

KNX (end. EIB)

Instabus
ABB I-bus
EIBus

EIBA - European Installation Bus Association + EHSA + BatiBUS:
Uuena 12.2003 KNX standard – Konnex System (www.knx.org)
open STANDARD for home & building control



<https://youtu.be/68ufYEgNf9A>

Konnex Association

Liikmeid >500 (nt. ABB, Berker, Bosch, Cisco, Brandt, Danfoss, Eaton, Electrolux, EnOcean, Gira, Gorenje, Hager, Honeywell, Invensys, Jung, Legrand, LG, MatrikonOPC, Miele, Moeller, Oras, Oventrop, Panasonic, Schneider, Schüco, Siemens, Toshiba, Uponor, Viessmann, jpt.) Seadmete tootjatel ISO9001

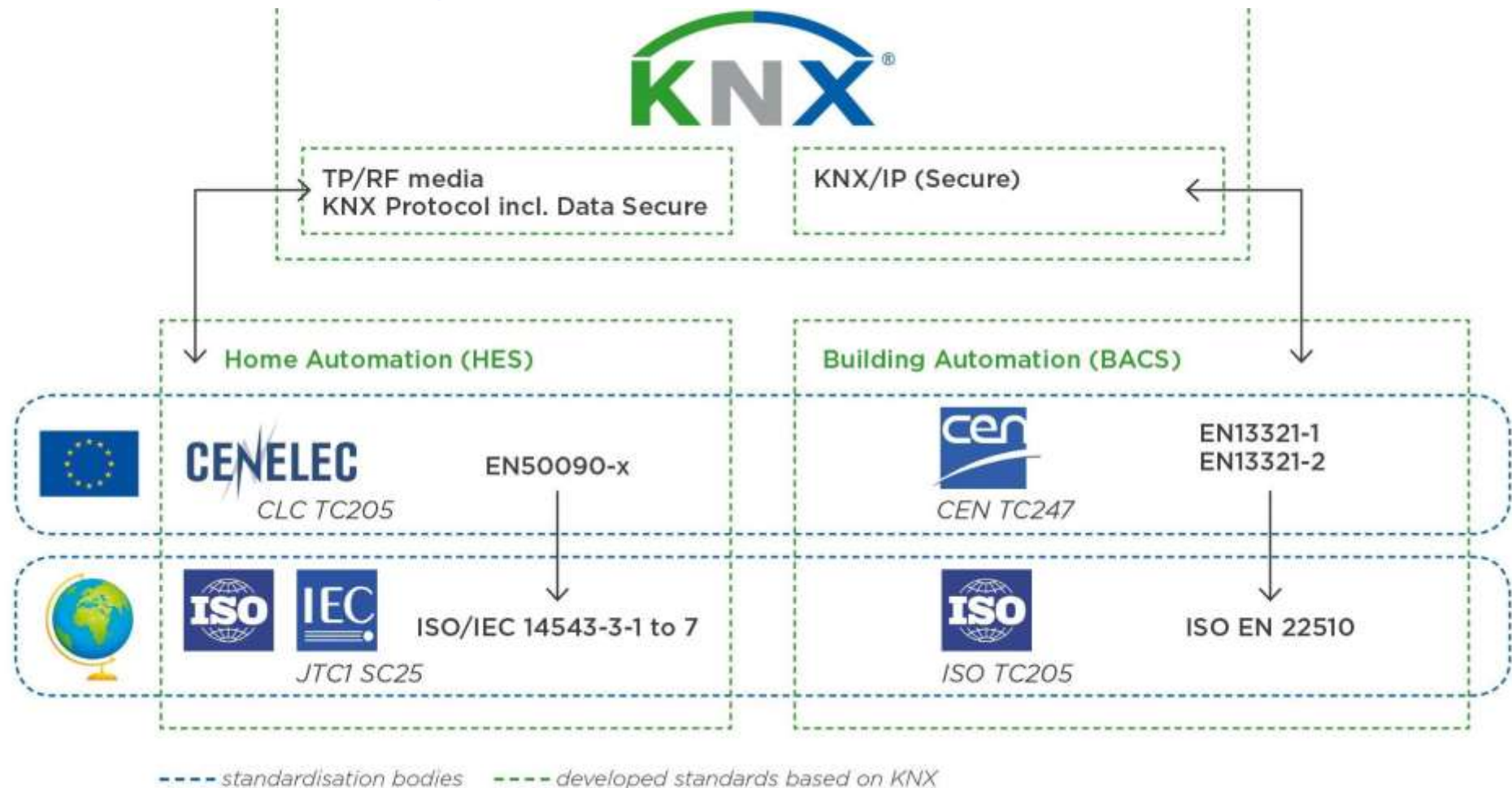
Tootjatest sõltumatu süsteemi projekteerimise ja konfigureerimise tarkvara

ETSTM - Engineering Tool Software (litsentse müüdnud 120 riigis)
(+ EITT – Interworking Test Tool, ++ **Apps**)



Euroopa standardite seeria EN 50090(-2-2; [CENELEC](#) standard for Home and Building Electronic Systems) OSA,
CEN EN 13321-1 approved 2005. Rahvusvaheliselt ISO/IEC 14543-3 :2006 (layers)

<https://www.knx.org/knx-en/for-professionals/newsroom/en/news/KNX-IP-Secure-becomes-new-ISO-Standard/>



KNX Secure: AES 128 CMM
KNX IoT OSCORE messaging protocol using CoAP and CBOR
KNX Secure online tool <https://secure.knx.org>

03.2025

10. 2020

10. 2015

132 600 KNX partners
in 190 countries
(c +4000/year)

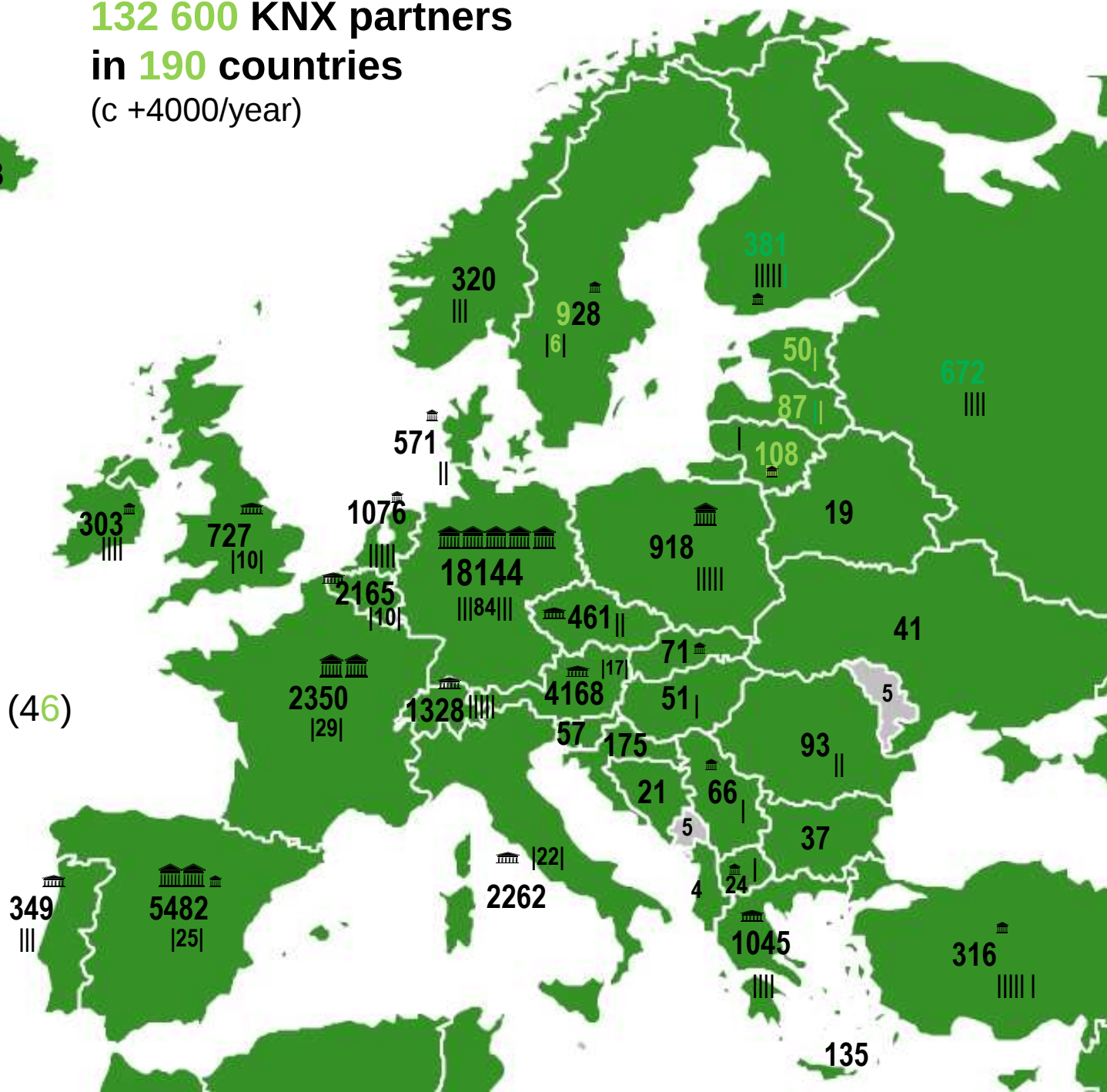
|||517|||

Training Centres
in 73 countries



184 (158)
Scientific Partners
in 40 countries

KNX National Groups (46)
The Baltics (02.2011)



KNX kasutamine

Seadmeid on valida kõikide hoone süsteemide jaoks:

valgustuse, elektritarvitite juhtimine,

energiahaldus (-sääst),
(arvestid)

HVAC, °C



lähipääsu- ja turvasüsteem, prEN 14604:2002



jm “aruka maja” valdkonnad (nt kaughaldus, audio-video)

KNX IoT



Seadmete vastavus/koostöövalmidus testitud sertifitseerimislaborite poolt.

Hinnanguliselt on installeeritud üle 373 000 000¹ võrgusõlme sadades tuhandetes süsteemiprojektides (>190-s riigis).

Enam kui 8 000 KNX certified products tootjatelt.

Nt KNX installatsioonid Eestis

KNX valgustuse juhtimisautomaatikaga: www.ACDC.ee

Bauhaus kauplus (üle 120 KNX seadme*), Peetri kool, Rakvere Põhjakeskus, Järvakandi klaas tootmishoone, Vabaduse väljaku maa-alune osa, eramud

KNX hooneautomaatikasüsteemiga (seotud valgustuse-, kütte-, jahutuse-, ventilatsiooni-, osadel ka kardinate-, turvaseadmed jm): Äri-/korterimaja Laev (>300*)

Väike-Paala Peterburgi ärikvartal, Pädaste mõisahoone (> 80*), elamud ja villad Maarjamäel, Rohuneemes (>150*), Tabasalus, Nõmmel, Pirital jm, Kõltsu mõisahooned, korterid Tornimäel, Kadriorus jm, Tallinna ajaloomuuseum.



<http://www.georgihotell.ee/nutikas-hotell>

firmuselekter.ee

www.clik.ee

www.saksasmart.ee



Lennusadam, TÜ loomemaja, Kosemetsa korterelamud

www.itk-ib.ee

Fertilitas kliinik

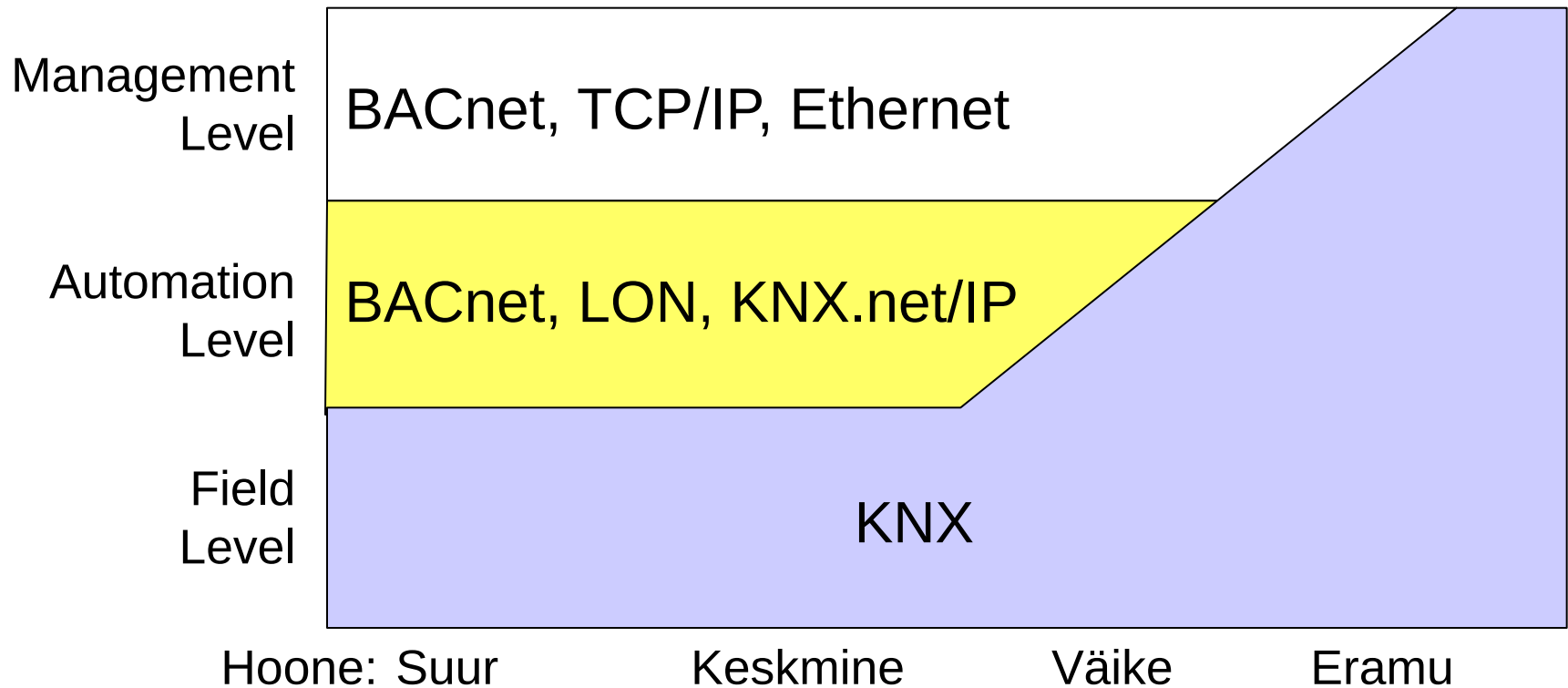


www.abb.ee

[Specification toolbox - Engineering tools \(Building and Home Automation Solutions | ABB\)](#)

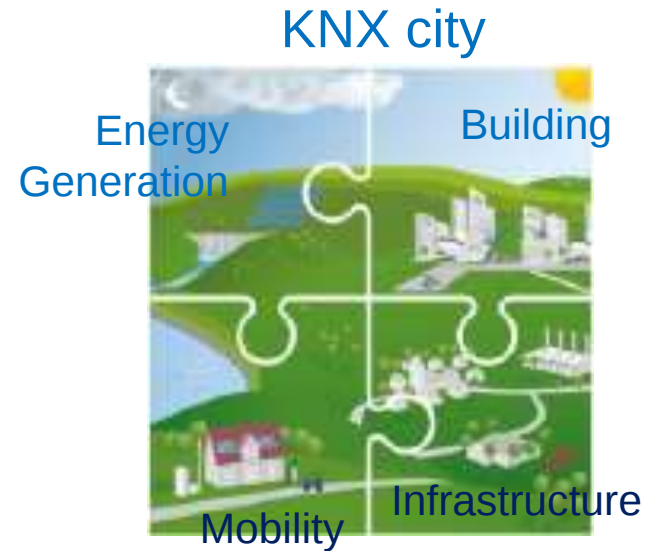
<https://www.comfortclick.com/>

KNX-i sobivus



KNX-i kasutatavus

Frost & Sullivan recognizes KNX
with the 2023 Global Technology
Innovation Leadership Award



<https://hiddenwires.co.uk/case-studies/article/state-of-the-smart-home>

2023.a KNX: 63%, Wi-Fi 52%, BT 30%

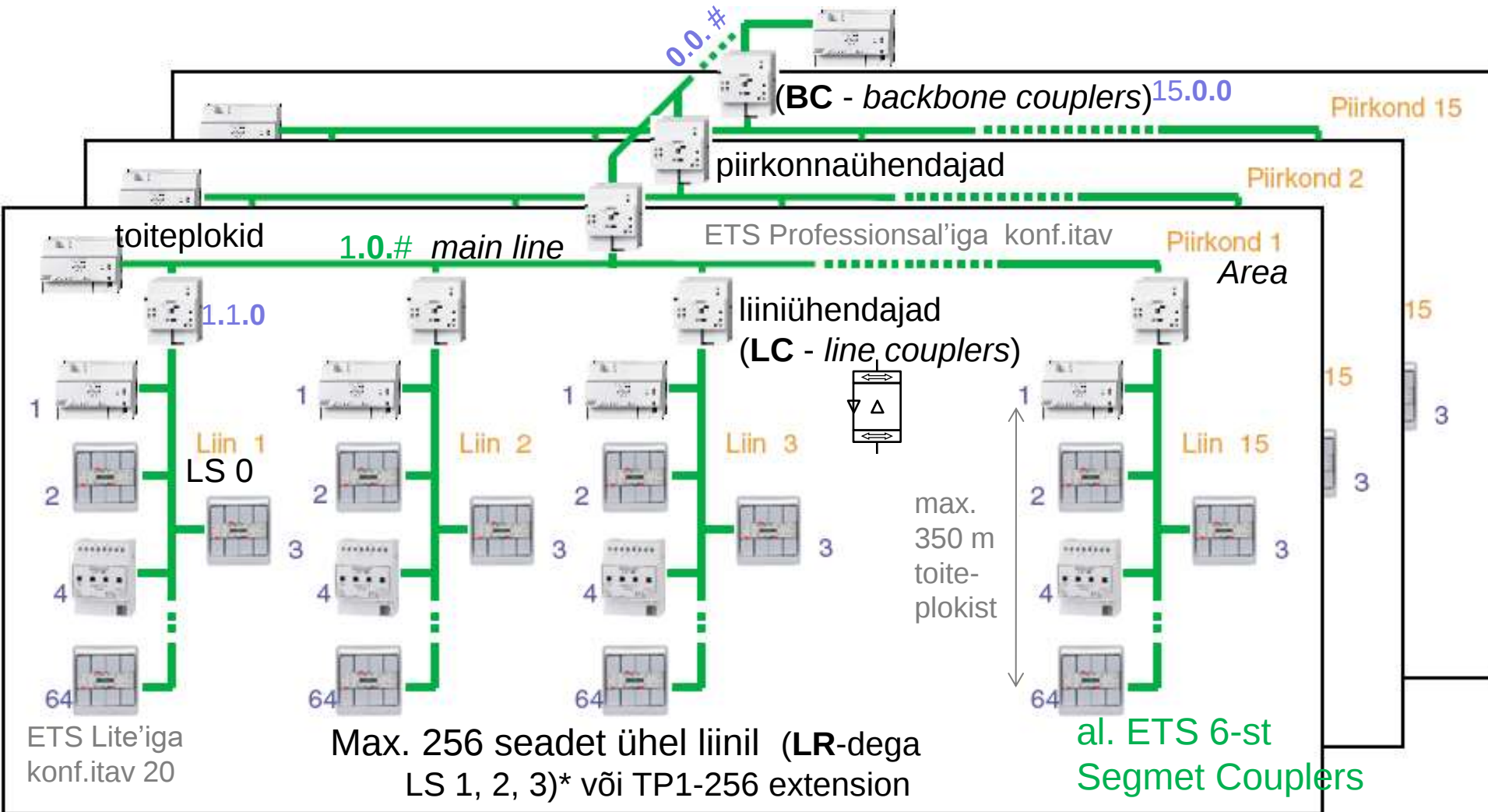
Lighting 71%, Temp.control 64%, Blinds 52%, Energ.management 50%

BSRIA 2017: KNX is the leading
communication protocol in the European
& Chinese smart homes / light
commercial market. GER 56%, FRA 32%,
UK 27%



Market Survey @
“Light + Building 04.2010”

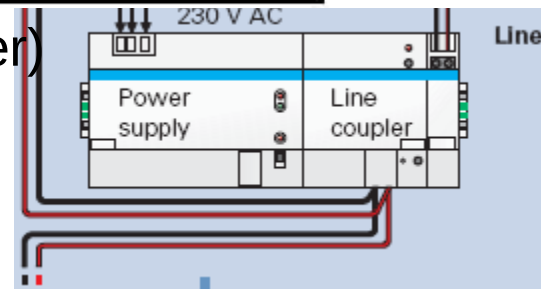
KNX kaabeldusega süsteemi struktuur



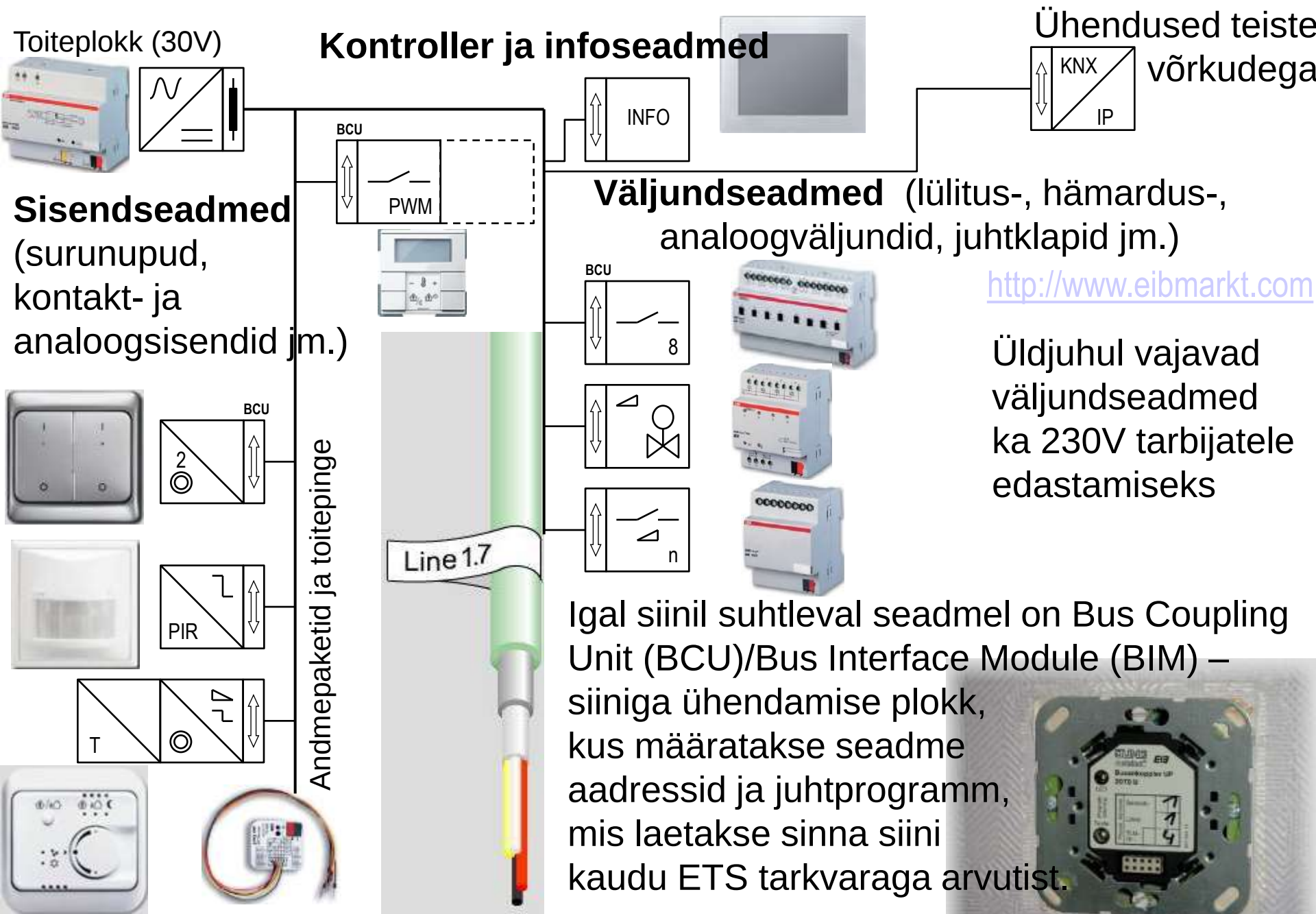
Detsentraliseeritud (ilma keskse controllerita, multi-master) siinisüsteem.

Max. 15 piirkonda (igas kuni 15 liini a <1000m).

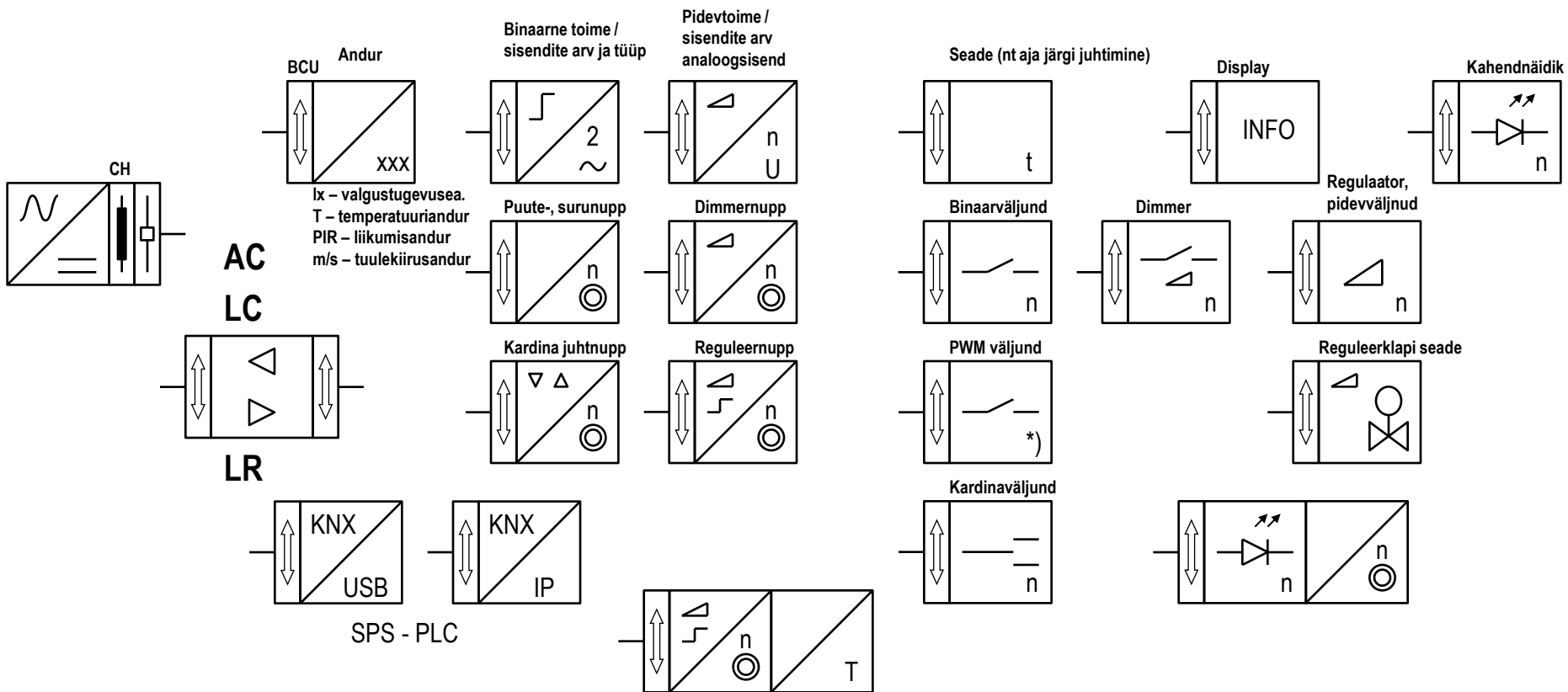
Kokku kuni 58 000 seadet.



KNX liiniseadmed

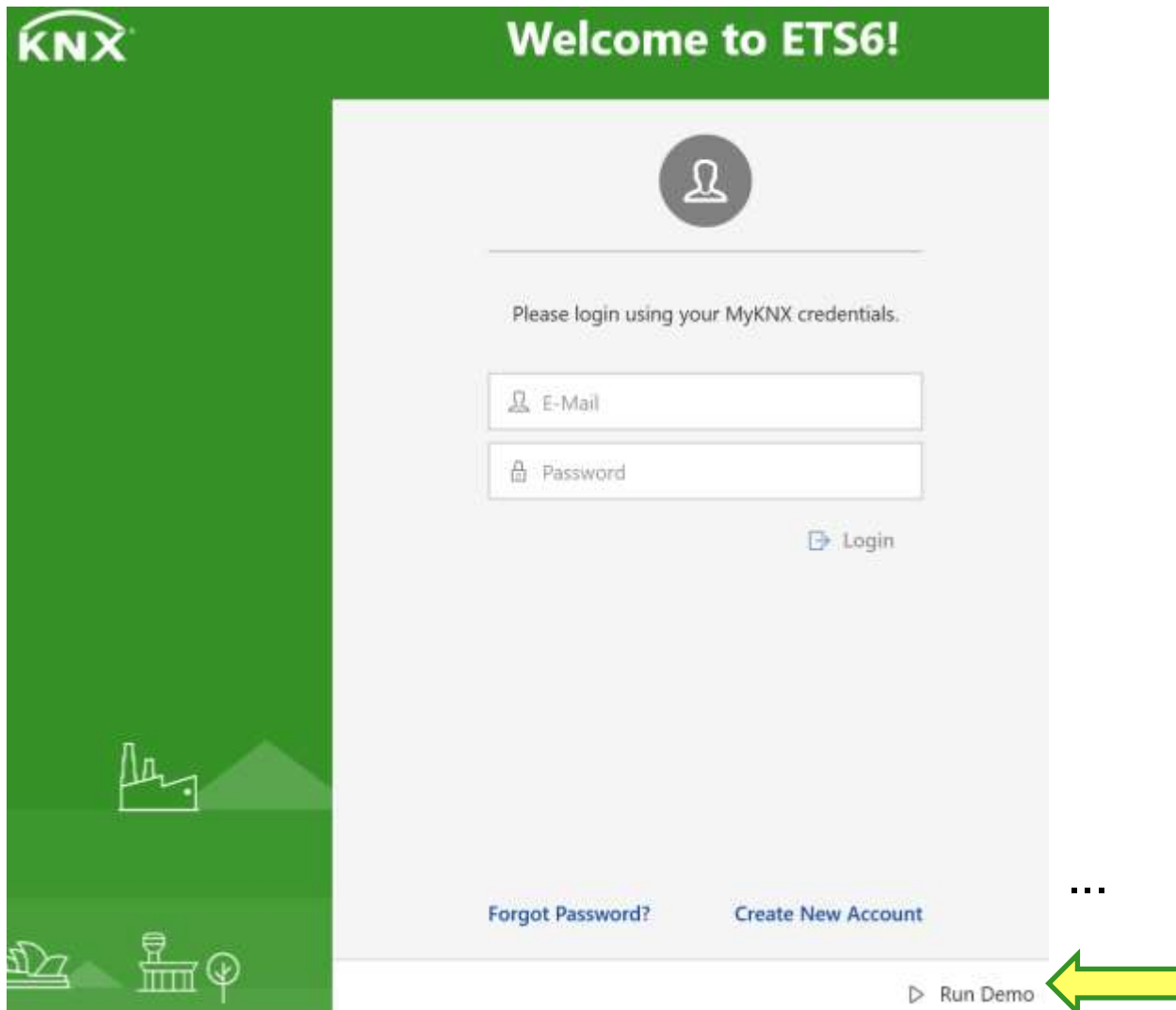


KNX tingmärgid



ETS

<https://www.ets6.org/>



The image shows the ETS6 Welcome screen. It features a green header with the KNX logo and the text "Welcome to ETS6!". Below the header is a white login form. The form includes a user icon, a prompt to login with MyKNX credentials, and two input fields for "E-Mail" and "Password". A "Login" button is positioned below the password field. At the bottom of the form, there are links for "Forgot Password?" and "Create New Account". To the right of the form, there are three dots and a "Run Demo" button with a play icon. A yellow arrow points to the "Run Demo" button.

KNX

Welcome to ETS6!



Please login using your MyKNX credentials.

 E-Mail

 Password

 Login

[Forgot Password?](#) [Create New Account](#) ...

 Run Demo

KNX ETS6 **eCampus** web based training: <http://ecampus.knx.org>

~~ETS Inside~~ ETS Home

<https://www.knx.org/knx-en/for-professionals/software/ets6/>

03.2025: „*Learn the basics in the ETS eCampus and get a free ETS license after successful completion*“

vt. ETS 6 ja KNX **Virtual** (KNX Association channel)

https://youtu.be/9RdXqeLBycA?si=NF7D8r_9RjreQFmV

KNX adresseerimine

Füüsilise aadressi (paiknemine siinisegmendis) formaat:

piirkond.liin.seade

1-15.1-15.1-256

Grupiaadressi (funktsionaalsed seosed) formaat:

peagrupp/alamgrupp

0-31 / 0-2047

peagrupp/keskgrupp/alamgrupp

0-31 / 0-7 / 0-255

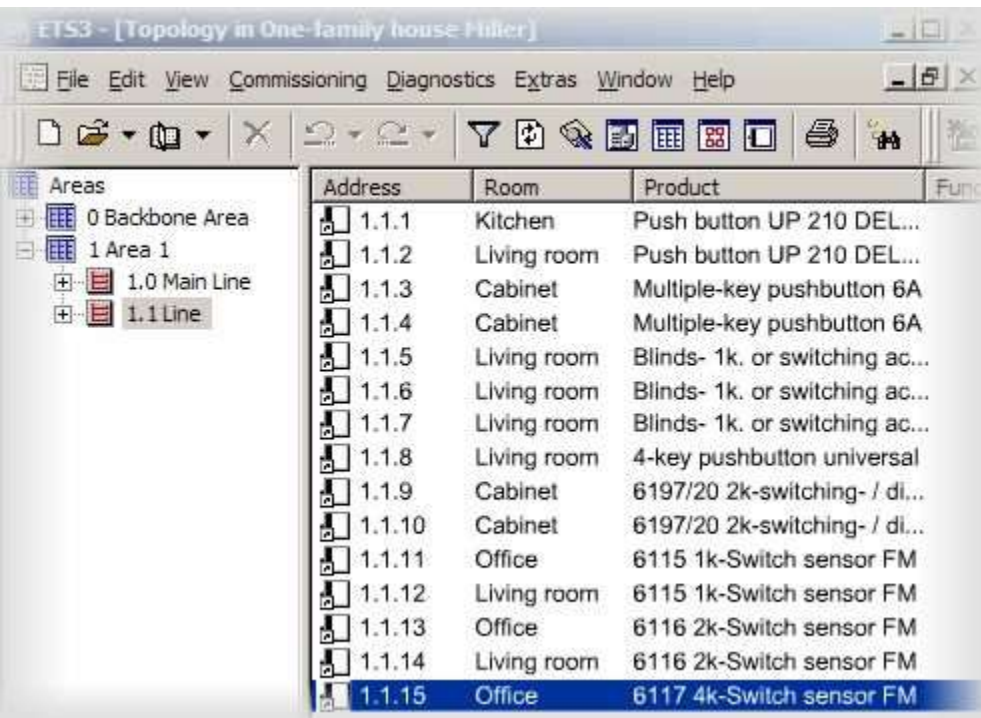
või tasemevabad grupid 1..65535*

Output Object GO

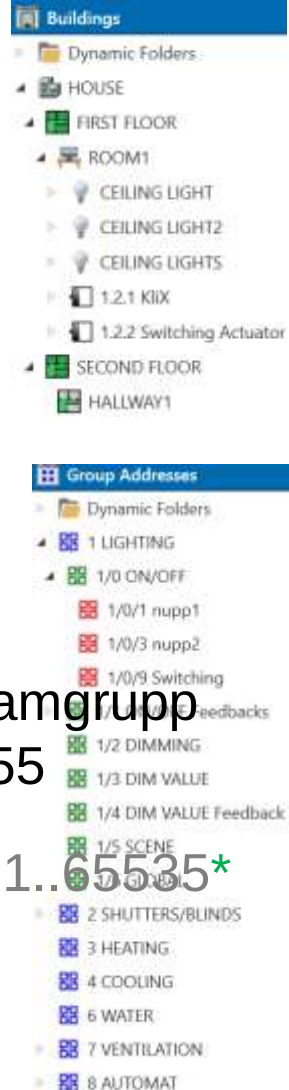
GA – *Group Address*

GO – *Input Object*

+unique serial number



Address	Room	Product	Func
1.1.1	Kitchen	Push button UP 210 DEL...	
1.1.2	Living room	Push button UP 210 DEL...	
1.1.3	Cabinet	Multiple-key pushbutton 6A	
1.1.4	Cabinet	Multiple-key pushbutton 6A	
1.1.5	Living room	Blinds- 1k. or switching ac...	
1.1.6	Living room	Blinds- 1k. or switching ac...	
1.1.7	Living room	Blinds- 1k. or switching ac...	
1.1.8	Living room	4-key pushbutton universal	
1.1.9	Cabinet	6197/20 2k-switching- / di...	
1.1.10	Cabinet	6197/20 2k-switching- / di...	
1.1.11	Office	6115 1k-Switch sensor FM	
1.1.12	Living room	6115 1k-Switch sensor FM	
1.1.13	Office	6116 2k-Switch sensor FM	
1.1.14	Living room	6116 2k-Switch sensor FM	
1.1.15	Office	6117 4k-Switch sensor FM	



Group Address	Object
1 LIGHTING	
1/0 ON/OFF	
1/0/1 nupp1	
1/0/3 nupp2	
1/0/9 Switching	
1/2 DIMMING	
1/3 DIM VALUE	
1/4 DIM VALUE Feedback	
1/5 SCENE	
2 SHUTTERS/BLINDS	
3 HEATING	
4 COOLING	
6 WATER	
7 VENTILATION	
8 AUTOMAT	

eib Communication Objects = Group Objects

Receiving and transmitting data through Group Objects - standardized containers for data-points.

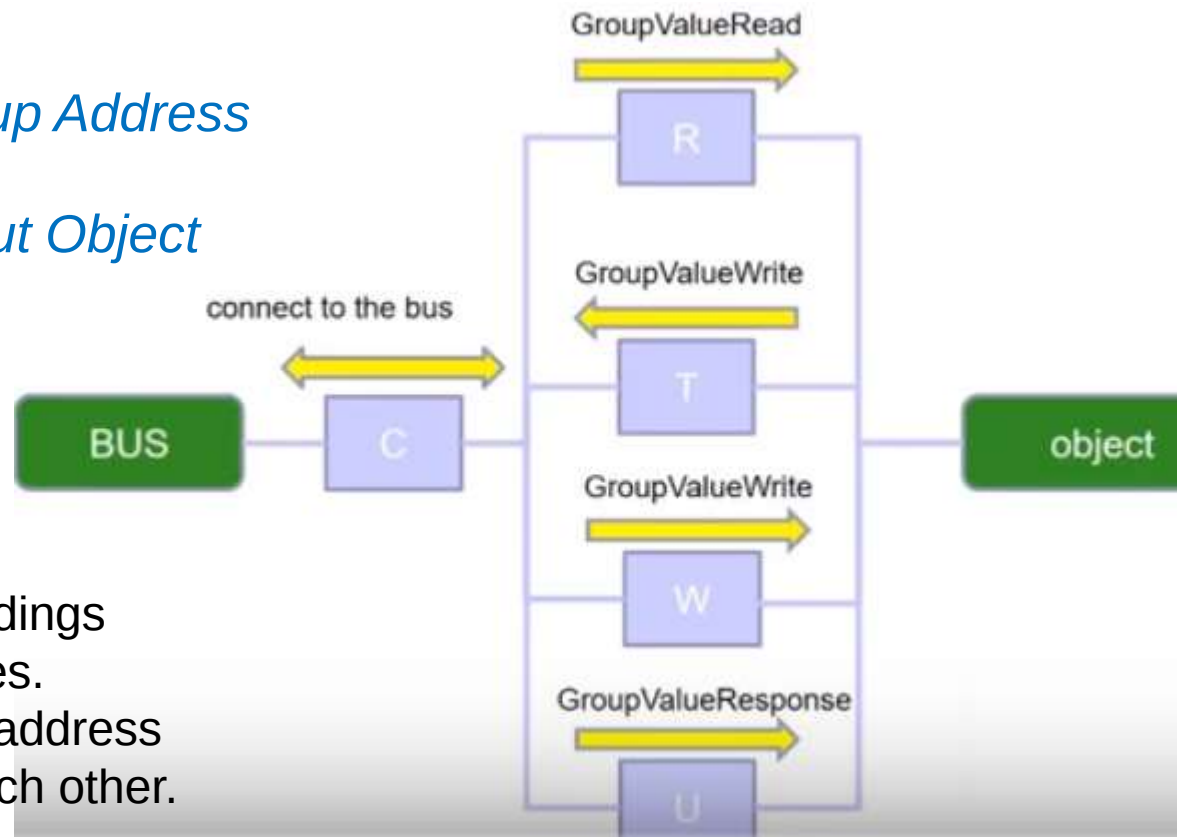
Device publish datapoints known as (Group) Communication Objects. Device app sees the bus as limited set of Group Objects; these corresponds to those data-points, which are direct relevance to it.

Output Object GO

GA – *Group Address*

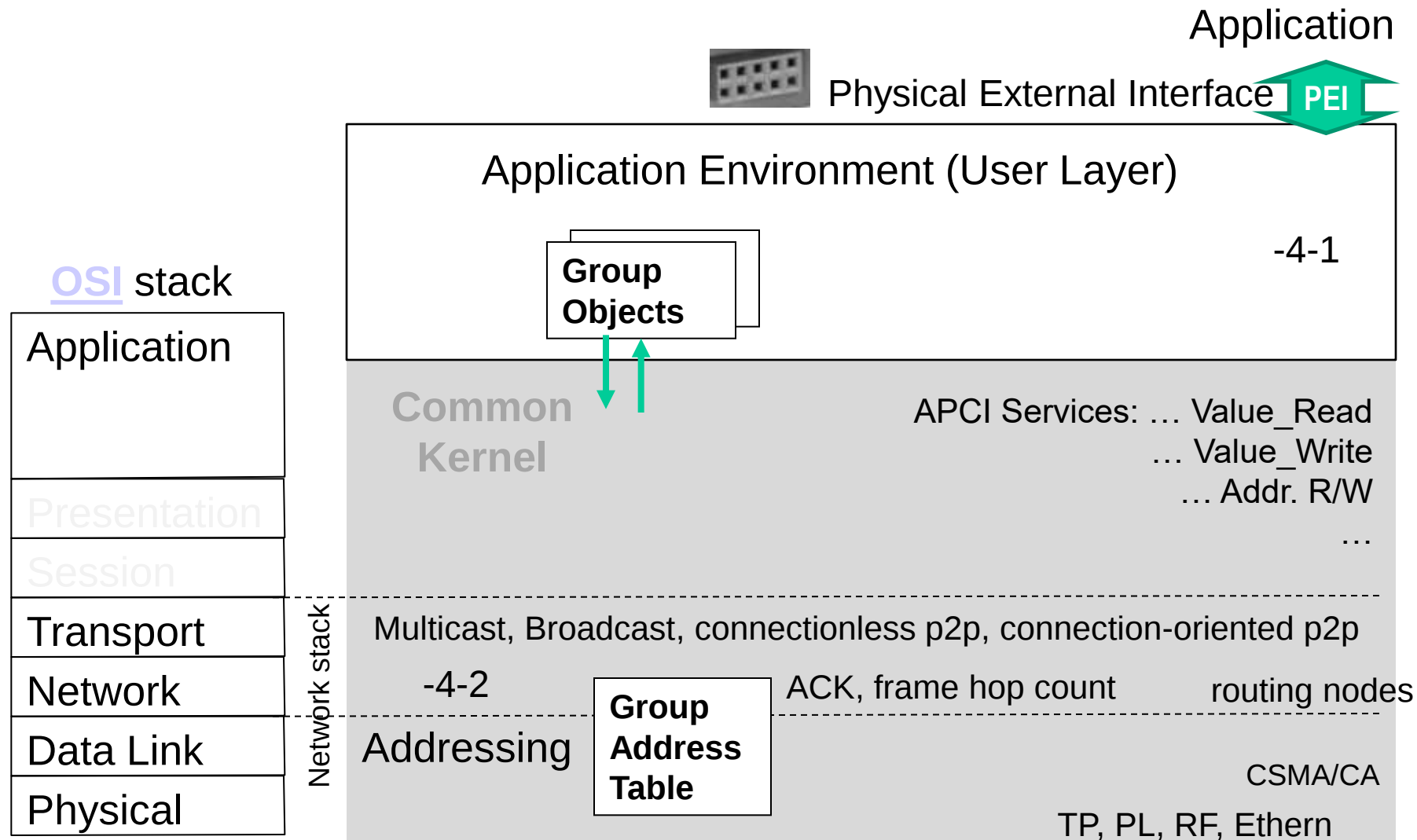
GO – *Input Object*

sending data-point GVW
GVResp



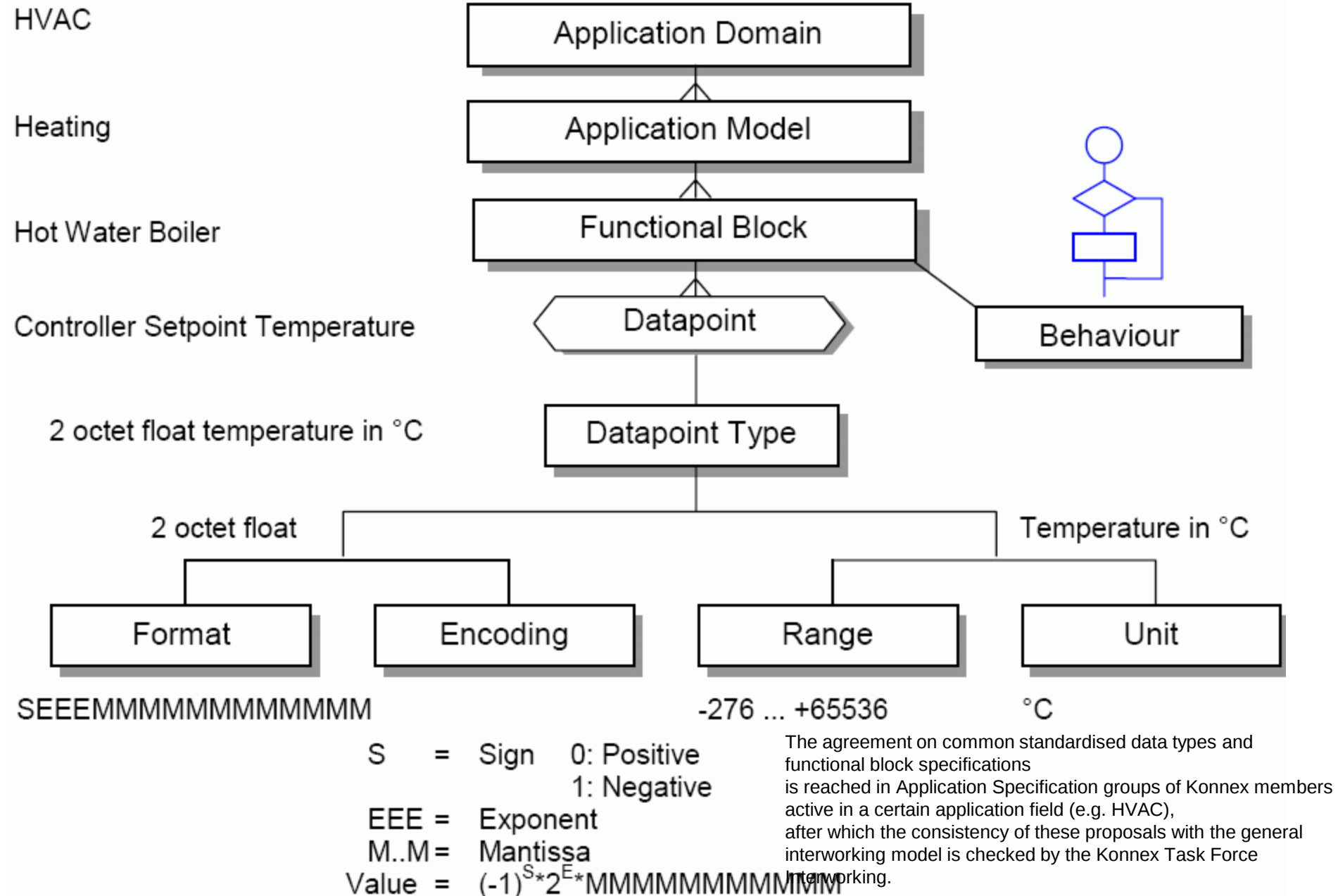
S-mode is characterized by the assignment of (logical) Group Addresses to individual datapoints to create the communications bindings for the exchange of process values. Devices bearing the same group address exchange process values with each other.

KNX com kihid



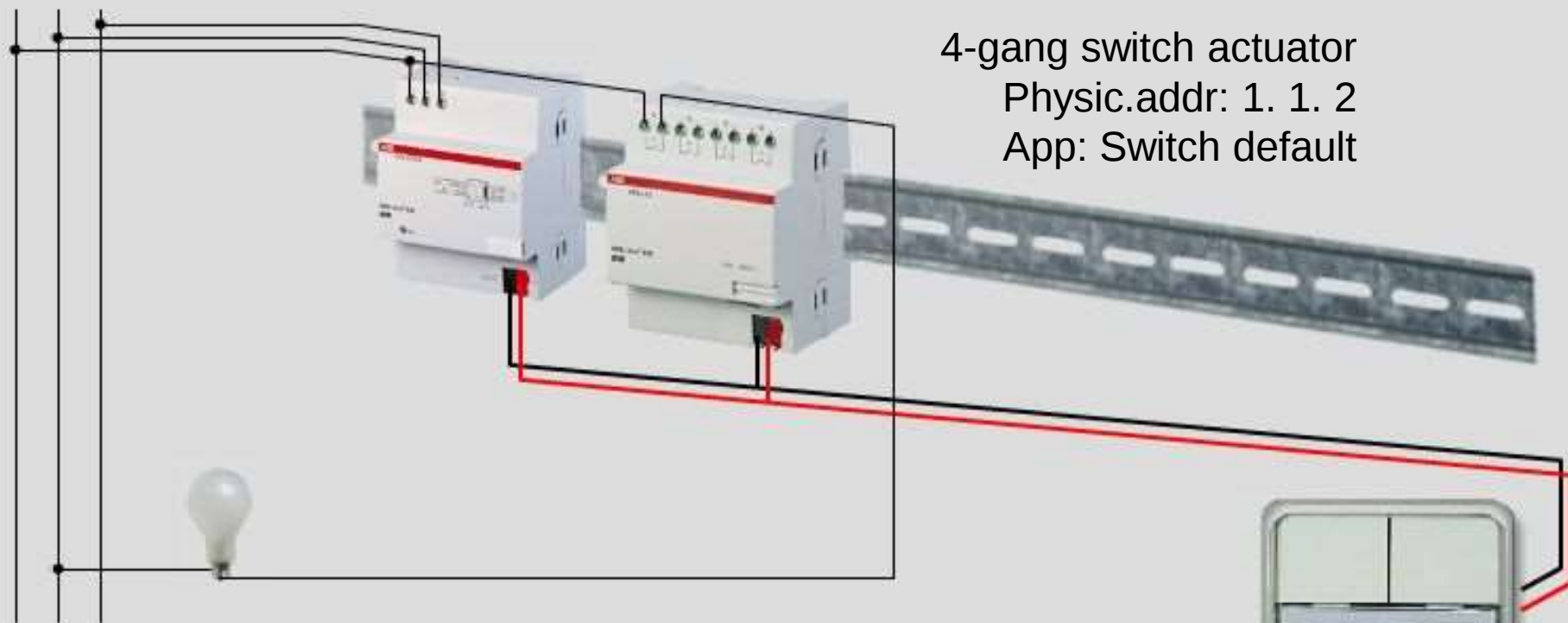
Hierarhiline võrgu topoloogia jätab välja vaid Session ja Presentation kihi esituse

KNX Interworking





L1 N PE

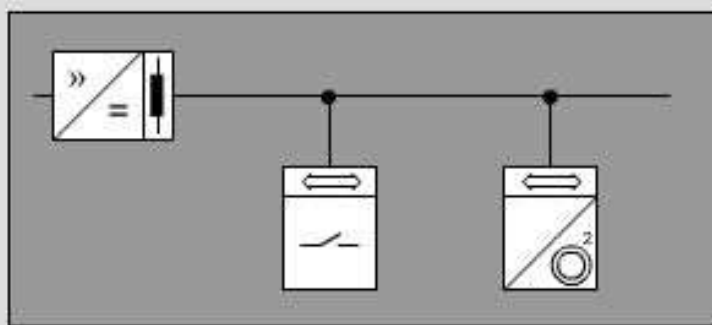


4-gang switch actuator
Physic.addr: 1. 1. 2
App: Switch default



4-gang switch sensor
Physic.addr: 1. 1. 1
App: Switch Dim ...

Circuit symbols

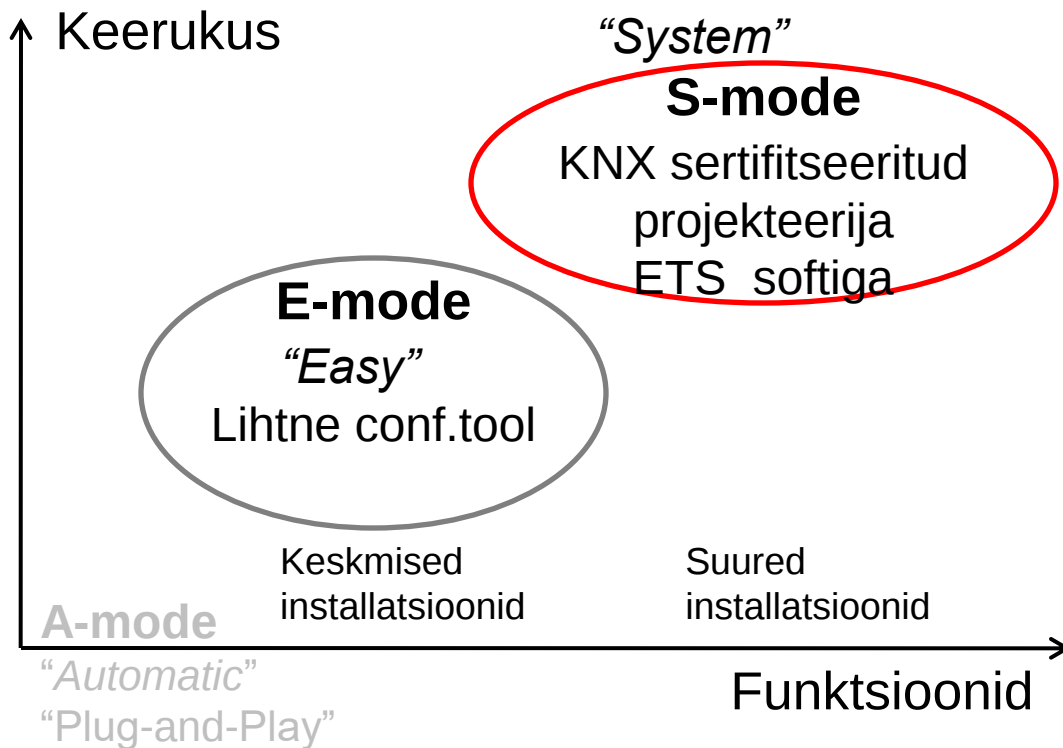


SELV
29V

KNX configuration modes

Seostamine ja parametriseerimine

Seade (andmed) tekib hajutatud rakenduses ja koostoitumine saavutatakse stand. DPT ja FB objektidega



Ctrl - *Easy Controller*; kontrolleri leiab partnerseadmed võrgus ja seadistamine toimub kontrolleri display-l

PB - *Easy Push Button*; täituri ja anduri koos aktiveerimine (RF)

LT - *Easy Logical Tag* (nt Code Wheel)

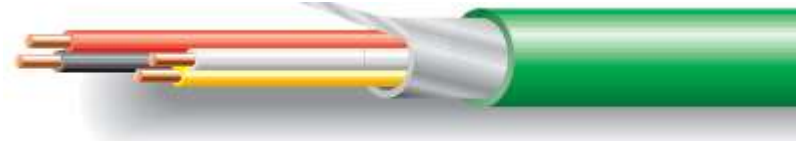
LTE - *Easy Logical Tag Extended*; HVAC seadmetele tsooni om.

Paljud Ctrl ja LTE moodiga seadmed on ka S-mode võimalised

KNX ühendusmeediad

YCYM 2x2x0.8

- 1) TP (Twisted Pair) – keerupaar kaabeldus



TP1 9600 bits/s (EIB-st tulnud), TP0* 4800 bits/s

CSMA/CA

- 2) PL (Power Line) – toitejuhtmete kaudu (EN 50065-1 compliant)

PL-110 (110 kHz) 1200 bits/s (EIB-st tulnud)

PL-132 (132 kHz) 2400 bits/s (EHS-st tulnud)*

lisatud 16-bit *domain* aadress identifitseerimaks installatsiooni

- 3) RF (Radio frequency 868,3 MHz) – raadiovõrk. 16 kbits/s

KNX RF, the only [☐] worldwide radio frequency standard for home and building system technology (ISO/IEC 14543) (EN 50090 5-3 :2006,2016,2020)

- 4) Ethernet, (KNX-over- IP) – KNX kaader kapseldatud IP paketti

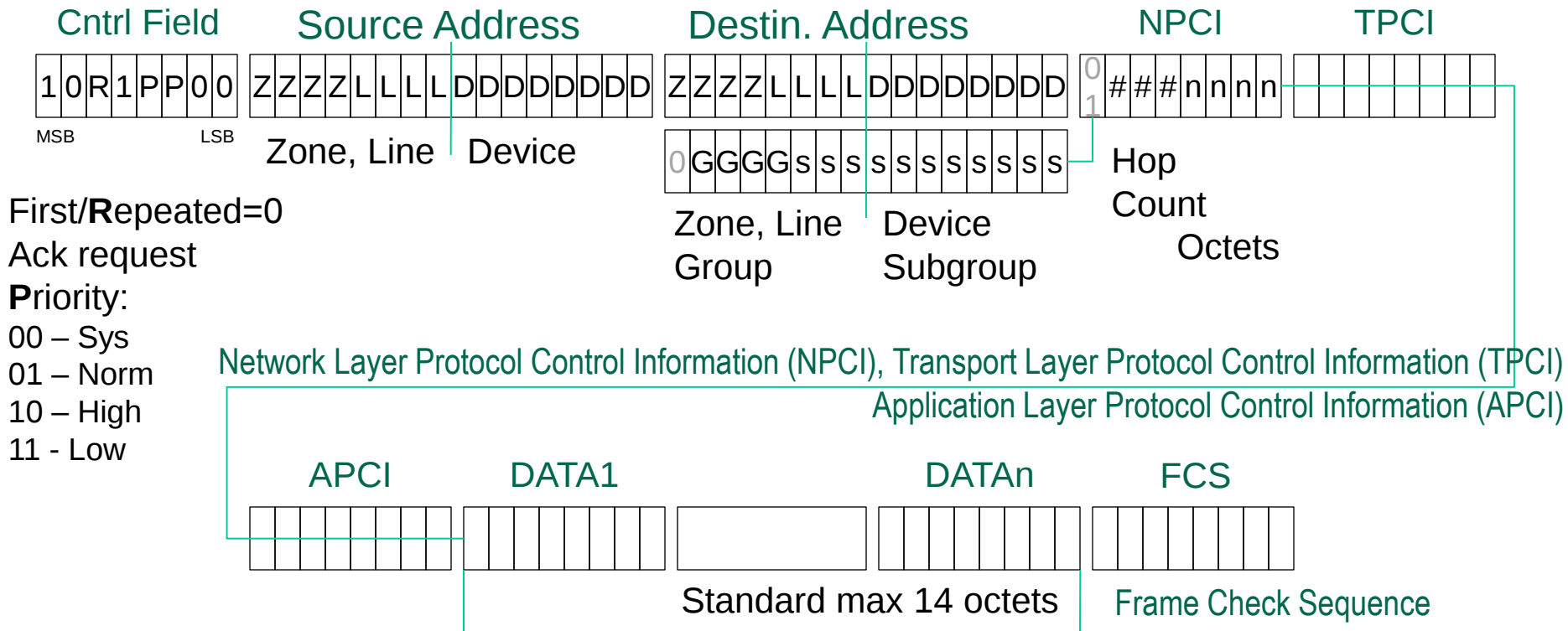
(CEN EN 13321-2 :2006, 50090-4-3)

*- KNX seadme ja sama meediat toetava vanema seadme suhtlus pole võimalik või nõuab protokollide konverteerit

☐- KNX Journal 2007 Nr. 2

KNX kaader (*frame*)

Andmeside kaardi *DLL* formaat



peale TPCI, APCI, Data (Lyr.4/7) ja Hop Count (Lyr.3) valdavalt Data Link kihilt

PL paketil paketi ees 16 bit *Domain* aadress (0000h – broadcast)

KNX meediapöördus

keerupaaris (*differential signaling*)

CSMA/CA - Carrier Sense Multiple Access with Collision Avoidance

bit-wise bus arbitration

If two devices start transmitting at exactly the same time, one or other will discover that the bus is not reacting to its transmission in that the bus has gone low (a “1”) when the device would have expected it to stay high (a “0”). In this case that device will immediately cease transmission allowing the other to continue uninterrupted. In this manner, and since one of the earliest frames transmitted on the bus is the device address which immediately follows the control field which itself includes a priority field, the device address has a degree of priority associated with it. Importantly, no packets are lost through collisions.

KNX RF

Radio frequency (RF) standard (ISO/IEC 14543) for building control.
Töötab 868.3 Mhz (+-50kHz, FSK)*.

Saatevõimsus 1...25mW, (katab eramu või korteri) levi kuni 30 m (100 väljas)
Kuni 250 seadet liinil. 16.4kBit/s, raadiosuhtluse lisainfi tõttu sama TP-ga (u 50 sõnumit sekundis). Andmed läbi “*Group messages*” (nagu KNX); saatjalt mitmele vastuvõtjale korraga. 1% “Duty Cycle” piirang. Unikaalne seadme “Serial Number” *Extended* aadressis, kui vaja (on pealtkuulata).v).

The coding of the data, the so-called Interworking, was not changed for the RF. No product database was required. All information necessary for the (“Easy-Mode”) configuration is stored in the device itself. Configuration with the help of ETS5 (Engineering Tool Software).

Unidirectional (transmit-only) device – patarei säästlikkus

Bidirectional device (reception to) – täiturseadmena omab tavaliselt võrgutoidet

RETRASMITTERS, leviulatuse laiendamiseks

MEDIA COUPLERS, Twisted Pair seadmete liinile ühendamiseks (keerukates süsteemides ka Ethernet ja Powerline seadmetele), aadresside teisendamiseks.

* - ISM (Instrumentation, Science and Medicine) licence free band Euroopa: 863-870 MHz and US: 902-928 Nt. 864 MHz – audiorakendused

KNX RF Ready, RF Multi, RF Multi SLE

RF (*Radio frequency*) Ready*

Unencrypted, Ack puudub (osadel 3x kordus)

RF Multi**

KNX Secure (RF Multi S-mode);

3 kiiret (*Fast*) + 2 aeglast kanalit (*Slow*/SLE, patareitoitel seadmetele) ;
kanali hüpitus;

„*Fast Acks*“ kviteerimine;

Media Coupler – dekrüptib vanale (KNX *Classic*) TP liinile ja liidestab erinevaid RF tüüpe.

RF *Segment Coupler* seadme tüüp
[oma domain aadressi seadistusega,
samaselt SLE seadmetes (preambulas
ka GA-d)]

* - EN 50090-5-3, IEC 870-5-1/2 FT3

** - EN13757-3/4 (ka M-bus), SLE – Slow Low Energy

RF Multi ver KNX IoT on Thread ver Matter on Thread

Heal tasemel usaldusväärsus, levi ulatus, koostalitluse standardiseerimine, turvalisus, arendusvahendite saadavus (Chipid ja Stackid).

☹ Halb on, et seadmemudeleid on veel vähe.

Olemas on installeerimise lahendused, tehnoloogia teadmine.

RF Multi'l hea patarei säästlikkus, teistel kogemused selle kohta tekkimas.

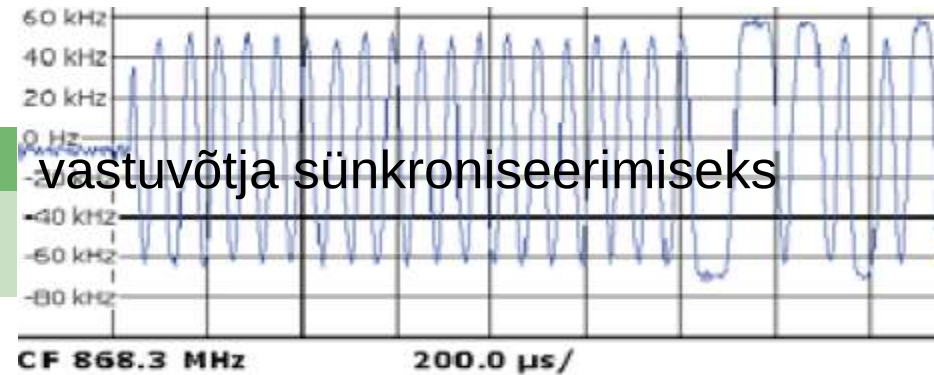
RF Multi'l ja IoT' olemas rakenduste profiilid, arendajad ja sertifitseerimine, Matter'il kogemused selle koha peal alles tekkimas.

☹ RF Multi'l ligikaudne ühe sõlme maksumus kõige suurem (c 3 ver 2 ver 2) ja IP suhtlus pole vahetu.

KNX RF

Andmeside paketi (*frame*) formaat 1.0

Preheader		
Preamble	Manchester violation	Sync word
15x'01'chip	'000111'	'011010010110'



Block 1											
Length	C-Field	Esc	Ctrl	SN	SN	SN	SN	SN	SN	CRC hi	CRC lo
0x11	0x44	0xFF	0x03								

10+2 baiti

Control	Source		Destination		Block 2						
KNX-Ctrl	Src hi	Src lo	Dst hi	Dst lo	L/NPCI	TPCI	APCI	Data	...	CRC hi	CRC lo
0x00	0x05	0xFF	0x00	0x01	0xE6	0x00	0x81				

max16+2 baiti

Selle rakenduse andmete ja järgmiste plokkide kodeering vastab taval. KNX-le

Network Layer Protocol Control Information (NPCI)

Transport Layer Protocol Control Information (TPCI)

Application Layer Protocol Control Information (APCI)

Standard frame: kuni 14 baiti Data (EIBga ühildumiseks)

Extended frame: kuni 248 baiti Data (nt LTE Mode-is)

SN - "Serial Number" *Extended* aadressis, või *Domain* aadress sellel kohal

KNX standardi muud osad

Vol. 4 Hardware Specif.-s and Tests

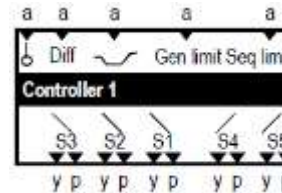
- seadmete elektrilised, funktsionaalsed, keskkonna, ohutuse ja kvaliteedi nõuded*, et täita KNX tsertifitseerituse taset



Vol. 5 Certification – Konnex-i tsertifikaadi saamine toodetele

Vol. 6 Profiles – tsertif. seadmed peavad vastama profiilile (min. nõuded)

Vol. 7 Application Descriptions – FB(funktsionaalplokid) rakendustes



Vol. 8 System Conformance Tests – meedia, kommunikatsiooni, interfeiside ja “Interworking” testimine

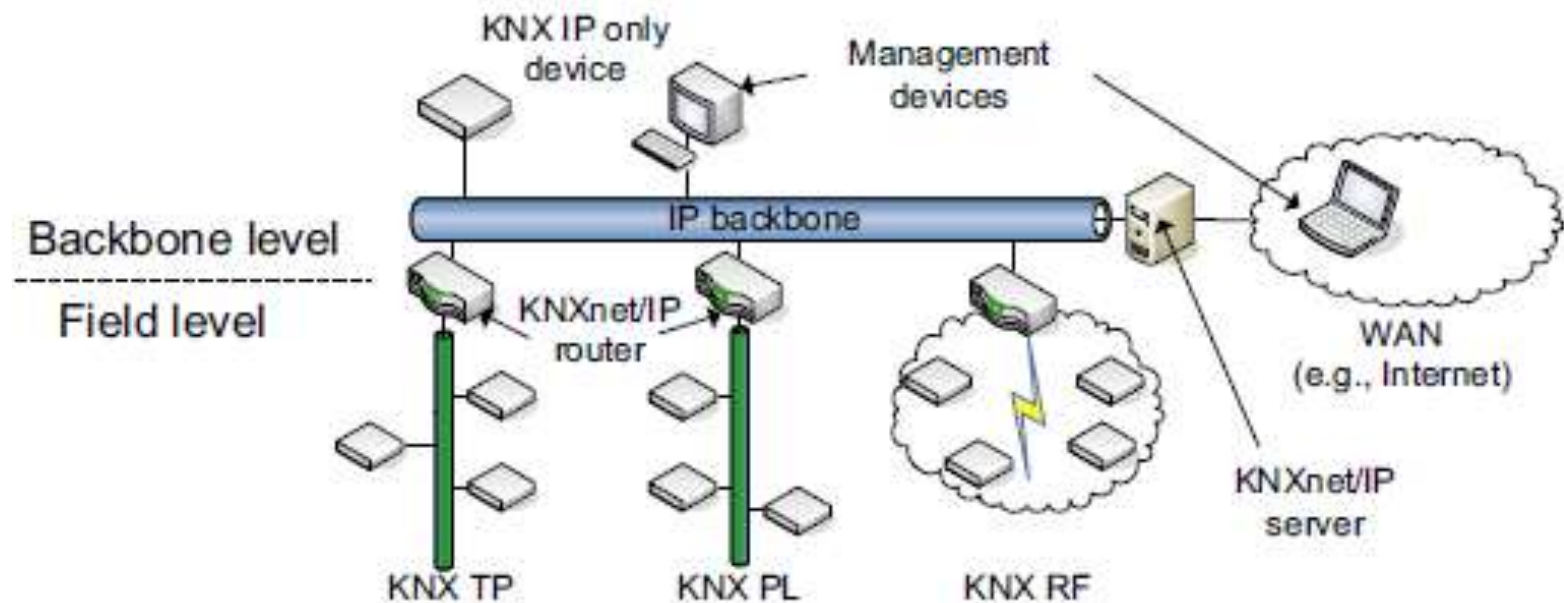
Vol. 9 Standardized components and Devices and Test – standardsete kaablite, pistikute jm komponentide(BCUs,BIMs) nõuded ja testimine tsertifitseerimiseks (couplers – magistraalliinide ühendajad)

Vol. 10 Application Domain specific Standards – rakendusvallast sõltuvad spetsifikatsioonid (Logical Tag Ext.) nt. HVAC

*-paljuski EN 50090-2-2 põhised või kõrgemad ja täienduseks

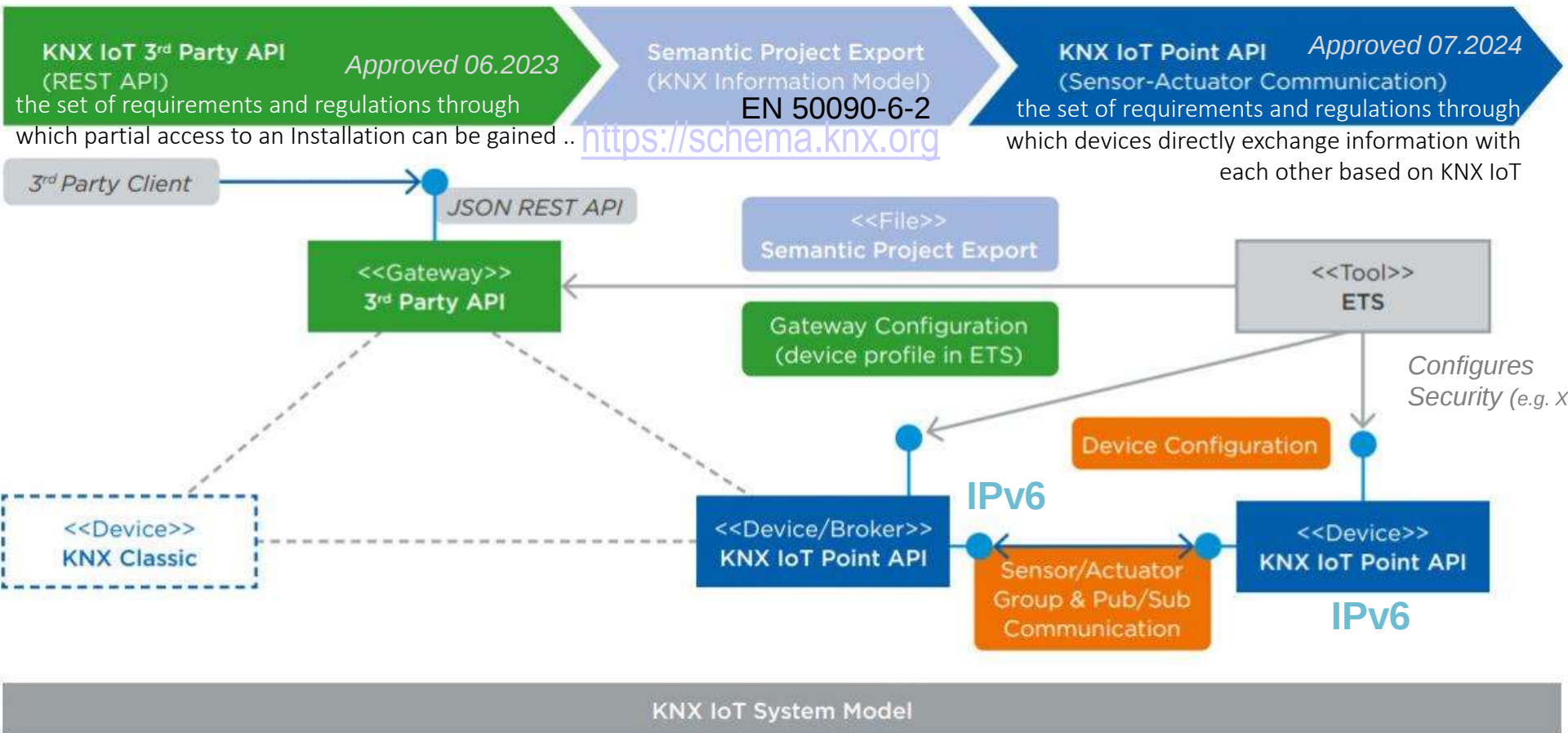
Security for KNXnet/IP

<http://knxsecure.knx.org>



KNX IoT System Specification Parts

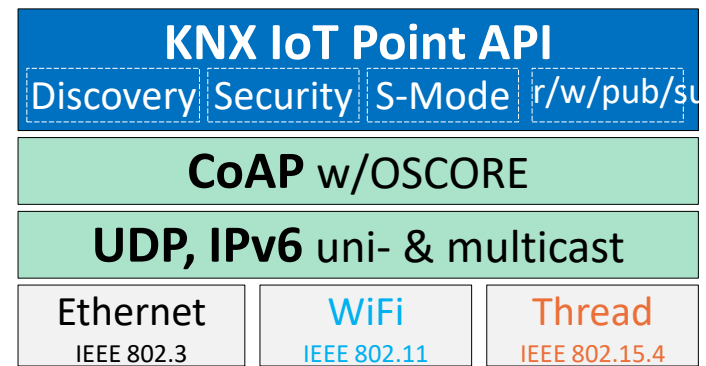
(AN198)

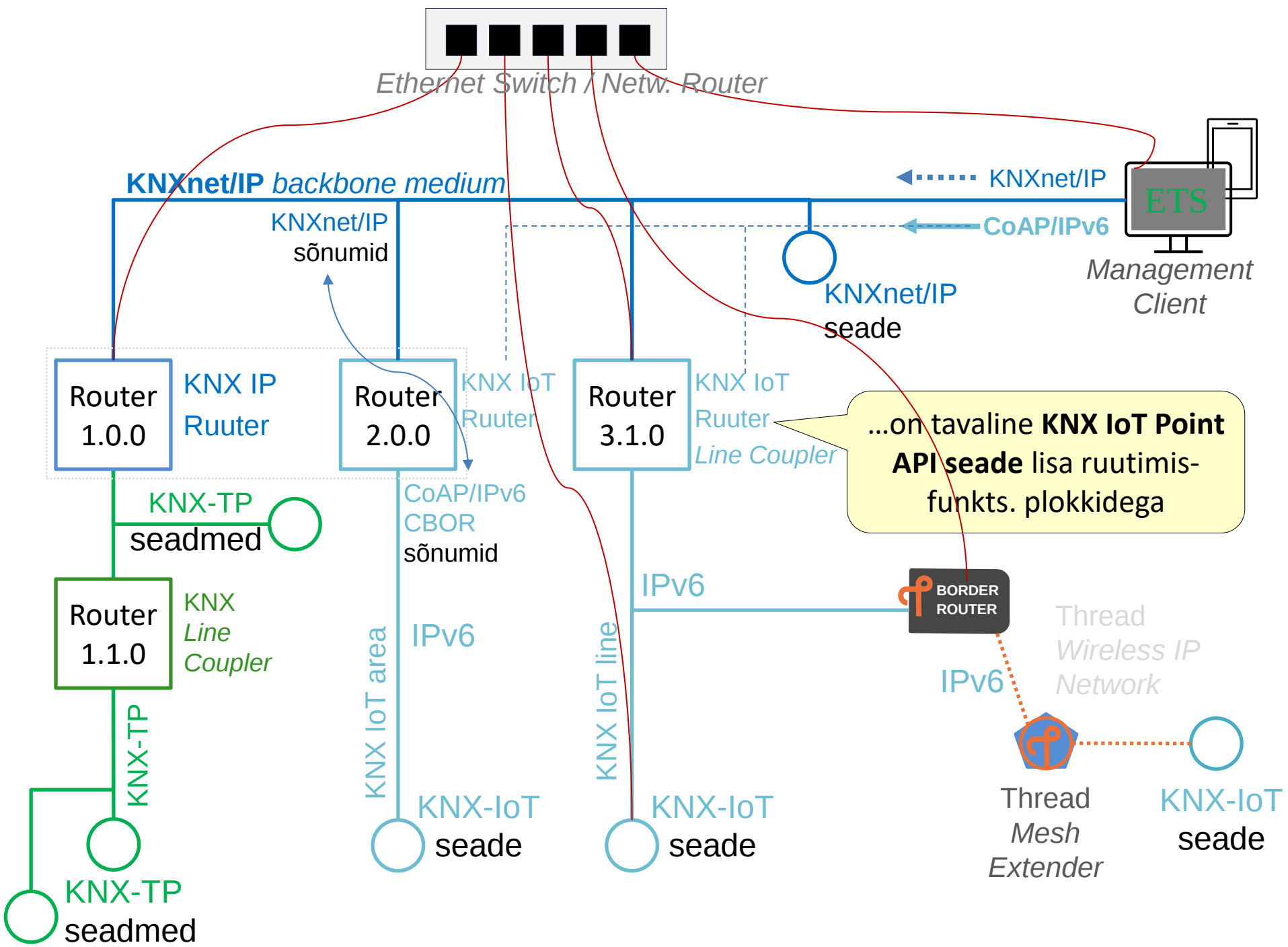


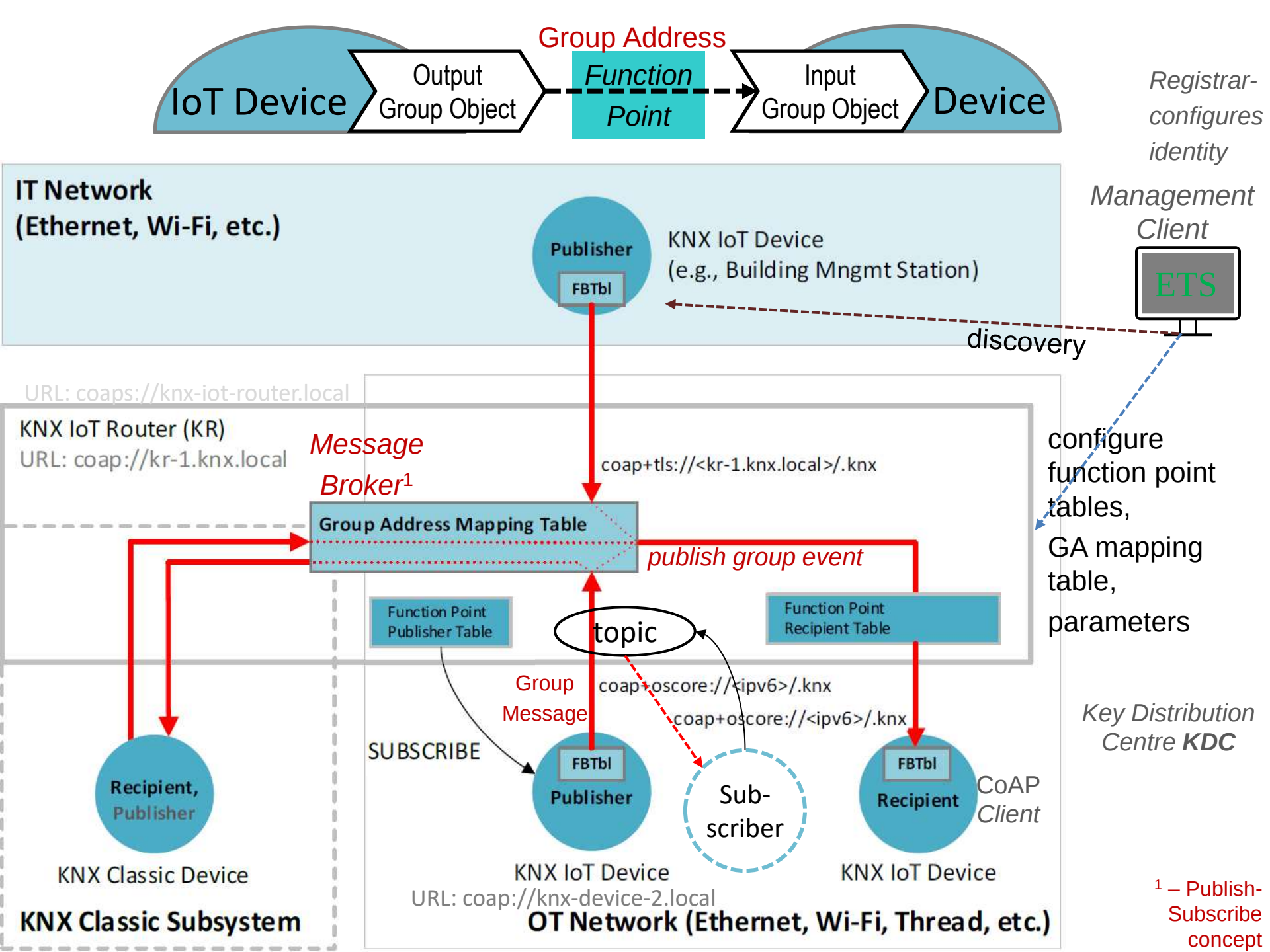
---- out-of-scope of KNX IoT

OSCORE (application layer security) is used for S-Mode messaging, Point read, write, and publish/subscribe.

(D)TLS (transport layer security) is mainly used for mutually authenticated pre-shared key distribution.

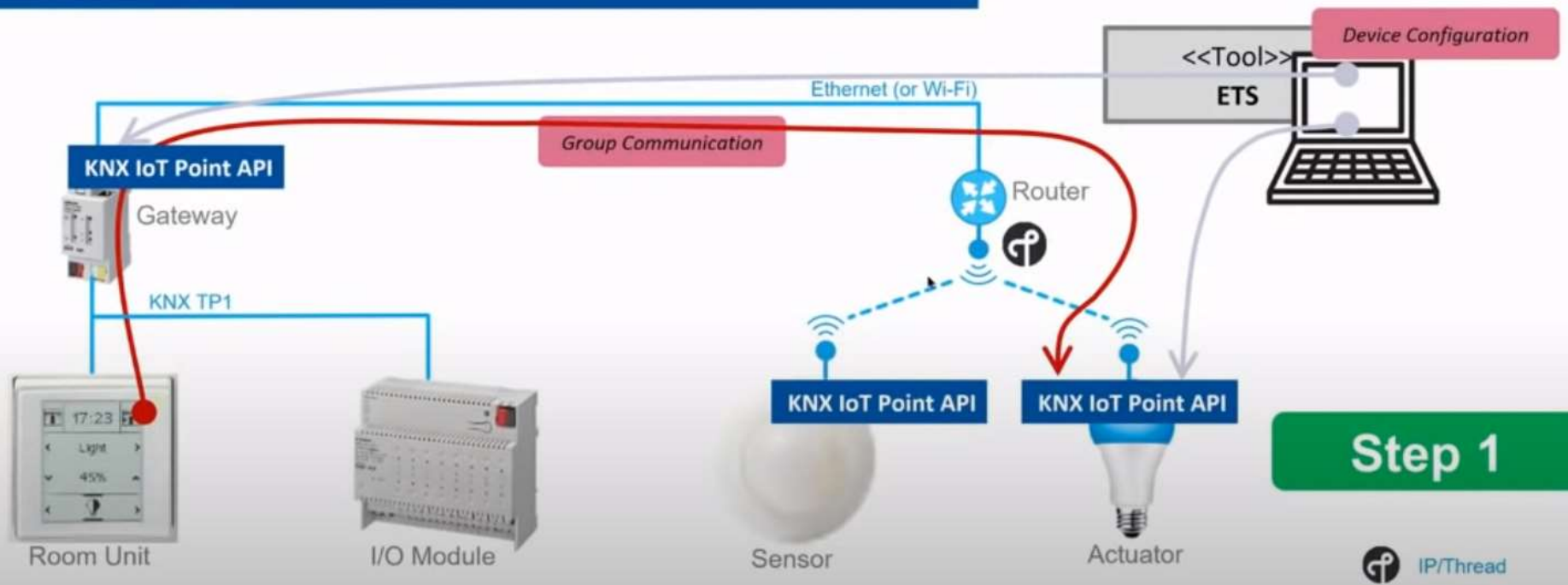






- ETS needs to implement a Point API client
- Device manufacturer(s) provide a Point API server

ETS 6.2



KNX võrgu/seadmete funktsioonide kofigureerimine

Synco 700 HVAC controllers

Room controllers (RXB fancoil)

Synco Living

tsoonipõhine sidumine

Elektriseadmete juhtimise

andur/täitur- seadmed/paneelid

gruppiaadressiga sidumine



ACS Service Tool
(+ OCI700 adapter)

Töörežiimide muutmine kogu hoonele
või ruumide kaupa.

Sisekliima seadesuuruste määramine
kogu hoonele või ruumide kaupa.

Näidud ja veateated.

Valgustusgruppide lülitamine ja
dimming. Aknakatete juhtimine.
Ajagraafikud. Indikatsioon/näit
(aknad, ukсед, tuul, päike, tuleoht,
valvesign.)

Erinevad koostoime stsenaariumid