IoT-Enabled Smart Cities Market Creation

Kim Brostrøm
Head of DOLL Living Lab
Copenhagen

DOLL

Lighting Up the Future of Smart Cities

Lighting Metropolis

DOLL a Photonics GreenLab

Funded by the Government

The Danish Ministry of Energy, Utilities and Climate
The Capital Region of Denmark - Vækstforum hovedstaden
Region Zealand

Consortium Partners

Albertslund Municipality
Gate 21
Technical University of Denmark

GREEN LABS DK

Vækstforum Hovedstaden

REGION SJÆLLAND – vi er til for dig

DTU Fotonik Institut for Fotonik

Albertslund Kommune

GATE 21

Greater Copenhagen

A: Gladsaxe
B: Herlev
C: Ballerup
D: Frederiksberg
E: Rødovre
F: Glostrup
G: Albertslund
H: Høje Taastrup
I: Hvidovre
J: Brøndby
K: Vallensbæk
L: Ishøj

GATE 21

42 Municipalities

5 Universities

+40 Companies & Utility providers

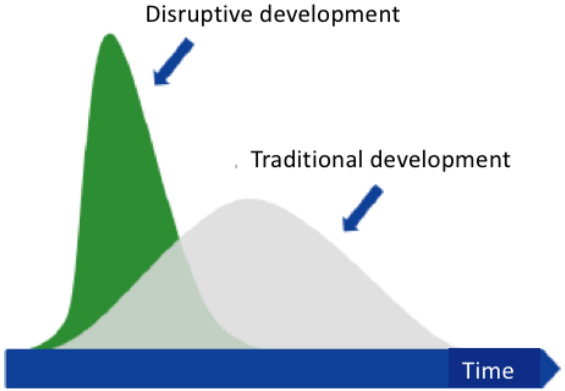
GOLD
Cluster Management Excellence
PROVEN FOR CLUSTER EXCELLENCE

Digitalization a new Basic Conditions

ERHVERVS- OG VÆKSTMINISTERIET

Digitalization a new Basic Conditions

- Short product life time
  Disruptive vs. traditional development



Kilde: Egen tilvirkning på baggrund af Downes & Nunes (2013)

- Period of time to reach 50 millions users

Phone	75 Years
Radio	38 Years
Television	13 Years
Internet	4 Years
iPod	3 Years
Facebook	1 Years
Twitter	9 Months
Angry Birds	35 Days
Pokémon Go	19 Days

Kilde: Egen tilvirkning på baggrund af McKinsey & Company (2012)

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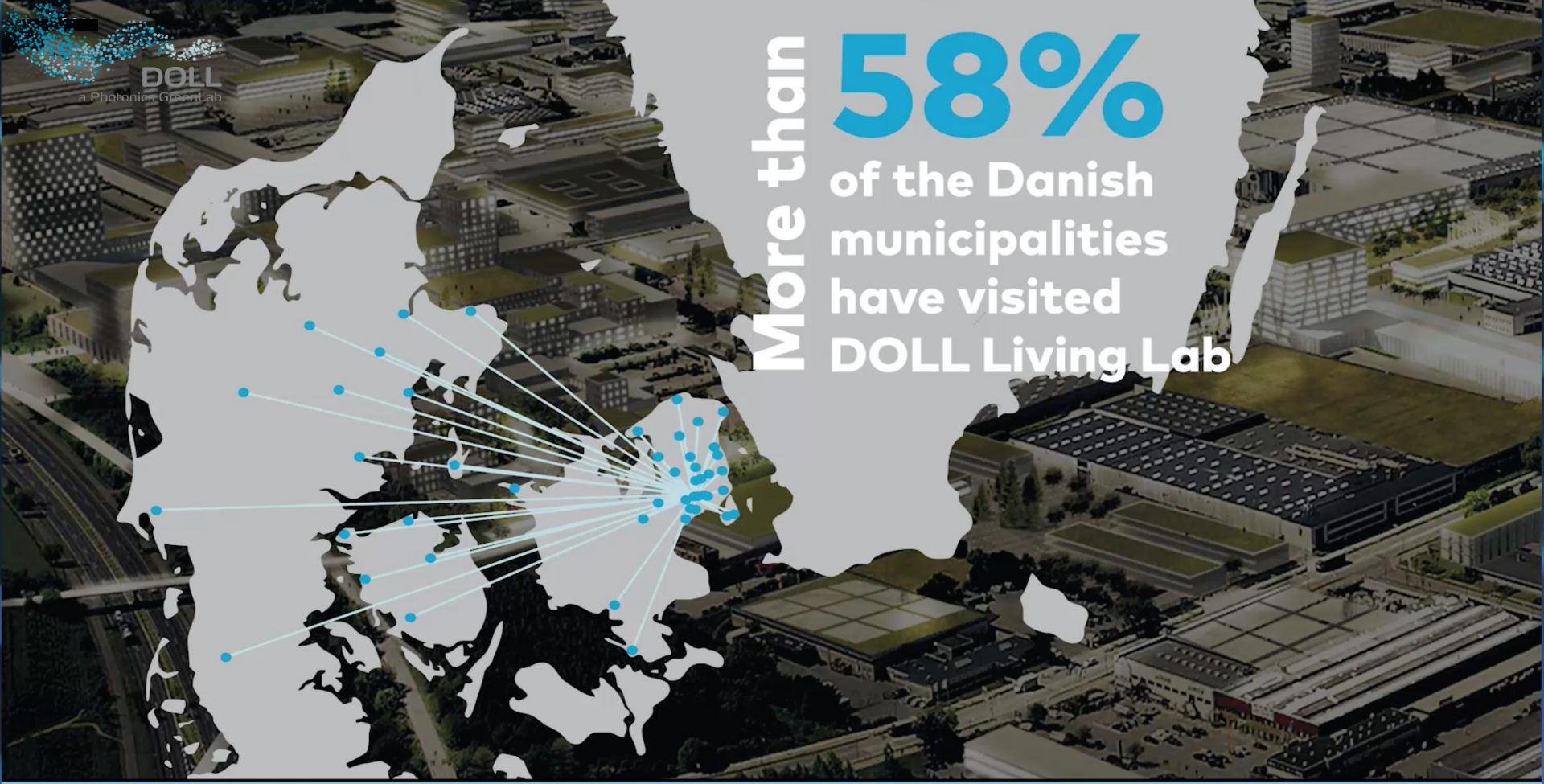
1:1
DOLL Living Lab



Aabenraa - Aarhus - Albertslund - Allerød - Assens - Ballerup - Brøndby - Dragør - Egedal - Faaborg-Midtfyn - Favrskov - Fredensborg - Frederiksberg - Frederikssund - Furesø - Gentofte - Gladsaxe - Glostrup - Greve - Gribskov - Halsnæs - Helsingør - Herlev - Herning - Hillerød - Horsens - Hvidovre - Høje-Taastrup - Hørsholm - Ishøj - Kalundborg - København - Lejre - Middelfart - Norddjurs - Nordfyn - Næstved - Odense - Randers - Roskilde - Rudersdal - Rødovre - Silkeborg - Tønder - Tårnby - Vallensbæk - Varde - Viborg - Vordingborg - and many more...

Addis Ababa - Accra - Adelaide - Beijing - Birmingham - Bogotá - Dublin - Frogn - Guanzhou - Hong Kong - London - Malmö - New York - Oslo - Portland - Reykjavik - Rio de janeiro - Rygge - Seine et Marne - Seoul - Singapore - Stockholm - Sydney - Taipei - Time - Warszawa - Wellington - Xiaolab City - Zürich - Ås - and more...

Media publicity from 80+ different media outlets

Smart Lighting in the Danish capital
BBC Radio

A small Danish suburb is a lab for the world's smartest streetlights
Gizmodo

Lamppost shines a light on Smart Cities
Financial Times

How LED's are going to change the way we look at cities
Forbes.com

Energy-efficient lighting system on installation in Denmark
CCTV

Mass 'Smart City' experiment lights up Copenhagen suburb
Reuters TV

Algiers - Beijing - Bengaluru - Berlin - Boston - Candas - Copenhagen - Denver - Detroit - Düsseldorf - Frankfurt - Hamborg - Harlan - Ho Chi Min City - Jersey City - Kiev - Kisumu - London - Lyon - Madrid - Nashua - Nashville - Negaunee - New Delhi - New York - Norwich - Paris - Philadelphia - Rom - Sacramento - San Jose - Seattle - Stockholm - Sydney - Taiwan - Tel Aviv - Washington D. C. - Wellington - and more...

Largest facility in Europe

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- **Location:** A suburb to Copenhagen, industrial/commercial area, 10.000 employees
- **Area**: 1,5 km^2, 12 kilometres of road and bicycle lanes, our sandbox environment
- **Zones**: 49 zones with Lighting and smart city-technology
- **IoT-infrastructure**: 5 types of digital networks
- **Sensor network**: For waste, parking, air quality, noise, temp., etc.
- **Intelligent lighting network**: 435 connected light points, IP-address, real time control
- **Intelligent lighting solutions:** 80 different lighting lumieres
- **Management systems**: 20+ systems
- **Data platforms**: 1

50+ Partner Companies in DOLL Living Lab
50+ Gate21 Partners

Delux Denmark
Riegens
Swarco Danmark
Focus Lighting
Thorn Lighting
X-Light
Louis Poulsen
Ubitricity
Fagerhult
OSRAM
Byteblocs
Citilio
Smart Bin
Leapcraft
Cisco
Sweco
Tridonic

Philips Danmark
Alfred Priess
Scotia
PlasmaTech
NRGi
Citelum
Dong Energy
EnergiMidt
SEAS NVE
Zumtobel Group
Danintra / Rosa
NordSense
Cleverciti
SoundEar
Seneco
Telensa
Lug Light

TDC
LITE
Amplex
Schreder
Delta
Ewo
Enevo
GLS

Paradox
Big Belly
Joca
Sensity
TviLight
Wastecontrol
Exlumi
CommuniThings

Schneider Electric
IBM
NCC
Implement
Rambøll
Vitani
HOFOR
Movia
Nobina

Kuben Management
Next
Bloxhub
Technical University of Denmark
Ålborg University
Roskilde University
Capital Region
Region Sjælland
42 municipalities

Europe's largest Showroom & Test Field for Intelligent Lighting & Smart Urban Services

Intelligent Light System

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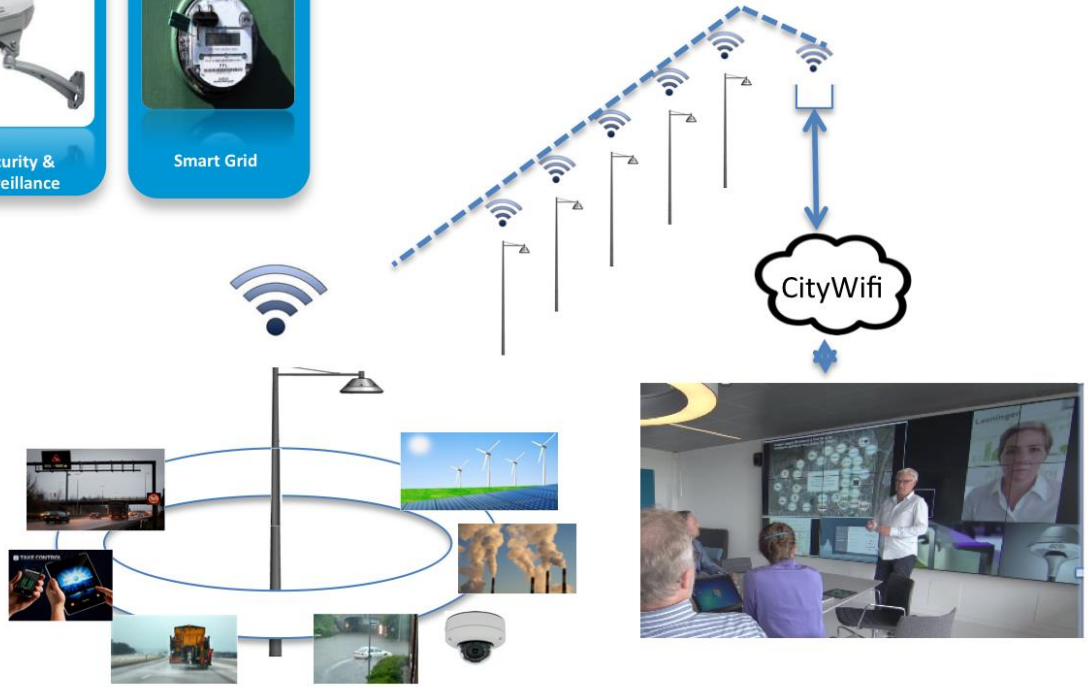
SENSING the WORLD…

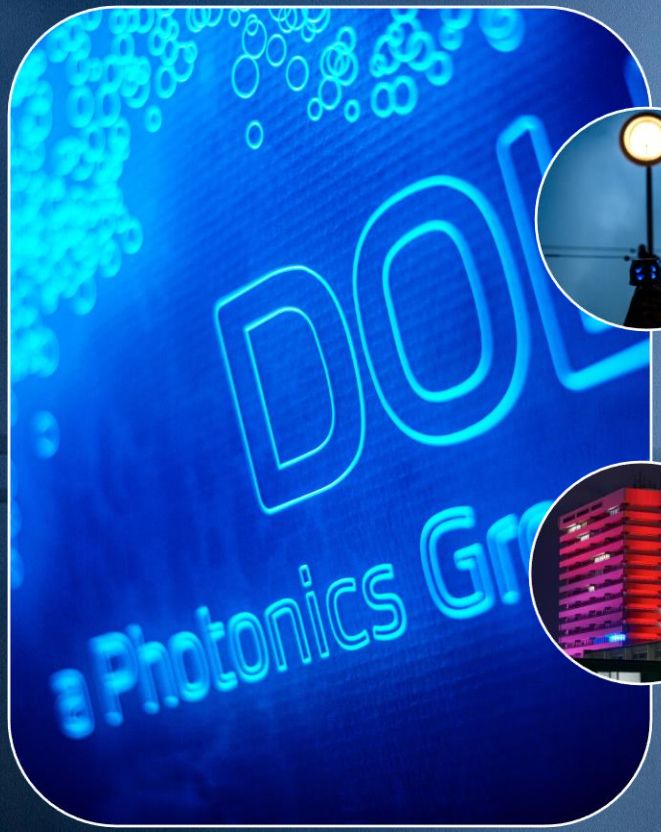
NO_X and CO
Temperature
Pressure
Humidity
Ambient light
Rainfall
Wind
Particulate matter
Radiation
UVA/UVB

Real-time location systems (RTLS)
Ultrasound
IR
Power monitoring
Motion
Audio
Video
Accelerometer

Smart Urban Services

Innovation Platform





BECOME PART OF: EUROPE'S LARGEST TEST FIELD, SHOWROOM, AND INNOVATION HUB

- Leading living lab for intelligent outdoor lighting and Smart City-technologies
- One-stop-shop, 30 min from Copenhagen Airport and Copenhagen City Centre
- Live environment, industrial and commercial area (10.000 employees), 13 km of road and bicycle lanes
- Cutting-edge knowledge, co-development, license to fail

GET ACCESS TO: RICH PARTNER ECO-SYSTEM

- DOLL Living Lab: 50+ private partners and knowledge institutions; 80+ city-delegations per year
- Access to Gate 21: Projects together with 40+ municipalities, 36 companies, and 6 knowledge institutions
- Eco-system: Manufactures (sensors, luminaires, etc.), utility companies, network and telecom operators, data analytics and processing companies, and application & system integrators
- Sectors: Digital infrastructure, intelligent outdoor lighting, waste, parking, environmental monitoring, etc.

PLUG INTO: ADVANCED DIGITAL INFRASTRUCTURE

- Plug into preferred digital infrastructure: City wifi, LoRa Wan, Sigfox, NB-IoT, and more
- Modern and advanced power infrastructure
- Access to specialists and installers

BRING YOUR COSTUMERS: DOLL AS NEUTRAL GROUND

- Use DOLL Visitor Centre in the heart of DOLL Living Lab; meeting and conference facilities
- Control Room: Video wall, servers and management systems
- You will get your own key and access code
- Catering, bus service and cleaning are all part of the DOLL Visitor Centre

MAKE USE OF: THE DOLL TEAM, COMPETENCIES, AND NETWORK

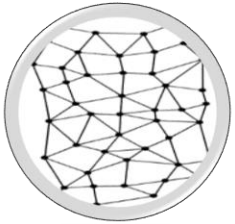
Ask if we can assist or facilitate your presentation or workshop with costumers

Ask if we can facilitate a FIELD TOUR in the living lab

Ask if we can assist connecting you to the relevant partners

Ask how you become part of workshops and seminars together with cities

Key Building Blocks & Challenges of Community Digitization



The Art of IoT Architectures

Proof of Values

Ecosystems

Big Data, A.I.

Proof of Value

Standards

Security & Resilience

Skills

Digital-Ready Governance

Ready for smart growth
23 Participating municipalities

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Allerød
Albertslund
Bornholm
Brøndby
Egedal
Fredensborg
Frederiksberg
Gentofte
Gladsaxe
Guldborgsund
Hillerød
Hørsholm
Hvidovre
Høje-Taastrup
Hørsholm
Kalundborg
Næstved
Odsherred
Rudersdal
Roskilde
Slagelse
Sorø
Vordingborg

The Smart City Academy

Forging a Smart City Strategy

Building a Living Lab

The Art of Connecting Everything

RAINMAKING Urban

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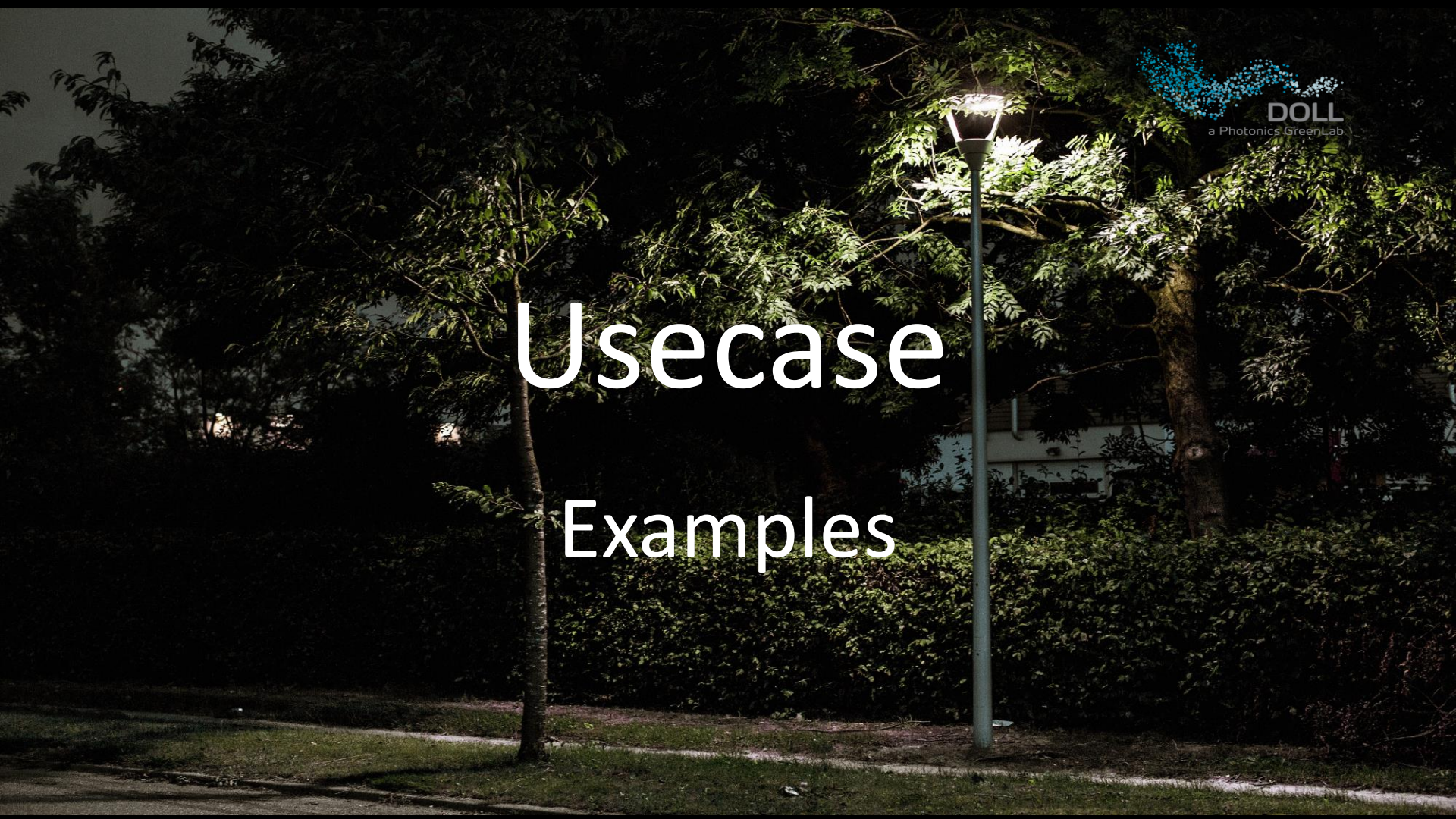
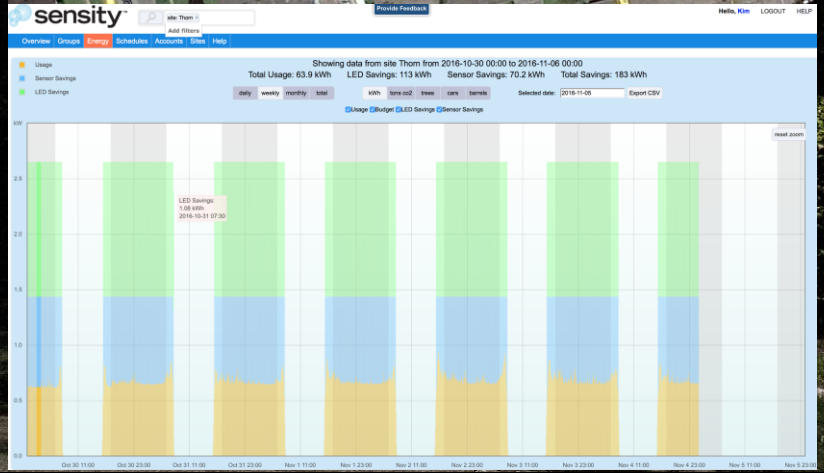
GATE 21
THE GATEWAY TO GREEN GROWTH

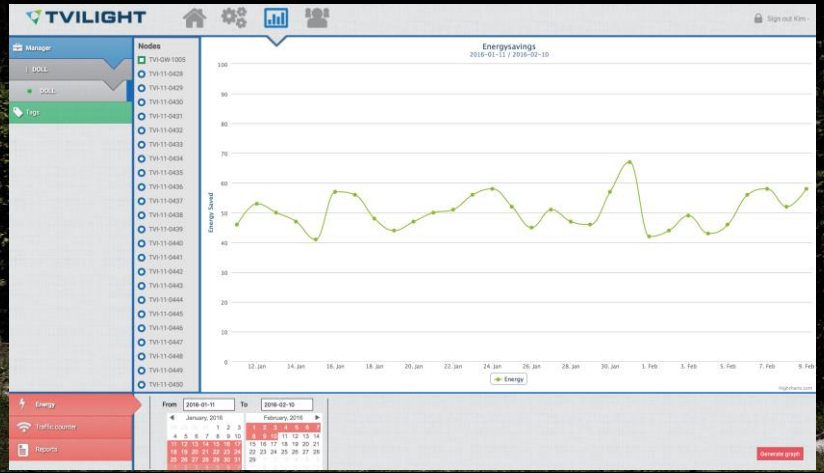


Usecase

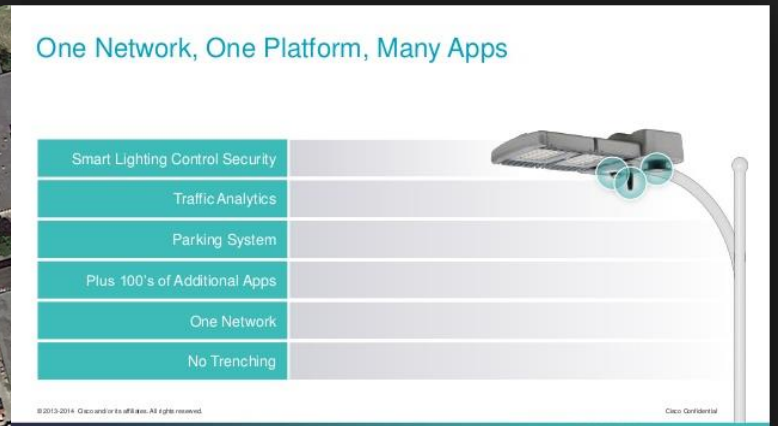
Examples

Motion Detection

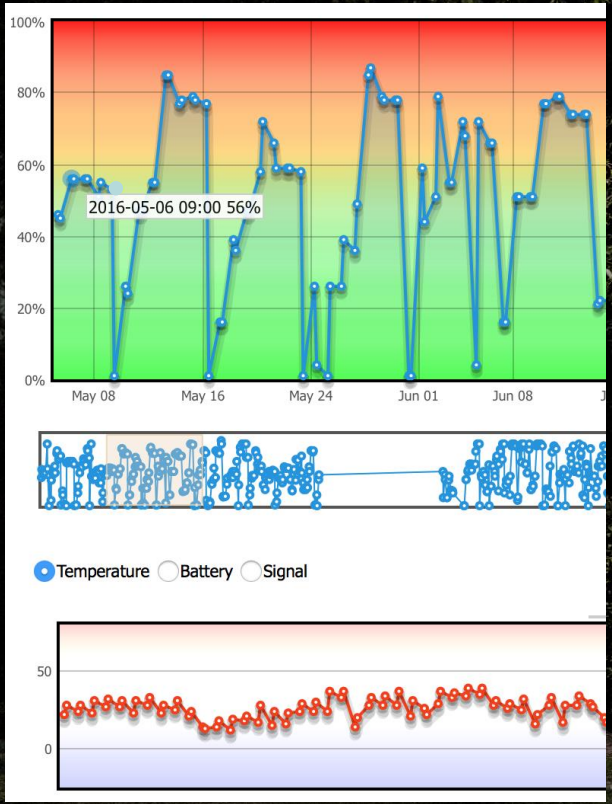


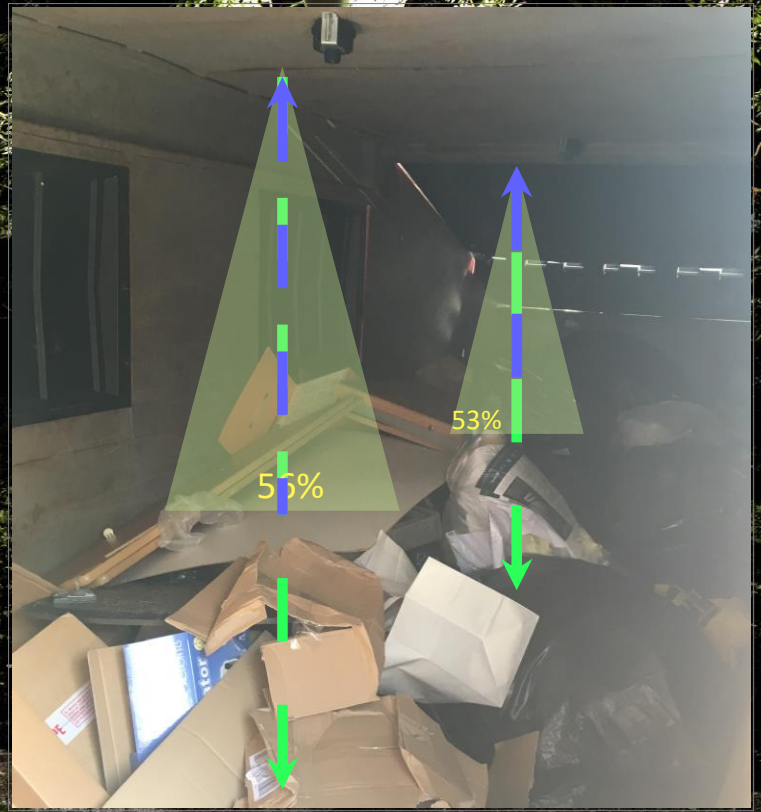


Smart Parking



Waste


100%
80%
60%
40%
20%
0%
2016-05-06 09:00 56%
May 08
May 16
May 24
Jun 01
Jun 08
Temperature
Battery
Signal
50
0


53%

Waste

Nordsense
Central waste containers
Partial underground
Hyldespjældet
7 x Glass 2,5m2
7 x Metal
7 x Cardboard
7 x Paper
7 x Plastic
14 x Residual
7x7 – 49 pcs

YMATRON
Central waste containers
Galgebakken
1 x Glass 400 L
1 x Metal 400 L
3 x Cardboard 660 L
2 x Paper 400 L
1 x Plastic 660 L
8 pcs

Big Belly
Veksø

ECOnTOP
Joca

Totalaffald in minicontainer:
10 pcs

Big Belly
Veksø

SMART BIN.
Office (Nordea)
Office
8 pcs

YMATRON
Central waste containers
Partial underground
Snebærhaven
Glass, metal, paper, Plastic, Cardboard
5 pcs

Nordsense
Central waste containers
Hersted Øster skole
6 x Glass
6 x Metal
6 x Cardboard
6 x Paper
6 x Plastic
20 x Residual
50 pcs

ECOnTOP
Joca

Waste Control in Central waste containers:
30 pcs

ENEVO
Partial underground central waste containers.
6 pcs

Sweco
Mobile
Mini containers
20 pcs

SMART BIN
Fully embedded con.
Hedemarken
10 pcs

YMATRON
Partial underground x 2
VA 4 Række
1 x Residual 5 m3
2 x Residual 2,5 m3
1 x Glass 2,5 m3
1 x Paper 2,5 m3
10 pcs

Sweco
TBD
Mini containers
30 pcs

Autonomous Vehicles

Regional Data Platform

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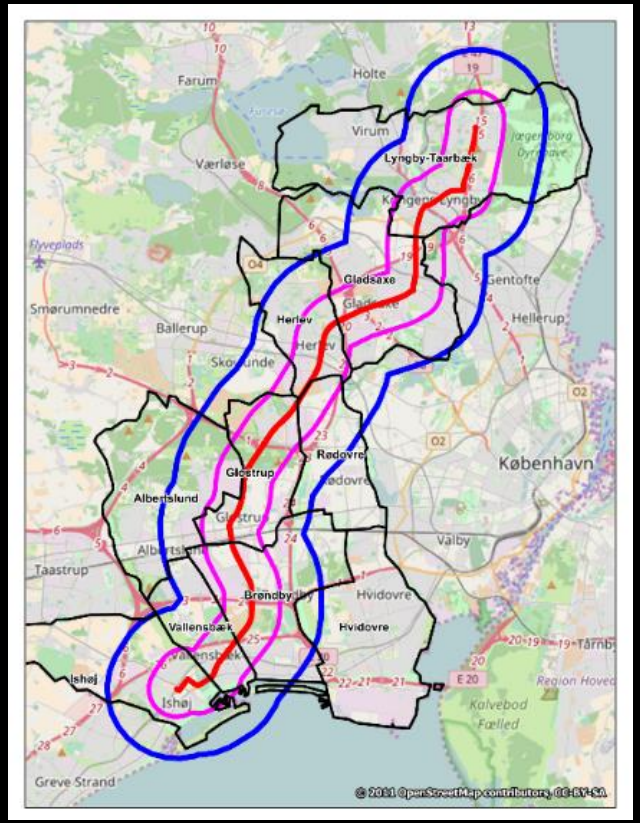
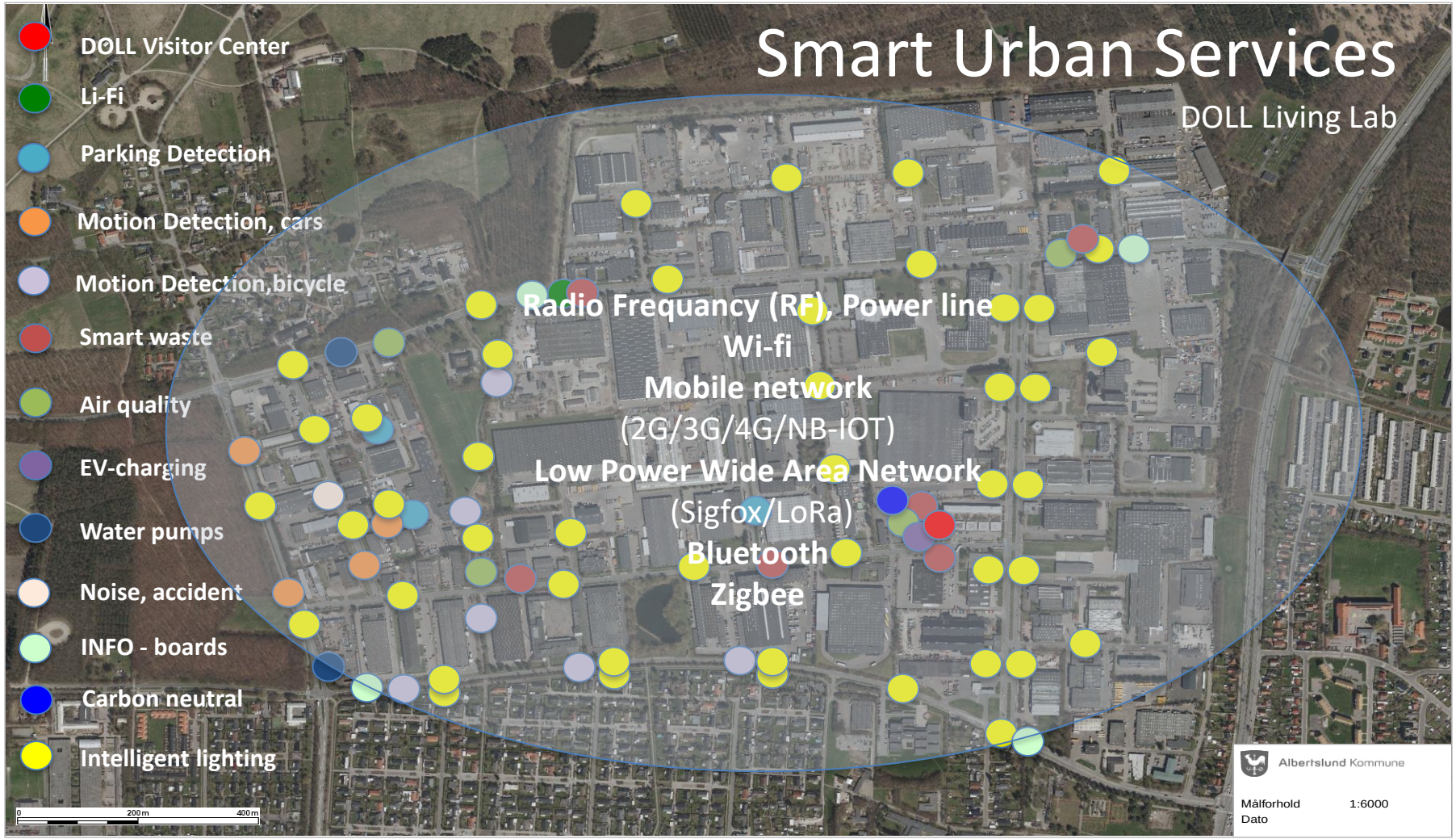


LOOP CITY

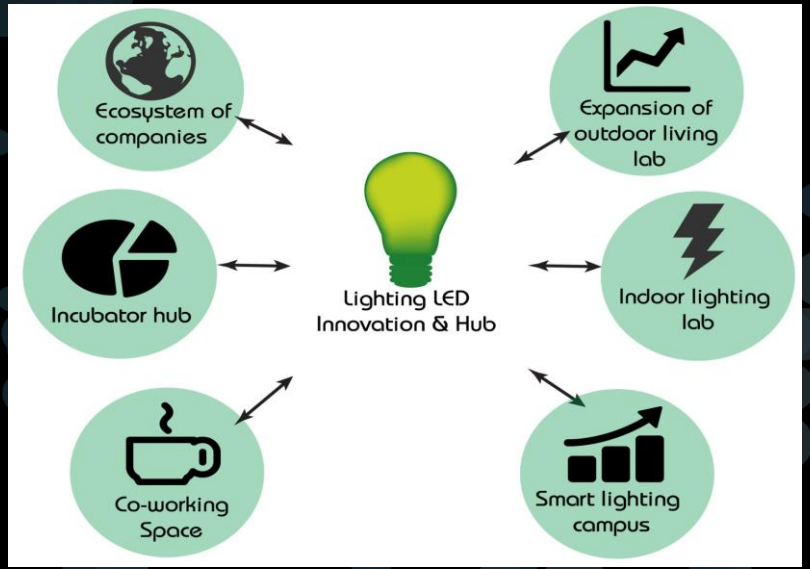
Smart Urban Services

DOLL Living Lab



Innovation Platform

Start Up Incubation



Thank you