Introduction to KNX

L'avenir est à créer

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Parts of this presentation are based on the content of this link on *knxnet* and *actuasim*.

knxnet* et *actuasim is developed by Adrian Lescourt under the EMG4B project:

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KNX is approved as an open standard

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- **CENELEC**
  EN 50090 – the only European Standard for Home and Building Electronic Systems (HBES) based on KNX.
- **CEN**
  EN 13321-1 – the European Standard for Building Automation based on KNX.
- **ISO / IEC**
  ISO/IEC 14543-3 – the World`s only Standard for Home Electronic Systems (HES) based on KNX.
- **GB/Z**
  GB/Z 20965 – Chinese Standard for Home and Building Control based on KNX.
- **US Standard (ANSI/ASHRAE 135)**

KNX: The worldwide STANDARD for home and building control

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339 KNX members in 37 countries

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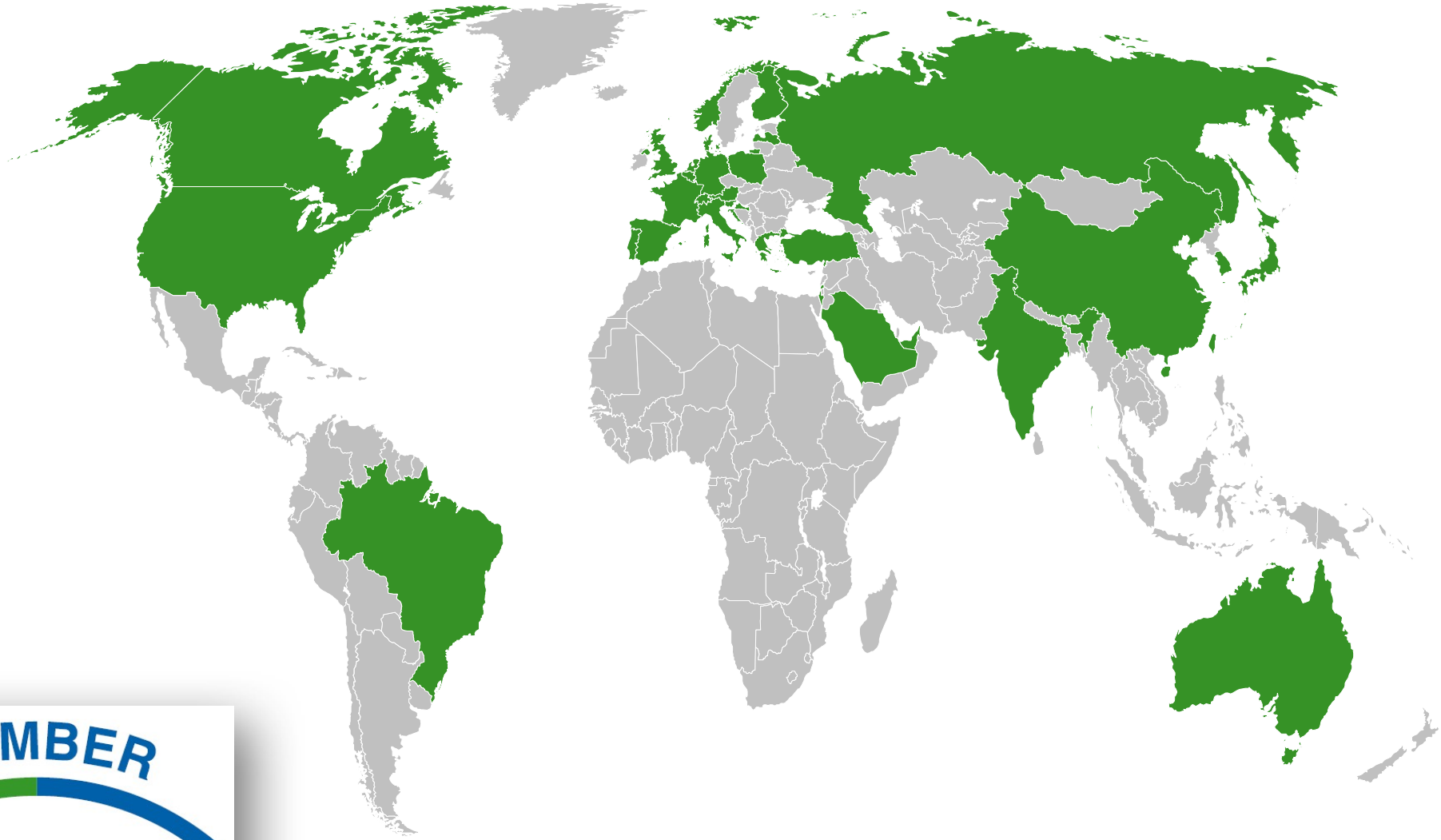

MEMBER
KNX

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32'561 KNX partners in 117 countries

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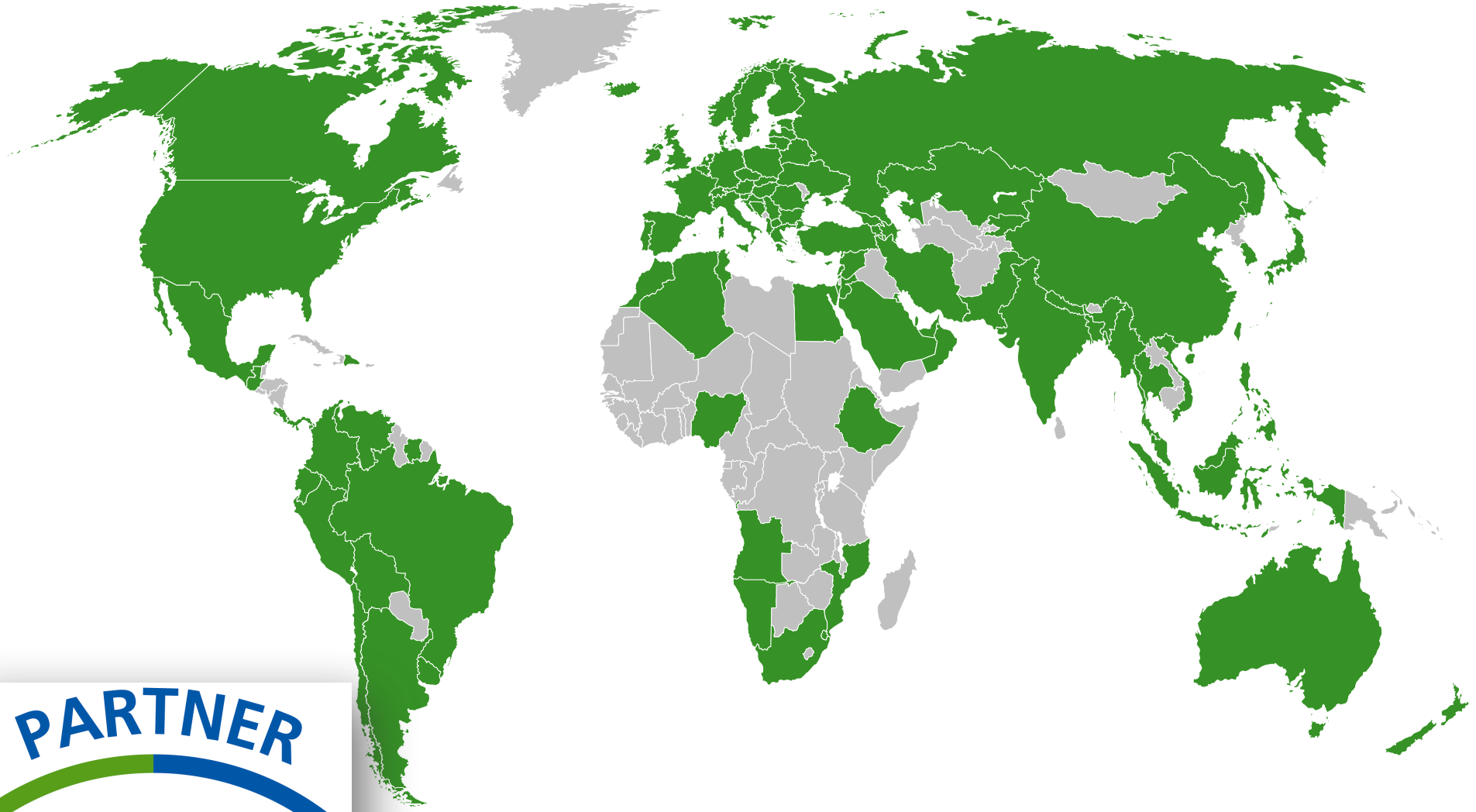
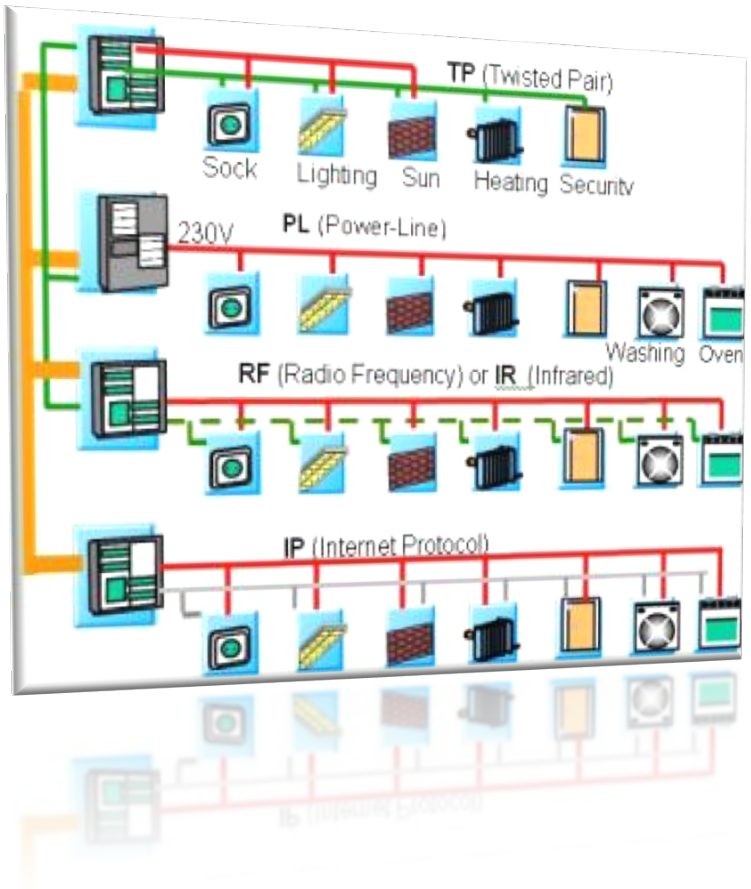


PARTNER

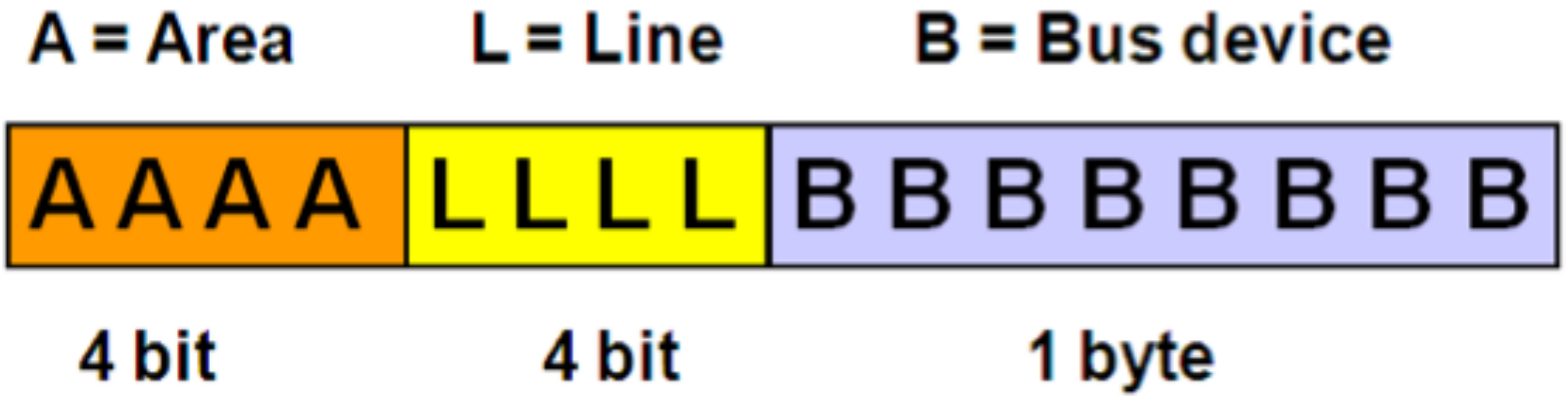
KNX

KNX supports several communication media

- **Twisted Pair (TP)**
- **Power Line (PL)**
- **Radio Frequency (RF)**
- **IP/Ethernet**

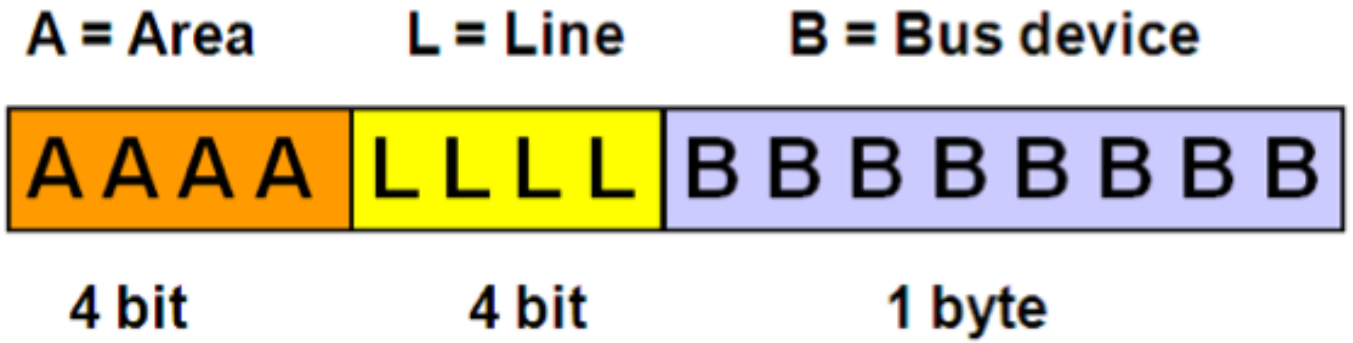


Individual address (physical address)



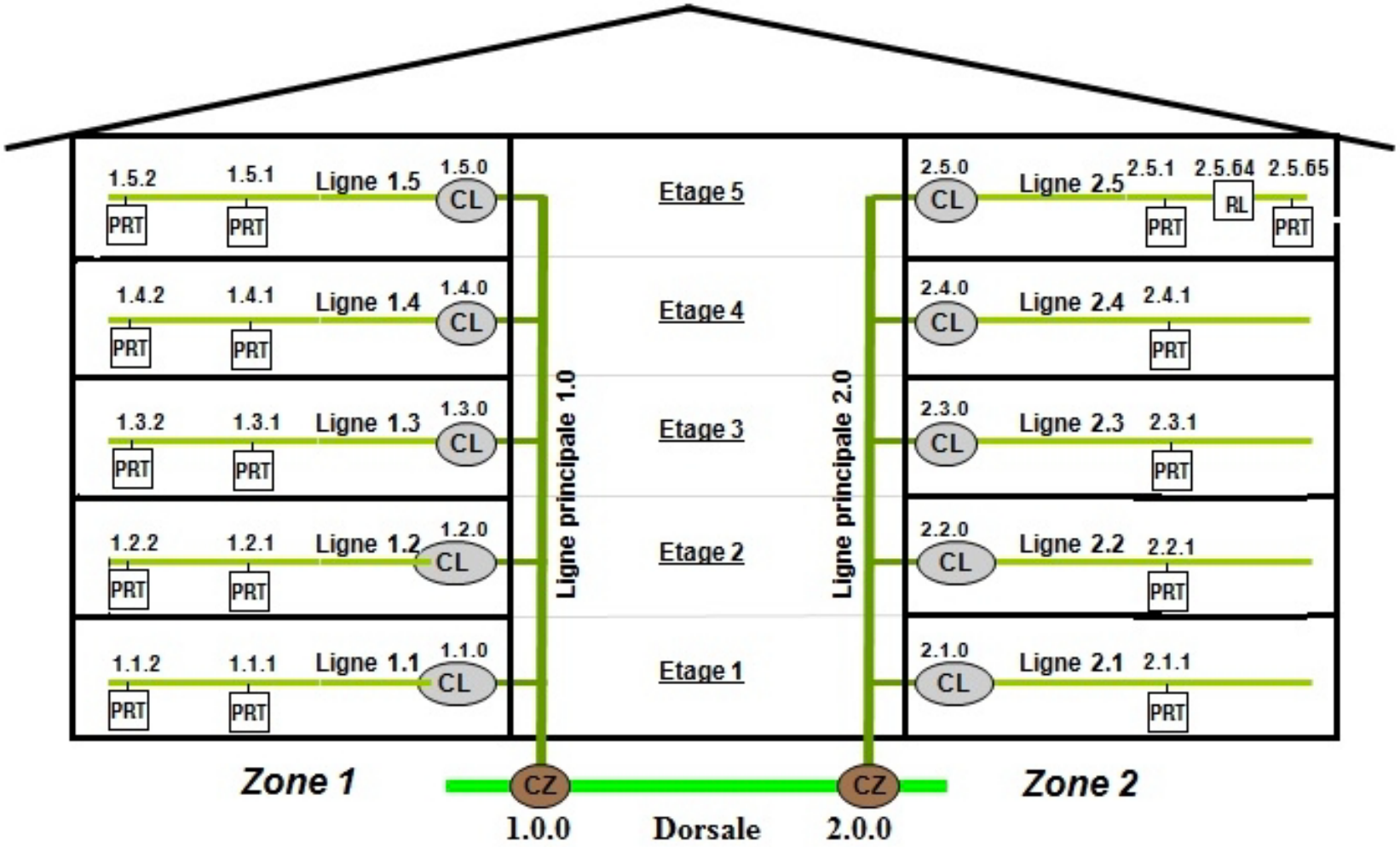
- Used for diagnosis, error rectification, modification of the installation by reprogramming
- Has no significance during normal operation.

Individual address (physical address)

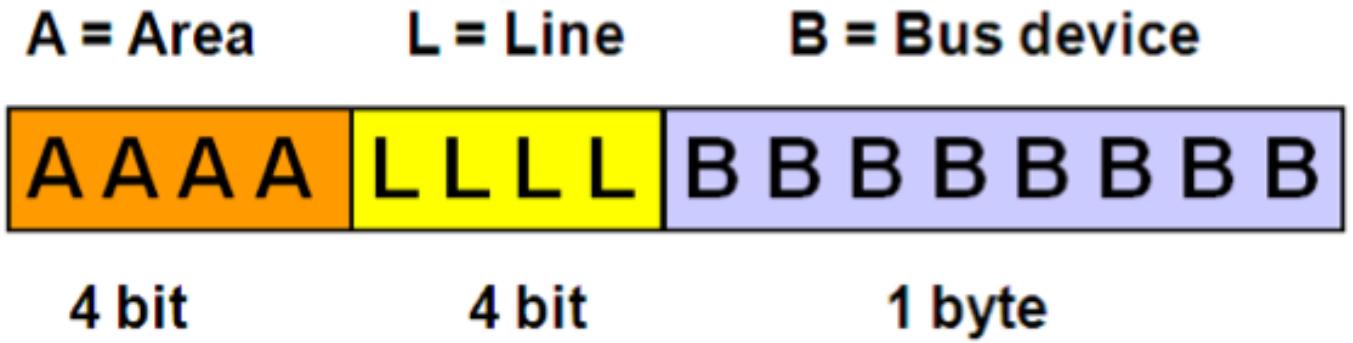


- The Physical address of the KNX device is defined with 16 bits: maximum of 35536 KNX devices.
- The individual address is used for diagnosis, error rectification, modification of the installation by reprogramming
- The individual address has no significance during normal operation.

Individual address (physical address)



Individual address (physical address)

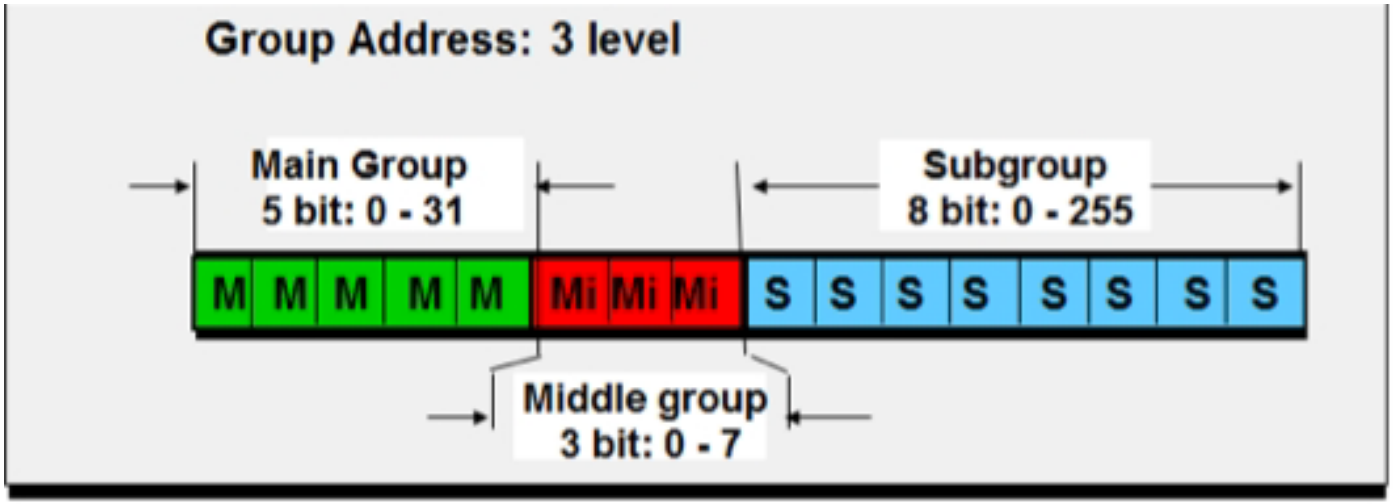


- Area number 0 is reserved for Backbone line.
- Line number 0 is reserved for Main line.
- Maximum of 15 areas with Backbone line
- Maximum of 15 lines with Main line in every area
- Maximum of 256 devices in every line

Group address

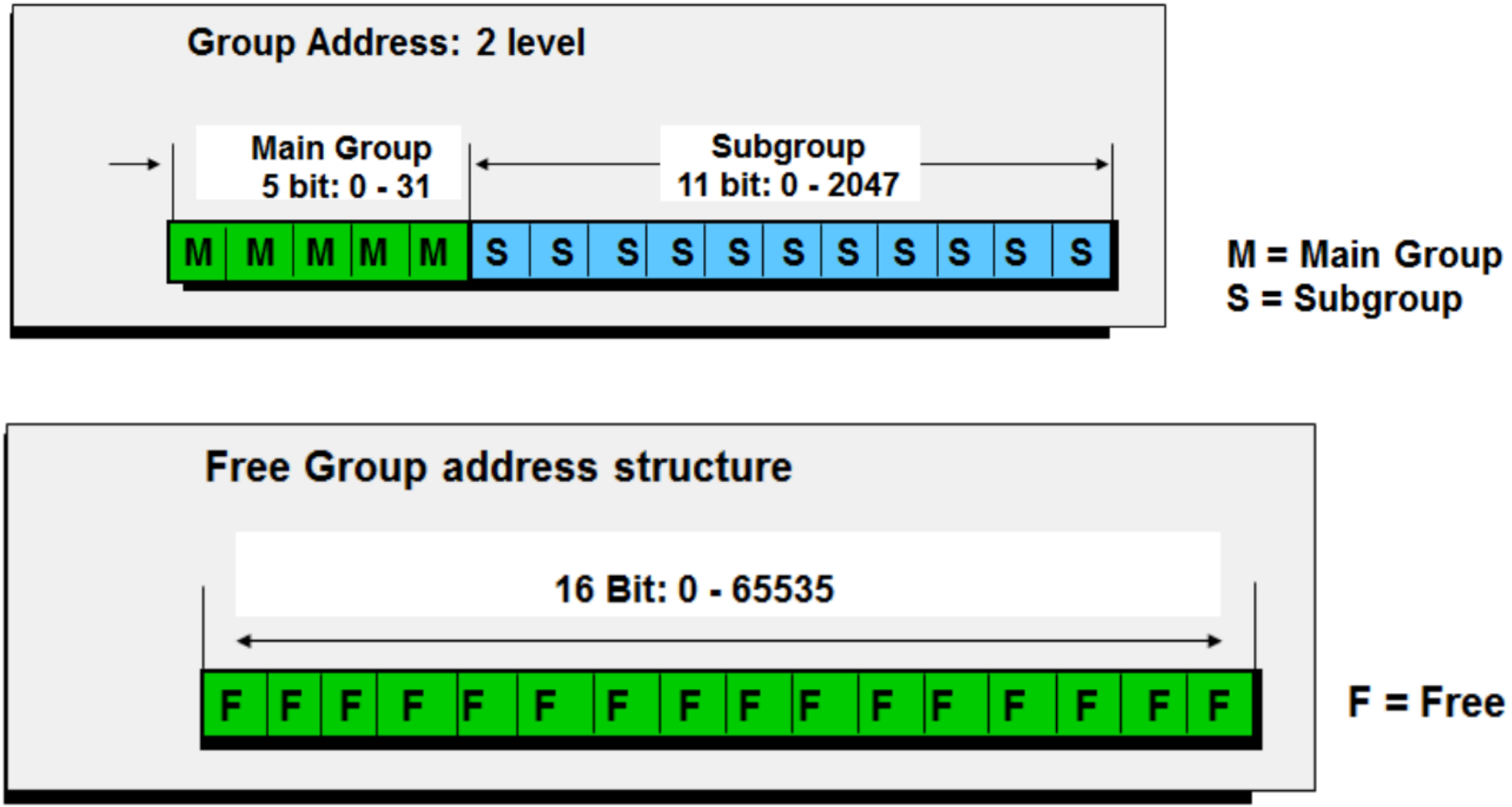
- Group addresses have logic or semantic meaning in the KNX network.
- Group addresses are used to define functions in the KNX network. These functions are from real life environment and not from the KNX world.
- A device can have several group addresses
- Group address x/y/z
  - x : function (Light switch, Light dimming, Blinds control, etc)
  - y: part of the house (Base floor, 1st floor, Basement …)
  - z : definition of the function

Group address



M = Main Group
Mi = Middle Group
S = Subgroup

Group address



Engineering Tool Software :ETS

- ETS is a manufacturer independent configuration software tool to design and configure intelligent home and building control installations with the KNX system.
- ETS is a software, which runs on Windows© platform based computers.

Telegram

	Contrôle	Adresse expéditeur	Adresse destinataire	Compteur de routage	Longueur	Données	Sécurité
Bits	8	16	17	3	4	16 x 8 Maximum	8

- Contrôle: indique la priorité du telegram.
- Adresse expéditeur: @ physique de la source du telegram.
- Adresse destinataire: @ physique ou adresse de groupe du destinataire.
- Le 17ème bit détermine le type d'adresse. 0 : @ physique. 1 : @ de groupe
- Compteur de routage : joue le même rôle que TTL dans un paquet IP.
- Longueur : nombre d'octets du champ "Données".
- Données : continent les données.
- Sécurité : détection d'erreur : contrôle de parité des octets du télégramme.

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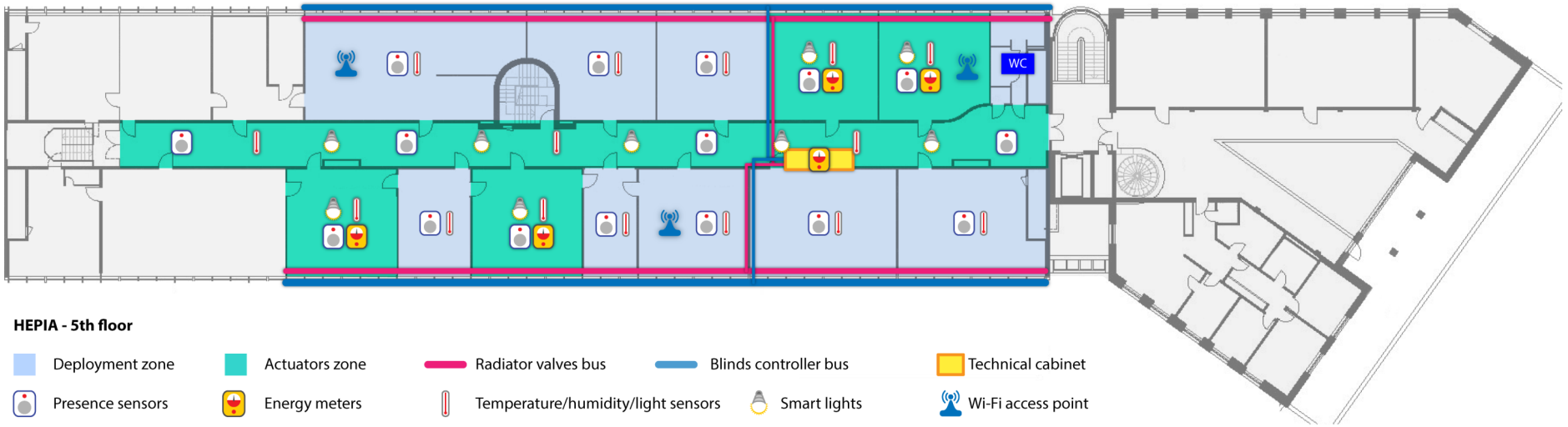
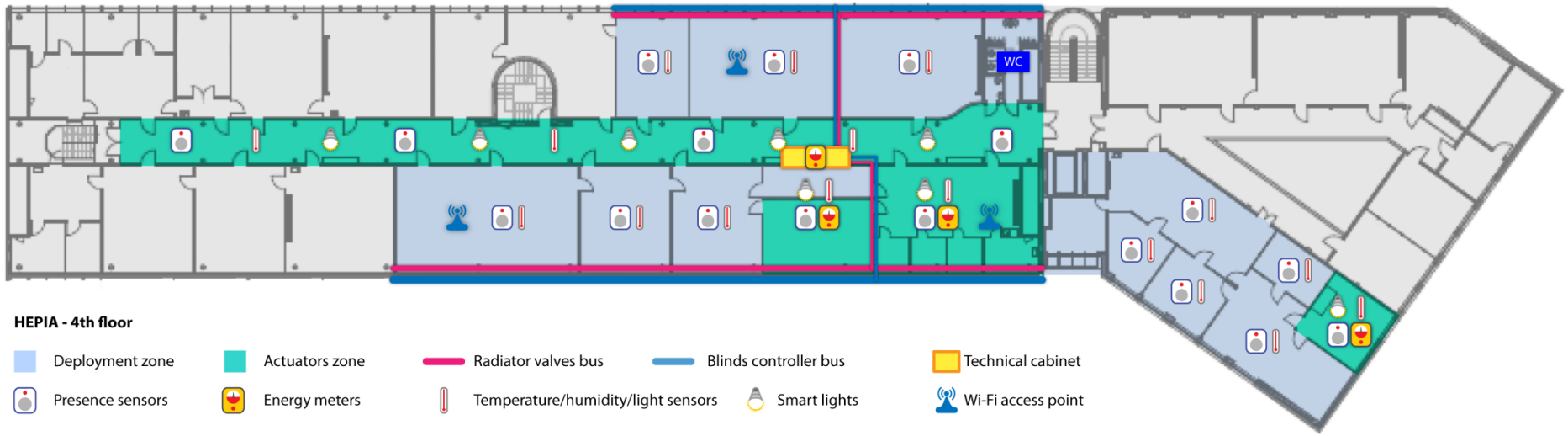


HEPIA - 5th floor

Deployment zone
Actuators zone
Radiator valves bus
Blinds controller bus
Technical cabinet
Presence sensors
Energy meters
Temperature/humidity/light sensors
Smart lights
Wi-Fi access point

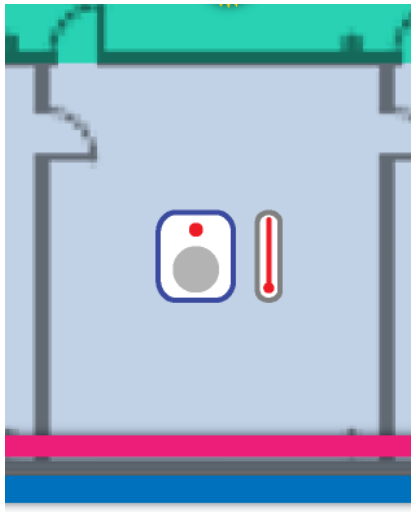


HEPIA - 4th floor

Deployment zone
Actuators zone
Radiator valves bus
Blinds controller bus
Technical cabinet
Presence sensors
Energy meters
Temperature/humidity/light sensors
Smart lights
Wi-Fi access point

First deployment

- Measures of :
  - Temperature
  - Humidity
  - Brightness
  - Presence



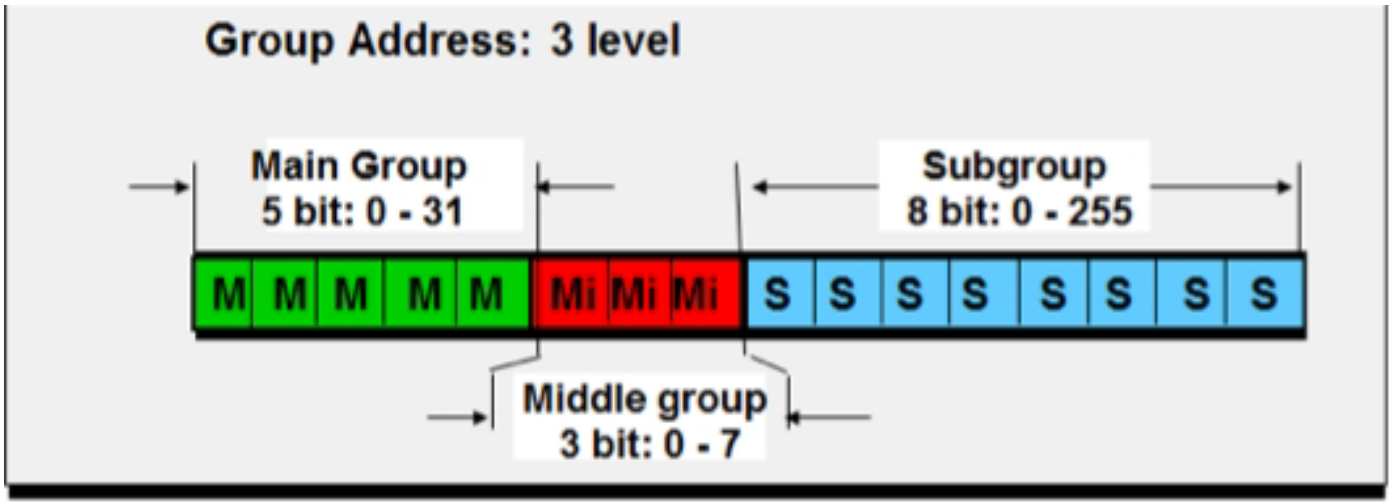
Second deployment

- Measures of :
  - Temperature
  - Humidity
  - Brightness
  - Presence
- Monitoring of :
  - Windows blinds
  - Radiators
  - Light

ETS: configuration des actionneurs dans smart-hepia

- Group address : x/y/z
  - x: type d'action (commande)
  - y: étage
  - z: numéro du bloc

- Actions (x)
  - 0: commande de la valve
  - 1: Fermeture du store
  - 2: Ouverture du store
  - 3: fermeture/ouverture partielle du store

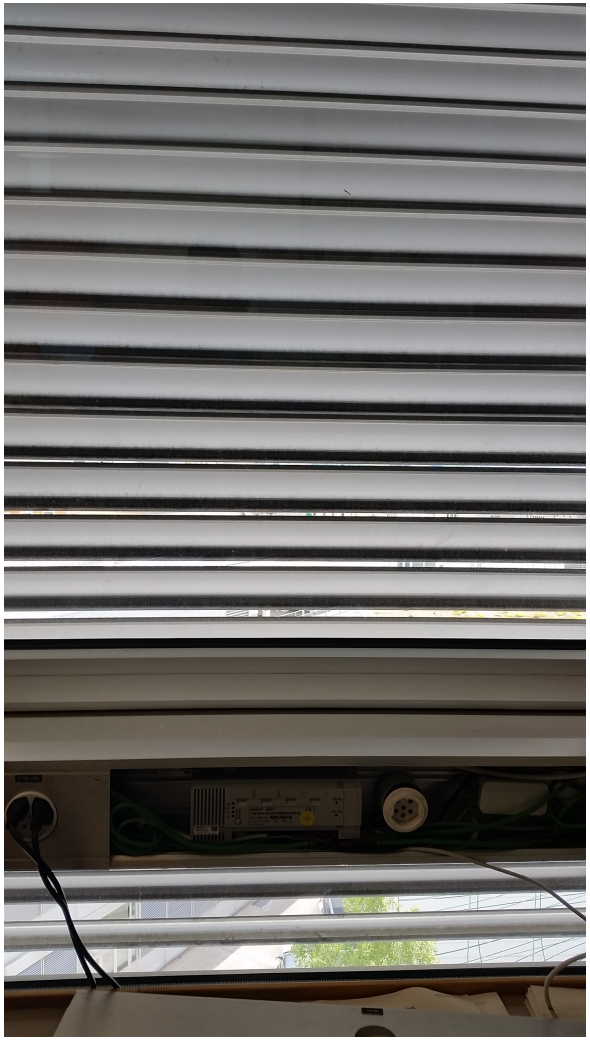


Actions

- Actions (champ *Données* dans le telegram):
  - **0** : commande des valves. la donnée transmise est un entier (2 octets): 0 (0%) 255 (100%)
  - **1** : commande des stores. La donnée transmise est un bit (1 octet) : 0 (ouverture à 100%) ou 1 (fermeture à 100%).
  - **2** : à ne pas utiliser
  - **3** : commande des stores. La donnée transmise est un entier (2 octets) : 0 (ouverture à 100%) .... 255 (fermeture à 100%)
  - **4** : Lecture de l'état du store : 0 (ouverture à 100%) .... 255 (fermeture à 100%).

	Contrôle	Adresse expéditeur	Adresse destinataire	Compteur de routage	Longueur	Données	Sécurité
Bits	8	16	17	3	4	16 x 8 Maximum	8

Animeo KNX (Somfy)



- Peut contrôler 4 moteurs

Servomoteur de vanne de radiateur KNX

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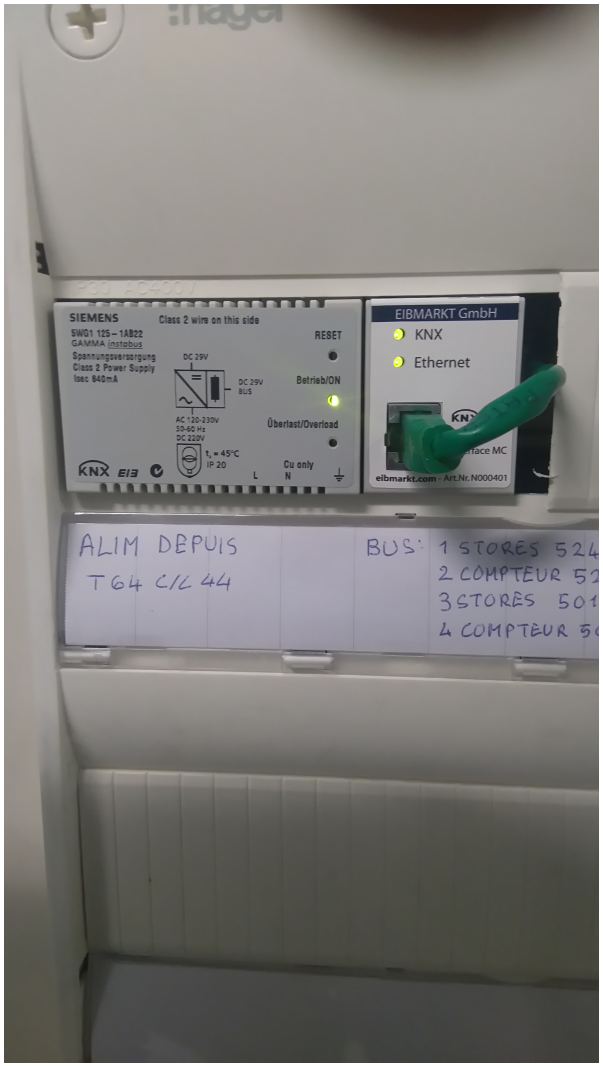
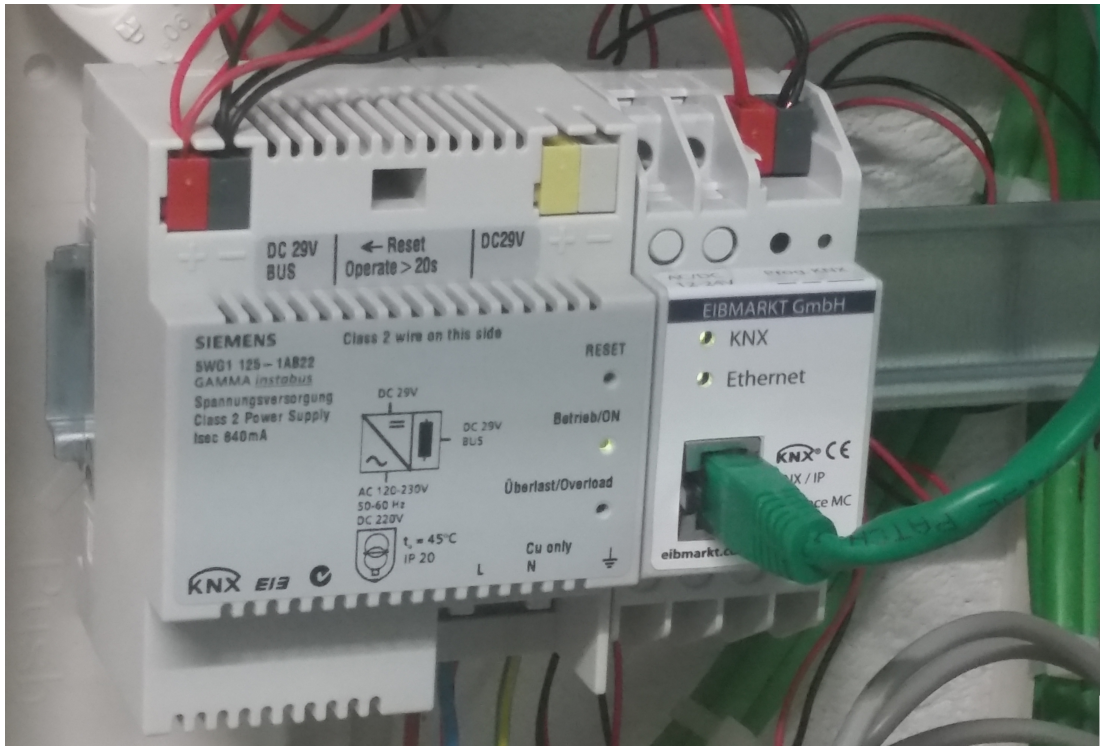
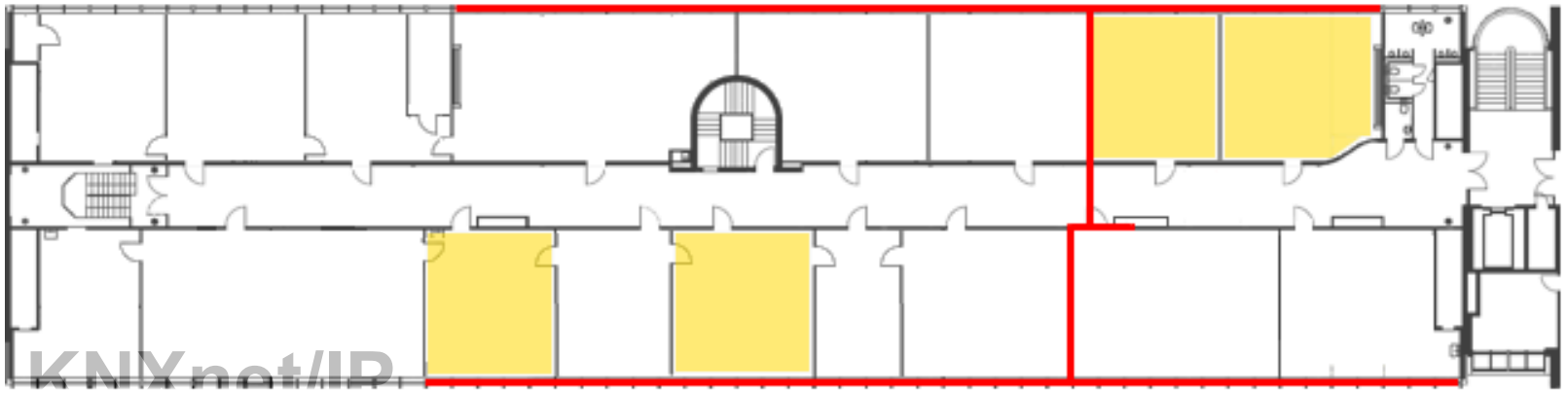
KNX/IP

Passerelle KNX/IP (EIBMARKT)

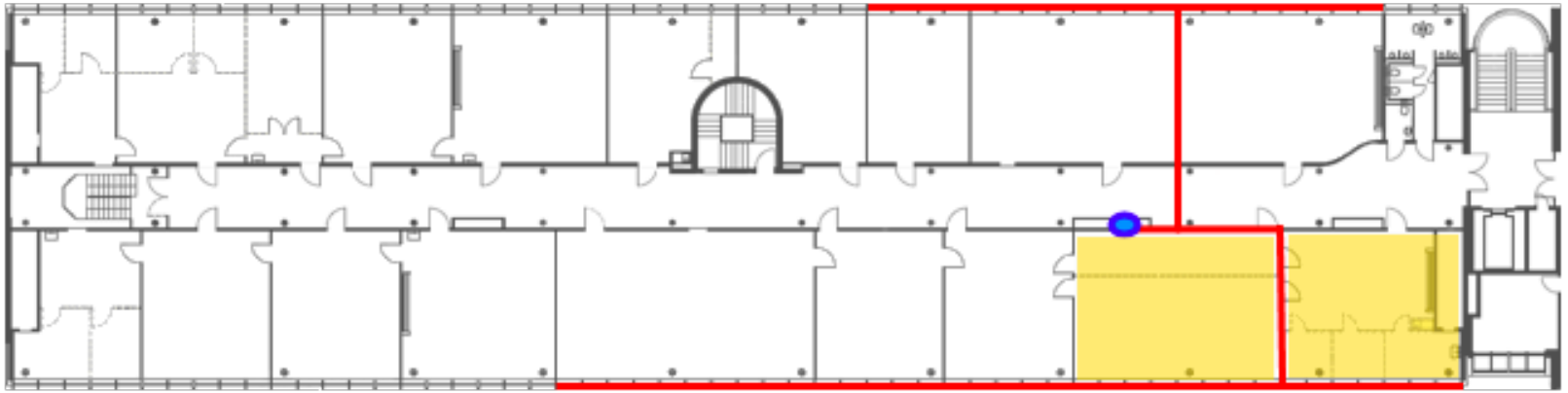




5éme étage



4éme étage

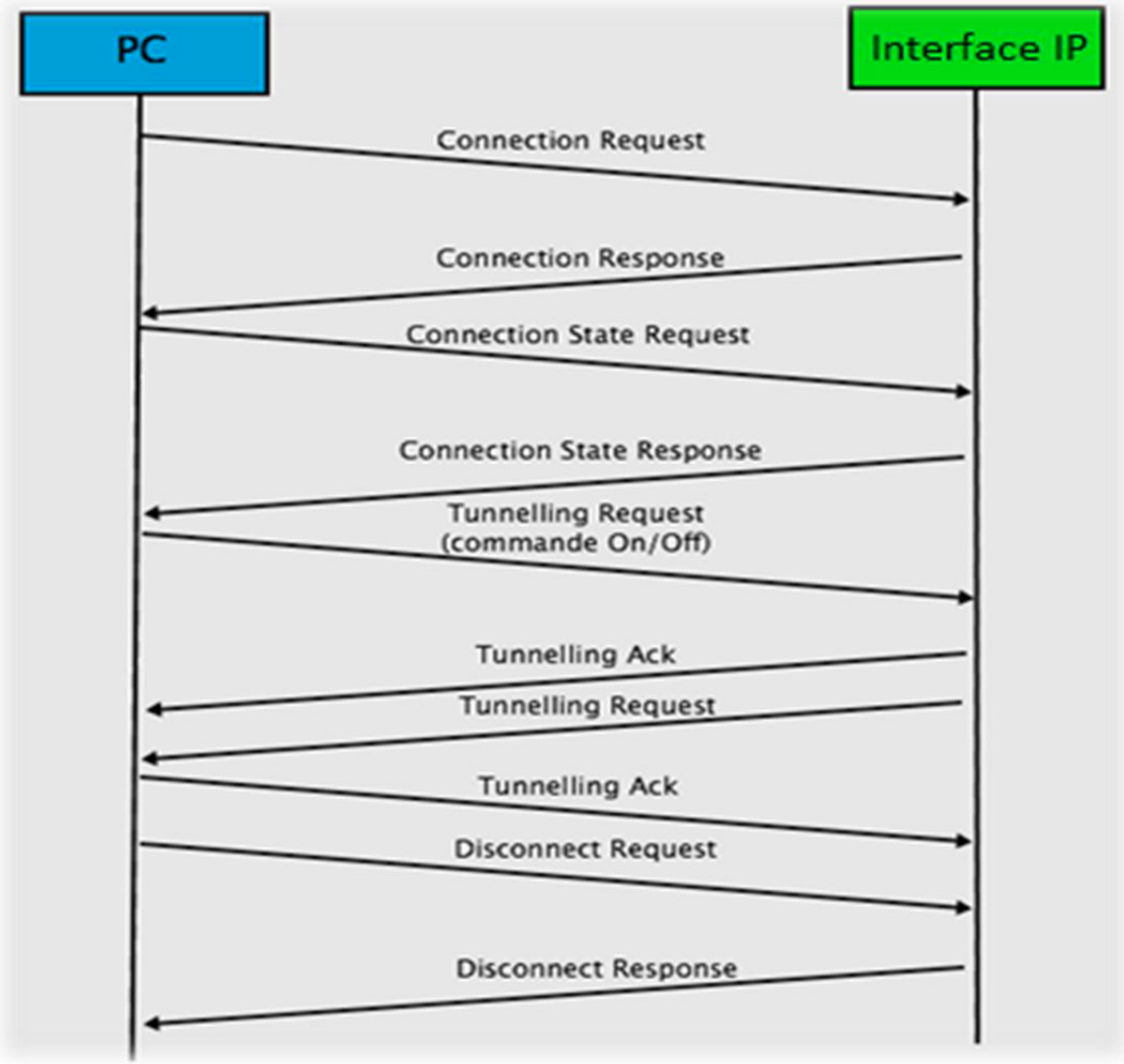


Interface KNX/IP

Salle équipée d'actionneurs

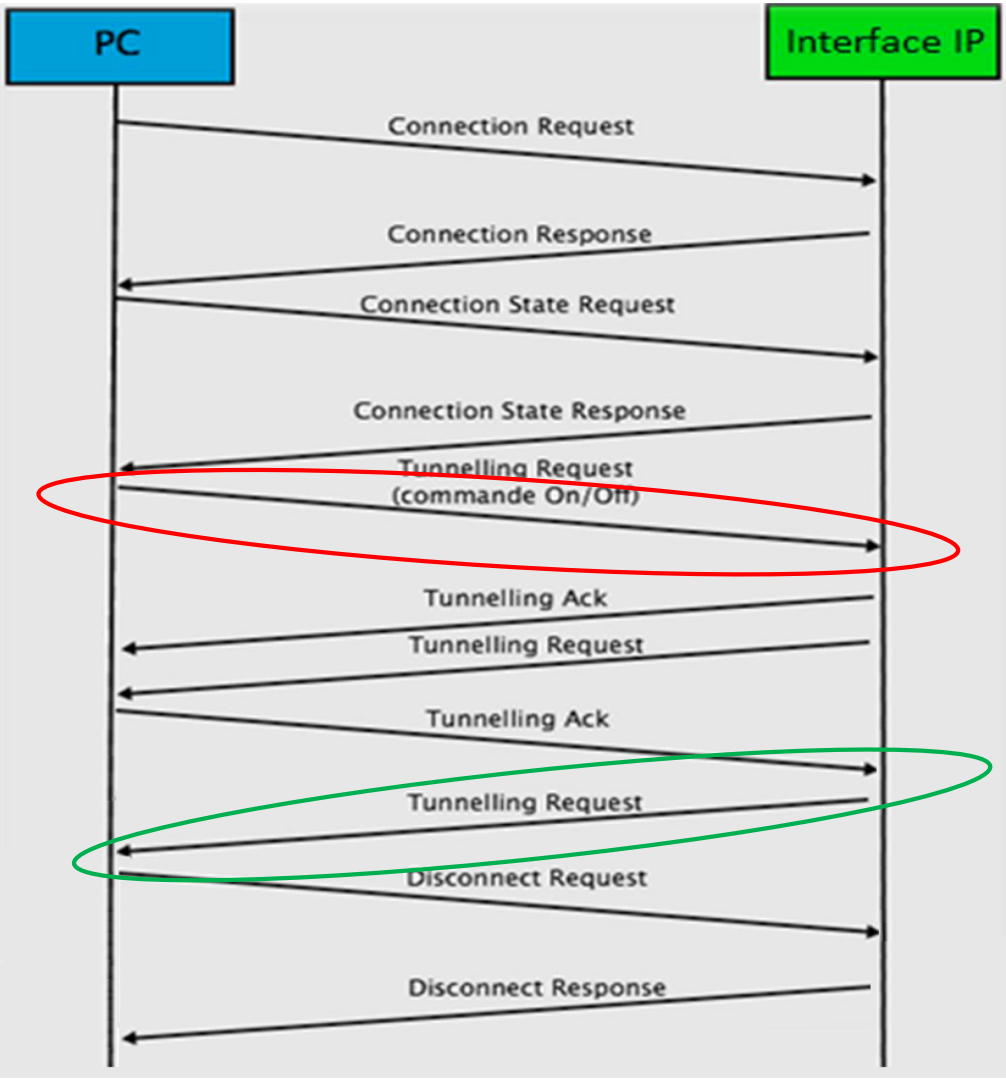
Bus KNX

KNX/IP (protocol used for a "write" operation: sending command)



http://www.eb-systeme.de/?page_id=479

KNX/IP (protocol used for a "read" operation: retrieving data)



Read command (question)

Reply (answer): Device status

CONNECTION_REQUEST & CONNECTION _RESPONSE

- Build a CONNECTION_REQUEST message (*conn_request*)
- Send *conn_request* to the KNX/IP router
  - Use UDP socket
  - The KNX/IP router is a "socket server" (IP, port)
- Receive a "reply" message from the KNX/IP router containing a CONNECTION_RESPONSE message (*conn_response*)
  - The *conn_response message* must be extracted from the "reply" message
  - The *conn_response* message contains a field called *channel_id.*

TUNNELLING_REQUEST & TUNNELLING_ACK

- Build a TUNNELLING_REQUEST message (tunnel_req)
  - TUNNELLING_REQUEST message includes:
    - receiver group address,
    - channel_id,
    - data,
    - data size,
    - apci
- Send the TUNNELLING_REQUEST to the KNX/IP router via the UDP socket
- Receive a "reply" message from the KNX/IP router containing a TUNNEL ACK message

Blinds' control

	Data	Size	apci	Group address
Full open	0 (100% opened)	1	2	1/floor/bloc
Full close	1 (100% closed)	1	2	1/floor/bloc
Lecture	Not used. Put any value	1	0	4/floor/bloc
Open/close (partial)	[0 … 255] 0 : 100% opened 255 : 100% closed	2	2	3/floor/bloc

Valves' control

	Data	Size	apci	Group address
Control	[0 … 255] 0 : 100% closed 255 : 100% opened	2	2	0/floor/bloc
Lecture	Not used. Put any value	1	0	0/floor/bloc

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knxnet

knxnet

- knxnet is a Python3 library to create and decode KNXnet/IP datagram for Tunnelling.
- Then you can send/receive the frames to/from a KNX/IP router with UDP.
- This library was developed in the HES-SO project: EMG4B. (**Thank you Adrien Lescourt!!**)

knxnet: installation (on Ubuntu machine)

- sudo apt-get update
- sudo apt-get install python3-setuptools
- sudo apt-get install git
- sudo git clone https://githepia.hesge.ch/adrienma.lescourt/knxnet_iot.git
- cd knxnet_iot/
- sudo python3 setup.py install

knxnet

- Use UDP sockets
- Use this method to transform a “string” (x/y/z format) group address into a “KNX” group address:
  - dest_addr = knxnet.GroupAddress.from_str(addr)

actuasim: installation (on Ubuntu machine)

- sudo apt-get update
- sudo apt-get install python3-pyqt5
- sudo apt-get install git
- git clone https://githepia.hesge.ch/adrienma.lescourt/actuasim_iot.git cd actuasim
- python3 actuasim.py