“Smart buildings to the rescue”.

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

WISe WCS (Window Contact Sensor)
- Window open/closed, Temp

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

TUNE WISe
Commissioning tool

lumenradio
Pre iPhone era
2005

Post iPhone era
2013

Pope Benedict inauguration in 2005 vs. Pope Francis in 2013

Change Happens!
’First gradually - then Suddenly’
IoT - the 3rd wave of connectivity

- **1969**: Arpanet
- **1975**: TCP/IP
- **1990**: HTTP
- **1993**: Mosaic
- **1998**: Google
- **2007**: iPhone
- **2020**: ?

Connected Devices (bn)

#1 - Internet

#2 - Mobile Internet

#3 - Internet of Things
Kids of today will never understand...
Companies of today will never understand…
NOVEMBER 12 2007

iPhone 2007

NOVEMBER 12 2007

iPhone 2007
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.
At 1.9 GFLOPS* peak performance, it was the fastest machine in the world when it was released.

* floating point operations per second
The Challenge?
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.”

Martec’s Law

Technology changes exponentially (fast), yet organizations change logarithmically (slow).

Management must strategically choose which technological changes to embrace, given the highly constrained bandwidth for absorbing organizational changes.

by Scott Brinker (@chiefmartec)
“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
“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
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

<table>
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<th>Long-Term Search</th>
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<th>Property Management</th>
<th>Construction Management</th>
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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

€30
Energy

€300
Building

€3000
People

Focus is shifting from energy savings to increased productivity.

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

Source: JLL (Jones Lang LaSalle)
AS-IS: Revenue during the lifespan of a system

Timeline of Revenue

- 3 yr  Moving in  + 5 yr  + 20 yr

Architect:
Consultant:
Installer:
Real Estate Owner:
Tenant:
Facility Mgmt Svc:
TO-BE: Revenue during the lifespan of a system

Architect: Consultant: Installer: Real Estate Owner: Tenant: Facility Mgmt Svc:

Timeline of Revenue

- 3 yr Moving in + 5 yr + 20 yr

Profitable growth based on Services

Realtime Analysis of the Real Estate based on:
- Performance
- Usage
- Comfort
- Economy

$ $ $
WISE
Demand-controlled indoor climate has never been easier
THE INTERNET OF THINGS
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

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

SuperWISE
The "Brain"

DIRECTOR
Wireless "router"

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.
100% Wireless Controls and Data Collection

WISE OCS (Occupancy Sensor)  
RH, Temp

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

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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

TUNE WISE Commissioning tool
A tried and tested concept

- Already in operation in more than 300 projects!
  - New construction
  - Refurbishment
  - Offices
  - Retail
  - Schools
  - Hotels
  - Healthcare
How is the Wireless Communication Working? (Video)
How is the Wireless Communication Working? (Video)
AN EXPLOSION of WIRELESS AWESOMENESS!!!
Looking back, what was the problem we tried to solve?
Results

- Wireless enabled HVAC reduces:
  - Installation
  - Commissioning
  - Troubleshooting

- Increased flexibility
  - Installation and refurbishment
  - New applications
  - New services and offers

Total installed cost (USD)

- 60% REDUCTION
Results

- **Wireless enabled HVAC reduces:**
  - Installation
  - Commissioning
  - TROUBLESHOOTING!

- **Increased flexibility**
  - Installation and refurbishment
  - New applications
  - New services and offers
Energy Cost = €15.52/m²

Cleaning Cost = €13.58/m²

Office building services costs breakdown¹

Note: (1) excluding FM services such as phone, restaurant, internal mail and others similar
Edge Computing Open up New Opportunities

BMS

BACnet object

Data migration

REST API

Sensors

WISE OCS (Decayaway Sensor) RH, Temp
WISE RTA (Room Temperature Adjuster) Temp, Set point adj, Dri
WISE MQ/CMHI (Indoor Air Quality) VOC or CO2, Temp, RH
WISE RTF (Infrared Room Temperature sensor) Room Temp, Floor Temp
WISE RTS (Room Temperature Sensor) Temp
WISE NCS (Window Contact Sensor) Window open/closed, Temp

Actuators/Dampers/Chillers/Diffusers

WISE IBE (Indoor Radio Extender) 1 Analog in 0-10V or Digital in
WISE ORE (Output Radio Extender) 2 Analog out 0-10V, 2 Analog out 0-5V, 1 Analog in 0-5V
WISE SMA (Sensor Module Advanced) Sensor Module Basic PIR, Temp, LED
WISE SMAB (Sensor Module Basic) PIR, Temp, LED
API - the key to value creation
Let the building do the talk (It's not about BACnet and Modbus anymore…)

It all starts with a sensor

Database

Third-Party Developer Community

Open API i.e. REST

Backend Systems

Mobile & Web Applications

Extend Customer Reach

Increase Revenue

Stimulate Innovation
Presence / Air Quality
Graph – Presence & Temperature
### Graph – Details

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Pressure (kPa)</th>
<th>Flow (l/s)</th>
<th>Flow (l/s)</th>
<th>MWh</th>
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![Graph Image]

- **Temp (in)**: 22°C
- **Tryck (till)**: 32 Pa
- **Tryck (från)**: 33 Pa
- **Flöde (till)**: 128 l/s
- **Flöde (från)**: 127 l/s
- **Energiförrätt (tot)**: 281 MWh

- **Eget förval 1**

- **Svenska Hotel och Konferens**
- **Schema**
- **Optimering**
- **Grupper**
- **Driftsättning**
- **Dokumentation**
- **Inställningar**
- **Användare**

- **Anders A**
- **Logga ut**
Presence sensors in an HVAC control system accessible through a well defined API can be used to generate Heat Maps.
Pay for actual usage!

Energy Cost = €15.52/m²

Cleaning Cost = €13.58/m²

Note: (1) excluding FM services such as phone, restaurant, internal mail and others similar
Challenges with going Wireless
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
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.
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
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