



**CENTRO STUDI  
DI ECONOMIA E TECNICA DELL'ENERGIA  
“GIORGIO LEVI CASES”**

OVERVIEW

BACKGROUND

ADVANCEMENTS

OUTCOMES

SYNERGIES

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CENTRO STUDI DI ECONOMIA E  
TECNICA DELL'ENERGIA  
"GIORGIO LEVI CASES"



# OVERVIEW

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CENTRO STUDI DI ECONOMIA E  
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"GIORGIO LEVI CASES"



# OVERVIEW

## Open protocols for energy networks

BIM IFC standards and lot solutions to support digital twin based  
Energy Management of public real estate assets



CENTRO STUDI DI ECONOMIA E  
TECNICA DELL'ENERGIA  
"GIORGIO LEVI CASES"

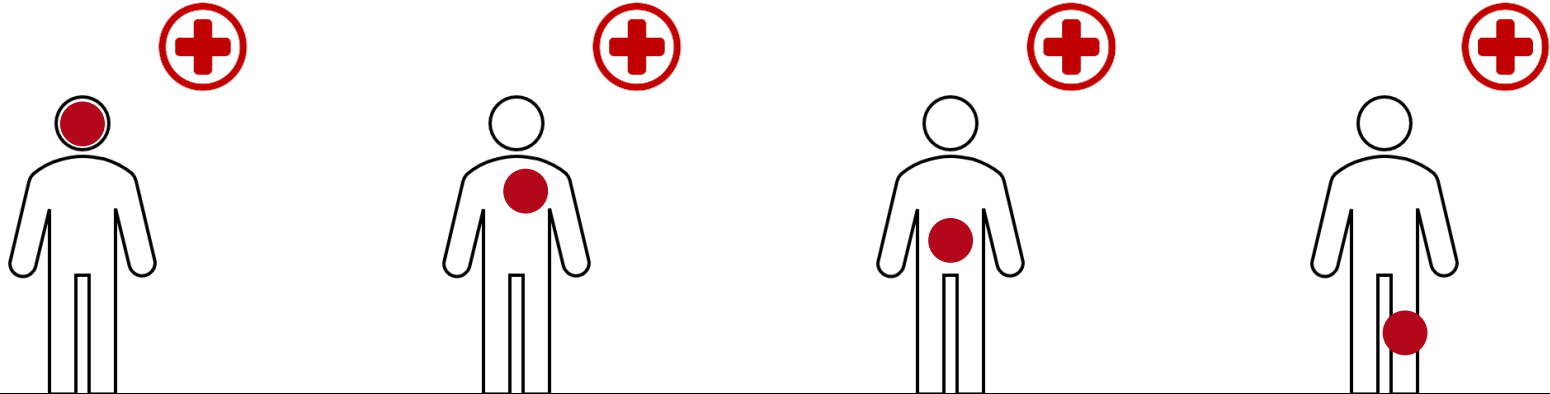


# OVERVIEW

WHY IS IT RELEVANT IN THE ENERGY TRANSITION?

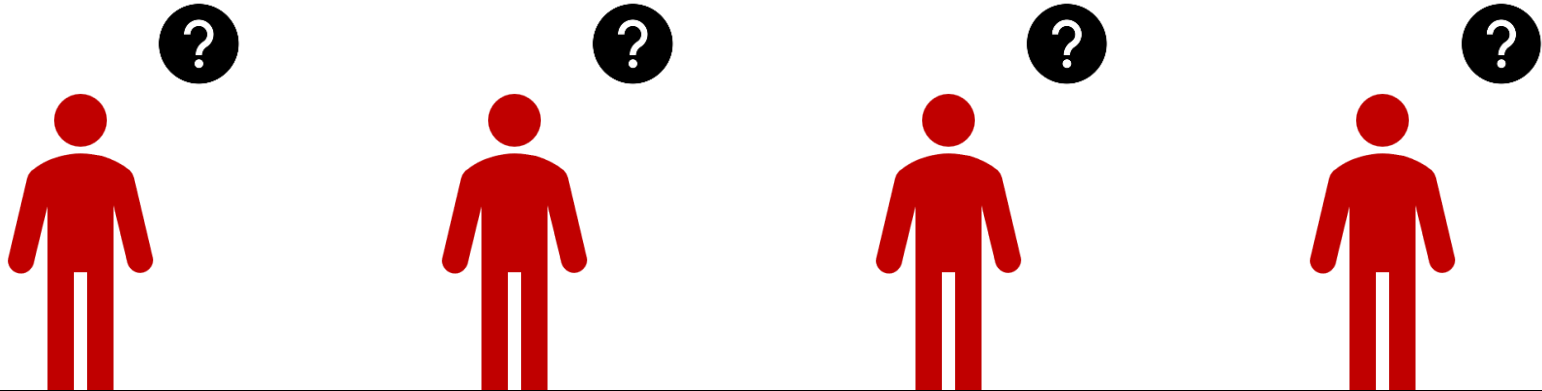
Open protocols for energy networks

# OVERVIEW



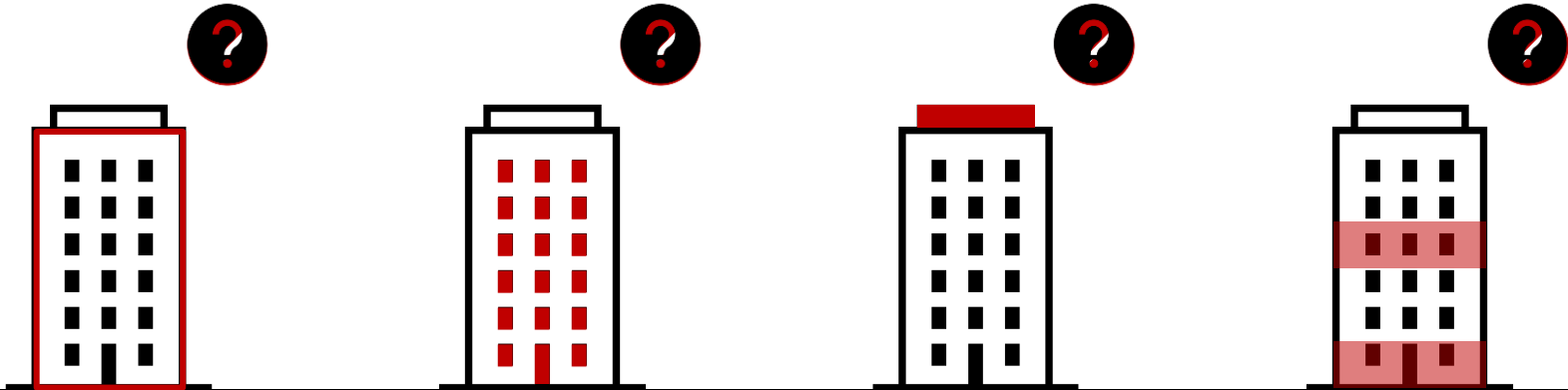
**O**pen **p**rotocols for **e**nergy **n**etworks

# OVERVIEW



Open protocols for energy networks

# OVERVIEW



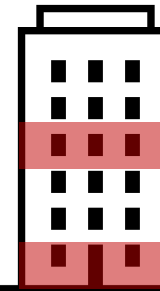
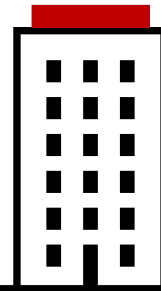
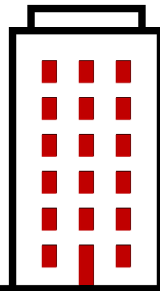
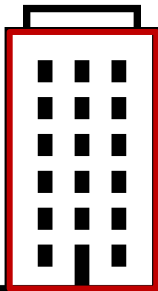
**Open  
BIM**

IFC ISO  
standard  
16739

**p**rotocols for **e**nergy **n**etworks



# OVERVIEW



Open  
BIM

protocols for energy networks

BMS

BMS

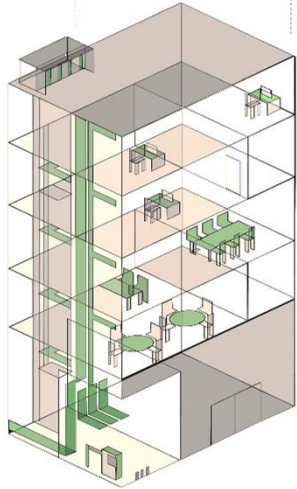
BMS

BMS

BMS

# OVERVIEW

(interoperability layer –  
openDATA)



**BIM**



**DATA**



**SIMULATION**

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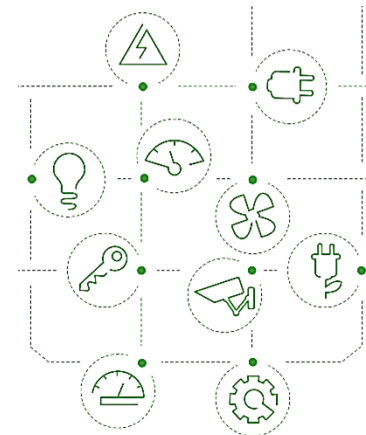
**MONITORING**



**IMPLEMENTATIO**



**BMS**



# OVERVIEW

## BUILDING MANAGEMENT SYSTEM

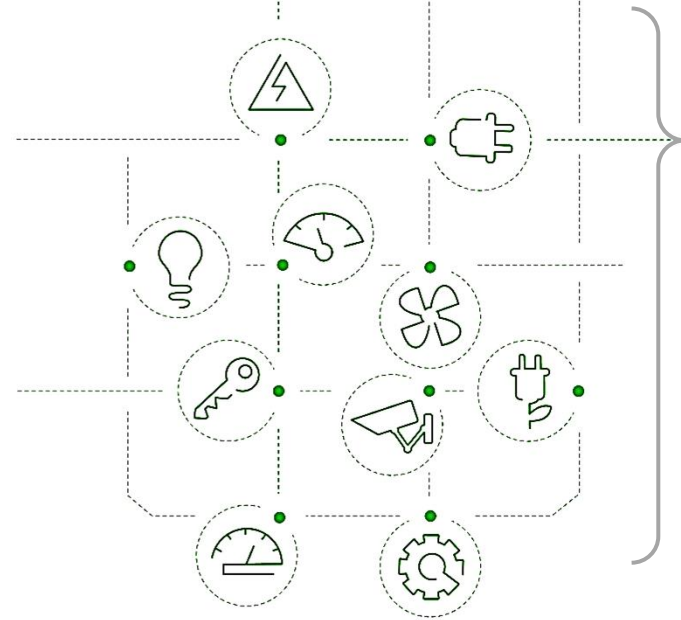
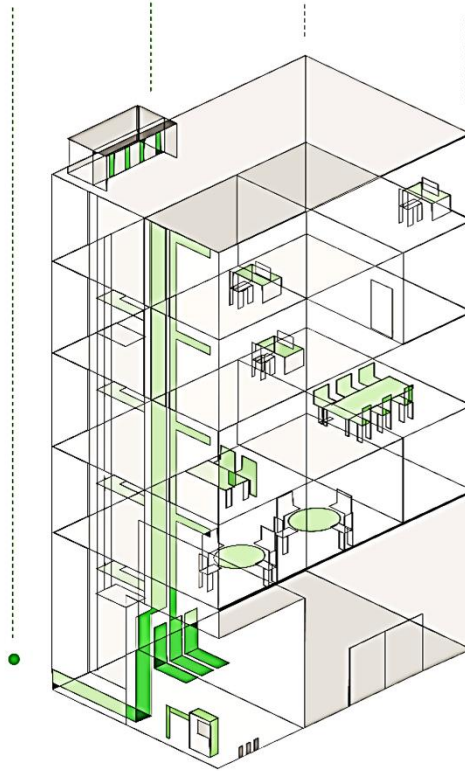
(Interoperability layer – openDATA)

DAT DAT DAT DAT

DAT A DAT A DAT A

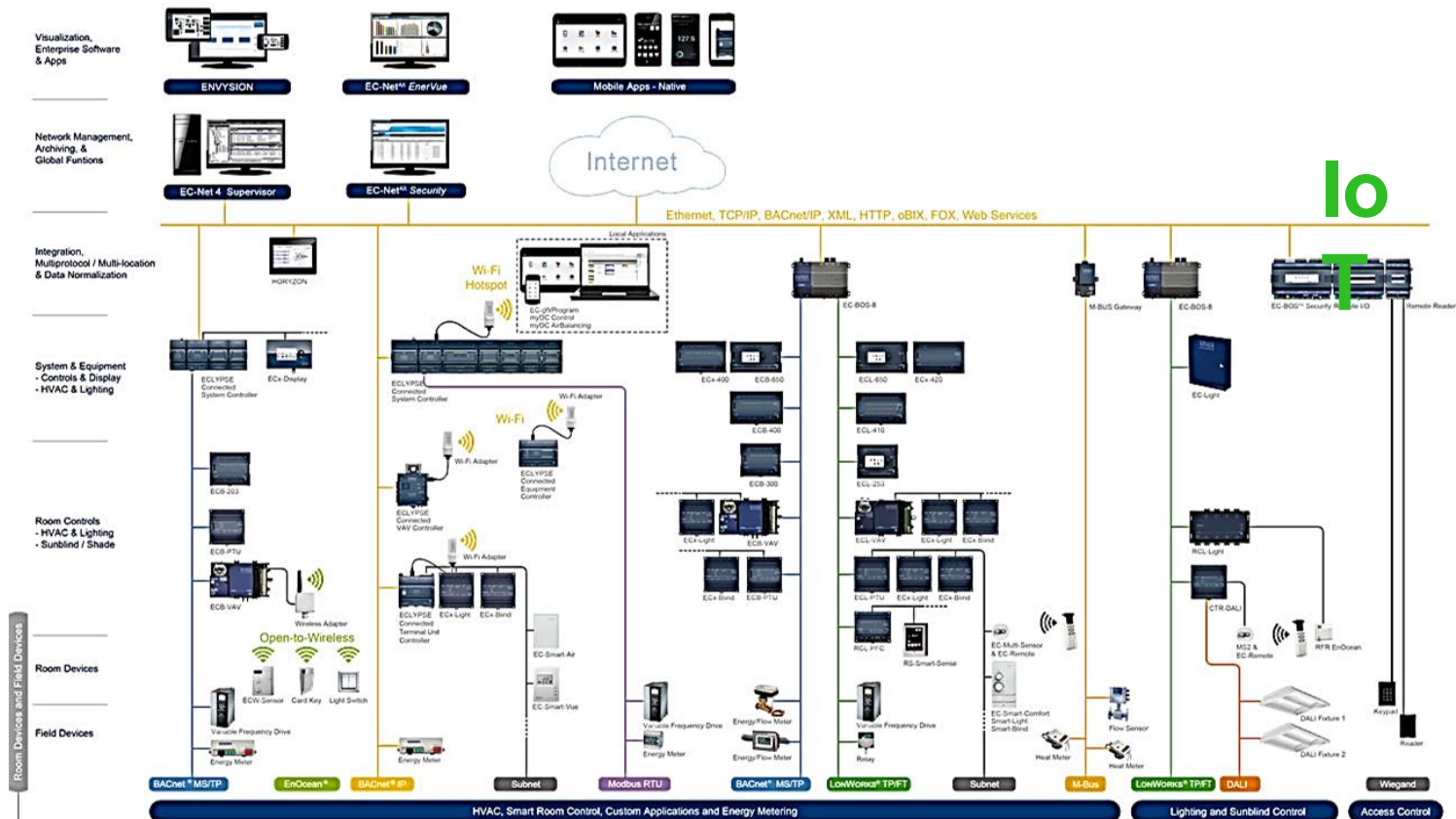
Mode  
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s



IoT

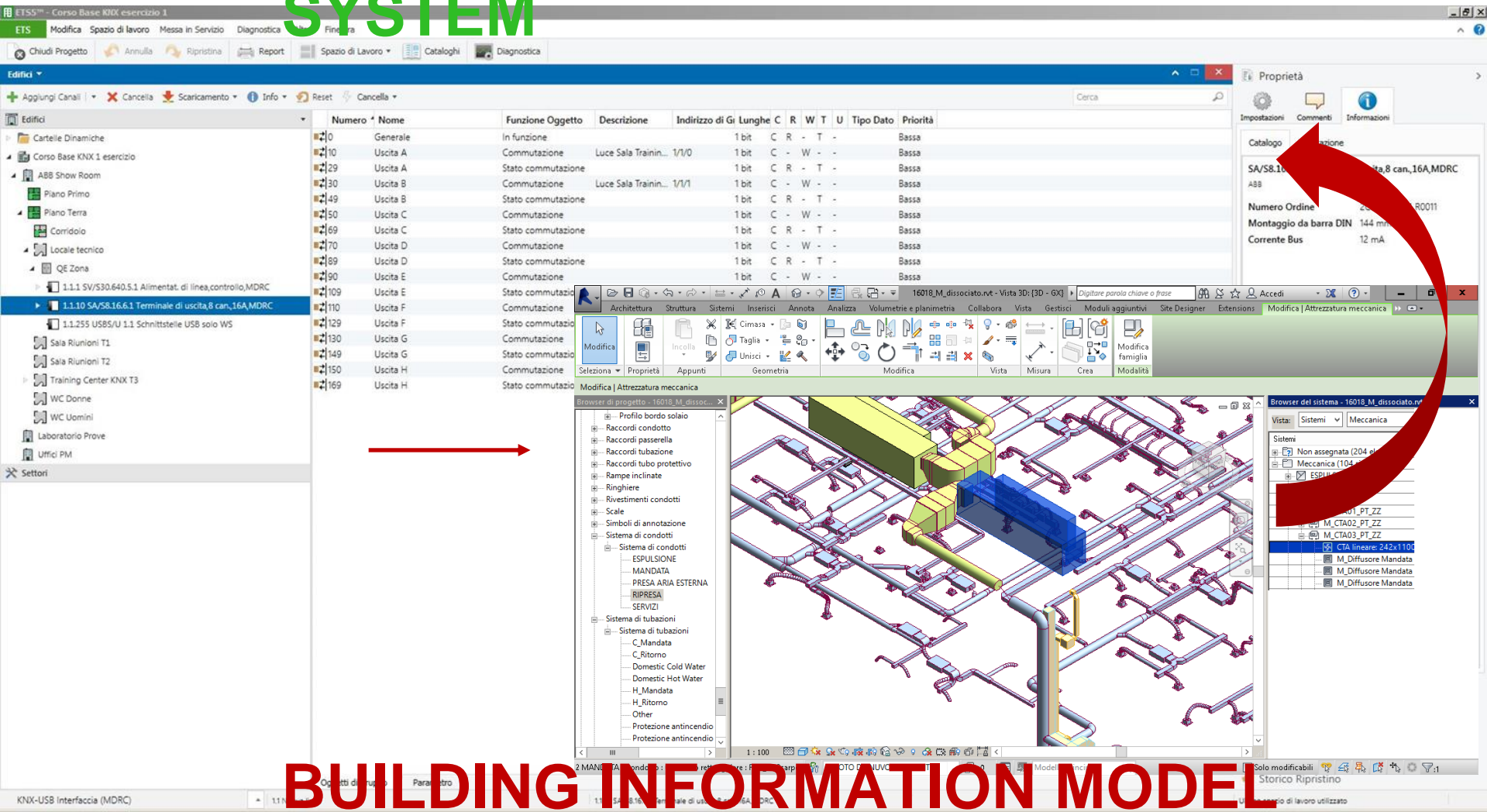
## BUILDING MANAGEMENT SYSTEM



Distech Controls offers an extensive range of best-of-breed, performance-proven field devices that complement our building automation offering. This comprehensive line of field devices - including a variety of Distech Controls labelled products - offers a complete, cost effective solution, from design to installation.



## BUILDING MANAGEMENT SYSTEM



The screenshot displays the ETS software interface for building management system design. The main window shows a table of components with the following columns: Numero, Nome, Funzione Oggetto, Descrizione, Indirizzo di Gi, Lungh, C, R, W, T, U, Tipo Dato, and Priorità.

Numero	Nome	Funzione Oggetto	Descrizione	Indirizzo di Gi	Lungh	C	R	W	T	U	Tipo Dato	Priorità
0	Generale	In funzione			1 bit	C	R	-	T	-		Bassa
10	Uscita A	Commutazione	Luce Sala Trainin... 1/1/0		1 bit	C	-	W	-	-		Bassa
29	Uscita A	Stato commutazione			1 bit	C	R	-	T	-		Bassa
30	Uscita B	Commutazione	Luce Sala Trainin... 1/1/1		1 bit	C	-	W	-	-		Bassa
49	Uscita B	Stato commutazione			1 bit	C	R	-	T	-		Bassa
50	Uscita C	Commutazione			1 bit	C	-	W	-	-		Bassa
69	Uscita C	Stato commutazione			1 bit	C	R	-	T	-		Bassa
70	Uscita D	Commutazione			1 bit	C	-	W	-	-		Bassa
89	Uscita D	Stato commutazione			1 bit	C	R	-	T	-		Bassa
90	Uscita E	Commutazione			1 bit	C	-	W	-	-		Bassa
109	Uscita E	Stato commutazione			1 bit	C	R	-	T	-		Bassa
110	Uscita F	Commutazione			1 bit	C	-	W	-	-		Bassa
129	Uscita F	Stato commutazione			1 bit	C	R	-	T	-		Bassa
130	Uscita G	Commutazione			1 bit	C	-	W	-	-		Bassa
149	Uscita G	Stato commutazione			1 bit	C	R	-	T	-		Bassa
150	Uscita H	Commutazione			1 bit	C	-	W	-	-		Bassa
169	Uscita H	Stato commutazione			1 bit	C	R	-	T	-		Bassa

The interface also features a 3D model of the system components, a tree view on the left, and a properties panel on the right. A red arrow points from the table to the 3D model, and another red arrow points from the 3D model to the properties panel.

## BUILDING INFORMATION MODEL



# OVERVIEW

## BUILDING MANAGEMENT SYSTEM



```
<ObjectIdentifier displayName="analog-input,2" value="0,2" propertyIdentifier="75"/>
<String value="CT1_STMandata" propertyIdentifier="77" name="ObjectName"/>
<Enumerated displayName="analog-input" value="0" propertyIdentifier="79" name="ObjectType"/>
<Real value="150.000000" propertyIdentifier="85" name="PresentValue"/>
<String value="sonda temperatura mandata" propertyIdentifier="28" name="Description"/>
<BitString value="" propertyIdentifier="111" name="StatusFlags"/>
<Enumerated displayName="normal" value="0" propertyIdentifier="36" name="EventState"/>
<Enumerated displayName="no-fault-detected" value="0" propertyIdentifier="103" name="Reliability"/>
<Boolean value="FALSE" propertyIdentifier="81" name="OutOfService"/>
<Enumerated displayName="degrees-Celsius" value="62" propertyIdentifier="117" name="units"/>
</Object>
```

**IfcOpenshell:** editing e query su modelli ifc

**ElementTree:** editing e query su modelli xml



PYTHON

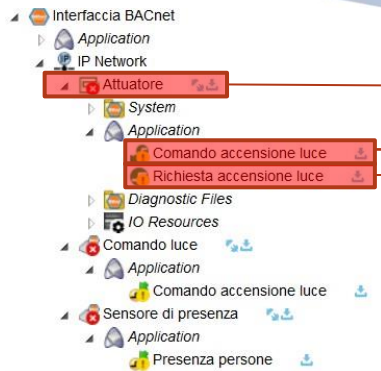
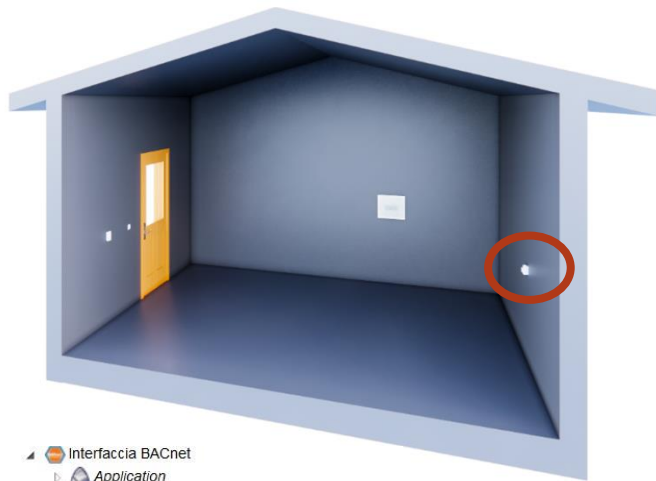


openBIM/ifc

```
3996 <IfcPropertySingleValue id="12486">
3997 <Name>INPUT sonda temp. mandata (°C)</Name>
3998 <Object>
3999 <ObjectIdentifier displayName="analog-input,2" value="0,2" propertyIdentifier="75"/>
4000 <String value="CT1_STMandata" propertyIdentifier="77" name="ObjectName"/>
4001 <Enumerated displayName="analog-input" value="0" propertyIdentifier="79" name="ObjectType"/>
4002 <Real value="150.000000" propertyIdentifier="85" name="PresentValue"/>
4003 <String value="sonda temperatura mandata" propertyIdentifier="28" name="Description"/>
4004 <BitString value="" propertyIdentifier="111" name="StatusFlags"/>
4005 <Enumerated displayName="normal" value="0" propertyIdentifier="36" name="EventState"/>
4006 <Enumerated displayName="no-fault-detected" value="0" propertyIdentifier="103" name="Reliability"/>
4007 <Boolean value="FALSE" propertyIdentifier="81" name="OutOfService"/>
4008 <Enumerated displayName="degrees-Celsius" value="62" propertyIdentifier="117" name="units"/>
4009 </Object>
4010 <NominalValue>
4011 <IfcReal-wrapper>21.5</IfcReal-wrapper>
4012 </NominalValue>
4013 </IfcPropertySingleValue>
```

# BUILDING INFORMATION MODEL

# OVERVIEW



```

9 <ExportedObjects>
10 <OI NAME="Interfaccia BACnet" TYPE="bacnet.Device">
11 <OI NAME="IP Network" TYPE="bacnet.IPDataLink">
12 <PI Name="NetworkId" Value="1"/>
13 <OI NAME="Attuatore" TYPE="bacnet.mpx.udt.RPC12A">
14 <OI NAME="IO Resources" TYPE="bacnet.mpx.IOResources" declared="1">
15 <OI NAME="Ports" TYPE="bacnet.mpx.PortsFolder" declared="1">
16 <OI DESCR="Room Bus" NAME="RS485-COMB" TYPE="bacnet.mpx.ports.RS485" declared="1"/>
17 <OI DESCR="Sensor Bus" NAME="RS485-COMA" TYPE="bacnet.mpx.ports.RS485" declared="1"/>
18 <OI DESCR="USB" NAME="USB" TYPE="bacnet.mpx.ports.USBPort" declared="1"/>
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52 <OI NAME="Application" TYPE="bacnet.mpx.RPXApplicationProxy" declared="1">
53 <OI NAME="Richiesta accensione luce" TYPE="bacnet.mpx.value.DigitalValue">
54 <PI Name="ActiveText" Value=""/>
55 <PI Name="ForeignAddress" Value="&lt;binary-value, 10&gt;"/>
56 <PI Name="InactiveText" Value=""/>
57 <PI Name="Priority1" Type="bacnet.pt.BACnetBinaryPV"/>
58 <PI Name="Priority10" Type="bacnet.pt.BACnetBinaryPV"/>
59 <PI Name="Priority11" Type="bacnet.pt.BACnetBinaryPV"/>
60 <PI Name="Priority12" Type="bacnet.pt.BACnetBinaryPV"/>
61 <PI Name="Priority13">
62
63
64
65
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79
80 <OI NAME="Comando accensione luce" TYPE="bacnet.mpx.point.DigitalOutput">
81 <PI Name="ForeignAddress" Value="&lt;binary-output, 11&gt;"/>
82 <PI Name="Priority1" Type="bacnet.pt.BACnetBinaryPV"/>
83 <PI Name="Priority10" Type="bacnet.pt.BACnetBinaryPV"/>
84 <PI Name="Priority11" Type="bacnet.pt.BACnetBinaryPV"/>
85 <PI Name="Priority12" Type="bacnet.pt.BACnetBinaryPV"/>
86 <PI Name="Priority13" Type="bacnet.pt.BACnetBinaryPV"/>

```

# BACKGROUND

*“why it is relevant in the energy transition”*

***GESTIONE DIGITALE DEI CONSUMI E INTEROPERABILITÀ DELLE  
INFORMAZIONI RELATIVE AGLI ASSET EDILIZI***

*“how it helps to meet the 2030 and 2050 target on CO2 emissions”*

***ASSICURARE LA EFFICACE IMPLEMENTAZIONE DELLE STRATEGIE DI  
GOVERNO E LA CIRCUITAZIONE DEI DATI/BEST PRACTICES***

*“if you are using a specific technology”*

***BIM / BACS IN OPENFORMAT (STANDARD ISO 16739 E ISO 16484-6)***

*“how current international agencies are projecting such technology”*

***OBBLIGO NORMATIVO: (EU) DIRETTIVA 24/2014 (IT) DM 560/16 E SSMM***



*“how the project advances respect to the state of the art”*

- ***USO LIMITATO DEGLI STANDARD***
- ***POCA COMPETENZA SUL CORRETTO INDIRIZZAMENTO DELLE INFORMAZIONI ALLE CLASSI PREPOSTE***
- ***LIMITATA DISPONIBILITÀ DI TECNOLOGIE INFORMATICHE***

# OUTCOMES

*“how it can follow up in future research (and if LC can help)”*

- ***USO LIMITATO DEGLI STANDARD***
- ***APPROFONDIMENTO DELLA CONOSCENZA SULLO STANDARD E DEFINIZIONE DI STANDARD PER IL MONITORAGGIO***
- ***POCA COMPETENZA SUL CORRETTO INDIRIZZAMENTO DELLE INFORMAZIONI ALLE CLASSI PREPOSTE***
- ***SPERIMENTAZIONE SULLE PROCEDURE DI CONDIVISIONE DEI DATI***
- ***LIMITATA DISPONIBILITÀ DI TECNOLOGIE INFORMATICHE***
- ***SVILUPPO DI SOLUZIONI DI COMPILAZIONE E INFORMATION EXCHANGE***

*“synergies between different groups (i.e interdisciplinary approach)”*

- **USO LIMITATO DEGLI STANDARD**
- **LIVELLO DISCIPLINARE: SISTEMI EDILIZI- SISTEMI IMPIANTISTICI – ENERGETICA DEGLI EDIFICI**
- **POCA COMPETENZA SUL CORRETTO INDIRIZZAMENTO DELLE INFORMAZIONI ALLE CLASSI PREPOSTE**
- **LIVELLO STRATEGICO: ANALISI DATI – ENERGY MANAGEMENT – INFORMATION MODELING AND MANAGEMENT**
- **LIMITATA DISPONIBILITÀ DI TECNOLOGIE INFORMATICHE**
- **LIVELLO TATTICO: COSING – DATA ANALYSIS**

**grazie!**



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