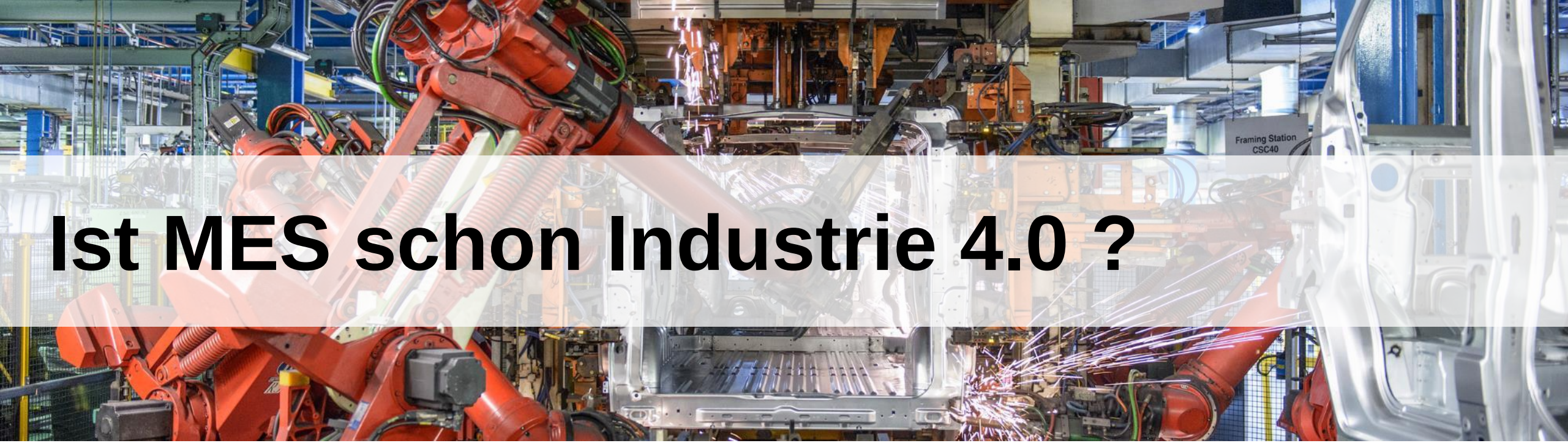


Ist MES schon Industrie 4.0 ?

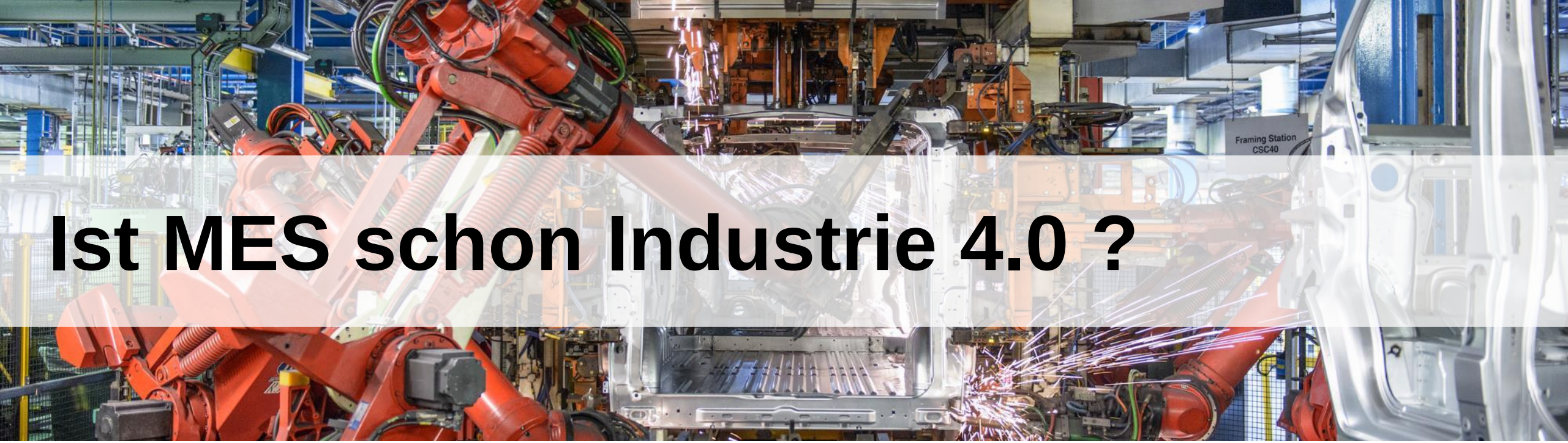
Aachener ERP-Tage 2017:

ERP und MES – Intelligente Vernetzung auf dem Weg zu Industrie 4.0

Martina Weidner | SAP

21. Juni 2017

SAP Run Simple



Ist MES schon Industrie 4.0 ?

N E I N, natürlich nicht . . .

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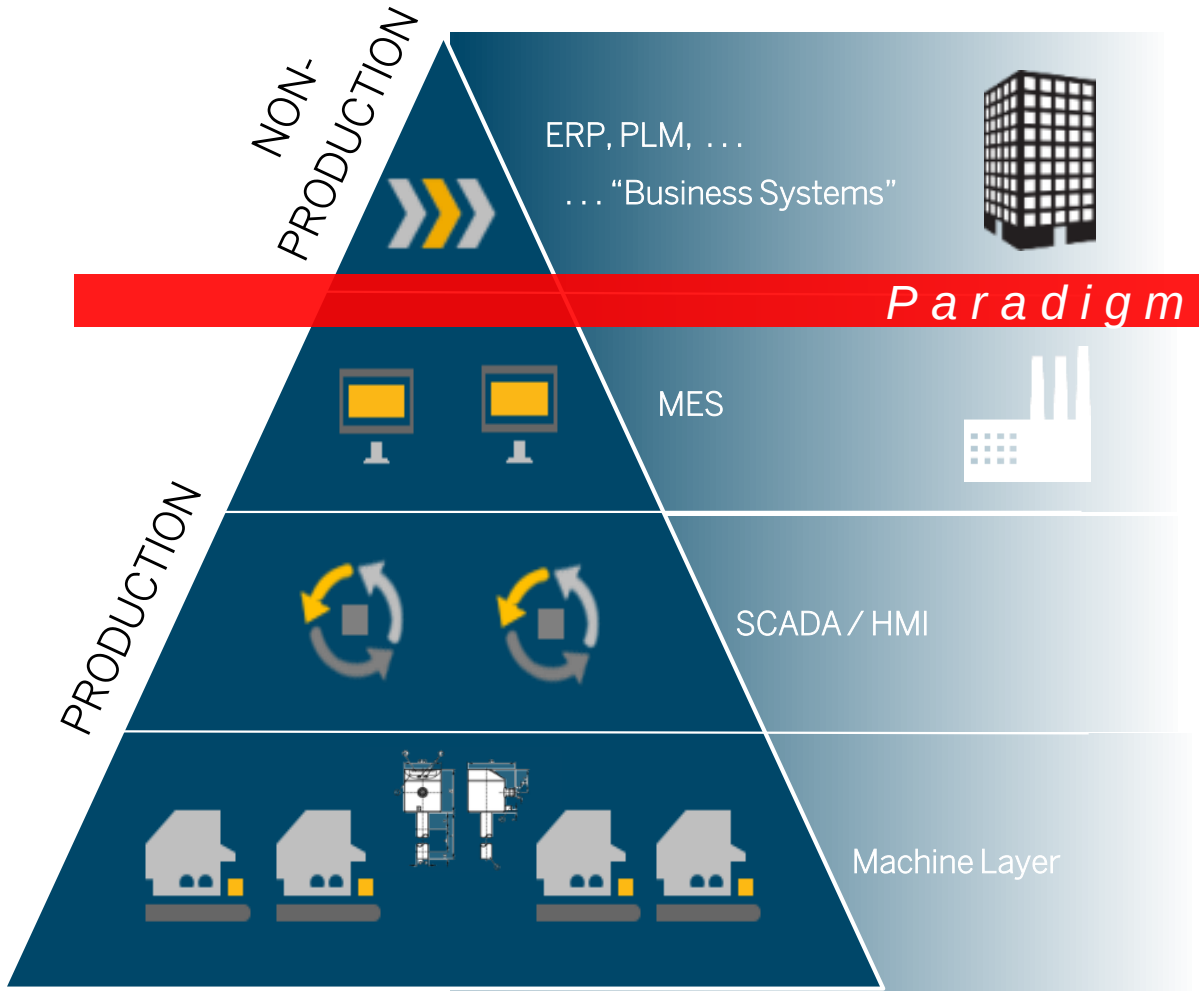
MES *today*

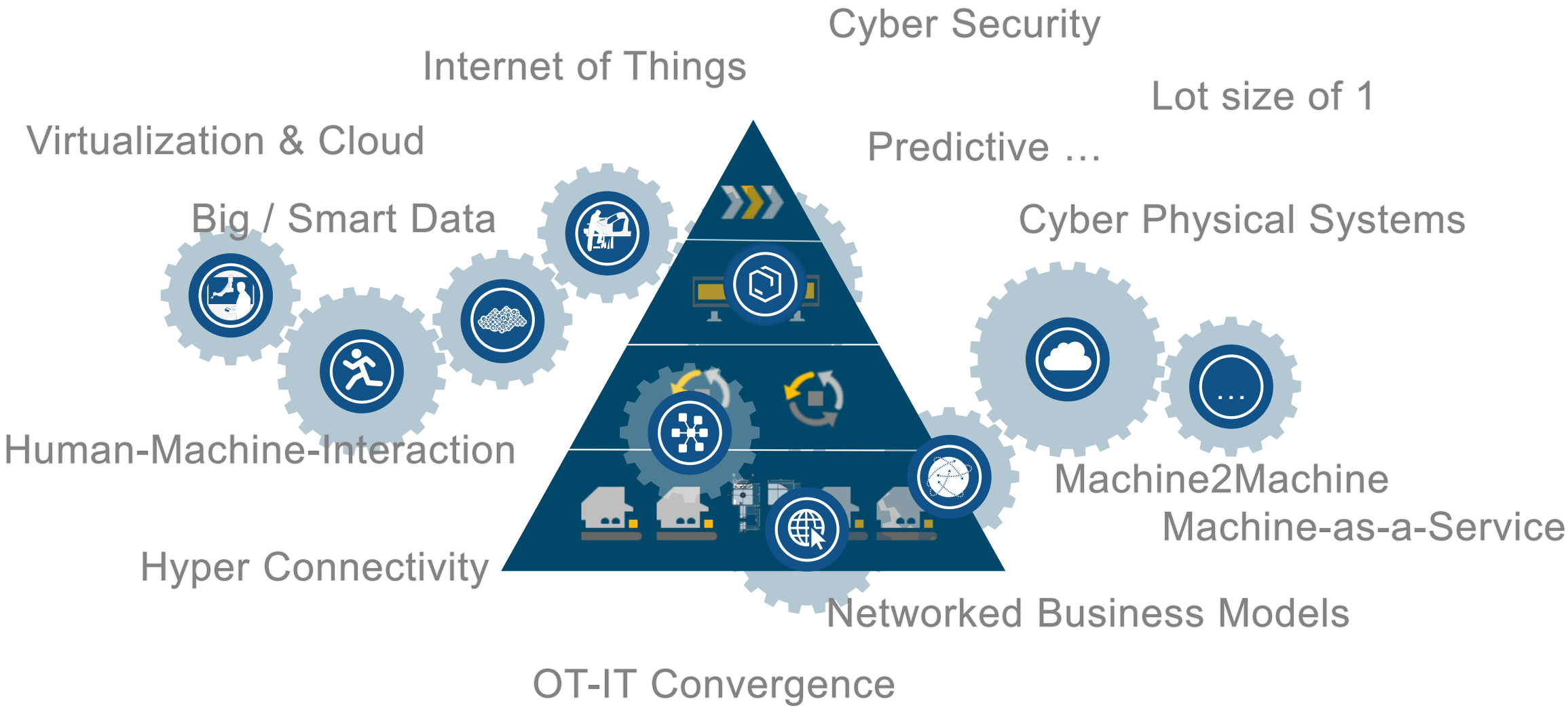


MES =

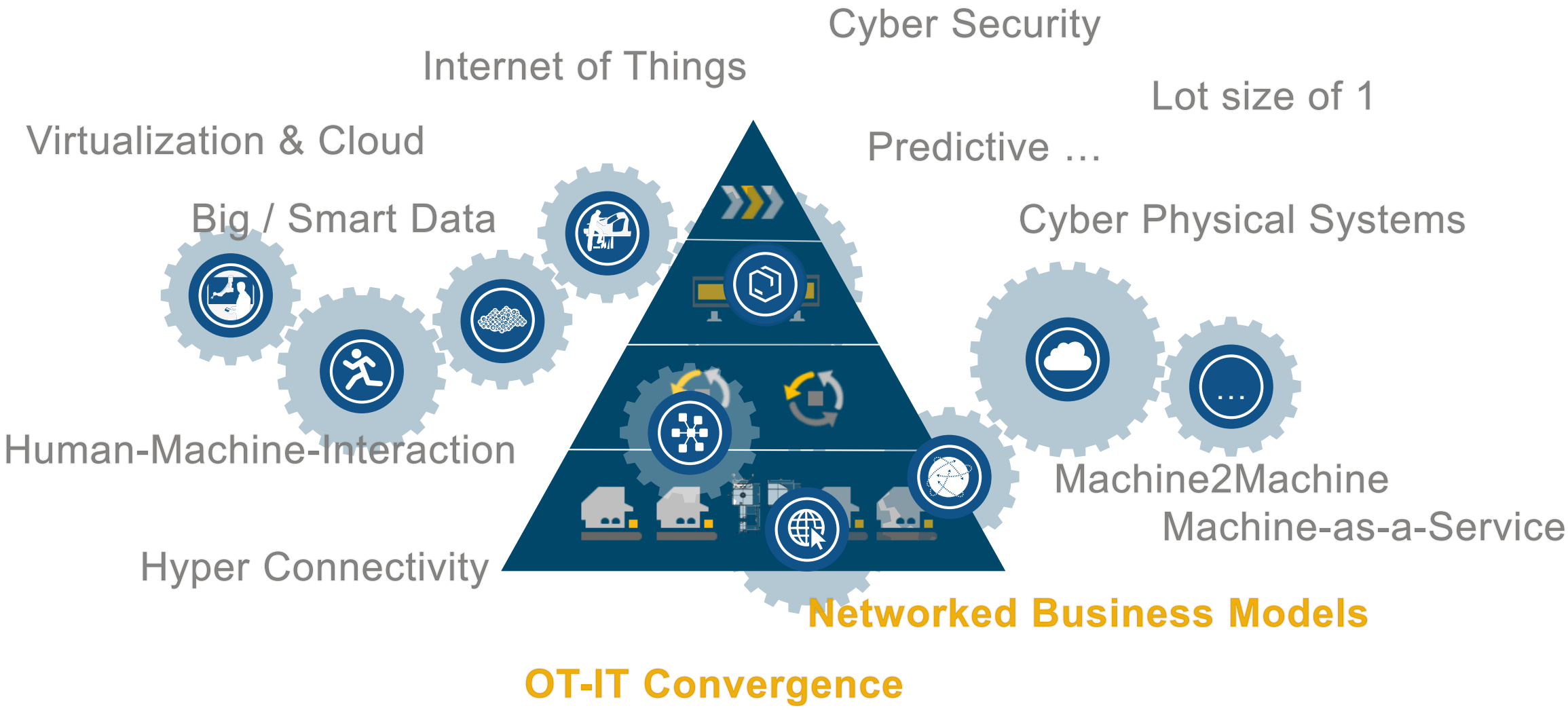
an IT system of standard functions and features

- Ensure self-sustaining operations in production
  - ⇨ „horizontal integration“
  - ⇨ provide functionality that reaches beyond manufacturing *execution*
- Real-time capabilities and failure-proof operations
  - ⇨ machine / automation integration
- Avoid interfaces – all required functions from one system source
  - ⇨ lack of mutual understanding and acceptance
  - ⇨ lack of end-to-end process thinking and acting

MES in the Era of Industrie 4.0



MES in the Era of Industrie 4.0



Market Trends Influenced by the Digital Transformation
. . . Challenging Production

Rapid Innovation

- Time to market
- Innovative (smart) products
- New business models

The Market of One

- Highly configurable products
- Individualized products
- Service-enabled solutions

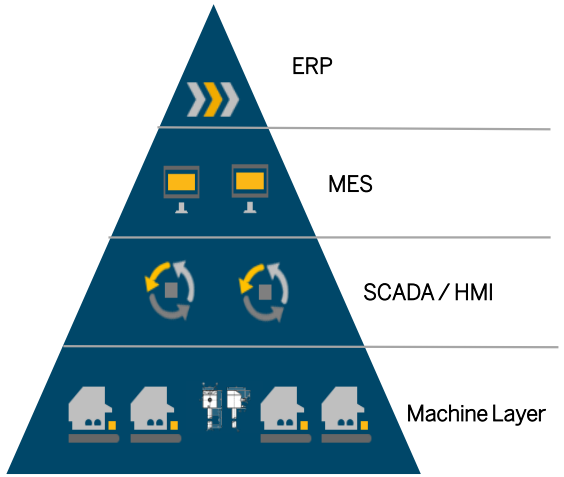
Extreme Variability

- High flexibility & productivity
- Innovative technologies
- Employee enablement & empowerment

The Internet of Things and its Impact on Manufacturing

Time to change paradigms !

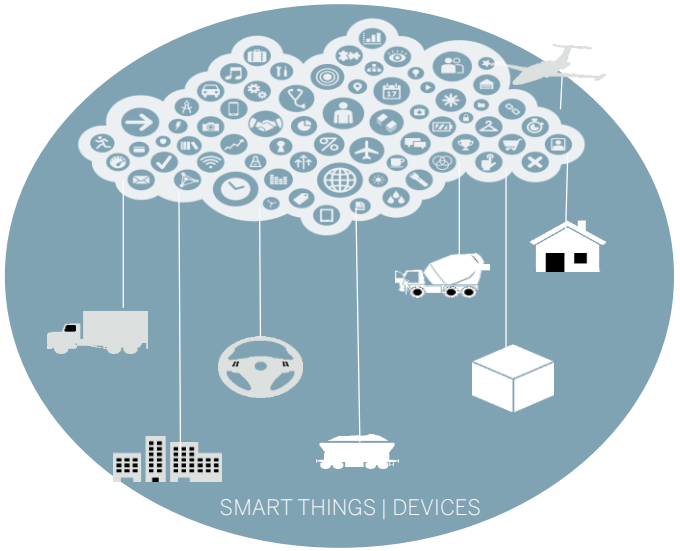
Industrial Internet of Things



Business defines the game and the rules

- New business models impacting product design and capabilities – responsiveness of process stakeholders – required product serviceablility
- Product individualization
- More configurable products & higher degree of configuration
  - ⇨ increasing number of variants
  - ⇨ decreasing lot sizes – down to a lot size of 1
- Product prices not to increase considerably

Internet of Things



Production –no matter where located – needs to adopt and deliver flexibly

- Highly agile and adoptable to change
- Produce at mass production costs

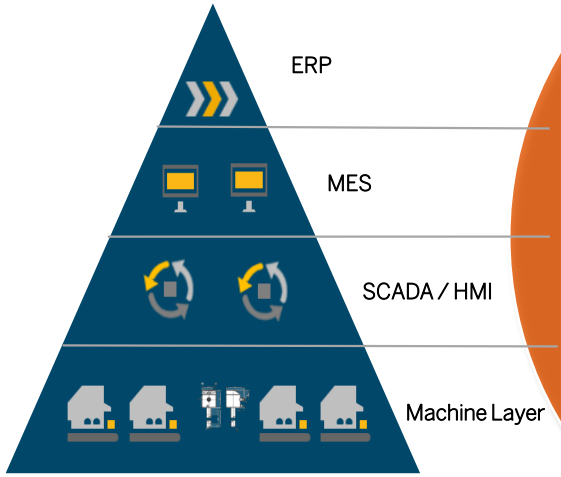
- **CHANGE PARADIGMS !**
  - ⇨ ***no longer:*** **production vs. non-production**
  - ⇨ ***in future:*** **Manufacturing Execution is A NETWORKED TASK to be performed** considering and deploying all “resources” that are necessary | available | that provide the required skills a/o capabilities

The Internet of Things and its Impact on Manufacturing

OT-IT Convergence: Understanding *a n d* doing it the right way

Industrial IoT scenarios ← **OT- IT Convergence** → **External IoT scenarios**

Industrial Internet of Things



Industrial Internet of Things

» … where **Manufacturing Execution is**

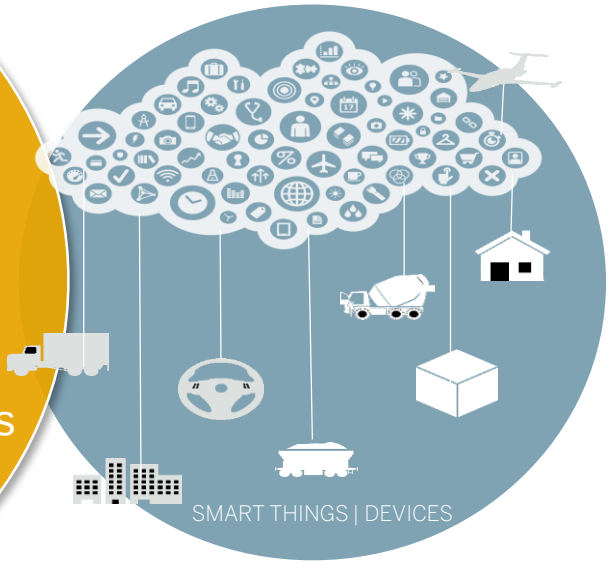
- **a NETWORKED task to be performed**
- deploying all available and necessary resources (humans, technology, systems, …)

Internet of Things

» New, connected business models

» Business networks

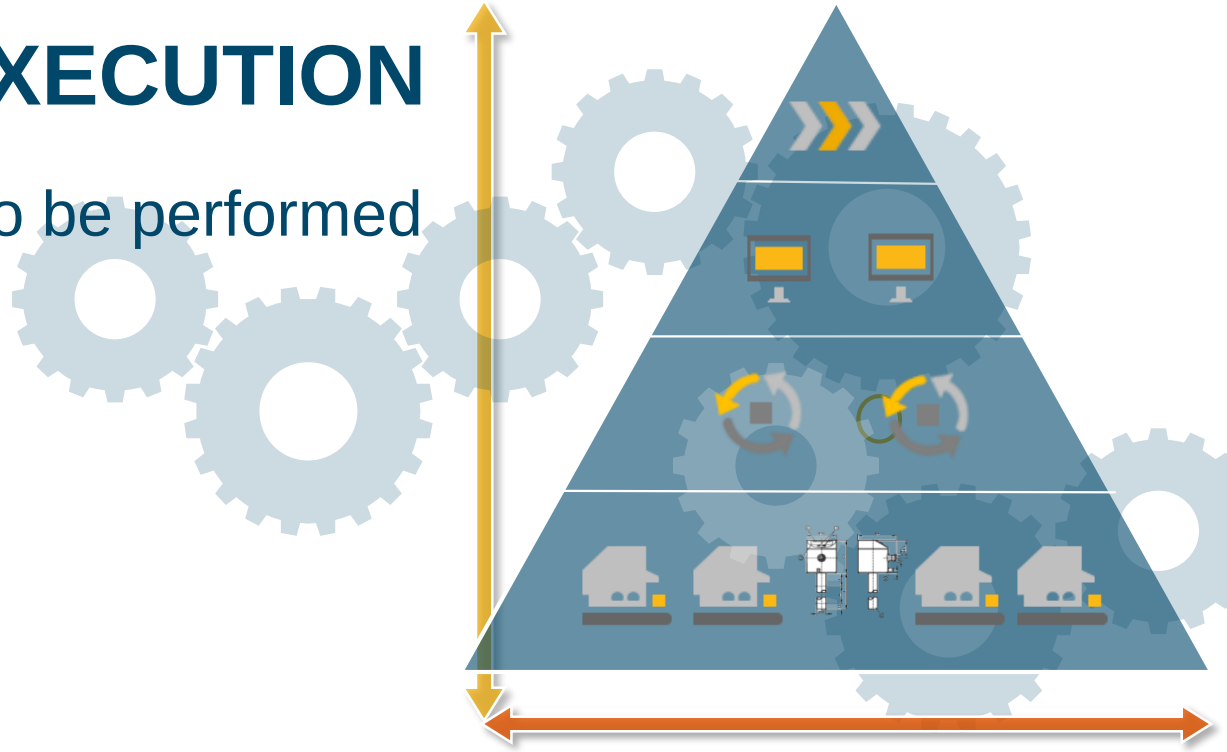
Internet of Things



MES *T O M O R R O W*

MANUFACTURING EXECUTION

⇨ Task to be performed



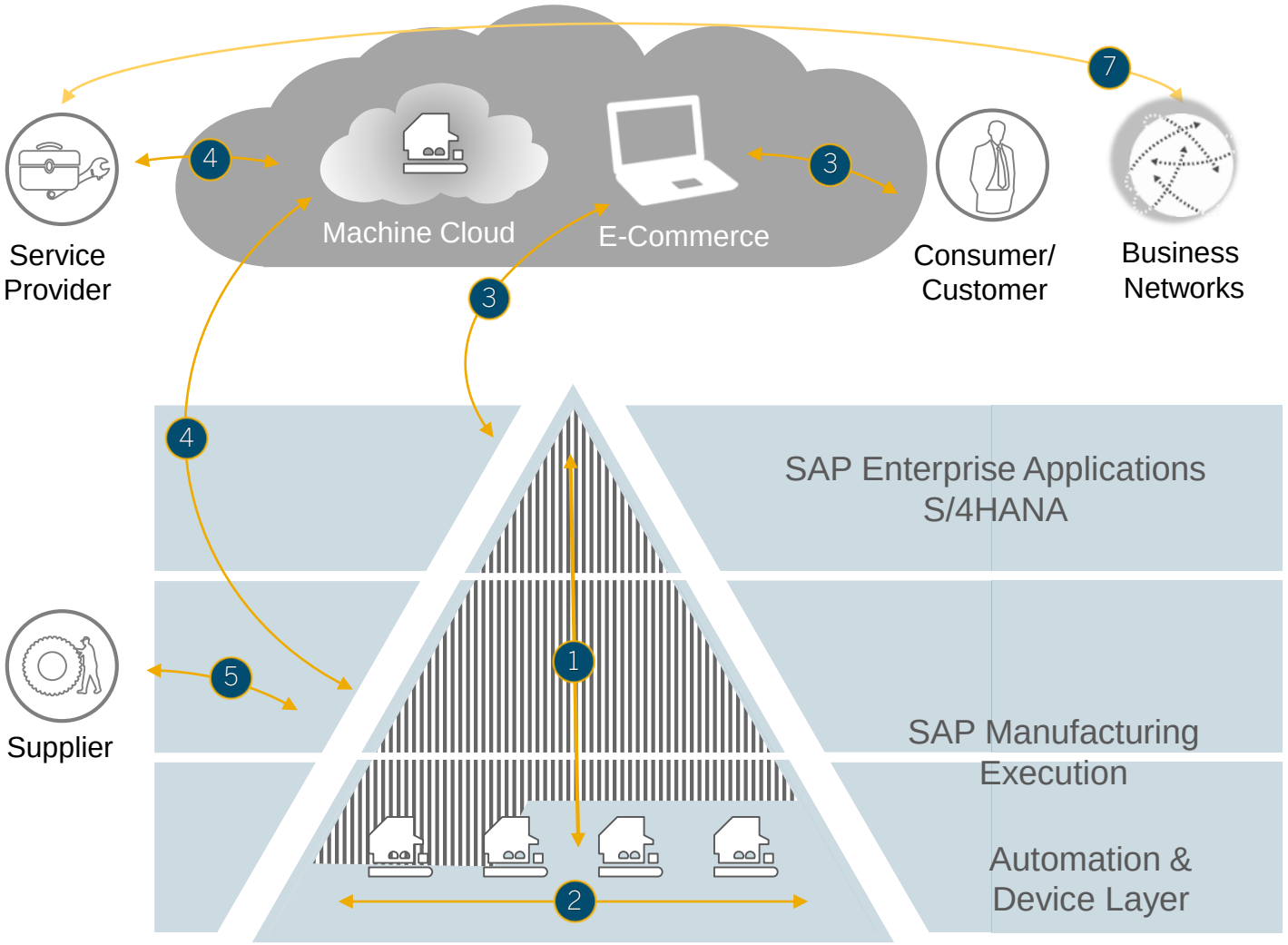
SYSTEM

⇨ Synonym: *N E T W O R K*

⇨ *Intermodal acting of* systems, resources, technologies, humans

⇨ **SAP Connected Manufacturing**

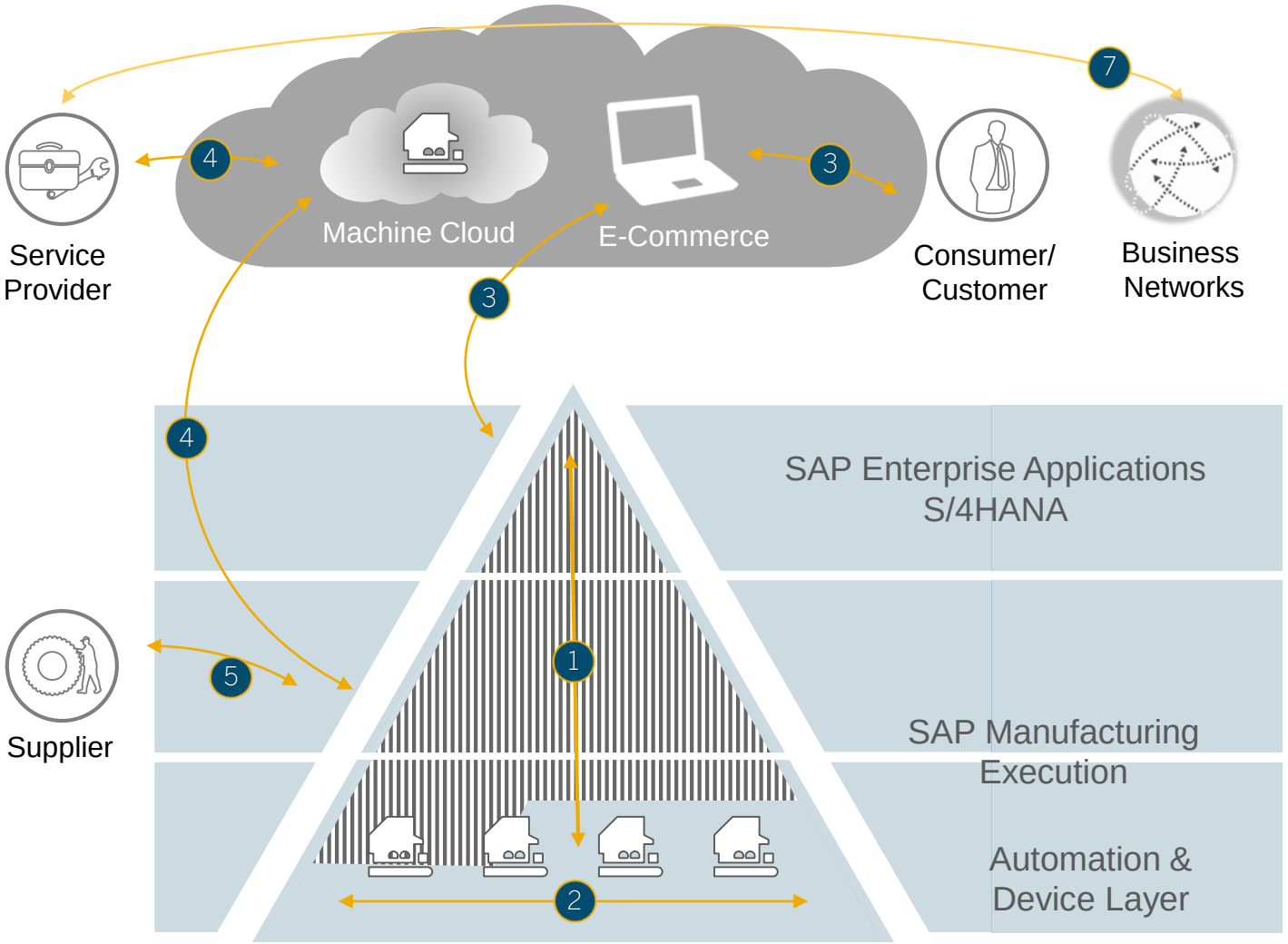
Connecting Production to the Internet of Things



INTEGRATION SCENARIOS

1. Shop Floor to Top Floor
2. Machine to Machine
3. e-Commerce Integration
4. Machine Cloud
5. Supplier Integration & Direct Replenishment
6. People Integration
7. Business Network Integration
8. . . .

Key Enablers



Comprehensive Integration *E2E*

→ Integrated business processes

Human Factor Support *E2E*

→ Intuitive and efficienct user guidance

Insight to Action *E2E*

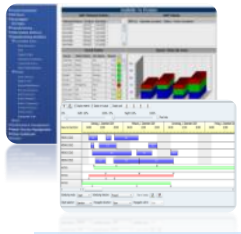
→ Performance management and manufacturing analytics in near real time – that automatically trigger smart action

. . . powered by open platforms and common technology and communication standards

SAP Open Integrated Factory

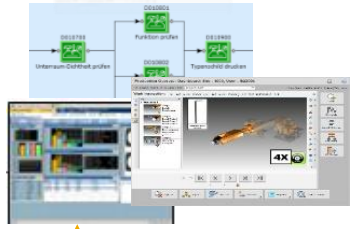
SAP Web Shop

- Product configuration
- Select custom logo plate
- Describe individualization
- Place order
- Sales order status update



SAP ERP

- Production plan
- Bill of materials (BoM)
- Variant management
- Production steps
- Serial Numbers
- Quality results per lot
- Order confirmation
- Inventory update & equipment usage



SAP MES (ME & MII) *ORCHESTRATION*

- Production details management
- Detailed and flexible
- Production steps / routing
- Shop floor controls for each step
- Log parametric data
- Tolerance checks
- Return „conformance“ or „non-conformance“ decisions
- Update device history record

Connectors

SAP PCo OPC UA

- Caching of master/recipe data – shop order data – routing options
- Mapping of ME production details to PLC control parameters (recipe)
- Mapping of data returned from PLC to ME production details
- Buffering of data
- Transfer data to orchestration layer

Machine as a Service

OPC UA SOA PLCs (Machine)

- Empty material carrier available
- Requests order + control parameters from orchestration layer
- Machine Unit reports completion of particular job and requests next operation

Ask questions differently – ask *N E W* questions !

⇨ **What does „LOT SIZE of 1“ actually mean?**

⇨ **How should FLEXIBILITY in production be interpreted?**

- Eliminate the management of business logic (⇨ machine parameters) from the automation layer
- Don‘t program – c o n f i g u r e !
- Your production control system (MES) can adequately support any operation‘s execution mode (⇨ manual / automated)
- Your manufacturing execution system should take the role of an **ORCHESTRATION LAYER**
- Not all functions and features required to execute as planned / as specified need to be provided by one single-source IT system ⇨ be smart – integrate!

ebm-papst: 2015 Winner of the "Landmarks in the Land of Ideas" Contest

*"Urban Space. Rural Space. Cyber Space! Innovations for a Digital World." **

Because of its networked production process enabled by SAP Manufacturing Execution, German fan and motor producer **ebm-papst was named one of the 100 winners of the 2015 contest** staged by the "Germany – Land of Ideas" initiative.

** 2015 contest theme*

With more than 15,000 products and 650 engineers and technicians, ebm-papst implemented SAP MES in 2009 to centralize control of its production operations.

As a result, its suppliers and international locations are incorporated fully in the digital information flow. And employees can also track an individual product's status at any point in the production process.

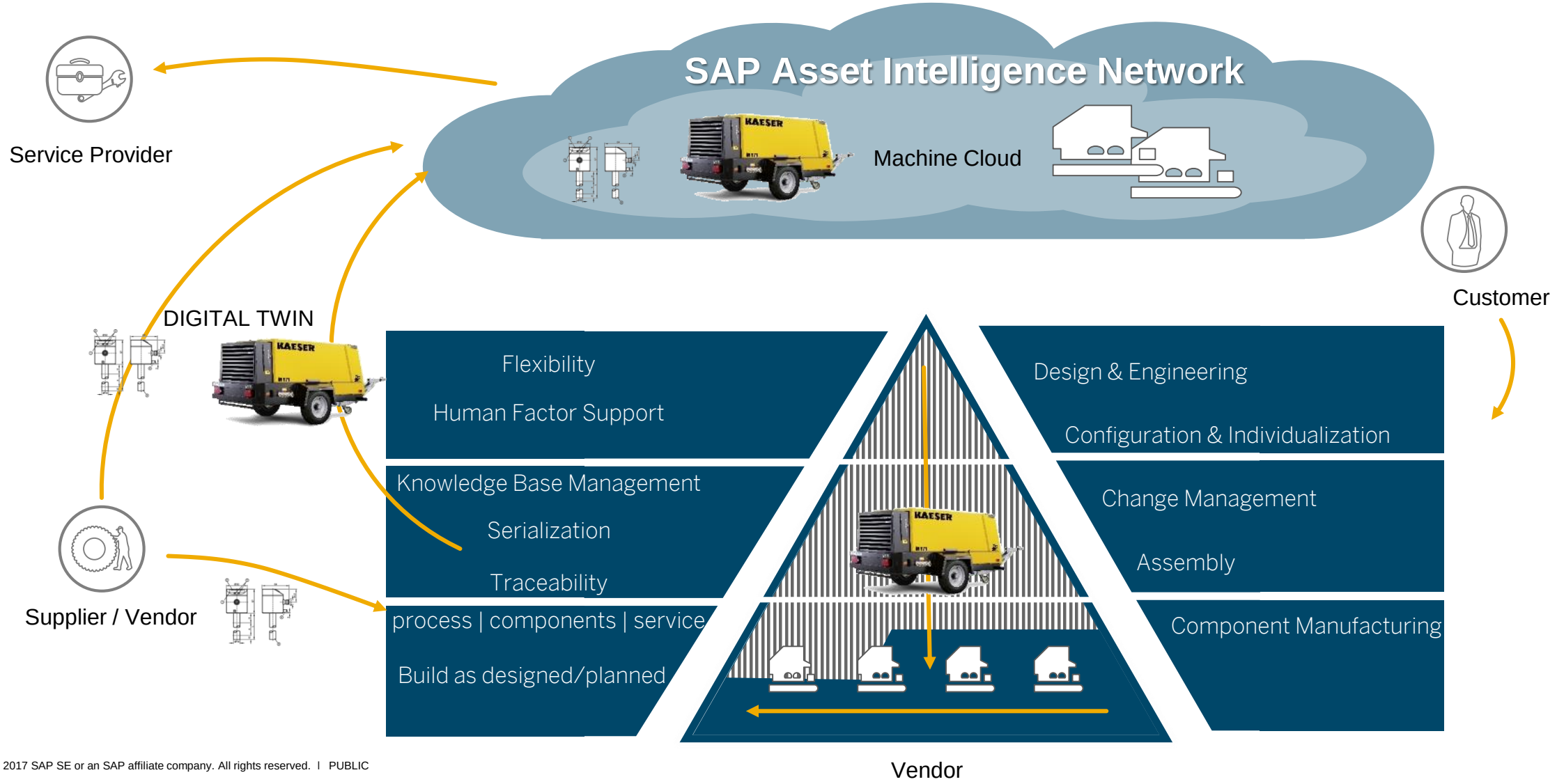
"The benefit of IoT for our customers is our high flexibility with regards to new requirements. We can offer a high number of varieties with different lot sizes at short supply times."

Patrick Reinwald – ITP Head of Industry Solutions and Intelligence, ebm-papst
at SAP Executive Summit IoT – Berlin, September 16/17, 2015

Customer Video

KAESER Mobilair

Compressed Air – from Idea to Performance



Ask questions differently – ask N E W questions !

Which tasks need to be executed in a (near) real-time / fail-safe mode?

Which resources (machines, IT functions, …) are required to support their execution ?

- These are the ones to be run locally – because issues imposed by external telecommunication infrastructure are beyond your control

Manufacturing operations: local or centralized management | on-premise or cloud ?

- All functions and resources that do not need to be available in a fail-safe mode
  - can be managed centrally
  - access to remote (centrally managed) functions and information via web browser, web service, etc.
  - especially reporting and analytical functions will profit from a centralized deployment approach (⇨ TCO) since an eventually high-end solution infrastructure – e.g. necessary to manage multi-source „big data“ and sophisticated real-time analytics – pays off when managed centrally and deployed cross-plant, whether managed on-premise or in the cloud

. . . and there are many more *NEW* questions to be asked !

"Manufacturing in the digital economy requires connected and intelligent solutions that empower production workers, make manufacturing processes more transparent and efficient and enable turning insight into immediate action.

In Industrie 4.0, software and technology are key enablers for innovation."

Bernd Leukert
Member of the Executive Board SAP SE

SAP Open Integrated Factory

Thank you.

Martina Weidner

Solution Advisor Manufacturing & IoT / Industrie 4.0

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