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# **Prednosti i nedostaci primjene norme IEC 61850 u elektroenergetskim postrojenjima**

**Predavač:**

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# IEC 61850 – Osnovne prednosti i problemi

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- Glavne prednosti
  - Brža i jeftinija integracija sustava
  - Jednostavnije konfiguriranje uređaja i aplikacija
- Glavni nedostaci
  - Sloboda u određivanju konfiguracije
  - Nepotpuna sukladnost uređaja i aplikacija
- Rješavanje probleme
  - Poznavanje IEC 61850 standarda
  - Poznavanje načela rada sa SCL datotekama

## IEC 61850-6 – SCL

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- XML (eXtensible Markup Language) -> Notacija
- IED (Intelligent Electronic Device) -> Releji, upravljački uređaji
- SCL (System Configuration description Language) -> Jezik
  - SSD (System Specification Description) -> Sučelja opreme
  - ICD (IED Capability Description) -> Mogućnosti uređaja
  - IID (Instantiated IED Description) -> Trenutna konfiguracija
  - CID (Configured IED Description) -> Konačna konfiguracija
  - SCD (System Configuration Description) -> Konačna konfiguracija
  - SED (System Exchange Description) -> Sučelja za proširenja

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# IEC 61850-6 – Konfiguracija (XML)

<BOOKS>

<book id="123" loc="library">

<author>Hull</author>

<title>California</title>

<year> 1995 </year>

</book>

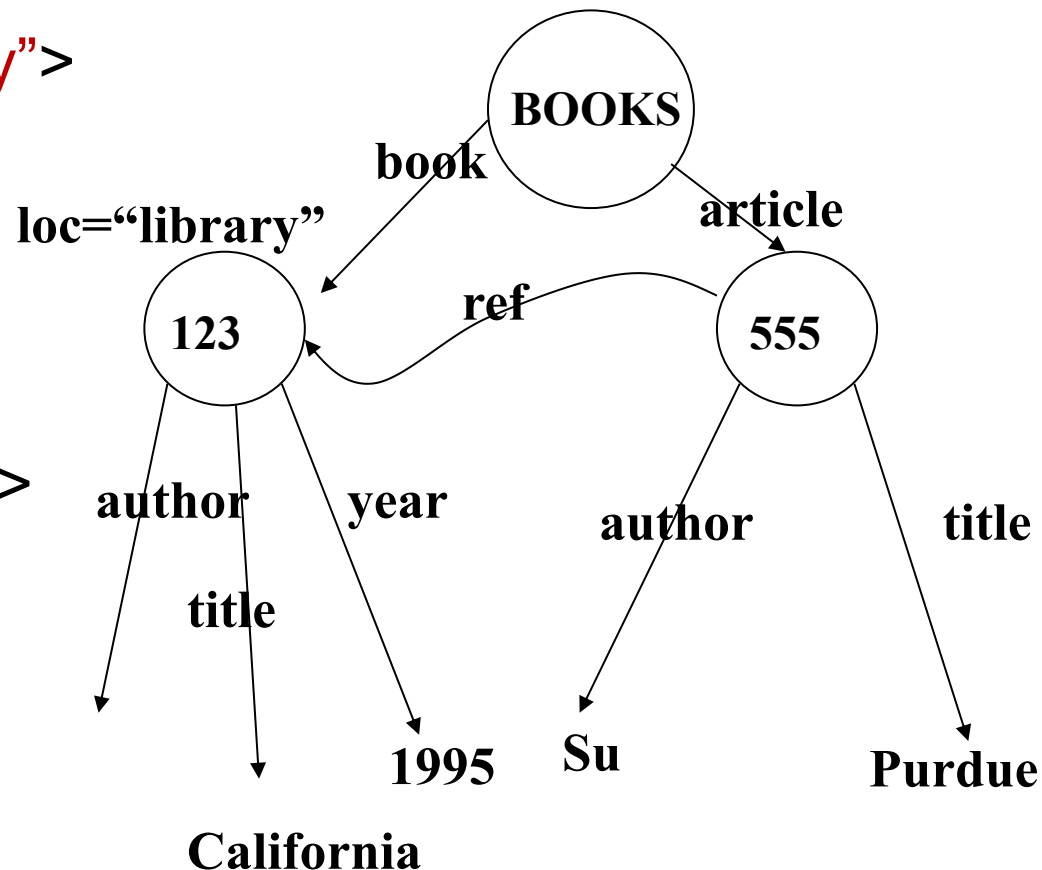
<article id="555" ref="123">

<author>Su</author>

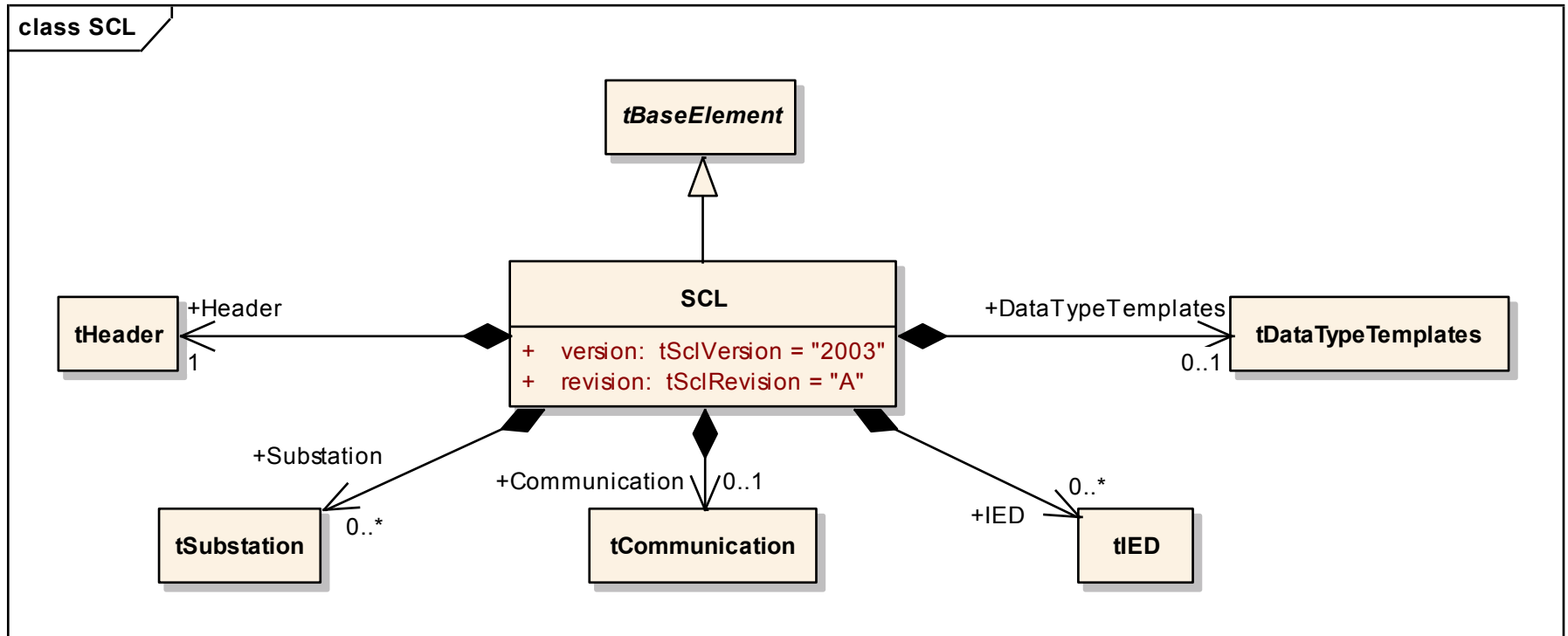
<title> Purdue</title>

</article>

</BOOKS>



# IEC 61850-6 – SCL struktura



- XDS - XML Schema Description

File name	Description
SCL_Enums.xsd	The used XML schema enumerations
SCL_BaseSimpleTypes.xsd	The basic simple types used by the other parts
SCL_BaseTypes.xsd	The basic complex type definitions used by the other parts
SCL_Substation.xsd	The Substation related syntax definitions
SCL_Communication.xsd	The Communication related syntax definitions
SCL_IED.xsd	The IED related syntax definitions
SCL_DataTypeTemplates.xsd	The data type template related syntax definitions
SCL.xsd	The main SCL schema syntax definition, which defines the root element of each SCL file

# IEC 61850-6 – Primjer (Jednopolna shema)

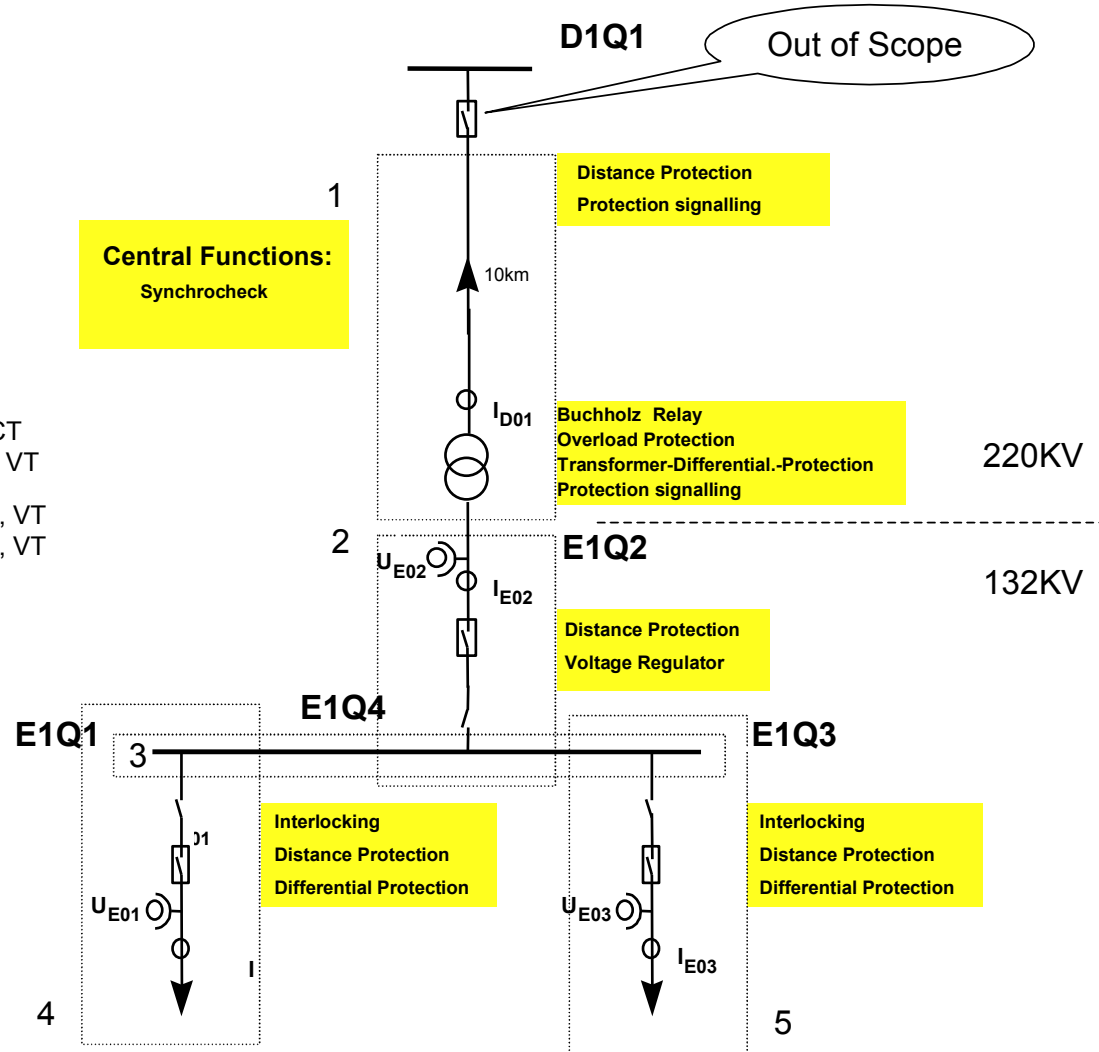
## Example T 1-1

### 2 Voltage Levels

D1 – 220 kV  
E1 – 132 kV

### 5 Bays

- 1 – D1Q1 Feeder with Transformer, CT
- 2 – E1Q2 Feeder with DIS, CBR, CT, VT
- 3 – E1Q4 Static Busbar
- 4 – E1Q1 Feeder with DIS, CBR, CT, VT
- 5 – E1Q3 Feeder with DIS, CBR, CT, VT





# IEC 61850-6 – Primjer SCL (Jednopolna shema)

```
<Substation name="S12" desc="Baden">
  <PowerTransformer name="T1" type="PTR">
    <LNode InInst="1" InClass="PDIF" IdInst="F1" iedName="D1Q1BP2" />
    <LNode InInst="1" InClass="YLTC" IdInst="S12D1T1" iedName="None" />
    <TransformerWinding name="W1" type="PTW">
      <Terminal connectivityNode="S12/D1/Q1/L1" substationName="S12" voltageLevelName="D1" bayName="Q1" cNodeName="L1" />
    </TransformerWinding>
  </PowerTransformer>
  <VoltageLevel name="D1">
    <Voltage multiplier="k" unit="V">220</Voltage>
    <Bay name="Q1">
      <LNode iedName="None" IdInst="S12D1Q1" InClass="PDIS" InInst="1" />
      <ConductingEquipment name="I1" type="CTR">
        <Terminal connectivityNode="S12/D1/Q1/L1" substationName="S12" voltageLevelName="D1" bayName="Q1" cNodeName="L1" />
        <SubEquipment name="R" phase="A">
          <LNode iedName="D1Q1BP2" IdInst="F1" InClass="TCTR" InInst="1" />
        </SubEquipment>
        <SubEquipment name="S" phase="B">
          <LNode iedName="D1Q1BP2" IdInst="F1" InClass="TCTR" InInst="2" />
        </SubEquipment>
        <SubEquipment name="T" phase="C">
          <LNode iedName="D1Q1BP2" IdInst="F1" InClass="TCTR" InInst="3" />
        </SubEquipment>
      </ConductingEquipment>
      <ConnectivityNode name="L1" pathName="S12/D1/Q1/L1" />
    </Bay>
```

# IEC 61850-6 – Primjer (Komunikacija)

## Example T 1-1

Single communication bus

IEDs for:

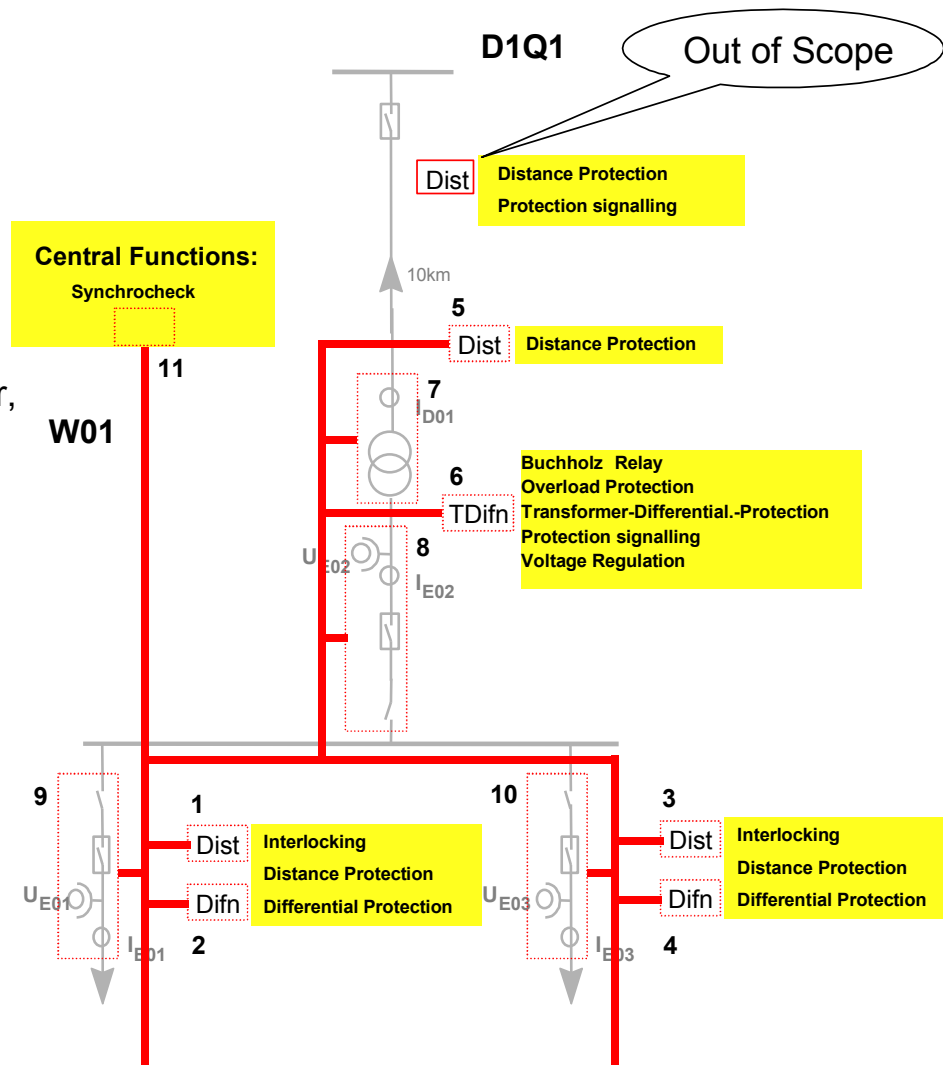
Transformer.

Combined Bay Unit (Circuit Breaker, Disconnecter, CT and VT).

Each Protection.

Central Functions.

No.	Name	ID
1	Dist	E1Q1BP3 (PDIS)
2	Difn	E1Q1BP2 (PDIF)
3	Dist	E1Q3BP3 (PDIS)
4	Difn	E1Q3BP2 (PDIF)
5	Dist	D1Q1BP3 (PDIS)
6	TDifn	D1Q1BP2 (PDIF)
7	Trafo	D1Q1SB1
8	LV Bay1	E1Q2SB1
9	LV Bay2	E1Q1SB1
10	LV Bay3	E1Q3SB1
11	Central	D1Q1SB4 (CILO, RSYN)



# IEC 61850-6 – Primjer SCL (Komunikacija)

<Communication>

<SubNetwork name="W01" type="8-MMS">

<Text>Station bus</Text>

<BitRate unit="b/s">10</BitRate>

<ConnectedAP iedName="D1Q1SB4" apName="S1">

<Address>

<P type="IP">10.0.0.11</P>

<P type="IP-SUBNET">255.255.255.0</P>

<P type="IP-GATEWAY">10.0.0.101</P>

<P type="OSI-TSEL">00000001</P>

<P type="OSI-PSEL">01</P>

<P type="OSI-SSEL">01</P>

</Address>

<PhysConn type="Connection">

<P type="Type">FOC</P>

<P type="Plug">ST</P>

</PhysConn>

<SMV IdInst="C1" cbName="Volt">

<Address>

<P type="MAC-Address">01-0C-CD-04-00-01</P>

<P type="APPID">4000</P>

<P type="VLAN-ID">123</P>

<P type="VLAN-PRIORITY">4</P>

</Address>

</SMV>

</ConnectedAP>

</Communication>



- Podržani servisi

```
<IED name="E1Q1SB1">
  <Services>
    <ClientServices goose="true" sv="true" />
    <DynAssociation />
    <GetDirectory />
    <GetDataObjectDefinition />
    <GetDataSetValue />
    <DataSetDirectory />
    <ConfDataSet max="4" maxAttributes="50" />
    <ReadWrite />
    <ConfReportControl max="12" />
    <GetCBValues />
    <ConfLogControl max="1" />
    <ReportSettings cbName="Conf" dataSet="Conf" rptID="Dyn" optFields="Conf" bufTime="Dyn" intgPd="Dyn" />
    <GSESettings cbName="Conf" dataSet="Conf" appID="Conf" />
    <GOOSE max="2" />
    <SMVSettings cbName="Conf" dataSet="Conf" optFields="Fix" smpRate="Conf" svID="Conf">
      <SmpRate>80</SmpRate>
      <SmpRate>240</SmpRate>
    </SMVSettings>
    <FileHandling />
    <ConfLNs fixLnInst="true" />
  </Services>
```

# IEC 61850-6 – Primjer SCL (Uređaj)

- Postavke servisa:

```
<AccessPoint name="S1">
  <Server>
    <Authentication none="true" />
    <LDevice inst="C1">
      <LN0 inst="" InClass="LLN0" InType="LN0">
        <DataSet name="Positions">
          <FCDA IdInst="C1" prefix="" InClass="CSWI" InInst="1" doName="Pos" fc="ST" />
          <FCDA IdInst="C1" prefix="" InClass="CSWI" InInst="2" doName="Pos" fc="ST" />
        </DataSet>
        <DataSet name="Measurands">
          <FCDA IdInst="C1" prefix="" InClass="MMXN" InInst="1" doName="Amp" fc="MX" />
          <FCDA IdInst="C1" prefix="" InClass="MMXN" InInst="1" doName="Volt" fc="MX" />
        </DataSet>
        <DataSet name="smv">
          <FCDA IdInst="C1" prefix="" InClass="TVTR" InInst="1" doName="Vol" daName="instMag" fc="MX" />
        </DataSet>
      <ReportControl name="PosReport" rptID="E1Q1Switches" datSet="Positions" confRev="1">
        <TrgOps dchg="true" qchg="true" />
        <OptFields />
        <RptEnabled max="5">
          <ClientLN iedName="A1KA1" IdInst="none" InInst="1" InClass="IHMI" />
        </RptEnabled>
      </ReportControl>
    </LDevice>
  </Server>
</AccessPoint>
```

# IEC 61850-6 – Primjer SCL (Podaci)

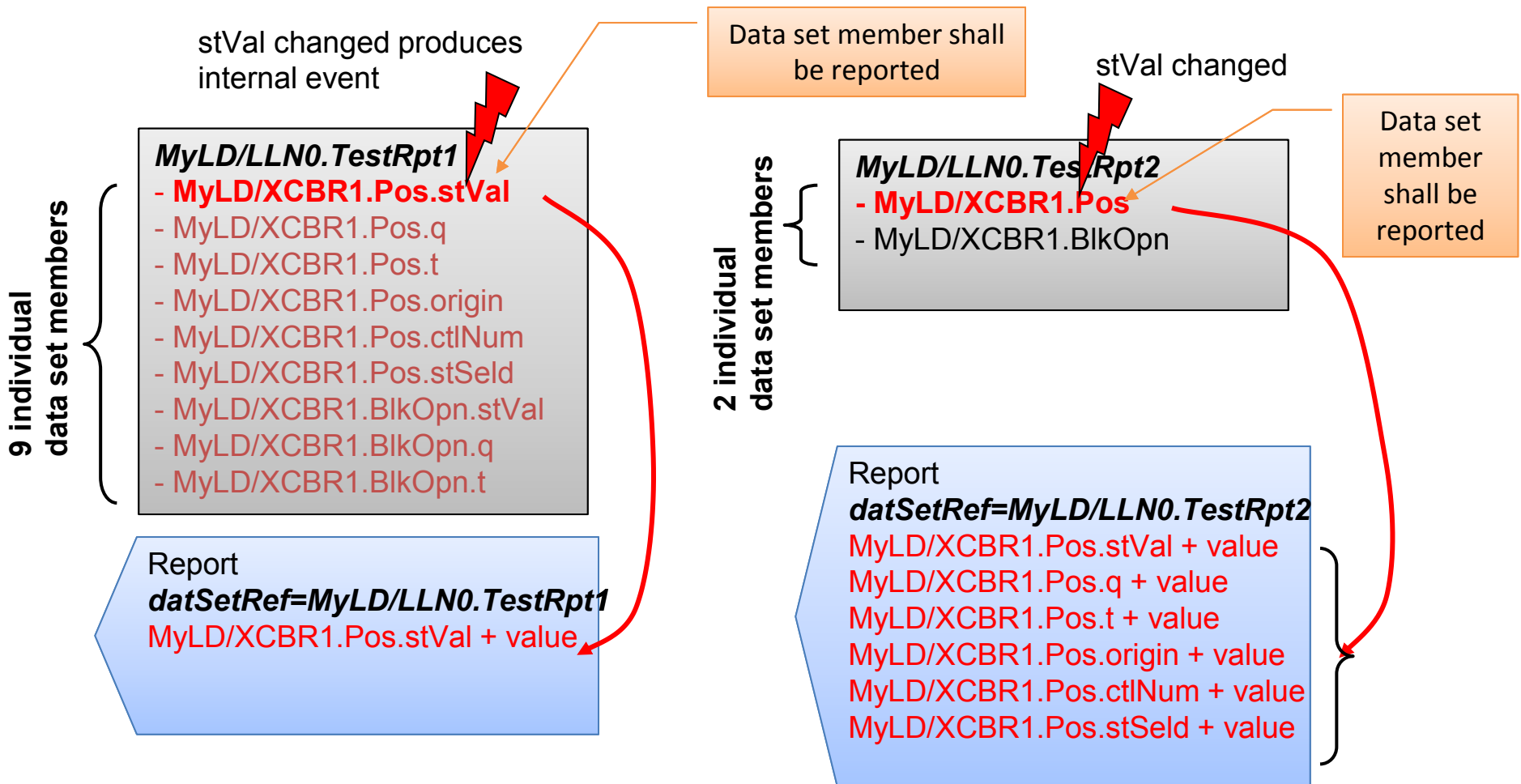
- Tipovi podataka:

```
<DataTypeTemplates>
  <LNNodeType id="LN0" InClass="LLN0">
    <DO name="Mod" type="myMod" />
    <DO name="Beh" type="myBeh" />
    <DO name="Health" type="myHealth" />
    <DO name="NamPlt" type="myLN0LPL" />
  </LNNodeType>
  <LNNodeType id="LPHDa" InClass="LPHD">
    <DO name="PhyNam" type="myDPL" />
    <DO name="PhyHealth" type="myINS" />
    <DO name="Proxy" type="mySPS" />
  </LNNodeType>
  <LNNodeType id="CSWIa" InClass="CSWI">
    <DO name="Mod" type="myMod" />
    <DO name="Beh" type="myBeh" />
    <DO name="Health" type="myHealth" />
    <DO name="NamPlt" type="myLPL" />
    <DO name="Pos" type="myPos" />
  </LNNodeType>
  <LNNodeType id="MMXNa" InClass="MMXN">
    <DO name="Mod" type="myMod" />
    <DO name="Beh" type="myHealth" />
    <DO name="Health" type="myBeh" />
  </LNNodeType>
</DataTypeTemplates>
```

- Enumeratori:

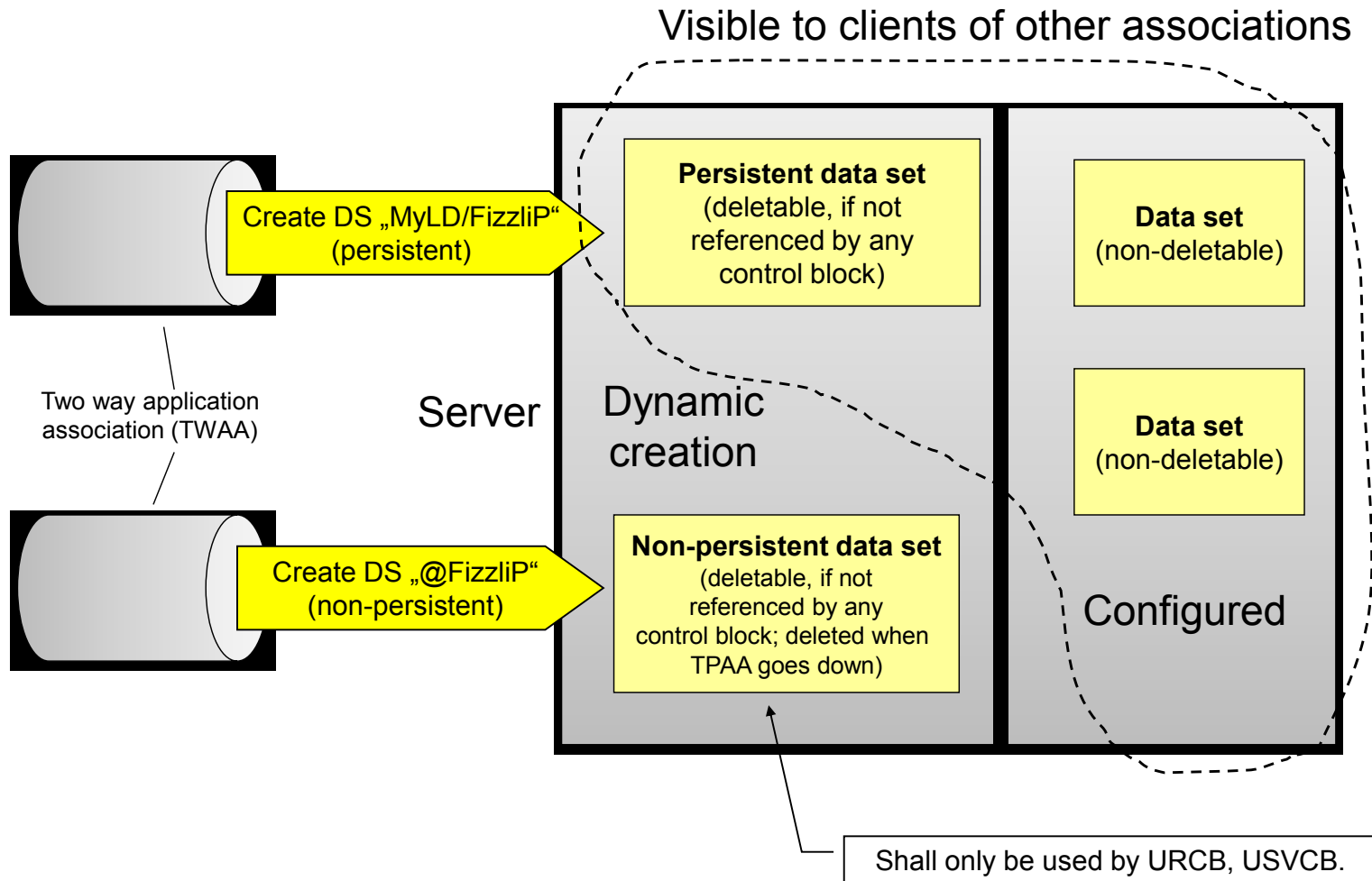
```
<EnumType id="SIUnit">
  <EnumVal ord="1"/>
  <EnumVal ord="2">m</EnumVal>
  <EnumVal ord="3">kg</EnumVal>
  <EnumVal ord="4">s</EnumVal>
  <EnumVal ord="5">A</EnumVal>
  <EnumVal ord="6">K</EnumVal>
  <EnumVal ord="7">mol</EnumVal>
  <EnumVal ord="8">cd</EnumVal>
  <EnumVal ord="9">deg</EnumVal>
  <EnumVal ord="10">rad</EnumVal>
  <EnumVal ord="11">sr</EnumVal>
  <EnumVal ord="21">Gy</EnumVal>
  <EnumVal ord="22">q</EnumVal>
  <EnumVal ord="23">°C</EnumVal>
  <EnumVal ord="24">Sv</EnumVal>
  <EnumVal ord="25">F</EnumVal>
  <EnumVal ord="26">C</EnumVal>
  <EnumVal ord="27">S</EnumVal>
  <EnumVal ord="28">H</EnumVal>
  <EnumVal ord="29">V</EnumVal>
  <EnumVal ord="30">ohm</EnumVal>
  <EnumVal ord="31">J</EnumVal>
  <EnumVal ord="32">N</EnumVal>
  <EnumVal ord="33">Hz</EnumVal>
  <EnumVal ord="34">Ix</EnumVal>
  <EnumVal ord="35">Lm</EnumVal>
  <EnumVal ord="36">Wb</EnumVal>
</EnumType>
```

# IEC 61850 – Dataset





# IEC 61850 – Dataset



# Postavke i testiranje horizontalne komunikacije

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- GOOSE poruke - osnovne primjene:
  - Blokade (eng. *interlocking*)
  - Slanje sklopnih naredbi (eng. *trips*)
  - Zaštita zatajenja prekidača
  - Mjerenja (u svrhu vizualizacije)
  - Međustanična komunikacija (prijenos kriterija distantne zaštite)



# Postavke i testiranje horizontalne komunikacije

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- Velik broj proizvođača opreme
- Različiti konfiguracijski alati
- Interpretacije standarda
- Vlasnička proširenja konfiguracije
- Primjer za 3 velika proizvođača IEC 61850 uređaja
  - ABB
  - Siemens
  - GE

# Postavke i testiranje horizontalne komunikacije

- Siemens
  - DIGSI Manager -> Konfiguracija uređaja

The image displays the Siemens DIGSI Manager software interface. The main window shows a configuration matrix for a SIPROTEC device. A 'Properties - SIPROTEC device' dialog box is open, showing the 'Communication parameters' tab. The 'General' section includes fields for 'VD address' (10011), 'Mirror VD' (10012), and 'red. Mirror VD' (0). The 'System interface [Ethernet]' section shows 'IP address' (10.196.24.61), 'Subnet mask' (255.255.255.0), 'Standard gateway' (10.196.24.1), 'UDP port' (50000), and 'IED name' (E6\_6MD). A note states: 'Important: Enable of the manual configuration can only be undone by import of an SCD file.' The background window shows a tree view of the project structure, including folders for '20 kV', 'E00\_X0', 'E01\_TR1', 'E02\_PEHUN', 'E03\_HZ\_A', 'E04\_SP', 'E05\_HZ\_B', 'E06\_MELINA', 'E07\_TR2', and 'IEC61850 SUSAK'.

# Postavke i testiranje horizontalne komunikacije

- Siemens

- DIGSI Manager -> Konfiguracija uređaja

- IEC 61850 System Configurator -> Konfiguracija IEC 61850 postavki

The screenshot displays the Siemens IEC 61850 System Configurator interface. It shows a project named 'SUSAK' with a network topology. The 'Subnets' table lists various devices and their IP addresses. The 'Properties' window for the 'E0\_GMD' device is open, showing its configuration details.

Name	Name in manager	IP address
Subnet1		
New devices		
E0_GMD	E0_GMD	10.196.24.101
E1_GMD	E1_GMD	10.196.24.11
E2_GMD	E2_GMD	10.196.24.21
E3_GMD	E3_GMD	10.196.24.31
E4_GMD	E4_GMD	10.196.24.41
E5_GMD	E5_GMD	10.196.24.51
E6_GMD	E6_GMD	10.196.24.61
E7_GMD	E7_GMD	10.196.24.71
E8_GMD	E8_GMD	10.196.24.76
E9_GMD	E9_GMD	10.196.24.77
E10_GMD	E10_GMD	10.196.24.78
E11_GMD	E11_GMD	10.196.24.79
E12_GMD	E12_GMD	10.196.24.80
E13_GMD	E13_GMD	10.196.24.81
E14_GMD	E14_GMD	10.196.24.82
E15_GMD	E15_GMD	10.196.24.83
E16_GMD	E16_GMD	10.196.24.84
E17_GMD	E17_GMD	10.196.24.85
E18_GMD	E18_GMD	10.196.24.86
E19_GMD	E19_GMD	10.196.24.87
E20_GMD	E20_GMD	10.196.24.88
E21_GMD	E21_GMD	10.196.24.89
E22_GMD	E22_GMD	10.196.24.90
E23_GMD	E23_GMD	10.196.24.91
E24_GMD	E24_GMD	10.196.24.92
E25_GMD	E25_GMD	10.196.24.93
E26_GMD	E26_GMD	10.196.24.94
E27_GMD	E27_GMD	10.196.24.95
E28_GMD	E28_GMD	10.196.24.96
E29_GMD	E29_GMD	10.196.24.97
E30_GMD	E30_GMD	10.196.24.98
E31_GMD	E31_GMD	10.196.24.99
E32_GMD	E32_GMD	10.196.24.100
E33_GMD	E33_GMD	10.196.24.101
E34_GMD	E34_GMD	10.196.24.102
E35_GMD	E35_GMD	10.196.24.103
E36_GMD	E36_GMD	10.196.24.104
E37_GMD	E37_GMD	10.196.24.105
E38_GMD	E38_GMD	10.196.24.106
E39_GMD	E39_GMD	10.196.24.107
E40_GMD	E40_GMD	10.196.24.108
E41_GMD	E41_GMD	10.196.24.109
E42_GMD	E42_GMD	10.196.24.110
E43_GMD	E43_GMD	10.196.24.111
E44_GMD	E44_GMD	10.196.24.112
E45_GMD	E45_GMD	10.196.24.113
E46_GMD	E46_GMD	10.196.24.114
E47_GMD	E47_GMD	10.196.24.115
E48_GMD	E48_GMD	10.196.24.116
E49_GMD	E49_GMD	10.196.24.117
E50_GMD	E50_GMD	10.196.24.118
E51_GMD	E51_GMD	10.196.24.119
E52_GMD	E52_GMD	10.196.24.120
E53_GMD	E53_GMD	10.196.24.121
E54_GMD	E54_GMD	10.196.24.122
E55_GMD	E55_GMD	10.196.24.123
E56_GMD	E56_GMD	10.196.24.124
E57_GMD	E57_GMD	10.196.24.125
E58_GMD	E58_GMD	10.196.24.126
E59_GMD	E59_GMD	10.196.24.127
E60_GMD	E60_GMD	10.196.24.128
E61_GMD	E61_GMD	10.196.24.129
E62_GMD	E62_GMD	10.196.24.130
E63_GMD	E63_GMD	10.196.24.131
E64_GMD	E64_GMD	10.196.24.132
E65_GMD	E65_GMD	10.196.24.133
E66_GMD	E66_GMD	10.196.24.134
E67_GMD	E67_GMD	10.196.24.135
E68_GMD	E68_GMD	10.196.24.136
E69_GMD	E69_GMD	10.196.24.137
E70_GMD	E70_GMD	10.196.24.138
E71_GMD	E71_GMD	10.196.24.139
E72_GMD	E72_GMD	10.196.24.140
E73_GMD	E73_GMD	10.196.24.141
E74_GMD	E74_GMD	10.196.24.142
E75_GMD	E75_GMD	10.196.24.143
E76_GMD	E76_GMD	10.196.24.144
E77_GMD	E77_GMD	10.196.24.145
E78_GMD	E78_GMD	10.196.24.146
E79_GMD	E79_GMD	10.196.24.147
E80_GMD	E80_GMD	10.196.24.148
E81_GMD	E81_GMD	10.196.24.149
E82_GMD	E82_GMD	10.196.24.150
E83_GMD	E83_GMD	10.196.24.151
E84_GMD	E84_GMD	10.196.24.152
E85_GMD	E85_GMD	10.196.24.153
E86_GMD	E86_GMD	10.196.24.154
E87_GMD	E87_GMD	10.196.24.155
E88_GMD	E88_GMD	10.196.24.156
E89_GMD	E89_GMD	10.196.24.157
E90_GMD	E90_GMD	10.196.24.158
E91_GMD	E91_GMD	10.196.24.159
E92_GMD	E92_GMD	10.196.24.160
E93_GMD	E93_GMD	10.196.24.161
E94_GMD	E94_GMD	10.196.24.162
E95_GMD	E95_GMD	10.196.24.163
E96_GMD	E96_GMD	10.196.24.164
E97_GMD	E97_GMD	10.196.24.165
E98_GMD	E98_GMD	10.196.24.166
E99_GMD	E99_GMD	10.196.24.167
E100_GMD	E100_GMD	10.196.24.168

**Properties**

**Identification**

- Name: E0\_GMD
- Name in manager: E0\_GMD
- Type: Connected access point
- Comment:
- Device type: Siprotec-6MD66x
- Device version: 1.0
- Manufacturer: SIEMENS

**Parameter**

- IP address: **10.196.24.101**
- Subnet mask: **255.255.255.0**
- Standard Gateway: **10.196.24.1**
- Device-device communication: Both
- Vertical communication: Server
- Timer function: False
- Router function: False

**Parameter for SIPROTEC**

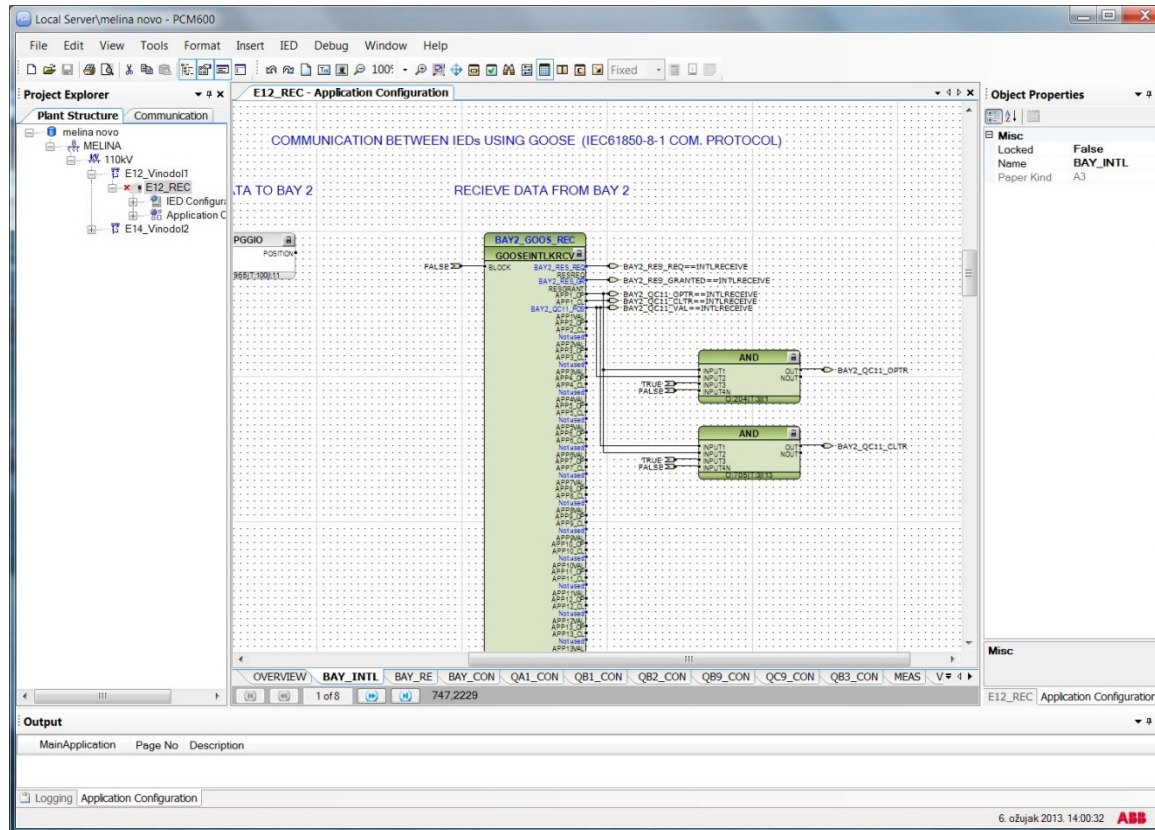
- Use as a timer: No
- Message buffering: **Dynamic and static reporting**

**Name**

- Name of device (access point):

# Postavke i testiranje horizontalne komunikacije

- ABB
  - PCM 600 -> Konfiguracija uređaja



# Postavke i testiranje horizontalne komunikacije

- ABB
  - PCM 600 -> Konfiguracija uređaja
  - IET 600 -> Konfiguracija IEC 61850 postavki

The screenshot displays the IET 600 software interface, which is used for configuring IEC 61850 communication. The main window is titled 'Editor Tools' and shows a project tree on the left with a selected logical device 'E4\_REC'. The central pane shows a table of communication parameters, and the right pane shows a detailed view of the selected parameter.

IED	LD	LN	Path	Value	Short Address	Description
E4_REC	LD0	CMMXU1	Mod			
E4_REC	LD0	CMMXU1	Mod.Oper			
E4_REC	LD0	CMMXU1	Mod.Oper.ctVal	on	007-1-1304.49.21	
E4_REC	LD0	CMMXU1	Mod.Oper.origin			
E4_REC	LD0	CMMXU1	Mod.Oper.originOrCat	not-supported	007-1-1304.49.21	
E4_REC	LD0	CMMXU1	Mod.Oper.originIdent			
E4_REC	LD0	CMMXU1	Mod.Oper.ctNum	0	007-1-1304.49.255	
E4_REC	LD0	CMMXU1	Mod.Oper.T	0001-01-01 00:00:00.000	007-1-1304.49.200	
E4_REC	LD0	CMMXU1	Mod.Oper.Test	False	007-1-1304.49.1	
E4_REC	LD0	CMMXU1	Mod.Oper.Check	0	007-1-1304.49.16	
E4_REC	LD0	CMMXU1	Mod.stVal	on	010-S-7318.152.29	Mode status parameter for 618
E4_REC	LD0	CMMXU1	Mod.q	Good	010-S-7318.152.100	Mode status parameter for 618
E4_REC	LD0	CMMXU1	Mod.cttModel	direct-with-normal-security	-1,-1,1	Mode status parameter for 618
E4_REC	LD0	CMMXU1	Beh			
E4_REC	LD0	CMMXU1	Beh.stVal	on	007-1-1303.152.29	Behaviour parameter for 61850
E4_REC	LD0	CMMXU1	Beh.q	Good	007-1-1303.152.100	Behaviour parameter for 61850

The right pane shows the 'Properties' window for the selected parameter, displaying fields for Identification (Logical Device Name: E4\_REC.LD0, Instance: LD0), Description, and Configuration (Access Control).

# Postavke i testiranje horizontalne komunikacije

- GE

– EnerVista-> Konfiguracija uređaja i IEC 61850 postavki

The screenshot displays the EnerVista UR Setup software interface, specifically the 'Tx Configurable GOOSE' configuration window. The window is divided into several panes:

- Left Pane:** A tree view showing the configuration hierarchy, including 'Serial Ports', 'Network', 'Modbus Protocol', 'DNP Protocol', 'IEC 61850', 'GSSE / GOOSE Configuration', 'Reception', 'Rx Configurable GOOSE', 'Server Configuration', 'Logical Node Prefixes', 'MMU Deadbands', 'GGOI Status Configuration', 'GGOI Control Configuration', 'GGOI Status Configuration', 'Report Control Configuration', 'XSBR Configuration', 'XSWI Configuration', 'Htp', 'TFTP', 'IEC 60870-5-104', 'SNTP', 'Modbus User Map', 'Real Time Clock', 'Fault Report', 'Oscillography', 'Data Logger', 'Demand', 'User-Programmable Leds', 'User-Programmable Self Tests', 'Control Pushbuttons', 'User-Programmable Pushbuttons', 'Flex States', 'User-definable displays', 'Direct I/O', 'Teleprotection', and 'Installation'.
- Top Pane:** A table with columns 'SETTING' and 'PARAMETER'. It lists various GGOSE parameters for IEC 61850, such as 'GGOSE 1 Value', 'GGOSE 1 db', 'GGOSE 1 1ms', 'GGOSE 1 max', etc., with their corresponding values (e.g., 'Off', '100 000 %', '0 000', '1000000 000').
- Right Pane:** A detailed configuration table for 'Tx Configurable GOOSE'. It lists various settings like 'GOOSEOut 1 Function', 'GOOSEOut 1 ID', 'GOOSEOut 1 Destination MAC', 'GOOSEOut 1 VLAN Priority', 'GOOSEOut 1 VLAN ID', 'GOOSEOut 1 ETYPE APPID', 'GOOSEOut 1 ConfFlow', 'GOOSEOut 1 Retransmission Curve', 'GOOSEOut 1 Dataset Item 1' through 'GOOSEOut 1 Dataset Item 36', and 'GOOSEOut 1 Dataset Item 37'. Each setting has a corresponding parameter value.
- Bottom Pane:** A status bar showing 'Screen ID: 30' and 'Screen ID: 32'.



# Analiza IEC 61850 komunikacije

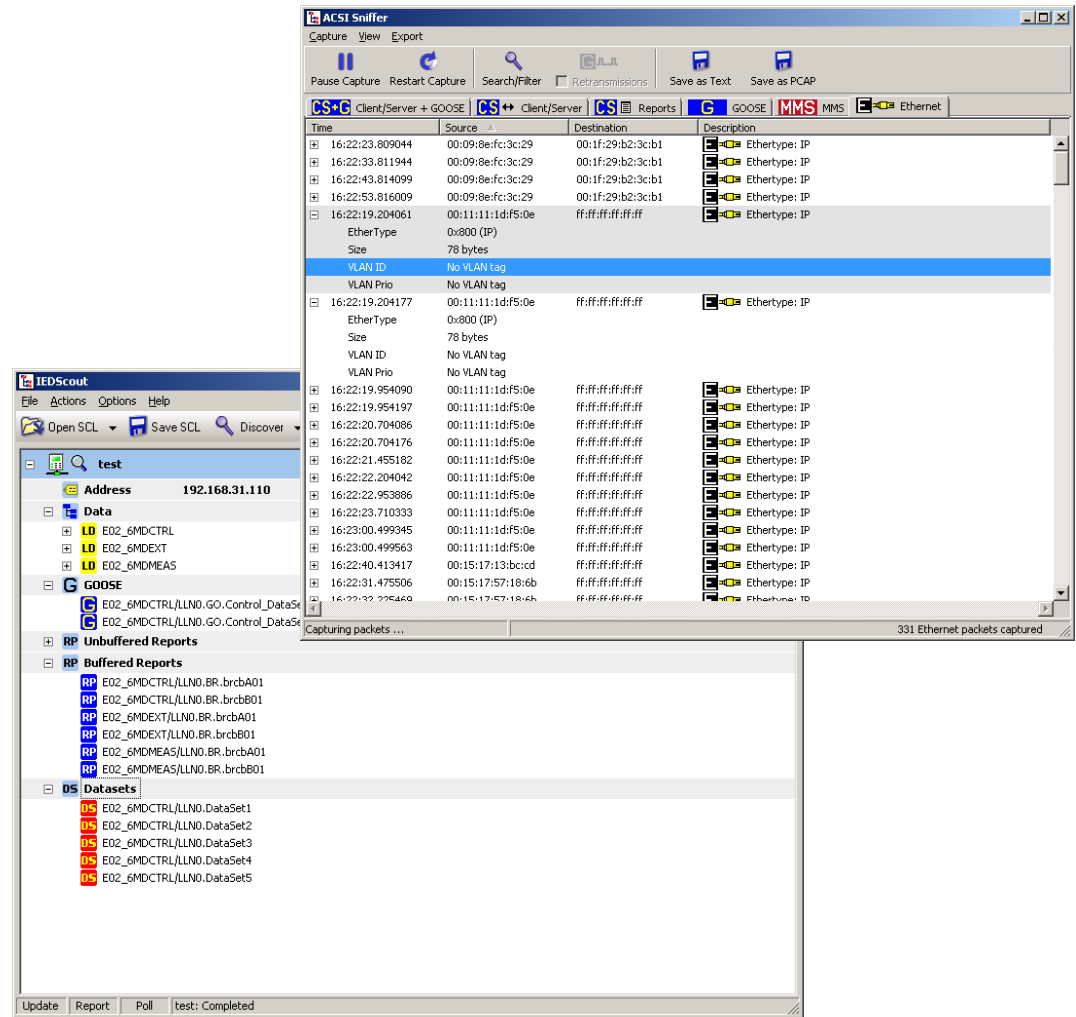
- Analizatori mrežnog prometa
  - Wireshark (Open source)
  - UniCA Analyzer (KEMA)

Wireshark interface showing a network traffic capture. The main pane displays a list of packets with columns for No., Time, Source, Destination, Protocol, and Info. Packet 30 is selected, showing details for Ethernet II, Internet Protocol, Transmission Control Protocol, and ISO 8823 OSI Presentation Protocol. The packet size is 129 bytes.

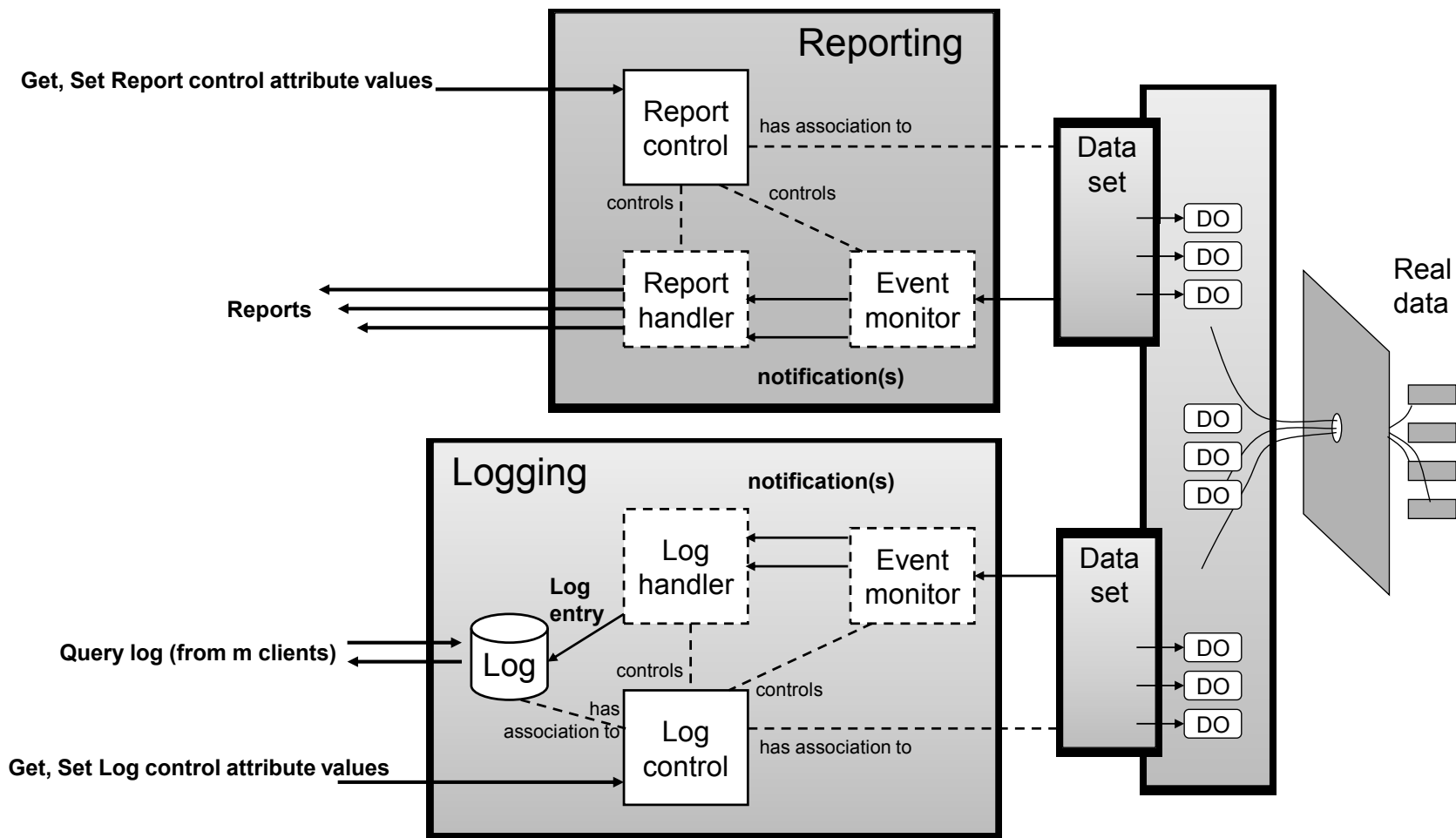
Detailed view of packet 30 in Wireshark, showing the ISO 8823 OSI Presentation Protocol section. It includes fields for user-data (fully-encoded-data), ISO/IEC 9506 MMS (conf request), and Read (4). A hex dump at the bottom shows the raw data bytes.

# Postavke i testiranje vertikalne komunikacije

- SCADA sustavi
  - MicroSCADA (ABB)
  - SICAM PAS (Siemens)
  - Zenon (COPA-DATA)
  - PROZA NET (Končar)
- Pomoćni alati
  - IED Scout (Omicron)
  - ITT600 (ABB)
  - ACSI Tools (Končar)

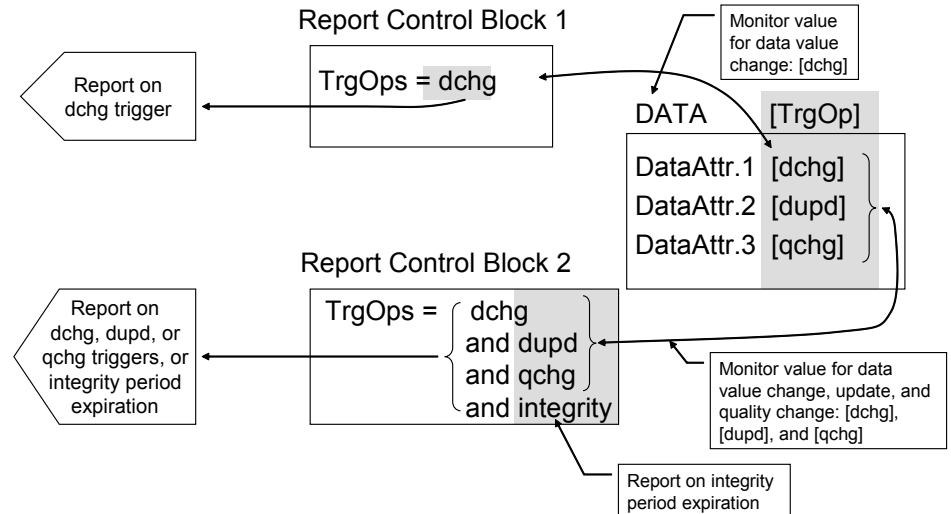
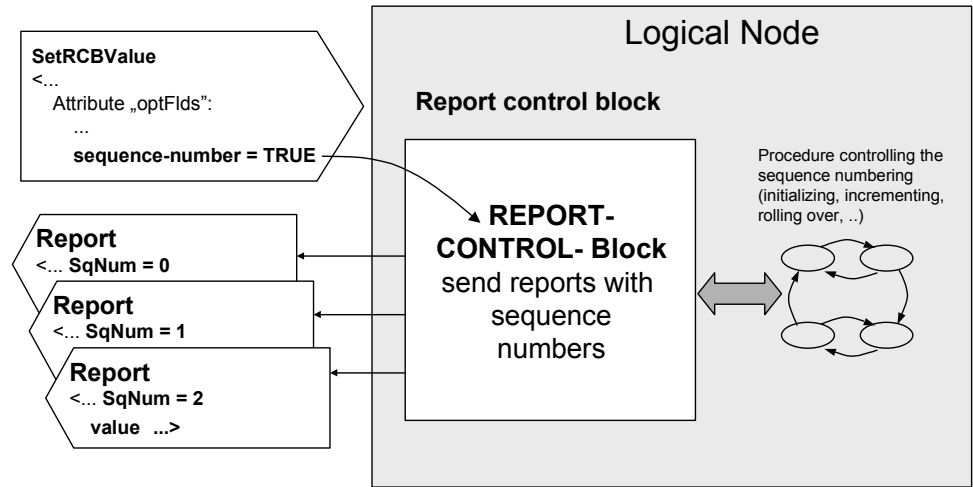


# IEC 61850 – Reporting (načela)



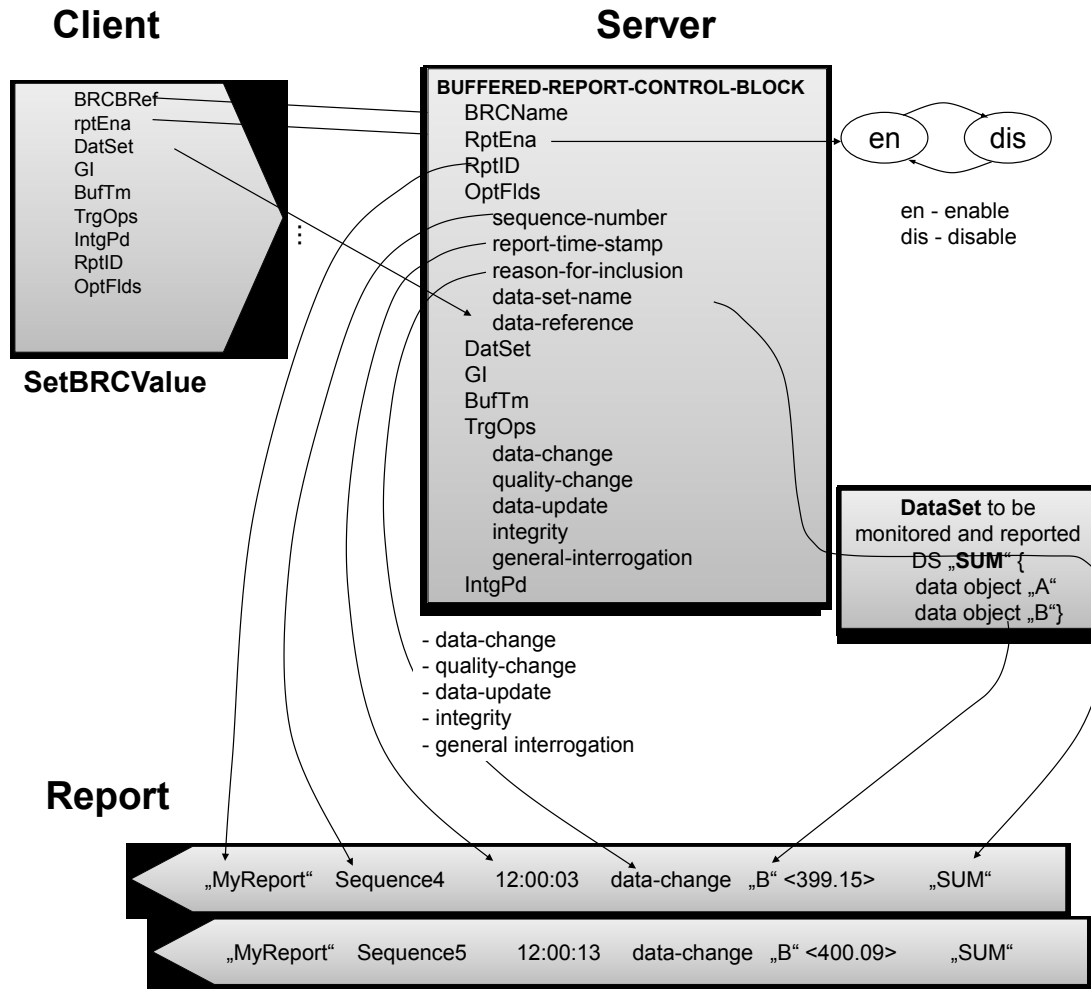
# IEC 61850 – Reporting

- Načela dostave
- Slijed akcija
- Uvjeti okidanja
- Dataset postavke
- DA rezolucija
- DO rezolucija



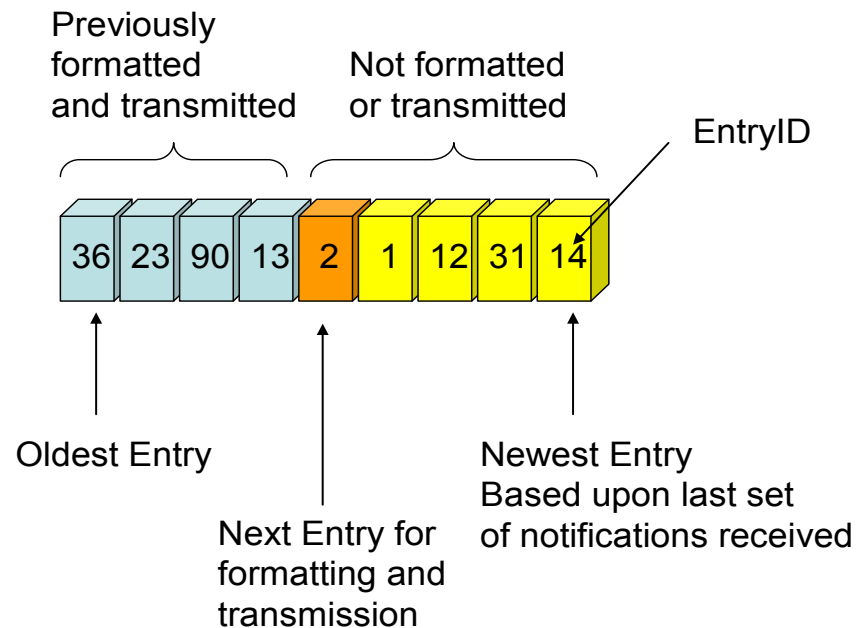
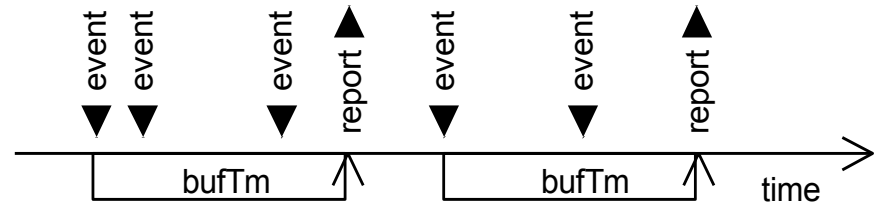
# IEC 61850 – Reporting (načela)

- Načela stvaranja IEC 61850 reporta
- Prilagođavanje postavki

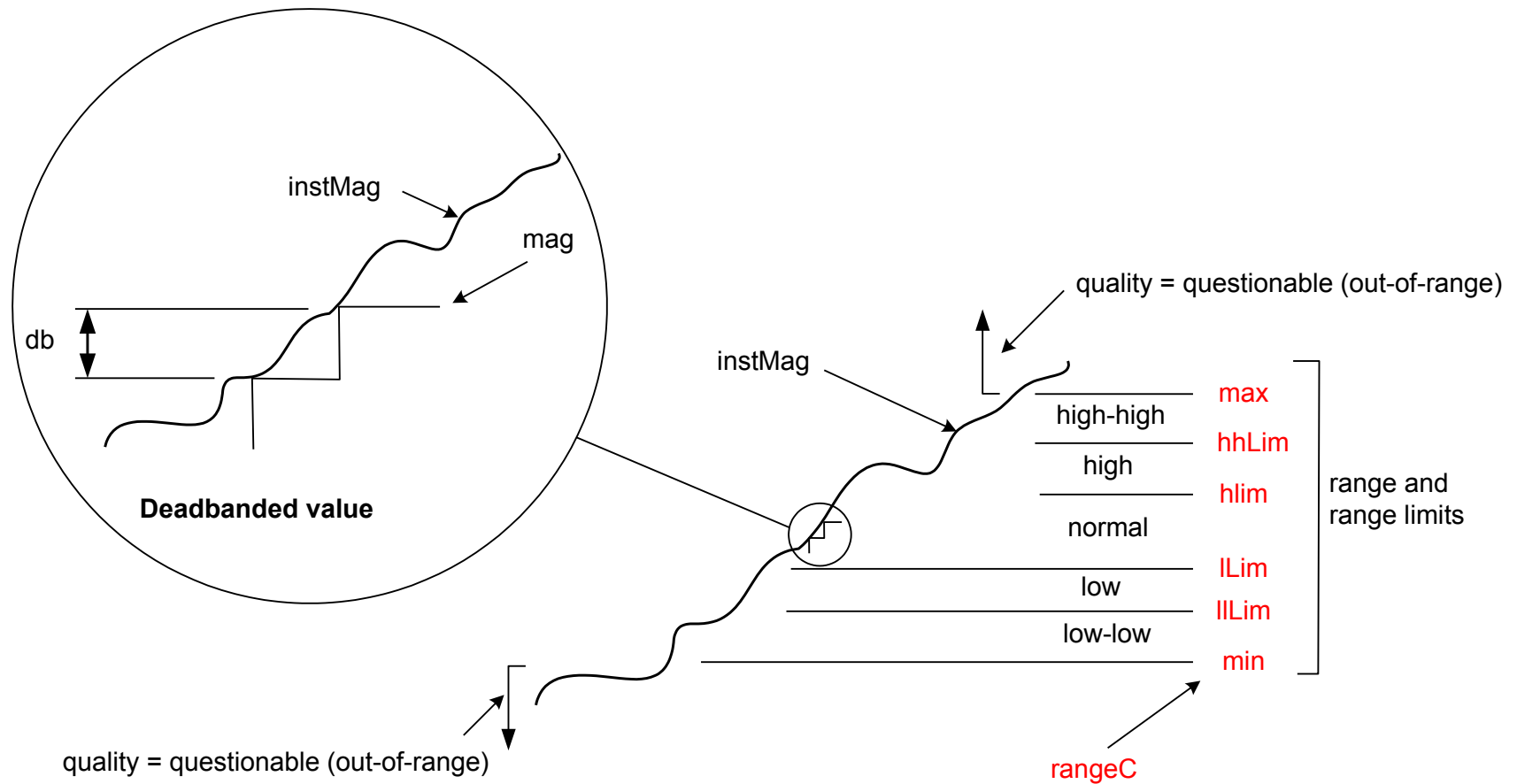


# IEC 61850 – Reporting (BRCB vs. URCB)

- (X)RCB
- Međuspemnik (buffer)
- Rad sa spremnikom
- BufTime
- EntryID
- Mjerenja vs. Signali

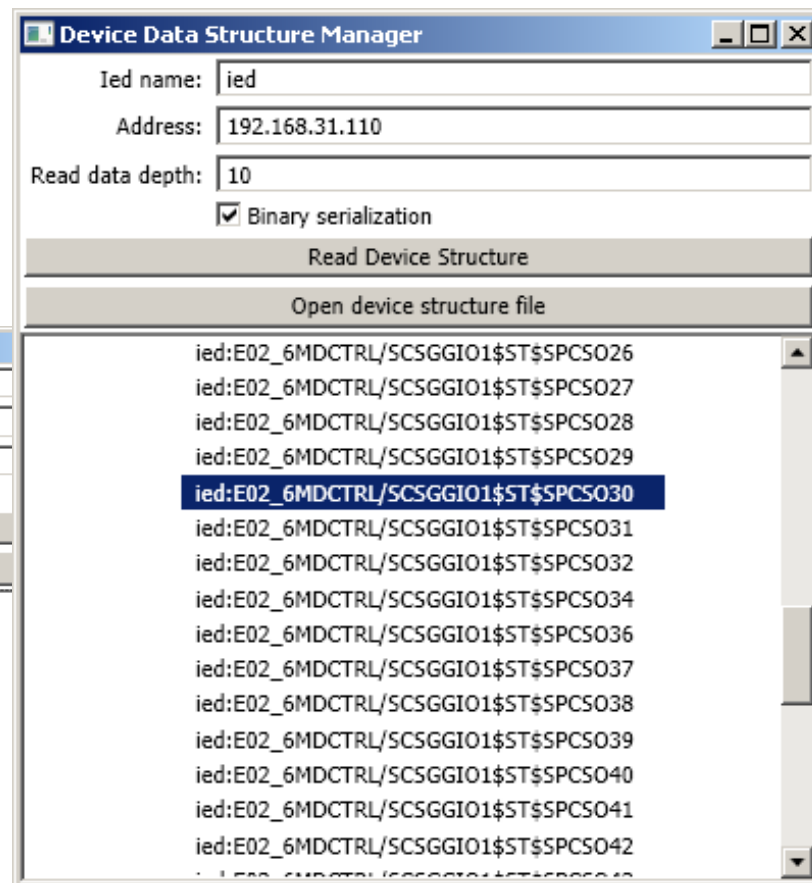
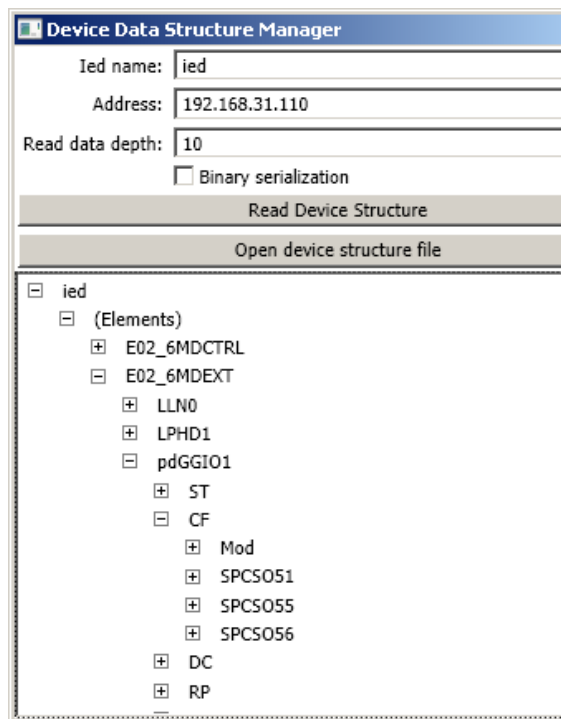


# IEC 61850 – Reporting (analogne vrijednosti)



# ACSI Tools - IEC 61850 pomoćni alati

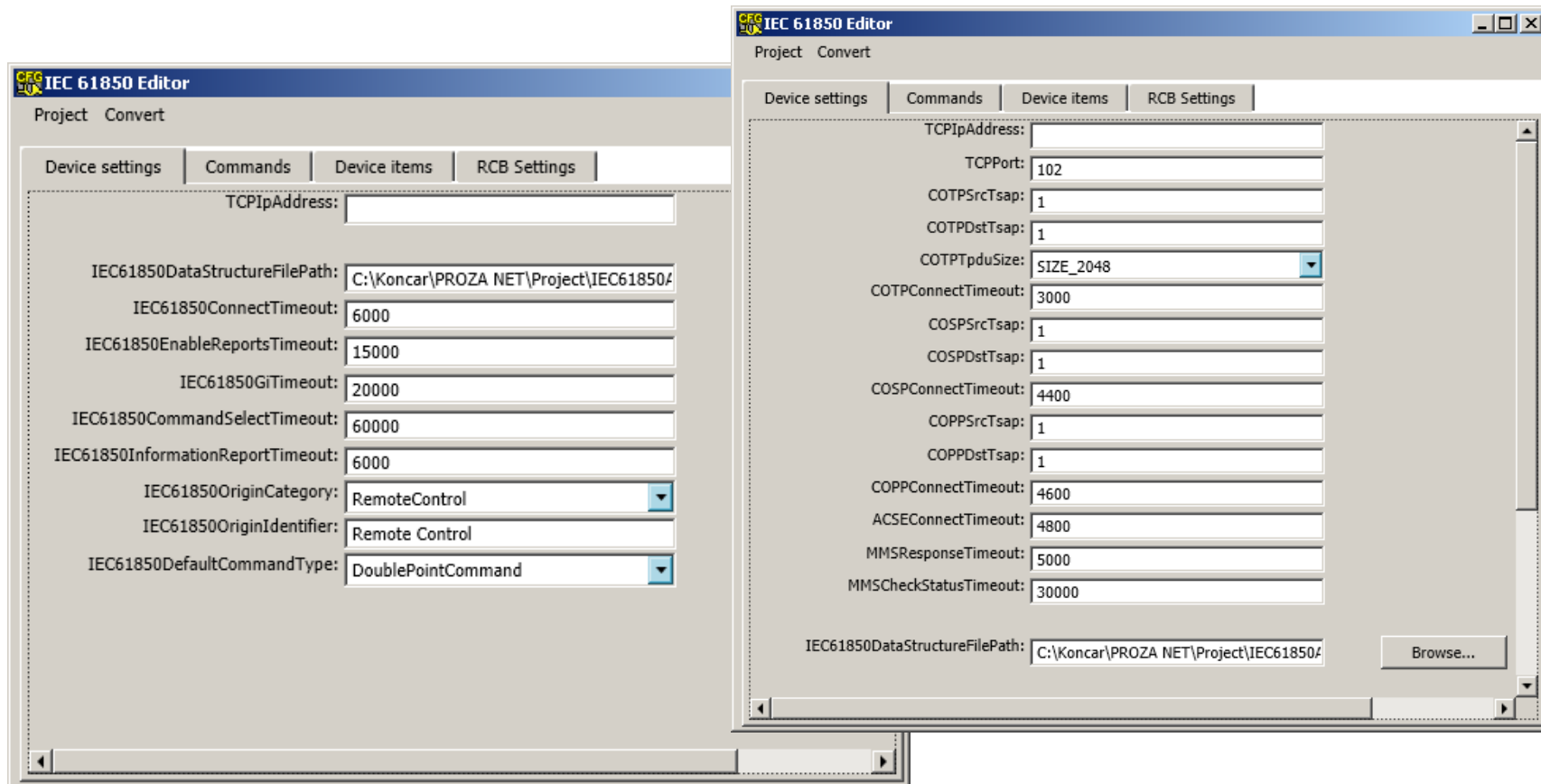
- Device Structure Manager
  - Prikupljanje strukture uređaja
  - Usklađeni format datoteke





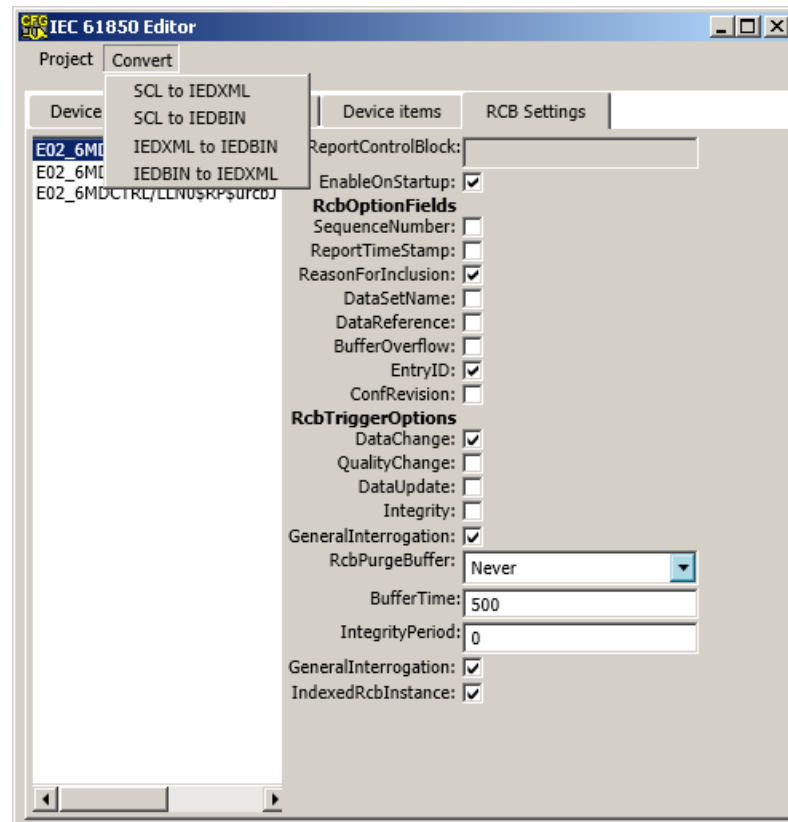
# ACSI Tools - IEC 61850 pomoćni alati

- IEC 61850 Editor
  - Uređivanje komunikacijski postavki



# ACSI Tools - IEC 61850 pomoćni alati

- IEC 61850 Editor
  - Prilagodba i analiza SCL datoteka
  - Analiza <Private> tag-ova
  - Usporedba sa .XSD shemama
  - Stvaranje SCL datoteka sukladnih sa standardnom shemom



# Naručivanje opreme

- Certifikati
  - Razine
  - Interpretacija
  - PICS/MICS/PIXIT



## IEC 61850 Certificate Level A<sup>1</sup>

Page 1/2

International Usersgroup

No. 30920420-Consulting 09-1712

Issued to:  
ABB Oy  
Distribution Automation  
Muuttitie 2 A  
FI-65101 Vaasa  
Finland

For the product:  
615 series  
Software version: 2.0.3  
Hardware revision: C

Issued by:

The product has not shown to be non-conforming to:  
**IEC 61850-6, 7-1, 7-2, 7-3, 7-4 and 8-1**  
Communication networks and systems in substations

The conformance test has been performed according to IEC 61850-10 with product's protocol, model and technical issue implementation conformance statements: "RE\_615\_IEC61850\_PICS\_756465\_ENc", "RE\_615\_IEC61850\_MICS\_756467\_ENc", "RE\_615\_IEC61850\_TICS\_756466\_ENc" and product's extra information for testing: "RE\_615\_IEC61850\_PIXIT\_756464\_ENc".

The following IEC 61850 conformance blocks have been tested with a positive result (number of relevant and executed test cases / total number of test cases as defined in the UCA International Users Group Device Test procedures V2.2):

1 Basic Exchange (20/24)	9a GOOSE Publish (7/12)
2 Data Sets (3/6)	9b GOOSE Subscribe (9/10)
4+ Setting Group Definition (10/11)	12a Direct Control (6/11)
5 Unbuffered Reporting (14/18)	12d Enhanced SBO Control (11/19)
6 Buffered Reporting (16/20)	13 Time Synchronization (3/4)
	14 File Transfer (4/7)

This Certificate includes a summary of the test results as carried out at ABB Oy in Finland with UniCasim 61850 version 3.19.02 with test suite 3.19.01 and UniCA 61850 analyzer 4.18.02. The test is based on the UCA International Users Group Device Test Procedures version 2.2. This document has been issued for information purposes only, and the original paper copy of the KEMA report: No. 30920420-Consulting 09-1711 will prevail.

The test has been carried out on one single specimen of the products as referred above and submitted to KEMA by ABB Oy. The manufacturer's production process has not been assessed. This Certificate does not imply that KEMA has certified or approved any product other than the specimen tested.

Amhem, July 27, 2009

W. Strabbing  
Manager Intelligent Networks and Communication

S.J.T. Mulder  
Senior Test Engineer

<sup>1</sup> Level A - Independent Test lab with certified ISO 9000 or ISO 17025 Quality System

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# Naručivanje opreme

depicted in Annex A.

<u>Test reference</u>	Test reference: <ACSI-model><[N][p/s]><number> e.g. Rp3	References to the IEC 61850 documents Clause and Subclause	Test purpose, e.g. test if association is set up correctly
<u>Ref. Part Clause and Subclause of IEC 61850</u>			<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
<u>Expected result</u>		Definition of the expected behavior of the DUT after a step	
<u>Test description</u>		Step by step description of how to perform the test	
<u>Comment</u>		Area for comments during testing, e.g. found problems and remarks	

Figure 3 – Test procedure format

IEC 600/05



Applicable Test Procedures from the UCA International Users Group Device Test Procedures version 2.2

Conformance Block	Mandatory	Conditional
1: Basic Exchange	Ass1, Ass2, Ass3, AssN2, AssN3, AssN4, AssN5 Srv1, Srv2, Srv3, Srv4, Srv5, SrvN1abod, SrvN4	Srv6, Srv7, Srv8, SrvN1e, SrvN2, SrvN3
2: Data Sets	Dset1, Dset10a, DsetN1ae	
4+: Setting Group Definition	Sg1, Sg2, Sg3a, Sg3b, Sg4 SgN1a, SgN1b, SgN2, SgN3, SgN4	
5: Unbuffered Reporting	Rp1, Rp2, Rp3, Rp4, Rp7, Rp10 RpN1, RpN2, RpN3, RpN4	Rp5, Rp8, RpN5, RpN6
6: Buffered Reporting	Br1, Br2, Br3, Br4, Br7, Br8, Br9, Br12 BrN1, BrN2, BrN3, BrN4, BrN5	Br5, Br10, BrN6
9a: GOOSE publish	Gop2, Gop3, Gop4, Gop7	Gop1, Gop8, GopN1
9b: GOOSE subscribe	Gos1a, Gos2, Gos3, GosN1, GosN2, GosN3, GosN4, GosN5, GosN6	
12a: Direct control	CtN3, CtN8, DOns1, DOns3	Ct2, CtN11
12d: Enhanced SBO control	Ct3, CtN1, CtN2, CtN3, CtN4, CtN9 SBOes1, SBOes2, SBOes3	Ct2, CtN11
13: Time sync	Tm1, Tm2, TmN1	
14: File transfer	Ft1, Ft2ab, FtN1ab, Ft4	Ft2c, FtN1c

The conformance test was executed with following 615 series IED variants using the same software version and hardware revision.

REF615, RED615, RET615 and REM615



# Zaključak

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- IEC 61850 ed1.0 -> ed2.0
- Usklađivanje proizvođača
- Pomoćni alati kao integralni dio sustava
- Nove metodologije konfiguriranja uređaja i aplikacija
- „*Plug-and-play*” načela integracije
- Jedinstveni pristup u automatizaciji budućih postrojenja EES-a