

Data for Smart Systems

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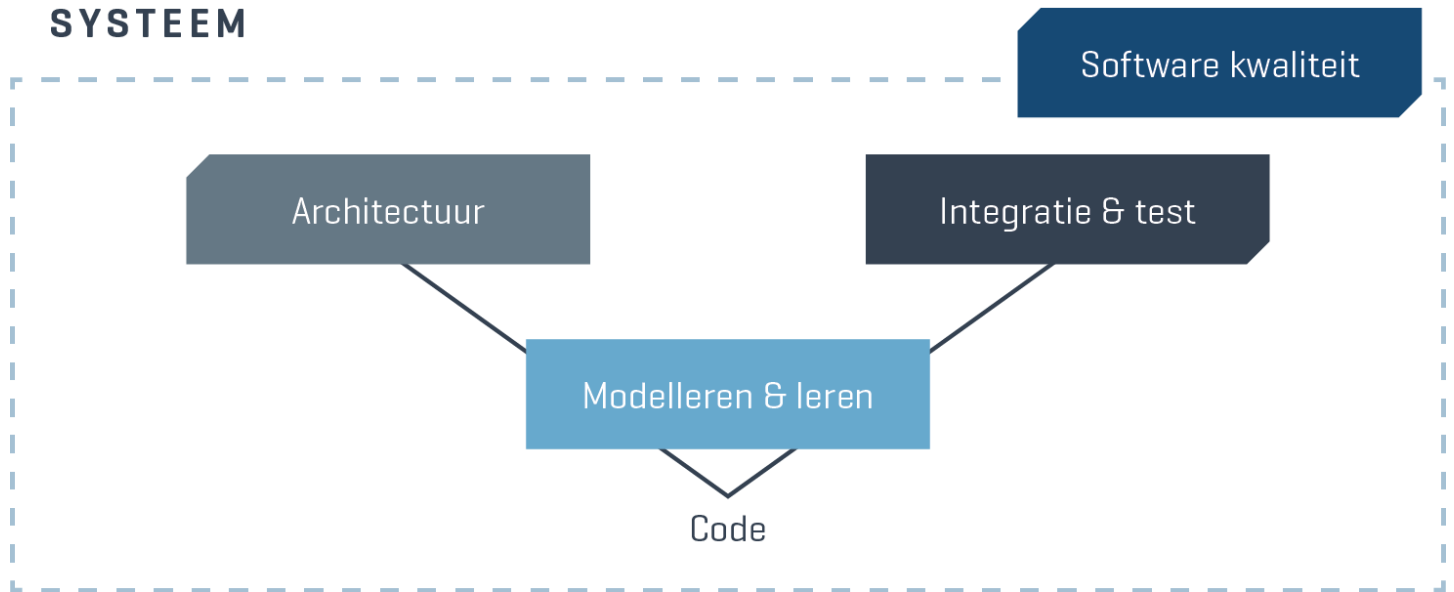
Lector High Tech Embedded Software (HTES)

Fontys Hogeschool ICT (FHICT)

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Software development for smart systems: mobile robots & sensor networks

SYSTEEM



Iron bridge



Smart Industry / Industrie 4.0

From Industry 1.0 to Industry 4.0

First Industrial Revolution

based on the introduction of mechanical production equipment driven by water and steam power

Second Industrial Revolution

based on mass production achieved by division of labor concept and the use of electrical energy

Third Industrial Revolution

based on the use of electronics and IT to further automate production

Fourth Industrial Revolution

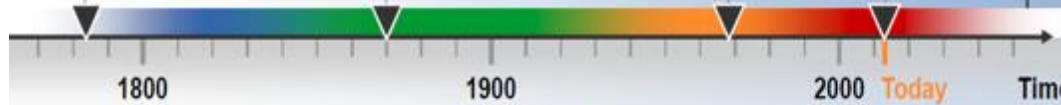
based on the use of cyber-physical systems



First conveyor belt, Cincinnati slaughterhouse, 1870

First programmable logic controller (PLC) Modicon 084, 1969

Degree of complexity



Data?

378 tons of iron at £7 a ton	£2,649
Stone and ashlar for the supporting abutments	£489
Direct labour costs	£2,430
Ropes	£65
Timber (for scaffolding etc.)	£153
Boat hire	£24
Beer for workers	£15
Legal fees (Parliamentary Bill)	£100
Architect's bills	£46
Advertising (including paintings).....	£40
Sundries	£2

Bill (of materials) Iron Bridge 1779

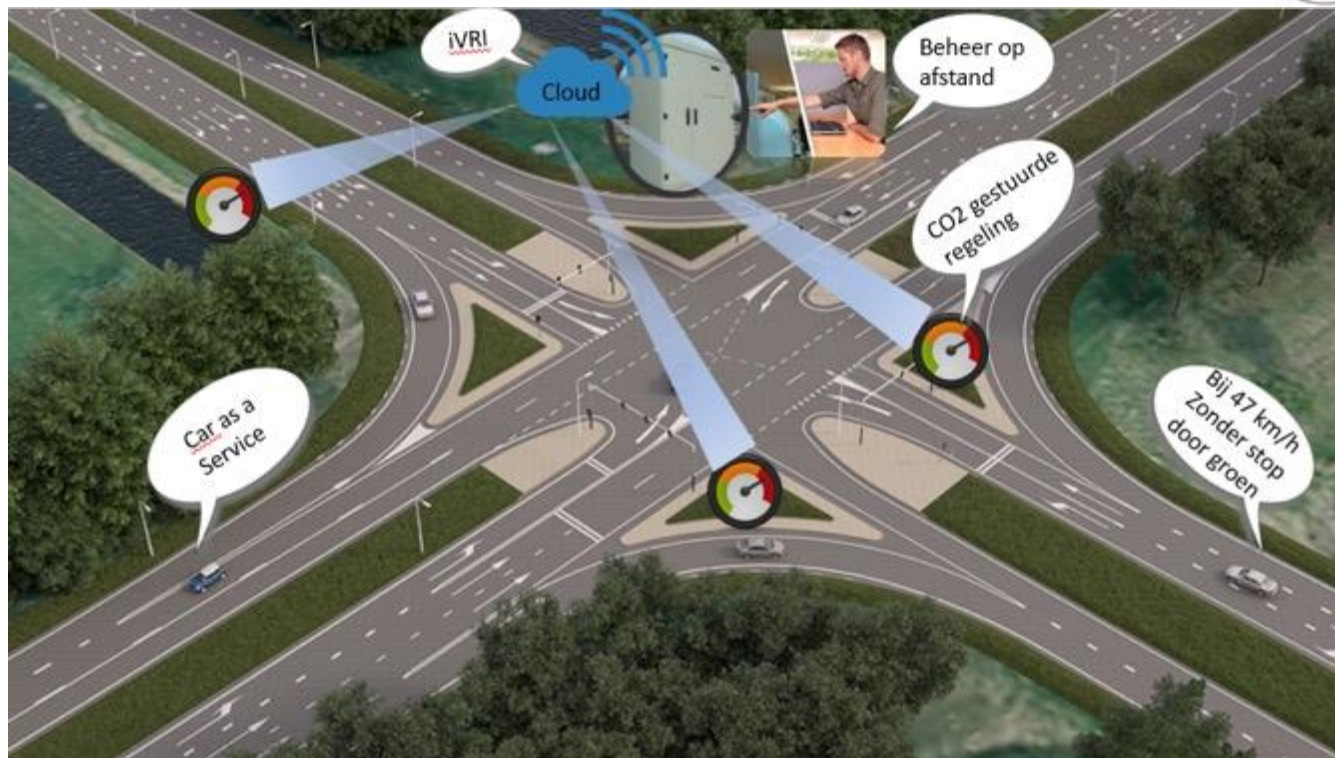
Smart system

- Senses its environment, makes decisions (autonomously) to actuate and controls the environment to perform smart actions
- Examples:
 - Traffic control system
 - Sensor grid in greenhouse
 - Digital factory

Digital
transformation



Traffic control system



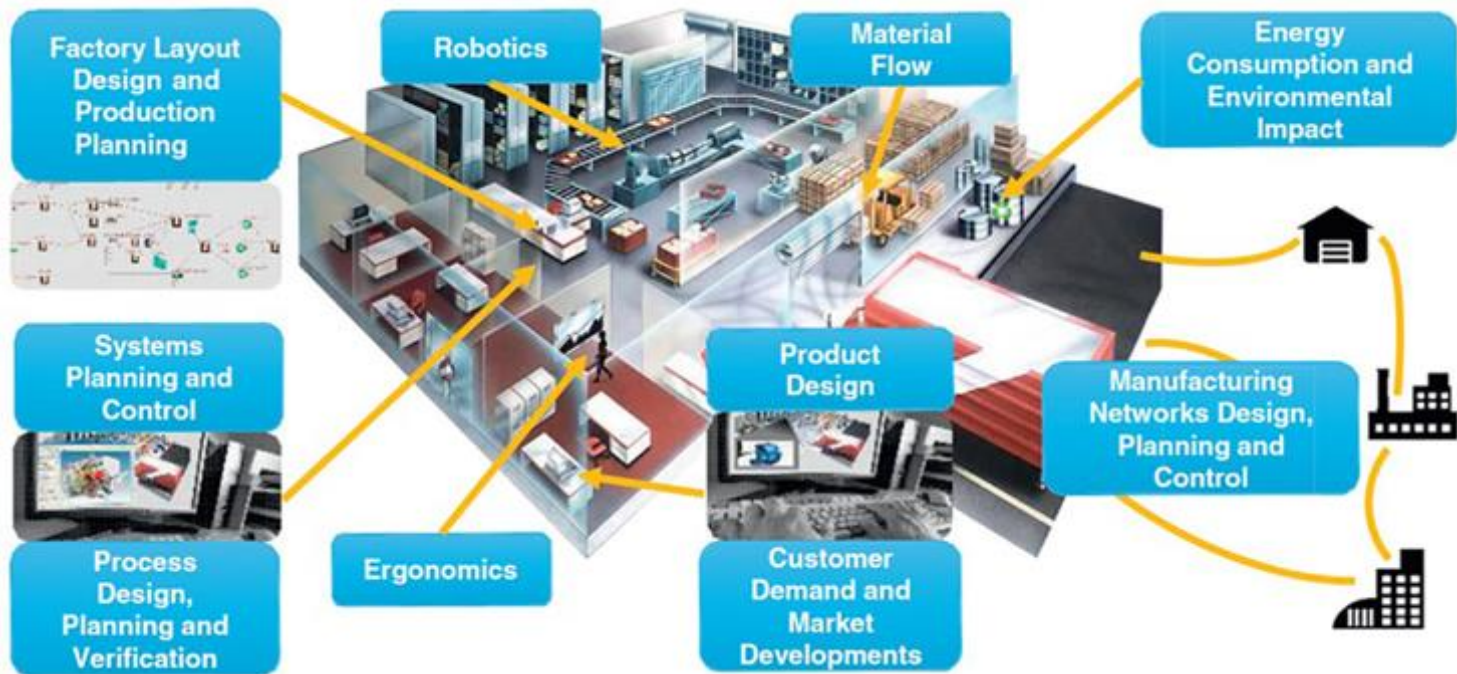
OP Zuid Smart Infra project

Sensorgrid Greenhouse



RAAK MKB Scout project

Digital factory



Brainport Industries Digitale Fabriek project

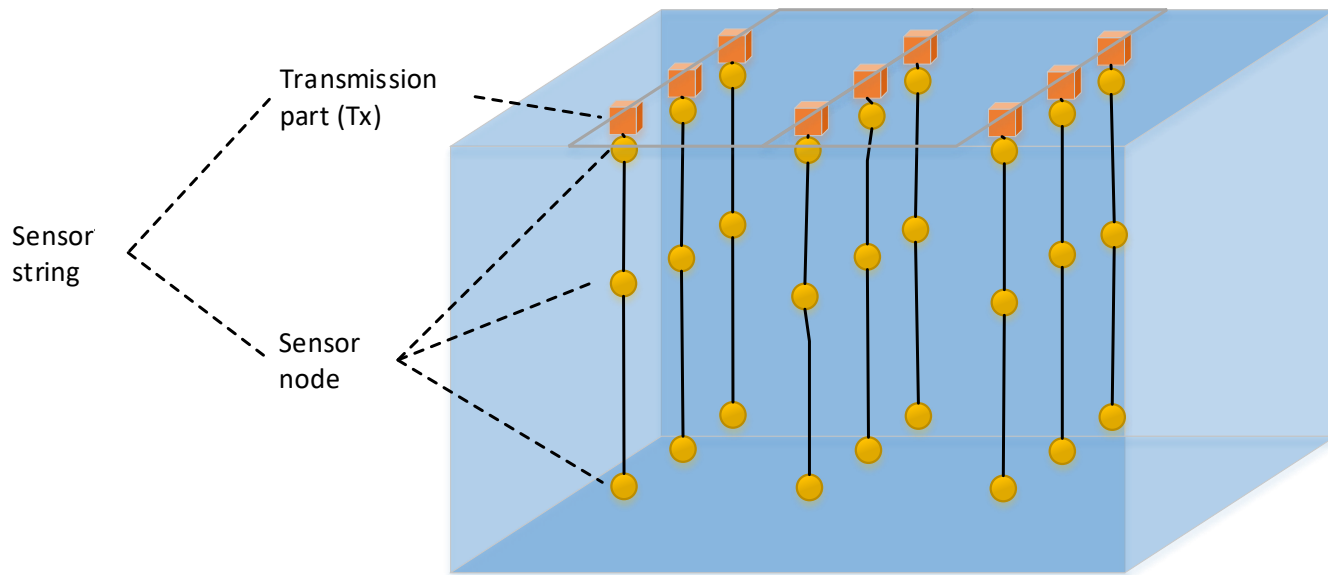
Data

- Smart systems use and produce data
- 5 guidelines
 - Apply open interfaces
 - Clean and combine your data
 - Predict with your data
 - Secure your data
 - Apply your data for system development

1 – Apply open interfaces

To get your data

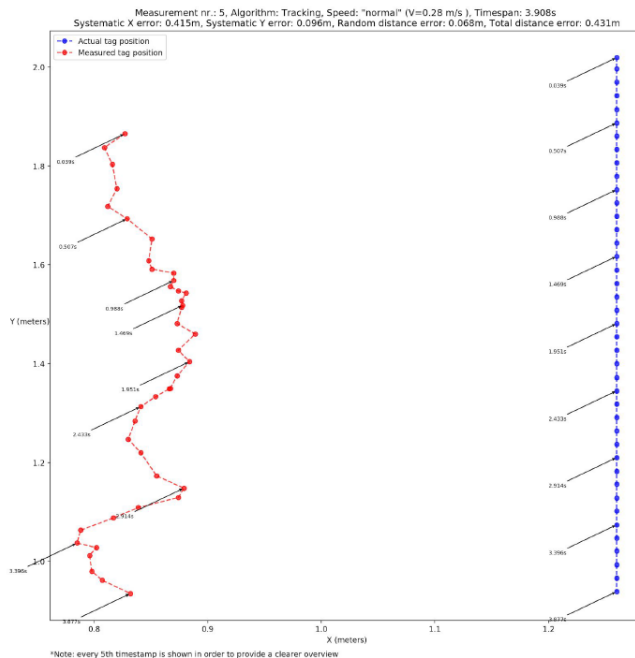
Sensor Grid / Greenhouse Measurement System (GMS)



Sensorstrings with nodes – Raak MKB Scout project

2 – Clean and combine data

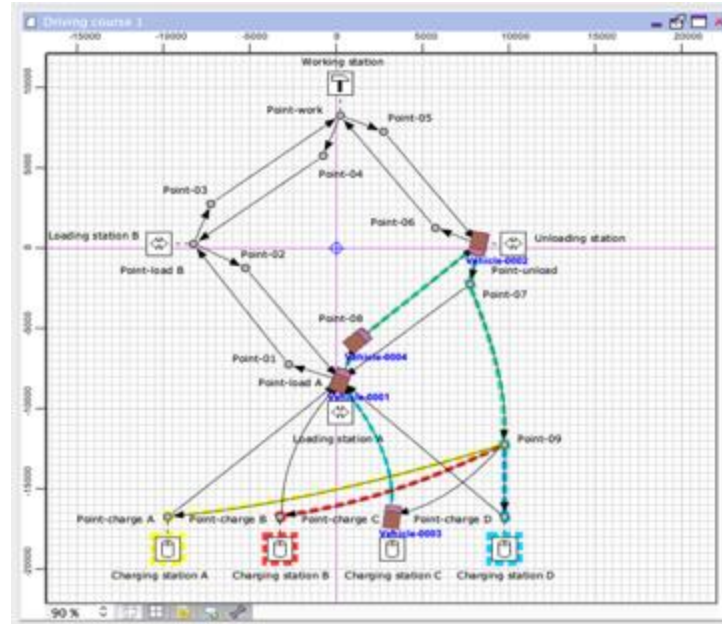
To improve your data



Indoor positioning with UWB – Raak MKB Let's Move IT project

3 – Predict with your data

To improve system performance

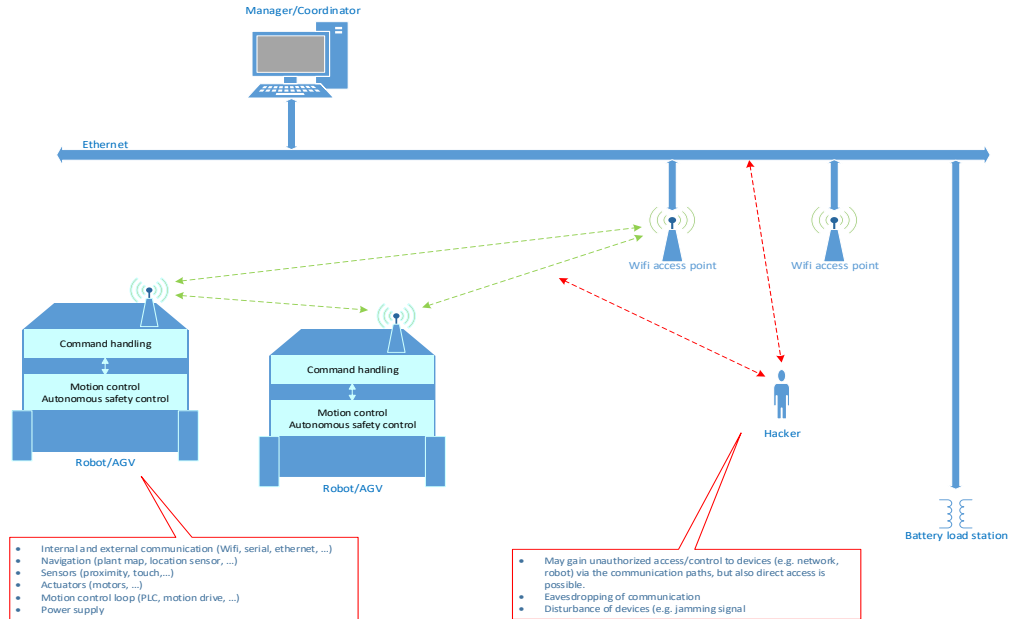


Predict with
Machine
learning

Fleetmanager OpenTCS – Raak MKB Let's Move IT project

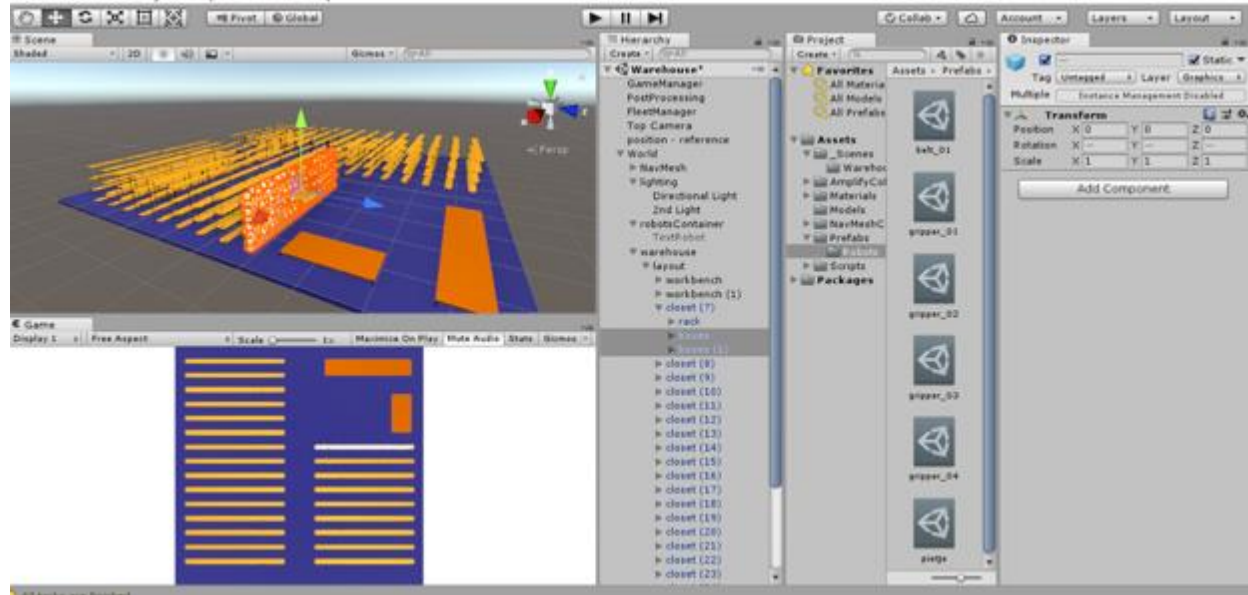
4 – Secure your data

To protect system performance



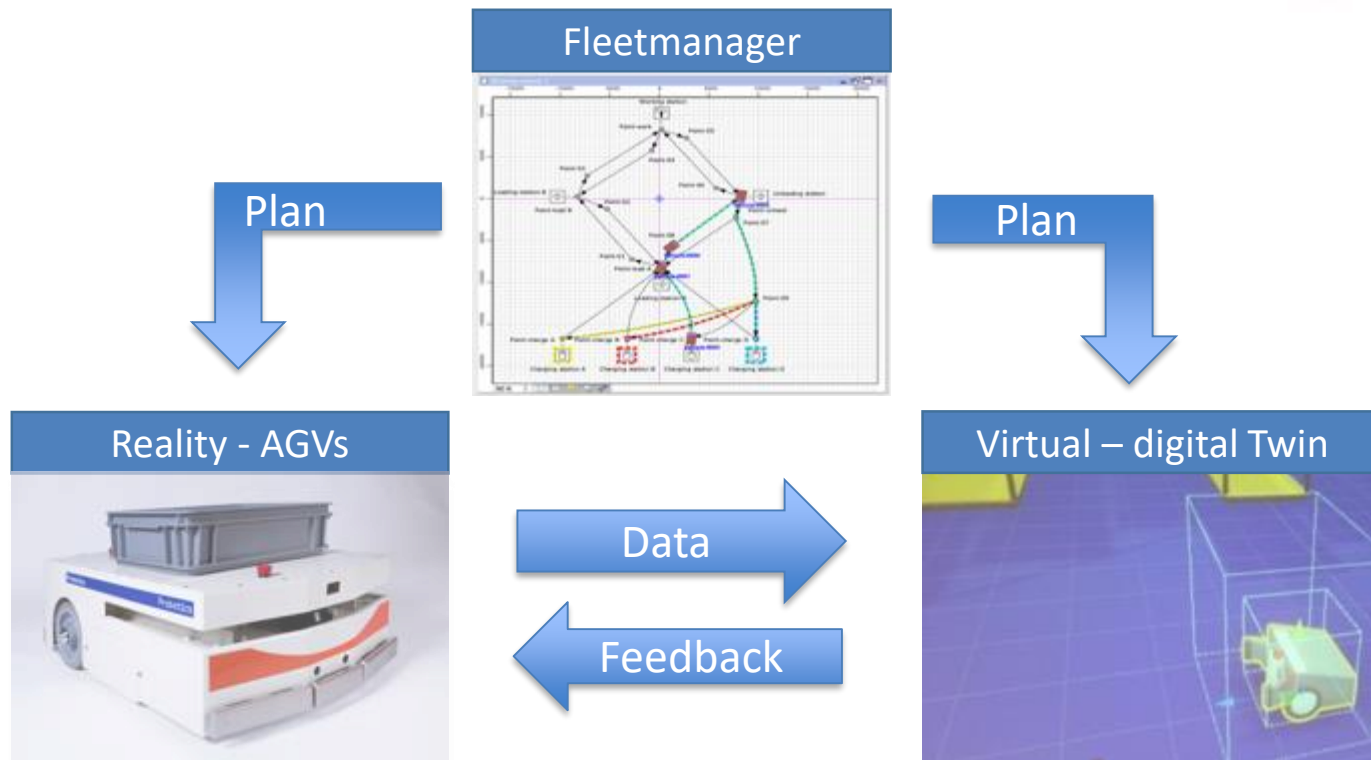
5 – Apply data for development

To develop new/adaptable systems



Digital twin: model of warehouse with AGVs – Let's Move IT project

5 – Apply data for development



Digital twin: model of warehouse with AGVs – Let's Move IT project

Summary



Thank you!



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More info: www.htesfontysict.nl