61850 GOOSE System Viewer

Program for visualization and monitoring of GOOSE communication in the IEC 61850 based system - user guide

Prepared by Wojciech Kozlowski November 2023

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Initial view after the program start



Toolbox

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New project





Open an existing project





SCD file content: list of published data

The content of an imported SCD file of the project is first presented as a list of published data.

It is possible to select data for further monitoring:

- viewing, —
- event logging,
- presentation as alarms (with user defined alarm conditions).

	🎇 Configuration						—		×
า	Data reference	Data name	Add to data view	Add to event log	Add to alarm view	Alarm condition			Т
of	P3U_211Relay/Obj1CSWI1.Pos.stVal [ST]	Not configured							_
	P3U_218Relay/Obj1CSWI1.Pos.stVal [ST]	Not configured							
t	P3U_220ARelay/Obj1CSWI1.Pos.stVal [ST]	Not configured	\checkmark	\checkmark					
st of	P3U_220ARelay/Obj7CSWI7.Pos.stVal [ST]	Not configured	\checkmark						
SU OI	P3U_220ARelay/I3pMMXU1.A.phsB.cVal.mag.f [MX]	Not configured	\checkmark						
	P3U_220ARelay/I3pMMXU1.A.phsC.cVal.mag.f [MX]	Not configured							
elect Is Iser									
	ОК							Cano	.el



Communication monitoring settings

The configuration of monitoring GOOSE communication and interpreting captured information as events and alarms can be defined also later by pressing **22** icon.

Data reference	Data name	Add to data view	Add to event log	Add to alarm view	Alarm condition		
P3U_211Relay/Obj1CSWI1.Pos.stVal [ST]	Not configured						
P3U_218Relay/Obj1CSWI1.Pos.stVal [ST]	Not configured	\checkmark		\checkmark			
23U_220ARelay/Obj1CSWI1.Pos.stVal [ST]	Not configured			\checkmark			
23U_220ARelay/Obj7CSWI7.Pos.stVal [ST]	Not configured						
23U_220ARelay/I3pMMXU1.A.phsB.cVal.mag.f [MX]	Not configured	\checkmark					
3U_220ARelay/I3pMMXU1.A.phsC.cVal.mag.f [MX]	Not configured	\checkmark					



Connection view – diagram of GOOSE data flows

Connection view is created already in offline mode: for a given SCD file the program creates the network of devices as rectangles with their lists of published data and lists of configured network inputs, and draws the lines of configured GOOSE data transfers between the devices.

Pointing any connection line invokes its description of source data and network inputs.

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Navigation in Connection view

Connection view

allows to navigate:

- to the selected IED,
- to transmitted source data,

- to the destination receiving data on the network inputs.

Click the right mouse button on the connection line to invoke the navigation menu.





Zoom in Connection view

It is possible to zoom in and out large GOOSE connection diagrams.



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Connection view in online mode

Connection view will present online communication status after pressing icon.

The program starts working in online mode.

Depending on the status of GOOSE transmission, the connection line (as well as outputs and inputs) can be marked with color:





Black- correct transmission (outputs and inputs in blue)

Magenta – old data

Orange – corrupted frame

Grey – no transmission

Dark blue – selected connection (marking for any above case) 11

The condition of capturing GOOSE data in online mode

Remember:

The program can show data from only these GOOSE frames that are routed to the computer's port by the switch in the system with IEC 61850 communication.

In a complex system, the switches configuration may intentionally filter the distribution of frames according to VLAN IDs, so that intensive GOOSE communications do not flood these network segments that are not the destinations for some of the transmitted messages. Thus, in a complex network there may even no such a port in any of the switches, for which it would be possible to capture **all** transmitted GOOSE frames.



Current status

Current status view presents the list of data transmitted in GOOSE frames even in offline mode.

In online mode this list contains information on the current communication status, recent data values and time stamps.

<u>Transmission</u> <u>Data</u> <u>View</u> <u>H</u> elp					
) 🎗 📂 💿 🎟 🔛 🖳 🖳 !	Network adapter Ethernet M.	AC: D4-81-D7-68-85-A2		- 2	
rent status Event list Alarm list Connection view Sender state	21				
ata reference	GCB reference	Name	Value	Time	Status
U_211Relay/Obj1CSWI1.Pos.stVal [ST]	P3U_211Relay/LLN0\$G0\$gcb1	Not configured	00	2023-11-23 13:57:22.909	OK
U_218Relay/Obj1CSWI1.Pos.stVal [ST]	P3U_218Relay/LLN0\$G0\$gcb1	Not configured	00	2023-11-23 13:57:06.186	OK
U_220ARelay/Obj1CSWI1.Pos.stVal [ST]	P3U_220ARelay/LLN0\$G0\$gcb1	Not configured	00	2023-11-23 13:56:44.501	OK
U_220ARelay/Obj7CSW17.Pos.stVal [ST]	P3U_220ARelay/LLN0\$G0\$gcb2	Not configured	00	2023-11-23 14:06:36.092	Old data
U_220ARelay/I3pMMXU1.A.phsB.cVal.mag.f [MX]	P3U_220ARelay/LLN0\$G0\$gcb2	Not configured	0	2023-11-23 14:06:36.092	Old data
U_220ARelay/I3pMMXU1.A.phsC.cVal.mag.f [MX]	P3U_220ARelay/LLN0\$G0\$gcb2	Not configured	0	2023-11-23 14:06:36.092	Old dat



GOOSE connection list

INFO 7

Choosing **Connection list** from **Data** menu allows to view and export the GOOSE connection list to a text file. The connection list can be filtered by selecting the sending device and/or the receiving device.

Source filter Source filter Source filter Source filter Source filter Source filter Destination filter Source filter Destination Destination Destination Destination Destination Destination Destination PJU_218Relay/ObjICSW11.Pos.stVal PJU_218Relay/ObjICSW11.Pos.stVal PJU_218Relay/ObjICSW11.Pos.stVal PJU_218Relay/ObjICSW11.Pos.stVal PJU_220RRelay/ObjICSW11.Pos.stVal PJU_220RRelay/ObjICSW11.Pos.stVal PJU_218Relay/ObjICSW11.Pos.stVal PJU_218Relay/ObjICSW11.Pos
Source Destination P3J_218Relay/Obj1CSWI1.Pos.stVal P3J_211Relay/LNO/N11 P3J_202ARelay/Obj1CSWI1.Pos.stVal P3J_211Relay/LNO/N12 P3J_211Relay/Obj1CSWI1.Pos.stVal P3J_211Relay/LNO/N13 P3J_211Relay/Obj1CSWI1.Pos.stVal P3J_211Relay/LNO/N14 P3J_212ARelay/Obj1CSWI1.Pos.stVal P3J_211Relay/LNO/N14 P3J_212ARelay/Obj1CSWI1.Pos.stVal P3J_211Relay/LNO/N14 P3J_220ARelay/Obj1CSWI1.Pos.stVal P3J_211Relay/LNO/N14 P3J_220ARelay/Obj1CSWI1.Pos.stVal P3J_211Relay/LNO/N14 P3J_220ARelay/Obj1CSWI1.Pos.stVal P3J_210Relay/LNO/N14 P3J_220ARelay/Obj1CSWI1.Pos.stVal P3J_210Relay/LNO/N14 P3J_220ARelay/ISpMMX01.A.phsC.cVal.mag.f P3J_210Relay/LNO/N11 P3J_211Relay/Obj1CSWI1.Pos.stVal P3J_210Relay/LNO/N11 P3J_211Relay/Obj1CSWI1.Pos.stVal P3J_210Relay/Obj1CSWI1.Pos.stVal P3J_211Relay/Obj1CSWI1.Pos.stVal P3J_210Relay/Obj1CSWI1.Pos.stVal P3J_213Relay/Obj1CSWI1.Pos.stVal P3J_210Relay/LNO/N11 P3J_213Relay/Obj1CSWI1.Pos.stVal P3J_210Relay/LNO/N12 P3J_213Relay/Obj1CSWI1.Pos.stVal P3J_200Relay/LNO/N12 P3J_213Relay/Obj1CSWI1.Pos.stVal P3J_200Relay/LNO/N12 P3J_213Relay/Obj1CSWI1.Pos.stVal P3J_20
Source Destination P3U_218Relay/Obj1CSWI1.Pos.stVal P3U_211Relay/LN0/NI1 P3U_220ARelay/Obj1CSWI1.Pos.stVal P3U_211Relay/LN0/NI2 P3U_211Relay/LD1/CSW11.Pos.stVal P3U_211Relay/LN0/NI3 P3U_220ARelay/Obj1CSWI1.Pos.stVal P3U_211Relay/LN0/NI3 P3U_220ARelay/Obj1CSWI1.Pos.stVal P3U_211Relay/LN0/NI1 P3U_220ARelay/Obj1CSWI1.Pos.stVal P3U_220ARelay/Dbj1CSWI1.Pos.stVal P3U_220ARelay/Dbj1CSWI1.Pos.stVal P3U_220ARelay/Dbj1CSWI1.Pos.stVal P3U_220ARelay/Dbj1CSWI1.Pos.stVal P3U_220ARelay/Dbj1CSWI1.Pos.stVal P3U_220ARelay/Dbj1CSWI1.Pos.stVal Nazwa P3U_221Relay/Dbj1CSWI1.Pos.stVal Nazwa P3U_221Relay/Dbj1CSWI1.Pos.stVal Nazwa P3U_211Relay/Dbj1CSWI1.Pos.stVal Nazwa P3U_2218Relay/Dbj1CSWI1.Pos.stVal Nazwa P3U_2218Relay/Dbj1CSWI1.Pos.stVal Nazwa P3U_2218Relay/Dbj1CSWI1.Pos.stVal Nazwa P3U_2218Relay/Dbj1CSWI1.Pos.stVal Nazwa P3U_2228Relay/Dbj1CSWI1.Pos.stVal Nazwa P3U_228Relay/Dbj1CSWI1.Pos.stVal Nazwa P3U_228Relay/Dbj1CSWI1.Pos.stVal Nazwa P3U_228Relay/Dbj1CSWI1.Pos.stVal Nazwa P3U_228Relay/Dbj1CSWI1.Pos.stVal Nazwa P3U_228Relay/Dbj1CSWI1.Pos.stVal Nazwa P3U_218Relay/Dbj1CSWI1.Pos.stVal
P3U_218Relay/Obj1CSWI1.Pos.stVal P3U_220Relay/Obj1CSWI1.Pos.stVal P3U_220Relay/Obj1CSWI1.Pos.stVal P3U_211Relay/Obj1CSWI1.Pos.stVal P3U_211Relay/Obj1CSWI1.Pos.stVal P3U_220Relay/Obj1CSWI1.Pos.stVal P3U_220Relay/Obj1CSWI1.Pos.stVal P3U_220Relay/Obj1CSWI1.Pos.stVal P3U_220Relay/Obj1CSWI1.Pos.stVal P3U_221Relay/Obj1CSWI1.Pos.stVal P3U_221Relay/Obj1CSWI1.Pos.stVal P3U_221Relay/Obj1CSWI1.Pos.stVal P3U_221Relay/Obj1CSWI1.Pos.stVal P3U_221Relay/Obj1CSWI1.Pos.stVal P3U_221Relay/Obj1CSWI1.Pos.stVal P3U_221Relay/Obj1CSWI1.Pos.stVal P3U_21RelaY/Obj1CSWI1.Pos.stVal P3U_21RelaY/Obj1CSWI1.Pos.stVal P3
P3J_220ARelay/Obj1CSWI1.Pos.stVal P3J_220ARelay/J3pMW01.A.phsB.cVal.mag.f P3J_21Relay/Obj1CSWI1.Pos.stVal
P3J_220ARelay/J30MMXU1.A.phsB.cVal.mag.f P3J_221ARelay/J0bjICSWI1.Pos.stVal P3J_21Relay/ObjICSWI1.Pos.stVal P3J_21BRelay/ObjICSWI1.Pos.stVal P3J_21BRelay/ObjICSWI1.Pos.stVal P3J_21BRelay/ObjICSWI1.Pos.stVal P3J_21BRelay/ObjICSWI1.Pos.stVal
P3J_220ARcleg/I)SpMMULA.ApriS.CV3I.m8g.r P3J_21Relay/ObjICSWII.Pos.stVal P3J_21Relay/ObjICSWII.Pos.stVal P3J_21Relay/ObjICSWII.Pos.stVal P3J_218Relay/ObjICSWII.Pos.stVal Biblotek Sec
P3J_211Relay/Obj1CSW11.Pos.stVal Oddarie migica C. C
Name - Harry NEWLICT - Tanian

Event list

Event list view allows to monitor in real time all selected events related to GOOSE transmissions (publishers and data). This list is presented in time order.

<u>T</u> ransmission <u>D</u> ata <u>V</u> iew <u>H</u> elp				
) 💥 📂 😳 💷 🖳 🖳 🖳	Network adapter Ethernet MAC: D4-81-D7-68-	85-A2	- 之	
rent status Event list Alarm list Connection view Sender status				
ata reference	GCB reference	Name	Value	Time
blisher	P3U_220ARelay/LLN0\$G0\$gcb2	Status	Old data	2023-11-23 15:06:44.162
blisher	P3U_220ARelay/LLN0\$G0\$gcb2	Status	OK	2023-11-23 15:06:36.109
blisher	P3U_211Relay/LLN0\$G0\$gcb1	Status	OK	2023-11-23 15:04:38.963
U_211Relay/Obj1CSWI1.Pos.stVal [ST]	P3U_211Relay/LLN0\$G0\$gcb1	Not configured	00	2023-11-23 13:57:22.909
blisher	P3U_220ARelay/LLN0\$G0\$gcb1	Status	OK	2023-11-23 15:04:38.551
U_220ARelay/Obj1CSWI1.Pos.stVal [ST]	P3U_220ARelay/LLN0\$G0\$gcb1	Not configured	00	2023-11-23 13:56:44.501
blisher	P3U_218Relay/LLN0\$G0\$gcb1	Status	OK	2023-11-23 15:04:38.251
U_218Relay/Obj1CSWI1.Pos.stVal [ST]	P3U_218Relay/LLN0\$G0\$gcb1	Not configured	00	2023-11-23 13:57:06.186
blisher	P3U_220ARelay/LLN0\$G0\$gcb1	Status	OK	2023-11-23 14:59:50.554
U_220ARelay/Obj1CSWI1.Pos.stVal [ST]	P3U_220ARelay/LLN0\$G0\$gcb1	Not configured	00	2023-11-23 13:56:44.501
blisher	P3U_218Relay/LLN0\$G0\$gcb1	Status	OK	2023-11-23 14:59:50.238
U_218Relay/Obj1CSWI1.Pos.stVal [ST]	P3U_218Relay/LLN0\$G0\$gcb1	Not configured	00	2023-11-23 13:57:06.186
blisher	P3U_211Relay/LLN0\$G0\$gcb1	Status	OK	2023-11-23 14:59:48.970
U_211Relay/Obj1CSWI1.Pos.stVal [ST]	P3U_211Relay/LLN0\$G0\$gcb1	Not configured	00	2023-11-23 13:57:22.909
blisher	P3U_220ARelay/LLN0\$G0\$gcb2	Status	Old data	2023-11-23 14:57:53.740
blisher	P3U_218Relay/LLN0\$G0\$gcb1	Status	OK	2023-11-23 14:57:32.242
U_218Relay/Obj1CSWI1.Pos.stVal [ST]	P3U_218Relay/LLN0\$G0\$gcb1	Not configured	00	2023-11-23 13:57:06.186
blisher	P3U_220ARelay/LLN0\$G0\$gcb2	Status	OK	2023-11-23 14:57:31.723
blisher	P3U_211Relay/LLN0\$G0\$gcb1	Status	OK	2023-11-23 14:57:30.968
U_211Relay/Obj1CSWI1.Pos.stVal [ST]	P3U_211Relay/LLN0\$G0\$gcb1	Not configured	00	2023-11-23 13:57:22.909
blisher	P3U 220ARelay/LLN0\$G0\$gcb1	Status	OK	2023-11-23 14:57:30.558
U_220ARelay/Obj1CSWI1.Pos.stVal [ST]	P3U_220ARelay/LLN0\$G0\$gcb1	Not configured	00	2023-11-23 13:56:44.501



Alarm list

Alarm list view presents these transmitted GOOSE data that have met the alarm condition specified in the monitoring settings. The alarm condition appears as active and can switch to inactive due to a change in the transmitted data value. The user can confirm both an active alarm and an inactive alarm. The background for

each item in the list informs about the alarm status and its acknowledgment.





Setup of alarm conditions

To set up alarm conditions, in offline mode invoke the configuration of monitoring GOOSE communication by pressing icon so (see page 6).

Data value received in any GOOSE network input can trigger an alarm according to the user defined formula. A variable \mathbf{v} in the formula represents the received data value. Alarm condition formula can use various arithmetic and logic operators.

Here are some examples of formulas:

- v = 1 rises an alarm when the data value changes to true (or 1 in case of integer or float types),
- v = 0 rises an alarm when the data value changes to false (or 0 in case of integer or float types),
- v > 100 rises an alarm when the data value goes above 100 (high alarm limit),
- \Box **v** < **10** rises an alarm when data value goes below 10 (low alarm limit).



Sender Status

Sender Status view allows to trace transmissions from GOOSE Control Blocks. The columns show: IED name, message type (routable /non-routable), MAC source address, MAC destination address, IP (for routable GOOSE messages), APPID, GOOSE ID (GoID), GCB reference address, message counter, bit states for TEST/SIMULATION and NDSCOM, receive status.

Depending on the status, a given transmission may be marked with the following background color:



ile <u>T</u> ransm	ission <u>D</u> ata	<u>/</u> iew <u>H</u> elp										
intert status	Event list	n list Connection view		O Ni	etwork adap	ter Ethernet MA	C: D4-81-D7-68-85-A	2	- 之			
ED 23U 211 23U 218 23U 220A	Type Not routable Not routable Not routable	Source MAC 00-00-00-00-00-00-00 00-00-00-00-00-00-	Destination MAC 01-0C-CD-01-00-00 01-0C-CD-01-00-01 01-0C-CD-01-00-02	IP N/A N/A N/A	App ID 0211 0218 0220	Config Rev 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	G00SE ID V 211 V 218 V 220	GCB ref P3U 211Relay/LL P3U 218Relay/LL P3U 220ARelay/L P3U 220ARelay/L	Messages 861 859 860	Sim FALSE FALSE FALSE	NDSCOM FALSE FALSE FALSE	Stat OK OK OK
00 2205	Hot lockable						100		20		THEOL	

White / Green - correct transmission

Magenta – old data

Maroon – frame corrupted

Red – strong address conflict (same MAC/IP, APPID, ConRev, GOID)

Yellow - address conflict (same MAC/IP, APPID, ConfRev)

Grey- no data/no transmission

Parser

After invoking the **Parser window** (dedicated icon), it is possible to track captured GOOSE frames.

The parsing outcome can be configured.



Image:	🚰 Parser window				×
2023.11.23 14:40:07.752616] Ethemet Dst MAC:27-0C-CD-01-00-01 Src MAC:D4-81-D7-68-85-A2 VLAN Hdr ID:0 PKI0:4 CFI:0 GOOSE Hdr AppID:536 PDUIen:105 GOOSE Data timestamp:2023.11.23 14:40:07.755500 StNum 2 SqNum 0 GOOSE Data values: 0: BS:01 [2023.11.23 14:40:28.386718] Ethernet Dst MAC:01-0C-CD-01-00-00 Src MAC:D4-81-D7-68-85-A2 VLAN Hdr ID:0 PRIO:4 CFI:0 GOOSE Hdr AppID:529 PDUIen:107 GOOSE Hdr AppID:529 PDUIen:107 GOOSE Data timestamp:2023.11.23 14:36:06.339500 StNum 2 SqNum 141 GOOSE Data values: 0: BS:01 [2023.11.23 14:40:29.417985] Ethernet Dst MAC:01-0C-CD-01-00-02 Src MAC:D4-81-D7-68-85-A2 VLAN Hdr ID:0 PRIO:4 CFI:0 GOOSE Data values: 0: BS:01 [2023.11.23 14:40:29.417985] Ethernet Dst MAC:01-0C-CD-01-00-02 Src MAC:D4-81-D7-68-85-A2 VLAN Hdr ID:0 PRIO:4 CFI:0 GOOSE Data timestamp:2023.11.23 14:36:06.339500 StNum 2 SqNum 141 GOOSE Data values: 0: BS:01 [2023.11.23 14:40:29.417985] Ethernet Dst MAC:01-0C-CD-01-00-02 Src MAC:D4-81-D7-68-85-A2 VLAN Hdr ID:0 PRIO:4 CFI:0 GOOSE Hdr AppID:544 PDUIen:108 GOOSE Data timestamp:2023.11.23 14:39:03.371499 StNum 1 SqNum 54 GOOSE Data values: 0: BS:10	🗙 📕 🛤 🖼 🗍 🗙				
Ethemet Dat MAC-201-0C-CD-01-00-01 Src MAC:D4-81-D7-68-85-A2 VLAN Hdr ID:0 PxIO:4 CFI:0 GOOSE Hdr AppID:536 PDUIen:105 GOOSE Ddta timestamp:2023.11.23 14:40:07.755500 StNum 2 SqNum 0 GOOSE Data values: 0: BS:01 [2023.11.23 14:40:28.386718] Ethernet Dat MAC:01-0C-CD-01-00-00 Src MAC:D4-81-D7-68-85-A2 VLAN Hdr ID:0 PRIO:4 CFI:0 GOOSE Hdr AppID:529 PDUIen:107 GOOSE Data timestramp:2023.11.23 14:36:06.339500 StNum 2 SqNum 141 GOOSE Data values: 0: BS:01 [2023.11.23 14:40:29.417985] Ethernet Dat MAC:01-0C-CD-01-00-02 Src MAC:D4-81-D7-68-85-A2 VLAN Hdr ID:0 PRIO:4 CFI:0 GOOSE Data timestramp:2023.11.23 14:36:06.339500 StNum 2 SqNum 141 GOOSE Data values: 0: BS:01 [2023.11.23 14:40:29.417985] Ethernet Dat MAC:01-0C-CD-01-00-02 Src MAC:D4-81-D7-68-85-A2 VLAN Hdr ID:0 PRIO:4 CFI:0 GOOSE FIDU CBR:FP3U_211Relay/LLN0SGOSgcb1 TTL:4000 DSR:FP3U_220ARelay/LLN0SDSG1 GID:V_210 Test:0 CfgRev:1, Nds GOOSE Data timestamp:2023.11.23 14:39:03.371499 StNum 1 SqNum 54 GOOSE Data values: 0: BS:10	[2023.11.23 14:40:07.755816]				
VLAN Hdr ID:0 PRIO:4 CFI:0 GOOSE Hdr AppID:536 PDULen:105 GOOSE Pdu CBRef:P3U_218Relay/LLN0\$GO\$gcb1 TTL:2 DSRef:P3U_218Relay/LLN0\$DSG1 GID:V_218 Test:0 CfgRev:1, NdsCo GOO's Data timestamp:2023.11.23 14:40:07.755500 StNum 2 SqNum 0 G'JOSE Data values: 0: BS:01 [2023.11.23 14:40:28.386718] Ethernet Dst MAC:01-0C-CD-01-00-00 Src MAC:D4-81-D7-68-85-A2 VLAN Hdr ID:0 PRIO:4 CFI:0 GOOSE PDU CBRef:P3U_211Relay/LLN0\$GO\$gcb1 TTL:4000 DSRef:P3U_211Relay/LLN0\$DSG1 GID:V_211 Test:0 CfgRev:1, Nds GOOSE Data timestamp:2023.11.23 14:36:06.339500 StNum 2 SqNum 141 GOOSE Data values: 0: BS:01 [2023.11.23 14:40:29.417985] Ethernet Dst MAC:01-0C-CD-01-00-02 Src MAC:D4-81-D7-68-85-A2 VLAN Hdr ID:0 PRIO:4 CFI:0 GOOSE Hdr AppID:544 PDUIen:108 GOOSE HDU CBRef:P3U_220ARelay/LLN0\$GO\$gcb1 TTL:4000 DSRef:P3U_220ARelay/LLN0\$DSG1 GID:V_220 Test:0 CfgRev:1, Nds GOOSE Data timestamp:2023.11.23 14:39:03.371499 StNum 1 SqNum 54 GOOSE Data values: 0: BS:10 D = D5	Ethernet Dst MAC:01-0C-CD-01-00-01 Src MAC:D4-81-E	17-68-85-A2			
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