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STKNX - comprehensive solution of home building automation

ST Automation Competence Center

Automation Competence Center

Automation focused application segments

Home, Building & City & Agriculture

Segment	Smart City	Smart Home & Building	Smart Farming & Agriculture
Application	Smart Infrastructure, Smart Mobility Management, Smart Public Safety, Smart Healthcare, Smart Building, Smart Utilities, Smart Security, Smart Education, Others	Safety and Security, Smart Appliances, HVAC, Home Entertainment, Lighting Systems, Energy Management, Others	Precision Farming, Livestock Monitoring, Fish Farm Monitoring, Smart Greenhouse, Others
End-Device	Smart Street Lighting, Parking Mgmt, Waste Mgmt, Traffic Mgmt, Smart Toilet	Gateway, Connectivity, KNX Solutions, Bldg Safety & Security, Smart Metering. Climate Control/HVAC, Smart Lock, Fire Alarm, Control Panel, People Detector, Smart Camera	Smart fisheries, Smart piggery, Smart Rubber Industry, LoRa Smart Sensors, Edge Gateway, Meteorological Environment Monitor, Pest and Disease Detector, Livestock Breeding

Automation Competence Center

STPMIC · STUSB · STSPIN · MasterGaN · STPOWER · STM32

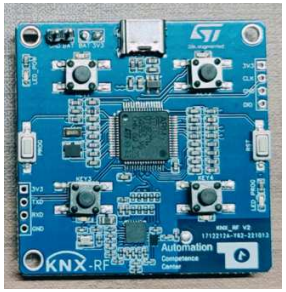
Products
STM32Fxxx Family, STM32G4/G0, STM32Wxx, IGBT,SLLIMM IPM, SJ MOSFET, Mdmesh M2, VIPer, STSPIN, Family of SIP, IGBT, IPM, MOSFET, Gate Drivers, Sensors, MEMS, ToF

Flight Sense · iNEMO · ST Op Amps · BlueNRG · VIPerPlus · ST PROTECT

Smart Home, Building and City Automation

IA.HA 0005.20
Slim Board for BlueNRG to KNX

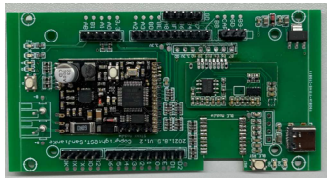
IA.HA 0013.21
KNX-RF General Function Board project



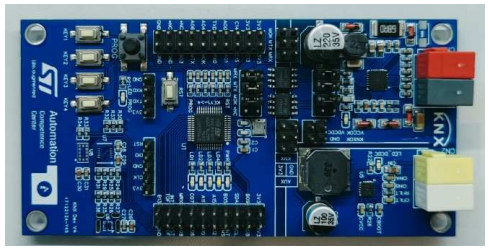
IA.HA 0007.20
KNX LED Lighting Control Design with GVS

IA.BA 0005.20
KNX-LoRa project based on STM32WL STKNX

IA.HA_0012.21
KNX Sensor Project



IA.BA_0013.22
STKNX evaluation and development board



IA.CA_0005.22
XH Smart Locker Project

IA.HA 0006.20
STM32G070 and STKNX Module design with GVS

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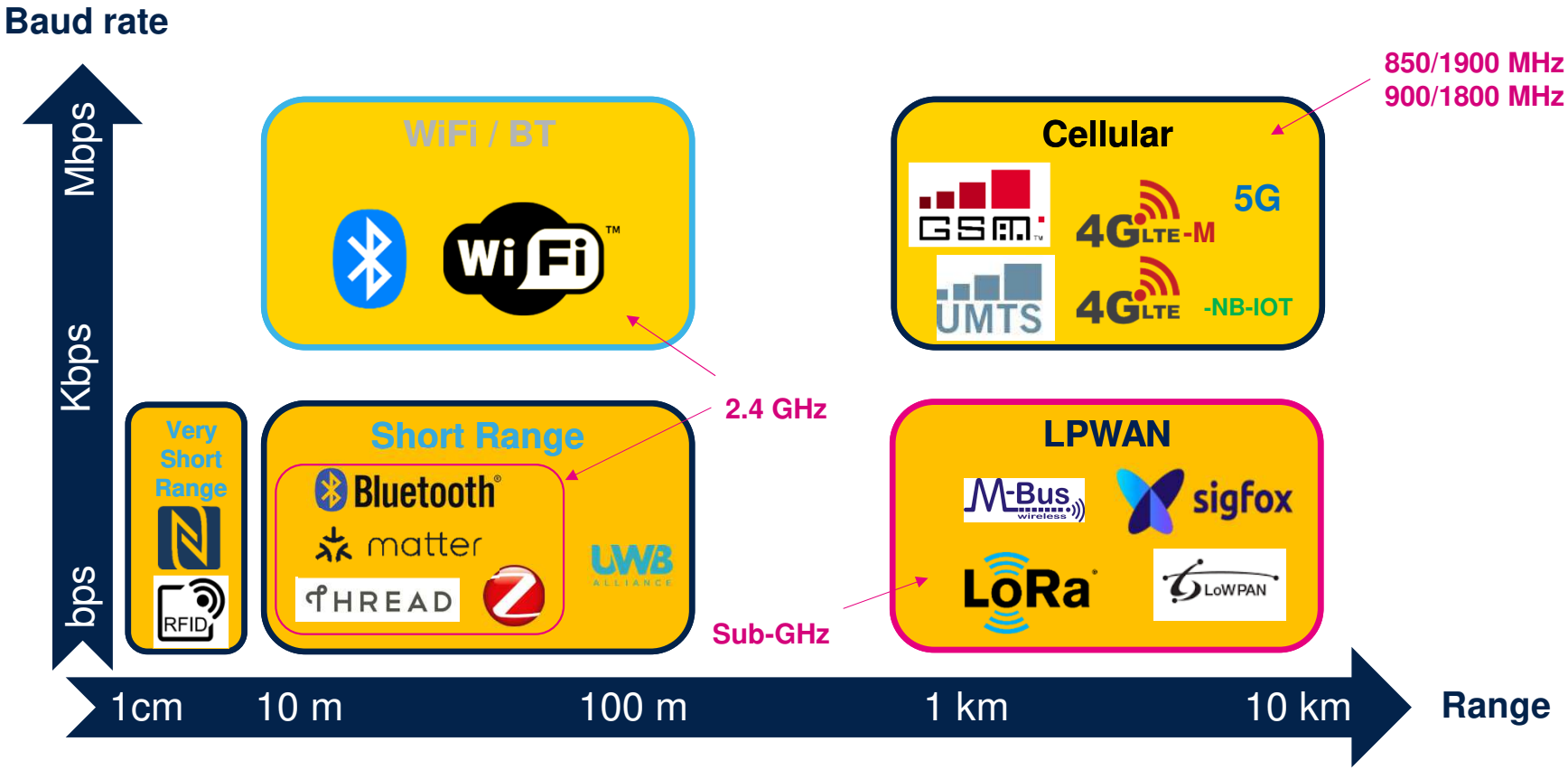
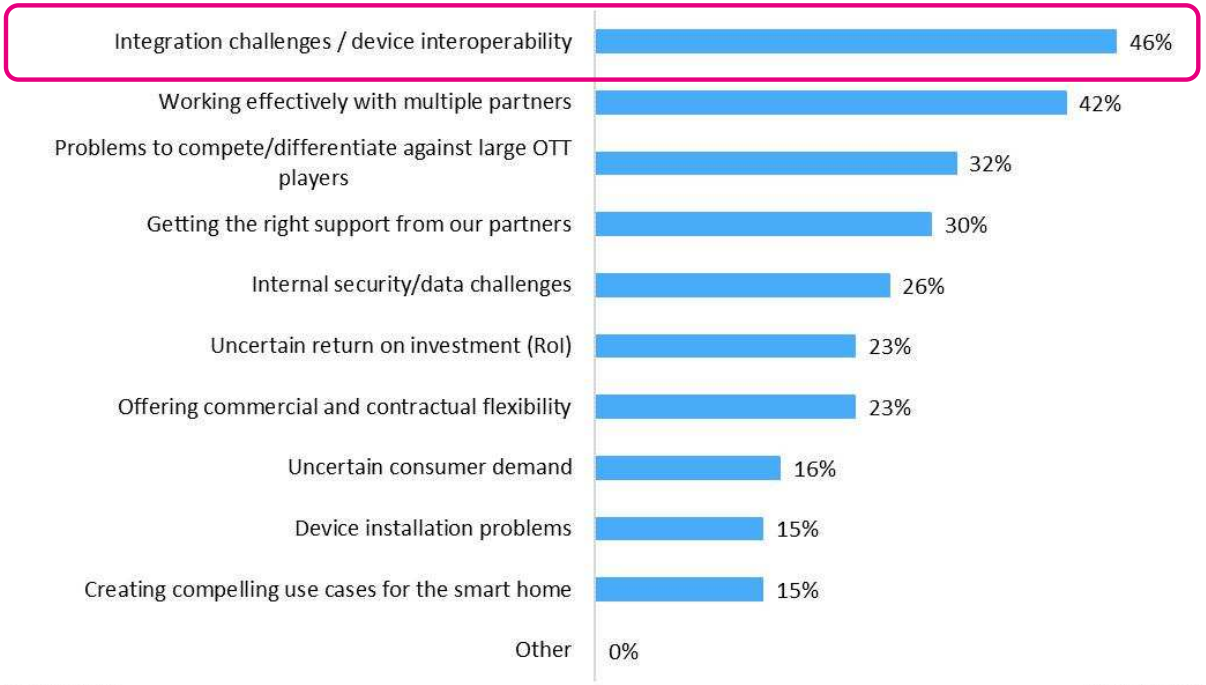
Wireless connectivity technologies - Overview



Smart home biggest challenges

Q: What are your company's biggest internal challenges in providing smart home services?



Source: Omdia

KNX

Interoperability	Standard	All applications	High Quality
Interoperability	Easy to use	Security	Reliability

matter

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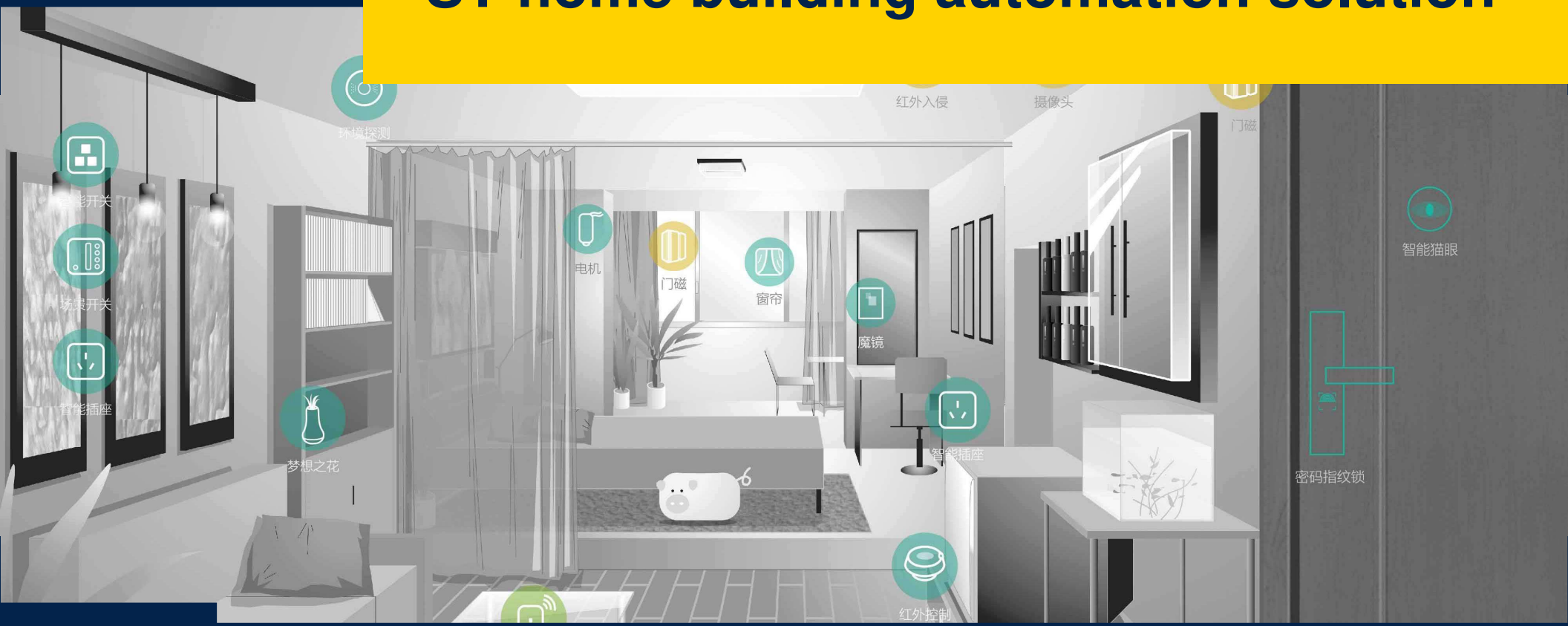
ST home building automation solution



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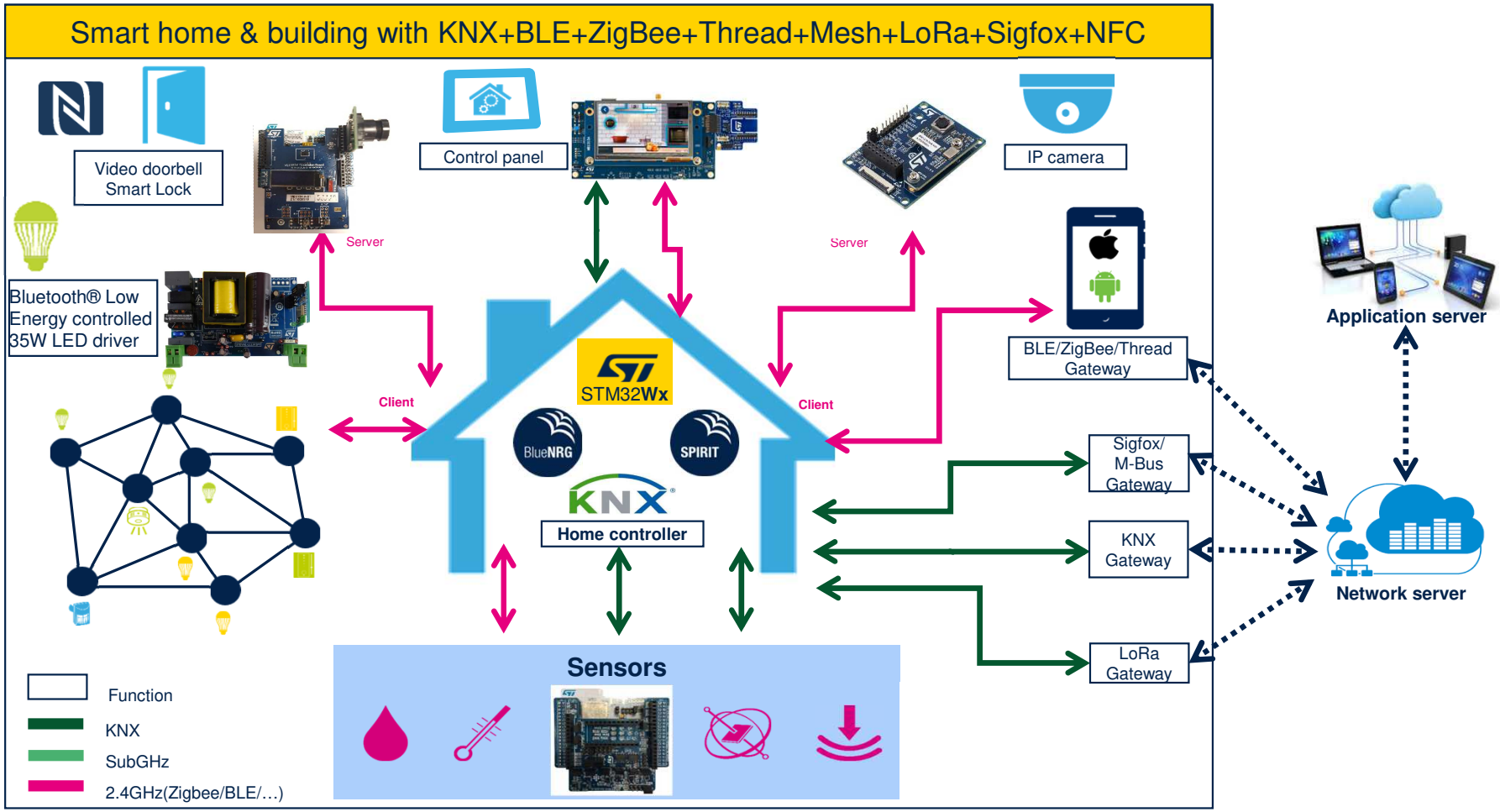
Smart home and building

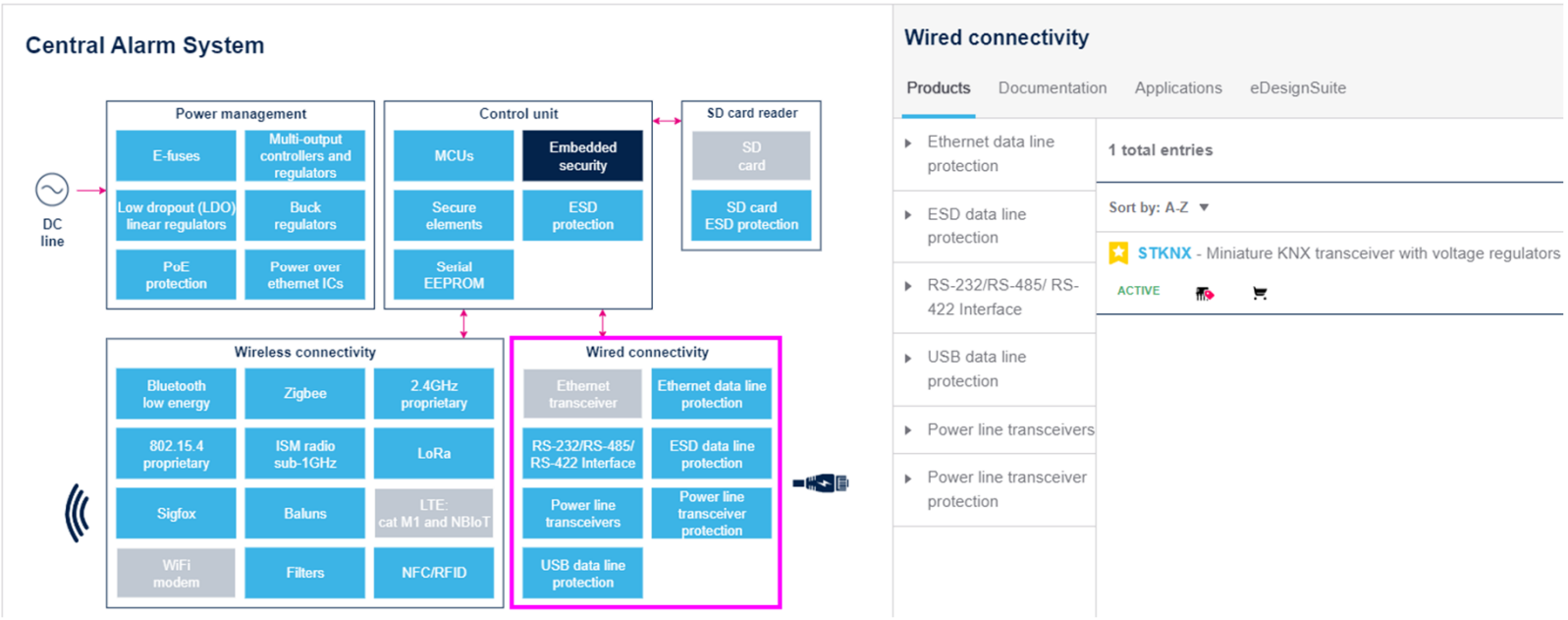


Home, building, and city automation

Central alarm system

ST->Applications->Industrial->Home, Building and City automation

Click on the diagram to choose the products you need, to start your design.



MCU

EEPROM

Protection

SENSOR

MPSFET

DIODE

VIPower

Op-amps

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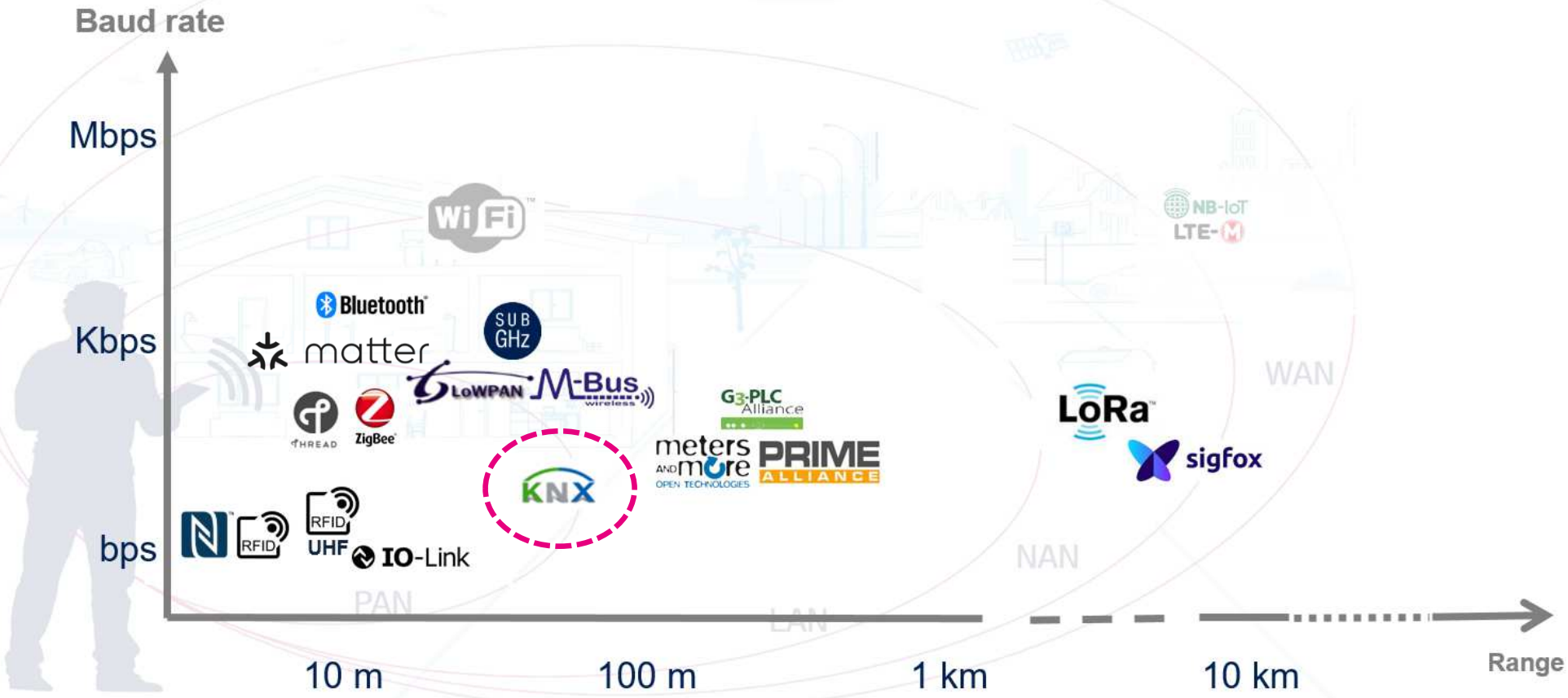
ST connectivity portfolio



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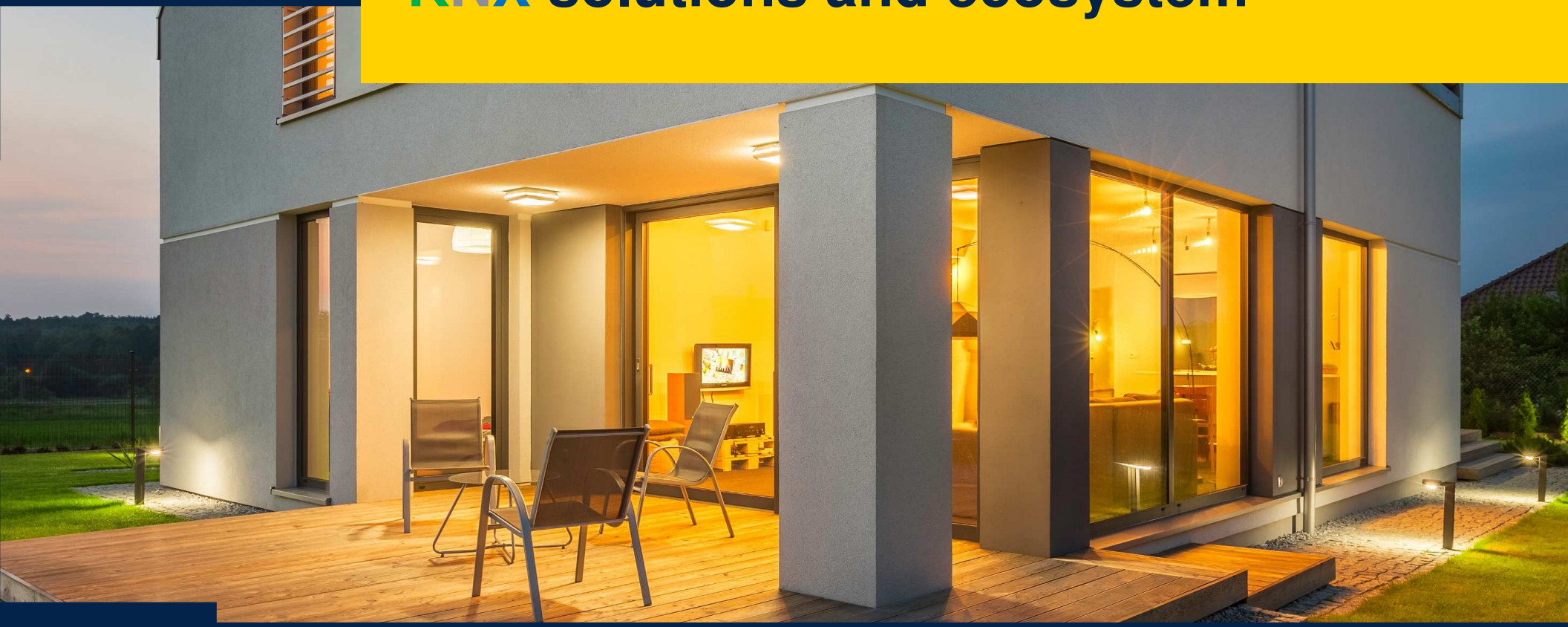
KNX solutions and ecosystem



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KNX developmental course

1983

- IEC TC 83 WG 1 "Home and Building Control Systems" Working Group was established

1989

- ISO/IEC JTC 1 SC 25 was established

1990

- EIBA(European Installation Bus Association)

1999 ★

- KNX Association Established

2003

- KNX protocol approved as a European standard EN 50090

2006

- The KNX protocol has been approved as an international standard ISO/IEC 14543-3

2008 ★

- KNX China User Organization Established

2013 ★

- KNX protocol approved as a Chinese standard GB/T 20965-2013

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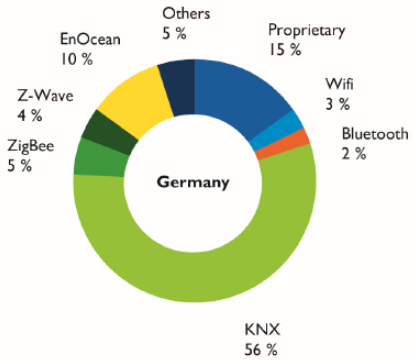
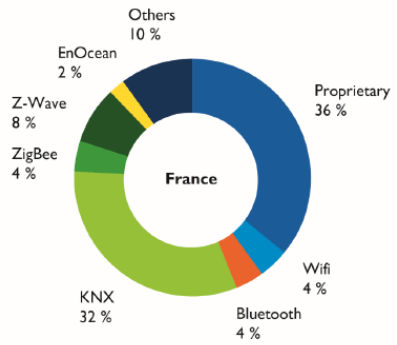
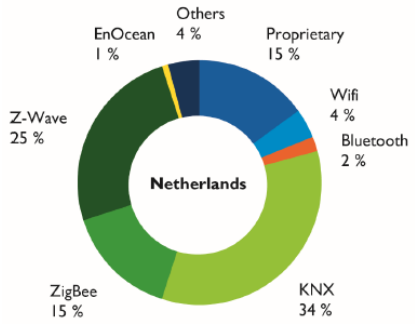
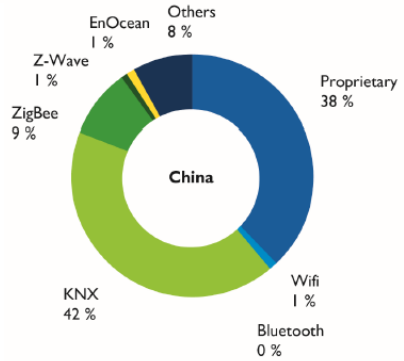
KNX Market Share

KNX Market share in SMART Homes and Commercial Buildings

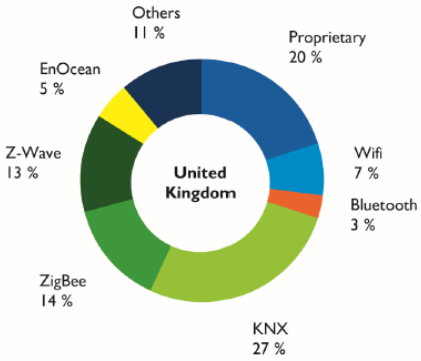








BSRIA



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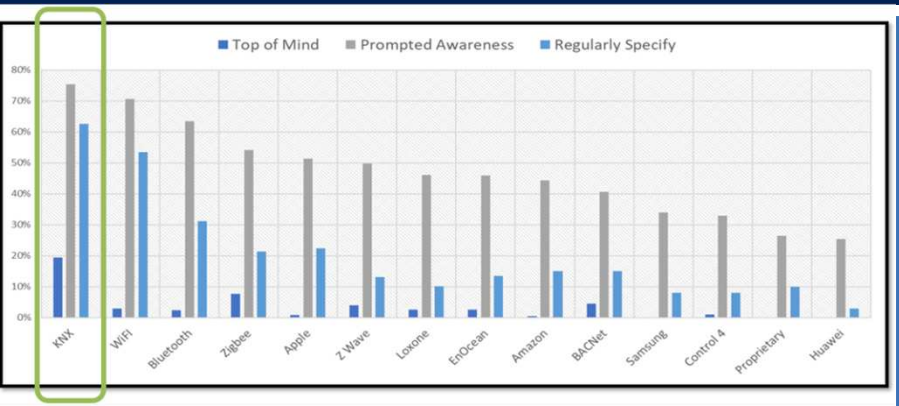
KNX Market Intelligence

Home building automation KNX market



Source: *1: INCISOR.TV

- Survey result is from “Hiddenwires” magazine
- Surveyed people are **8,000 industry professionals**, mostly from EMEA region, including largely system integrators(69%), designers, manufacturers, distributors, and architects.

- **Top of mind:** KNX as the wired based and nonproprietary protocol, is ranking 1st in the mind of professionals. WiFi and BLE are conventional standards.

- **Prompted awareness:** 75% industry professionals are aware of KNX as a technology for building automation.

- **Regularly specify:** 62% of industry professionals trust and specify KNX, especially in residential integration projects.

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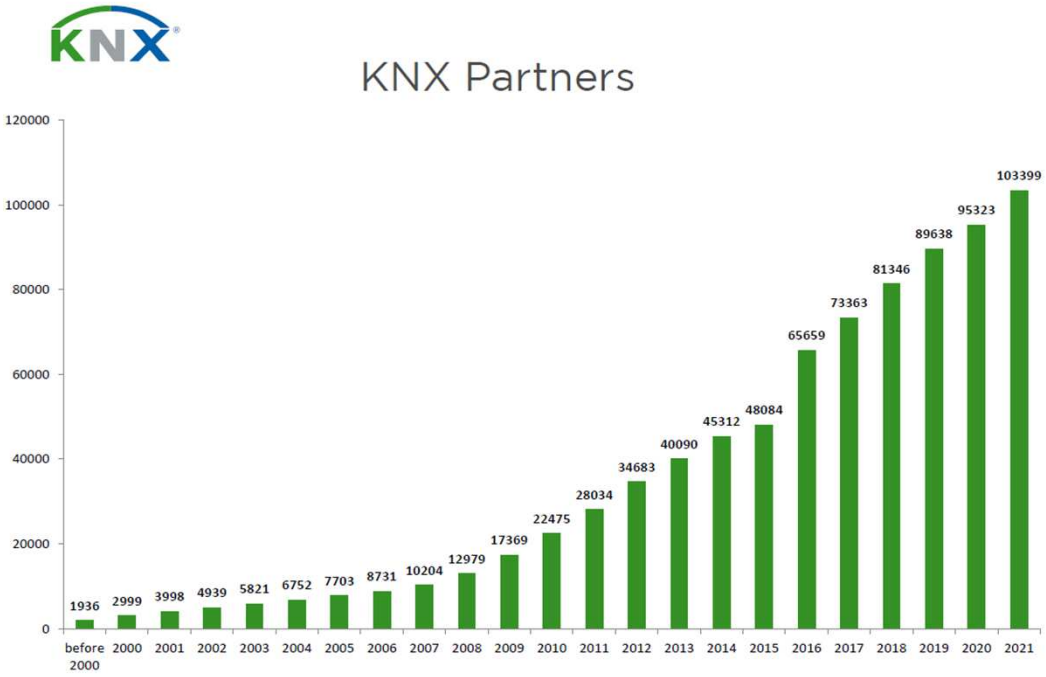
Center

KNX layout and growth



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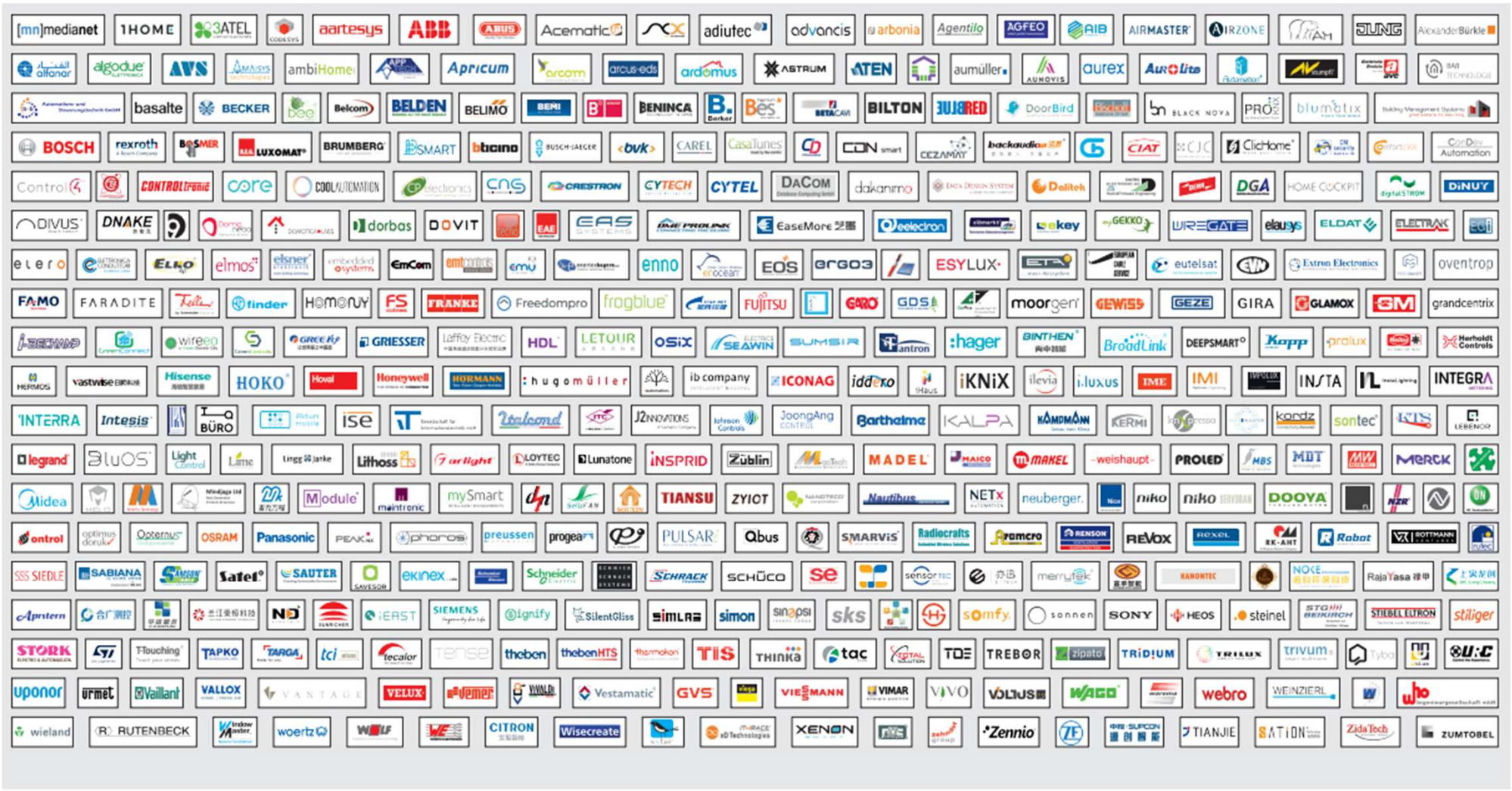
*Data by February 2022



KNX MEMBERS | 500 Manufacturers from 45 Countries

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KNX in smart home and building automation

KNX is an open worldwide standard for home and building automation

Covering a range of products from many manufacturers

Approved standard:

- International standard (ISO/IEC 14543-3)
- European standards (EN 50090, EN 13321)
- US standard (ANSI/ASHRAE 135)
- **Chinese standard (GB/T 20965).**

KNX MEMBER

*Data by February 2022

KNX

500 KNX Manufacturers
in 45 Countries
8000 KNX Certified Products

103399 KNX Partners
in 171 Countries

499 KNX Training Centres
in 72 Countries

173 KNX Scientific Partners
in 36 Countries

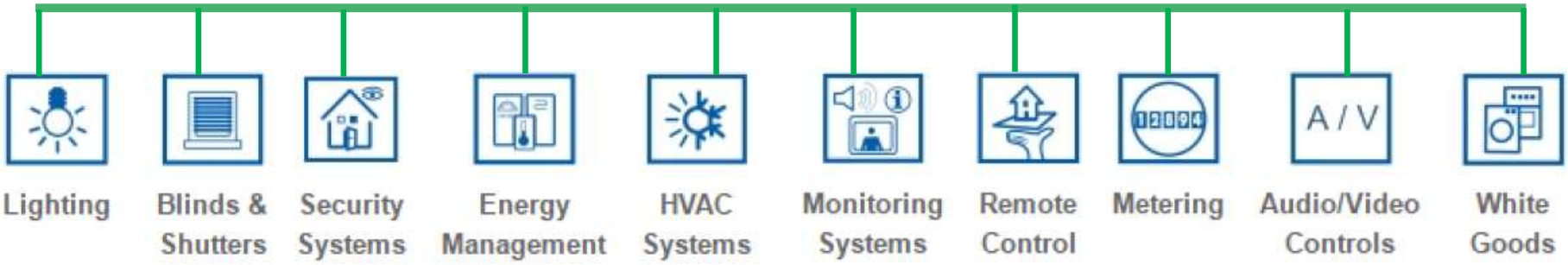
23 KNX Userclubs / Professionals
in 20 Countries

24 Associated Partners

45 KNX National Groups

17 Test Labs
in 9 Countries

ETS Sold
in 155 Countries



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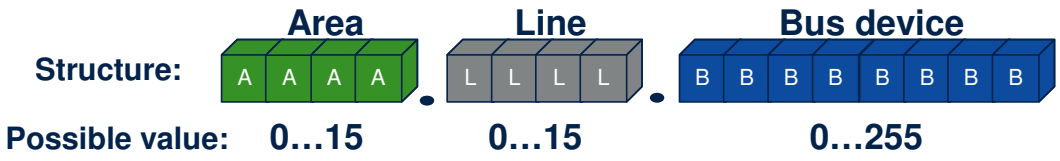
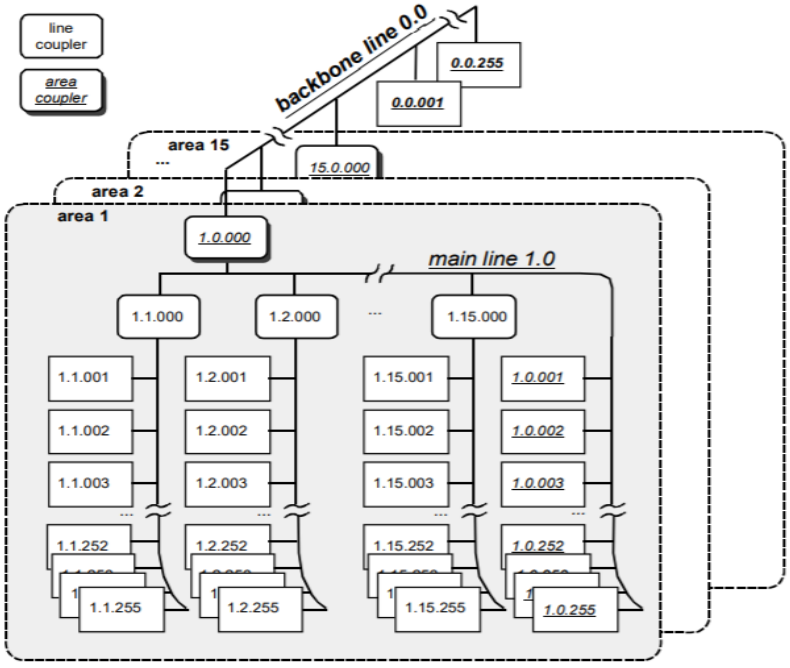
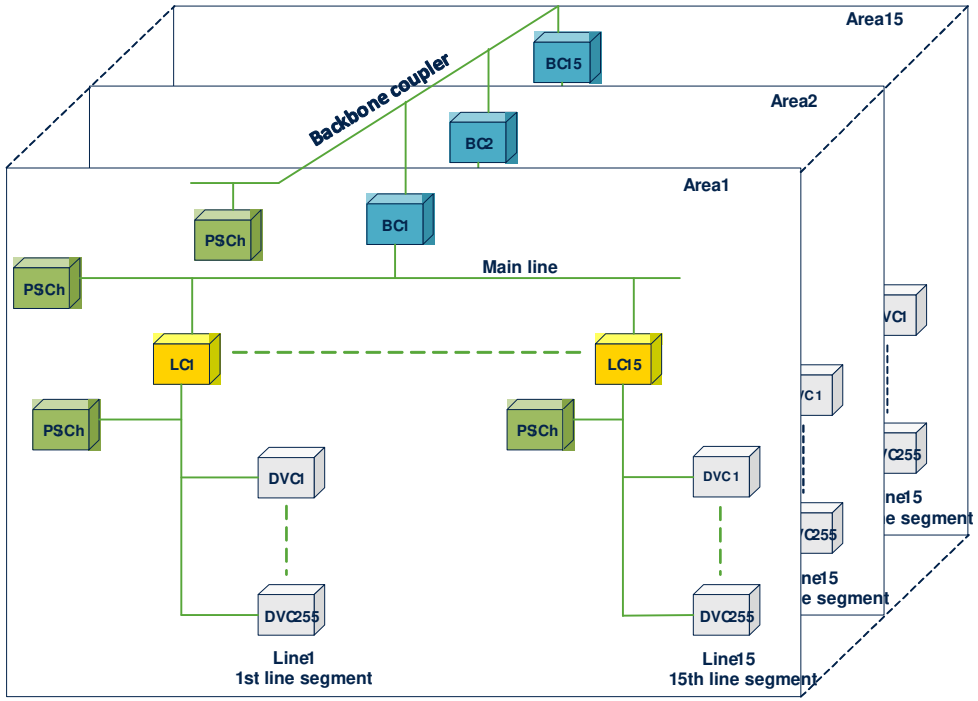
KNX Topology



KNX is a fully distributed network, which accommodates up to 65’536 devices in a 16bit Individual Address space. The logical topology or subnetwork structure allows 256 devices on one line. As shown in underlying lines may be grouped together with a main line into an area. An entire domain is formed by 15 areas together with a backbone line

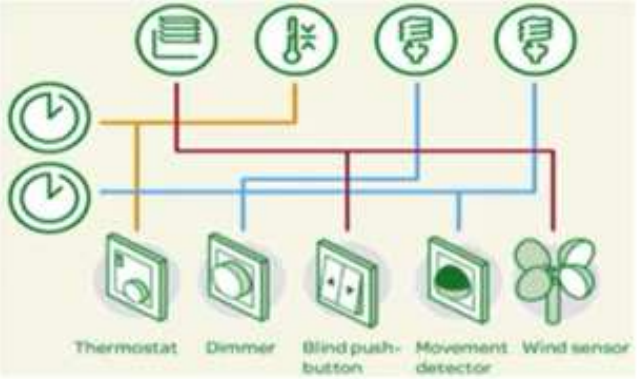




KNX advantages

Only one cable (the bus) for all information

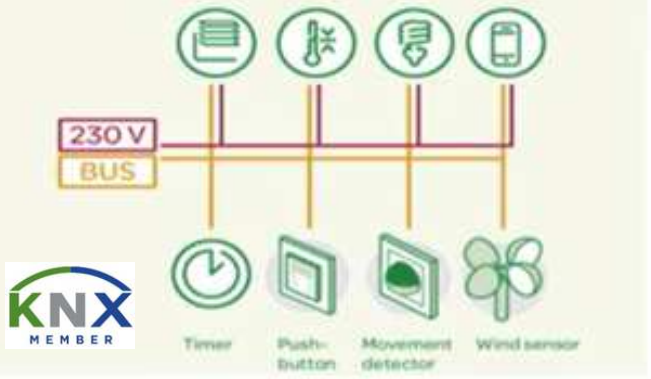
Conventional installation



Conventional installation

- Every function is realized with one or more cables
- Each device is used for one function only
- If a function should be changed, the physical installation has to be changed.
- 230V AC connected to switch panel

KNX installation



KNX installation

- Only one cable (the bus) for all information
- Functions depend on programming
- Can change of functions without changing the installation
- Over 65000 devices in one network with address assignment
- Safe voltage connected to switch panel

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Connectivity medium options

ST delivers twisted pair wired and RF wireless solutions

	Medium	Transmission via	Preferred areas of application
ST	**Twisted pair**	Separate control cable	• New installations • Extensive renovations • Highest level of transmission reliability
ST	**Radio frequency**	Radio line	• When no cable can be installed
	IP	Ethernet/WIFI	• In large installations where a fast backbone is needed • For communication with mobile devices
	Powerline	Existing network (neutral conductor must be available)	• If no additional control cable can be installed • When 230 V cable is available

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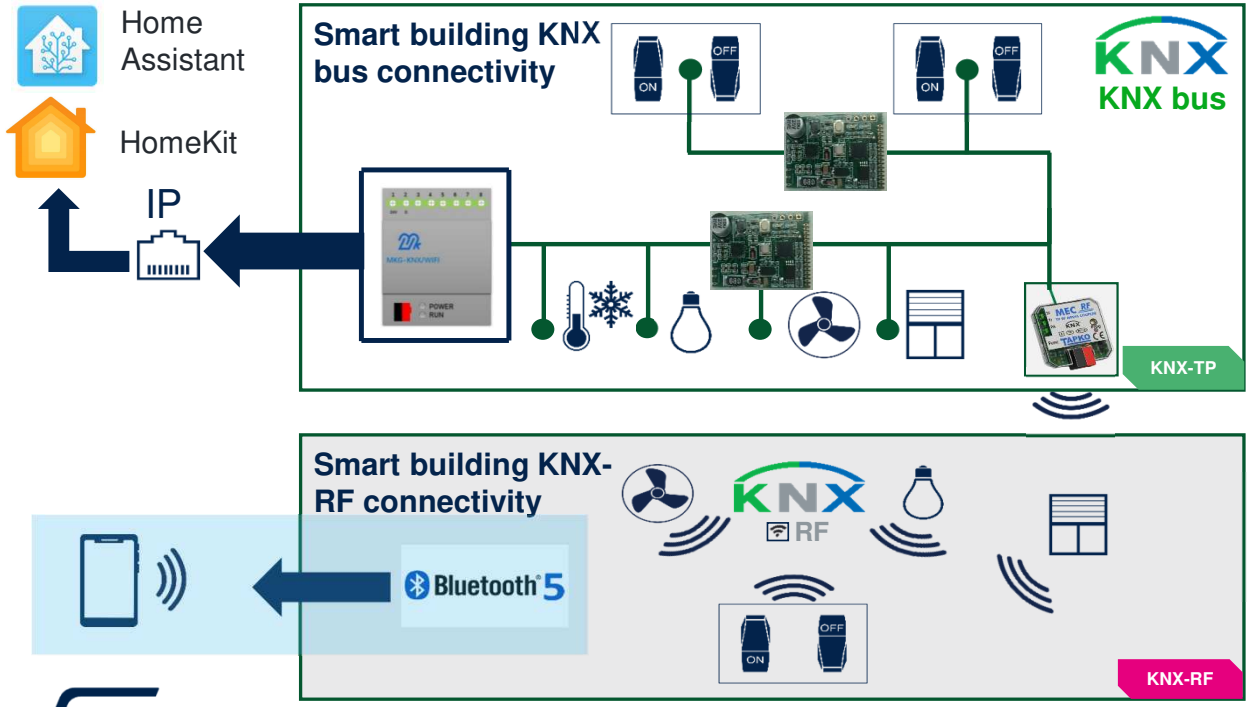
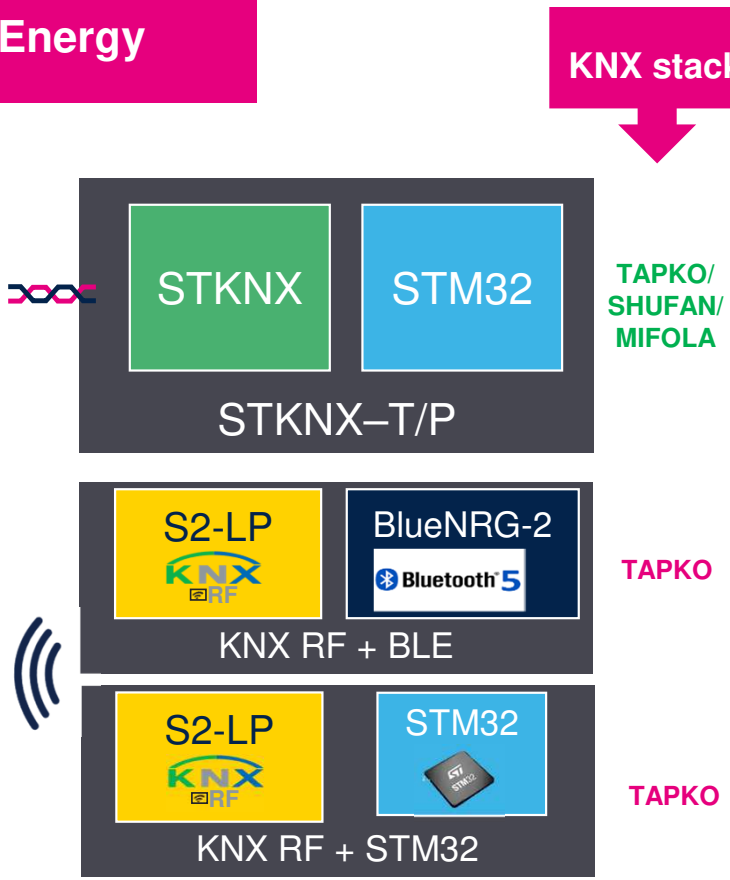
ST certified chipsets to KNX ecosystem building automation

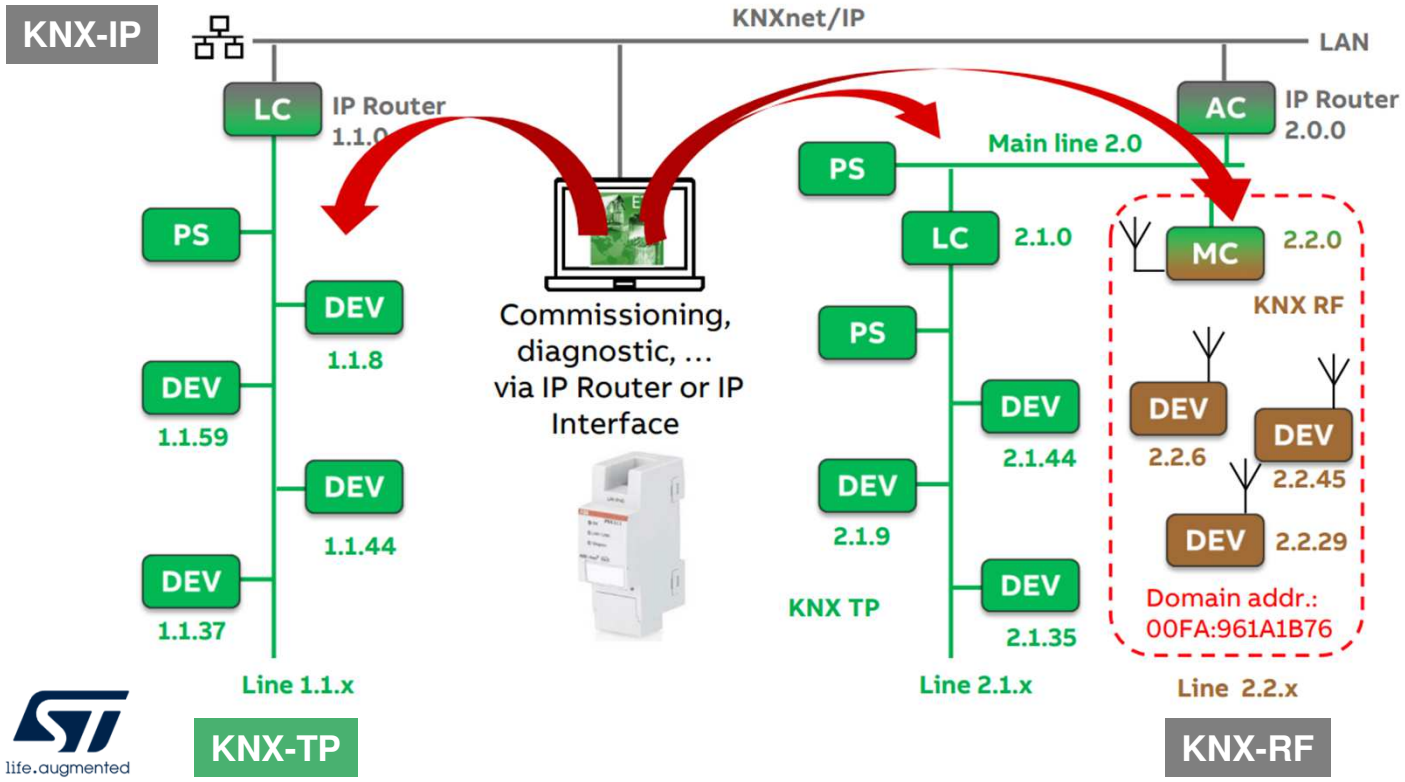
Wired and wireless KNX connectivity with Bluetooth® Low Energy





KNX mixed network application topology

Mixed network with KNX-RF, KNX-TP and KNX-IP



TAPKO KNX-RF stack

Example:

- IP Router and KNXnet/IP → IP
- IP Router 2.0.0 and Main Line 2.0 → TP
- Line 1.1.x and Line 2.1.x → TP
- Line 2.2.x → RF

*Source: Picture is from ABB

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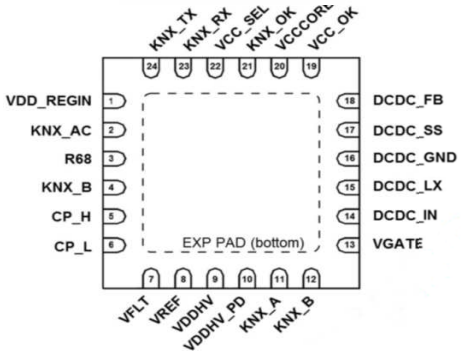
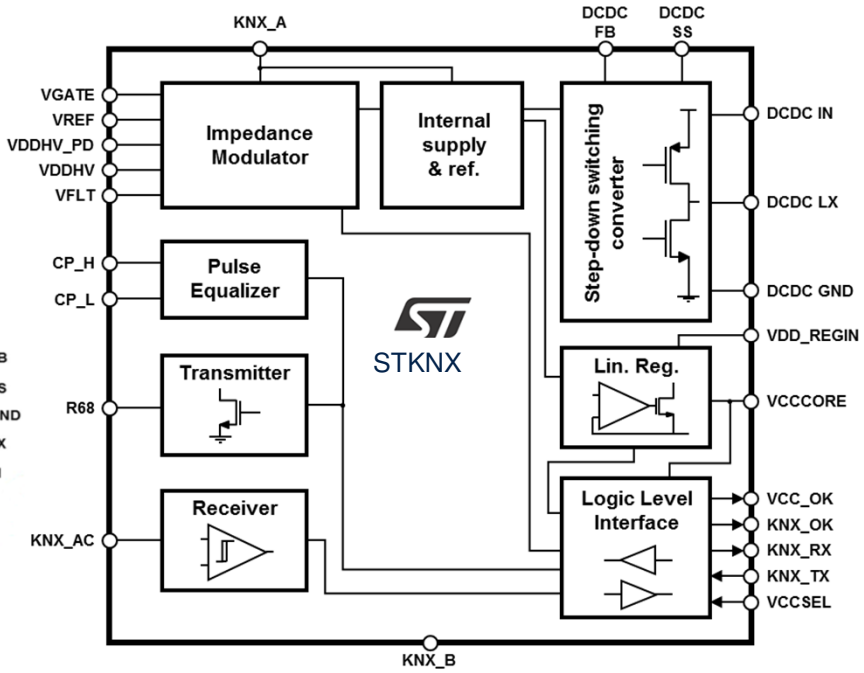
KNX TP solution - STKNX chipset

STKNX transceiver device for KNX TP communication; small package and few external components enable the very compact KNX nodes

4x4 VQFNPN
24-lead package





- KNX certified, KNX TP1-256 supported.
- Very small system solution
- Supports bus current up to 30mA (fan-in 3)
- Easy "Bit" interface to µC
- No crystal required
- 2 integrated voltage regulators for external use in application.
  - Selectable 3.3V / 5V – 20mA linear regulator
  - Adjustable 1V to 12V – 150mA high efficiency DC/DC switching converter
- Recommended list of passive parts is supplied in datasheet and schematics

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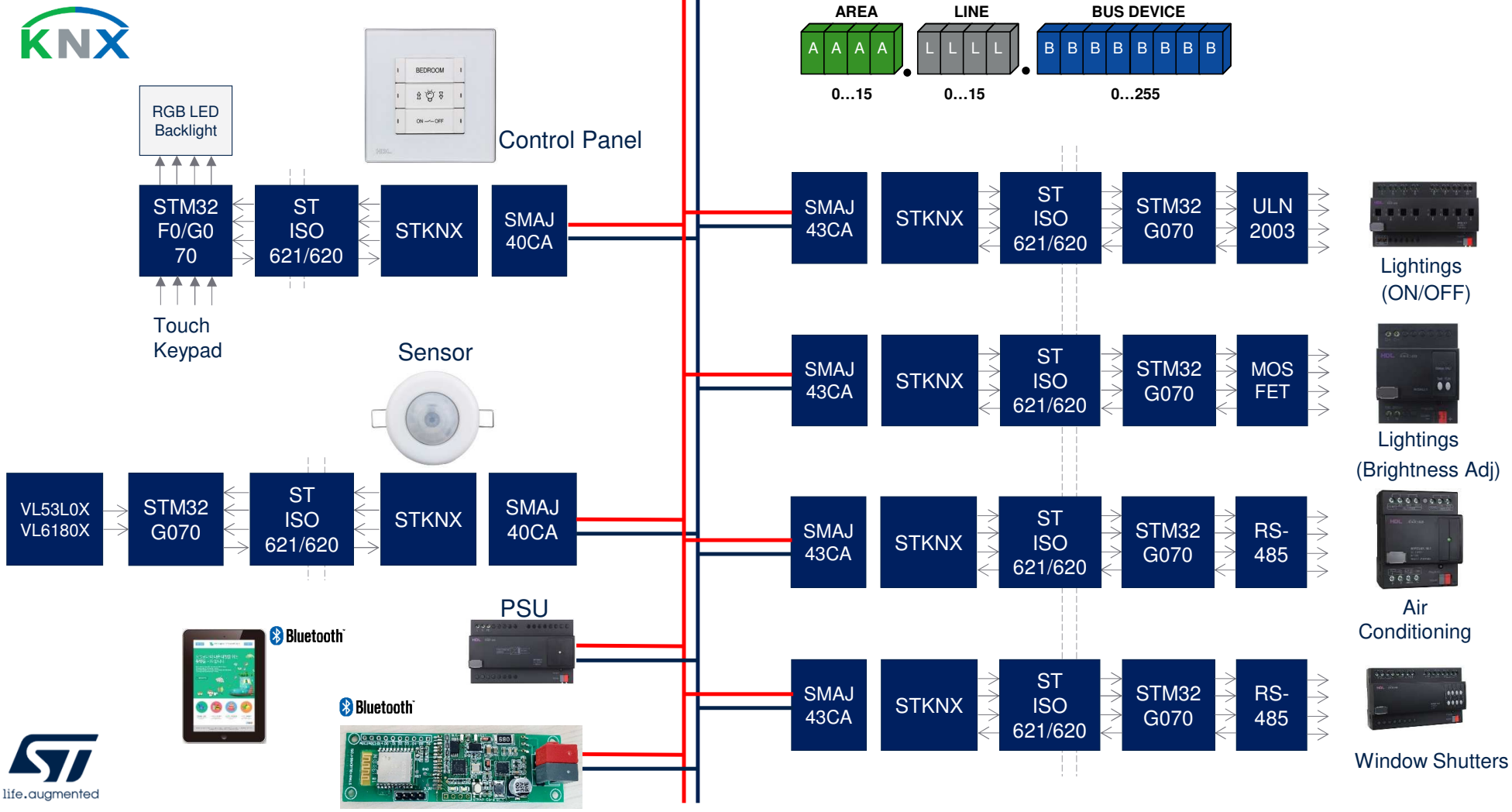
STKNX function blocks



S2-LP Sub-1 GHz transceiver

Generic S2-LP transceiver covers all KNX-RF radio bands: 433, 868 & 915 MHz (868 MHz certified only) and protocol requirements

S2-LPQTR
- 430-470MHz & 860-940MHz
- -40°C to +105°C
- QFN24 4x4x1

- State-of-the-art power consumption as wireless applications do not access to main power (e.g., KNX-RF switches)
- 10-years longevity commitment

S2-LP Power state	S2-LP current (@ 3v)
Tx @ +10dBm	10mA
Tx @ +14dBm	20mA
Rx in LPM	7mA
KNX-RF Multiscan	<10µA average
Shutdown / leakage	2,5nA

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BlueNRG-2 SoC & KNX-RF
Combines BlueNRG-2 with S2-LP

Advantages of BLE System-On-Chip in KNX-RF applications

Bluetooth 5 Certified

life.augmented KNX MEMBER

Combine 2-chip solution in dual-connectivity application

- KNX-RF connectivity with S2-LP
- BLE connectivity with BlueNRG-2
- KNX-RF stack certified on BlueNRG-2 Cortex-M0

Sustain low-cost and low-power application

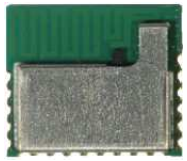
- BlueNRG-2 + CM0 architecture enough to handle KNX-RF and BLE stack
- BlueNRG SoC keeps reasonable current (~15 µA in BLE advertising mode / 1 second latency)

BlueNRG-2 also part of 10-years longevity commitment program

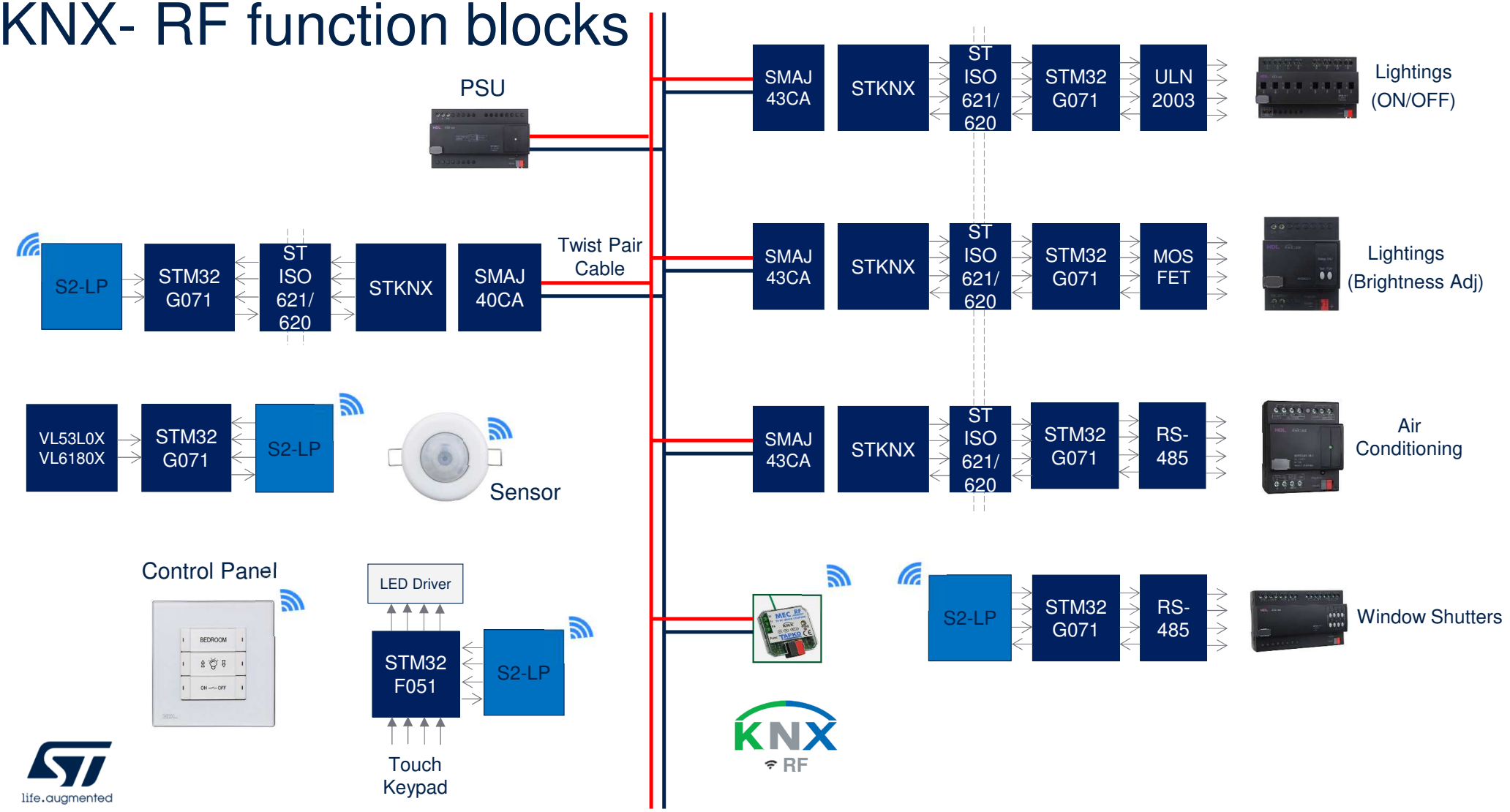
- Perfect for industrial customers

ST proposes BlueNRG-2 based modules

- Certified BLE 5.0 modules (same application SW as chipset)
- For smaller volumes leveraging ST module certification



KNX- RF function blocks



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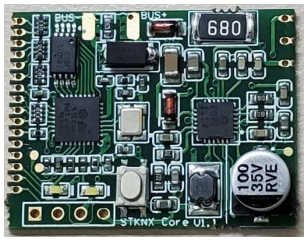
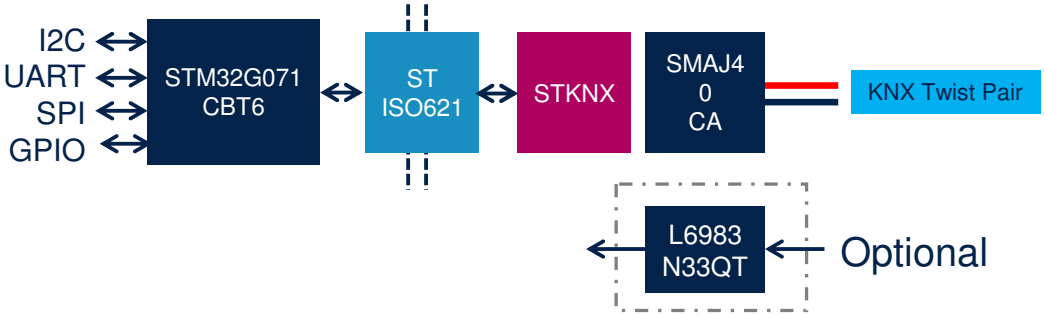
KNX-TP general function develop kit

- KNX-TP General function board
- Easy way to develop different KNX products for example KNX Sensor, Control Panel, Actuator etc.
- Plenty of expand interface of UART, I2C, SPI GPIO etc. for function expanding
- Isolation function between MCU & KNX transceiver
- Aux power supply is optional
- ST total solution
- Total cost competitive





Contact with ST Automation CC for free KNX development SDK (Evaluation version only)

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Automation
Competence
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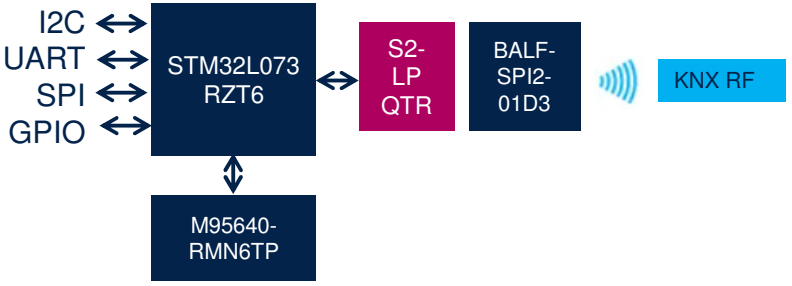
KNX-RF General function develop kit

- KNX-RF General function board
- Easy way to develop different KNX products
  (ex: KNX Sensor, control panel, actuator etc.)
- Plenty of expand interface of UART, I²C, SPI GPIO
- Battery or USB-C power supply
- 4 user buttons on the board
- 4 user LED indicators on the board
- Low-power consumption MCU - STM32L073
- S2-LP sub-1GHz RF transceiver
- 868MHz frequency band
- ST total solution
- Total cost competitive



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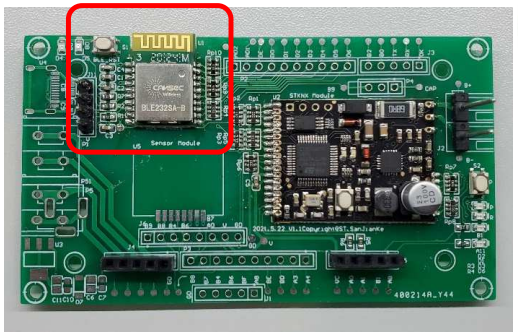
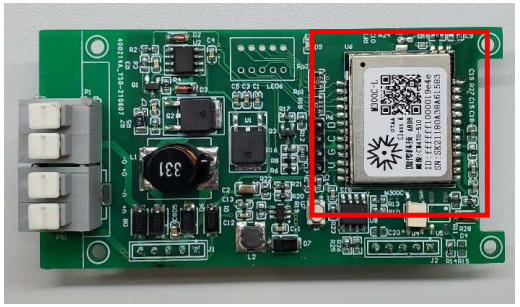
ST Open KNX-RF Demo Project Software (Evaluation version only)

KNX meet with Bluetooth, LoRa





- Input DC voltage: 5VDC to STM32WL board
- KNX bus voltage range: 24~30V max
- KNX compliant FW stack
- UART interface between STM32WL module and KNX module
- Flexible to build LoRa wireless to different KNX applications
- Compact PCB size

P/N	Pcs	Go-to-Market Materials	Y/N
STM32WL	1	Schematic	Y
STM32G071	1	PCB Layout	Y
STKNX	1	FW	Y
SMAJ40CA	1	User guide	Y
BlueNRG-232	1	GUI software	Y
HVLED002	1	Video	Y

Human presence & motion, approaching detection

TMOS sensor with KNX-TP

STHS34PF80

BOM List

STM32G071CBT6

STKNX

STHS34PF80

SMAJ40CA

M95640-RMN6TP

TMOS sensor with KNX-RF

STHS34PF80

BOM List

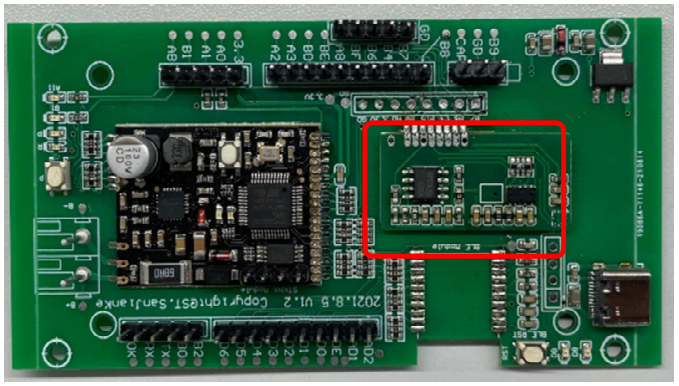
STM32L073RZ

S2-LP

STHS34PF80

BALF-SPI2-01D3

ESDZV5HS-1BF4



TOF sensor, temperature/humidity sensor

VL53L3CX

HTS221

BOM List

STM32G071CBT6

STKNX

VL53L3CX

HTS221

SMAJ40CA

M95640-RMN6TP

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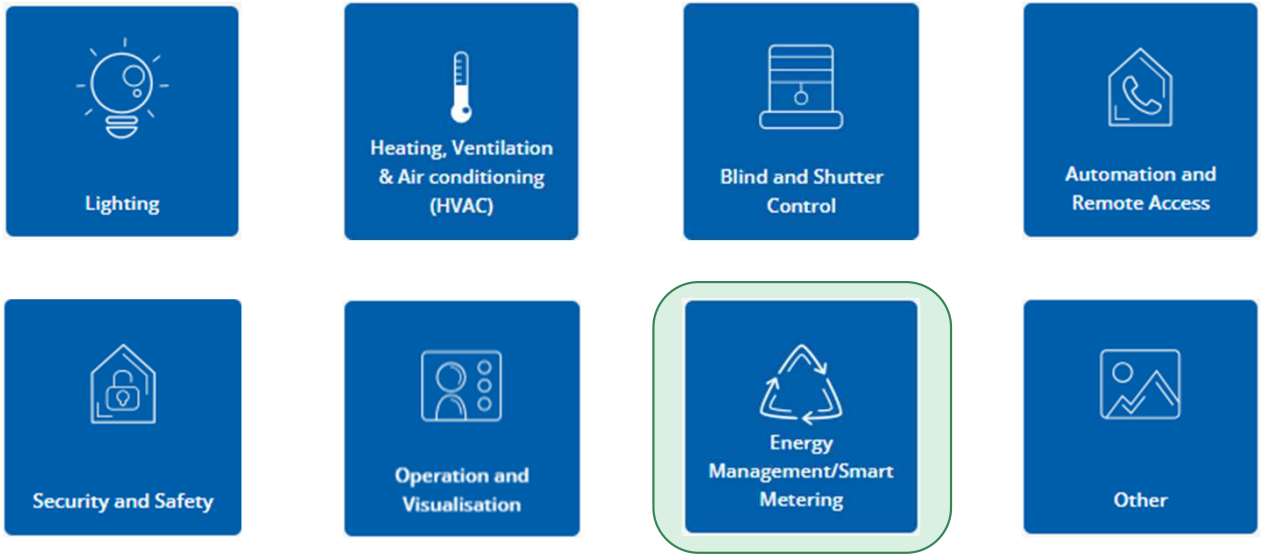
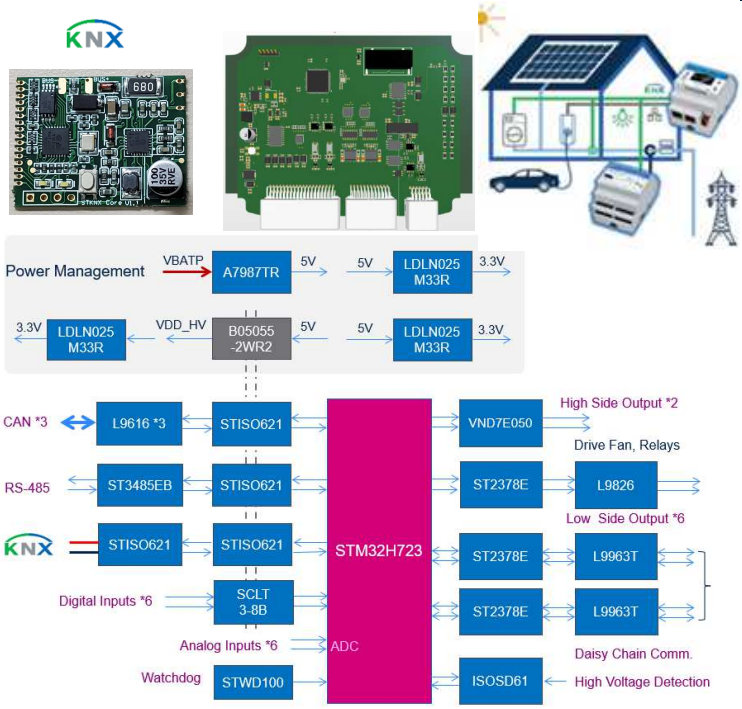
KNX applications – energy management

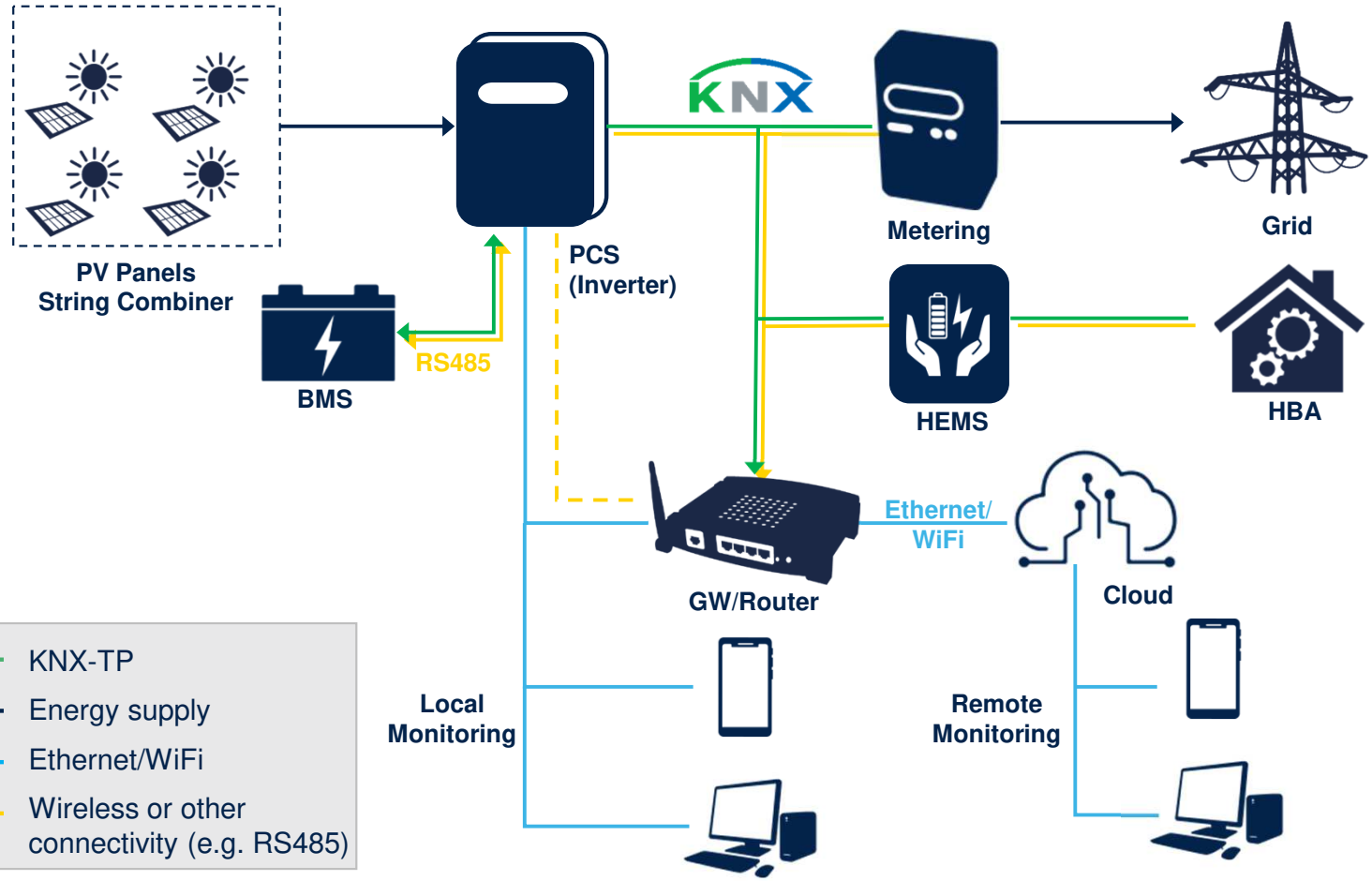
KNX applications in energy management





- **KNX energy Management:** metering , data Logging, visualization, current detection, fuel, or water tank level control, peak demand monitoring, load shedding, energy harvesting, renewable energies, battery storage

Home building KNX energy storage system



Enablers of KNX energy management

KNX Gateway for solar inverters

- KNX gateway for solar panel inverters
- Elausys link

KNX Smart Home energy solution

- A high-tech storage system that allows to cover about 75% of the yearly energy requirement with self-produced and clean energy
- Sonnen link

Electromobility in KNX Smart Home

- Dynamic load management and SMART CONNECT KNX e-charge II. Easily integrate up to 5 charging points from different manufacturers into the KNX.
- iSE - link

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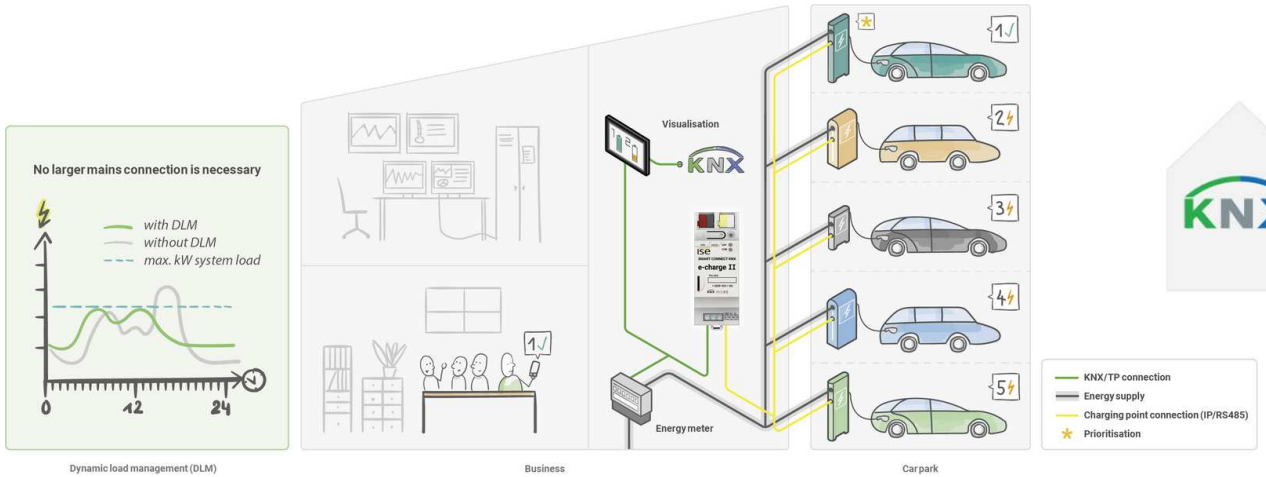
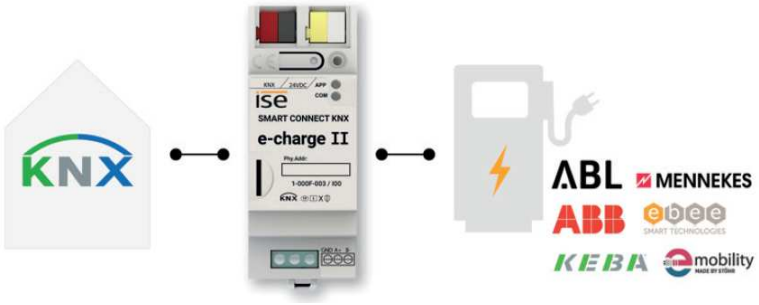
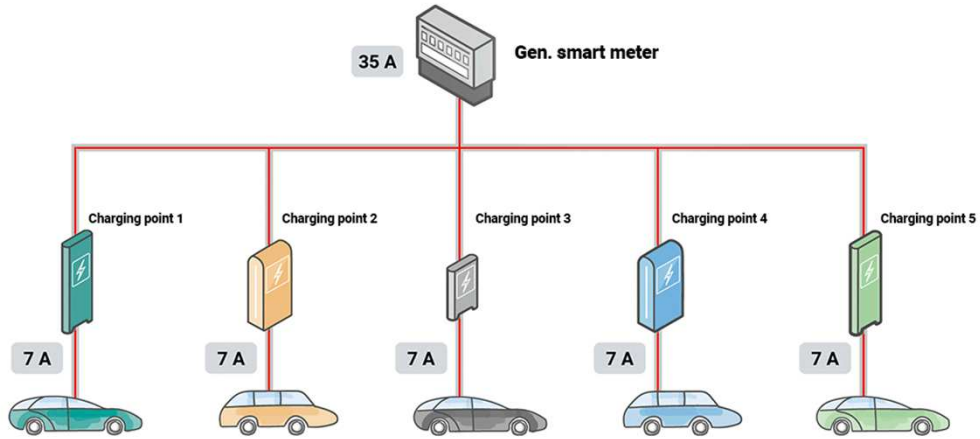
Source: KNX | energy management (sustainabilityknx.org)

KNX charging pile application







- With the SMART CONNECT KNX e-charge II, ISE brings electric mobility into the smart home. The SMART CONNECT KNX e-charge II integrates the charging poles of different manufacturers into KNX.
- Up to five charging poles per gateway can be controlled.

Source：ISE

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KNX EV charging station key profiles

Products

- KNX EV charging station

Profiles

- Power source
- Charging station status
- Visualizing
- Charging strategy
- Monitor and report
- KNX Secure

Parameters

- Smart Grid
- PV
- Energy storage
- Occupied
- Free
- Charging progress
- Various handheld devices
- Define specific charging time
- Limiting the charging power
- Check current tariff
- Overall energy consumption
- Last charge data
- Other data: Error reporting, etc.
- Protection against hackers

1. The EV market is clearly growing, and the demand for charging vehicles whilst at work/home will increase as the market expands.
2. KNX provides the mechanism to do this intelligently and securely, by integrating the charging of EVs within an energy management system that already covers all aspects of a home or building's energy consumption and generation.
3. **07B0h** is a recommend KNX configuration profile for EV charging station device, more than **2000** communication objects & parameters are supported by this profile .

Sources: KNX Org.

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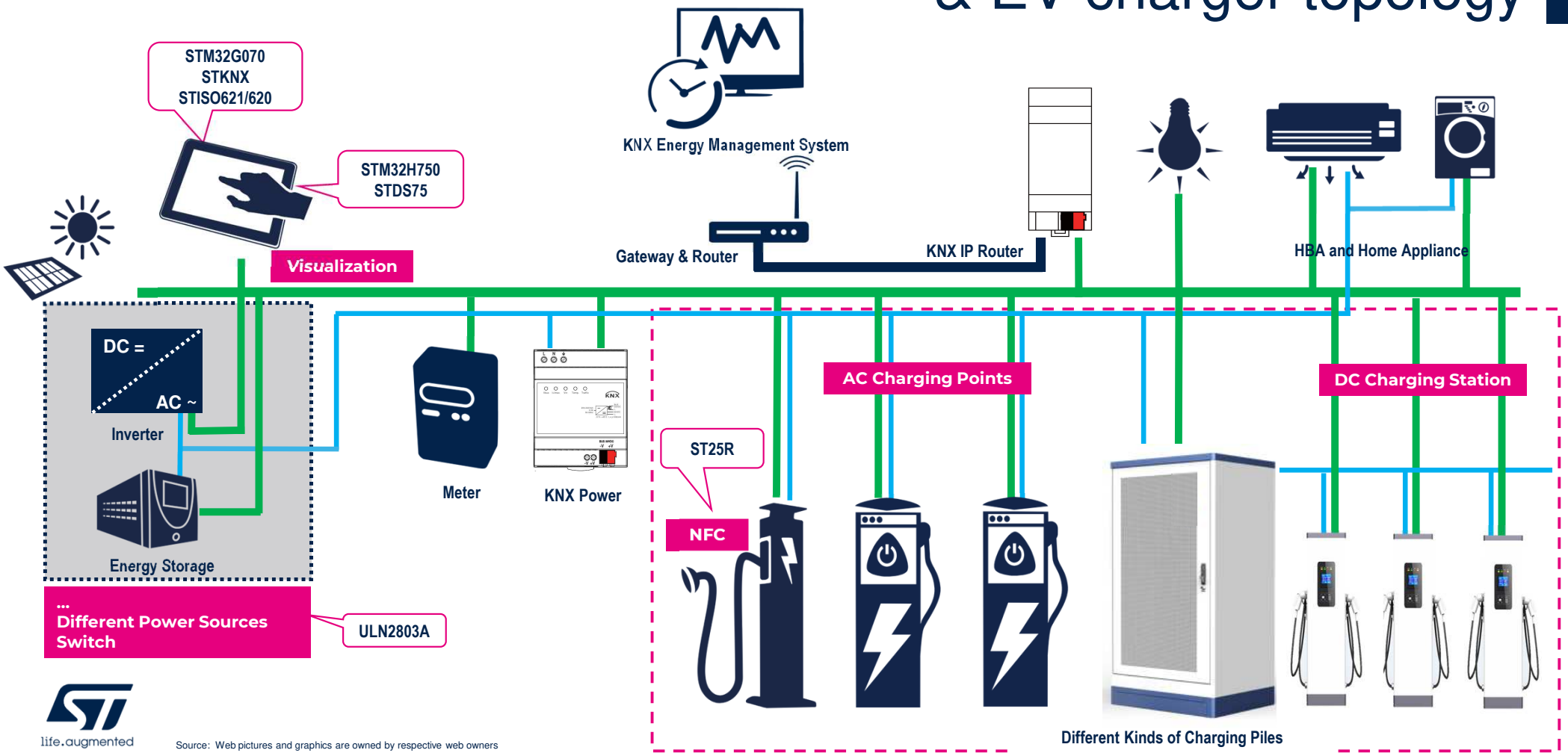
KNX energy management & EV charger topology



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Source: Web pictures and graphics are owned by respective web owners

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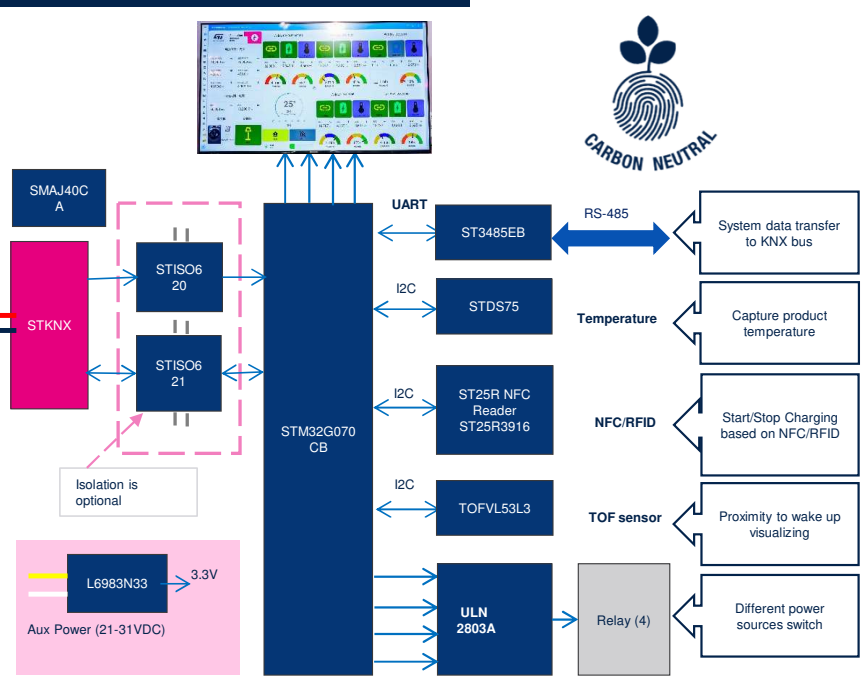
Smart KNX EV charging system

Accelerating EV Car transition with cost-effective EV Charging Infrastructure



Smart City Automation: Smart KNX EV Charging System

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[Demonstration video available for download]

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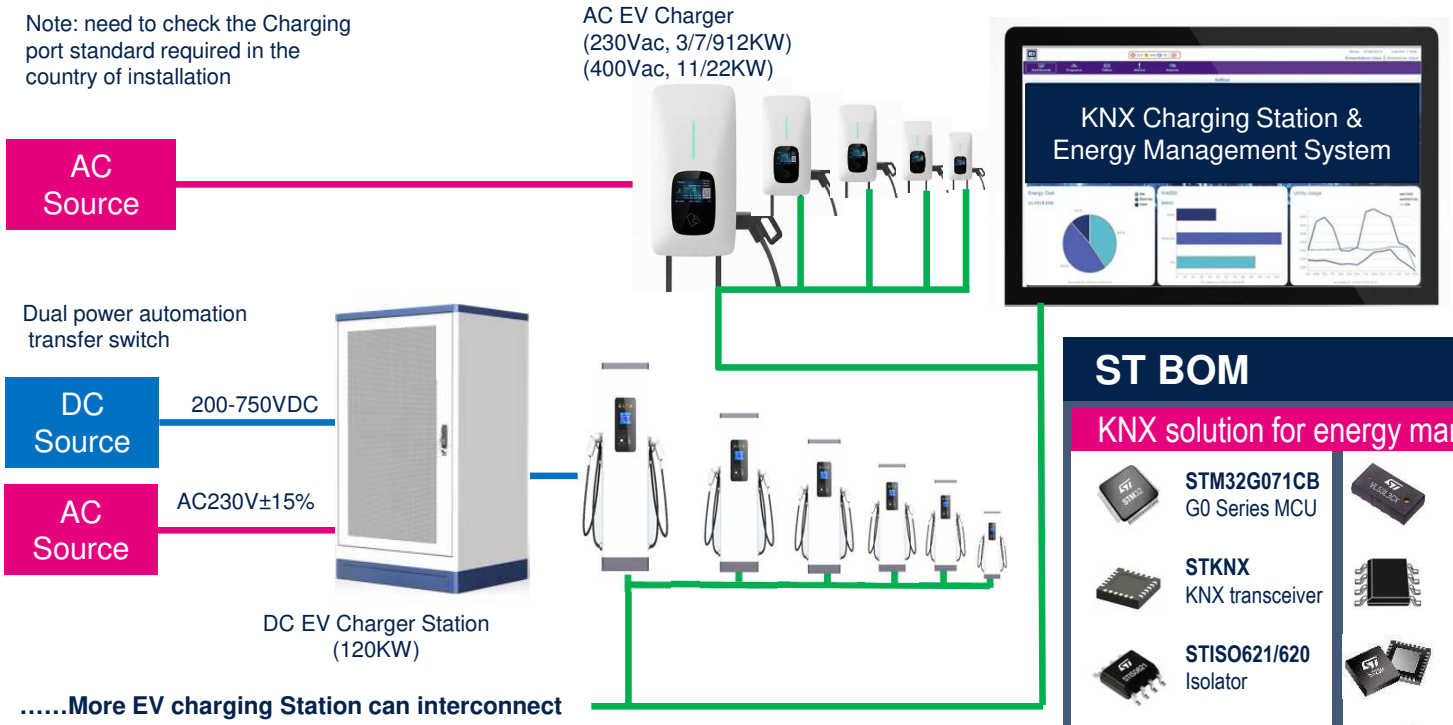
Charging station management system

KNX Energy Management System

Features:

1. Provides **status** and **power consumption** of charging
2. Start/Stop charging based on **NFC/RFID**
3. Different automation **power sources** switch
4. Automatic distribution of **charging current**
5. Provides management of energy from one charging station to another
6. Improves **intelligent utilization** of charging station reducing the idle EV chargers in peak hours
7. KNX **Secure** adds more protection in the IP and data transfers
8. Up to **65,000** nodes can be manage by KNX
9. Visualizing for charging progress, payment and error reporting, etc..



ST BOM

KNX solution for energy management

- **STM32G071CB** G0 Series MCU
- **VL53L3CX** ToF Sensor
- **STKNX** KNX transceiver
- **ST3485EB** RS485 Transceiver
- **STISO621/620** Isolator
- **ST25R3916FN** NFC Reader
- **L6983N33** Buck Regulator
- **ULN2803A** Darlington Arrays
- **SMAJ40CA** ESD protection
- **STDS75** Temperature Sensor

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Source: Web pictures and graphics are owned by respective web owners

KNX applications and use case sharing

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Application areas

Residential

Office buildings

Hotels

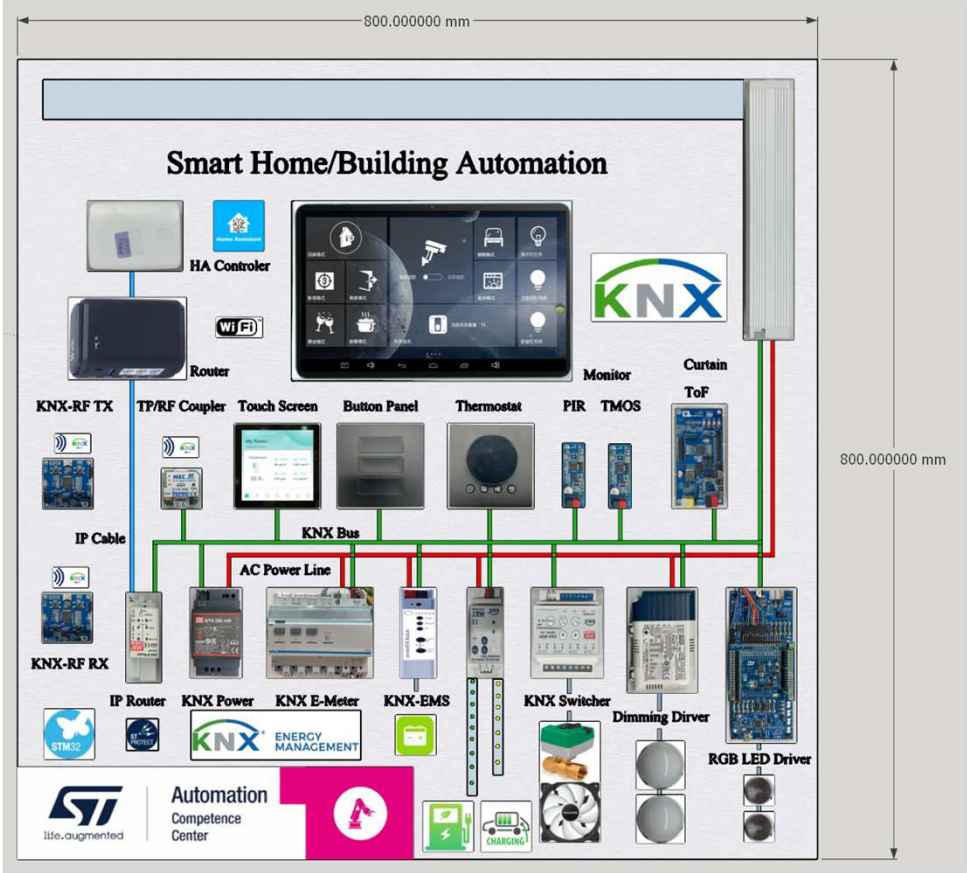
Airports

Hospitals

Schools & universities

Industrial buildings

Automation Competence Center System Solutions
- Home/Building Automation



Functions:

- KNX Push Button and Touch Panel
- HAVL Control Panel
- KNX Sensor of PIR, TMOS, TOF
- KNX Actuator of ON-OFF Control
- KNX Actuator of HVAL Control
- KNX Actuator of LED Dimming Control
- KNX Actuator of RGBW Control
- KNX Energy Meter for Energy Management
- KNX Actuator for EV Charging-Pile Control
- KNX-TP/RF Coupler for KNX-RF connection
- KNX-IP Gateway to support Home Assistant

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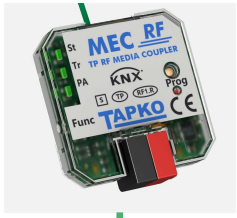
KNX system topology

KNX IP Gateway



KNX-TP BUS

KNX power supply

KNX keypad

KNX thermostat

KNX sensor

KNX LCD panel

ON/OFF switching

Dimming

Curtain control

Air conditioning

Lights

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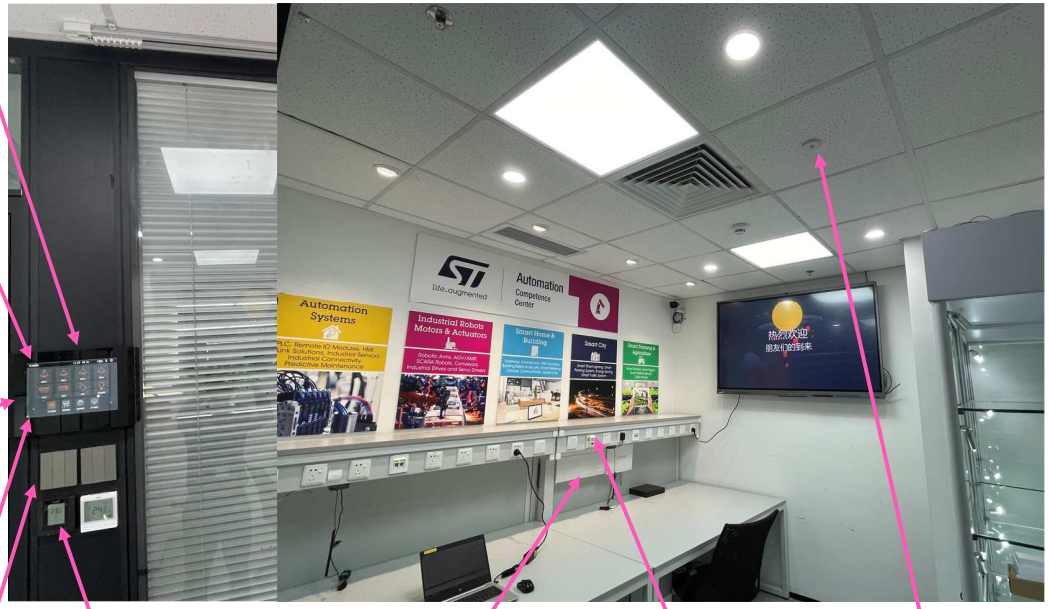
KNX intelligent control laboratory



Touch panel

Thermostat

KNX power and actuators

Air Quality Sensor

Motion Sensor

Installed KNX device

1: Touch LCD panel
2: Button
3: Thermostat
4: Air quality detection sensor
5: Human body motion detection sensor
6: Electric curtains
7: Actuator
8: KNX power supply

Key features

1: Different types of light control
2: Electric curtains control
3: Air conditioning control
4: Air quality detection
5: Light and air conditioning intelligent control with human body movement detection
6: KNX end devices control and status display on TV

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E-haus KNX HEMS case

- E-haus HEMS (Home Energy Management Systems) show real-life appliances being managed by the Alexander Maier Eisbaer multiprotocol gateway visualisation, allowing KNX to be mixed with other protocols. Examples of different functional models were shown, such as EV charging and home energy planning. *

KNX with other protocols for energy planning using the grid or solar inverter

*Source: www.knxtoday.com

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KNX examples

Guiyang Metro Transportation- Line 2

Beijing Daxing Airport

Shenzhen Longhua Jinmao House

Beijing MAHA Luxury House

Source: KNX Awards 2020 Nominees KNX Association [Official website]

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21IC training center for automation

https://www.21ic.com/stpower/training_center/#video_automation_c

ST KNX solution contributes to the sustainable development target

Home and building automation – Internet of Everything

ST KNX-RF solutions

How to quickly develop a KNX product based on ST KNX and STM32G0 MCU

STMicroelectronics Industrial automation and robotics solution

How to quickly develop a KNX product based on ST KNX and STM32G0 MCU

- Lots of training for AUTOMATION, especially for HBA and FA based on KNX and IO-Link technology…

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