Application Example: 2 Virtual Control Instances use VLAN and a CISCO switch and are connected to different fieldbus stacks (EN)

- <u>1. Step: Install the Docker container on the IPC / Server / deploy two</u> Instances of the CODESYS Virtual Control
- o Step 2: Setup VLAN create bash file
- Step 3: Transferring the VLAN interfaces in the CODESYS Deploy Control SL tool
- 4. Step: Configuration of the required ports of the Cisco switch
- o 5. Step: Assigning fieldbus devices in the CODESYS application

Hardware used:

Any IPC or Server with Debian based Linux OSCisco SwitchIE3400Beckhoff EtherCAT-DeviceWeidmüller Feldbuss-DeviceVeidmüller Feldbuss-

including RT_preempted kernel



Step 1: Install the Docker container on the IPC / Server / deploy two Instances of the CODESYS Virtual Control

https://content.helpmecodesys.com/en/CODESYS%20Control/_rtsl_virtual_control_sl_overview.html

Step 2: Setup VLAN - create bash file

• To use the virtual interfaces, two VLAN interfaces must be created in a bash file (extension .sh). One for Profinet and one for EtherCAT.

Input for creating a bash file

sudo nano ConfigureVLANInterfaces.sh

create VLAN Interfaces

activate VLAN Option on Linux sudo modprobe 8021q

Activate physical Adapter sudo ip link set up enp2s0

EtherCAT VLAN Interface sudo ip link add link enp2s0 name enp2s0.100 type vlan id 100 sudo ip addr add 192.168.0.200/24 dev enp2s0.100 sudo ip link set dev enp2s0.100 address 02:a0:04:d3:00:11

Profinet VLAN Interface sudo ip link add link enp2s0 name enp2s0.200 type vlan id 200 sudo ip addr add 192.168.179.90/24 dev enp2s0.200

Acitvate links sudo ip link set up enp2s0.100 sudo ip link set up enp2s0.200

- Then press Ctrl+O to hide and save
- Input to make the file executable

 $\label{eq:sudo_chmod} \ensuremath{\mathsf{sudo}}\xspace \ensur$

check with 'ip a' the two new VLAN interfaces should now appear (enp2s0.100@enp2s0 and enp2s0.200@enp2s0):



Step 3: Transferring the VLAN interfaces in the CODESYS Deploy Control SL tool

Profinet:



EtherCAT:

21	
< Instance	
Autostart	False
Capabilities	cap_chown, cap_ipc_lock, cap_kill, cap_net_admin, cap_net_bin
Dependencies	
Genericcommands	
Hostname	vplcweidmueller_ethercat
Image	codesyscontrol_virtuallinux:4.12.0.0-b.trunk.112
lpc	
Licenseserver	
Mounts	/var/opt/codesysvcontrol/instances/vplcweidmueller_ethercat/c
Network	
Nic	enp2s0.100/192.168.0.200/24
Ports	
Producttype	Runtime
Technology	Docker
Autostart	
Autostart whether the instance should start on system boot up creace VLAN Interfaces the approach VLAN Option in Linux	or not.
Autostart Whether the instance should start on system boot up Creace VLAN Interfaces # activate VLAN Option in Linux sudo modprobe 8021g	or not.
Autostart whether the instance should start on system boot up create VLAN Interfaces # activate VLAN Option in Linux sudo modprobe 8021g	or not. OK Cancel
Autostart hether the instance should start on system boot up create VLAN Interfaces # activate VLAN Option in Linux sudo modprobe 8021q # Activate physical Adapter	or not.
Autostart Thether the instance should start on system boot up a create VLAN Interfaces # activate VLAN Option in Linux sudo modprobe 8021q # Activate physical Adapter sudo ip link set up enp2s0	or not.
Autostart Thether the instance should start on system boot up Create VLAN Interfaces activate VLAN Option in Linux sudo modprobe 8021q Activate physical Adapter sudo ip link set up enp2s0 EtherCAT VLAN Interface	or not.
Autostart Mether the instance should start on system boot up create VLAN Interfaces activate VLAN Option in Linux sudo modprobe 8021q Activate physical Adapter sudo ip link set up enp2s0 EtherCAT VLAN Interface sudo ip link add link enp2s0 name_enp2s	OK Cancel
Autostart Mether the instance should start on system boot up create VLAN Interfaces activate VLAN Option in Linux sudo modprobe 8021q Activate physical Adapter sudo ip link set up enp2s0 EtherCAT VLAN Interface sudo ip link add link enp2s0 name enp2s sudo ip link add link enp2s0 name enp2s sudo ip link add link enp2s0 name enp2s	OK Cancel
Autostart Mether the instance should start on system boot up a create VLAN Interfaces activate VLAN Option in Linux sudo modprobe 8021q Activate physical Adapter sudo ip link set up enp2s0 EtherCAT VLAN Interface sudo ip link add link enp2s0 name enp2s sudo ip addr.add 192.168.0.200/24 dev e sudo ip link set dev enp2s0.100 address	OK Cancel
Autostart Antostart Antoptic the instance should start on system boot up a create VLAN Interfaces # activate VLAN Option in Linux sudo modprobe 8021q # Activate physical Adapter sudo ip link set up enp2s0 # EtherCAT VLAN Interface sudo ip link add link enp2s0 name enp2s sudo ip link add link enp2s0.100 address # Erofinet VLAN Interface	OK Cancel
Autostart Anther the instance should start on system boot up a create VLAN Interfaces a activate VLAN Option in Linux sudo modprobe 8021q a Activate physical Adapter sudo ip link set up enp2s0 a EtherCAT VLAN Interface sudo ip link add link enp2s0 name enp2s sudo ip link add 192.168.0.200/24 dev e sudo ip link set dev enp2s0.100 address b Profinet VLAN Interface sudo ip link add link enp2s0 name enp2s sudo ip link add link enp2s0 name enp2s	OK Cancel
Autostart Autostart Another the instance should start on system boot up a create VLAN Interfaces # activate VLAN Option in Linux sudo modprobe 8021q # Activate physical Adapter sudo ip link set up enp2s0 # EtherCAT VLAN Interface sudo ip link add link enp2s0 name enp2s sudo ip link add 192.168.0.200/24 dev e sudo ip link set dev enp2s0.100 address # Profinet VLAN Interface sudo ip link add link enp2s0 name enp2s sudo ip link add link enp2s0 name enp2s sudo ip link add link enp2s0 name enp2s	OK Cancel 00.100 type vlan id 100 mp2s0.100 02:a0:04:d3:00:11 0.200 type vlan id 200 enp2s0.200
Autostart Thether the instance should start on system boot up create VLAN Interfaces # activate VLAN Option in Linux sudo modprobe 8021q # Activate physical Adapter sudo ip link set up enp2s0 # EtherCAT VLAN Interface sudo ip link add link enp2s0 name enp2s sudo ip link set dev enp2s0.100 address # Profinet VLAN Interface sudo ip link add 192.168.0.200/24 dev # Profinet VLAN Interface sudo ip link add link enp2s0 name enp2s sudo ip link add link enp2s0 name enp2s sudo ip addr add 192.168.179.90/24 dev	OK Cancel 0.100 type vlan id 100 mp2s0.100 0.02:a0:04:d3:00:11 0.200 type vlan id 200 enp2s0.200
Autostart Thether the instance should start on system boot up create VLAN Interfaces # activate VLAN Option in Linux sudo modprobe 8021q # Activate physical Adapter sudo ip link set up enp2s0 # EtherCAT VLAN Interface sudo ip link add link enp2s0 name enp2s sudo ip link set dev enp2s0.100 address # Frofinet VLAN Interface sudo ip link set dev enp2s0.100 address # Frofinet VLAN Interface sudo ip link add link enp2s0 name enp2s sudo ip link set dev enp2s0.100 address # Activate links sudo ip link set up enp2s0.100	OK Cancel 0.100 type vlan id 100 np2s0.100 0.200 type vlan id 200 enp2s0.200

4. Step: Configuration of the required ports of the Cisco switch

• First, VLAN100 and VLAN200 must be created under Configuration \rightarrow Layer2 \rightarrow VLAN

Configu	uration • > Layer2 • > VLAN					
SVI	VLAN Group					
.+	Add X Delete					
	VLAN ID	Y Name	Ŧ	Status T	Ports	Ŧ
	1	default		active	Gi1/1, Ap1/1	
	15	ProductionVLAN_debian5		active		
	16	ProductionVLAN_debian6		active		
	20	VLAN0020		active	Gi1/2, Gi1/6, Gi1/7, Gi1/8,Gi1/9, Gi1/10	
	100	VLAN0100		active	Gi1/5	
	200	VLAN0200		active	Gi1/4	
н	4 1 × × 10 v					1 - 6 of 6 items

• Profinet must be enabled and assigned to VLAN200

PROFINET
BLED
2

• The Ethernet interfaces must then be configured under Configuration → Interface → Ethernet

											Multi Port Configura
,	Name	Admin Status	: Operational Status	IPv4 Address	:	IPv6 Address	:	Layer	:	Description	
c	3igabitEthernet1/1	0	0	unassigned		Unassigned		L2/L3			
C	GigabitEthernet1/2	o	O	unassigned		Unassigned		L2/L3			
C	SigabitEthernet1/3	o	0	unassigned		Unassigned		L2/L3		trunk	
G	3igabitEthernet1/4	o	0	unassigned		Unassigned		L2/L3		Profinet	
0	3igabitEthernet1/5	0	0	unassigned		Unassigned		L2/L3		Ethercat	
G	3igabitEthernet1/6	o	O	unassigned		Unassigned		L2/L3			
C	SigabitEthernet1/7	0	O	unassigned		Unassigned		L2/L3			
G	GigabitEthernet1/8	0	O	unassigned		Unassigned		L2/L3			
0	3igabitEthernet1/9	0	o	unassigned		Unassigned		L2/L3			
6	GigabitEthernet1/10	0	o	unassigned പ്രിപ്പ		Unassigned		L2/L3			

• Configuration of a trunk port (Port Gig 1/3)

								General Advanced	
	Name	:	Admin : Status	Operational Status	IPv4 Address	:	IPv6 Address	Interface Description	GigabitEthemet1/3 description
	GigabitEthernet1/1		o	0	unassigned		Unassigned		(1-200 Characters)
	GigabitEthernet1/2		0	0	unassigned		Unassigned	Speed	auto
	GigabitEthernet1/3		0	o	unassigned		Unassigned		
	GigabitEthernet1/4		0	o	unassigned		Unassigned		
	GigabitEthernet1/5		o	o	unassigned		Unassigned	Duplex	auto 🔻
	GigabitEthernet1/6		o	0	unassigned		Unassigned	Admin Status	UP 💽
	GigabitEthernet1/7		0	0	unassigned		Unassigned	Port Fast	trunk
	GigabitEthernet1/8		O	0	unassigned		Unassigned	Enable Laver 3 Address	DISABLED
	GigabitEthernet1/9		0	O	unassigned		Unassigned		
	GigabitEthernet1/10		o	O	unassigned		Unassigned	Switchport Mode	trunk
ii s	1 2 H	10	•					Allowed VLAN	All O VLAN IDs
								Native VLAN	20

• Configuration of a Profinet port (Port Gig 1/4)

Config	guration • > Interface	 Etherne 	t					Configure Inte	erfa	ce Gigal	bitEther	net1/4				
								General	1	Advanced	i i					
	Name	Admin	: 0	perational	IDvA Address		IDv6 Address	Interface				GigabitEth	nernet1/4			
	GigabitEthernet1/1	. 00000		O	unassigned	•	Unassigned	Description			ĺ	NOT INC.		(1	I-200 Characters)	
	GigabitEthernet1/2	G		0	unassigned	ι	Unassigned	Speed			ſ	auto				
	GigabitEthernet1/3	G		o	unassigned	l.	Unassigned	Speed				-	-		-	
	GigabitEthernet1/4	G		0	unassigned	l	Unassigned	<			L	10	100)	1000	
	GigabitEthernet1/5	G		o	unassigned	i	Unassigned	Duplex			L	auto		- <u>-</u>		
	GigabitEthernet1/6	G		0	unassigned	l	Unassigned	Admin Status			C	UP				
	GigabitEthernet1/7	G		0	unassigned	i	Unassigned	Port Fast				disable		-		
	GigabitEthernet1/8	G		0	unassigned	l	Unassigned	Enable Layer 3	Adc	dress	ſ	DISABL	ED			
	GigabitEthernet1/9	G		0	unassigned	l	Unassigned	Suitebaart Maa				dunamia a	da .	1		
	GigabitEthernet1/10	G	Ð	0	unassigned	i	Unassigned	Switchport Mod	de		L	dynamic at	Jto			
н	4 1 2 F H	10 🗸						Access VLAN				200	•	·		
								Allowed VLAN				All	O VL	AN IDs		
								Native VLAN				20				
											/					
																_

• Configuration of an EtherCAT port (Port Gig 1/5)

Config	guration • > Interface	• >	Ethernet	t						Configure Interface Gigabit	Ethernet1/5	
										General Advanced	GinabitEthernet1/5	
	Name	:	Admin Status	:	Operational Status	:	IPv4 Address	:	IPv6 Address	Description	EtherCAT	(4
	GigabitEthernet1/1		0		o		unassigned		Unassigned			(1-200 Characters)
	GigabitEthernet1/2		0		O		unassigned		Unassigned	Speed	auto 👻	
	GigabitEthernet1/3		0		0		unassigned		Unassigned			
	GigabitEthernet1/4		o		0		unassigned		Unassigned			LJ 1000
	GigabitEthernet1/5		0		0		unassigned		Unassigned	Duplex	auto	
	GigabitEthernet1/6		0		0		unassigned		Unassigned	Admin Status	UP 💽	
	GigabitEthernet1/7		O		0		unassigned		Unassigned	Port Fast	disable 🗸	
	GigabitEthernet1/8		o		O		unassigned		Unassigned	Enable Layer 3 Address	DISABLED	
	GigabitEthernet1/9		o		O		unassigned		Unassigned	Suiteboort Meda	dunamia auto -	
	GigabitEthernet1/10		0		0		unassigned		Unassigned	Switchport Mode		
8	< 1 2 ► H	10	•							Access VLAN	100 🔻	
										Allowed VLAN	All O VLAN	IDs
										Native VLAN	20	
							N					

5. Step: Assigning fieldbus devices in the CODESYS application

• for Profinet

Seneral	Network interface	enp2s0.200	Browse
Ethernet Device I/O Mapping	IP address	192 . 168 . 179 . 90	
thernet Device IEC Objects	Subnet mask	255 . 255 . 255 . 0	
	Default gateway	0.0.0.0	
atus		g system settings	
formation			

• for EtherCAT

Sync Unit Assignment EtherCAT NIC Set Overview Destination addr	tings	
Overview Destination addr		
	ESS(MAC) FF+F+F+F+F+F	Broadcast 🗌 Redundancy
Source address (MAC) 02-A0-04-D3-00-11	Select
Network name	enp2s0.100	
EtherCAT I/O Mapping Select network	k by MAC O Select net	work by name 🗌 Compare exact name
EtherCAT IEC Objects	:k	- Diffions
Status Cycle time	1000 🖨 µs	
Information Sync offset	20 🚖 %	
Sync window n	nonitoring	
Sync window	1 🌲 µs	

This is what the application should look like at the end after downloading and starting the application

rices 👻 🕂 🗙	Deploy Control SL 🗙 🗓	Device_1 EK1100	EL 20	02 🛛 🔐 EtherC	CAT_Maste
2VPLCs	Communication	Command			
E G P Device [connected] (CODESYS Virtual Control for Linux SL)	communication	÷ ↔ Start + Stop	•		
PLC Logic	Deployment	Testance	Ctata	Dependencies	1
= O Application [run]		Instance	State	Dependencies	6
Library Manager	Configuration	virtedge	Running		2
PLC_PRG (PRG)		vplcweidmueller	Running		
	Status/Command	vplcweidmueller_ethe	rcat Running		
MainTask (IEC-Tasks)					
PLC_PRG					
Photnet_Communication ask (IEC-Lasks)					
Frommet_IoTask (IEC-Tasks)					
Omerately					
E Controller (Precontroller)					
(0.020 DOT)					
G II test 10 3 (JR 20-8DO-P)					
G III test 10 4 (JR 20-16DT-P)					
G II test 10. 5 (UR 20-16DO-P)					
SoftMation General Axis Pool (SoftMation General Axis Pool)					
O Device 1 [connected] (CODESYS Virtual Control for Linux SL)					
PLC Logic					
😑 🔘 Application [run]					
- 🎁 Library Manager					
PLC_PRG (PRG)					
= 🙀 Task Configuration					
😏 🍪 EtherCAT_Task (IEC-Tasks)					
🗟 😳 b MainTask (IEC-Tasks)					
DIC_PRG					
= 🧐 🎒 EtherCAT_Master (EtherCAT Master SoftMotion)					
😑 😏 🞚 EK1100 (EK1100 EtherCAT Coupler (2A E-Bus))					
- 🚱 🚦 EL 1002 (EL 1002 2Ch. Dig. Input 24V, 3ms)					
EL2002 (EL2002 2Ch. Dig. Output 24V, 0.5A)					
EL6601 (EL6601 1 Port Switch (Ethernet, CoE))					
- 😔 🏅 SoftMotion General Axis Pool (SoftMotion General Axis Pool)					