20 LET
JSME TU
PRO VÁS
PRŮMYSLOVÉ
SYSTÉMY

FCC industrial systems
our way to Industry 4.0

Recommendations for implementing the strategic initiative INDUSTRIE 4.0 says:

End-to-end transparency is provided over the manufacturing process, facilitating optimised decision-making. Industrie 4.0 will also result in new ways of creating value and novel business models

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NATIONAL ACADEMY OF SCIENCE AND ENGINEERING

Securing the future of German manufacturing industry
Recommendations for implementing the strategic initiative INDUSTRIE 4.0
Final report of the Industrie 4.0 Working Group

April 2013

Small system integrator point of view

FCC průmyslové systémy (FCC industrial systems)
Industrial system integrator
Focused on:

- machine vision (automated inspection systems)
- robot application
- customized manufacturing machines

20 years on the market
30 employees
automotive / machinery /food industry

Small system integrator point od view

Certified patner in robotics of:
Mitsubishi
ABB (colaborative robotics)

our customers in the Czech Republic:

Skoda Auto
Koito Czech
Toyota Peugeot Citroën Automobile Czech
AWX Czech (Kyocera group)
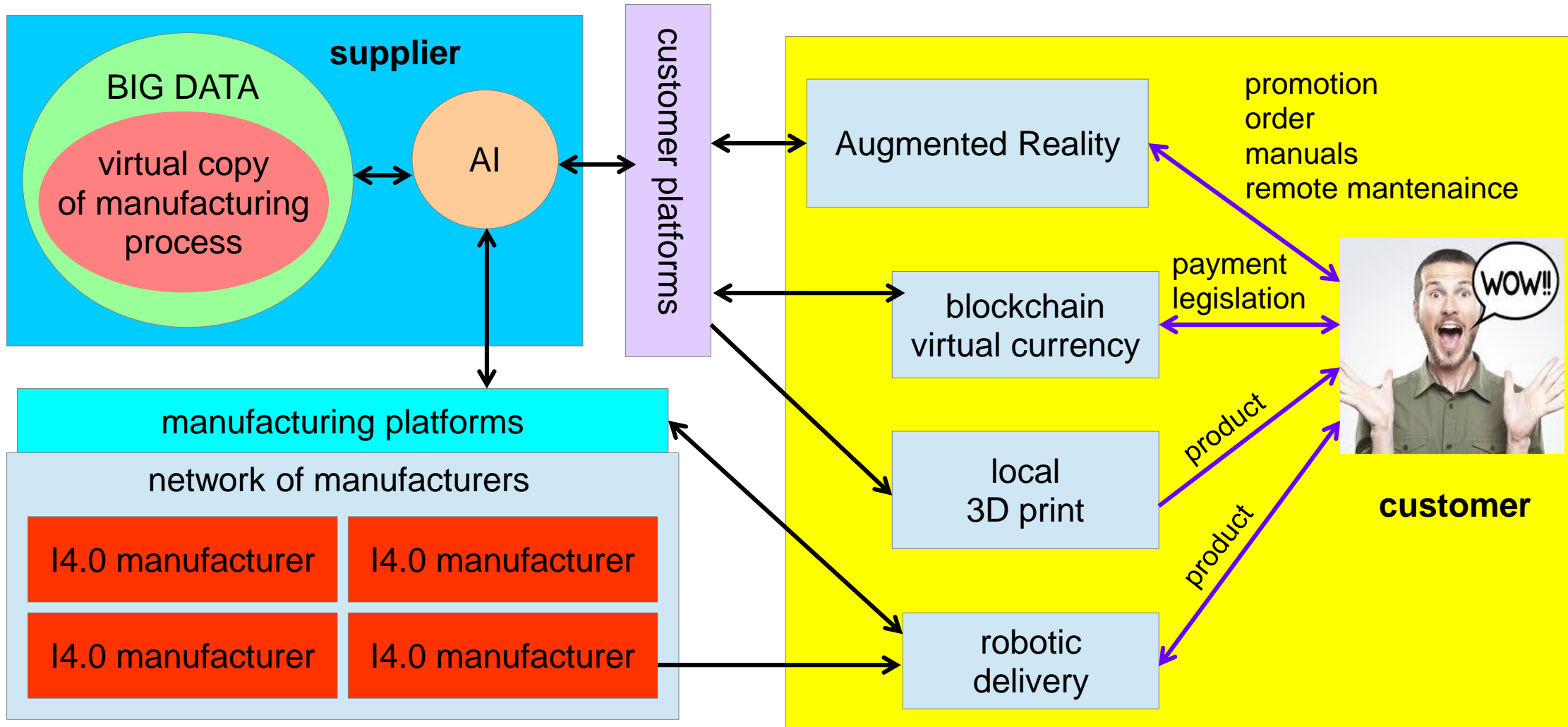
AGC Glass Czech (AGC Global)
Toyota Tsusho Europe S.A.
Daikin Device Czech (Daikin Global)
TRCZ (Tokai Rika)
NACHI Czech (NACHI-FUJIKOSHI)

I4.0 customer – supplier process

supplier

BIG DATA

virtual copy
of manufacturing
process

AI

customer platforms

manufacturing platforms

network of manufacturers

I4.0 manufacturer	I4.0 manufacturer
I4.0 manufacturer	I4.0 manufacturer

Augmented Reality

promotion
order
manuals
remote mantenaince

blockchain
virtual currency

payment
legislation

WOW!!

local
3D print

product

robotic
delivery

product

customer

Role of machine manufacturer / system integrator

FCC PS

Two aspects of system integrator position:

1. **integrator delivers machines in I4.0 environment**
   - manufacturing machine is a part of I4.0 plant
   - manufacturing machine produces products with I4.0 features
   - change of technology is needed

2. **integrator is a part of environment I4.0**
   - change of business model is needed

RAMI model of manufacturer (= customer) production

machine is a part of I4.0 plant and is a manufactured I4.0 product with I4.0 features
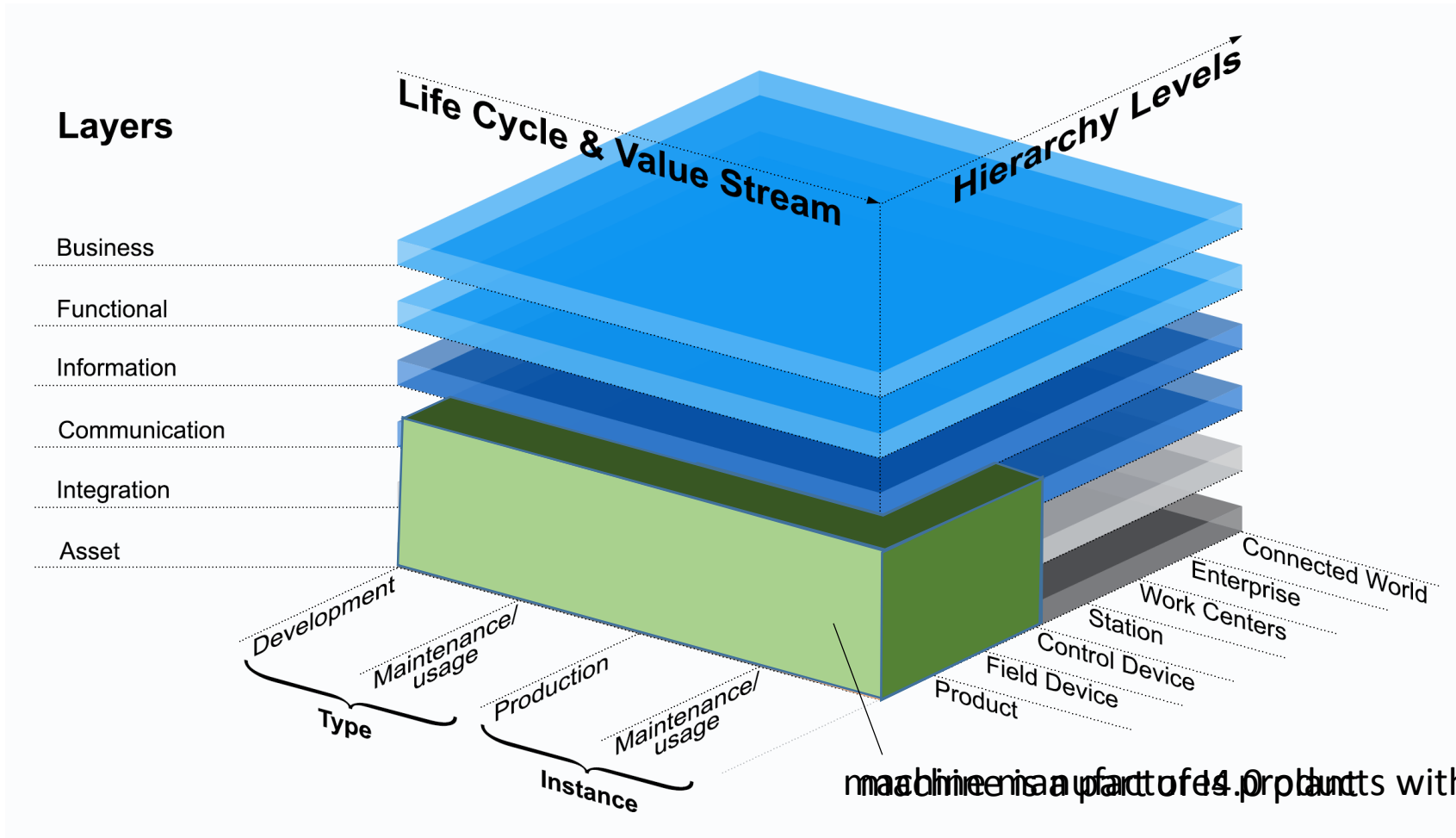
Typical I4.0 features:

- Industry Internet of Things (IIoT) communication
  (data collection for manufacture process monitoring)
- Predictive maintenance
  (association with plant maintenance system)
- Remote maintenance using augmented reality
 (individual and specialised maintenance)
- ....
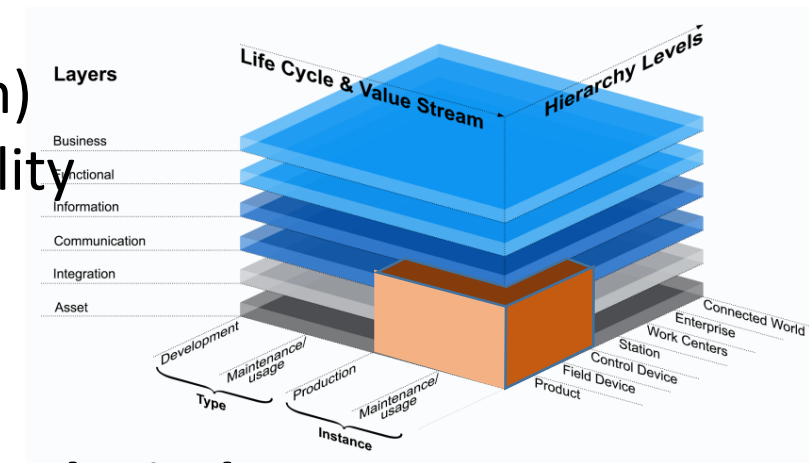
Implementation is possible using present technological means

Building machines for manufacturing I4.0 products

Manufacturing machine should serve for whole product lifecycle

Typical I4.0 feature:
manufacturing process is controlled by product

**features of AI needed
yet not all necessary technological means exist**
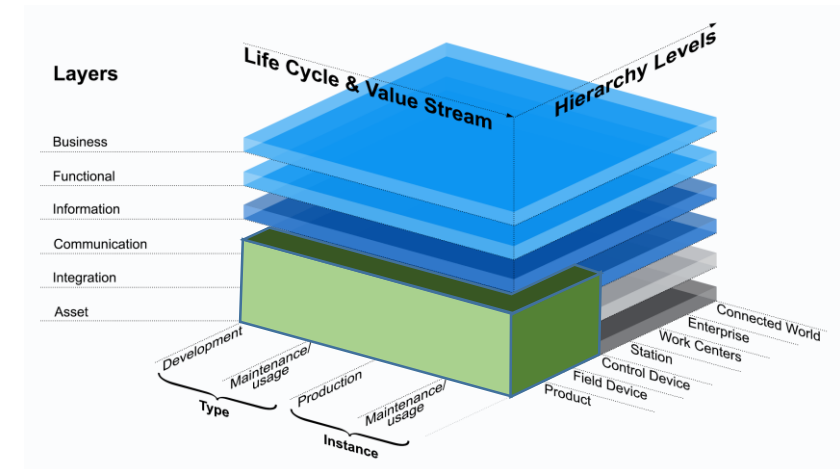
Robotic measuring system controlled by product

- developed since 2009 in three main phases
- serves for data collection for manufacturing process capability indices calculation
- measures product characteristic according to control plan
- used for big amount (several hundreds) product modification
- provided fully automatic measurement

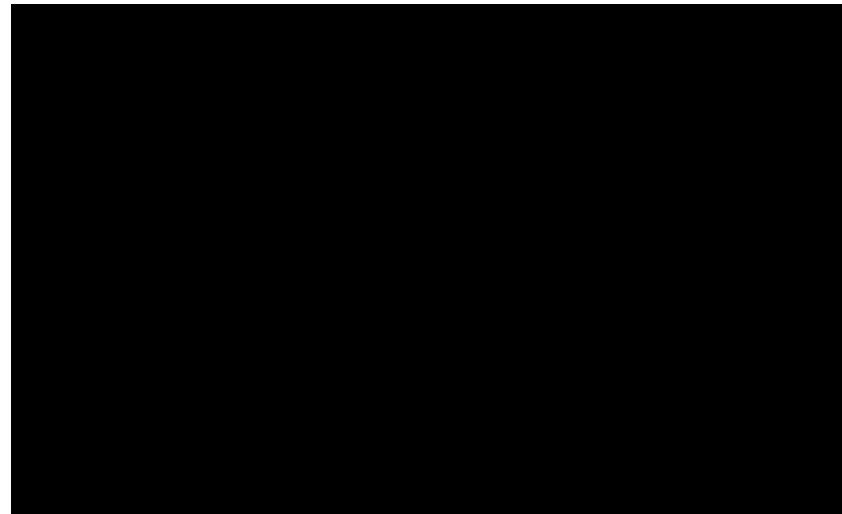# Robotic measuring system I

8 years ago

- measured object is identified with a bar code
- system checks some specific feature of object to ensure that right product is placed
- system proceses the specific measuring program developed in advance

Robotic measuring system II
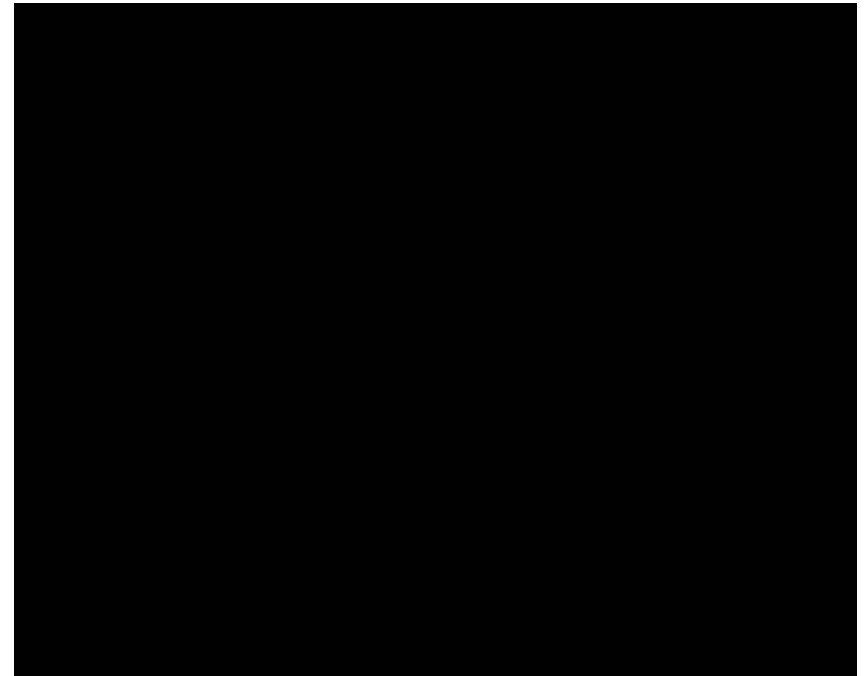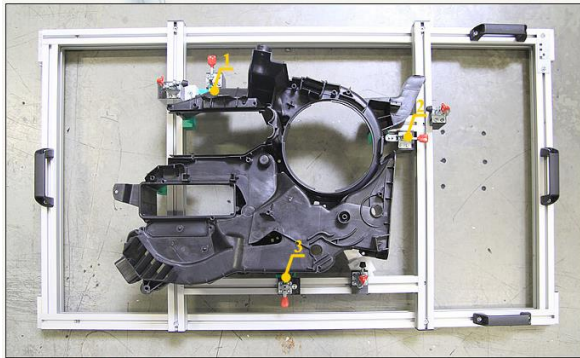
3 years ago – project ROMESY

- measured object is identified with bar code
- control plan (what and where should be measured) is loaded and updated
- interpretation of control plan for specific robotic system is created
  (measuring program is choiced, non-colision trajectory of robot is calculated)
- system checks some specific feature of object to ensure that right product is placed
- system proces the specific measuring program beeing assembled

- robotic operating system ROS
- 3D modeling used
- non-colision trajectory calculation

Robotic measuring system III

Future – project in preparation

- measured object is identified with information from data carrier inbuilt
- control plan is loaded from data carrier inbuilt
- interpretation of control plan for specific robotic system is created (measuring program is developed by AI, non-colision trajectory of robot is calculated)
- system proceses the specific measuring program assembled in site
- system saves the results in data carrier inbuilt

Role of machine manufacturer / system integrator
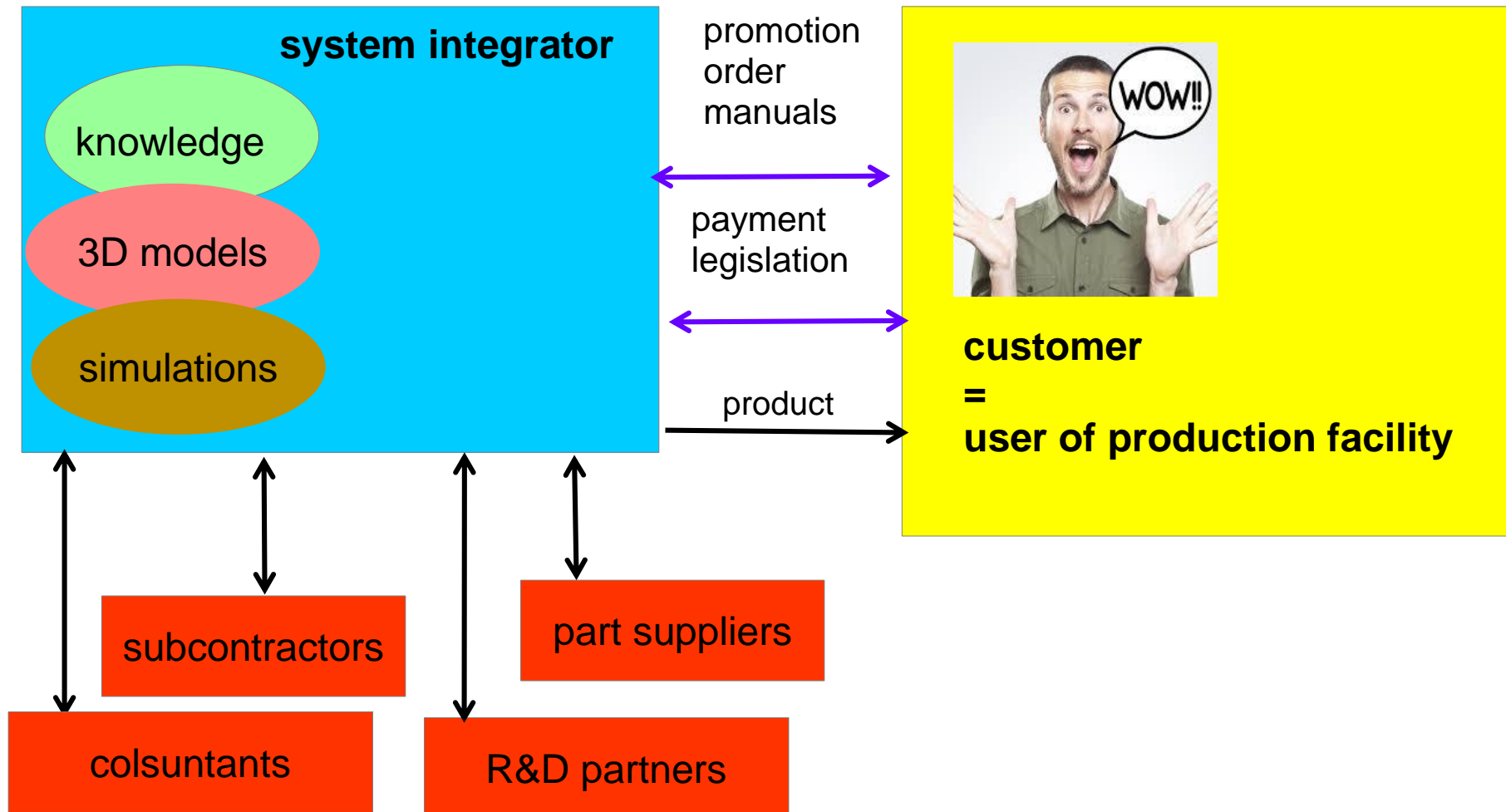
Two aspects of problem:

1. **integrator delivers a machines in I4.0 environment**
   - manufacturing machine is a part of I4.0 plant
   - manufacturing machine produces products with I4.0 features
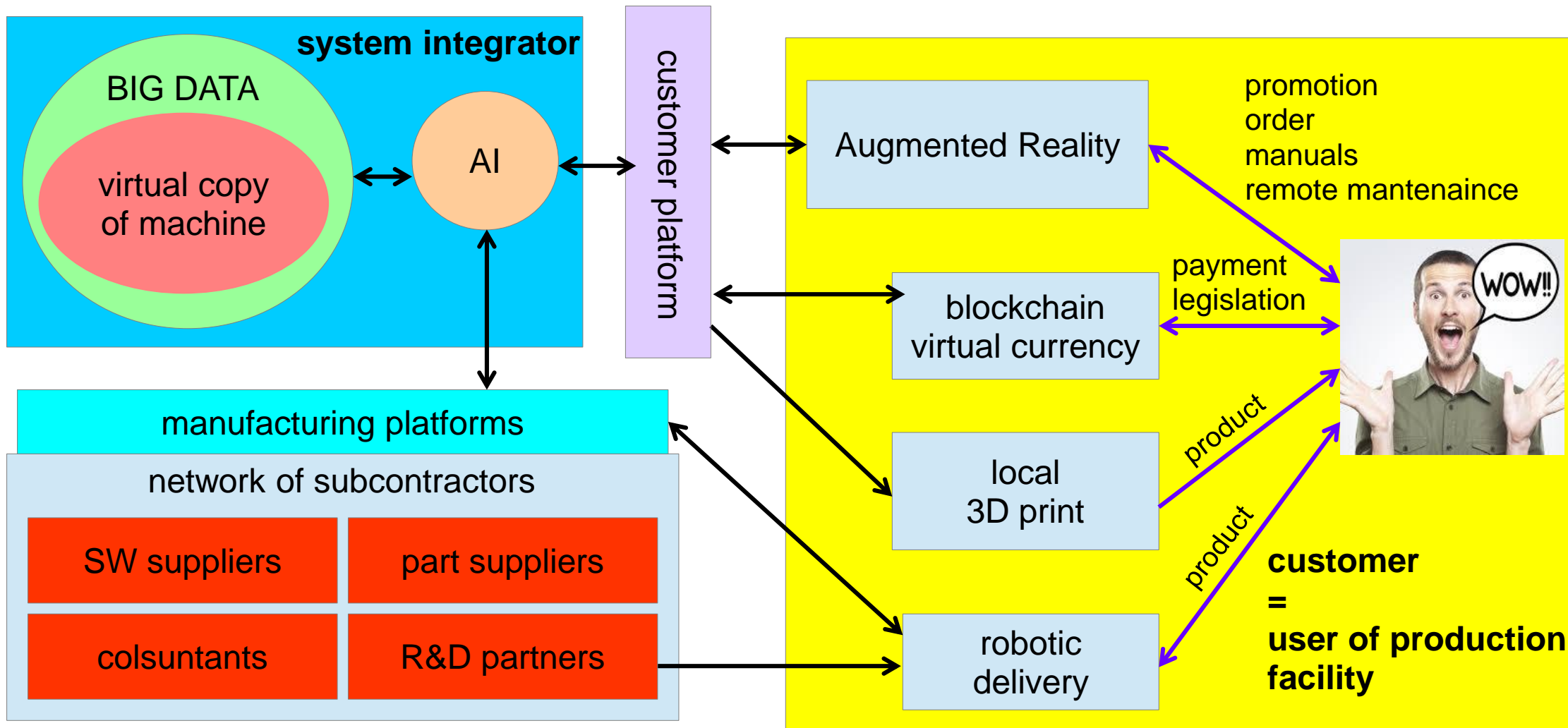   **- *change of technology is needed***

2. **integrator is a part of environment I4.0**
   **- *change of business model is needed***

system integrator in present

system integrator

knowledge

3D models

simulations

promotion
order
manuals

payment
legislation

product

WOW!!

**customer
=
user of production facility**

subcontractors

part suppliers

colsuntants

R&D partners

position of companies in the
digital / specific know-how
diagram
(according to Havelka)

system integrator a a part of environment I4.0

FCC PS
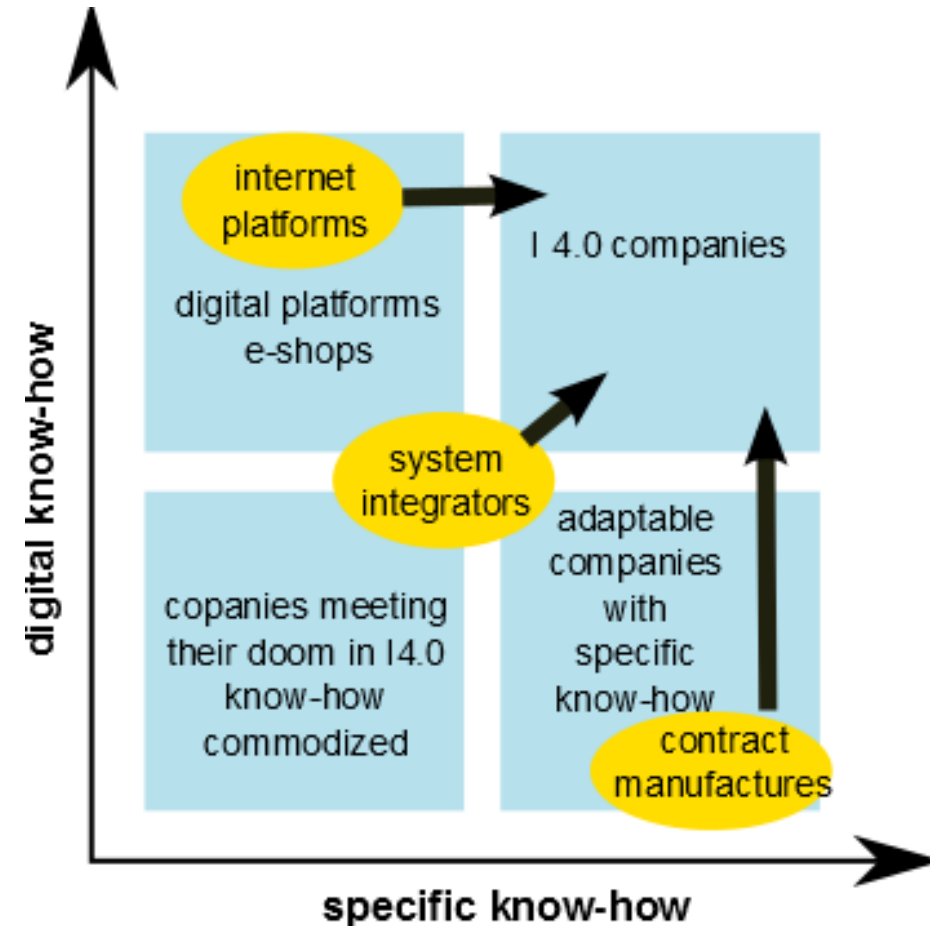
**branch cluster
verticaly structured
covered all subcontracts**

customer platform

Augmented Reality

blockchain
virtual currency

local
3D print

robotic
delivery

promotion
order
manuals
remote mantenaince

payment
legislation

product

product

**customer
=
user of production
facility**

WOW!!

Final report about SME:

Recommendations for implementing the strategic initiative INDUSTRIE 4.0 says:

pilot applications and best practice examples of networks of large-scale industrial undertakings and SMEs could help   .. convince small and medium-sized enterprises to adopt the methodological and organizational tools and technologies of the leading suppliers…

Thank you for your attention

Otto Havle
オットー・ハヴレ

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(FCC průmyslové systémy)

managing director
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