SESAM Seminar 2018

Augmented Reality & Artificial Intelligence

May 16th 2018
Per Engelbrechtsen & Kim Madsen

“We are here for the long term success and not for the short term profit”

BEUMERGROUP

Todays topics

Augmented Reality

Game engine for visualizing of data in 3D

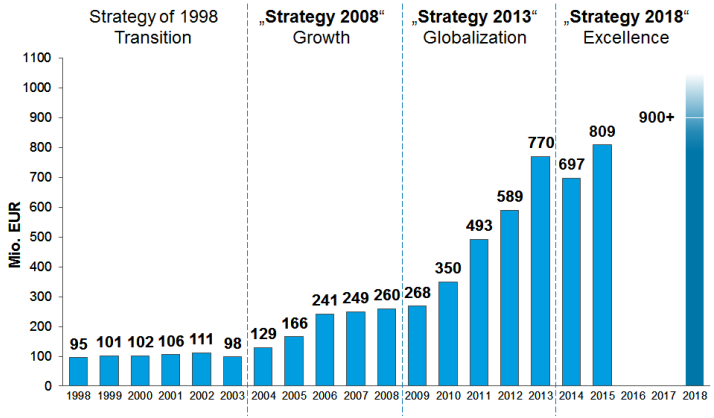
ELASTICSEARCH for real time queries in big data

Machine Learning

BUT

First you need to go through a 35 min introduction of BEUMER Group

Name:	BEUMER Group
Brands:	BEUMER & Crisplant
Status:	Independent and privately owned for 3 generations
Founded:	1935
Turnover:	2017: approx. € 900 Mio.
Employees:	Worldwide approx. 4,500
Contact:	beumergroup.com



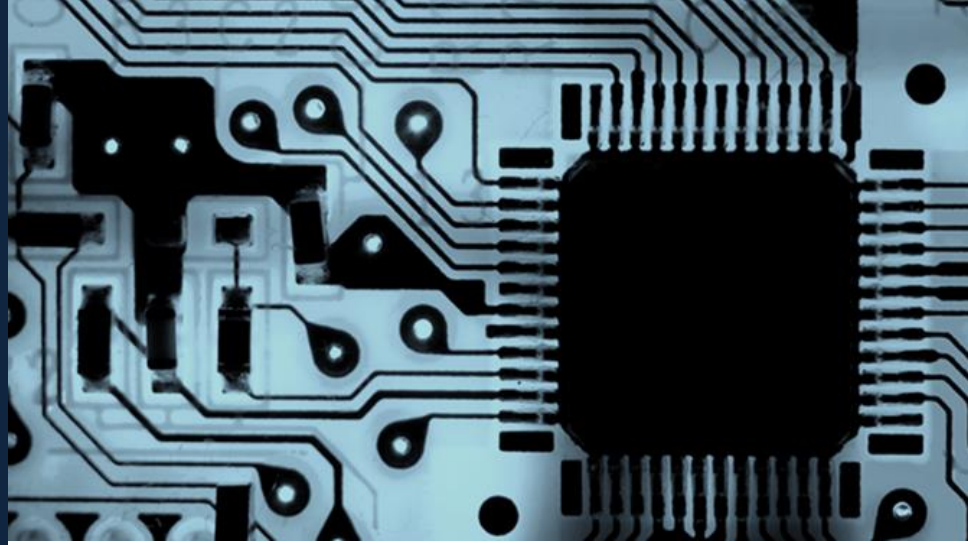
Johannesburg	Nike
Helsinki	Amazon
Copenhagen	Levi
Abu Dhabi	DHL
Guangzhou	FedEx
Calgary	Zara
Singapore	H&M
Arlanda	Bestseller
Bali	SF Express
Nanjing	Asos
Bangkok	VIP Shop
Paris CDG	Würth
San Francisco	….
Viracopos	….
….	….

“Last time we checked,
there where 25 different nationalities working
at the office here in Aarhus”

"….and last time we checked,
there where 125 software engineers
working at the office here in Aarhus"

What could change this?

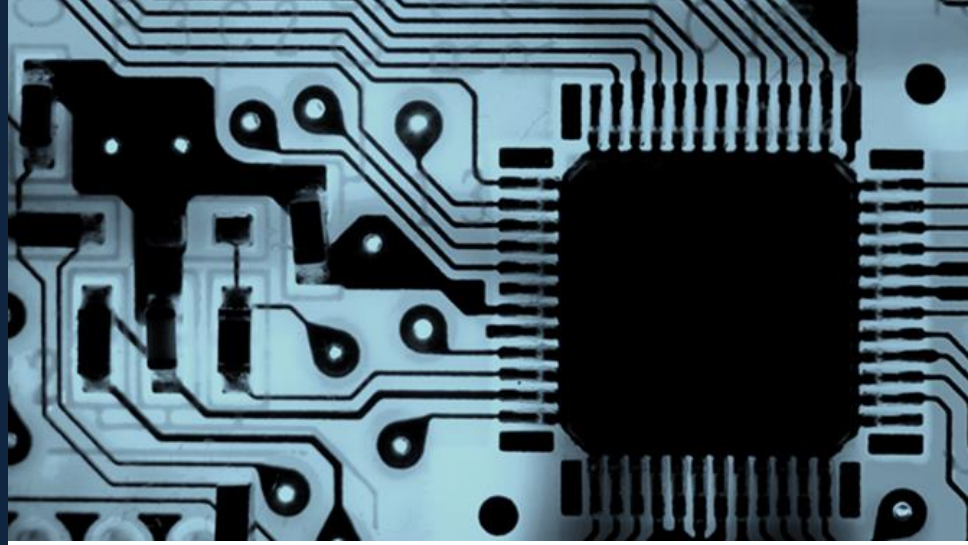
T5

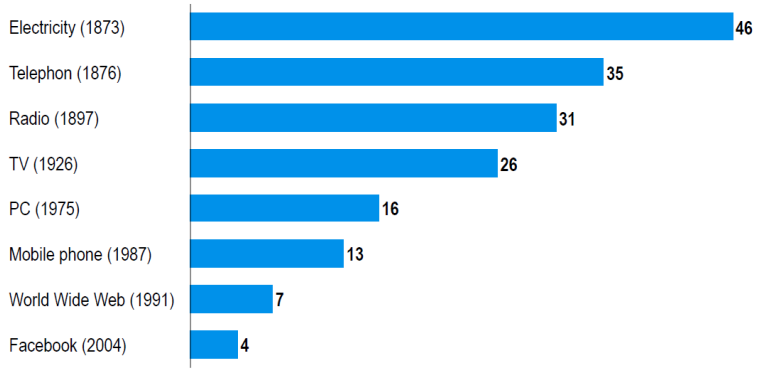


Disruptive technology

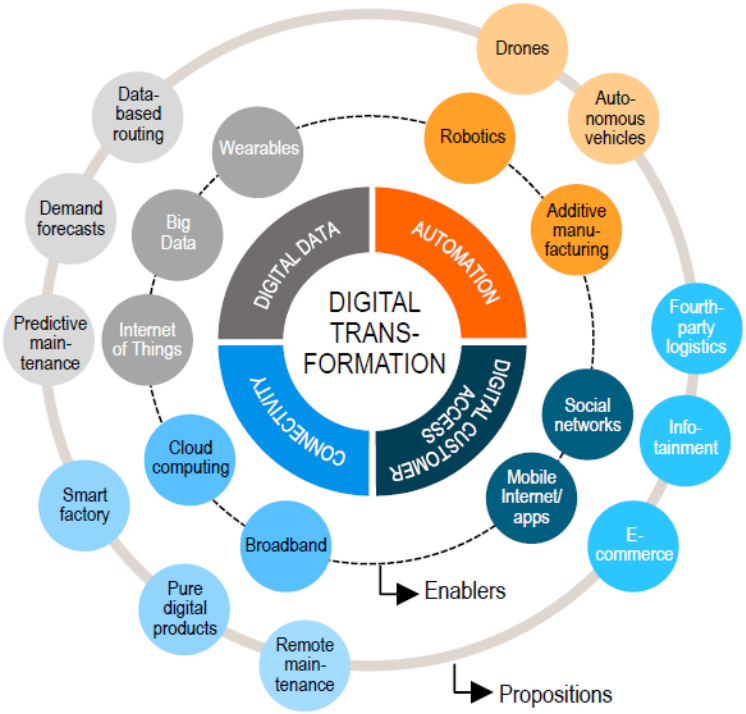
Right now someone is working on making our products obsolete!

T5

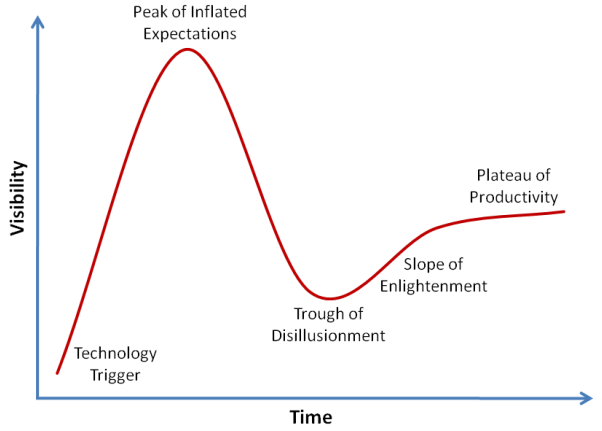



Electricity (1873)
46
Telephon (1876)
35
Radio (1897)
31
TV (1926)
26
PC (1975)
16
Mobile phone (1987)
13
World Wide Web (1991)
7
Facebook (2004)
4

T5

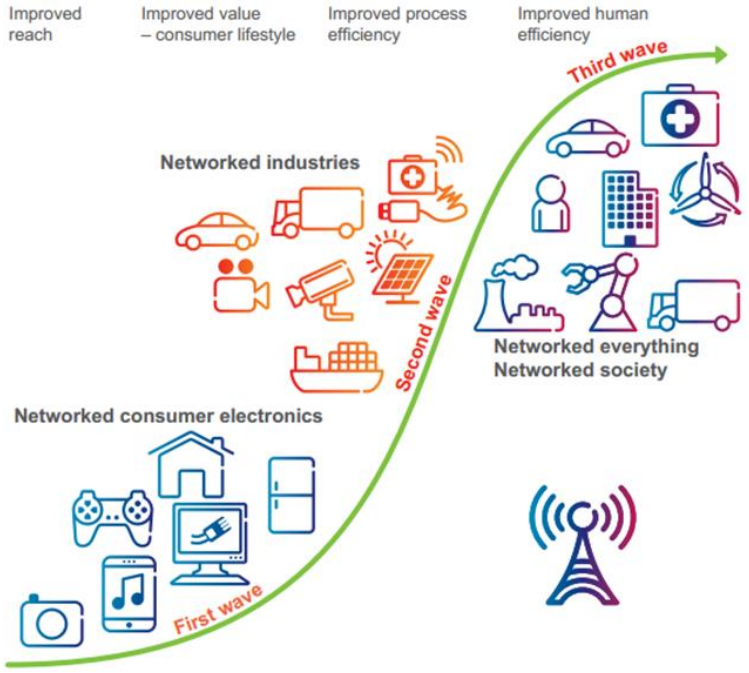

DIGITAL TRANS-FORMATION
DIGITAL DATA
AUTOMATION
CONNECTIVITY
DIGITAL CUSTOMER ACCESS
Drones
Auto-nomous vehicles
Robotics
Additive manu-facturing
Wearables
Data-based routing
Big Data
Demand forecasts
Internet of Things
Predictive main-tenance
Fourth-party logistics
Social networks
Info-tainment
Mobile Internet/ apps
E-commerce
Cloud computing
Smart factory
Broadband
Pure digital products
Remote main-tenance
Enablers
Propositions

T5


Peak of Inflated Expectations
Visibility
Plateau of Productivity
Slope of Enlightenment
Trough of Disillusionment
Technology Trigger
Time

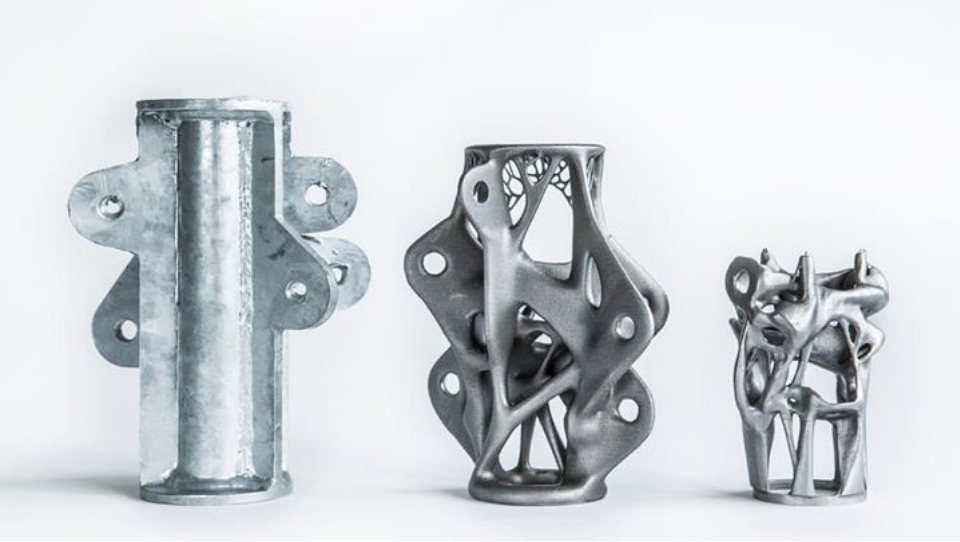
[hype.]

T5



125 bn devices expected by 2030

T5

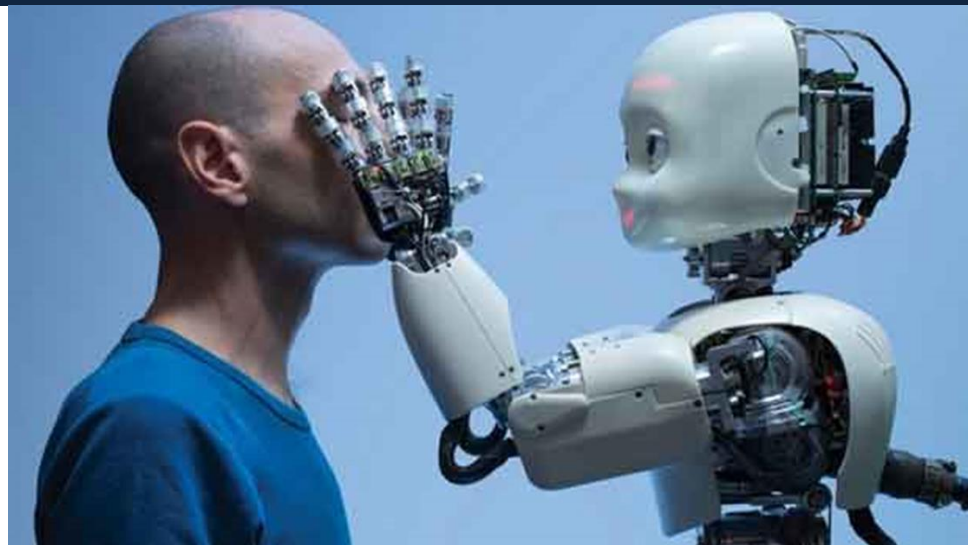


The challenge

Today’s challenge:

Bringing technologies together

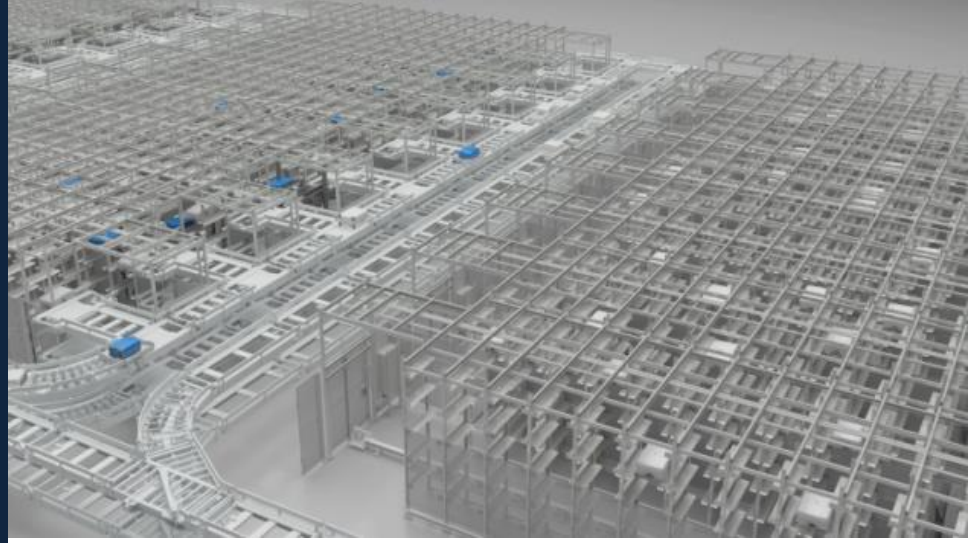
To understand, manage and to operate

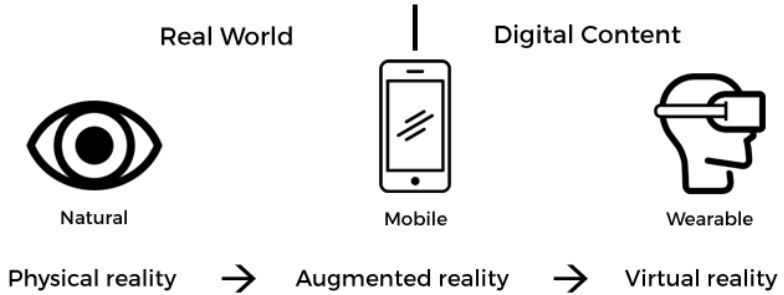


So, what have you done?

Augmented Reality:

To understand

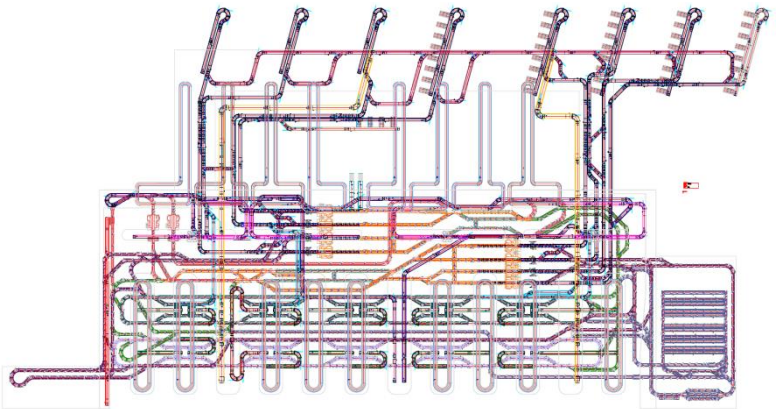




OK, but how?

3D AutoCAD Models

- are basis for sale
- are basis for simulation
- are basis for BOM and installation



Today & Tomorrow

- We have teamed up with cadpeople
- And they are using Unity
- We want to be able to create a model within hours

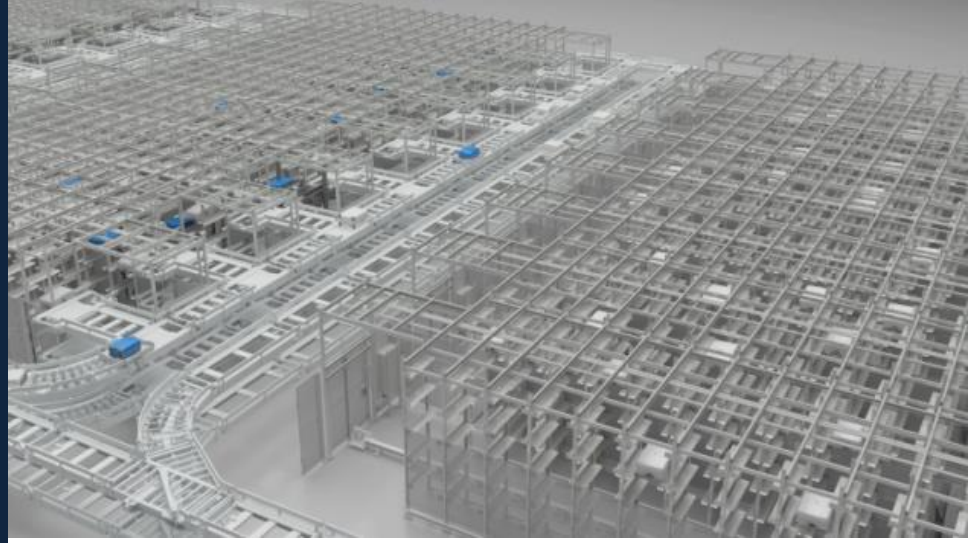
cadpeople
visual communication

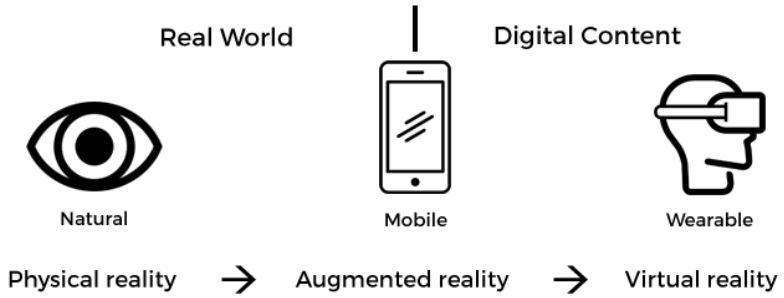
UNITY STUDIOS

Augmented Reality

Looking at Operation & Maintenance

But so far we are using this for sales & training





Real time data analytics:

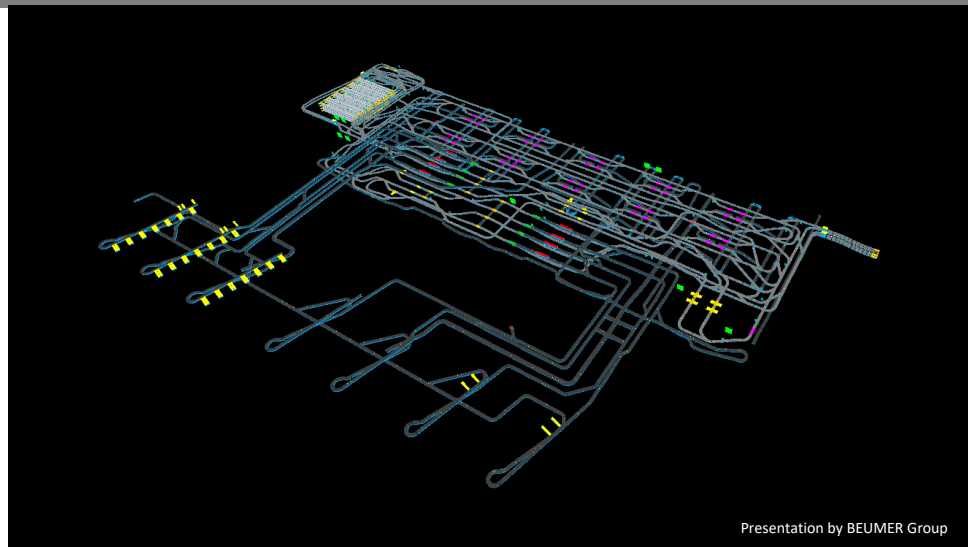
To manage

Real time data analytics applied on Baggage Handling System & Processes

Commissioning & Testing
and
Live operation

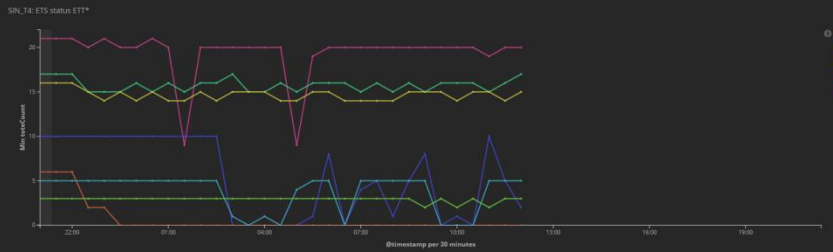
Real time data analytics applied on Baggage Handling System & Processes

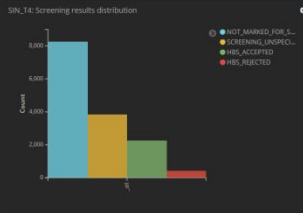
An auto-generated 3D model,
based upon a game engine,
providing real-time
and historical view of baggage handling

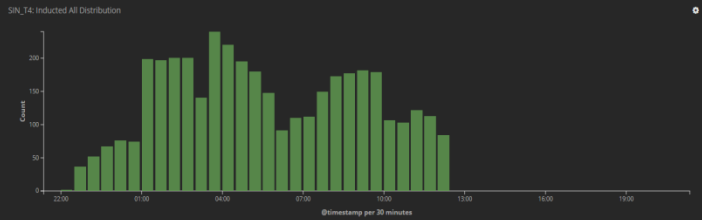


Real time data analytics applied on
Baggage Handling System & Processes

Flow Visualisation and Statistics are based upon same data streams

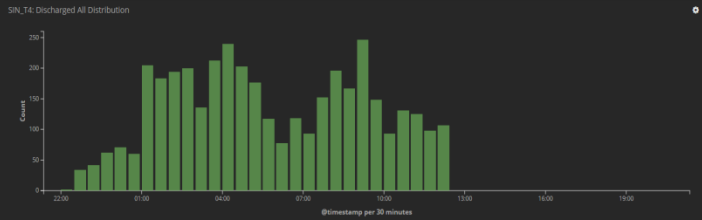






SIN_T4: Inducted Table

lineelement.keyword: Descending	Count
EDL16.TLA001	1,190
EDL15.TLA001	1,161
EDL27.TLA001	876
EDL23.TLA001	376
EDL28.TLA001	228
EDL12.TLA001	102
	3,933



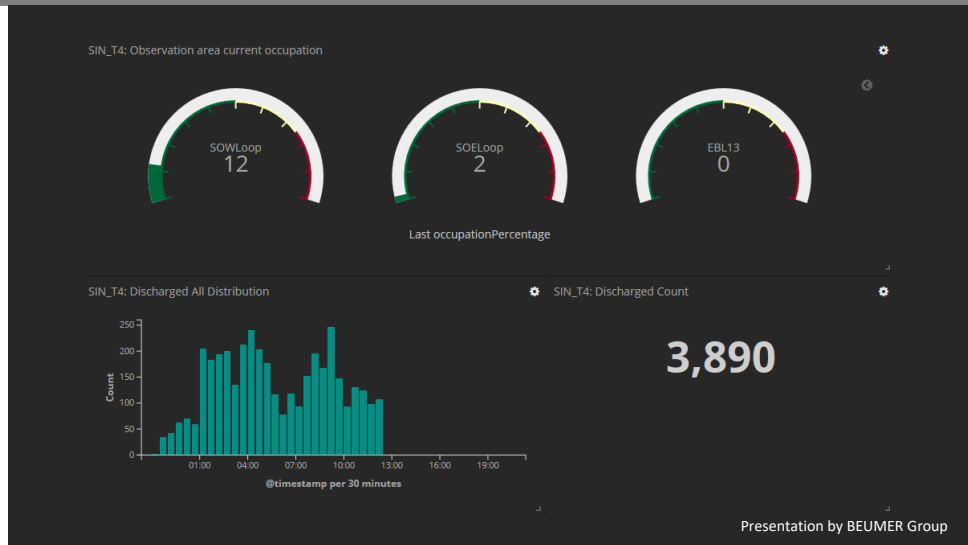
SIN_T4: Discharged Table

lineelement.keyword: Descending	Count
SOE22.CHU006	1,033
SOW12.CHU006	859
SOW11.CHU004	476
SOE21.CHU004	473
SOW11.CHU054	215
SOE21.CHU054	212
SOW12.CHU004	123
	3,890

Real time data analytics applied on
Baggage Handling System & Processes

Format of reports are flexible
and new views can be generated
when drilling down into an issue.

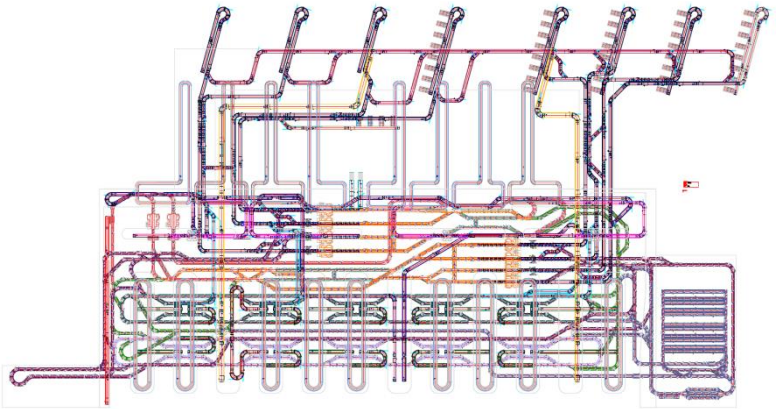
This makes investigation an instant activity



OK, but how?

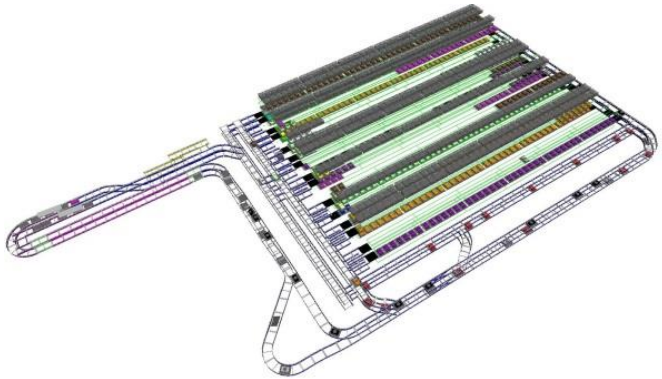
- are basis for sale
- are basis for simulation
- are basis for BOM and installation
- are basis for auto generation of PLC code, emulator code and configuration for HLC
- but are not really used in SW department

3D AutoCAD Models



Emulation vs Simulation

- 3D emulator using AutoMOD and Experior
- Models are auto generated based on export from AutoCAD
- Oh by the way….
  We are running VR on top of the Emulator



Goals

- Replay historic scenarios
- Visualise systems in real time

Solution

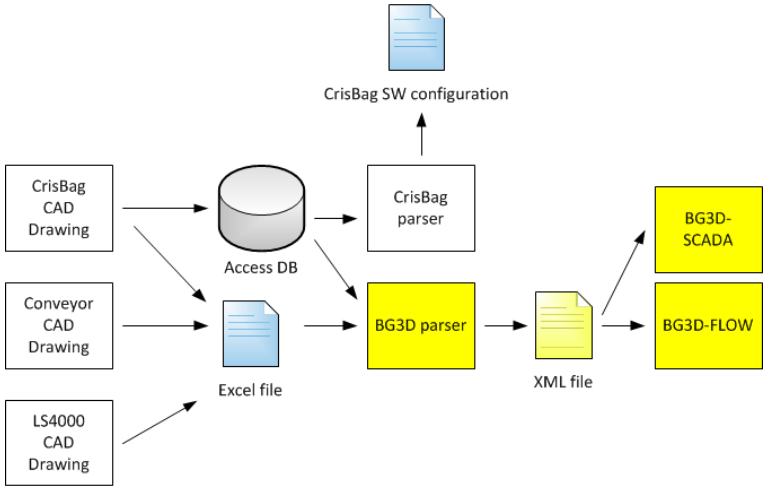
- We needed some lightweight 3D model to fulfill this purpose
- JPCT was already selected for a mobile 3D SCADA

Properties

- Deployment on tablet and desktop
- Free to use but not open source
- Source code obtained when we made first sale to customer
- Java and Android

Why we went for JPCT

So this is what we do

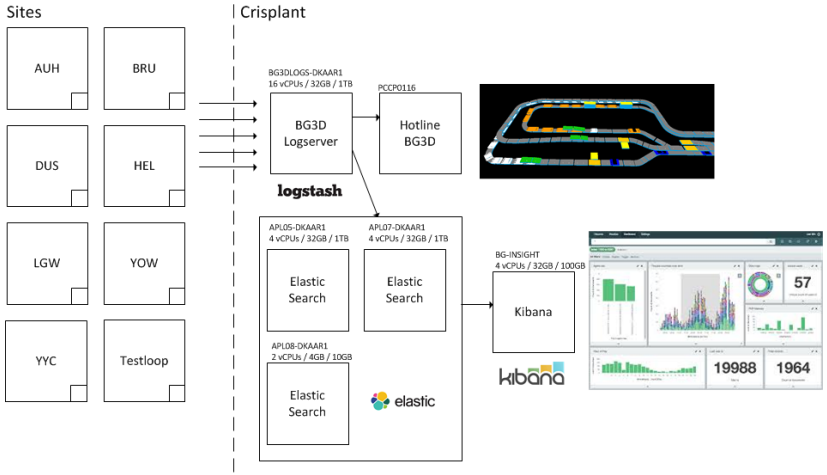


Elasticsearch for real time queries

- Open source
- Licensed under Apache 2.0
- Free to use and modify

- We’ve been using since 26/8-2015

Todays noise, tomorrows insight



How much data do you capture?

Big Data

Velocity, Volume Variety

38 Customer sites delivering data	**114** production servers	**>3,7 bn** records collected in storage	**122** dashboards
2,8 TB of streamed log-data	**141 GB** streamed on busiest day	**487 GB** streamed from busiest server	**...** and still growing

What do we capture?

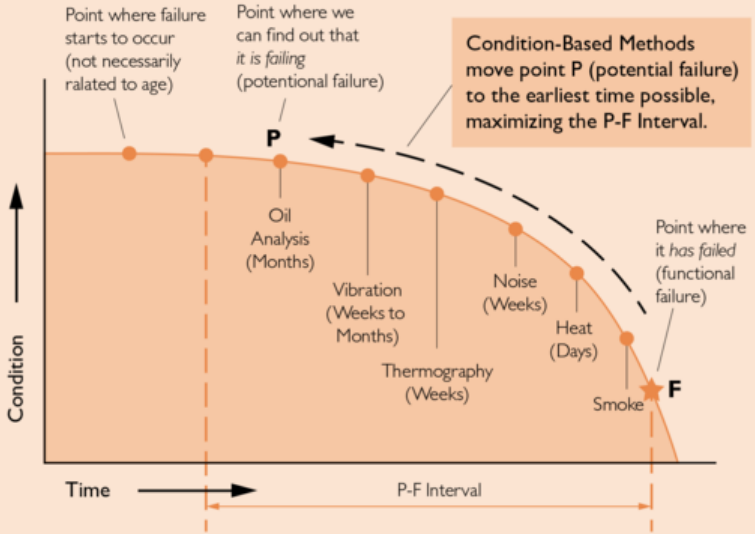
Movement of baggage and Events
for
Operational performance improvements

What will we capture?

Power consumption, health, vibration, temperature
etc. from IoT devices
for
Predictive maintenance

What will we capture?

Power consumption, health, vibration, temperature
etc. from IoT devices
for
Predictive maintenance



Velocity:

- Data flows in real time

Volume:

- Currently: 75 GB / day
  (400 million loglines / day)
- Potentially: 2 TB / day
  (8000 million loglines / day)

Variety:

- Existing log files (from HLC)
- Power consumption data
- HW server monitoring data
- Images from bags/parcels

“Personal data are not captured”

Std. A4 Matrix Printer paper

…

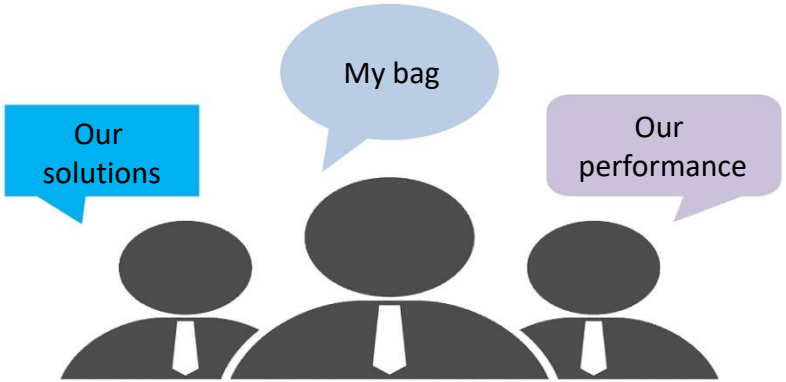
60 lines per page

…

722.700 km/year

3 perspectives on value

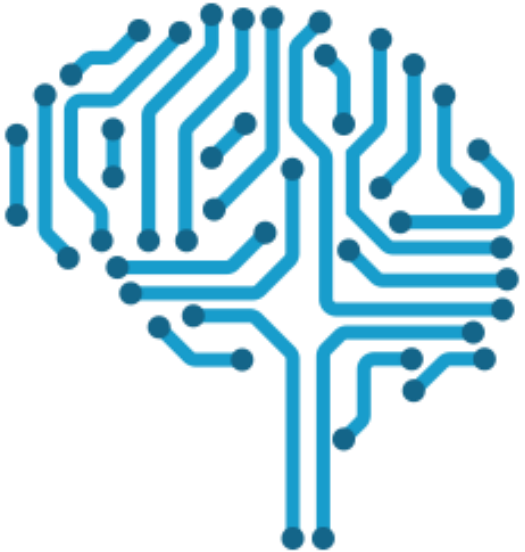
“Data is a multi stream value generator if shared”



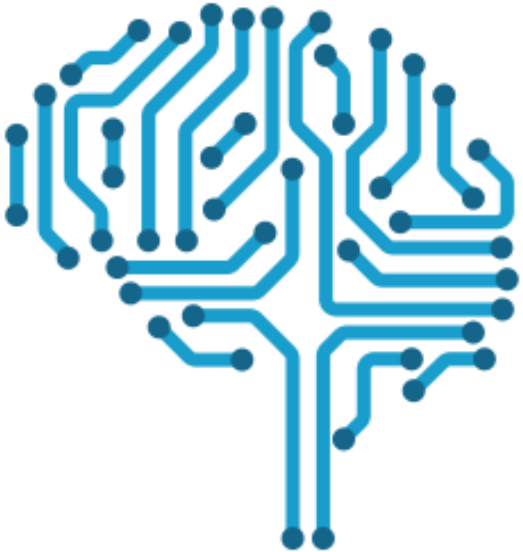
Oh, that was interesting….
But have you done more?

Machine Learning:

To operate



We have used machine learning for image classification



A spin off from a Video Coding Solution

- More and more of our systems are equipped with cameras
- Main purpose is to increase read rate for barcodes
- But why not use the images for other purposes:

  Video coding of bags that cannot be handled automatically

  Detect special situations

- Why we want for TensorFlow

  Open source product for machine learning from Google
  Linux and Windows version
  Is released in a version 1.0

- C++ and Python interface

- Seamless use of GPU’s

- There are many alternatives to TensorFlow

  Caffe
  Azure ML Studio
  MLLib

- Why we want for Gaming PC's

  Neural networks are very CPU intensive

- Using GPU's can boost performance 10-fold

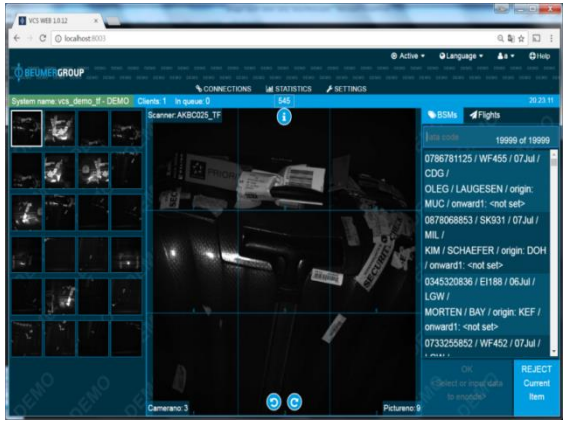
- Gaming PC's are the most cost-effective solution ☺

- We have a lot of images. So processing speed is important

8 core CPU	3 images/sec
Low end graphics card	6 images/sec
High end graphics card	20 images/sec

How to avoid false positives

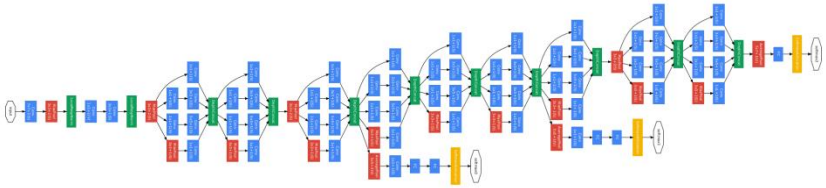
- Approx. 120 images of each bag
- We need to select the best images where the bag tag is readable
- Simple traditional algorithm works ok. But has many false positives
- Oh by the way…..
  the VCS is running a Cloud based OCR



Other applications:

Multiple item detection
Human intrusion

- This neural network can be re-trained on a custom set of images
- Re-training has been performed with:
  3500 images which contains a readable bag tag
  3500 images which does not contain a readable bag tag
- Re-training takes approx. 12 hours
- The neural network can now rank our images
- Results are very promising (Much better selection of images can be presented to the user)



Google has provided a pre-trained neural network called Inception v3

3 Questions looking forward

What are the next steps in
value creation through digitalisation?

How should we deal with the challenge of
complexity and time?

Will machine learning replace humans?

Thank you

BEUMERGROUP

SESAM Seminar 2018

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