Substation Automation Systems
IEC 61850 standard

Course map
Outline of the Lecture

- Recap of modern substation architectures
  - IEC 61850 substation
  - Purpose and scope of IEC 61850
- IEC 61850 Information Model
- Specification and configuration
- Substation communication
  - Very brief introduction (more coming next week)

Recap

Common components

- Remote Terminal Unit
  - Telemetry and remote control device
- Intelligent Electronic Device(s)
  - Implements functions
- Bay controller
  - controls all devices related to a single bay
- Human Machine Interface
  - Operator console for local control/configuration
- Communication bus(es)
  - Connection between devices
- Upwards communication interface.
  - To SCADA
Substation architectures
IEC 61850 substation

Substation architectures
The Merging Unit
Purpose and Scope of IEC 61850

Objectives

The 61850 standard was developed to:
- Address the need for a **more structured approach** to design of Substation Automation Systems
- **Separate Data model** from method of communication
- Utilise new technologies (**Ethernet, TCP/IP**)
- Enable **vendor independence**
- **Simplify** system configuration
- Enable **sharing of measurement** among devices

How is this achieved?

- **Model information about the real world**
  - Status, measurements, settings
  - Configuration of system
    - Single-line diagram
    - Function related information
- **Defines when to exchange values**
  - Configuration of IED
- **Defines how to exchange values**
  - Configuration of IED
- **Describe the recipient of the values**
  - Configuration of IED
- **Describe who to receive values from**
  - Configuration of IED
Outline of the lecture

- Recap of modern substation architectures
  - IEC 61850 substation
  - Purpose and scope of IEC 61850
- IEC 61850 Information Model
- Specification and configuration
- Substation communication
  - Very brief introduction (more coming next week)
IEC 61850 Information Model
Modelling a substation

- We would like to have some kind of standardized building-block for functionality
- Enter the Logical Node (LN)...

IEC 61850 Information Model

- Modelling a substation
- Component hierarchy
- IEC 61850-8-1 object name
- Logical Node (LN) groups
- Logical Node (LN) examples
- Assigning Logical Nodes
IEC 61850 Information Model

Modelling a substation

IEC 61850-7-2 Services

TCP/IP Network Mapping

SCSM IEC 61850-8-1

IEC 61850-7-4 logical node (circuit breaker)

IEC 61850-7-4 data (Position)

IEC 61850-6 configuration file

Logical device (Bay)

virtualisation

Real devices in any substation

IEC 61850 Information Model

Component hierarchy
IEC 61850 Information Model

IEC 61850-8-1 object name

Relay1/XCBR1$ST$Loc$stVal

Logical Device

Logical Node

Data

Functional Constraint

Attribute

IEC 61850 Information Model

Logical Nodes - Groups

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axxx</td>
<td>Automatic Control (4). ATCC (tap changer), AVCO (volt. ctrl), etc.</td>
</tr>
<tr>
<td>Cxxx</td>
<td>Supervisory Control (5). CILO (Interlocking), CSW1 (switch ctrl), etc.</td>
</tr>
<tr>
<td>Gxxx</td>
<td>Generic Function (3). OGO (generic I/O), etc.</td>
</tr>
<tr>
<td>Ixxx</td>
<td>Interfacing/Archiving (4). IARC (archive), IREMI (RMI), etc.</td>
</tr>
<tr>
<td>Lxxx</td>
<td>System Logical Nodes (2). LLNO (common), LPHD (Physical Device)</td>
</tr>
<tr>
<td>Mxxx</td>
<td>Metering &amp; Measurement (8). MMXU (mass), MMTR (meter), etc.</td>
</tr>
<tr>
<td>Pxxx</td>
<td>Protection (28). PDIF, PIOC, PDIS, PTOV, PTOH, PTOC, etc.</td>
</tr>
<tr>
<td>Rxxx</td>
<td>Protection Related (10). RREC (auto reclosing), RDRE (disturbance), etc.</td>
</tr>
<tr>
<td>Sxxx</td>
<td>Sensors, Monitoring (4). SARV (arch), SPDC (partial discharge), etc.</td>
</tr>
<tr>
<td>Txxx</td>
<td>Instrument Transformer (2). TCTR (current), TVTR (voltage)</td>
</tr>
<tr>
<td>Xxxx</td>
<td>Switchgear (2). XCBR (breaker), XCSW (switch)</td>
</tr>
<tr>
<td>Yxxx</td>
<td>Power Transformer (4). YPTTR (transformer), YPSH (shunt), etc.</td>
</tr>
<tr>
<td>Zxxx</td>
<td>Other Equipment (15). ZCAP (cap ctrl), ZMOT (motor), etc.</td>
</tr>
<tr>
<td>Wxxx</td>
<td>Wind (Set aside for other standards)</td>
</tr>
<tr>
<td>Oxxx</td>
<td>Solar (Set aside for other standards)</td>
</tr>
<tr>
<td>Hxxx</td>
<td>Hydropower (Set aside for other standards)</td>
</tr>
<tr>
<td>Nxxx</td>
<td>Power Plant (Set aside for other standards)</td>
</tr>
<tr>
<td>Bxxx</td>
<td>Battery (Set aside for other standards)</td>
</tr>
<tr>
<td>Fxxx</td>
<td>Fuel Cells (Set aside for other standards)</td>
</tr>
</tbody>
</table>
IEC 61850 Information Model

Logical Nodes – Example XCBR

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Attr Type</th>
<th>Explanation</th>
<th>M</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNname</td>
<td></td>
<td>Shall be inherited from Logical Node Class (see IEC 61850-7-3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data</td>
<td></td>
<td></td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>LN shall inherit all Mandatory Data from Common Logical Node Class</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locl</td>
<td>SPS</td>
<td>Local operation (local means without substation automation communication, hardwired direct control)</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>LEl</td>
<td>INS</td>
<td>External equipment health</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>LElname</td>
<td>SRL</td>
<td>External equipment name plate</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>OpCnt</td>
<td>INS</td>
<td>Operation counter</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Common Values</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pst</td>
<td>SPC</td>
<td>Switch position</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>BLoc</td>
<td>SPC</td>
<td>Block opening</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>BlkCl</td>
<td>SPC</td>
<td>Block closing</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>ChArKrSta</td>
<td>SPC</td>
<td>Charged motor enabled</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Metered Values</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SumSwAm</td>
<td>SCK</td>
<td>Sum of Switched Amperes, resetable</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Status Information</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBOpCap</td>
<td>INS</td>
<td>Circuit breaker operating capability</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>PONTCap</td>
<td>INS</td>
<td>Point On Time switching capability</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>MaxOpCap</td>
<td>INS</td>
<td>Circuit breaker operating capability when fully charged</td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

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IEC 61850 Information Model

Logical Nodes – Other examples

- **TVTR** – Voltage transformer
- **TCTR** – Current transformer
- **MMXU** – Measurement
- **XCBR** – Circuit Breaker
- **PDIF** – Differential Protection
- **PDIS** – Distance Protection
**IEC 61850 Information Model**

**Logical Nodes – Example MMXU – Measurement**

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Attr. Type</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>.Name</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vbc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vca</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vabc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ibc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ica</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iabc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**IEC 61850 Information Model**

**Logical Nodes – Example TVTR – Voltage Transformer**

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Attr. Type</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>.Name</td>
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<td></td>
</tr>
<tr>
<td>LN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vbc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vca</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vabc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V3</td>
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<td>Iab</td>
<td></td>
<td></td>
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<tr>
<td>Ibc</td>
<td></td>
<td></td>
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<tr>
<td>Ica</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iabc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P0</td>
<td></td>
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</tr>
<tr>
<td>Q0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

*Notes:*
- MMXU: Measurement Measuring Unit
- TVTR: Voltage Transformer Relay
- LN: Logical Node
- ENC: Event Configuration
- CIP: CIP (Client-Initiated Procedure)
### IEC 61850 Information Model

#### Logical Nodes – Example TCTR – Current Transformer

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Attribute Type</th>
<th>Explanation</th>
<th>T</th>
<th>M/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNName</td>
<td></td>
<td>Shall be inherited from Logical Node Class (see IEC 61850-7-2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Logical Node Information</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EEHealth</td>
<td>FTG</td>
<td>LN shall inherit all Mandatory Data from Common Logical Node Class</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>EEName</td>
<td>GNE</td>
<td>External equipment name plate</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>OpTime</td>
<td>NMS</td>
<td>Operation time</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Measured values</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amp</td>
<td>BAV</td>
<td>Current (Sampled value)</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Settings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RatC</td>
<td>ASG</td>
<td>Rated Current</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>RatF</td>
<td>ASG</td>
<td>Rated Frequency</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>RatR</td>
<td>ASG</td>
<td>Winning ratio of an external current transformer (transducer) if applicable</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Phase</td>
<td>ASG</td>
<td>Current phase magnitude correction of an external current transformer</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>PhaseA</td>
<td>ASG</td>
<td>Current phase angle correction of an external current transformer</td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

### IEC 61850 Information Model

#### Logical Nodes – Example XCBR – Circuit Breaker

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Attribute Type</th>
<th>Explanation</th>
<th>T</th>
<th>M/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNName</td>
<td></td>
<td>Shall be inherited from Logical Node Class (see IEC 61850-7-2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Logical Node Information</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loc</td>
<td>SPS</td>
<td>Local identification (local means without substation automation communication, transmitted digitally)</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>EEHealth</td>
<td>INS</td>
<td>External equipment health</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>EEName</td>
<td>LNS</td>
<td>External equipment name plate</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>OpCnt</td>
<td>NMS</td>
<td>Operation counter</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pos</td>
<td>EPC</td>
<td>Switch position</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>BBlocks</td>
<td>SPC</td>
<td>Block closed</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>BBlocks</td>
<td>EPC</td>
<td>Block opening</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Ch matched</td>
<td>EPC</td>
<td>Changer motor enabled</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Motorized</td>
<td>EPC</td>
<td></td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>SurFace</td>
<td>EPC</td>
<td>Sum of Switched Phases, restorable</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Static information</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cBSCap</td>
<td>INS</td>
<td>Circuit breaker operating capability</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>DOV</td>
<td>ERS</td>
<td>Point On Wave switching capability</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>PrQCap</td>
<td>ERS</td>
<td>Circuit breaker operating capability when fully charged</td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>
IEC 61850 Information Model
Logical Nodes – Example PTOC – Overcurrent Protection

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Attr. Type</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>LN</td>
<td>INC</td>
<td>Resolved operation counter</td>
</tr>
</tbody>
</table>

**Status Information**
- Sr: ACD
  - N
- Op: ACT
  - Operate
  - T

**Settings**
- TimCr: Curve Operating Curve Type
  - O
- SrVal: Start Value
  - O
- TImMul: Time Delay Multiplier
  - O
- MinOpTime: Minimum Operate Time
  - O
- MaxOpTime: Maximum Operate Time
  - O
- OpDelTime: Operate Delay Time
  - O
- TypSw: Type of Reset Curve
  - O
- ResDelTime: Reset Delay Time
  - O
- DirNod: Directional Node
  - O

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IEC 61850 Information Model
Logical Nodes – Example PDIS – Distance Protection

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Attr. Type</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>LN</td>
<td>INC</td>
<td>Resolved operation counter</td>
</tr>
</tbody>
</table>

**Status Information**
- Sr: ACD
  - N
- Op: ACT
  - Operate
  - T

**Settings**
- FutPre: Polar Reach of the Mho diagram
  - O
- PhSr: Phase Start Value
  - O
- GndSr: Ground Start Value
  - O
- Direc: Directional Node
  - O
- PerCent: Percent Reach
  - O
- OffSet: Offset
  - O
- PerOff: Percent Offset
  - O
- RelRea: Relative reach for load area
  - O
- Angle: Angle for load area
  - O
- TypDly: SPIS Operate Time Delay Mode
  - O
- OpDly: INC Operate Time Delay
  - O
- Multi: SPIS Operate Time Delay Multiphase Mode
  - O
- Single: INC Operate Time Delay for Single Phase
  - O
- SingleGnd: SPIS Operate Time Delay for Single Phase Ground Mode
  - O
- SingleDly: INC Operate Time Delay for single phase ground faults
  - O
IEC 61850 Information Model
Logical Nodes – Example

IEC 61850 Information Model
Logical Nodes – Example autoreclosure
IEC 61850 example
How is this done?

• Given the bay:

IEC 61850 example
How is this achieved?

Possible LNs

Add IEDs

- CB1
- CB2
- CB3
- Bus 1A
- Bus 1B
- Line 1A
- Line 1B
- Transformer 1A
- Transformer 1B
- T-connection
- CB 1
- CB 2
- CB 3
- Bus 2 A
- Bus 1B

- Control 1
- Control 2
- Control 3

- PCHB 21
- PCHF 04
- PCHF 07
- PCHF 27
- PCHF 50BF
- PSTN 01
- PSCH 27
- RYN 20
- REC 75
- RBF 00BF
- CSYH
- IMITR
- IMBDU

- PCHF 07
- PCHF 07
- PCHF 07
- PCHF 07
- PCHF 07
- PCHF 07
- PCHF 07
- PCHF 07
- PCHF 07
- PCHF 07
- PCHF 07
- PCHF 07
- PCHF 07
- PCHF 07
- PCHF 07
IEC 61850 example

How is this achieved?

* Could allocate like this:

IEC 61850 example

How is this achieved?

* Or like this:
Outline of the lecture

- Recap of modern substation architectures
  - IEC 61850 substation
  - Purpose and scope of IEC 61850
- IEC 61850 Information Model
- Specification and configuration
- Substation communication
  - Very brief introduction (more coming next week)

Specification and Configuration

- Integration and configuration process
- Substation Configuration Language (SCL)
- Design - System Specification Description (SSD)
- Specification – Substation Configuration Description (SCD)
Specification and Configuration
IEC 61850 configuration process

SCL is Part 6 of the 61850 standard
Formal description of:
- Substation automation system and
- The switchyard
- The relation between them
- IED configuration
Specification and Configuration
Substation Configuration Language

• **SSD**: System Specification Description
  - Entire system
• **SCD**: Substation Configuration Description
  - Single substation
• **ICD**: IED Capability Description
  - Items supported by an IED
• **CID**: Configured IED Description
  - Specific IED

• XML files

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XML
eXtensible Markup Language

• Set of rules for encoding documents in a machine-readable form
• Hundreds of XML-based languages exist
• Human-readable data serialization
  - converting to a storable format

• Main concepts:
  - Character
  - Processor (parser) and Application
  - Markup and Content
  - Tag
  - Element
  - Attribute
  - XML declaration

<?xml version="1.0" encoding="UTF-8"?>
Databases and XML

eXtensible Markup Language

```xml
<int version="1.0" encoding="UTF-8">
    <Header id="BISCO_IED1_Complete" version="1" revision="2" toolID="xml spy" nameSpace="IEDName"/>
    <Communication>
      <SubNetwork name="Subnet1" type="B-HMS/1TCP">
        <Text/>
        <bitrate unit="b/s" multiplier="M">1000</bitrate>
        <ConnectedAP ipName="BISCO_IED1" apName="AX54MMS_CIGRE">
          <Address>
            <IP type="IP" siseType="IP_IP">192.168.2.11</IP>
          </Address>
        </ConnectedAP>
        <GE inst="CTRL" cName="Control_DataSet1">
          <Address>
            <VLAN-ID type="IP_VLAN-ID">001</VLAN-ID>
            <VLAN-PRIORITY type="IP_VLAN-PRIORITY">1</VLAN-PRIORITY>
            <MAC-Address type="IP_MAC-Address">01-0C-CD-01-F1-04</MAC-Address>
          </Address>
        </GE>
      </SubNetwork>
      <SubNetwork name="Subnet2" type="B-HMS/1TCP">
        <Text/>
        <bitrate unit="b/s" multiplier="M">1000</bitrate>
        <ConnectedAP ipName="BISCO_IED1" apName="AX54MMS_CIGRE">
          <Address>
            <IP type="IP" siseType="IP_IP">192.168.2.11</IP>
          </Address>
        </ConnectedAP>
        <GE inst="CTRL" cName="Control_DataSet1">
          <Address>
            <VLAN-ID type="IP_VLAN-ID">001</VLAN-ID>
            <VLAN-PRIORITY type="IP_VLAN-PRIORITY">1</VLAN-PRIORITY>
            <MAC-Address type="IP_MAC-Address">01-0C-CD-01-F1-04</MAC-Address>
          </Address>
        </GE>
      </SubNetwork>
    </Communication>
  </SCL>
</int>
```
Specification and Configuration
IEC 61850 configuration process

**Design Sequence:**
1. Design SSD
2. Create SCD = integrate SSD with manufacturer provided ICDs and add communication configuration
3. Generate IED specific CID for each IED
4. Download CIDs into IEDs
Specification and Configuration
Design - System Specification Description (SSD)

- Single-line diagram represented as SSD file

Specification and Configuration
Specification – Substation Configuration Description (SCD)
Specification and Configuration
IEC 61850 configuration process

**Design Sequence:**

1. **Design SSD**

2. Create SCD = integrate SSD with manufacturer provided ICDs and add communication configuration

3. Generate IED specific CID for each IED

4. Download CIDs into IEDs
Outline of the lecture

- Recap of modern substation architectures
  - IEC 61850 substation
  - Purpose and scope of IEC 61850
- IEC 61850 Information Model
- Specification and configuration
- Substation communication
  - Very brief introduction (more coming next week)

Substation communication

- OO information exchange
- Protocols
Substation communication

OO information exchange

Substation communication

OO information exchange - Vertical
Substation communication

OO information exchange - Horizontal

Substation communication

Protocols
The End