

RELIABLE WIRELESS CONNECTIVITY

With patented technologies, a unique operating system and state of the art radio modules we provide ultra-reliable mesh connectivity for the most business critical applications.



“Smart buildings to the rescue”.

Alexander Hellström

Agenda

- ❑ Setting the stage part 1 - Why Connectivity and Wireless actually matter and why Change Happens – First gradually, then Suddenly...
- ❑ Setting the stage part 2 - What's happening in the world of Technology, Buildings and Indoor Climate
- ❑ WISE - How Swegon use wireless technology to create the best possible indoor climate and at the same time enable new smart services for you.

What is a smart building?

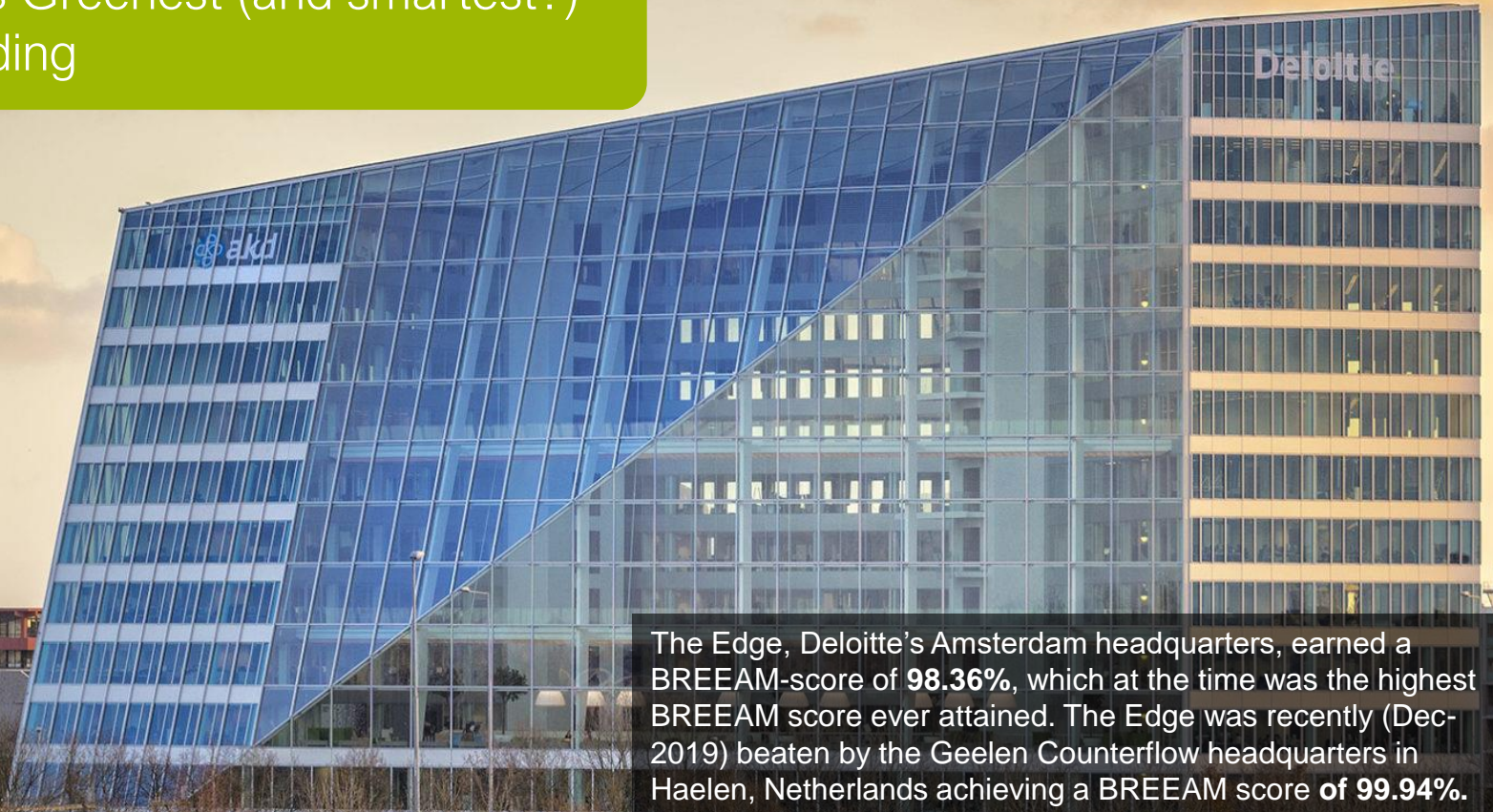
- ❑ Is it a sustainable building?
 - ❑ Is it an energy efficient building?
 - ❑ Is it a green building?
 - ❑ Is it a connected building?
 - ❑ Is it an building that is aware, that can react on human driven events and in some cases can predict them?
 - ❑ Is it a building that collects data and exposes the data so that you can create your own innovative services and apps for your tenants?
-
- ❑ **Or is it all of the above?**



**Which building is the Greenest in
the world?**

The Edge Amsterdam

The world's Greenest (and smartest?)
Office Building



The Edge, Deloitte's Amsterdam headquarters, earned a BREEAM-score of **98.36%**, which at the time was the highest BREEAM score ever attained. The Edge was recently (Dec-2019) beaten by the Geelen Counterflow headquarters in Haelen, Netherlands achieving a BREEAM score of **99.94%**.

“The Greenest Building Is... One That Is Already Built”

Architect Carl Elefante, Director of Sustainable Design at Qunin Evans Architects in Washington, D.C



Cables are our biggest enemy for energy efficient, sustainable, Green Buildings!





**AN EXPLOSION
of
WIRELESS
AWESOMENESS!!!**

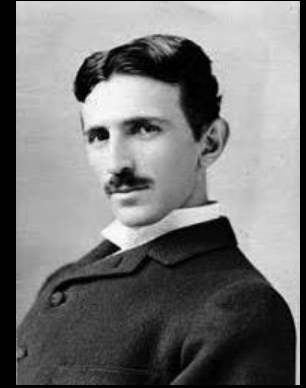
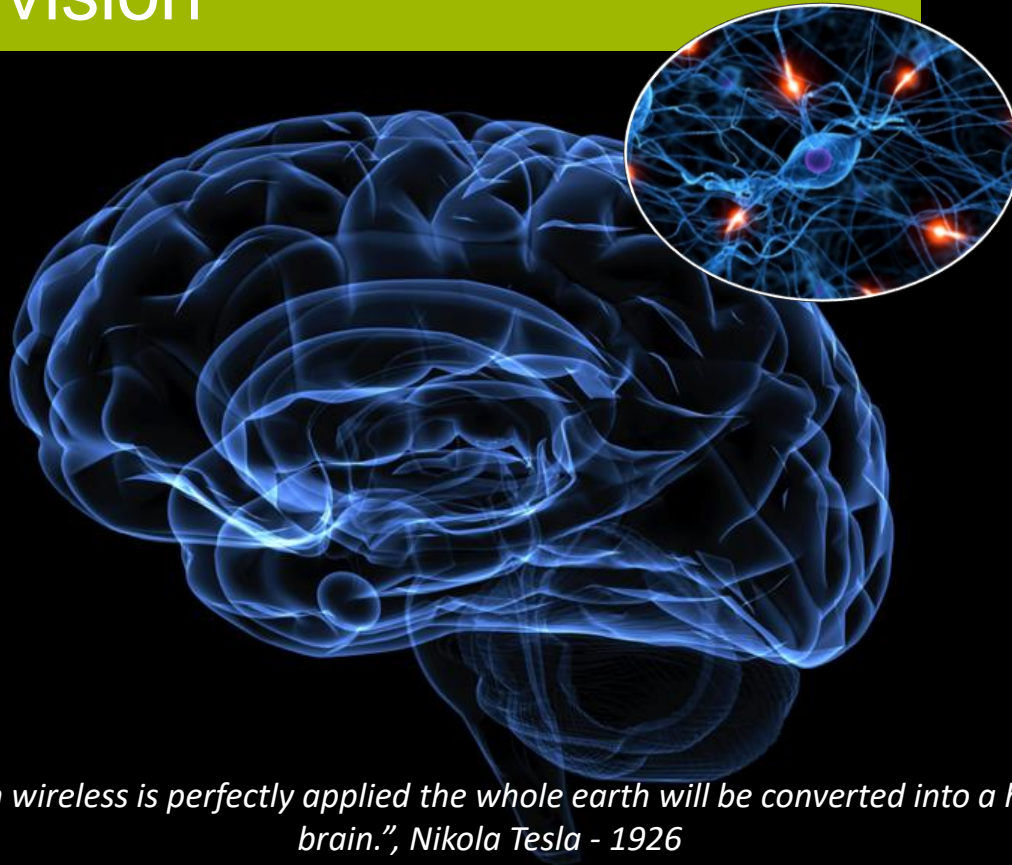
Introduction...

Alexander Hellström

- Computer Engineering, Linköping, Sweden
- A passionate technerd who love to see technology and business combined into awesome benefits.
- Been working with “emerging technologies” (internet, e-commerce, mobility, M2M) and digital strategies for the last 2 decades.
- As entrepreneur in wireless control system for the last 5 years.
- CEO - **ChiefEnergyOfficer @ LumenRadio**
- alexander.hellstrom@lumenradio.com



Our wireless vision

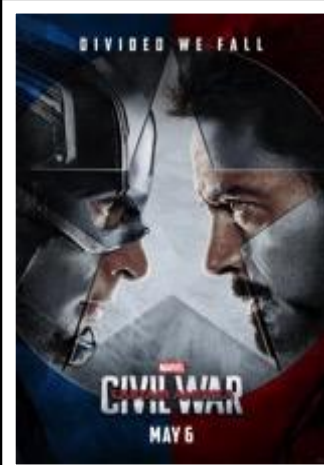


“When wireless is perfectly applied the whole earth will be converted into a huge brain.”, Nikola Tesla - 1926



COACHELLA
COACHELLA VALLEY MUSIC AND ARTS FESTIVAL

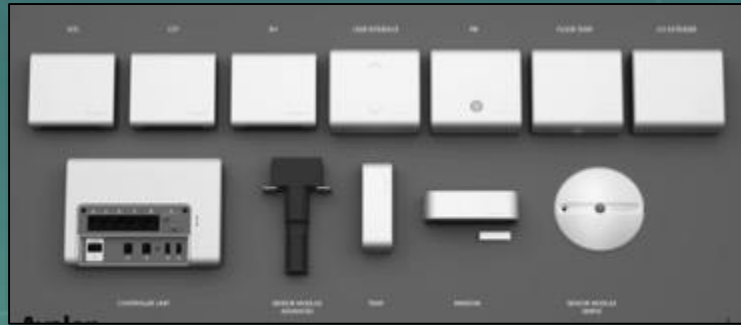








THE **Swegon** INTERNET OF THINGS



100% Wireless Controls and Data Collection



WISE OCS
(Occupancy Sensor)
RH, Temp



WISE RTA
(Room Temperature Adjuster)
Temp, Set point adj. DI



WISE IAQ Multi
(Indoor Air Quality)
VOC or CO2, Temp, RH



WISE IRT
(Infrared Room Temperature sensor)
Room Temp, Floor temp



WISE RTS
(Room Temperature Sensor)
Temp



TUNE WISE
Commissioning tool



WISE IRE
(Indoor Radio Extender)
1 Analog in 0-10V or Digital in



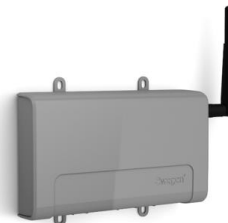
WISE IORE
(Input/Output Radio Extender)
2 Analog out 24VDC
2 Analog out 0-10V
1 Analog in 0-10V
1 Condensation sensor



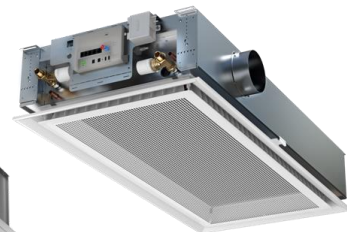
WISE SMA
(Sensor Module Advanced)
VOC, RH, Temp



WISE SMB
(Sensor Module Basic)
PIR, Temp, LED



WISE WCS
(Window Contact Sensor)
Window open/closed, Temp



Pre iPhone era
2005



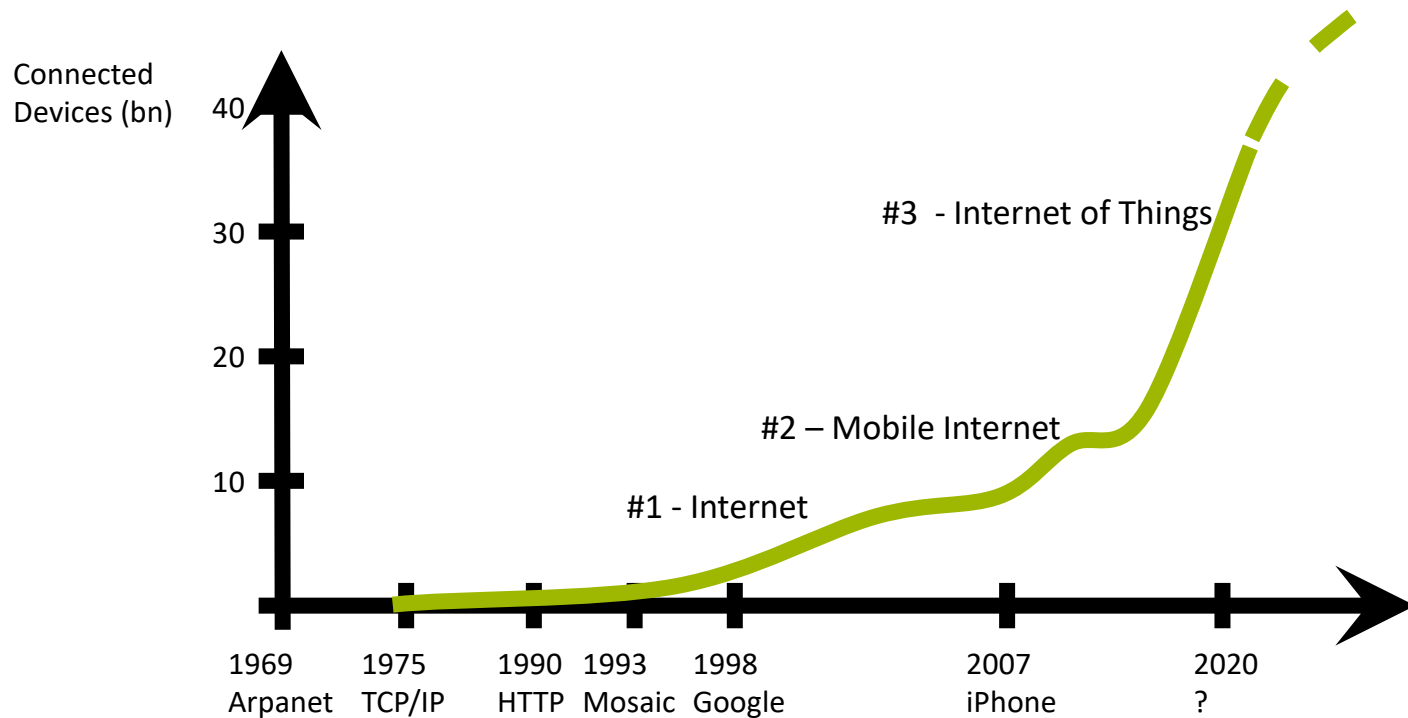
Post iPhone era
2013



Pope Benedict inauguration in 2005 vs. Pope Francis in 2013

Change Happens!

IoT - the 3rd wave of connectivity



Kids of today will never understand...



Companies of today will never understand...



REDSTONE
INSIDE THE FAMILY FEUD

**WHO TO
BLAME FOR
COLLEGE
COSTS**

**\$60 OIL?
BELIEVE IT**

**RETIREMENT GUIDE
REARRY OR SHACK UP?
DYING WITHOUT A WILL**

NOVEMBER 12, 2007 | WWW.FORBES.COM

Forbes

Nokia

**ONE BILLION
CUSTOMERS—
CAN ANYONE
CATCH THE
CELL PHONE KING?**

**PLUS
11 GADGETS WE LOVE**

Olli-Pekka Kallasvuo
Chief Executive

\$4.99 | Canada \$5.99




NOVEMBER 12 2007

iPhone 2007





Technology

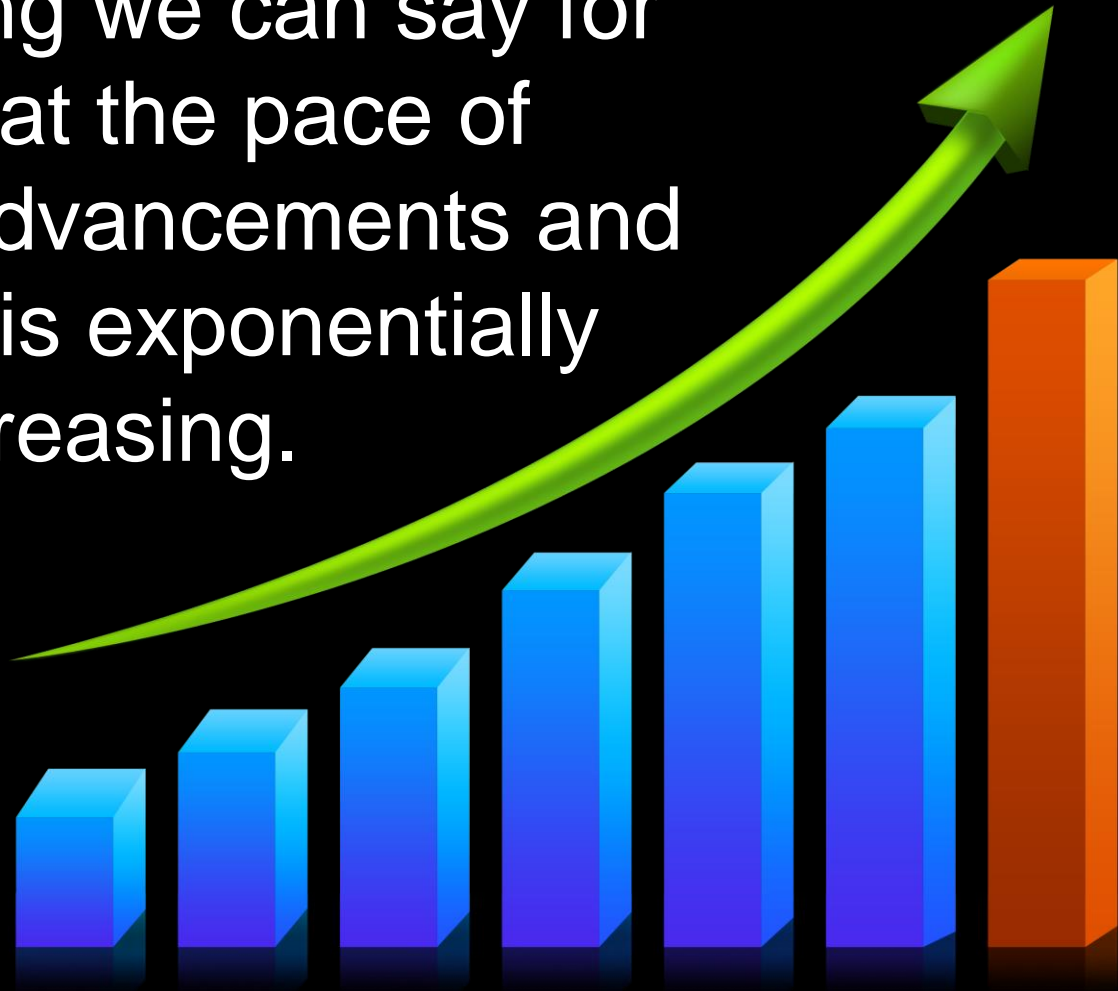


Can we predict what's going to be in **10** years from now by looking **10** years back in time?

*“The same amount of change we experienced in the past **20.000** years we will experience in the coming **100** years.!”*

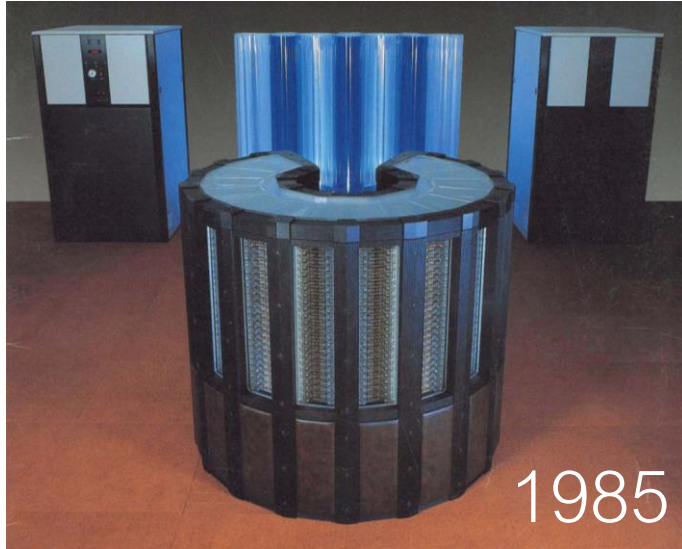
*- Ray Kurzweil, inventor and futurist
(head of Google R&D)*

The only thing we can say for sure is that the pace of technology advancements and innovation is exponentially increasing.

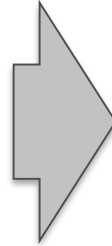


Exponential Times

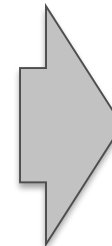
CRAY - 2



At 1.9 GFLOPS* peak performance, it was the fastest machine in the world when it was released



iPhone 4



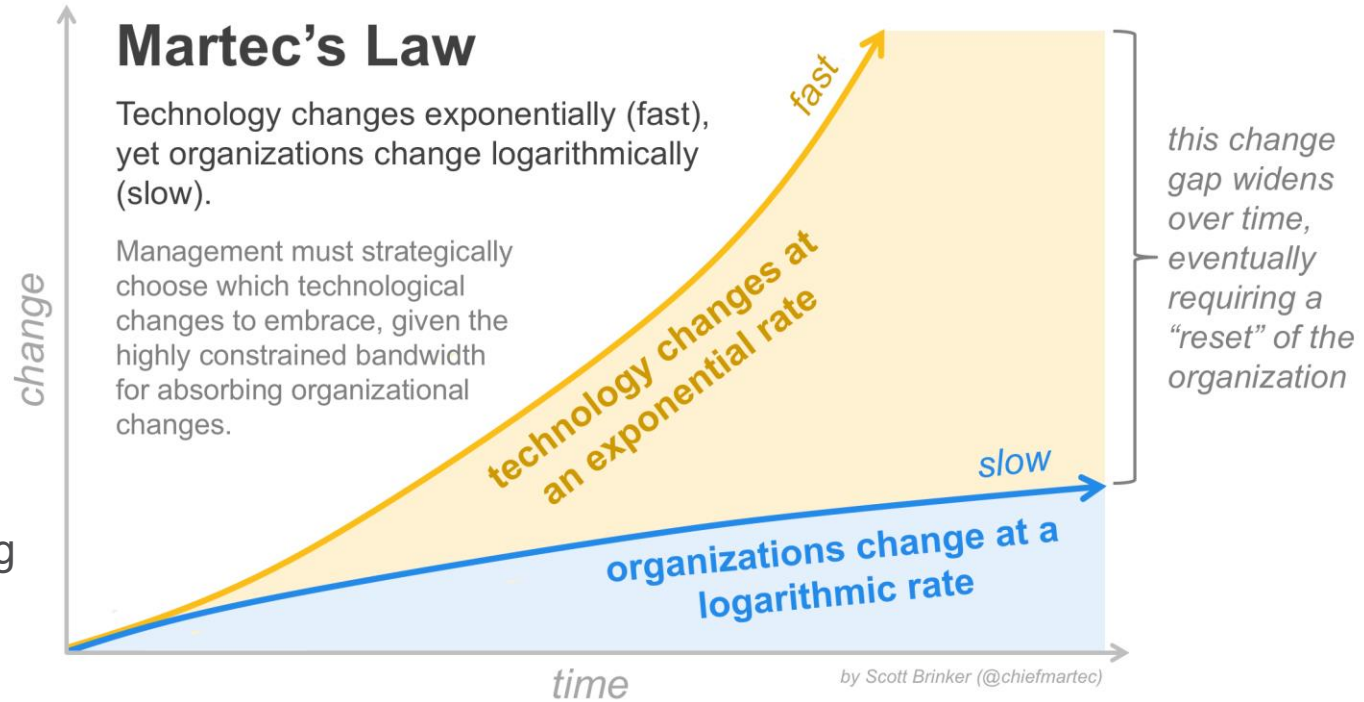
Today

The Challenge?

Martec's Law

Martec's Law states that technology changes at an exponential (very fast) rate, but organizations change at a logarithmic (much slower) rate.

It's very hard for organisations to change as "technology is changing faster than organizations can absorb change."

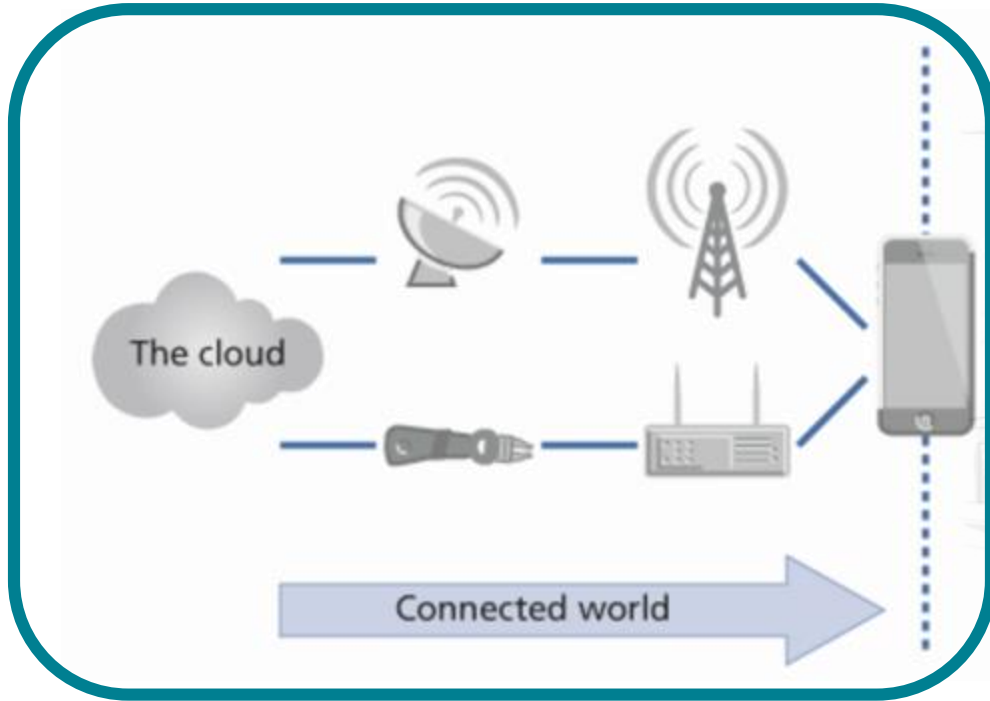


“The pace of change has never been this fast, yet it will never be this slow again.”

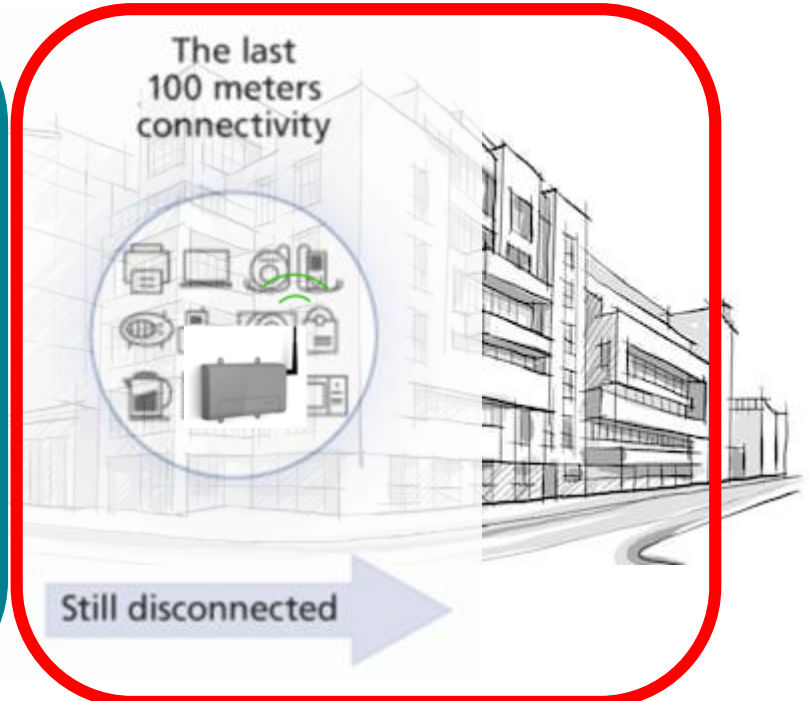
Justin Trudeau, Prime Minister of Canada, World Economic Forum 2018

**What's happening in the world of
Technology, Buildings and Indoor
Climate?**

What's happening in the connected world

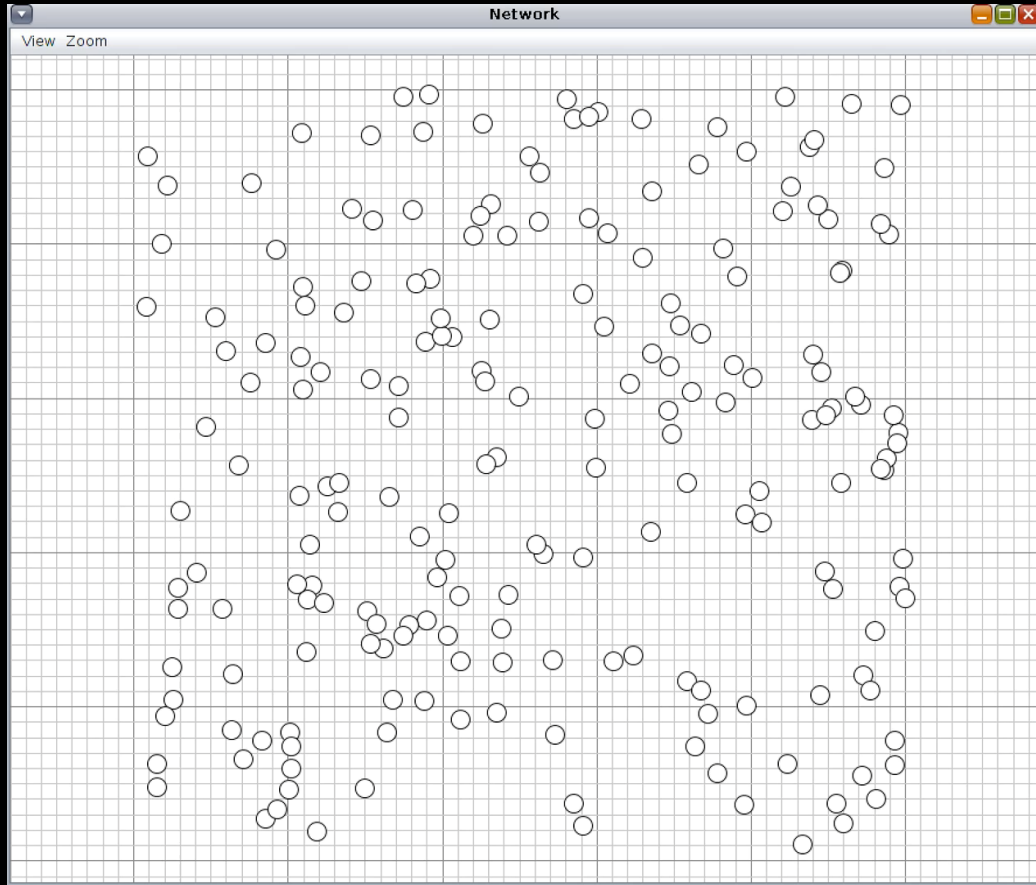


Well proven technology

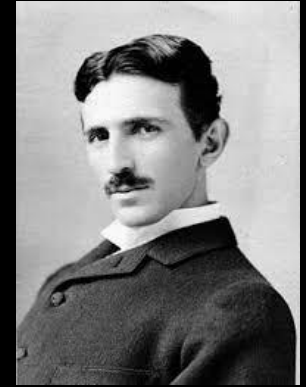
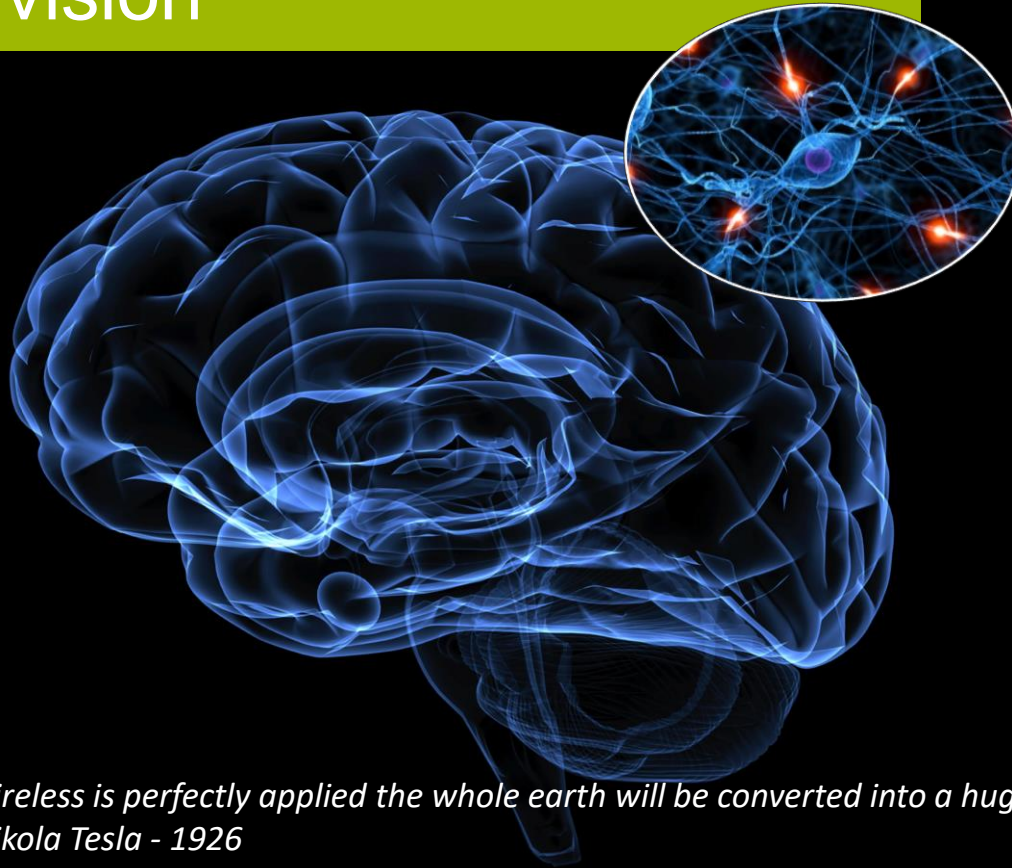


Exponential development

A wireless meshed network in action



Our wireless vision



“When wireless is perfectly applied the whole earth will be converted into a huge brain.”, Nikola Tesla - 1926

What are the driving forces behind wireless connectivity on commercial buildings

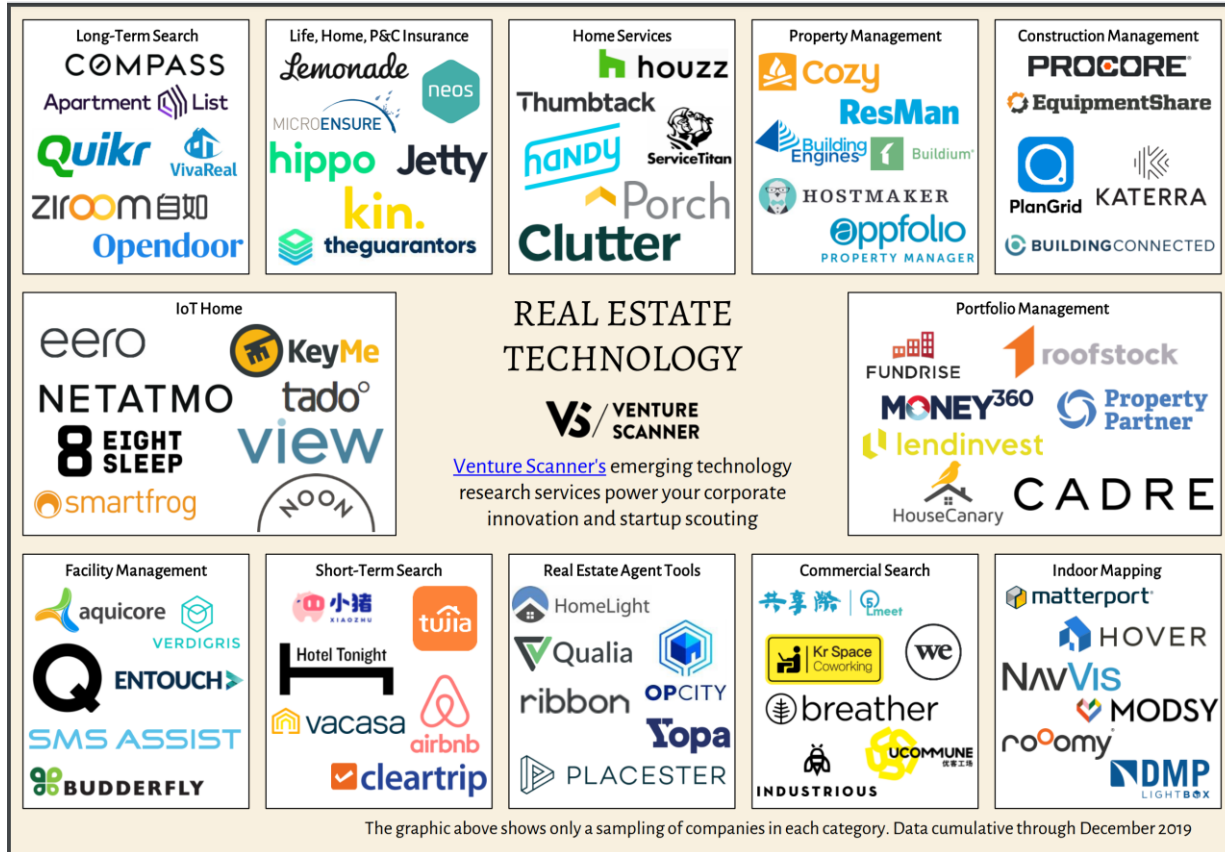


Our Environment - Market

- ❑ **Agenda 2030 -> Sustainability -> New Building Directives and certifications -> The need of RetroFit.**
- ❑ **Indoor Environment becomes more and more important (we spend 90% of our time indoor) -> Meaning that Lighting, HVAC, Security & Access converge → IAQ → IEQ**
- ❑ **RetroFit → Zero Wires → IoT → Big Data → Need of New Data models - > From IoT and integration with BMS → IT (CIO)**
- ❑ **Exponential technology development and PropTech on the rise → New Entrants (Startups) → Global Tech Cluster → New Ecosystem**

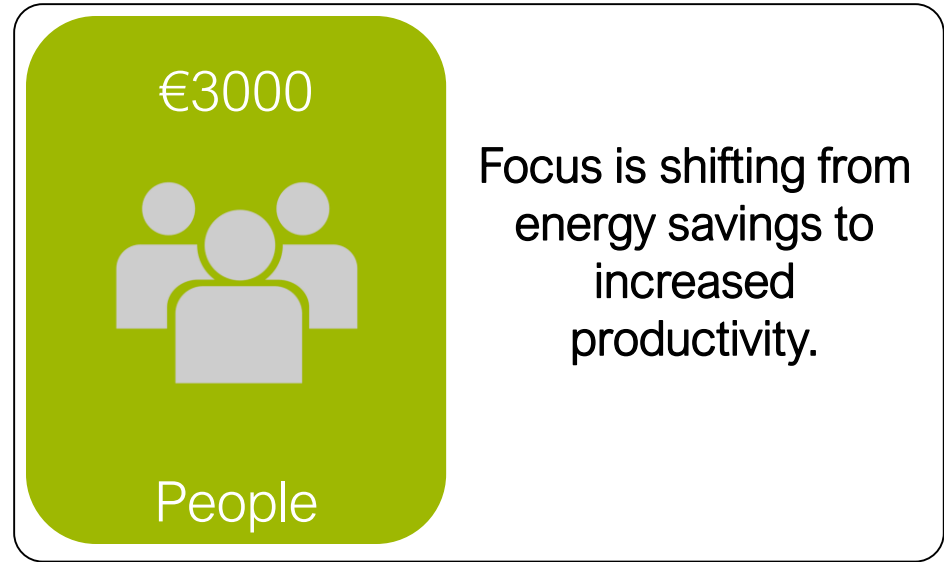


Prop Technology: 12 categories, 1785 companies, \$77B in funding



The graphic above shows only a sampling of companies in each category. Data cumulative through December 2019

The 30-300-3000 spending rule of real estate

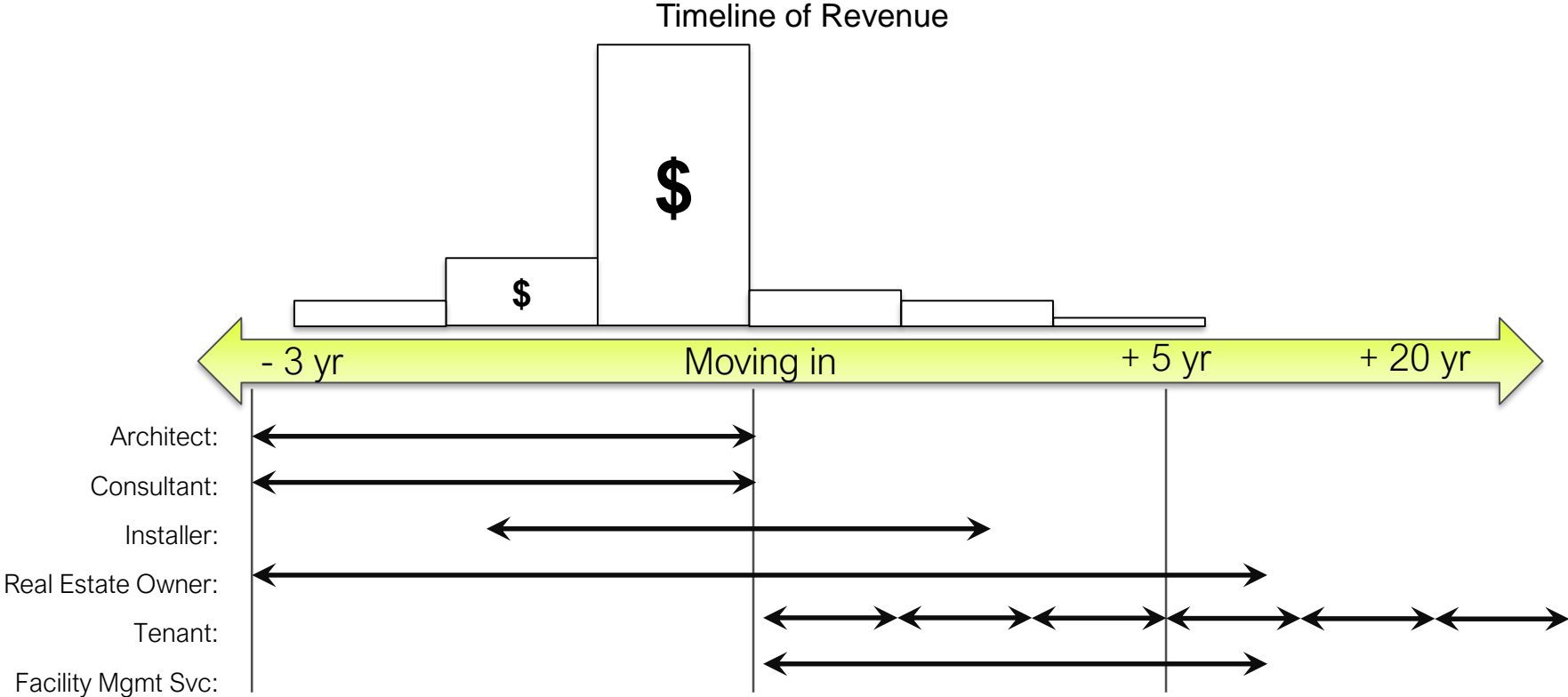


10% decrease of energy use will save €3
10% increase price per sq, in will generate €30
10% increase in productivity is worth €300

/

sq meter

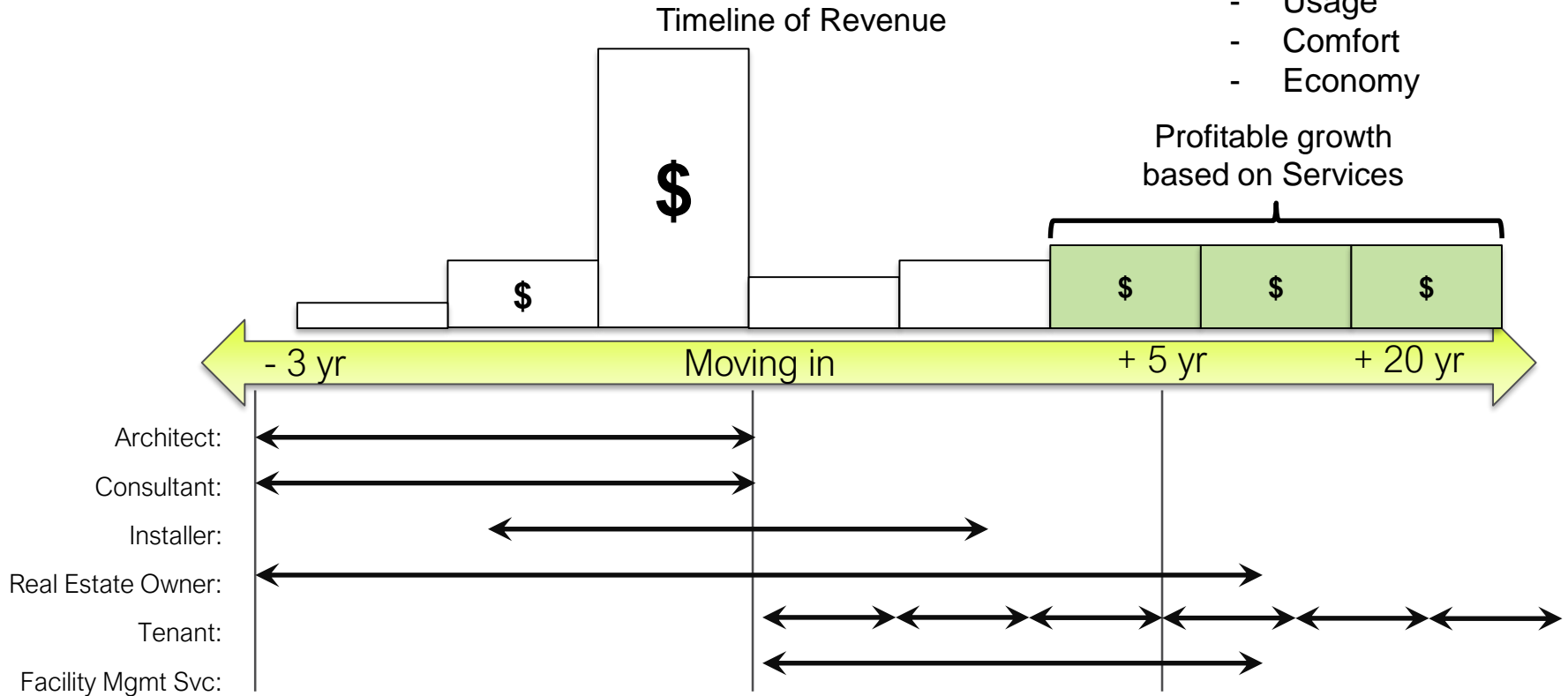
AS-IS: Revenue during the lifespan of a system



TO-BE: Revenue during the lifespan of a system

Realtime Analysis of the Real Estate based on:

- Performance
- Usage
- Comfort
- Economy





Swegon^l

WISE

**Demand-controlled indoor
climate has never been easier**

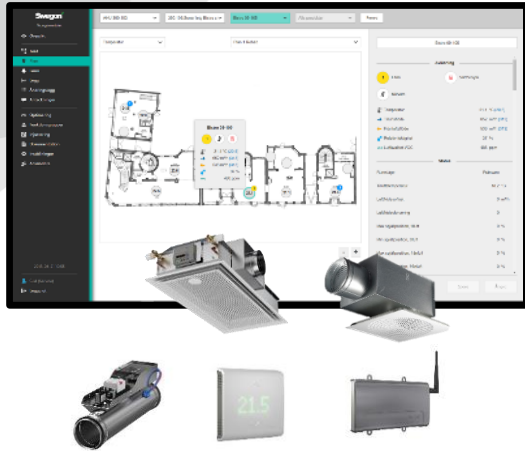
THE **Swegon** INTERNET OF THINGS



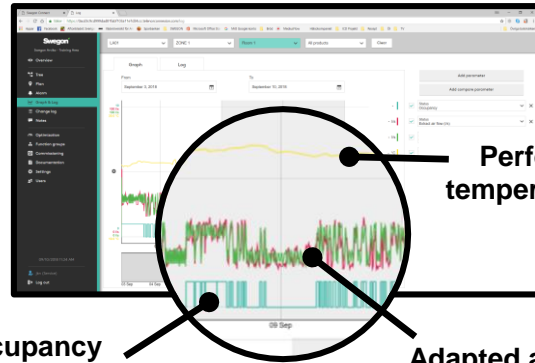
A dramatic explosion of fire and smoke, with bright orange and yellow flames rising from a dark, smoky base. The scene is set against a black background, emphasizing the intensity of the fire. Overlaid on the center of the image is bold, white, sans-serif text with a thick red outline. The text reads: "AN EXPLOSION of WIRELESS AWESOMENESS!!!".

AN EXPLOSION
of
WIRELESS
AWESOMENESS!!!

What is WISE?



A complete system for the indoor climate
From room products to air handling units, fully integrated via wireless communications and accessible in a common user interface



Occupancy in the room

Perfect temperature

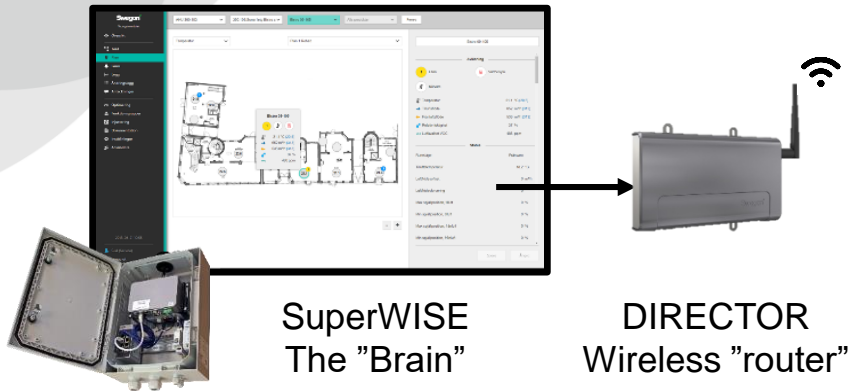
Adapted air flows

Demand-controlled indoor climate
A Brain that adapts the climate to the current requirement in each room, for optimal balance between comfort and maximum energy efficiency. Not only ventilation – also heating and cooling. Both waterborne and airborne room products are fully integrated



An efficient construction process
Smart solutions simplify every step in the construction process, from sketch to operation, and create flexibility for future remodeling

The System



All products needed for distribution of air, cooling and heating:

- Dampers, Diffusers, Chilled Beams, Comfort modules.
- Accessories (Sensors) for Data Collections and Controls for 3rd party products.



100m

48
mph



Self-Driving



- INTERNET
- WIFI
- GPS
- PHONE
- APP



100% Wireless Controls and Data Collection



WISE OCS
(Occupancy Sensor)
RH, Temp



WISE RTA
(Room Temperature Adjuster)
Temp, Set point adj. DI



WISE IAQ Multi
(Indoor Air Quality)
VOC or CO2, Temp, RH



WISE IRT
(Infrared Room Temperature sensor)
Room Temp, Floor temp



WISE RTS
(Room Temperature Sensor)
Temp



TUNE WISE
Commissioning tool



WISE IRE
(Indoor Radio Extender)
1 Analog in 0-10V or Digital in



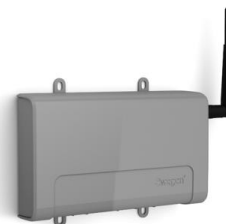
WISE IORE
(Input/Output Radio Extender)
2 Analog out 24VDC
2 Analog out 0-10V
1 Analog in 0-10V
1 Condensation sensor



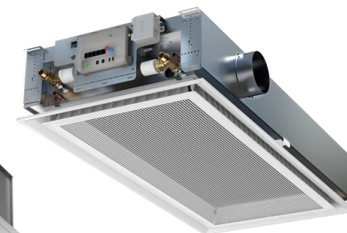
WISE SMA
(Sensor Module Advanced)
VOC, RH, Temp



WISE SMB
(Sensor Module Basic)
PIR, Temp, LED



WISE WCS
(Window Contact Sensor)
Window open/closed, Temp



A tried and tested concept

- Already in operation in more than 300 projects!
 - New construction
 - Refurbishment
 - Offices
 - Retail
 - Schools
 - Hotels
 - Healthcare





Dalarni

F.T.N

USDC

Löps

STAD



torsplan

Löps

Löps

Löps

USDC

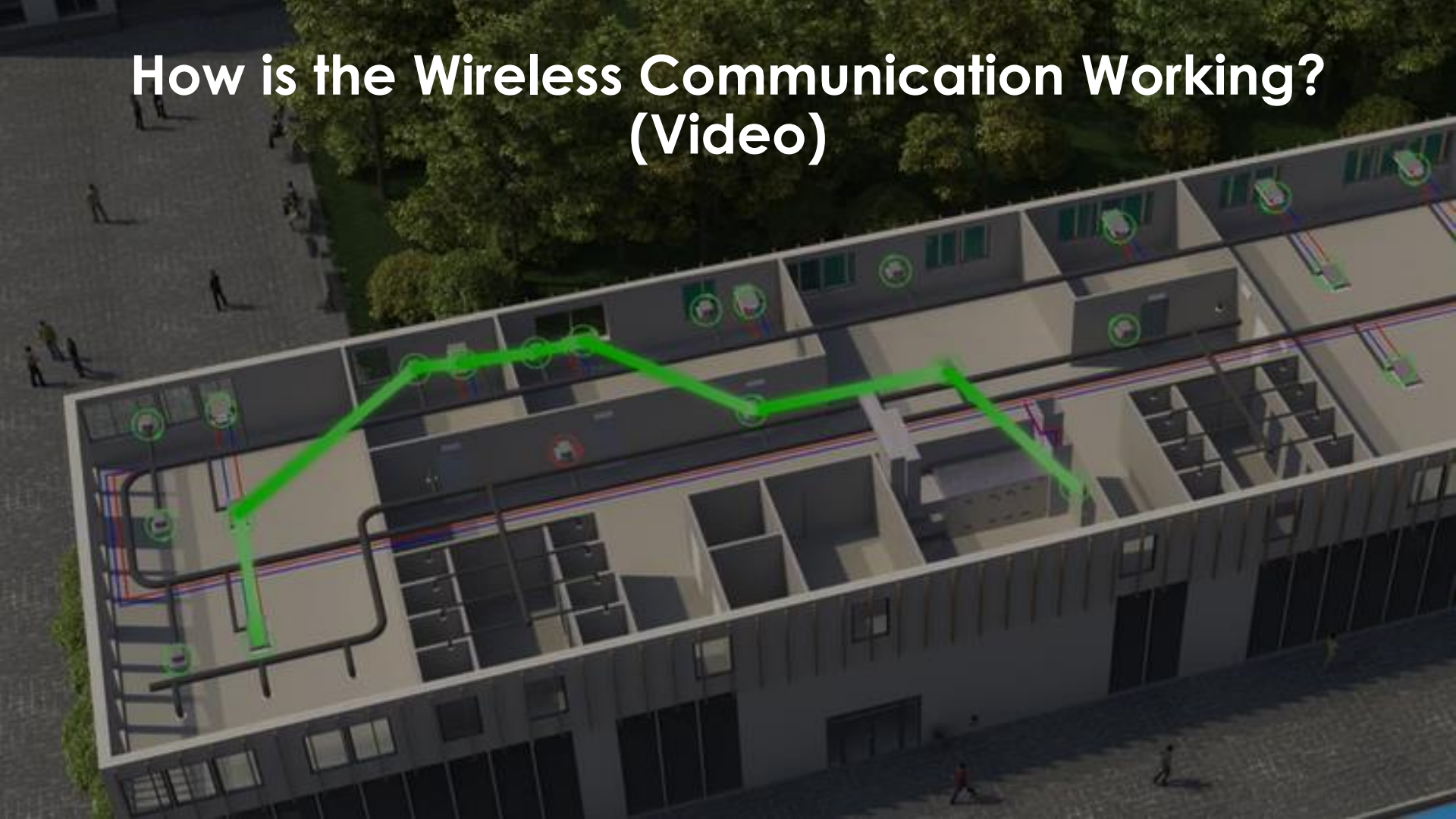
Dalarni

F.T.N

USDC

STAD 600

How is the Wireless Communication Working? (Video)





A dramatic explosion of fire and smoke, with a bright orange and yellow fireball at the center, surrounded by dark, billowing smoke. The background is black, making the fire stand out. The text is overlaid on the fire.

AN EXPLOSION
of
WIRELESS
AWESOMENESS!!!

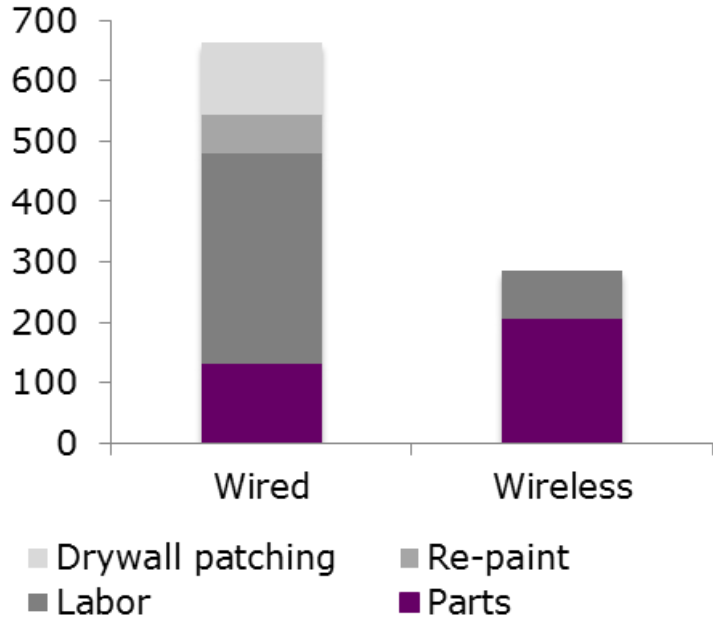
**Looking back, what was the
problem we tried to solve?**





Results

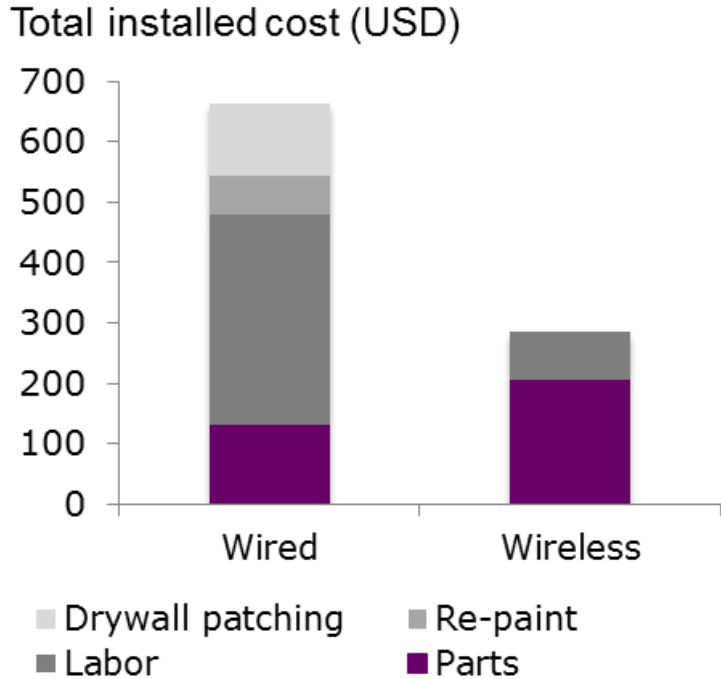
Total installed cost (USD)



- Wireless enabled HVAC systems reduces:
 - Installation
 - Commissioning
 - TROUBLESHOOTING!
- Increased flexibility
 - Installation and refurbishment
 - New applications
 - New services and offers

60% REDUCTION

Results



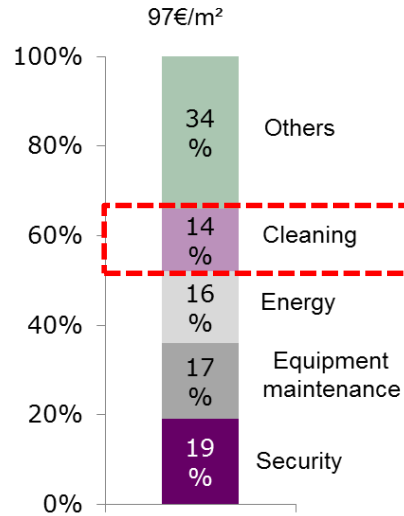
- Wireless enabled HVAC reduces:
 - Installation
 - Commissioning
 - **TROUBLESHOOTING!**
- Increased flexibility
 - Installation and refurbishment
 - New applications
 - New services and offers

Heating/Cooling

The screenshot displays the Swegon control interface for Heating/Cooling in Room 115. The interface is divided into several sections:

- Navigation Menu (Left):** A vertical menu with icons for Home, Planvy, Systemvy, Larm, Grafer, Schema, Optimering, Grupper, Driftsättning, Dokumentation, Inställningar, and Användare. At the bottom, there are user profile icons for Anders A and a Logga ut button.
- Header (Top):** Displays the location: LB01, Zon 1, Rum 115, Alla produkter, and Rensa. A dropdown menu for "Värme / Kyla" is highlighted with a red box.
- Main Control Area (Center):** A floor plan of Room 115 showing various units and controls. A blue circle with an 'i' icon is visible on the left side of the plan. A "Våning" (Floor) indicator shows floors 1, 2, and 3, with floor 1 selected.
- Control Panel (Right):** A detailed control panel for Room 115. It includes:
 - Buttons for "Rum 115", "Flödesbild", "Anteckningar", and "Ändringslogg".
 - Current temperature: 22.7°C.
 - Air quality: 534 ppm.
 - Occupancy: 1 person icon.
 - Mode: "Värme / Kyla" (Heating/Cooling).
 - Forcing: "Forcering" (Forcing).
 - Airflow: "Luftflöden" (Airflow) with a value of 38.3 l/s (10).
 - Temperature and Air Quality Data:
 - Temperatur, Tilluft: 18.9°C
 - Temperatur, Börvärde: 21°C
 - Temperatur, Kylbörvärde: 23°C
 - Temperatur, Värmebörvärde: 21°C
 - Luftkvalitet, Övre Gräns: 1000 ppm
 - Luftkvalitet, Undre Gräns: 800 ppm
 - Forcing, Manuell: A toggle switch.
 - Närvaro: A dropdown menu set to 20 min.
 - Buttons for "Spara" (Save) and "Ångra" (Undo).

Office building services costs breakdown¹



Note : (1) excluding FM services such as phone, restaurant, internal mail and others similar

Energy Cost = €15.52/m²

Cleaning Cost = €13.58/m²

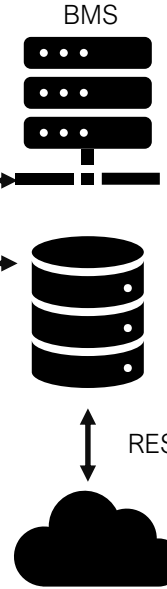


Edge Computing Open up New Opportunities

Sensors

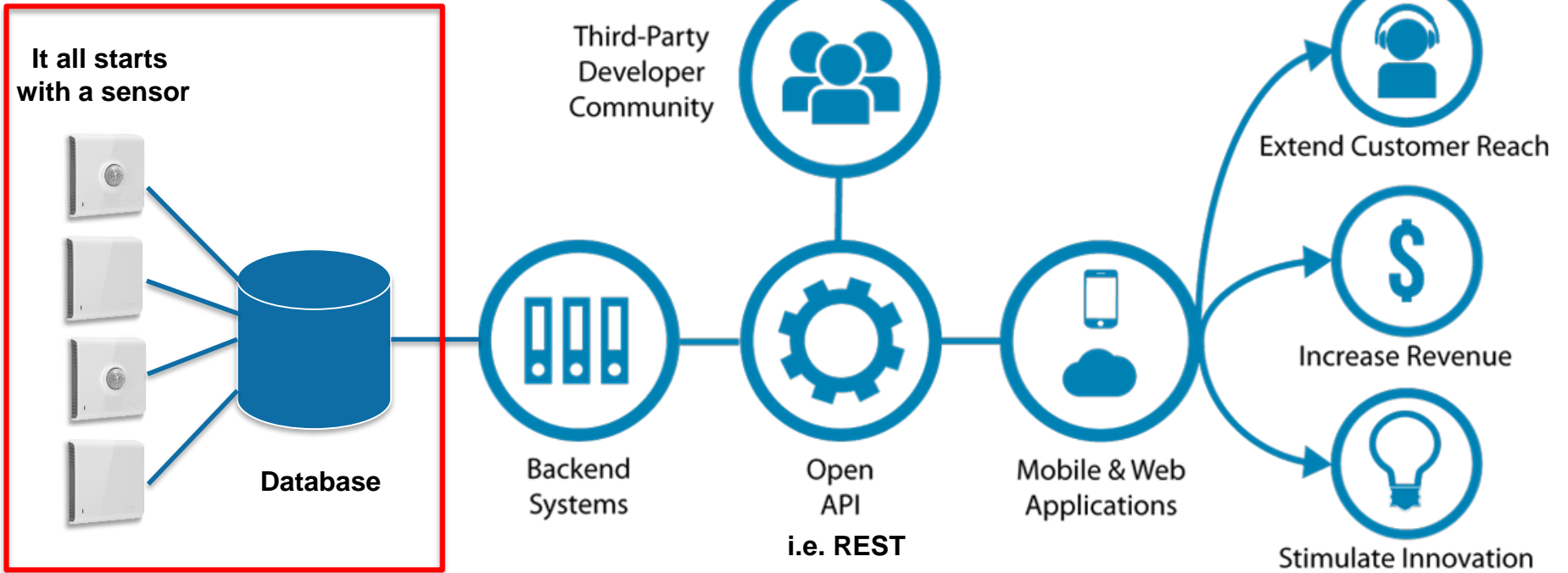


Actuators/Dampers/Chillers/Diffusers



API - the key to value creation

Let the building do the talk (It's not about BACnet and Modbus anymore...)

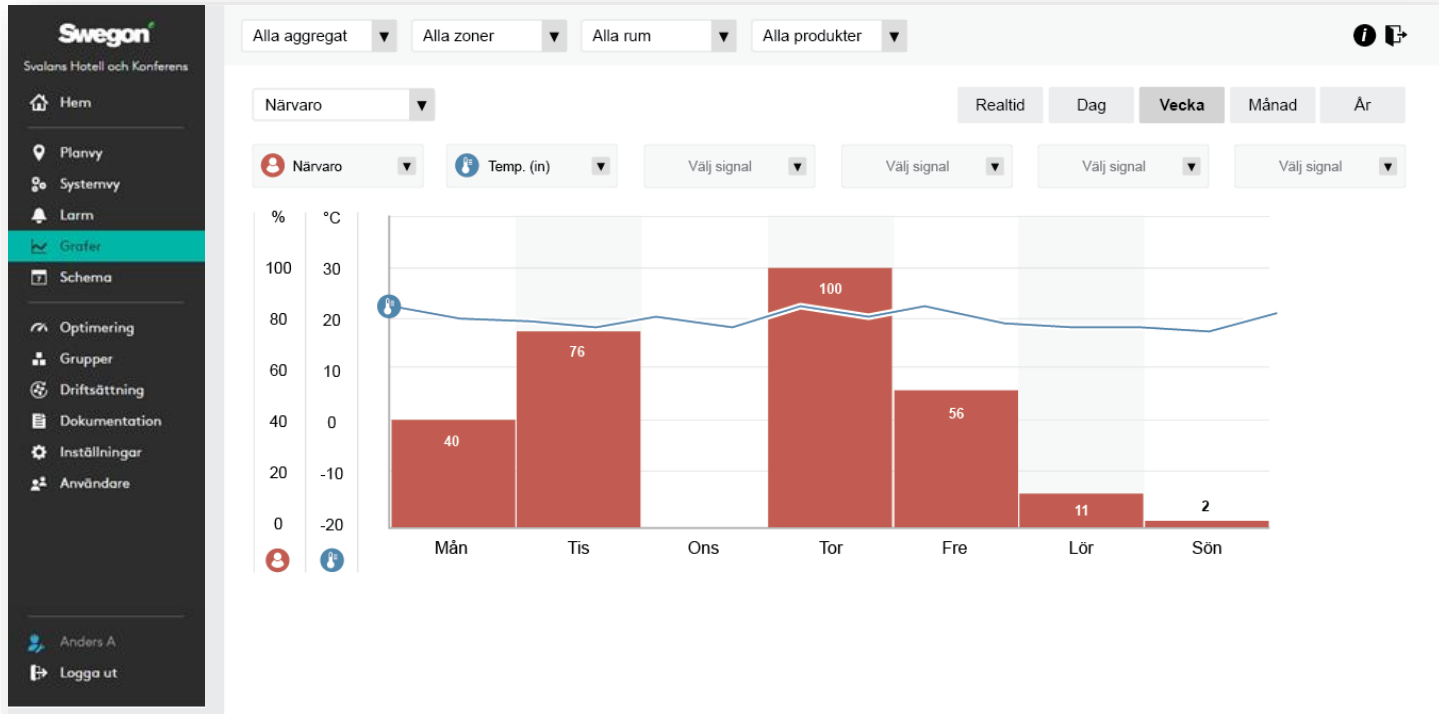


Presence / Air Quality

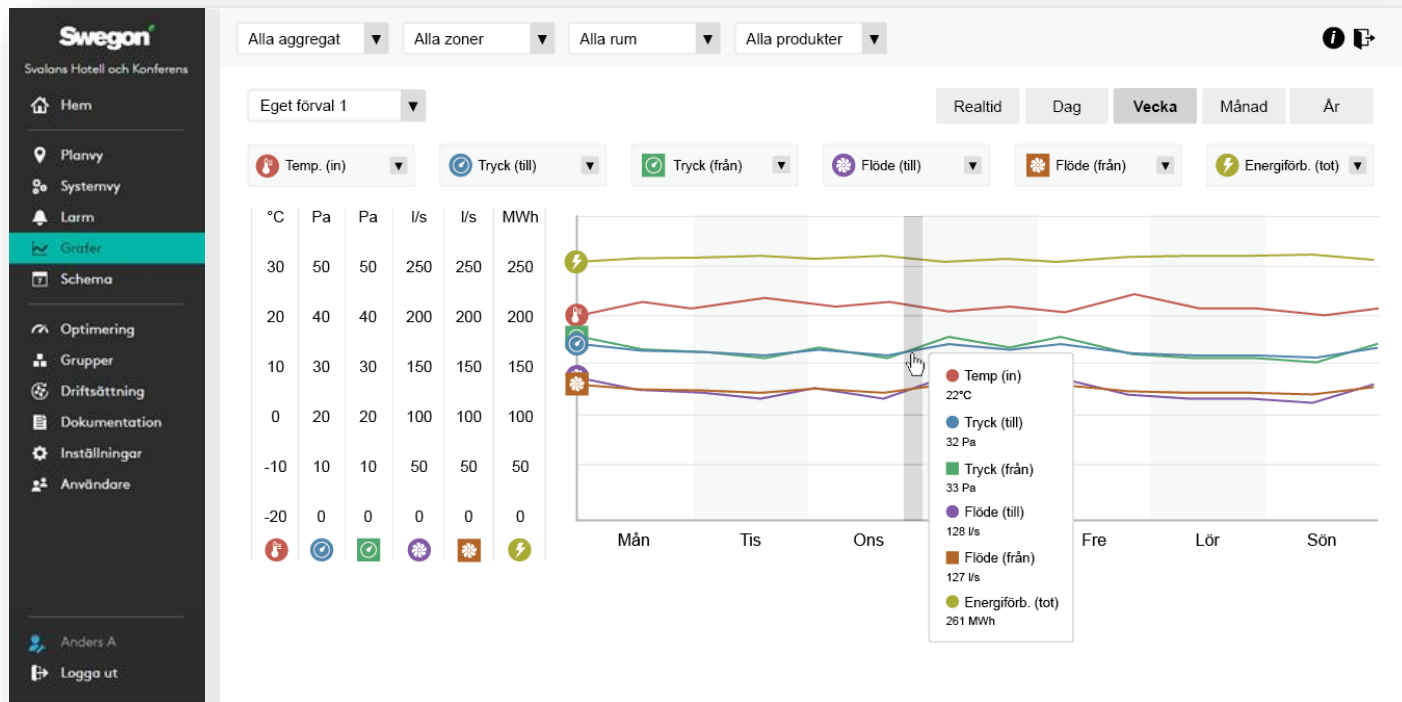
The screenshot displays the Swegon control interface for Room 115. The interface is divided into several sections:

- Header:** Shows the current location: LB01, Zon 1, and Rum 115. There are also buttons for "Alla produkter" and "Rensa".
- Navigation:** A sidebar on the left contains menu items: Hem, Planvy, Systemvy, Larm, Grafer, Schema, Optimering, Grupper, Driftsättning, Dokumentation, Inställningar, and Användare. The user "Anders A" is logged in.
- Room Selection:** A dropdown menu labeled "Närvaro" is highlighted with a red box. Above the floor plan, there are buttons for "Våning" (1, 2, 3) and "B".
- Floor Plan:** A schematic of the room layout with various sensors indicated by icons: a blue 'i' icon, green person icons, and grey minus signs.
- Control Panel (Right):**
 - Buttons for "Rum 115", "Flödesbild", "Anteckningar", and "Ändringslogg".
 - Current values: Temperatur (22.7°), Luftkvalitet (534), and Närvaro (green person icon).
 - Options for "Värme / Kyla" and "Forcering" (set to -).
 - Luftflöden:** A section showing air flow data: "→ 38.3 l/s (10)".
 - Temperature and air quality data:
 - Temperatur, Tilluft: 18.9 °C
 - Temperatur, Börvärde: 21 °C
 - Temperatur, Kylbörvärde: 23 °C
 - Temperatur, Värmebörvärde: 21 °C
 - Luftkvalitet, Övre Gräns: 1000 ppm
 - Luftkvalitet, Undre Gräns: 800 ppm
 - Forcering, Manuell: Off
 - Närvaro: 20 min
 - Buttons for "Spara" and "Ångra".

Graph – Presence & Temperature

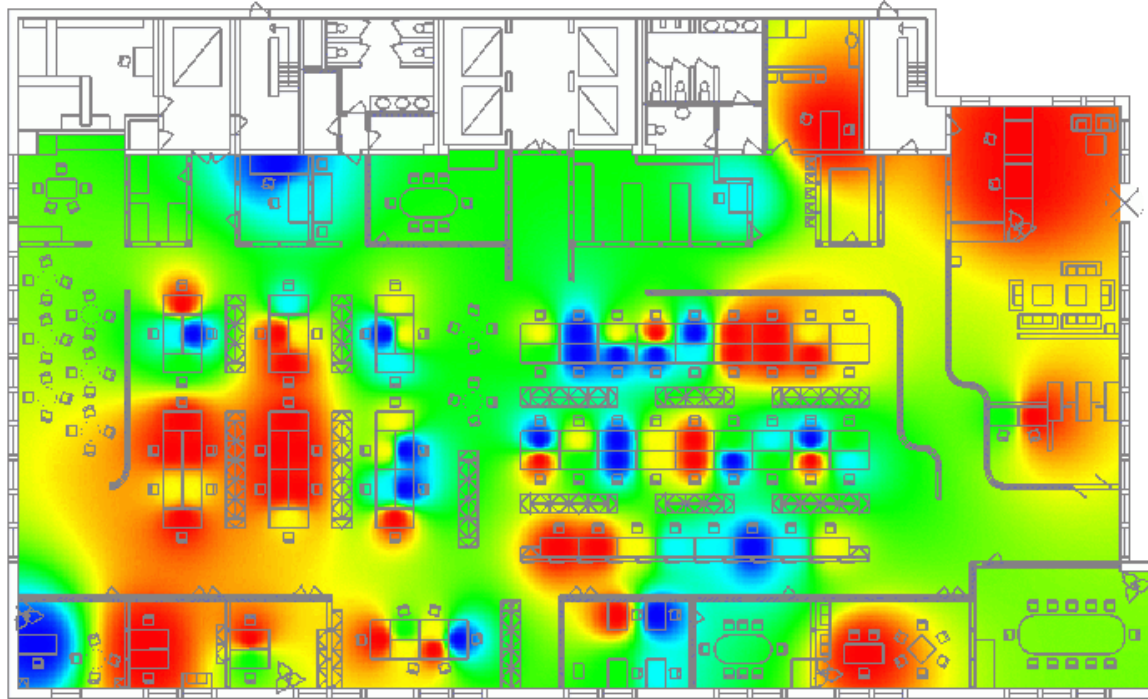


Graph – Details



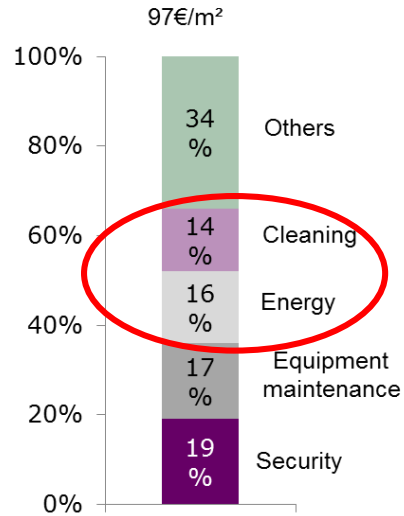
New business opportunities

Space and Occupancy management



Presence sensors in an HVAC control system accessible through a well defined API can be used to generate Heat Maps.

Office building services costs breakdown¹



Note : (1) excluding FM services such as phone, restaurant, internal mail and others similar

Energy Cost = €15.52/m²

Cleaning Cost = €13.58/m²

Pay for actual usage!

= \$

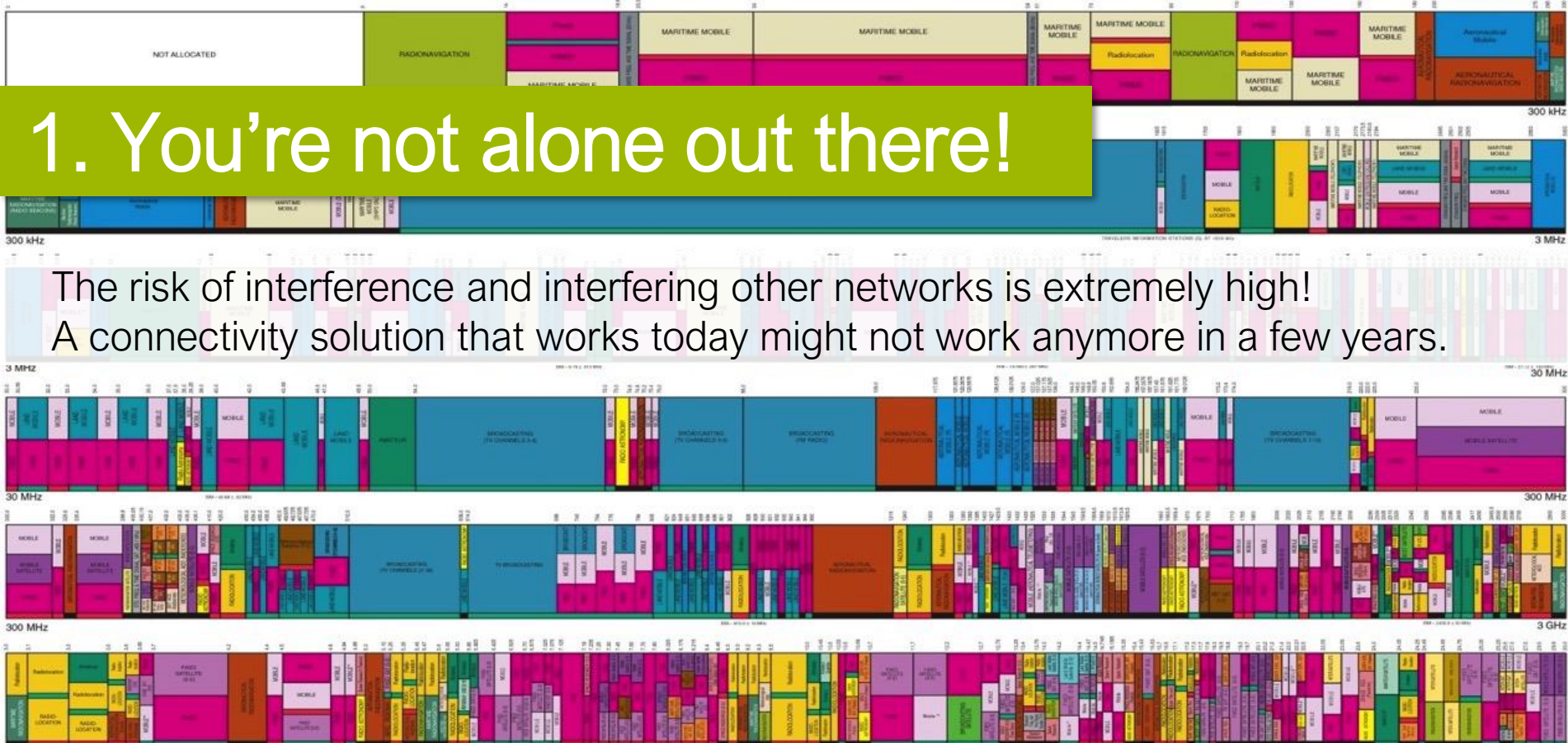
Challenges with going Wireless



Challenges

1. You're not alone out there!

The risk of interference and interfering other networks is extremely high!
A connectivity solution that works today might not work anymore in a few years.



1. You're not alone out there!





Design Now for the Interference of Things

Julius Knapp, Chief of the FCC's Office of Engineering

2. Battery powered devices – Zero Wires



3. Range



4. Security



5. Don't forget the installation and maintenance

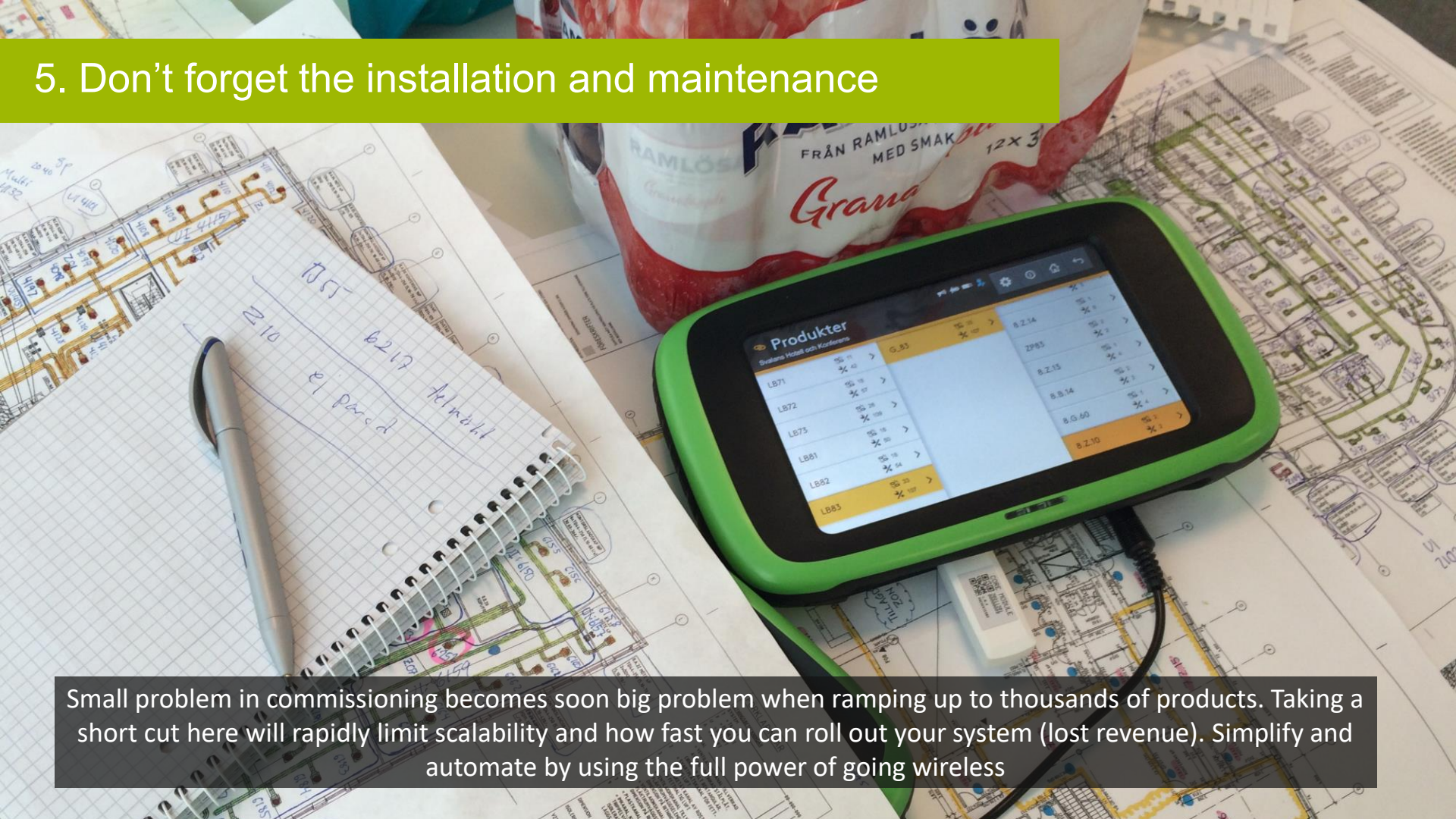
Small problem in commissioning becomes soon big problem when ramping up to thousands of products. Taking a short cut here will rapidly limit scalability and how fast you can roll out your system (lost revenue). Simplify and automate by using the full power of going wireless

5. Don't forget the installation and maintenance



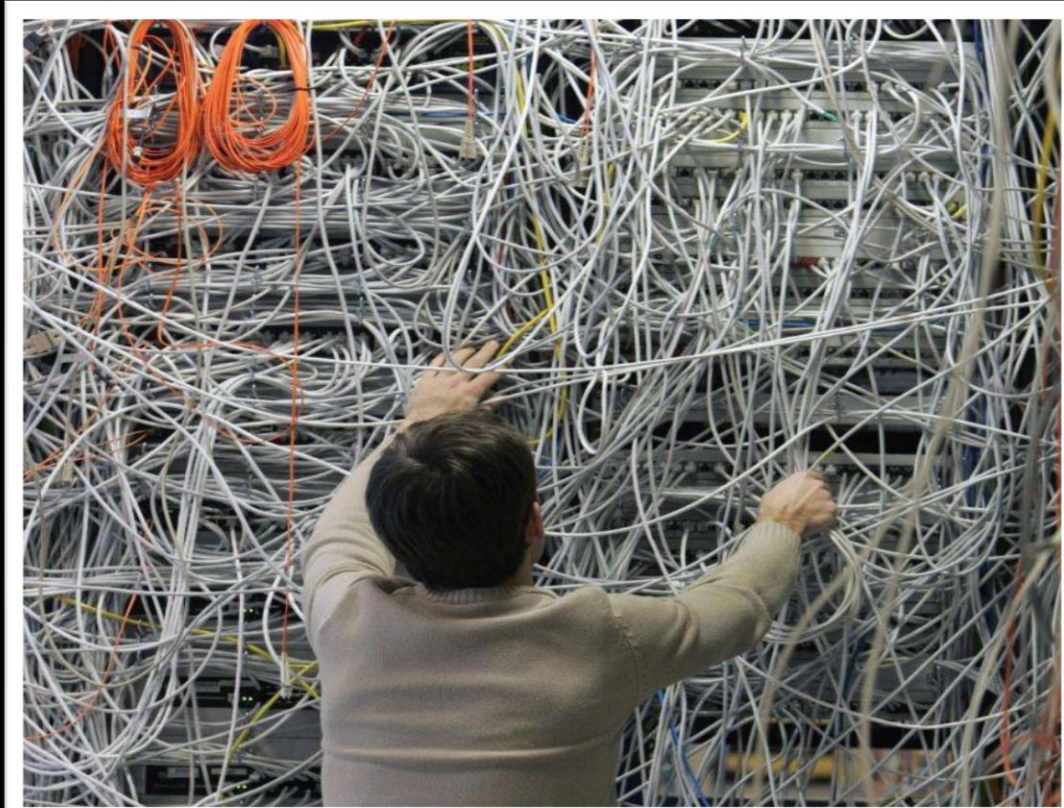
Small problem in commissioning becomes soon big problem when ramping up to thousands of products. Taking a short cut here will rapidly limit scalability and how fast you can roll out your system (lost revenue). Simplify and automate by using the full power of going wireless

5. Don't forget the installation and maintenance



Small problem in commissioning becomes soon big problem when ramping up to thousands of products. Taking a short cut here will rapidly limit scalability and how fast you can roll out your system (lost revenue). Simplify and automate by using the full power of going wireless

Cables are our biggest enemy for energy efficient, sustainable, Green Buildings!



**CHANGE
HAPPENS**

... are you ready?





Thanks for listening

Lumenradio

Connectivity for a better tomorrow