16 Habilithet, Connection, PLCI, Station 192, 168, 16 erating mode forline', led: Alarms cannot be restored from the pensist	0:010; Aask 0, Stot 3. 0:010; Aask 0, Stot 3. 0:010; Aask 0, Stot 3. 0:010; Aask 0, Stot 3. 0:01; Aask 0, Stot 3. 0:01; Aask 0, Stot 3. 0:02; Aask 1; Stot 3.	.
			T
		E	xit



(C) 手动运行 PLC_1,变量 PLC1_Master 变为 0,变量 PLC2_Master 仍为 1,均不会触发 系统函数 ChangeConnection,连接 Connection_PLCX 依然指向 PLC2,如图 15 所示。

RT Simulator	V11.00.02.01_01.02 [100%]			Color Car
SIEMEN	5			MATIC PANEL
				TO
	PLC1_Master	PLC2_Master	Clock Memory	i i i
	00000000	00000001	01010011	110
	11/5/2012 4:32:36 FM § 14/2001 Correction eff 11/5/2012 4:12:36 FM § 14/2001 Correction eff 11/5/2012 4:13:57 FM § 14/2001 Correction eff 11/5/2012 4:31:35 FM § 14/2001 Correction eff 11/5/2012 4:30:35 FM § 11/2001 Correction eff 11/5/2012 4:30:35 FM § 11/2001 Correction eff 11/5/2012 4:30:35 FM § 11/2001 Correction eff	abilited: Connection FLC1, Station 192,168.0 connector: Connection, PLC1, Station 192, 169.0 solitiled: Connection, PLCX, Station 192, 169.0 connector: Connection, PLCX, Station 192, 169.0 connector: Connection, PLCX, Station 192, 169.0 abilited: Connection, PLC1, Station 192, 169.0 abilited: Connection, PLC2, Station 192,169.0 abilited: Connection, PLC2, Station 192,169.0 crating mode 'online'. At Alarmis cannot be restored from the persista	101, Roth 0, Stort 3, 1010, Rosk 1, Stort 3, 100, Rosk 1, Stort 3, 1010, Rosk 0, Stort 3, 1010, Rosk 0, Stort 3, 1010, Rosk 0, Stort 3, 101, Rosk 0, Stort 3, 102, Rosk 1, Stort 3, 102, Rosk 1, Stort 3, ant alarm buffer.	•
			E	T T
{				

图 15

(D) 手动停止 PLC2,变量 PLC1_Master 变为 1,超出上限触发系统函数

ChangeConnection, 连接 Connection_PLCX 指向 PLC1, 而变量 PLC2_Master 仍为 1, 如 图 16 所示。



图 16

(E) 手动运行 PLC_2, 变量 PLC1_Master 仍为 1, 变量 PLC2_Master 变为 0, 均不会触发 系统函数 ChangeConnection, 连接 Connection_PLCX 依然指向 PLC1, 如图 17 所示。

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图 17

该项目仅能实现在通信连接正常的情况下,Basic Panel 在 S7-400H PN 主从切换时,始终保持到主 CPU 的连接。

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