Graag eerst doen: download **Kahoot!** app uit de [App Store] [Google Play]

Testing Smart Building LIVE

October 2017
Han Duisterwinkel en Richard Nieuwland

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Agenda

Graag eerst doen: download **Kahoot!** app uit de [App Store] [Google Play]

- Wie zijn wij
- Wat is IOT en hoe groot wordt het
- Voorbeelden IOT projecten.
- Smart Building
  - Waarom, hoe, wat
  - Input/output
- IoT en testen
- Smart Building en testen

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Wie zijn wij?

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Han

- Principal IT (Agile / Test) consultant
- Lead Test NNL
- Lead Agile / DevOps NNL
- > 20 jaar ervaring
- Laatste presentaties:
  - "Off-shore testing (how) does it work?" Dutch Testing Day 2007
  - Tutorial "Applying Traditional Test Specification Techniques with UML" EuroSTAR 2009
  - "Van Agile (via test) naar beheer" NoorderTest 2013
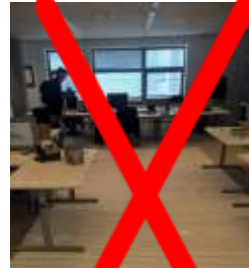 - "X-shaped tester 5.38" NoorderTest 2016
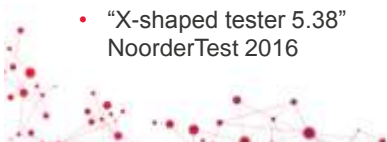
Richard

- Principal IT (IoT) consultant

- Technical Lead IoT (oplossingen)
- > 20 jaar ervaring
- Laatste presentaties:
  - Jan 2016: DevCampNoord, onderwerp: IoT
  - April 2016: IOT Tech Days 2016, onderwerp: Win 10 IoT core
  - Juni 2016: Assen, onderwerp: IoT
  - Feb 2017: Beta Business Day, onderwerp: IoT
  - Feb 2017: Stockholm, onderwerp: Machine Learning

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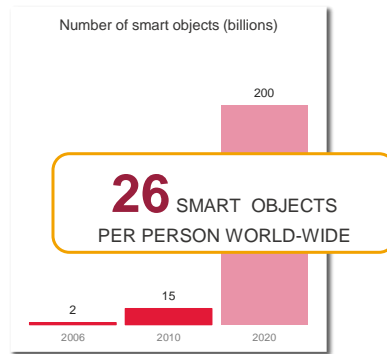Live … maar

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Wat is IoT?
Hoe groot wordt IoT?

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Predictive Maintenance
Internet of Things
Disruption
Predictive Analytics
Digital Transformation
Connected
Big Data
DCS
Manufacturing
Wearables
Sensors SCADA
Mobility
Friction
Industry 40
PLC
Friction Free

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IoT

Number of smart objects (billions)

200

26 SMART OBJECTS
PER PERSON WORLD-WIDE

2
15

2006   2010   2020

Source: IDC, Intel, UN

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IoT is built on three core components

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Kahoot 1

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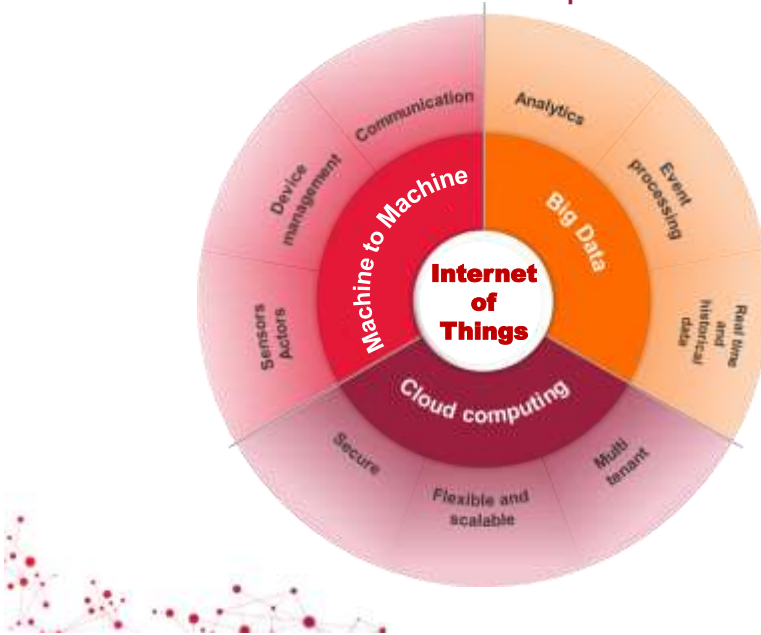
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CGI's real life cases

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IoT Solution delivers real-time global lift management capability to ThyssenKrupp to provide unique capability

The solution provides *ThyssenKrupp* with real-time data through a Secured Azure cloud environment to increase its ability to proactively maintain lifts.

Problem

With city populations exploding, city planners and builders have critical problems to solve. Keeping elevators running smoothly is key; in buildings that soar to more than 1,000 feet.

Solution

The real-time solution draws on the power of the Internet of Things by connecting its lifts to the cloud, gathering data from its sensors and systems providing valuable business intelligence.

Results

ThyssenKrupp is vastly improving operations — and offering something its competitors do not: "We wanted to go beyond the industry standard of preventative maintenance, to offer predictive and even pre-emptive maintenance.

filmpje   hololens   **CGI**

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Highway operator reduced costs through intelligent management of resources

The *Ministry of Infrastructure and Environment* is responsible for the road infrastructure in the Netherlands. For the major roads in the Netherlands they operate all highway lighting dynamically.

Problem

Lights have to managed dynamically and have to be switched off during the low traffic night hours. The operators in the commands center needs to be able to switch the lighting on in case of incidents or weather conditions.

Solution

The real-time solution has the capability to scale to thousands of devices and sensors and manage them through one integrated solution. meaningful data from sensors and intelligent solution

Results

This resulted in the ability to reduce operational costs and maintenance cost significantly while maintaining road safety. Operations data is used to determine service intervals based on actual operating hours.

filmpje

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Managing future electricity grids reliable with one integrated management system

Grid operators are facing challenges in power management in a world where renewable energy sources are connected to the grid.

Problem

Introducing renewable energy sources in the grid brings challenges to the grid operator. This uncontrolled sources tend to cause so call unbalance, worst case resulting in power outages.

Solution

CEMS offers the ability for clients to better manage when and how electricity is consumed. With smart home appliances, (local) electricity is used when it is available.

Results

The grid operator establishes a more balanced reliable electricity network.

The consumer has the advantage of using energy at a lower charge when it's locally available.

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IoT solution delivers care to patients at home

The solution provides *patients* with the option to conduct exercises at home and *clinicians* with the option to monitor and evaluate the exercises.

filmpje

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Problem

With increasing costs to healthcare comes focus to supporting patients at their own home. However professional supervision is still required.
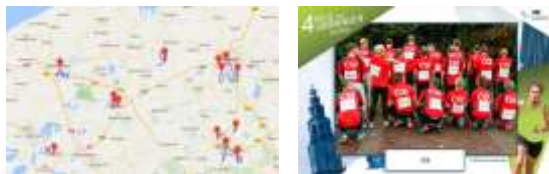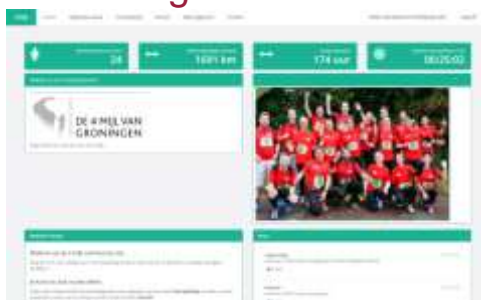
Solution

The solution enables patient to perform exercises at home in the form of serious games. Data generated by motion sensors and wearables is collected in real time to provide clinicians with an overview of the patients' progress and execution of the exercises. The environment of patient – such as light or music - can automatically react to events the game.

Results

Clinicians can support patients without the need to see them on a day-today basis, while patients can work on their health in the safety of their own home and supported by their circle-of-care.

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Groningen 4-mile

Challenge

Providing the, mostly untrained CGI participants of the 4-mile, a platform to share their running exercises in a fun way.

Solution

Retrieving runs from Runkeeper or Strava, the 4-mile site encourages the runners with time-predictions, statistics, competition and the possibility to share routes between each other.

Results

For the 2nd year good prepared runners. Talk of the run, due to the printed predictions on our backs. This year Menzis and Traffic4U joined CGI by using their own copy of the 4 Mile community site.

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Sprint@Work

Challenge
Due to ageing of the society the average age of an employee increases. Aging is accompanied by physical and cognitive changes which may have an impact on the performance of work. Sprint@Work is investigating the consequences by monitoring elderly employees with IOT.

Solution
The pilot will start with monitoring 50 employees with sensors. The system will provide direct feedback to the users based on rules which will be developed and evaluated by analyzing the sensor-data.

Results
Work in progress

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Testen bij IoT?

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Kahoot 2

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Testen bij IoT

Wat testen?

Waarom (niet) testen bij IoT?

Wanneer testen?

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Wat testen?

- Sensoren?
- Data uit sensoren?
  - Hoe verificatie of data uit sensor klopt ? Fout? Stuk?
  - Hoe omgaan met extremen (en wanneer is het een extreme)?
- Response tijden?
- Uptime?
- 'Intake' bij nieuwe sensoren?
- Integratietest sensoren aangesloten op (het samenhangende systeem)…
- Test van data-analyse?
- Test verwerken resultaten data-analyse?
- Test presentatie conclusies / user interface?

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Waarom (niet) testen bij IoT?

- Sensoren koop je toch? Gecertificeerd?
- Het is niet te testen!
  - Teveel data!
  - Data te divers!
- Testomgeving ≠ productie-omgeving!
- Heb je wel een testomgeving ?
- Stubs en drivers… kan dat wel?
- Acceptatietesten?
  - Wat zegt dat?
  - In welke omgeving?

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Wanneer testen bij IoT

- Eerste testopstelling?
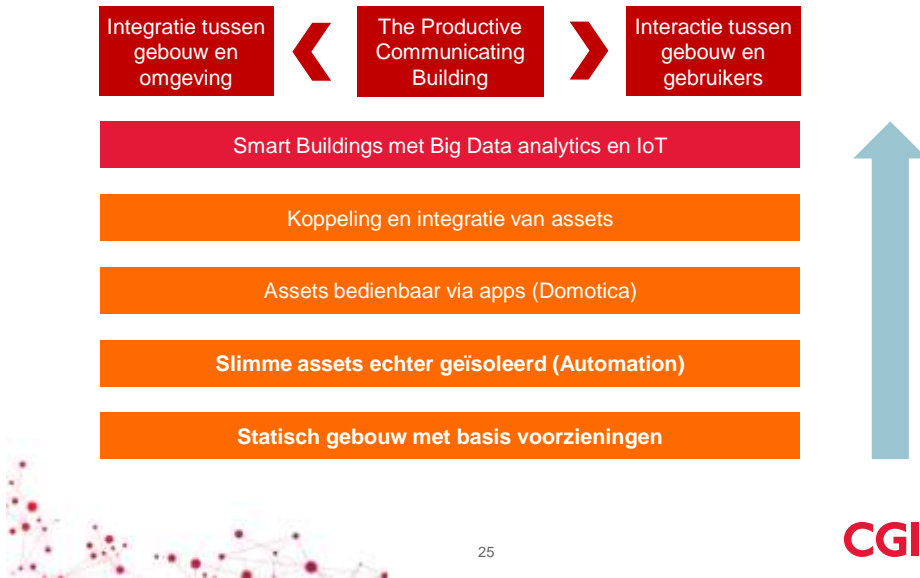- PoC
- Acceptatietest?
- Productieomgeving?

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Smart Building

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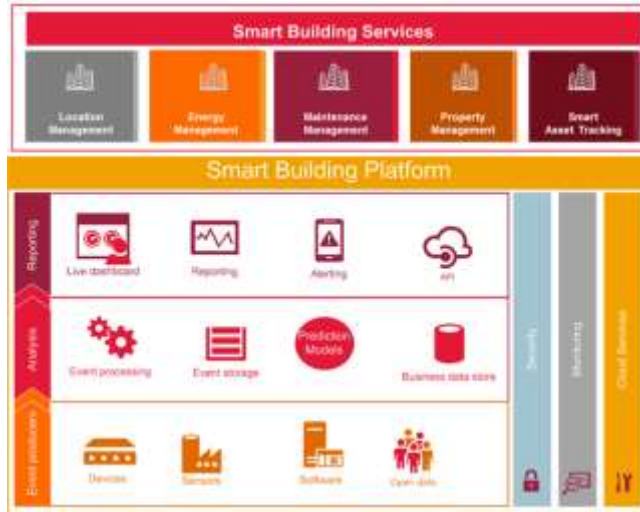
Evolutie Smart Buildings

Integratie tussen gebouw en omgeving	‹	The Productive Communicating Building	›	Interactie tussen gebouw en gebruikers

Smart Buildings met Big Data analytics en IoT

Koppeling en integratie van assets

Assets bedienbaar via apps (Domotica)

Slimme assets echter geïsoleerd (Automation)

Statisch gebouw met basis voorzieningen

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Scenario's

Early warning guest arrival	Interactive conference room	Secured and monitored access	Analytics, monitoring systems	Personal locker system	Project Collaboration
Self service portal	Activity based ambient control	Learn & be informed	Pay by phone	Social on-boarding	Profiled services
Next Generation applications	biometrics & sensors	3D visual assistant	Intelligent Systems	Personal sustainability monitor	Smart parking

Filmpje

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Smart Building platform

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Input: Nodes, sensors en gateway

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Output: apps, rapportages en een heleboel data
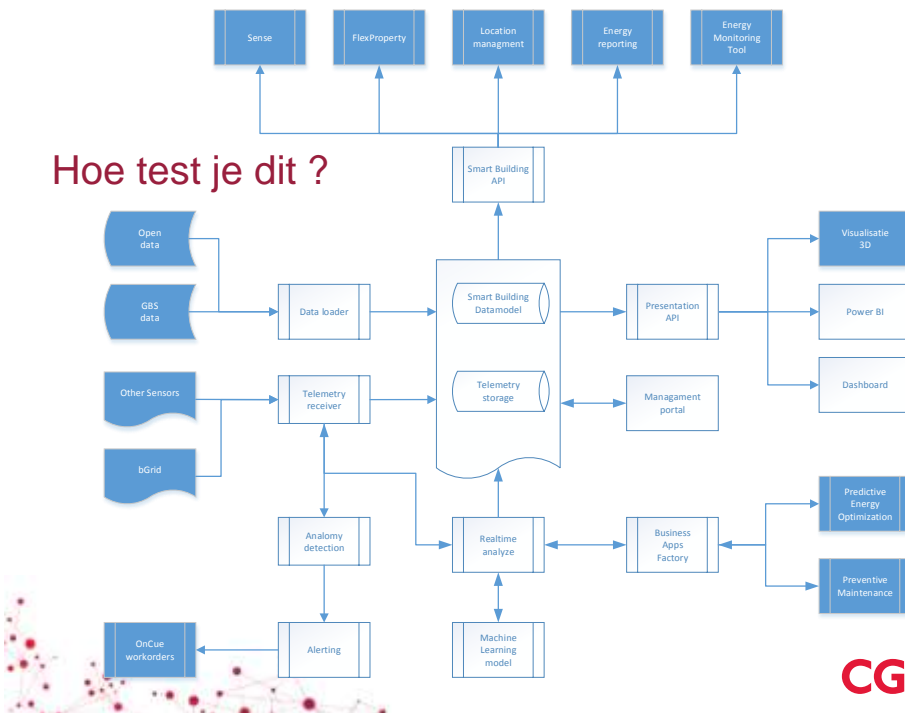
Mapiq

Bot

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Hoe test je dit ?

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IoT - Testing

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Testuitdagingen bij IoT

Voorwaarden om IoT te kunnen testen?

Welke test-aspecten bij IoT testen?

Wat testen we eigenlijk bij IoT testen?

Welke risico's onderkennen we bij IoT testen?

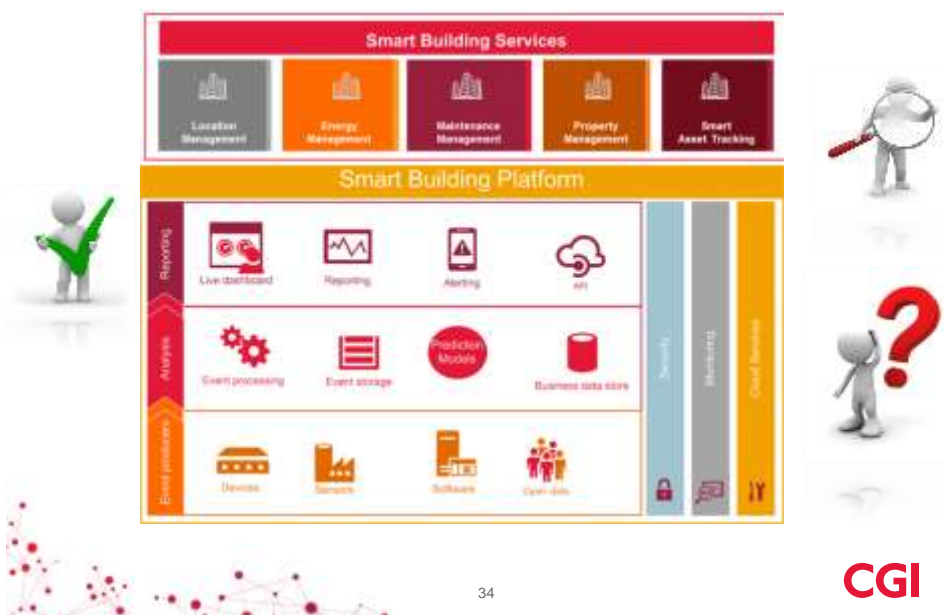**CGI**

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Testuitdagingen

- Acceptatiecriteria klant?
- Voorwaarden voor in productie name?
- Testaanpak?
- Privacy | AFG (algemene verordening gegevensbescherming)
- Wetgeving landen… data (waar) in de Cloud
- Betrouwbaarheid meting en verwerking
- Security
- Performance
- Timing van signalen die binnenkomen
- Interopabillity (nieuwe versies)
- BI-er nodig om data te analyseren

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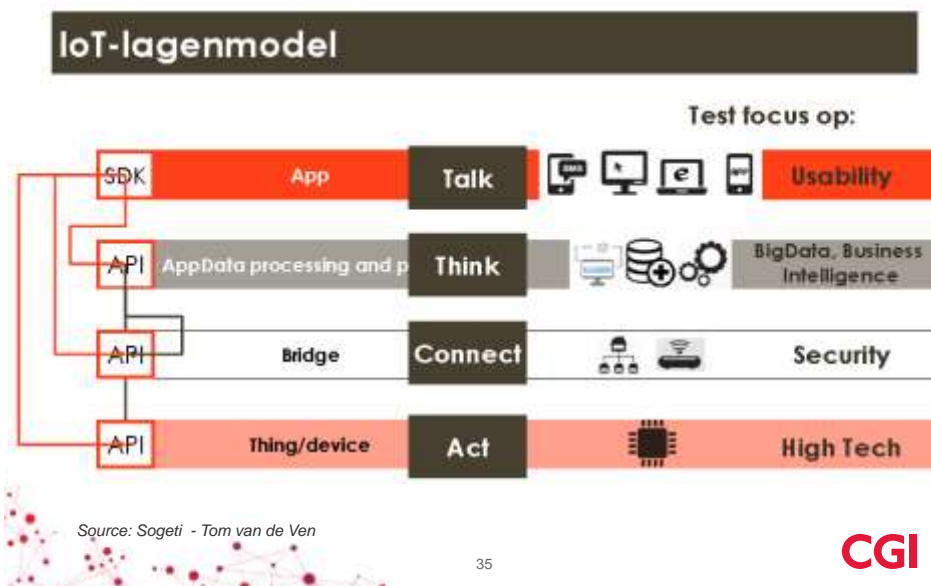**CGI**

IoT Smart Building platform – Hoe testen?

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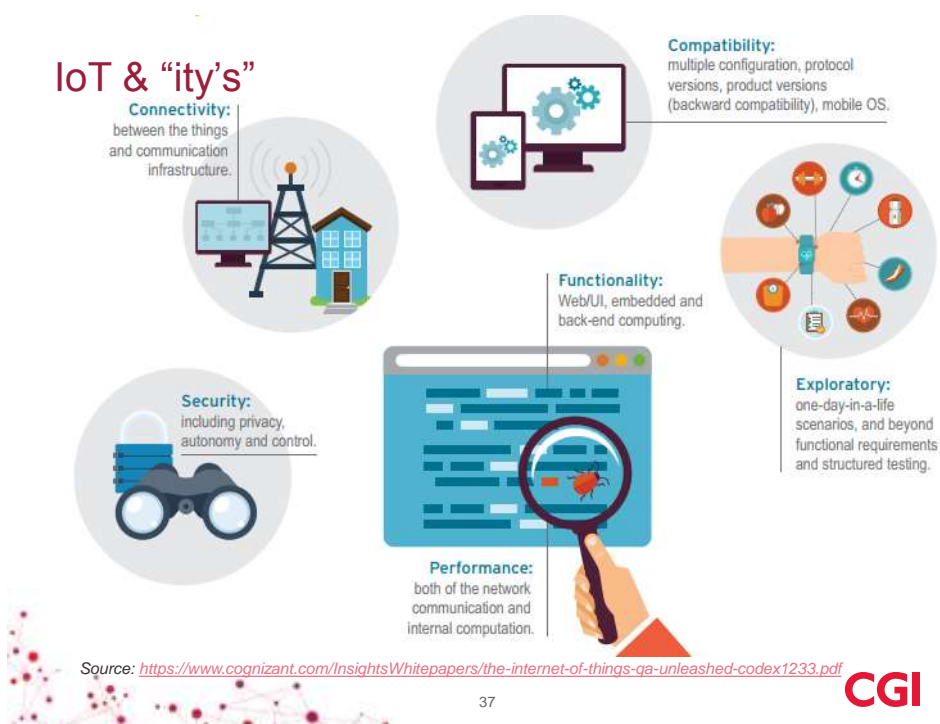**CGI**

Voorbeeld IoT – Testen in lagen

Source: Sogeti - Tom van de Ven

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Voorbeeld IoT - Teststrategie

Source: https://www.sogeti.nl/expertises/testen-een-iot-omgeving

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IoT & "ity's"

Connectivity:
between the things and communication infrastructure.

Compatibility:
multiple configuration, protocol versions, product versions (backward compatibility), mobile OS.

Functionality:
Web/UI, embedded and back-end computing.

Exploratory:
one-day-in-a-life scenarios, and beyond functional requirements and structured testing.

Security:
including privacy, autonomy and control.

Performance:
both of the network communication and internal computation.

Source: https://www.cognizant.com/InsightsWhitepapers/the-internet-of-things-qa-unleashed-codex1233.pdf

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IoT & Kwaliteitsattributen

- ISO_25010 (productkwaliteit)
  - Functionele geschiktheid (Functional suitability)
  - Prestatie-efficiëntie (Performance efficiency)
  - Uitwisselbaarheid (Compatibility)
    - Koppelbaarheid (Interoperability)
  - Bruikbaarheid (Usability)
  - Betrouwbaarheid (Reliability)
    - Beschikbaarheid (Availability)
    - Herstelbaarheid (Recoverability)
  - Beveiligbaarheid (Security)
    - Vertrouwelijkheid (Confidentiality)
    - Integriteit (Integrity)
  - Onderhoudbaarheid (Maintainability)
  - Overdraagbaarheid (Portability)
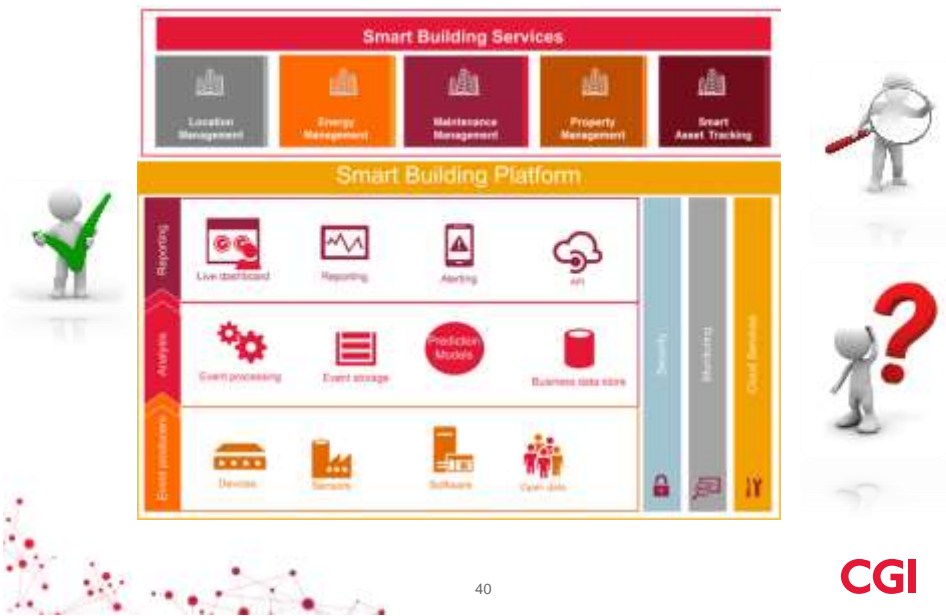
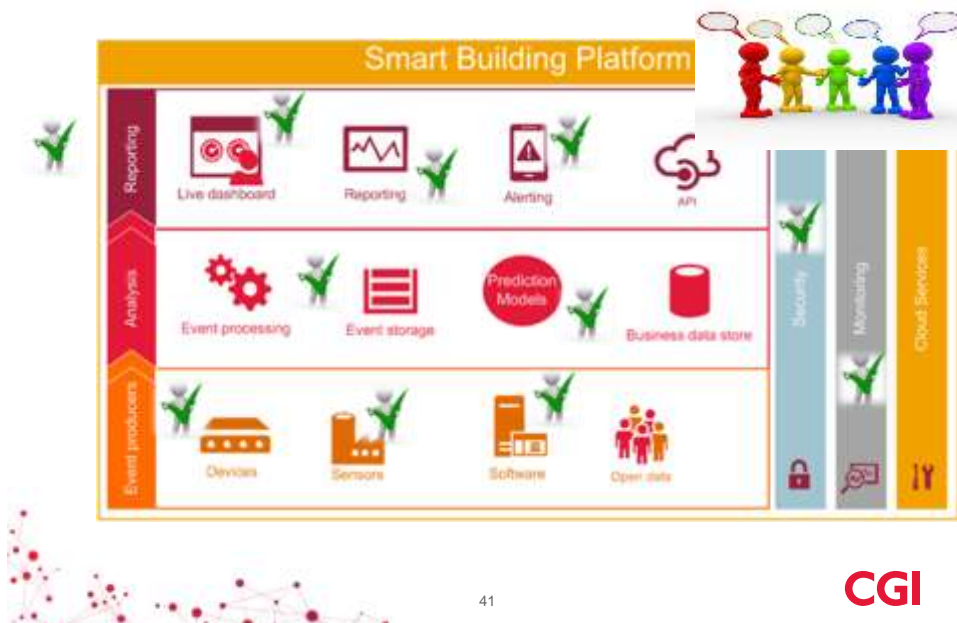*Source: https://nl.wikipedia.org/wiki/ISO_25010*

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Smart Building - Testing

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IoT Smart Building platform – Hoe testen?

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IoT Smart Building platform – Hoe testen?

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IoT Smart Building - Testaanpak

- Verschillende lagen
- Verschillende testaspecten
- Risico gebaseerd
- Keuzes maken wat te testen in welke lagen
- Scenario's door de hele keten (en de lagen) heen als acceptatietest
- CTM gebruiken?

- Basis opzet in testomgeving
- Verdere opzet (en test) in productieomgeving (m.b.v. eindgebruikers?)
- Stubs en drivers nog steeds nodig!

- Focus op verschillende kwaliteitsattributen! Security, Performance, Reliability, Interoperability, Portability, Usability
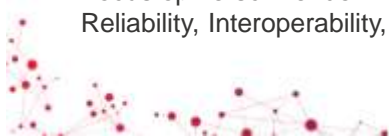
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Dank voor jullie aanwezigheid!
Dank voor jullie interactie!

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Richard.Nieuwland@cgi.com

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