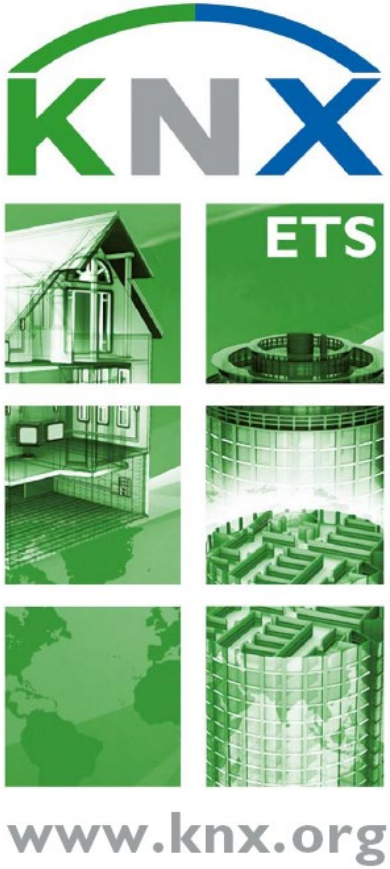
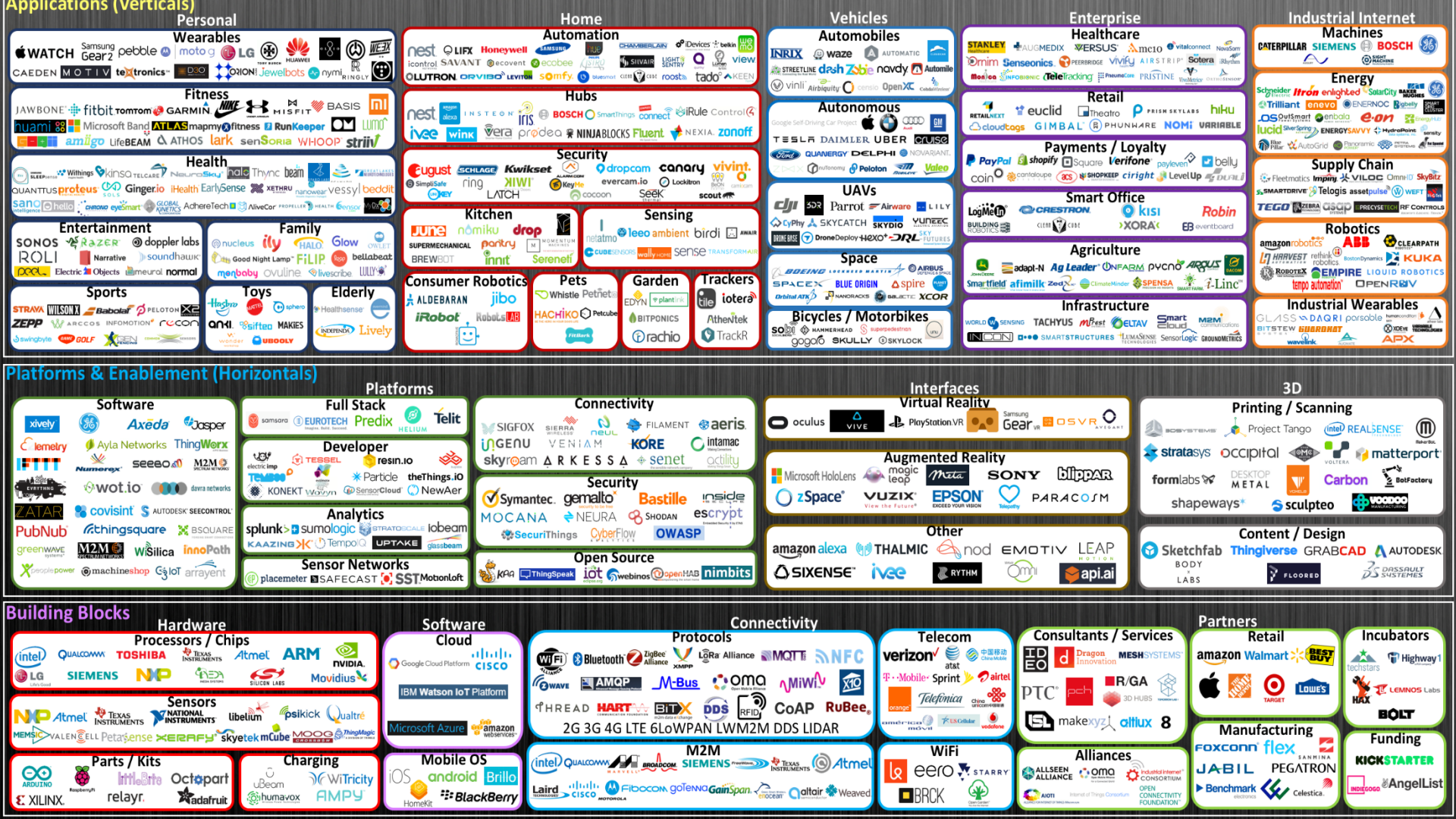


The Future of IoT in Home and Building Automation

Buildings have become IP driven

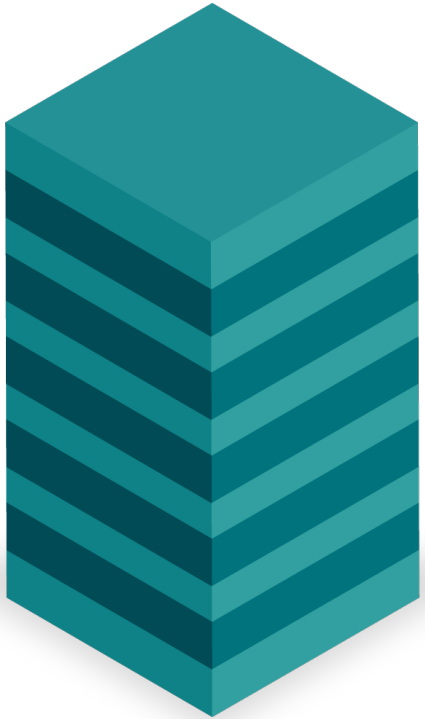
Heinz Lux, CEO
KNX Association

Join **us**
www.knx.org


Applications (Verticals)
Personal
Wearables
Fitness
Health
Entertainment
Family
Sports
Toys
Elderly
Home
Automation
Hubs
Security
Kitchen
Sensing
Consumer Robotics
Pets
Garden
Trackers
Vehicles
Automobiles
Autonomous
UAVs
Smart Office
Space
Agriculture
Infrastructure
Bicycles / Motorbikes
Enterprise
Healthcare
Retail
Payments / Loyalty
Industrial Internet
Machines
Energy
Supply Chain
Robotics
Industrial Wearables
Platforms & Enablement (Horizontals)
Platforms
Software
Full Stack
Developer
Analytics
Sensor Networks
Connectivity
Security
Open Source
Interfaces
Virtual Reality
Augmented Reality
Other
3D
Printing / Scanning
Content / Design
Building Blocks
Hardware
Processors / Chips
Sensors
Parts / Kits
Charging
Software
Cloud
Mobile OS
Connectivity
Protocols
2G 3G 4G LTE 6LoWPAN LWM2M DDS LIDAR
M2M
WiFi
Telecom
Consultants / Services
Alliances
Partners
Retail
Manufacturing
Incubators
Funding

Buildings have become IP driven

Buildings in the past

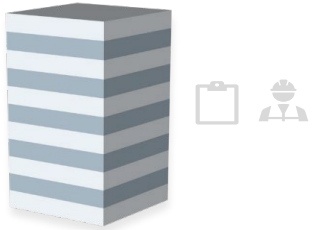


Buildings have become IP driven

Buildings today and tomorrow

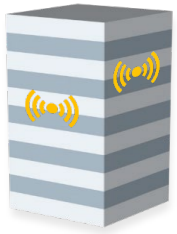
Buildings have become IP driven

< 2010
Traditional Building



Local switches and on-site services managed by paper and clipboards

2010
Automated Building



Automated Operation
Automated systems with on-prem building management stations

Preventive Maintenance
Software-supported inspection and maintenance planning

2020
Smart Building

Connected Operation
Remote building controls with centralized management stations

Predictive Maintenance
IoT-enabled remote diagnostics and failure prediction

2030
Collaborative Building

Self-adaptive Operation
Intelligent building automation with the ability to self-adapt and optimize

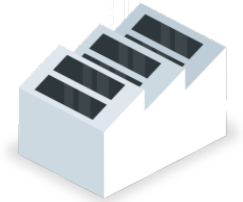
Prescriptive Maintenance
Automatic service scheduling and
step-by-step maintenance instructions

Buildings have become IP driven

The cloud

connected sensors

connected edge devices



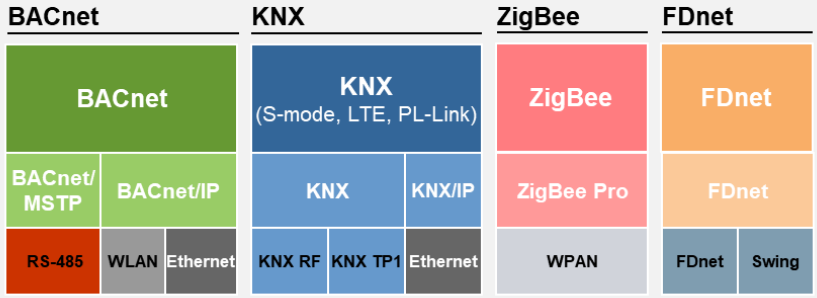
connected controllers

connected fire panels

Buildings have become IP driven

As-Is: Variety of non-IP field busses

- Different standards do not only provide individual data model & services but also different application, transport, network, link and physical layers



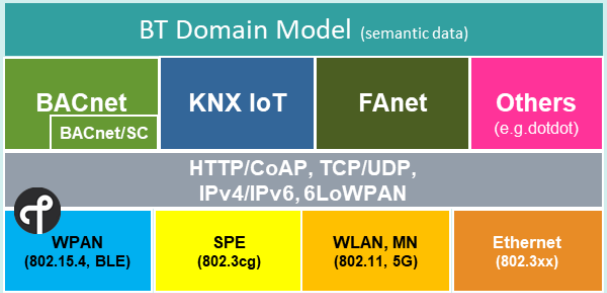
As Desired: Converged Stack

Aligned Information Models & Services
Standard Security

- Open standards, IT friendly, Multi-vendor- & cloud agnostic

IP for Network Communication

- Well-known protocols, open standards



Market Interest Group

Standards Joining Forces

IP-BLiS

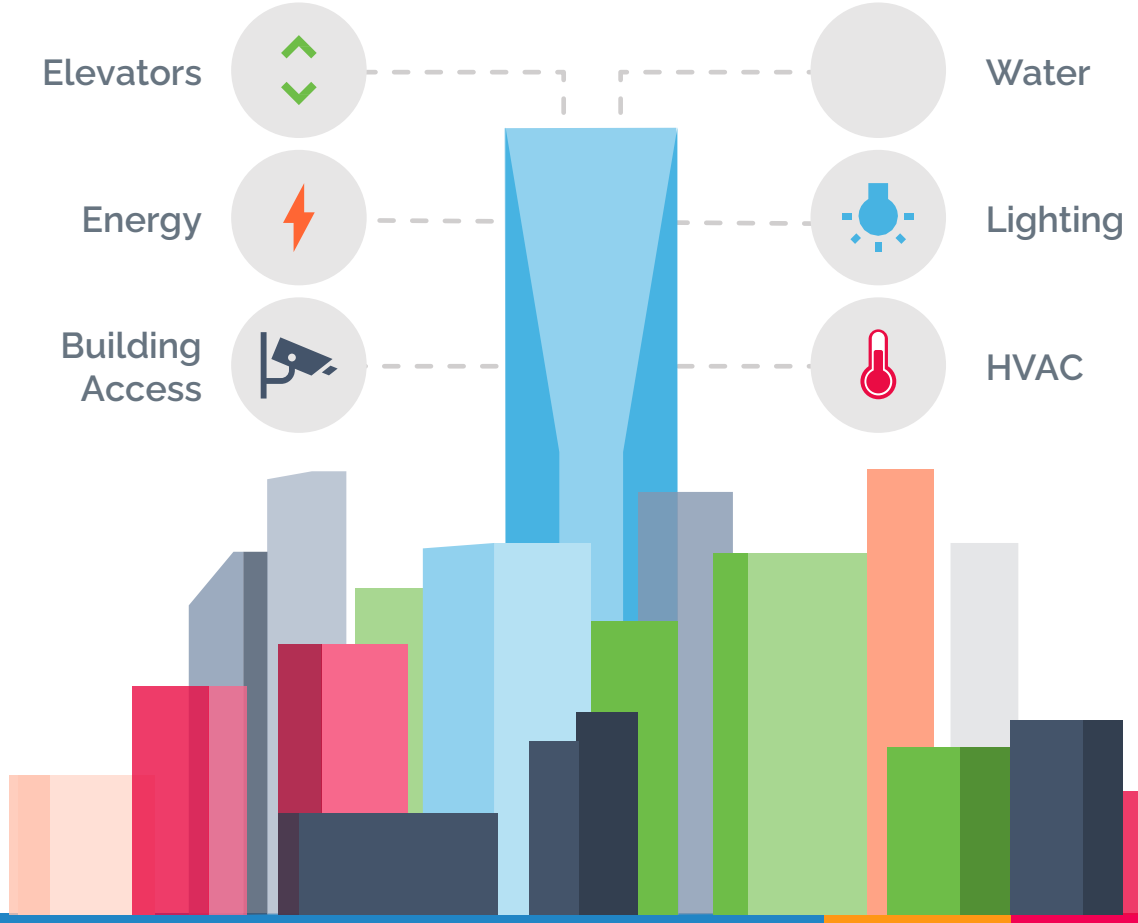
(Internet Protocol for Building & Lighting Standards)

Not a new organization

Existing organizations
working together

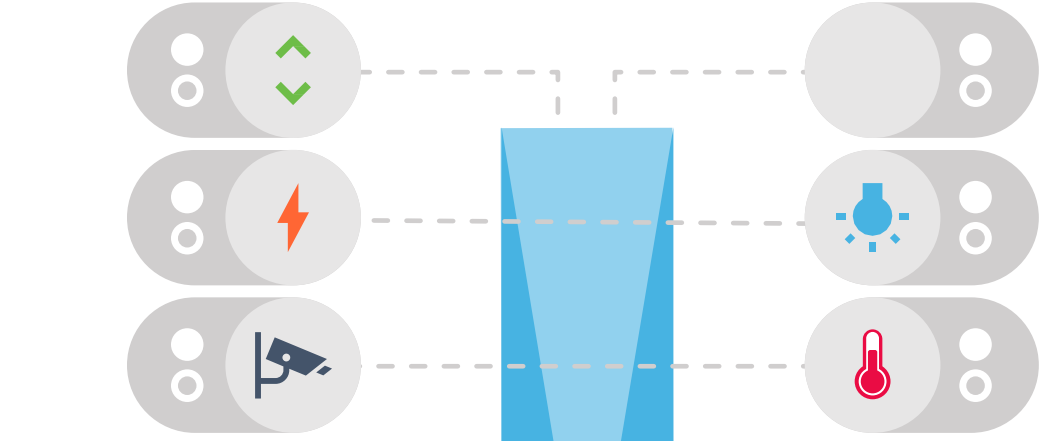
Today: Many Building Technologies…

There are more connected devices in Smart Buildings every day



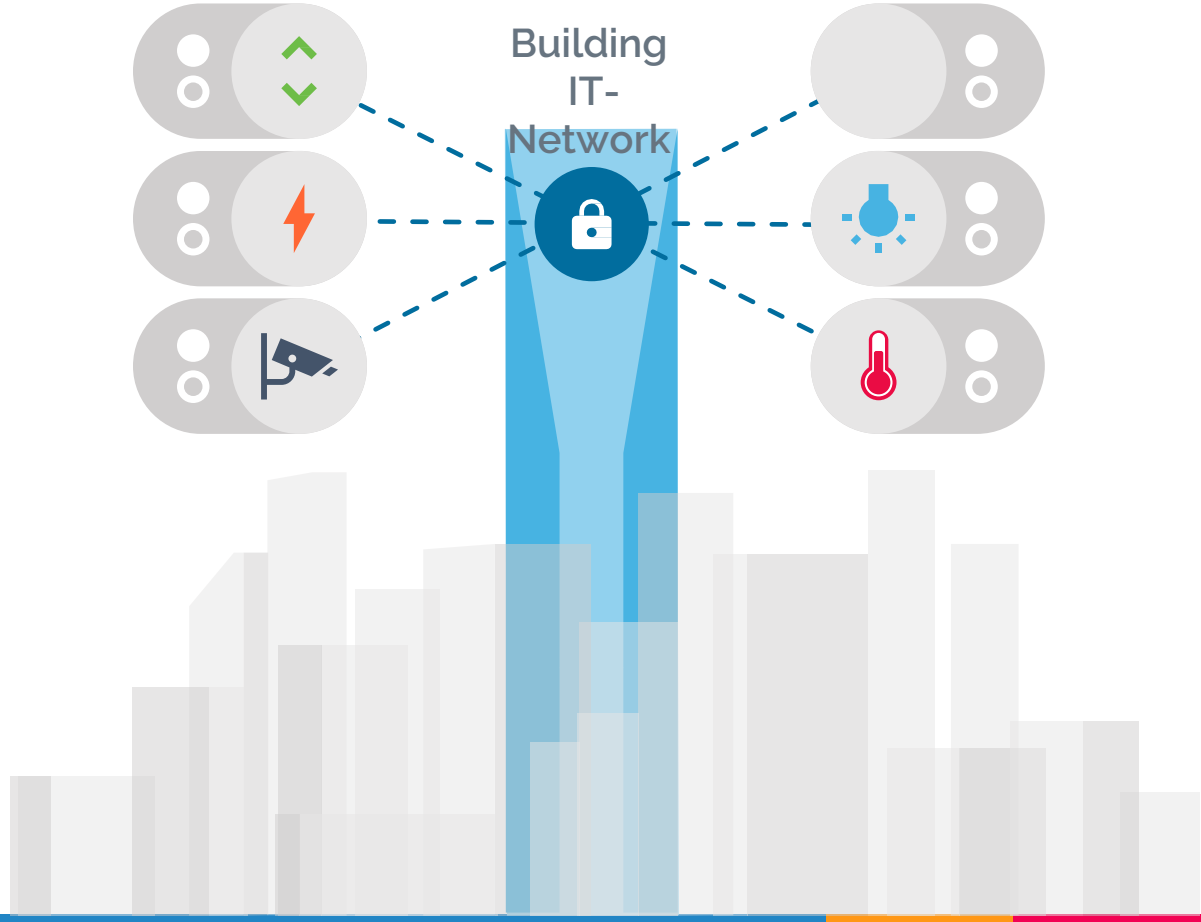
Today: Building Technologies in Silos

Each system evolved independently with their own proprietary solution



Trend: Convergence of Building Systems with IT…

This will result in a common secure IP-based infrastructure



Trend: Facilitates IoT for Commercial Buildings...

No silos.
No proprietary applications.

Allows multiple systems to communicate together using cloud services & cloud computing

IP-BLiS Vision & Goal

Our VISION

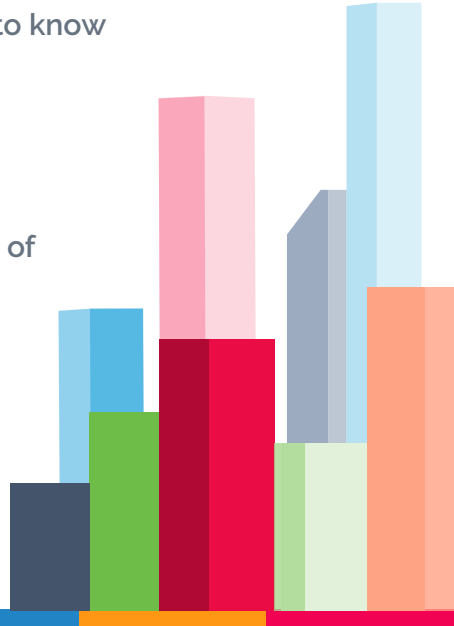
To make commercial buildings more responsive to the needs of users by promoting a secure, multi-standard, IP-based harmonized IoT solution

OUR GOAL

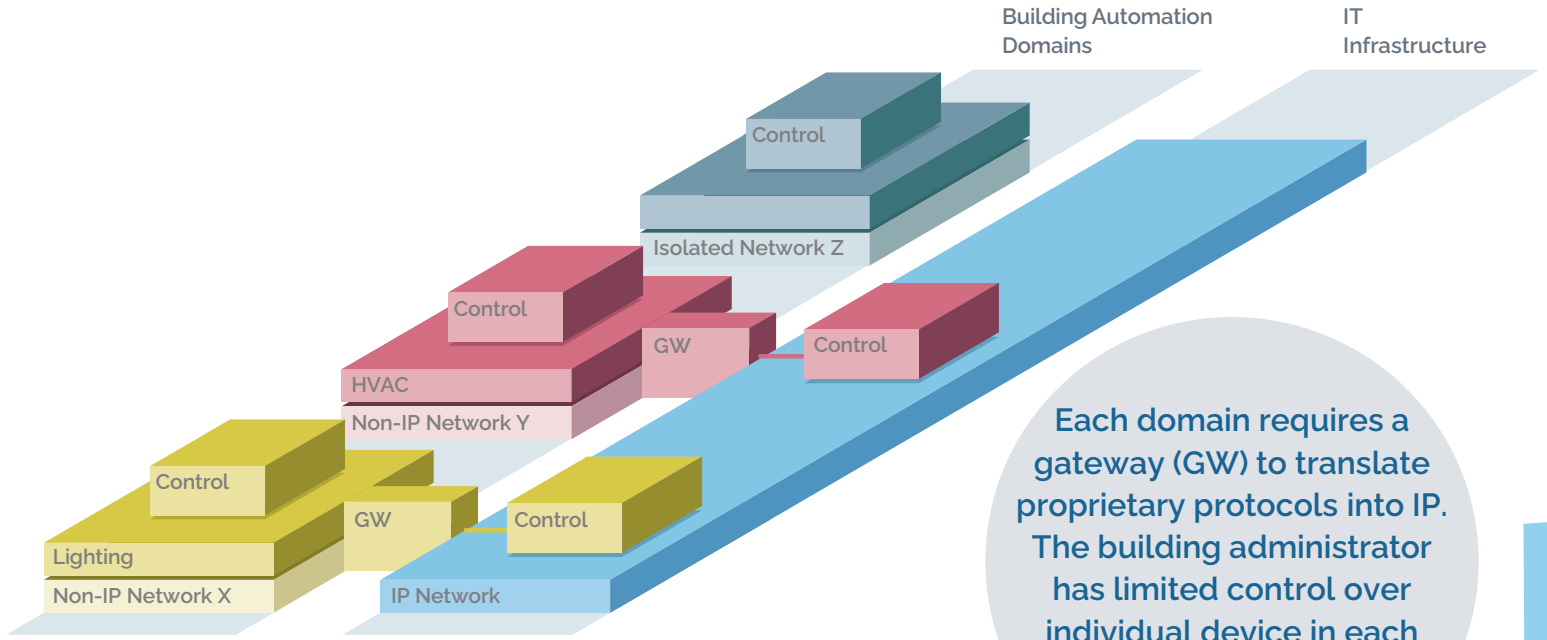
Harmonization of access to an IP network with connected building automation products allowing for better integration

Benefits of IP-BLiS

Single IP Backbone	For all building automation products: IP (IPV6)
Common Security	Allows common security in building networks
Simplified Support & Administration	Eases IT department's ability to support, eliminates need to know application protocol for building automation products
Seamless Connectivity Options	Seamlessly integrates wired and wireless connectivity options to reduce installation costs
Device Groups & Policies Possible	Uses Common IP networks to allow for monitoring groups of devices instead of single devices
Scalability	Offers limitless scalability & simple cloud integration
Application	Potentially enables common semantic interpretation of data independent from the used application protocol



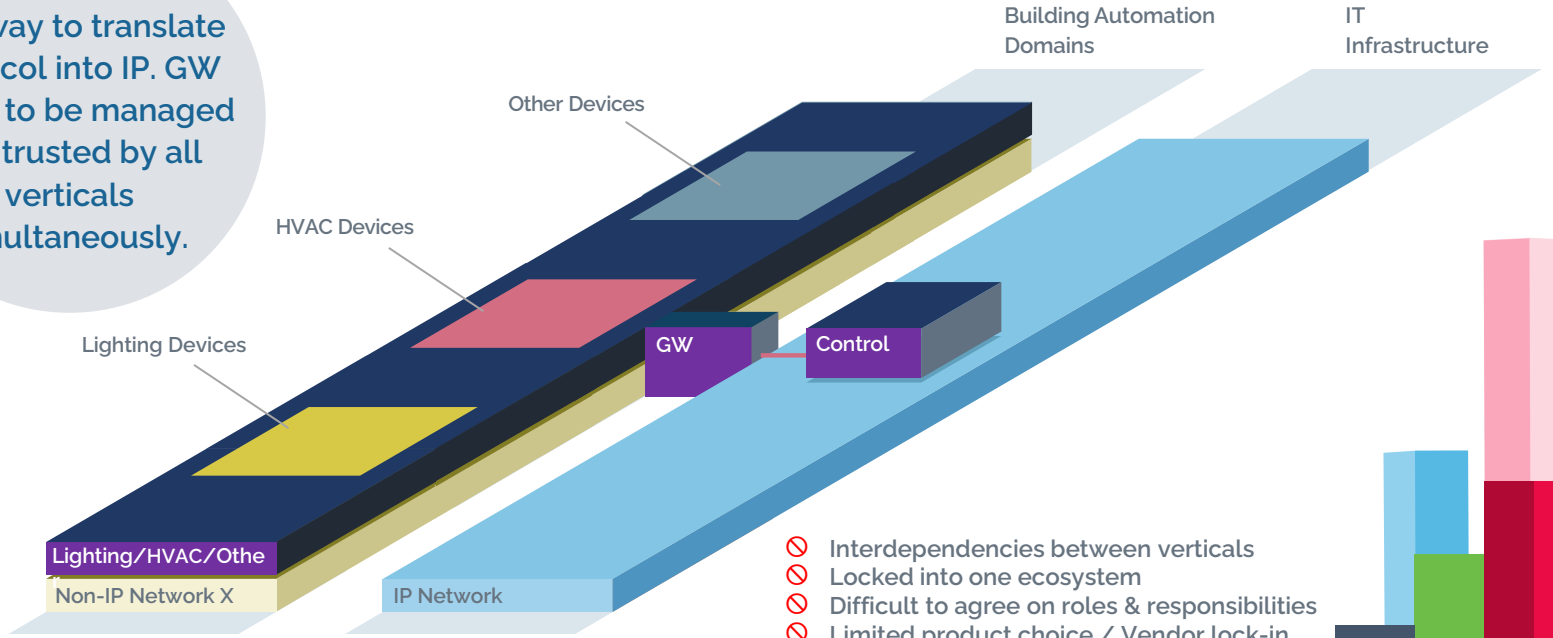
PROBLEM: Isolated building-automation domains and networks



Each domain requires a gateway (GW) to translate proprietary protocols into IP. The building administrator has limited control over individual device in each domain, and provisioning is complex.

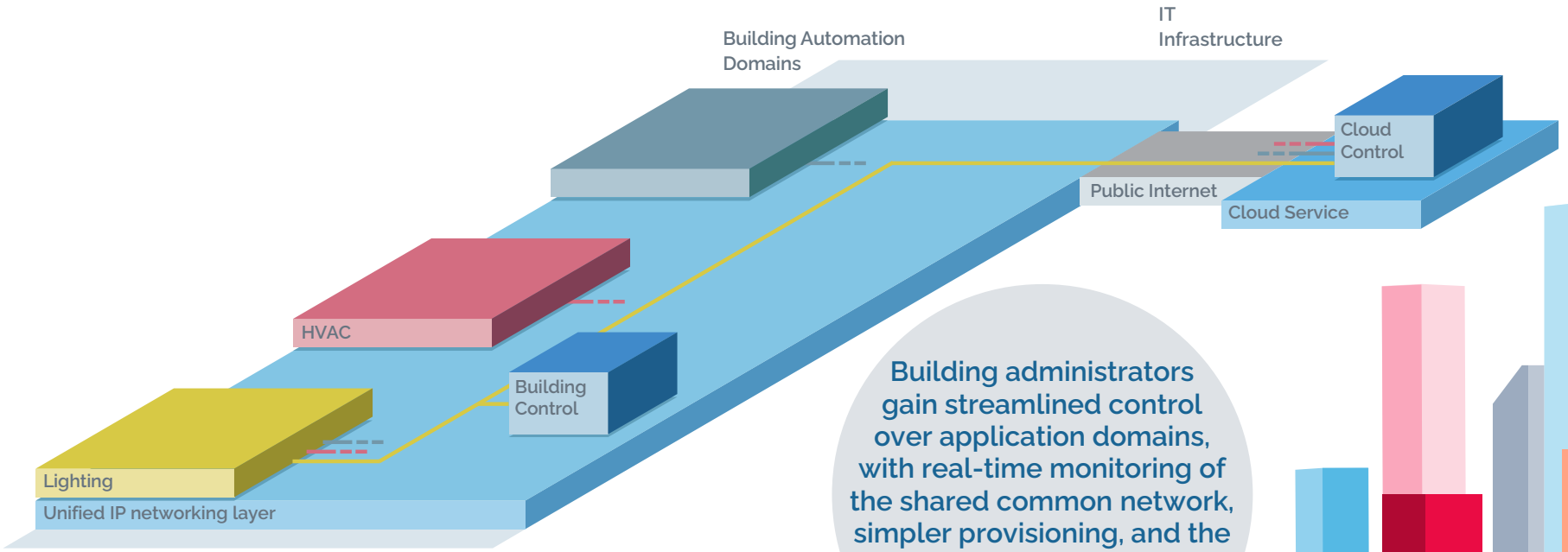
PROBLEM: Why convergence on the application layer doesn't (always) work

One shared gateway to translate protocol into IP. GW needs to be managed and trusted by all verticals simultaneously.



- Interdependencies between verticals
- Locked into one ecosystem
- Difficult to agree on roles & responsibilities
- Limited product choice / Vendor lock-in
- Less scalable
- No end-to-end encryption (trusted gateway)
- → May end up with multiple networks

SOLUTION: Common IP-based infrastructure



Building administrators gain streamlined control over application domains, with real-time monitoring of the shared common network, simpler provisioning, and the possibility to extend this to multiple buildings through the cloud.

Buildings have become IP driven
Vision

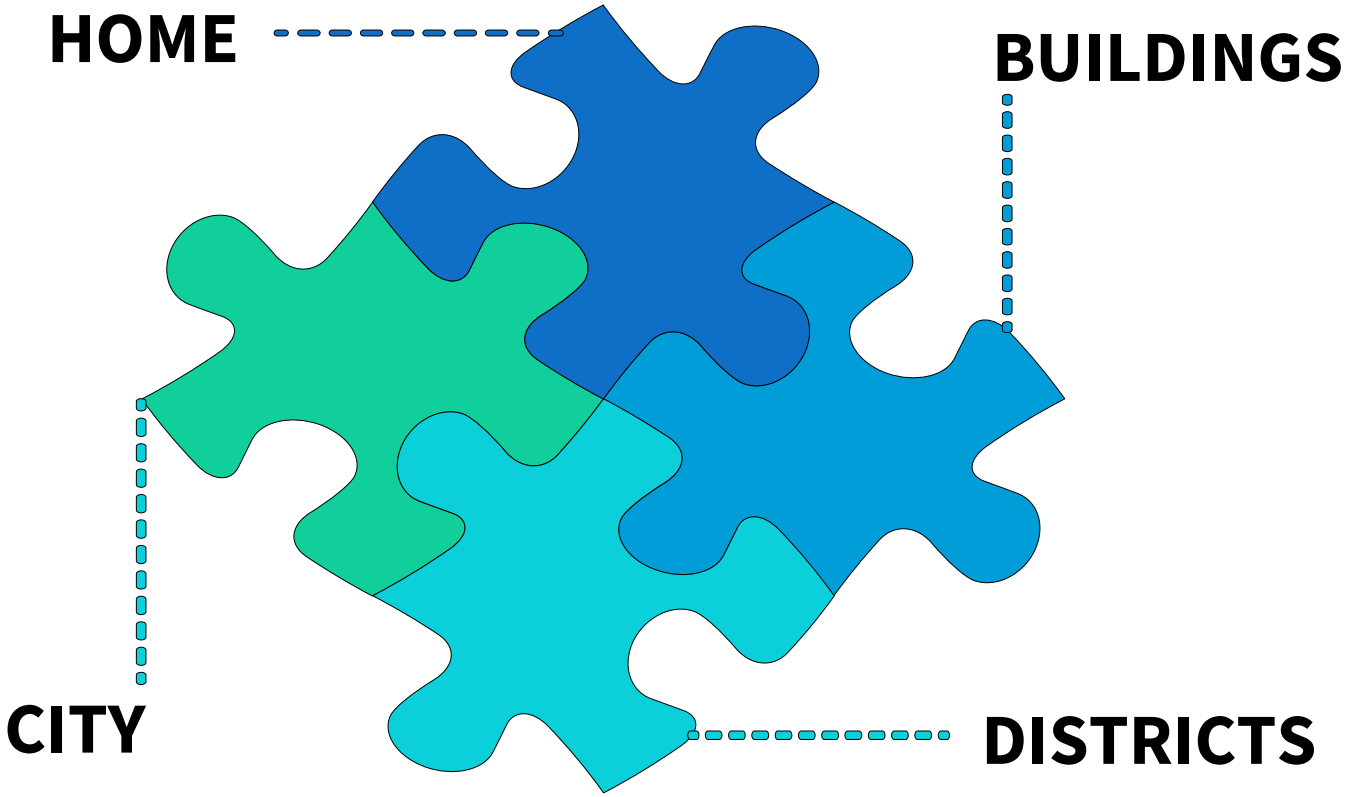
Environmental Transition

Digital Transition

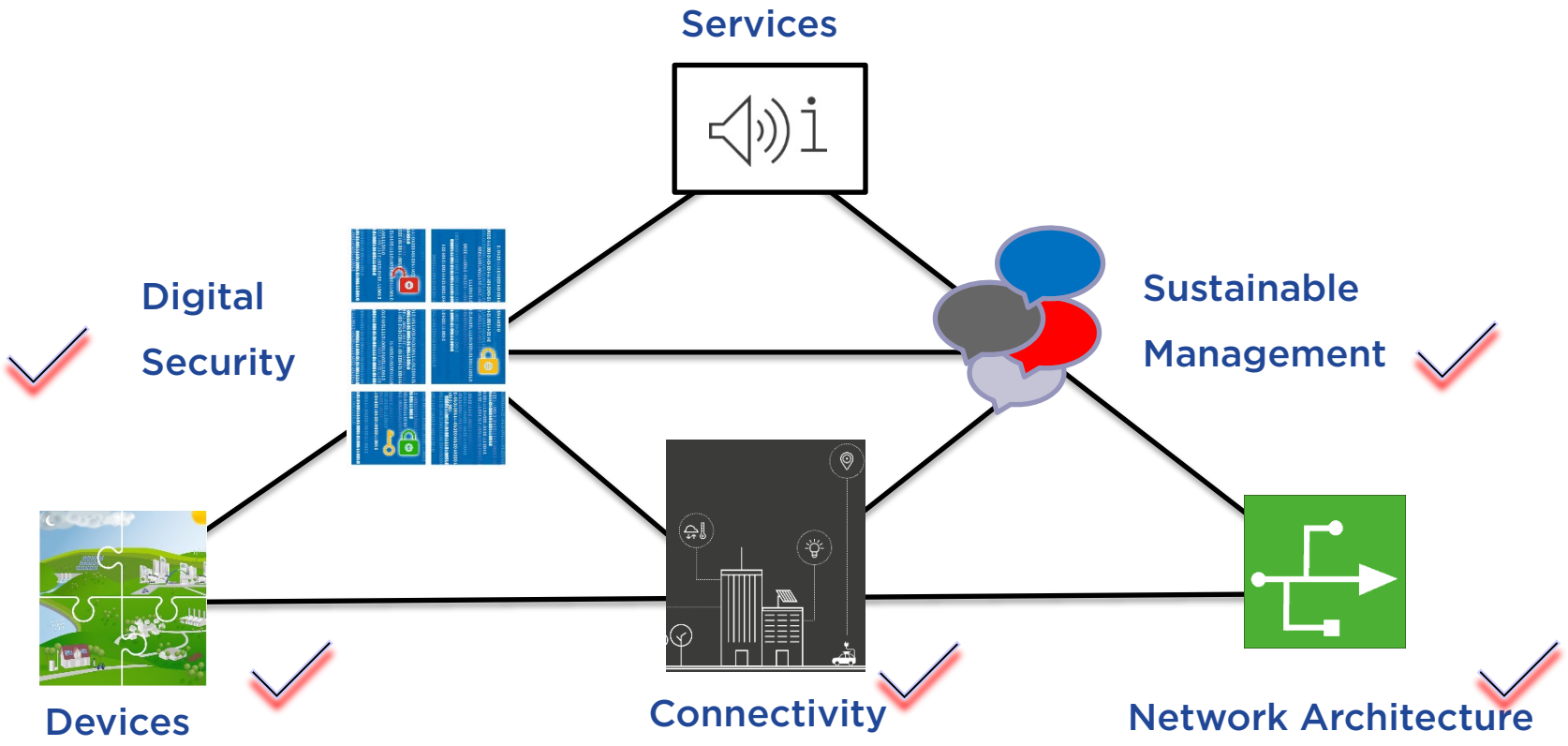
"The development of new digitally enhanced services in buildings and cities will become possible when traditional silo approaches are overcome"

Buildings have become IP driven

Scope & Goal

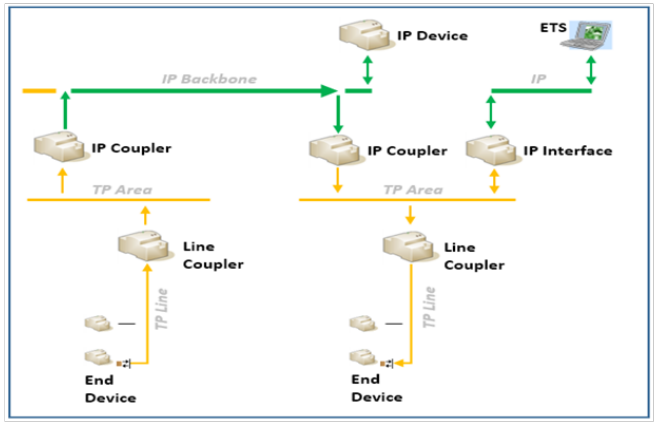


Buildings have become IP driven



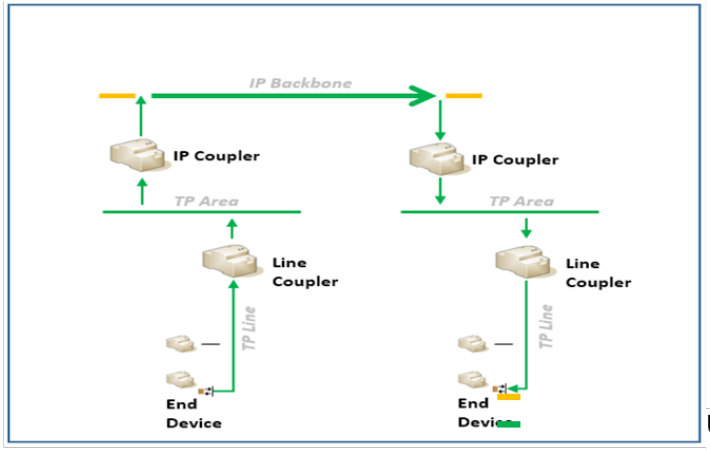
Buildings have become IP driven

KNX IP Secure



All KNX telegrams between the two (or more) IP Couplers are encrypted

KNX Data Secure



The group communication of a particular sender (one or more group objects) to another group object(s) is encrypted

Unsecured communication

Secured communication

- **KNX IP Secure** and **KNX Data Secure** can be combined in an ETS project/ installation.
- ETS handles key management/ distribution, establishes 'secure links' and downloads these links in KNX Secure devices independent of the KNX Secure types.

Buildings have become IP driven

- KNX Secure uses AES128 CCM for encryption/ authentication and elliptic curve Diffie-Hellman for a secure key exchange

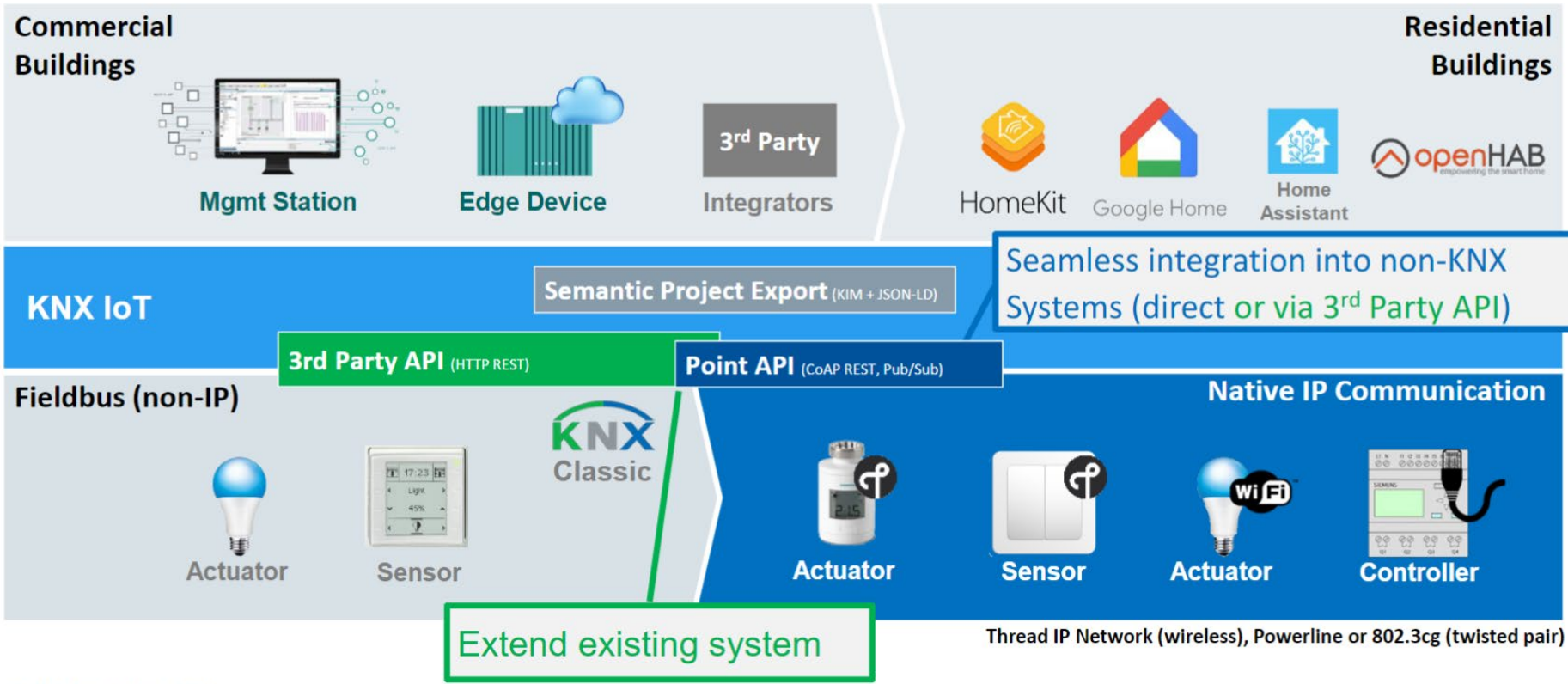
- Advanced Encryption Standard (AES) is a standard encryption algorithm ISO/IEC 18033-3

Several animations on the Internet (https://www.youtube.com/watch?v=mlzxpkdX), usage in KNX (KNX IP Secure)

- Elliptic curve Diffie- Hellman key exchange is a worldwide standardized and widely used algorithm to share a common secret key on an unsecure communication channel

- KNX Secure is an own international standard:
  - **EN 50090-3-4 : Data Secure**
  - **prEN ISO 22510 : IP Secure**

KNX IoT
Horizontal and Vertical Integration



Buildings have become IP driven
The Future of IoT in Home and Building Automation

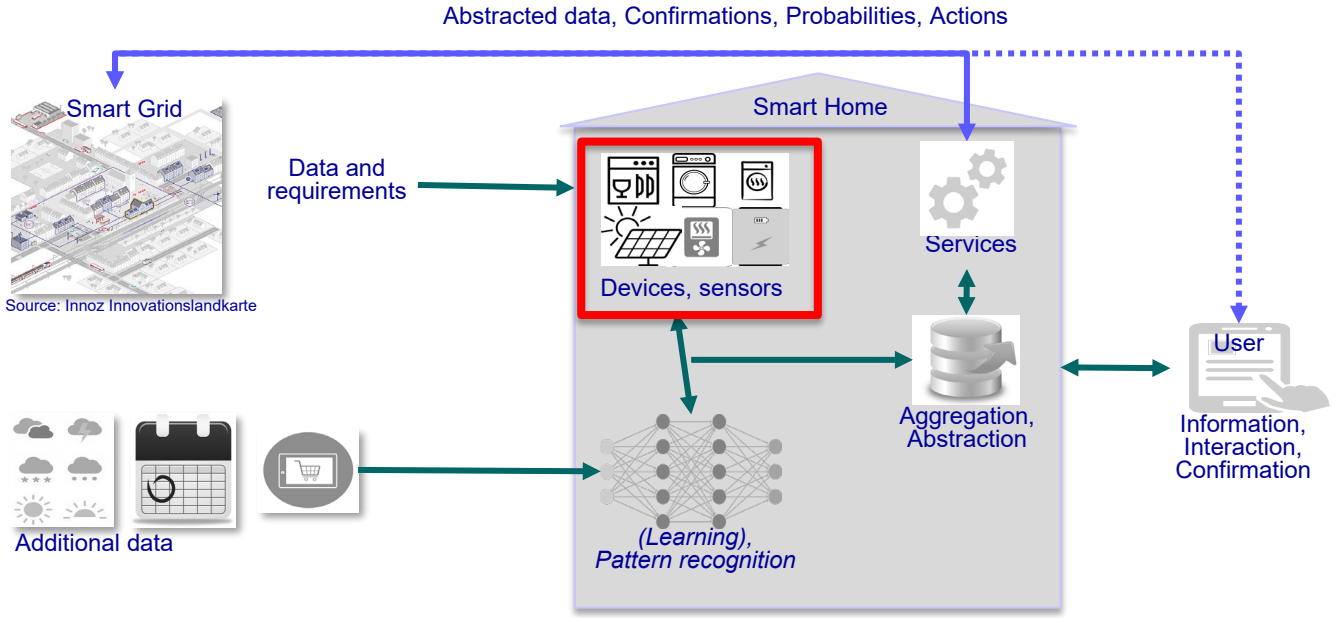
- Smart Homes & Buildings become intelligent
- The perspective changes from „inside“ to „outside“, i.e. there will be much more external applications, which will use the data and functions of a building in a simple way
- Also „Smart Home & Building non-specialists“ will/must use this infrastructure
- The semantic description of data will improve the provision of data and the interoperability

Source: DFKI

Buildings have become IP driven

The Future of IoT in Home and Building Automation

Building as Service



Source: DFKI

Buildings have become IP driven
Services with KNX

“As KNX enters its fourth decade, everything is different. KNX is forging ahead again, taking new paths into a new age, into a new era. On the threshold of a new decade and with all our experience, we know: if we are to remain reliable, sustainable and fit for the future, we must take part in shaping the future. If data is the oil of the future, then services are the smart applications of the future.”

“...Services are increasingly becoming a business model of the future. Data is the new oil.”

Buildings have become IP driven

More Information?

heinz.lux@knx.org