

# Zahtjevi na ispitnu opremu – Test Equipment Requirements

Oliver Janke, OMICRON



## Test Equipment Requirements



## OMICRON Solutions for IEC 61850 Testing

Oliver Janke



Seminar  
PRIMJENA NORME IEC 61850 TE NJEZIN UTJECAJ NA RAZVOJ OPREME  
Zagreb, 14. ožujak 2013.



## IEC 61850 and OMICRON

- OMICRON contributes to all demonstrations since the beginning (2002, 2004, 2006)
- Employees of OMICRON are authors and contributors of parts of IEC61850, active members of WG 10 and national committees

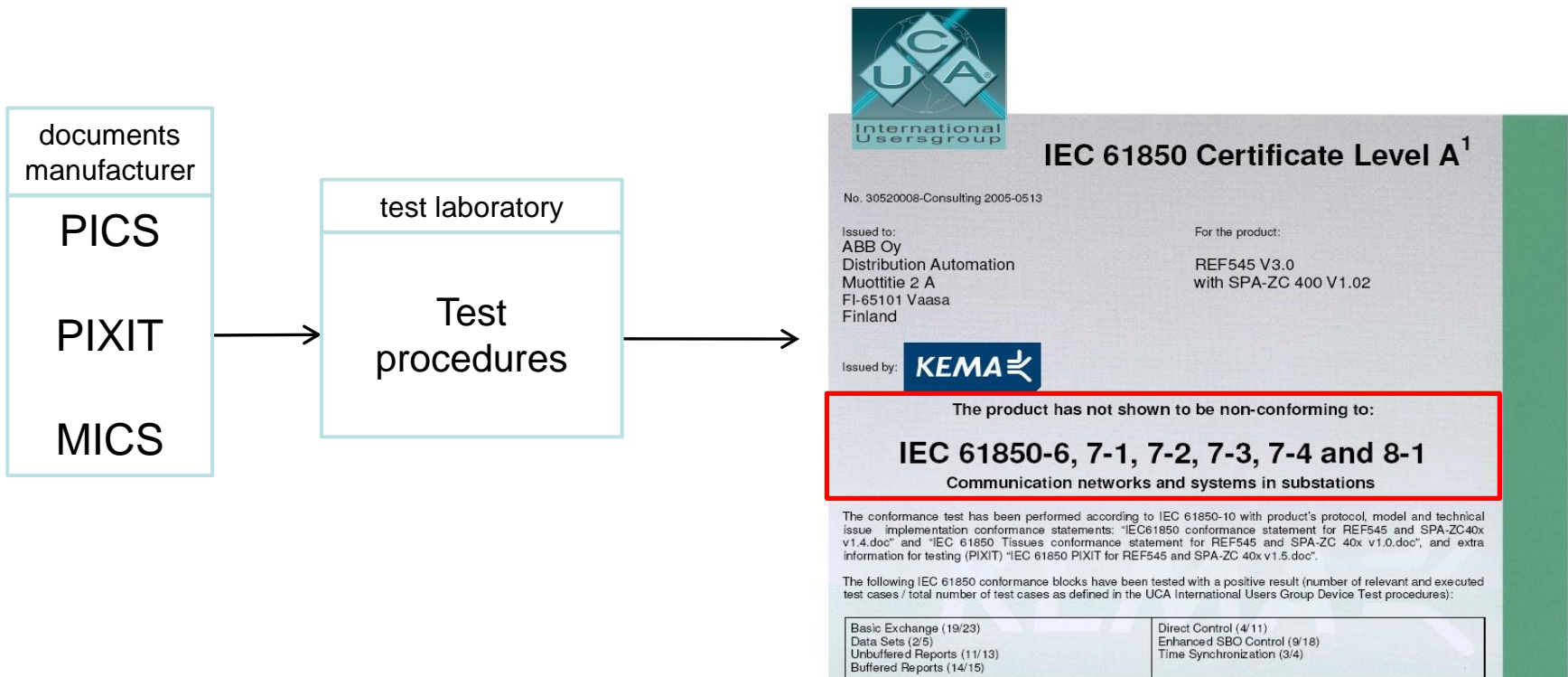


## Types of Tests

- Conformance Test
- Performance Test
- Functional Test
  - during FAT (Factory Acceptance Test) and SAT (Site Acceptance Test)
  - routine tests

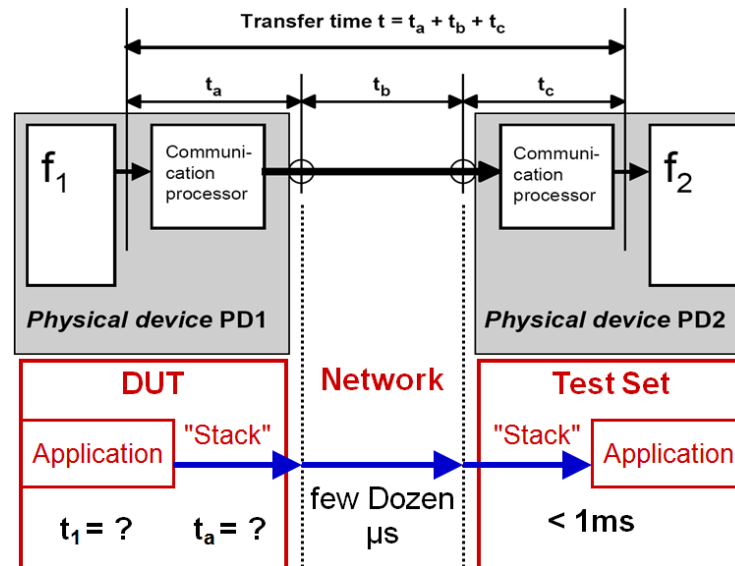
## Conformance Testing

- IEC 61850-10
- Cooperation with the UCA International Users Group



## Performance Testing

- Timing Performance
  - IED performance
  - Network performance



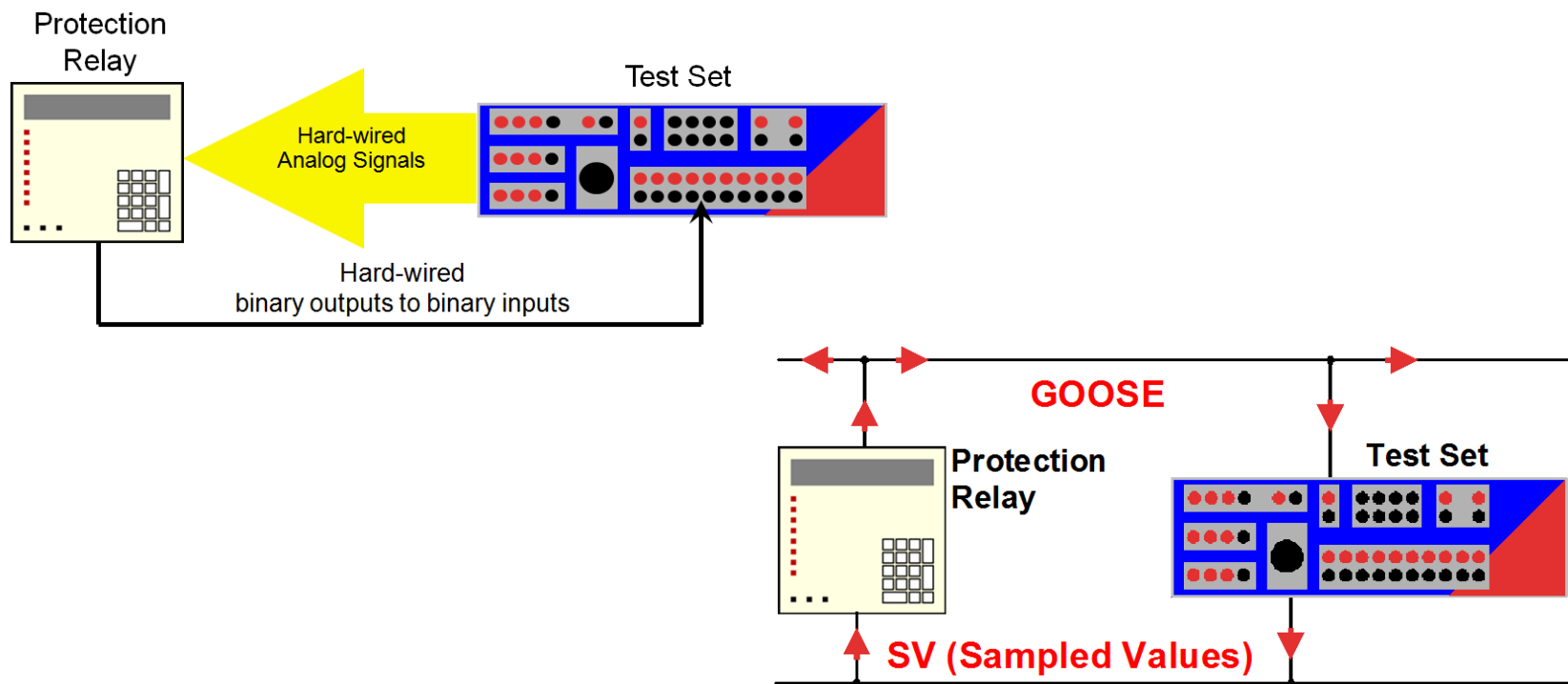
- IEC 61850-5:
  - Performance requirements

| Message Type     | Description  | Performance Class | Max. overall time |
|------------------|--------------|-------------------|-------------------|
| Type 1A "Trip"   | Fast message | P1                | 10ms              |
|                  |              | P2/P3             | 3ms               |
| Type 1B "Others" | Fast message | P1                | 100ms             |
|                  |              | P2/P3             | 20ms              |
| Type 2           | Medium speed | -                 | 100ms             |

- IEC 61850-10
  - „Performance metrics“: what should be measured!

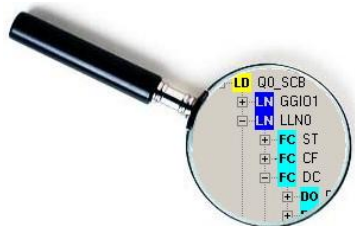
# Functional Testing

- not specified by the standard...
- ... but some Test Features are defined!

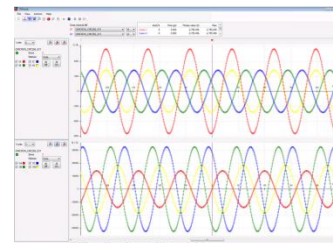


## Overview

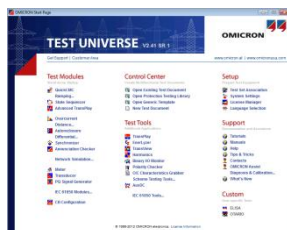
IEDScout



SV Scout



Secondary Test Set (CMC) with Test Universe Software



GOOSE Configuration Module

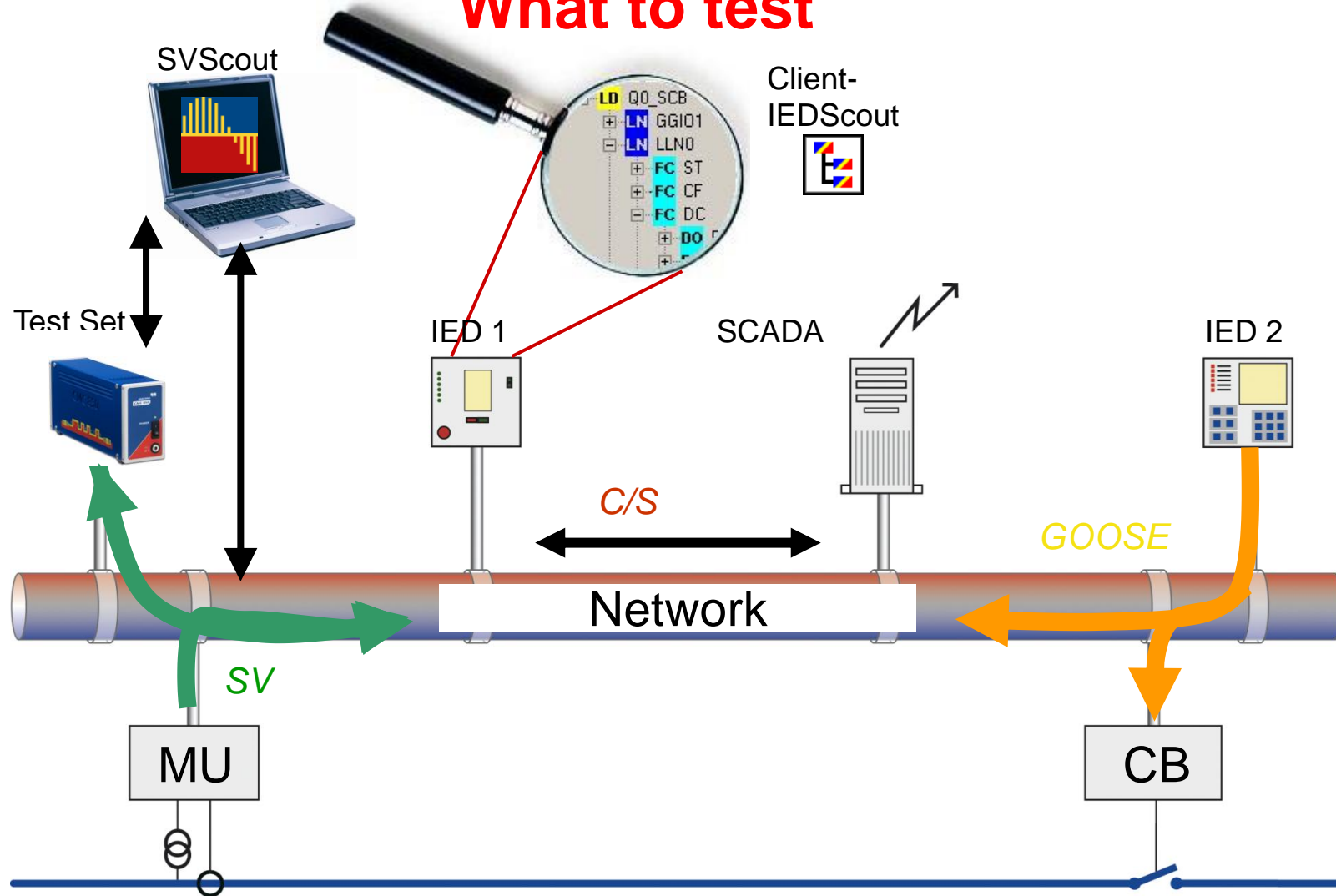


SV Configuration Module



Primary Test Set (CPC)

## What to test



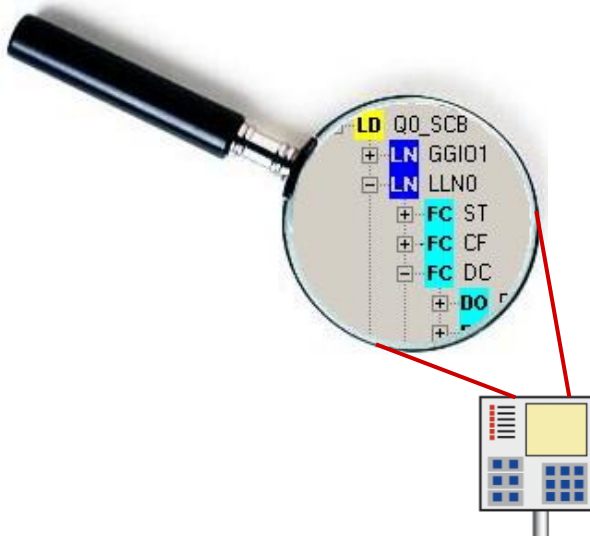
Seminar

PRIMJENA NORME IEC 61850 TE NJEZIN UTJECAJ NA RAZVOJ OPREME

Zagreb, 14. ožujak 2013.



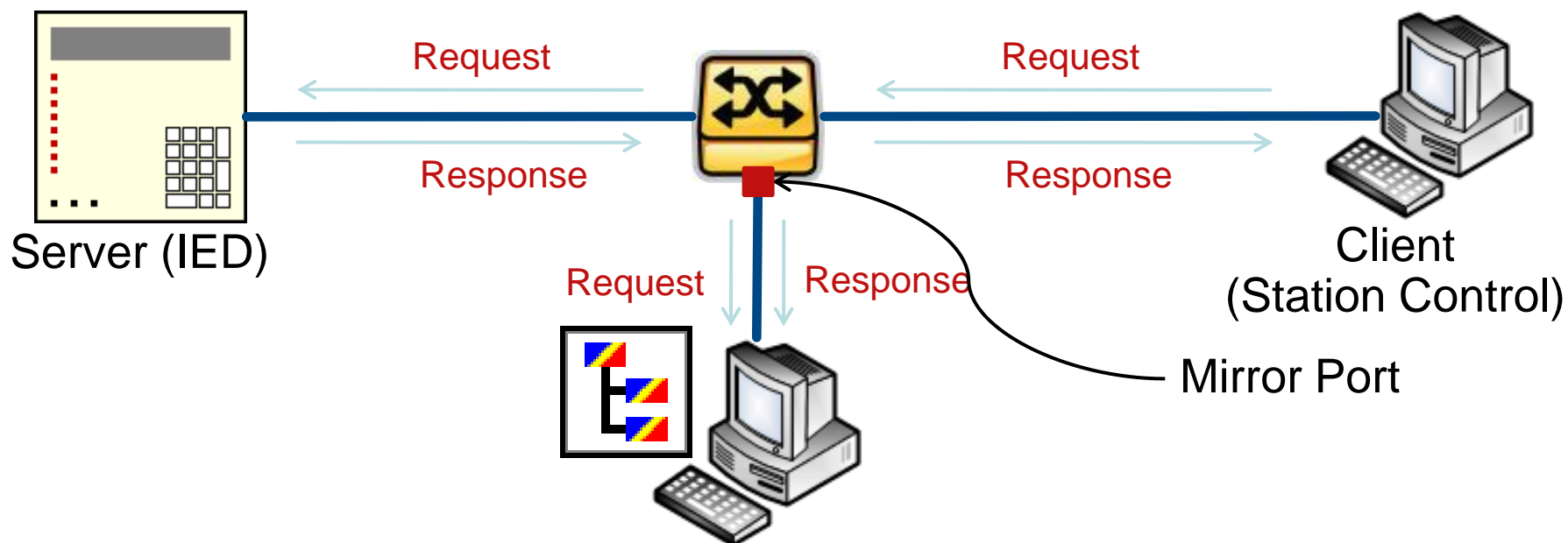
## IEDScout



- Test Client
- Read and Browse Data Models
- GOOSE (Visualisation, Sniffing, Simulation)
- Creation of ICD-files
- Report
- Control
- General Interrogation
- ....

## Sniffing of Client Server Traffic

- Listen to „foreign“ traffic
  - C/S is point-to-point, no multicast
  - Only destination receives packets
  - connection for IEDScout, mirror ports, TAPs



## Event List

| Time            | Source             | Destination        | Description                                   |
|-----------------|--------------------|--------------------|---|
| 19:07:47.382215 | 192.168.0.242:1220 | 192.168.0.77:102   | SelectWithValue of Q0_SCB/XCBR1.Pos.SBOW [CO] |
| 19:07:49.091432 | 00:13:10:d9:02:76  | 01:0c:cd:01:01:ff  | GOOSE Status Change                           |
| 19:07:49.151922 | 192.168.0.242:1220 | 192.168.0.77:102   | Operate of Q0_SCB/XCBR1.Pos.Oper [CO]         |
| 19:07:49.151922 | 192.168.0.77:102   | 192.168.0.242:1220 | Report urcbSTa01                              |
| 19:07:49.151922 | 192.168.0.77:102   | 192.168.0.242:1220 | Report Q0_SCB/XCBR1.Pos.Oper [CO]             |
| 19:07:49.161527 | 00:13:10:d9:02:76  | 01:0c:cd:01:01:ff  | GOOSE Status Change                           |
| 19:07:49.221637 | 192.168.0.77:102   | 192.168.0.242:1220 | Report urcbSTa01                              |
| 19:07:50.301706 | 192.168.0.77:102   | 192.168.0.242:1220 | Report urcbSTa01                              |
| 19:07:52.955156 | 00:50:c2:c1:61:ab  | 01:0c:cd:01:00:04  | GOOSE Status Change                           |
| 19:07:52.955512 | 00:13:10:d9:02:76  | 01:0c:cd:01:01:ff  | GOOSE Status Change                           |
| 19:07:52.971521 | 00:13:10:d9:02:76  | 01:0c:cd:01:01:ff  | GOOSE Status Change                           |
| 19:07:53.011475 | 00:13:10:d9:02:76  | 01:0c:cd:01:01:ff  | GOOSE Status Change                           |
| 19:07:53.013510 | 192.168.0.77:102   | 192.168.0.242:1220 | Report urcbSTa01                              |
| 19:07:53.013510 | 192.168.0.77:102   | 192.168.0.242:1220 | Report urcbSTa01                              |
| 19:07:53.031473 | 00:13:10:d9:02:76  | 01:0c:cd:01:01:ff  | GOOSE Status Change                           |
| 19:07:53.091639 | 192.168.0.77:102   | 192.168.0.242:1220 | Report urcbSTa01                              |
| 19:07:53.091639 | 192.168.0.77:102   | 192.168.0.242:1220 | Report urcbSTa01                              |
| 19:07:54.012385 | 00:50:c2:c1:61:ab  | 01:0c:cd:01:00:04  | GOOSE Status Change                           |

Capture paused | 44 Ethernet packets captured

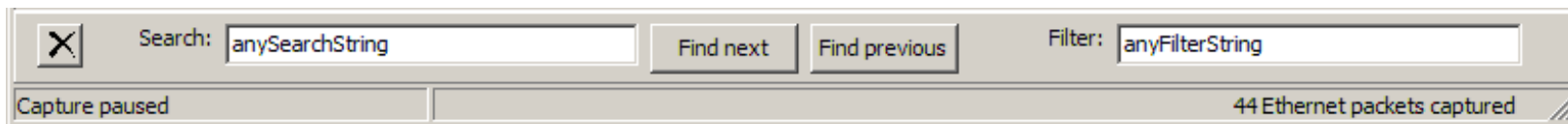
## Event List

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| 19:07:49.091432                               | 00:13:10:d9:02:76  | 01:0c:cd:01:01:ff  | GOOSE Status Change                           |
| 19:07:49.151922                               | 192.168.0.242:1220 | 192.168.0.77:102   | Operate of Q0_SCB/XCBR1.Pos.Oper [CO]         |
| Request Operate of Q0_SCB/XCBR1.Pos.Oper [CO] |                    |                    |   |
| Arrival Time 19:07:49.045311                  |                    |                    |   |
| ACSI Class Control                            |                    |                    |   |
| ACSI Service Operate                          |                    |                    |   |
| Data  |                    |                    |   |
| Response+ SUCCESS                             |                    |                    |   |
| Arrival Time 19:07:49.151922                  |                    |                    |   |
| Value [0] SUCCESS                             |                    |                    |   |
| 19:07:49.151922                               | 192.168.0.77:102   | 192.168.0.242:1220 | Report urcbSTa01                              |
| 19:07:49.151922                               | 192.168.0.77:102   | 192.168.0.242:1220 | Report Q0_SCB/XCBR1.Pos.Oper [CO]             |
| 19:07:49.161527                               | 00:13:10:d9:02:76  | 01:0c:cd:01:01:ff  | GOOSE Status Change                           |
| 19:07:49.221637                               | 192.168.0.77:102   | 192.168.0.242:1220 | Report urcbSTa01                              |
| 19:07:50.301706                               | 192.168.0.77:102   | 192.168.0.242:1220 | Report urcbSTa01                              |
| 19:07:52.955156                               | 00:50:c2:c1:61:ab  | 01:0c:cd:01:00:04  | GOOSE Status Change                           |

Capture paused 44 Ethernet packets captured

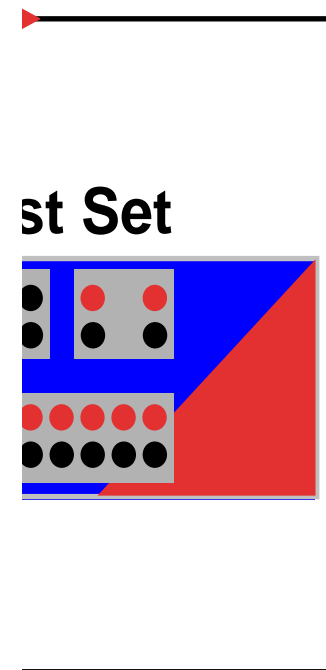
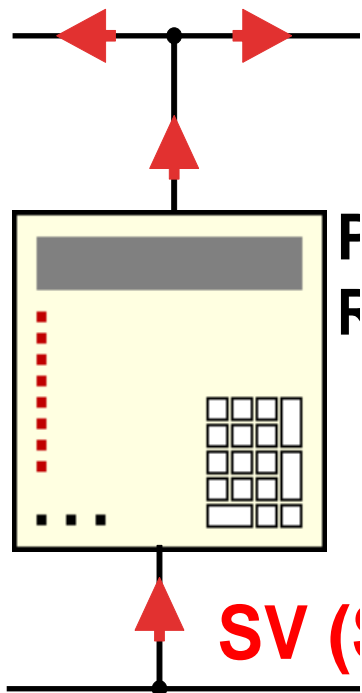
## Search, Filters, Export

- Search and Filter
  - Focus the scope and find specific messages



- Export Data in PCAP Format
  - Analyze with external tools (e.g. Wireshark)
- Export to text file
  - File or Clipboard
  - For documentation

# The Vision: Fully Networked Protection Testing



## CMC Test Sets



Interface for CMIRIG-B or CMGPS

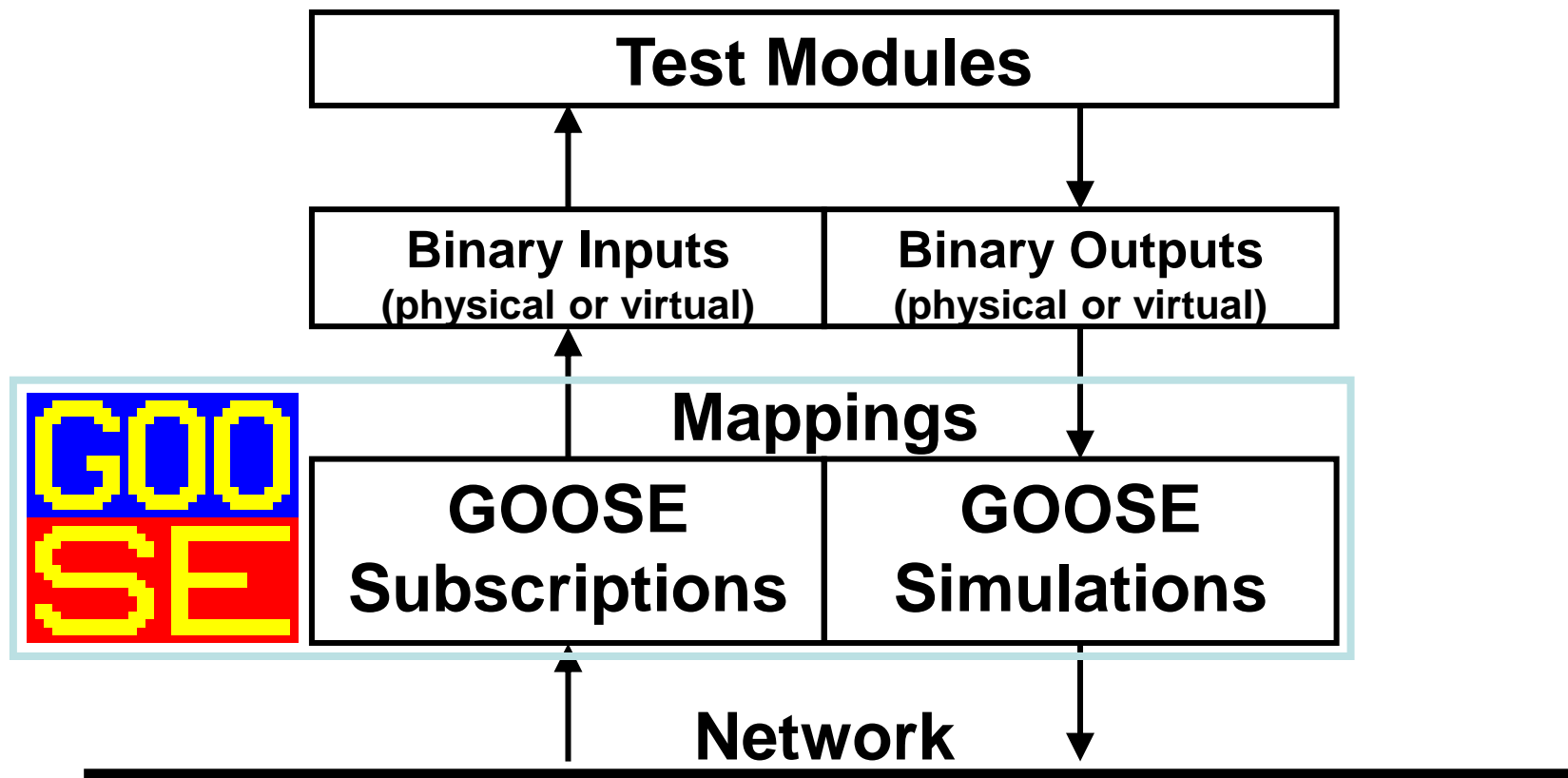
Low level outputs 1 - 6

Low level outputs 7 - 12

2 Ethernet interfaces  
For PC control and IEC 61850 GOOSE  
and Sampled Values



# GOOSE Configuration Module





## GOOSE Configuration Module

OMICRON GOOSE Configuration - [Test View: GOOSE Configuration in Cired 2007.occ]

File Edit View Test Parameters Window ?

Subscriptions Simulations

**Inputs**

- [-] Trip
  - Boolean- IED\_000PROT/PTRC1.Tr.general
- [-] 52a
  - DoubleBit- OMIC1CB/XCBR1.Pos.stVal
- [-] 52b
  - DoubleBit- OMIC1CB/XCBR1.Pos.stVal
- [-] SensingDevice
  - Bin. in 5
  - Bin. in 6
  - Input 7
  - Input 8

**GOOSEs**

- [-] G OMIC1CB/LLN0\$GO\$gcST
  - [-] DS Dataset
    - DA DoubleBit- OMIC1CB/XCBR1.Pos.stVal
    - DA BitString- OMIC1CB/XCBR1.Pos.q
    - DA Integer- OMIC1CB/XCBR1.OpCnt.stVal
    - DA BitString- OMIC1CB/XCBR1.OpCnt.q
    - DA Boolean- OMIC1CB/GGIO1.Ind1.stVal
    - DA BitString- OMIC1CB/GGIO1.Ind1.q
  - [-] G IED\_000PROT/LLN0\$GO\$Control\_DataSet1
    - [-] DS Dataset

**Configuration**

**SCL Import**

IED\_000PROT/PTRC1.Tr.general

|          |                              |
|----------|------------------------------|
| Inverted | False                        |
| Name     | IED_000PROT/PTRC1.Tr.general |

IED\_000PROT/PTRC1.Tr.general

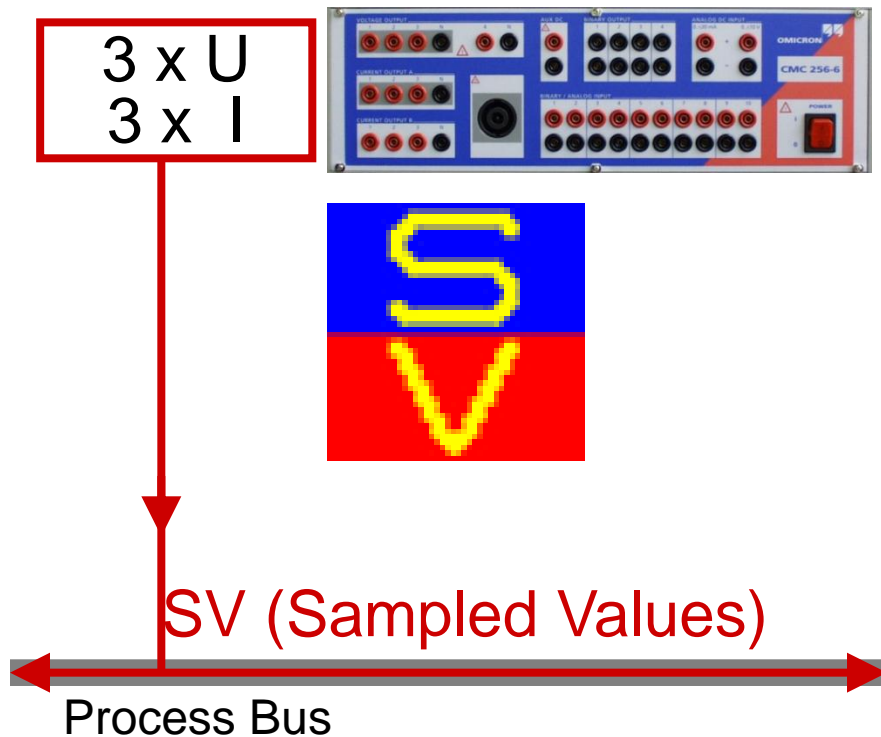
|   |                              |
|---|------------------------------|
| Name  | IED_000PROT/PTRC1.Tr.general |
| Attribute name (typically Object Reference) |                              |

CMC256-6 (GK208P) connected to PC

# GOOSE Configuration Module

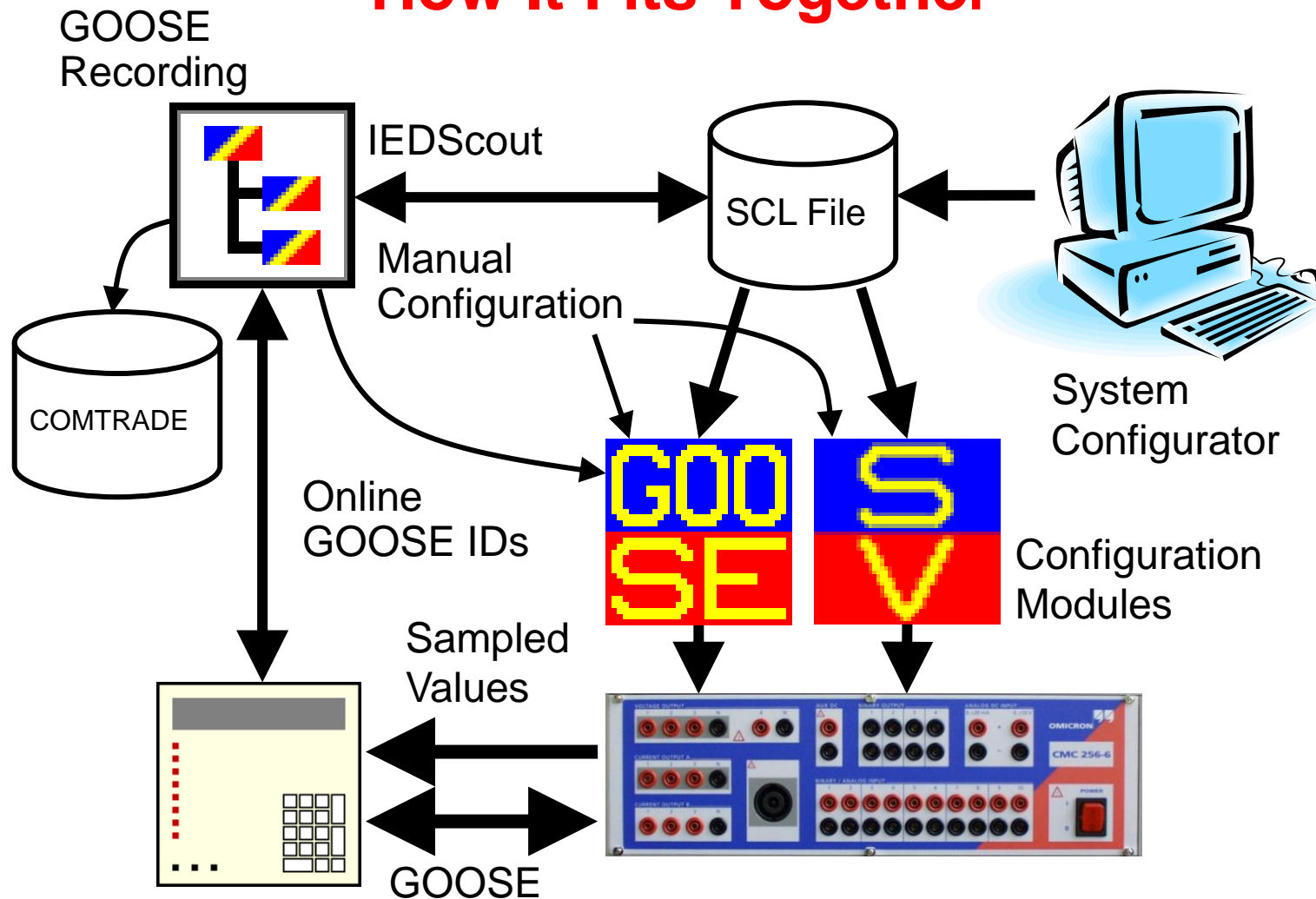
- Paste sniffed GOOSE from IEDScout
- Simulations
- Can be used with every other test module
- Almost unlimited number of GOOSEs
- Synchronization possible
- ....

## Sampled Values Configuration Module



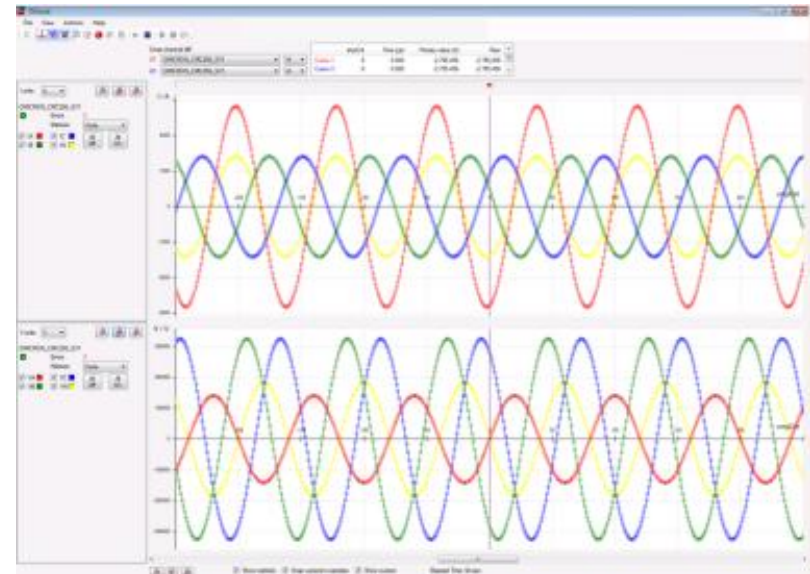
- Profile of IEC 61850-9-2: "9-2LE"
- Can be used with all other modules
- Several streams possible (up to 3)
- Synchronization possible

# How It Fits Together

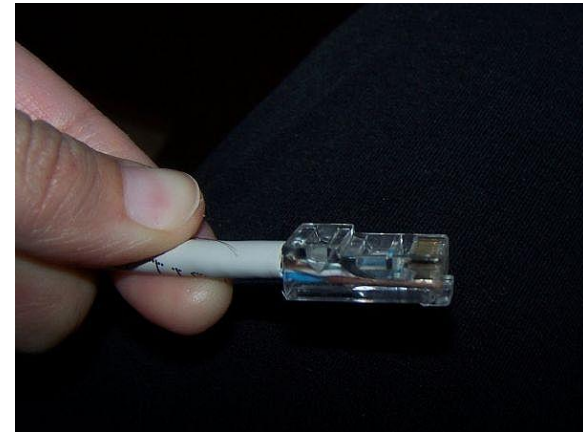


## SVScout

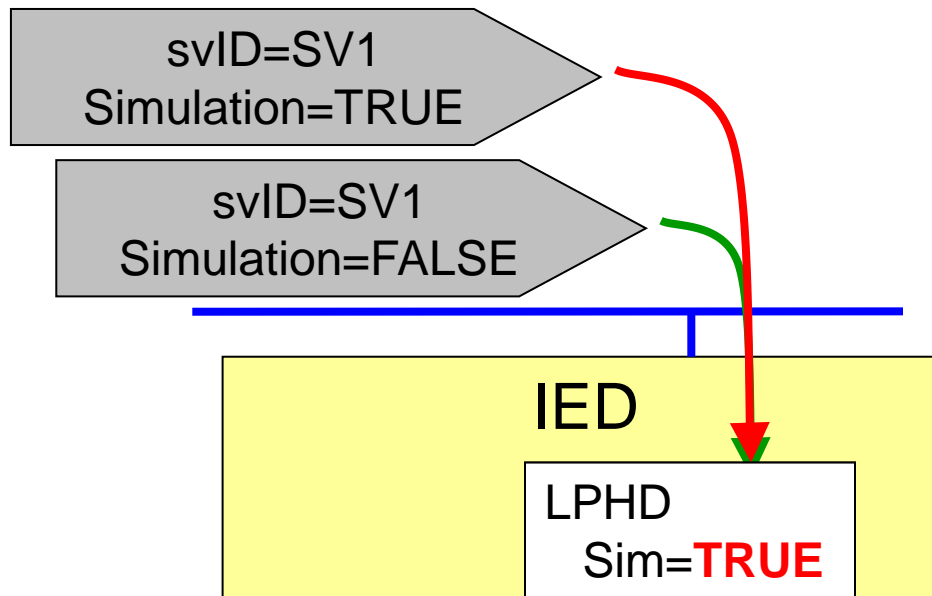
- Oszilloscope view of Sampled Values
- Phasor Diagram
- Recording and export as Comtrade
- Detail information about streams
- ....



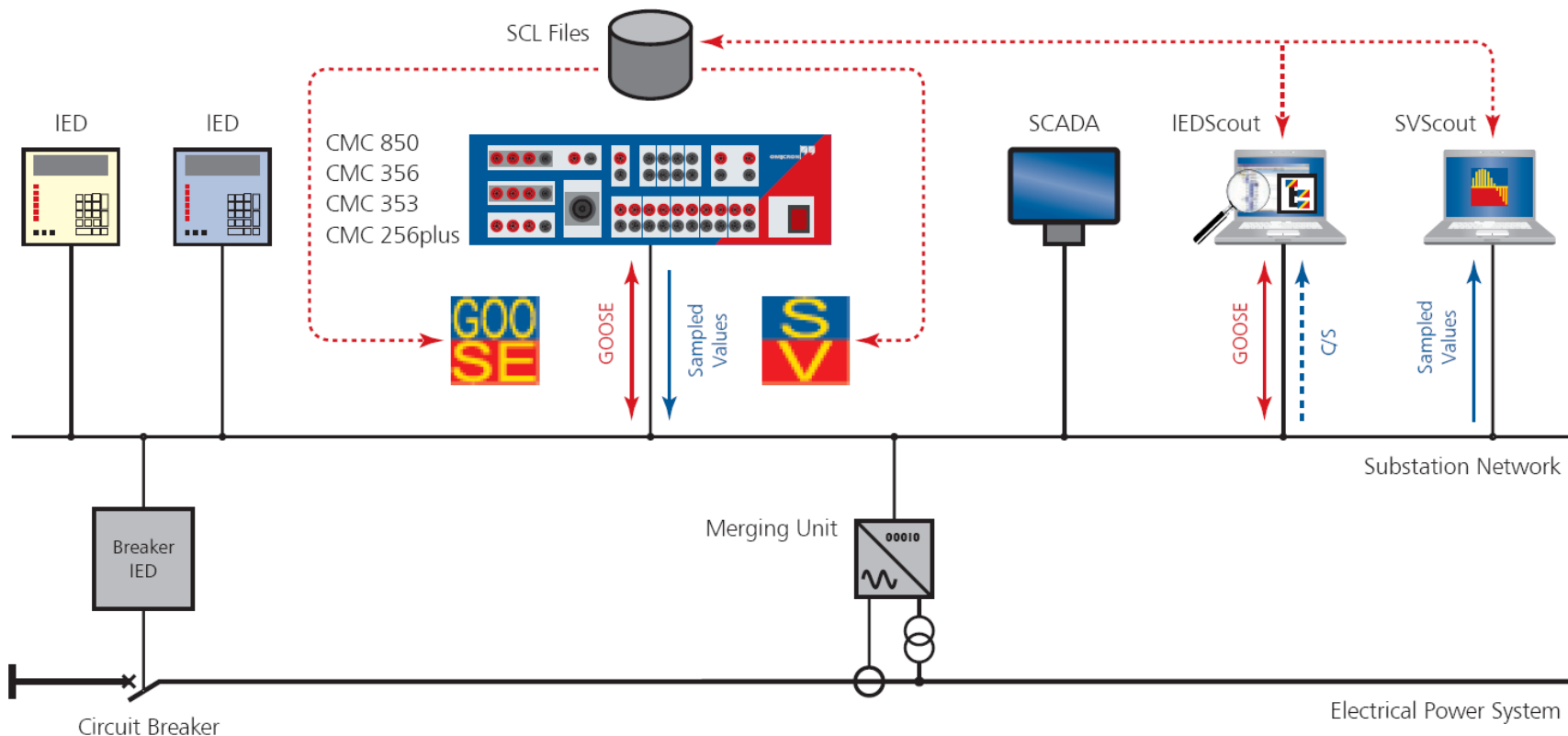
## Testing in IEC 61850?



# Test and Simulation of Sampled Values (and GOOSE) acc. to Edition 2



# OMICRON Solutions





# Closed Loop Test with MU and SV

