



Graag eerst doen: download **Kahoot!** app uit de



Testing Smart Building LIVE

October 2017
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Agenda

Graag eerst doen: download **Kahoot!** app uit de



- 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



Wie zijn wij?

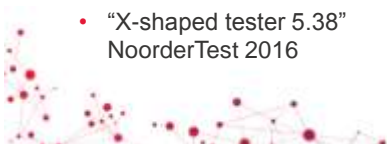


3

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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

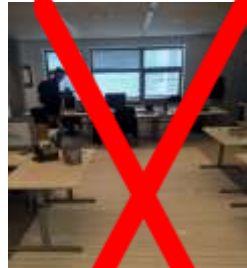


Richard

- 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



5

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Wat is IoT?
Hoe groot wordt IoT?

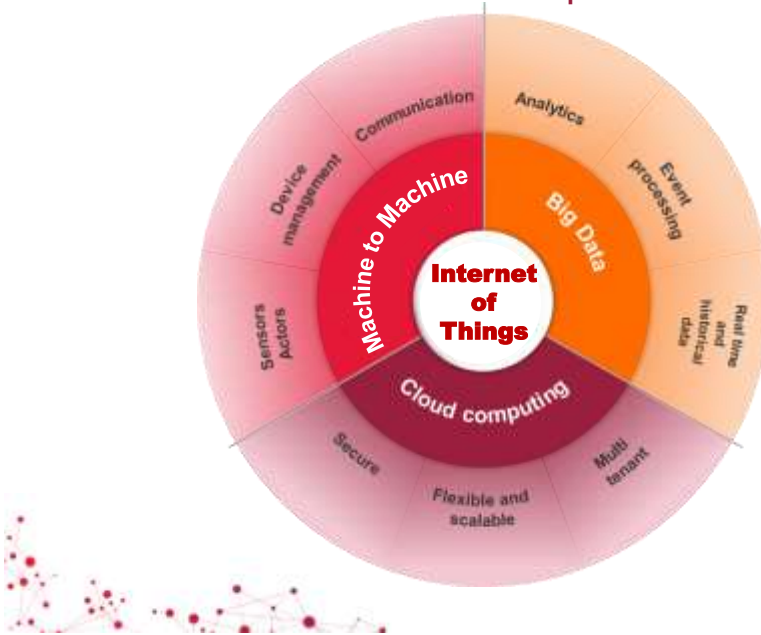


6

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IoT is built on three core components



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Kahoot 1

Kahoot!



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CGI's real life cases



11

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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](#)



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 be managed dynamically and have to be switched off during the low traffic night hours. The operators in the command center need 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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13

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](#)

15

Problem

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

Solution

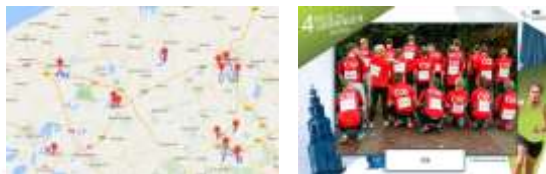
The solution enables patient to perform exercises at home in the form of serious games. Data generated by motion sensors and wearables is collected in real time to provide clinicians with an overview of the patients' progress and execution of the exercises. The environment of patient – such as light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

Results

Clinicians can support patients without the need to see them on a day-to-day 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.

16

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Sprint@Work



17

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?



18

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Kahoot 2

Kahoot!



19

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Testen bij IoT



20

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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?



21

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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?



22

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Wanneer testen bij IoT

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



23

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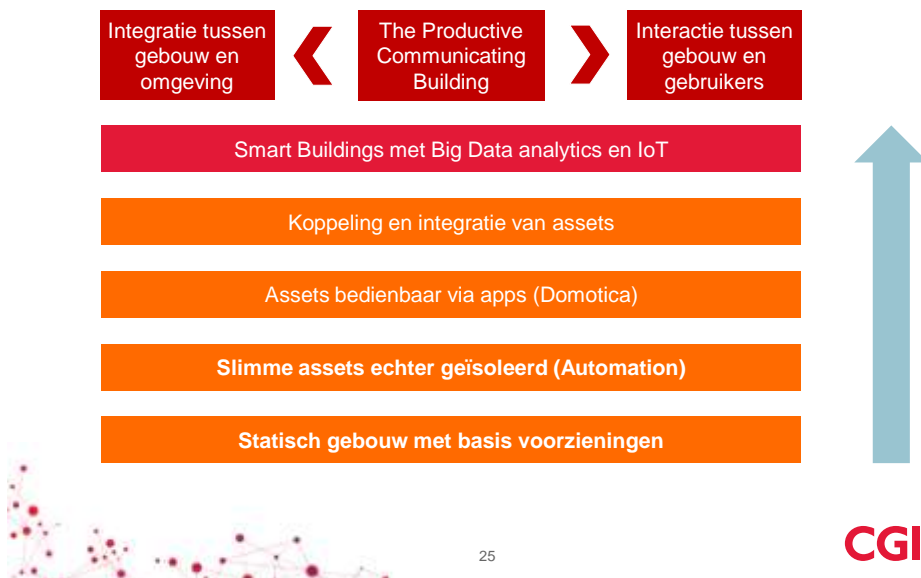
Smart Building



24

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Evolutie Smart Buildings



25

Scenario's

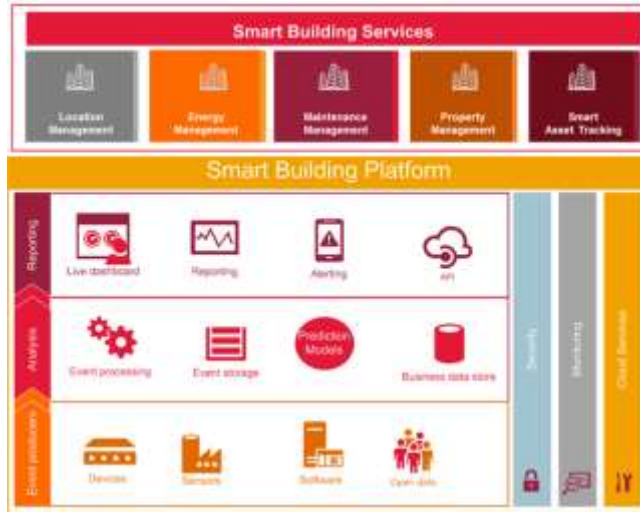


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Smart Building platform



27

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Input: Nodes, sensors en gateway



28

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Output: apps, rapportages en een heleboel data

Mapiq

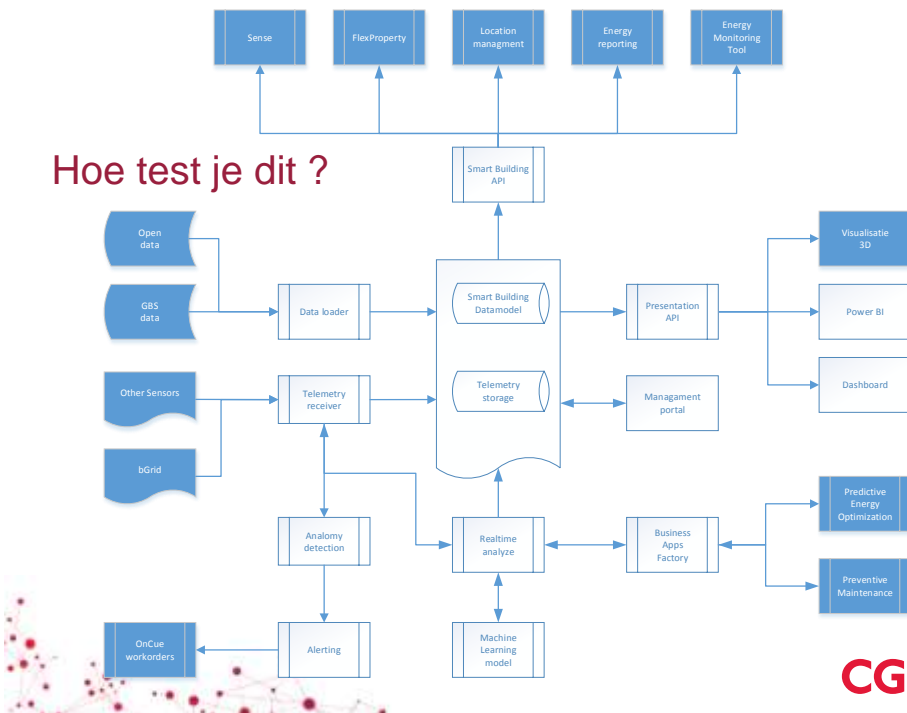


Bot

29



Hoe test je dit ?



IoT - Testing



31

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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?



32

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Testuitdagingen

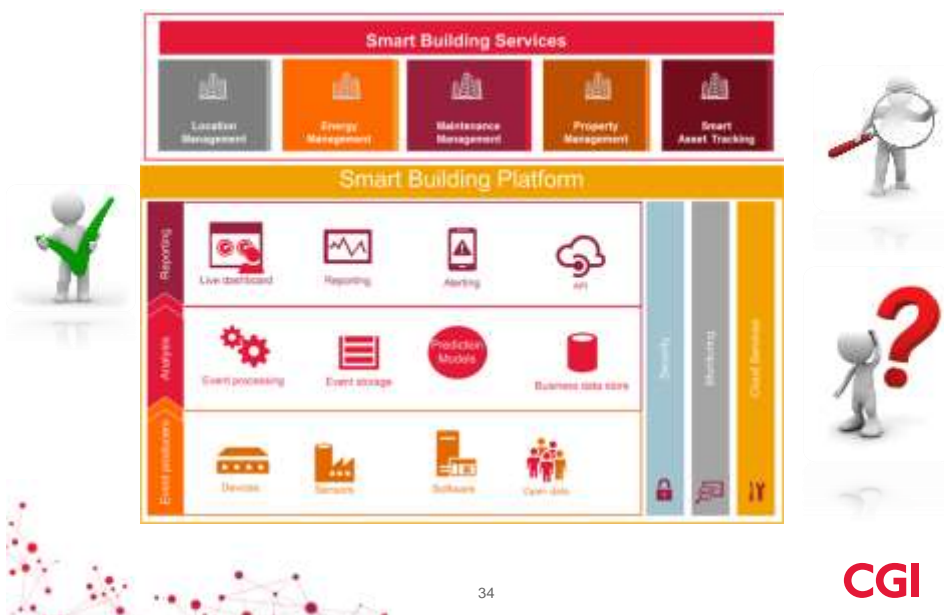
- Acceptatiecriteria klant?
- Voorwaarden voor in productie name?
- Testaanpak?
- Privacy | AFG (algemene verordening gegevensbescherming)
- Wetgeving landen... data (waar) in de Cloud
- Betrouwbaarheid meting en verwerking
- Security
- Performance
- Timing van signalen die binnenkomen
- Interopability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



33

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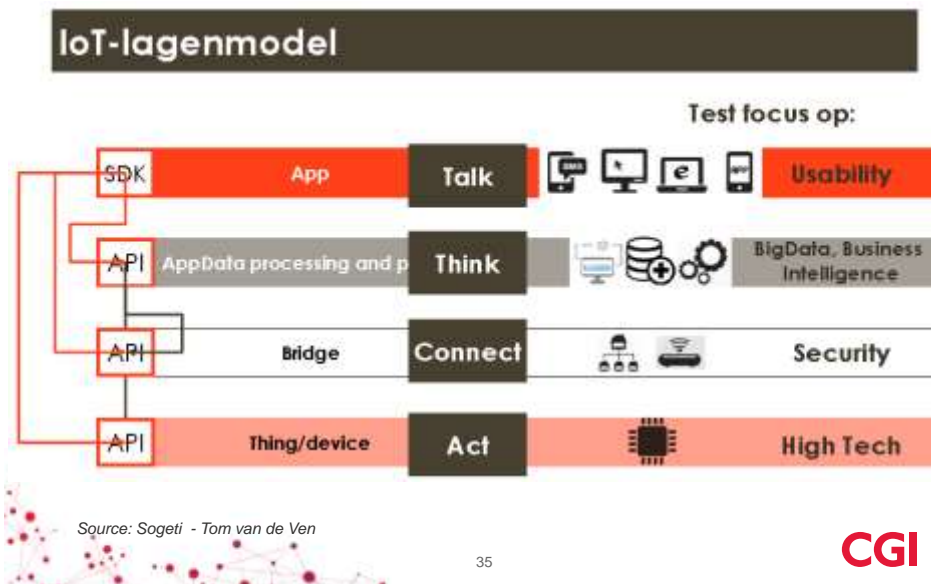
IoT Smart Building platform – Hoe testen?



34

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Voorbeeld IoT – Testen in lagen

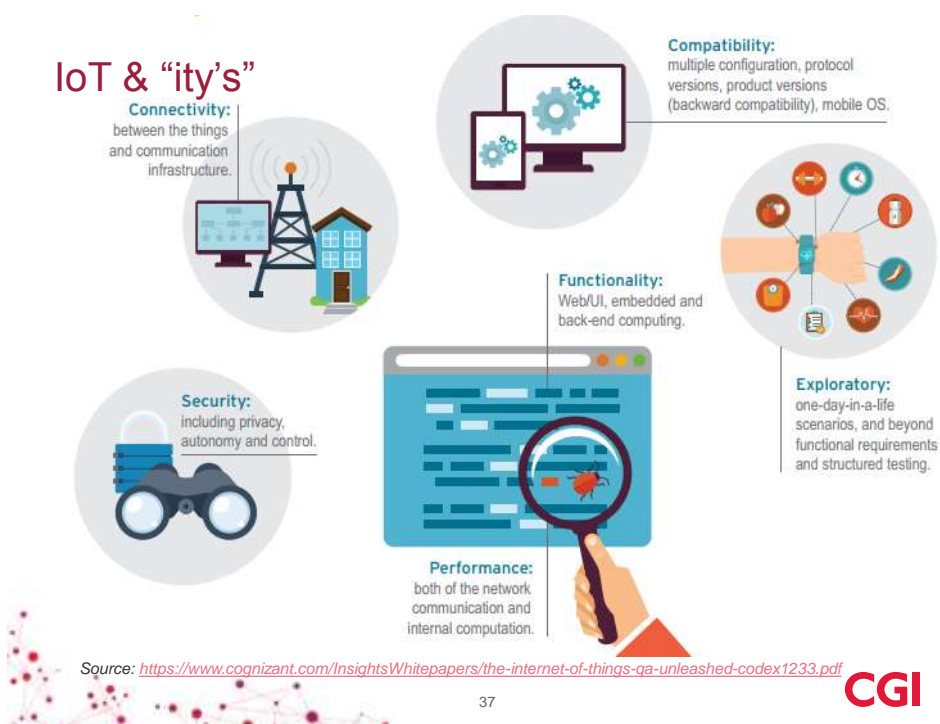


35

Voorbeeld IoT - Teststrategie



36



37

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

38

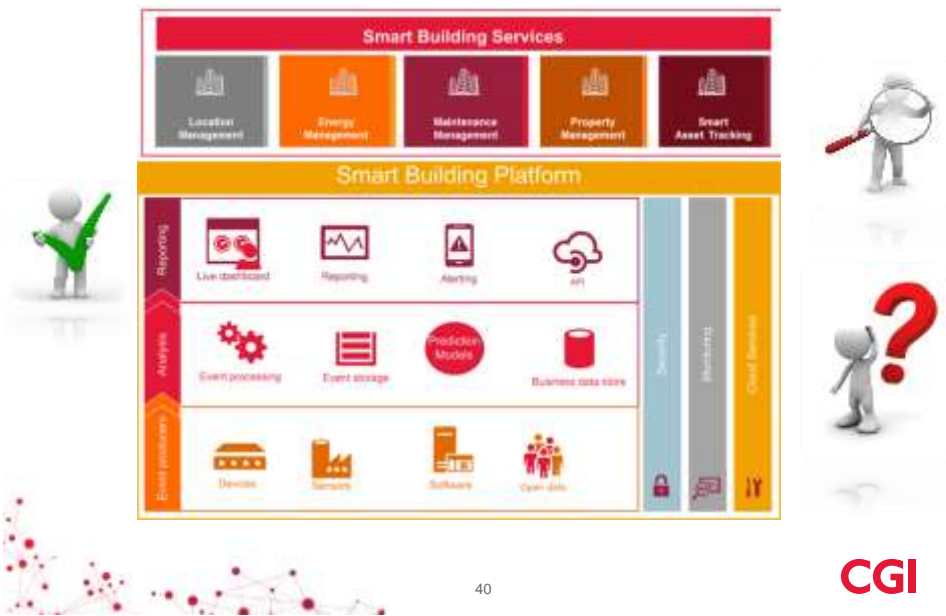
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Smart Building - Testing

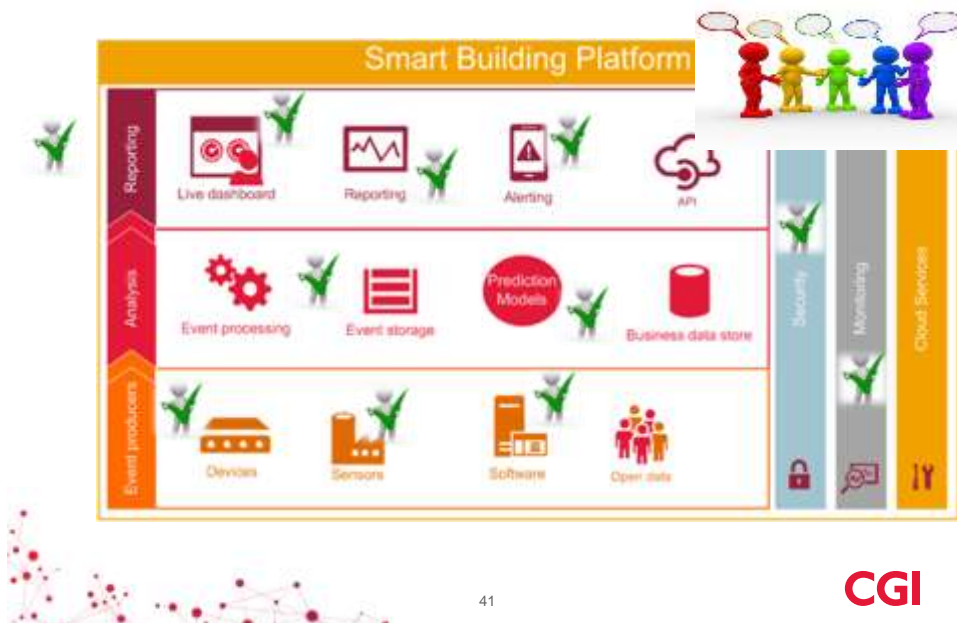


39

IoT Smart Building platform – Hoe testen?



IoT Smart Building platform – Hoe testen?

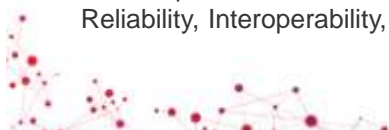


41

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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



42

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Dank voor jullie aanwezigheid!
Dank voor jullie interactie!

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