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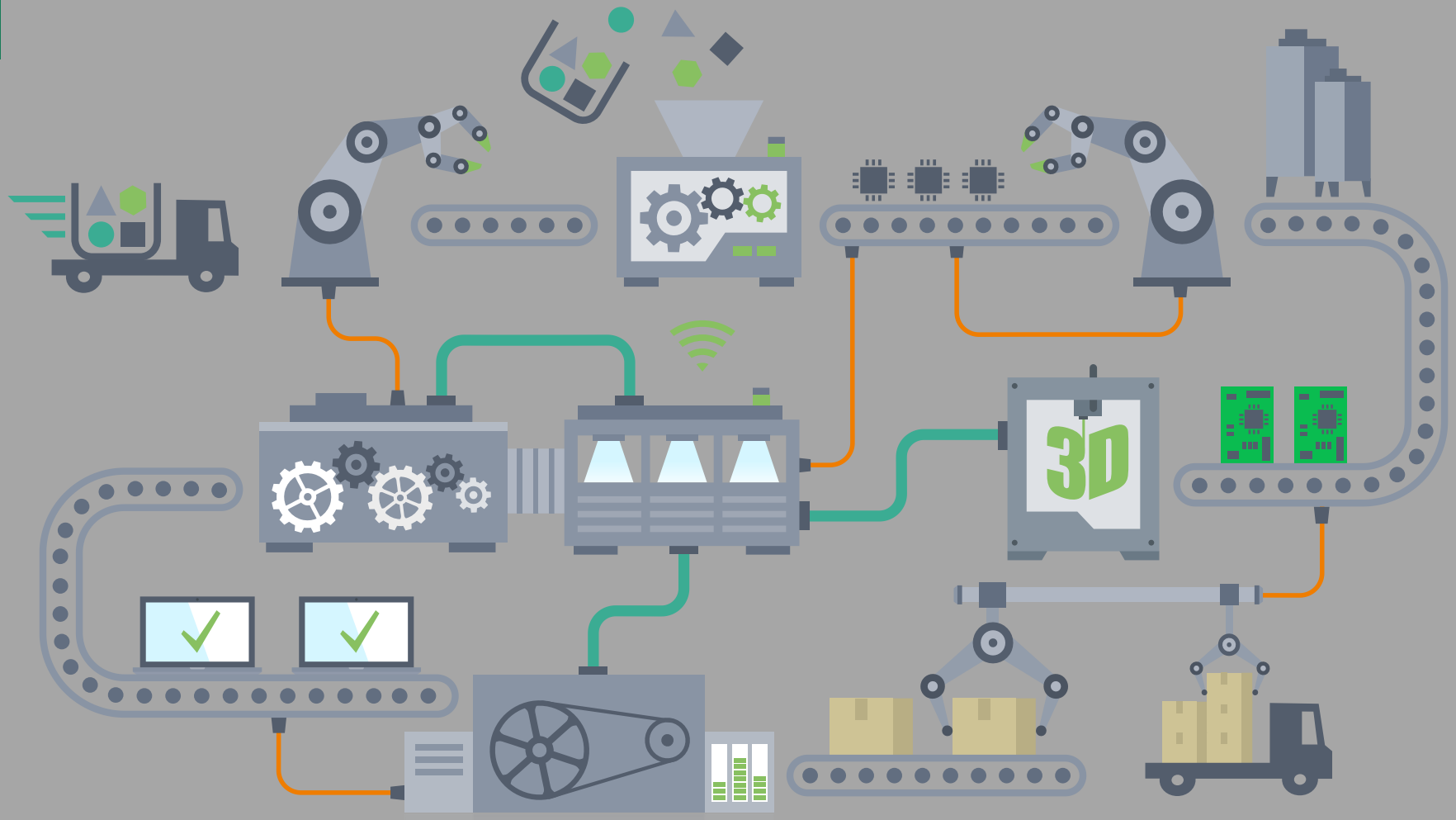

Industry 4.0

17 March 2016

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OUR PERCEPTION OF MANUFACTURING
5 YEARS AGO

TODAY MANUFACTURING IS BECOMING DIGITAL
AND HENCE TRENDY

Industry 4.0 is the fourth level of the industrial (r)evolution

1. Industrial revolution

Historical loom

Through introduction of mechanical production plants using water and steam power

Late 18th century

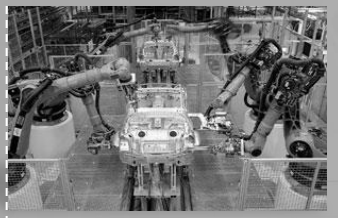
2. Industrial revolution

Automatic animal feeding system in mass production

Through introduction of work-division mass production using electrical energy

Early 20th century

3. Industrial revolution



Automated industrial robot in manufacturing

Through use of electronics and IT to further automate production

Early 1970s

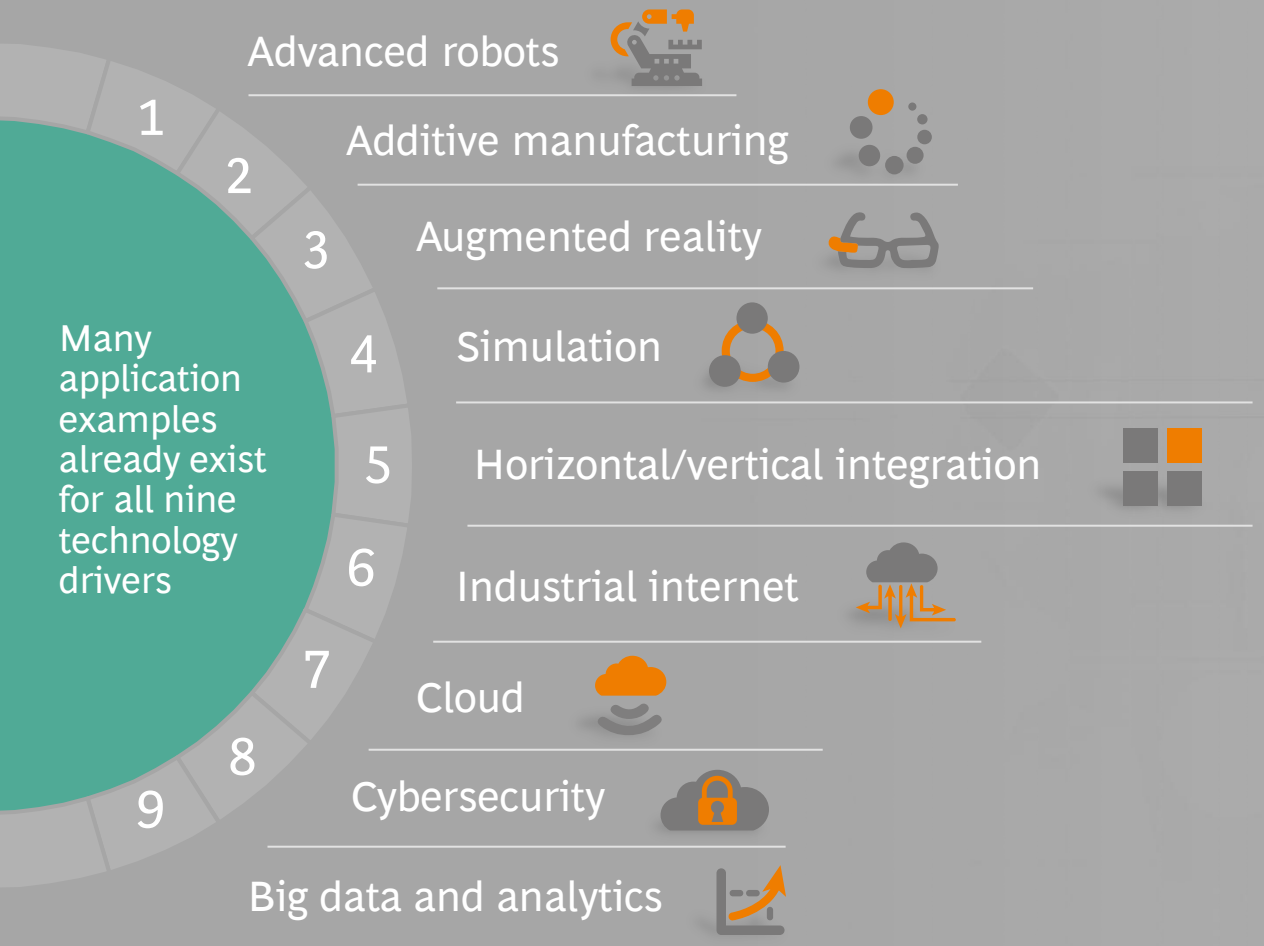
4. Industrial revolution

Connection between physical and digital systems

Based on cyber-physical systems (CPS) and dynamic data processing

Today and in the near future

Nine technology drivers enable physical and digital integration



Nine technology drivers enable physical and digital integration

Many application examples already exist for all nine technology drivers

1. **Advanced robots**
2. Additive manufacturing
3. Augmented reality
4. Simulation
5. Horizontal/vertical integration
6. Industrial internet
7. Cloud
8. Cybersecurity
9. Big data and analytics

- Autonomous, cooperating industrial robots
- Numerous integrated sensors and standardized interfaces

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1. Advanced robots
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- 3D printing, particularly for spare parts and prototypes
- Decentralized 3D facilities to reduce transport distances and inventory

Nine technology drivers enable physical and digital integration

Many application examples already exist for all nine technology drivers

1. Advanced robots
2. Additive manufacturing
3. Augmented reality
4. **Simulation**
5. Horizontal/vertical integration
6. Industrial internet
7. Cloud
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9. Big data and analytics

- Simulation of value networks
- Optimization based on real-time data from intelligent systems

Nine technology drivers enable physical and digital integration

Many application examples already exist for all nine technology drivers

1 Advanced robots

2 Additive manufacturing

3 Augmented reality

4 Simulation

5 Horizontal/vertical integration

6 Industrial internet

7 Cloud

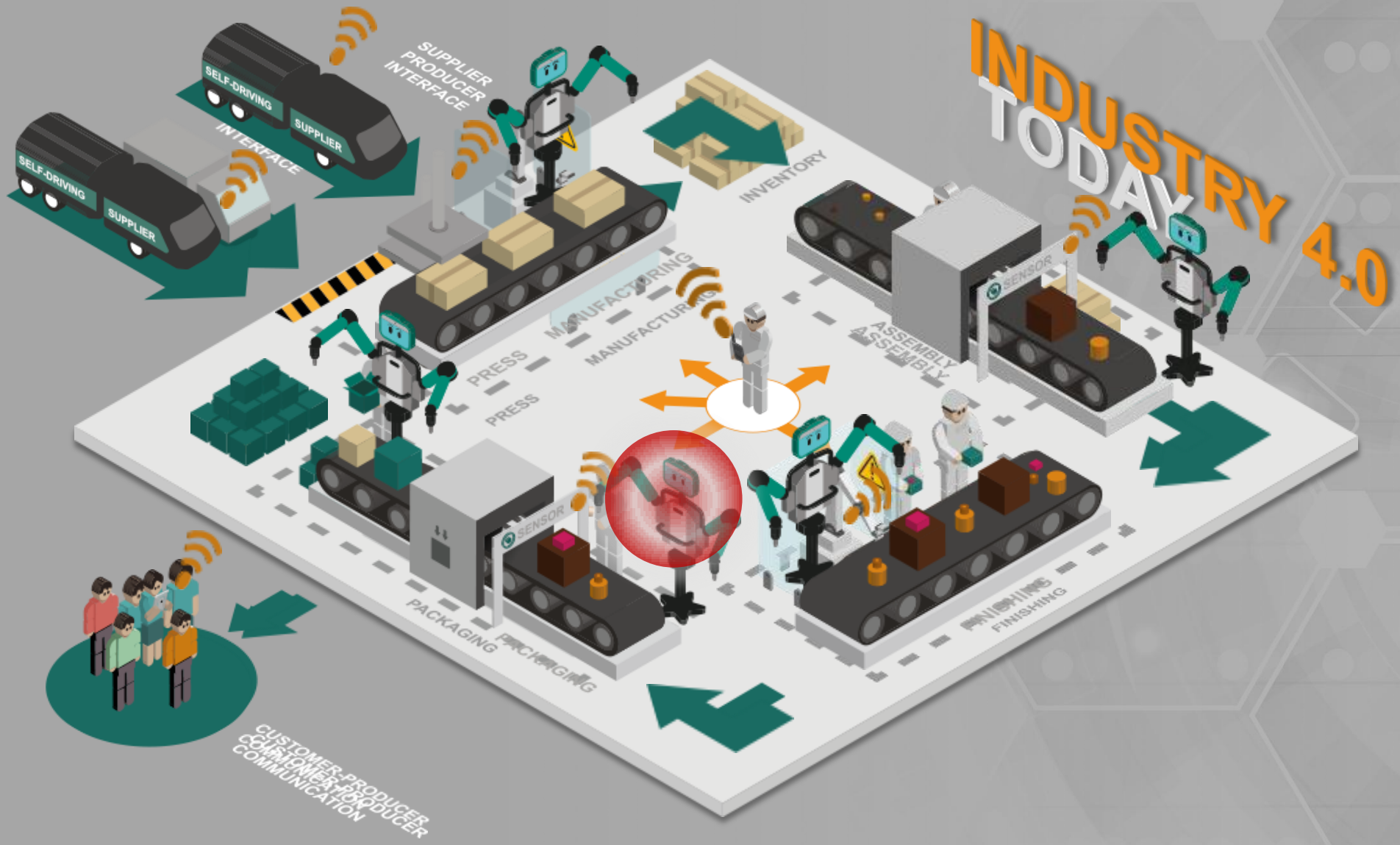
8 Cybersecurity

9 Big data and analytics

- Cross-company data integration based on data transfer standards
- Precondition for a fully automated value chain (from supplier to customer, from management to shop floor)

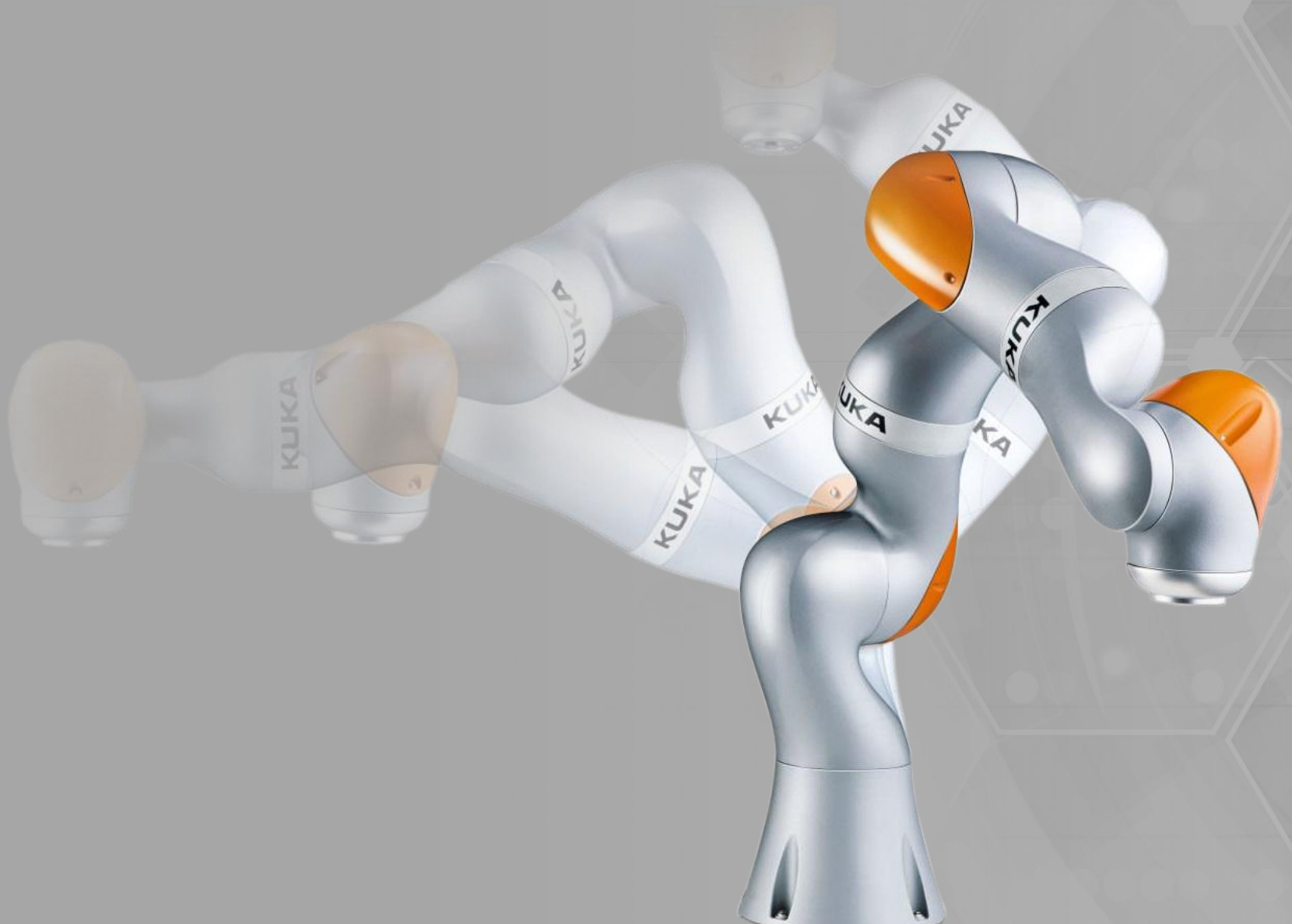
Core idea of I4.0:

From isolated sales to integrated data and production flows



Autonomous and cooperative robots

Optimization of single working stations



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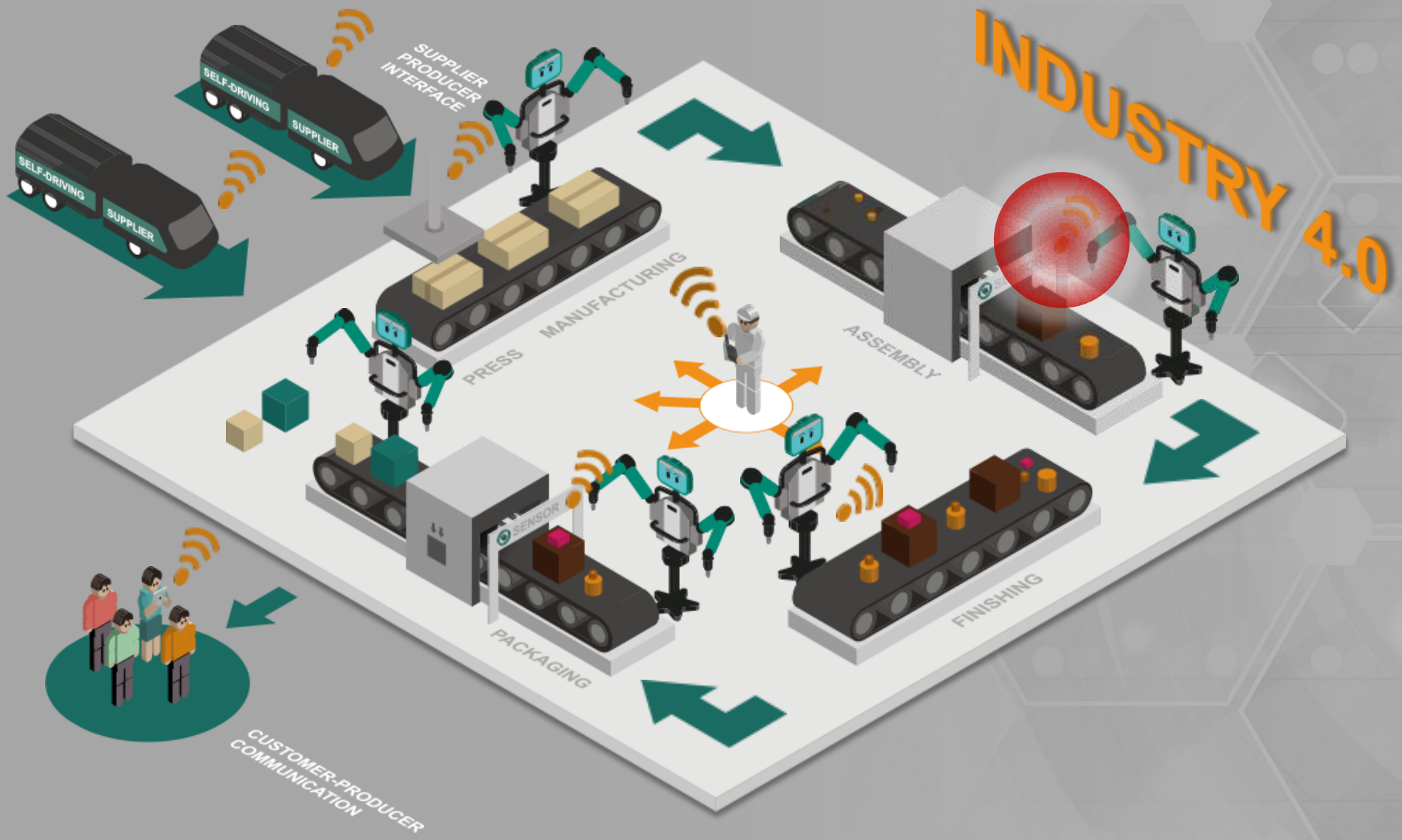
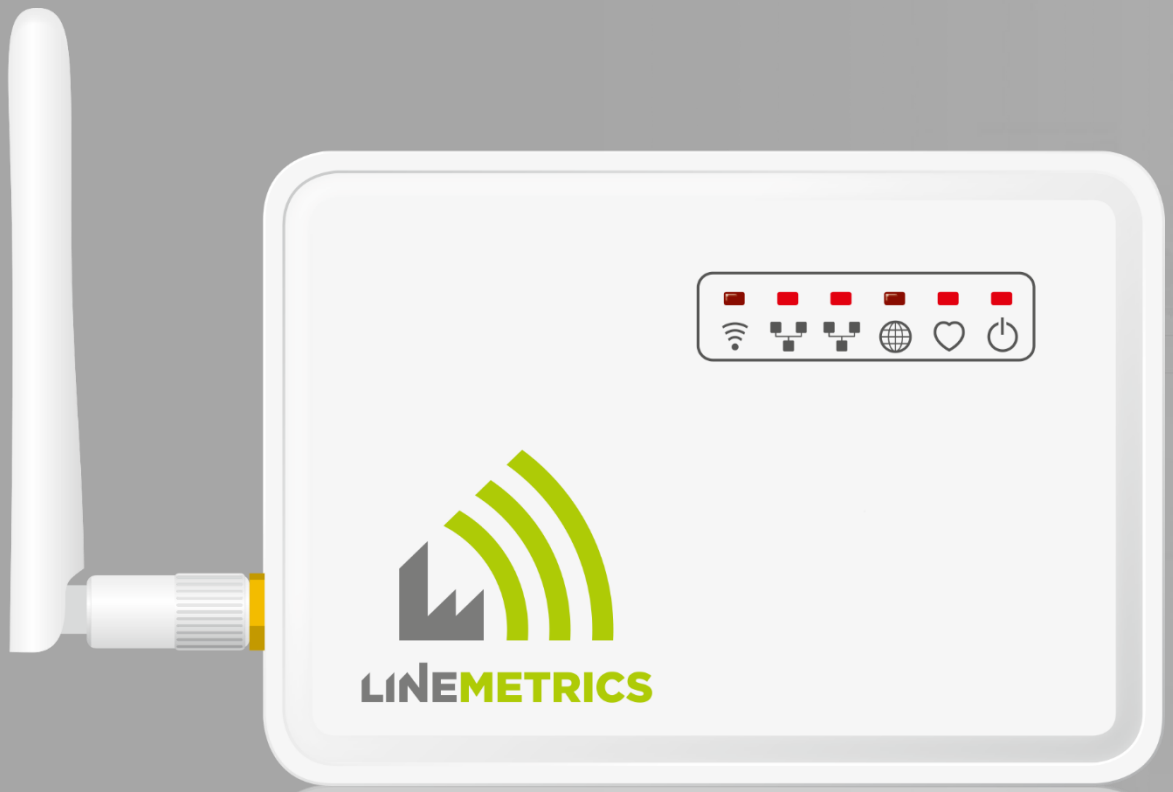


Real time performance tracking by plug & play sensors

Optimization of single machines



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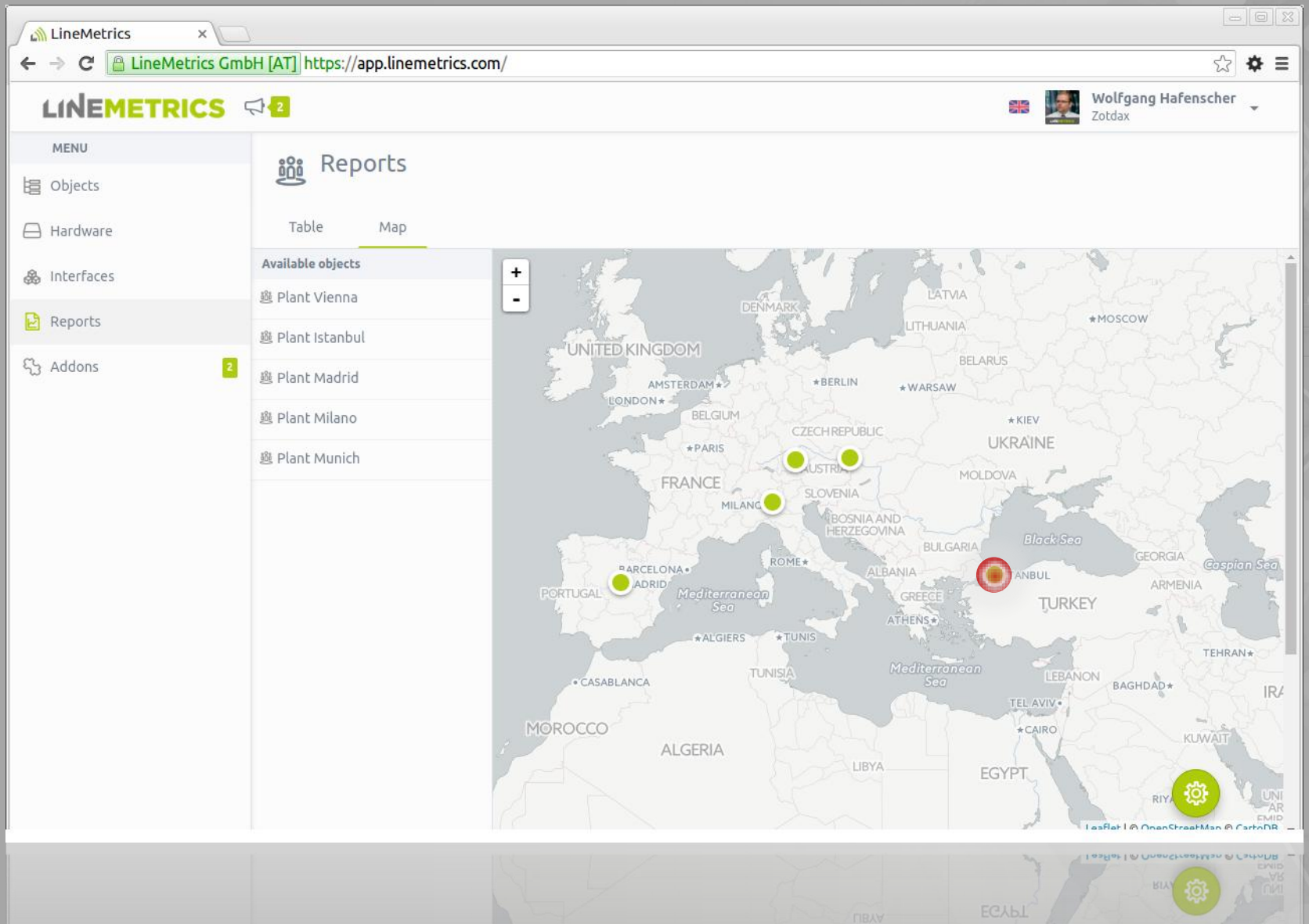

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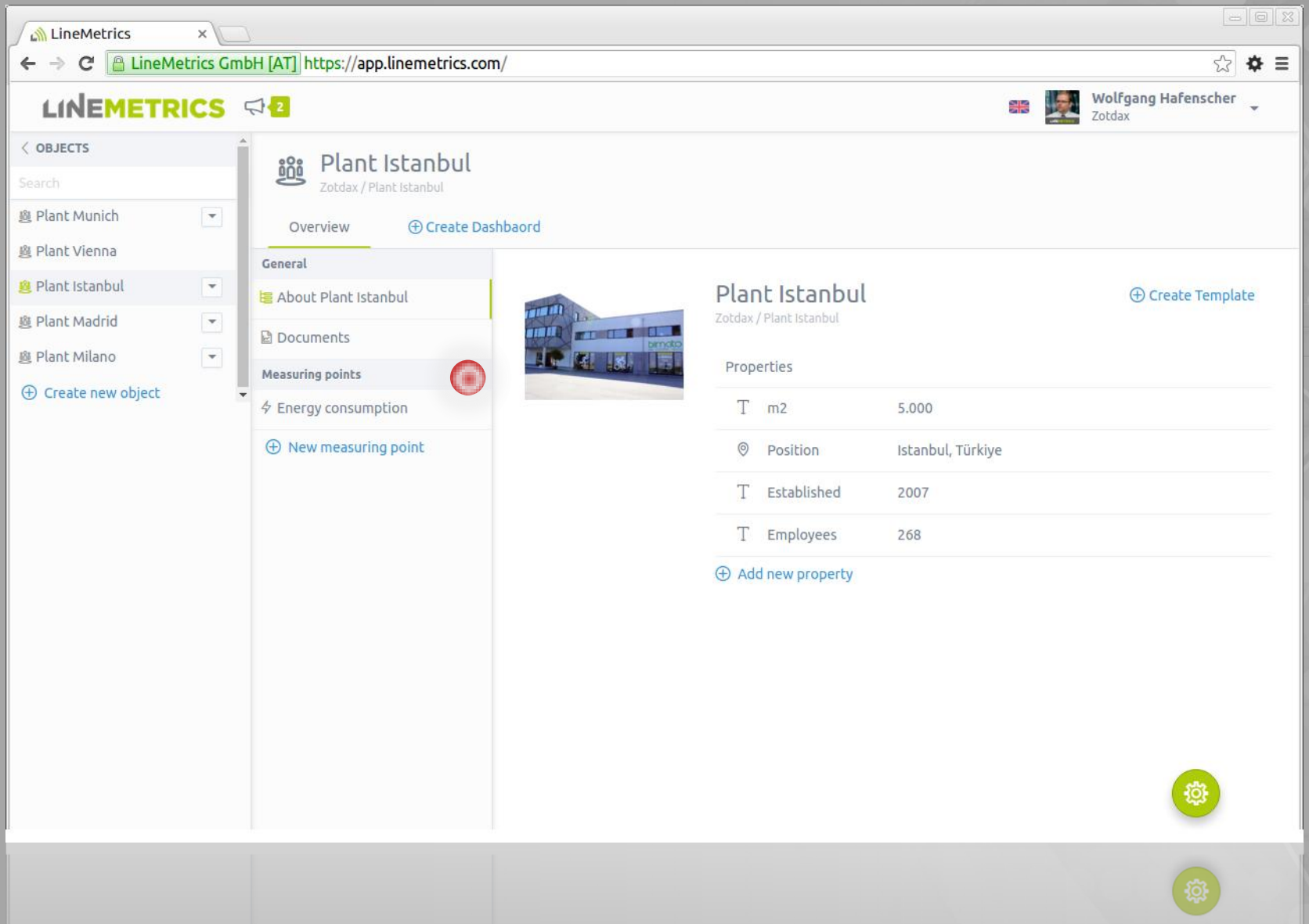

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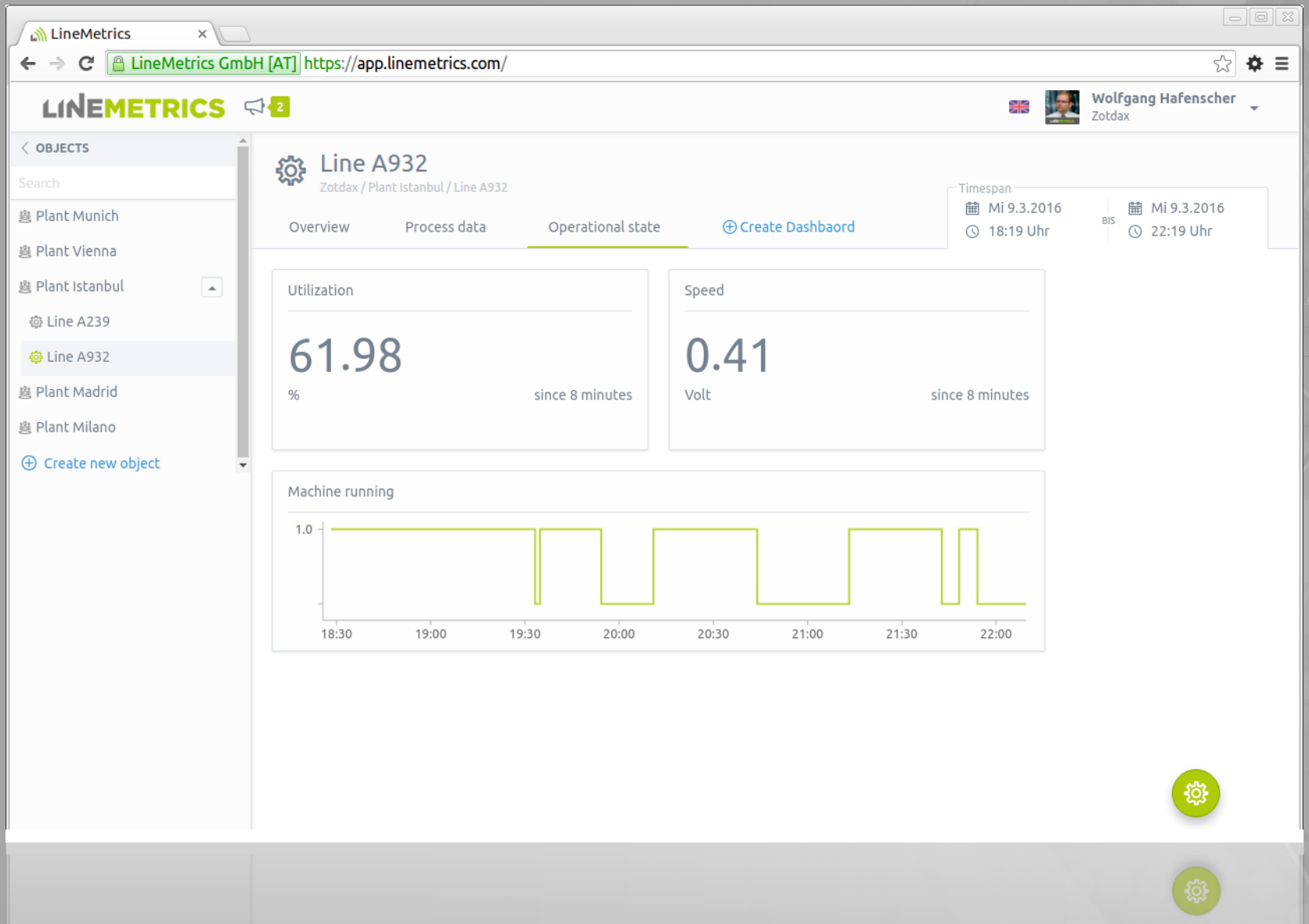

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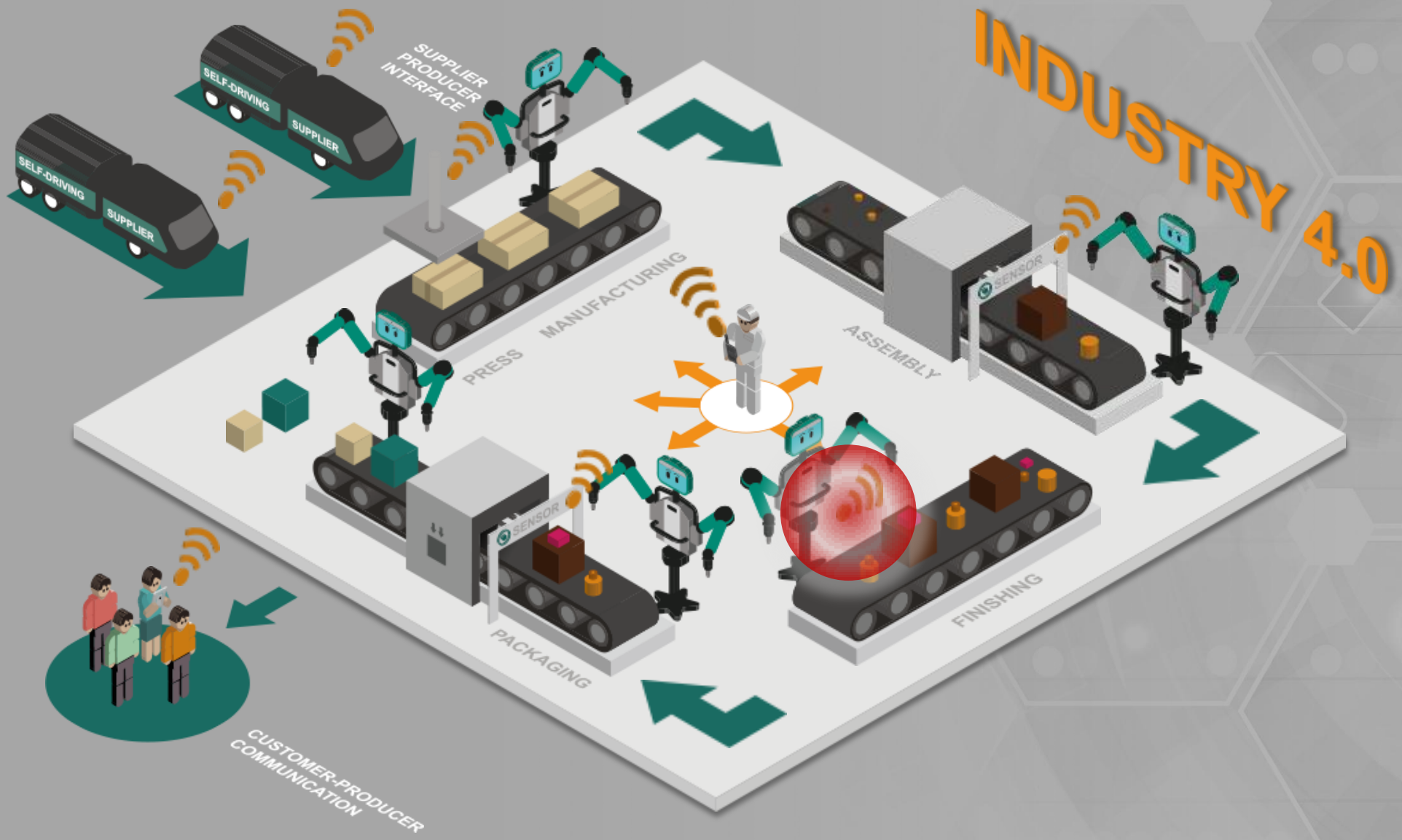
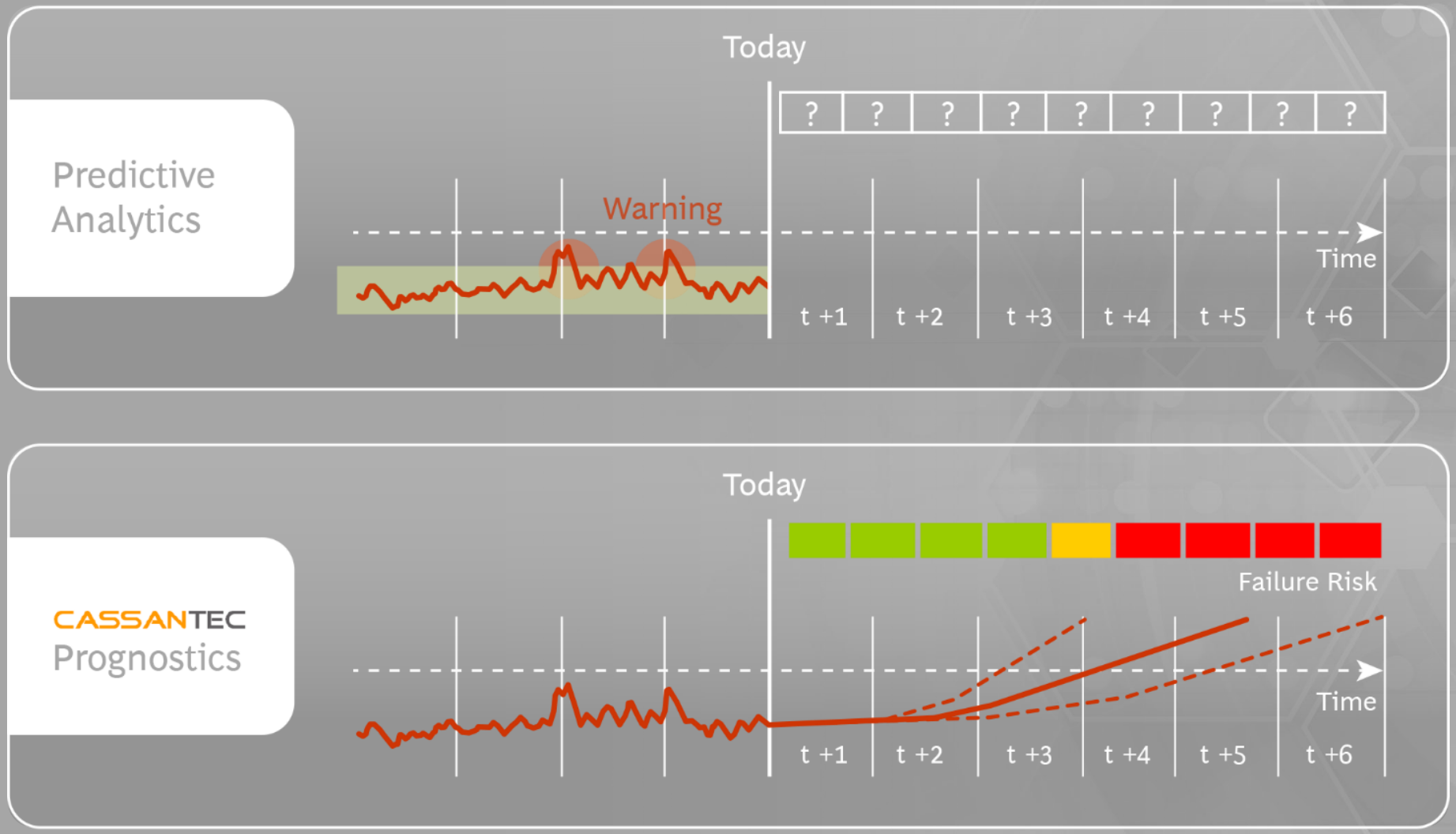


From predictive analytics to prognostics

Optimization of a single machines



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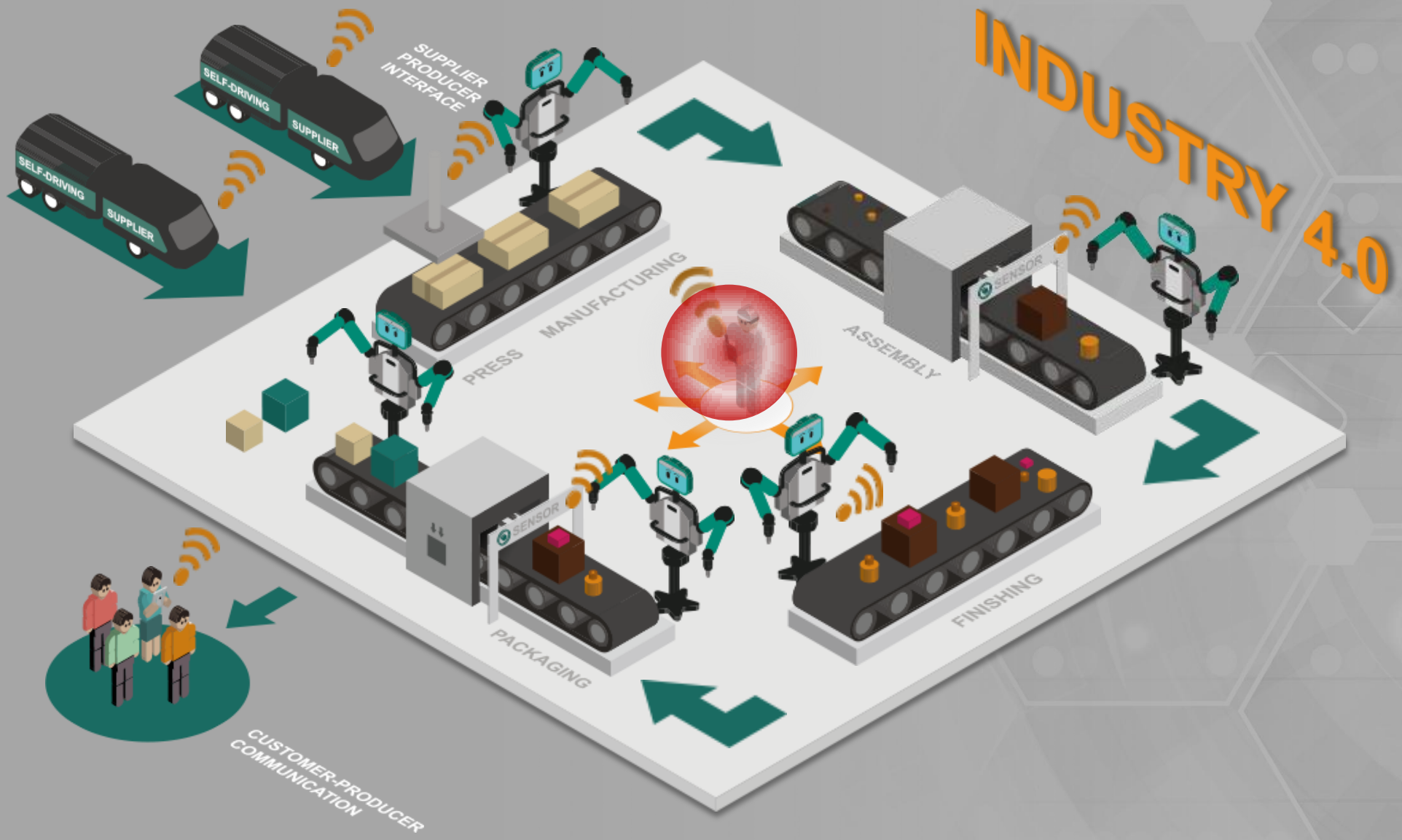
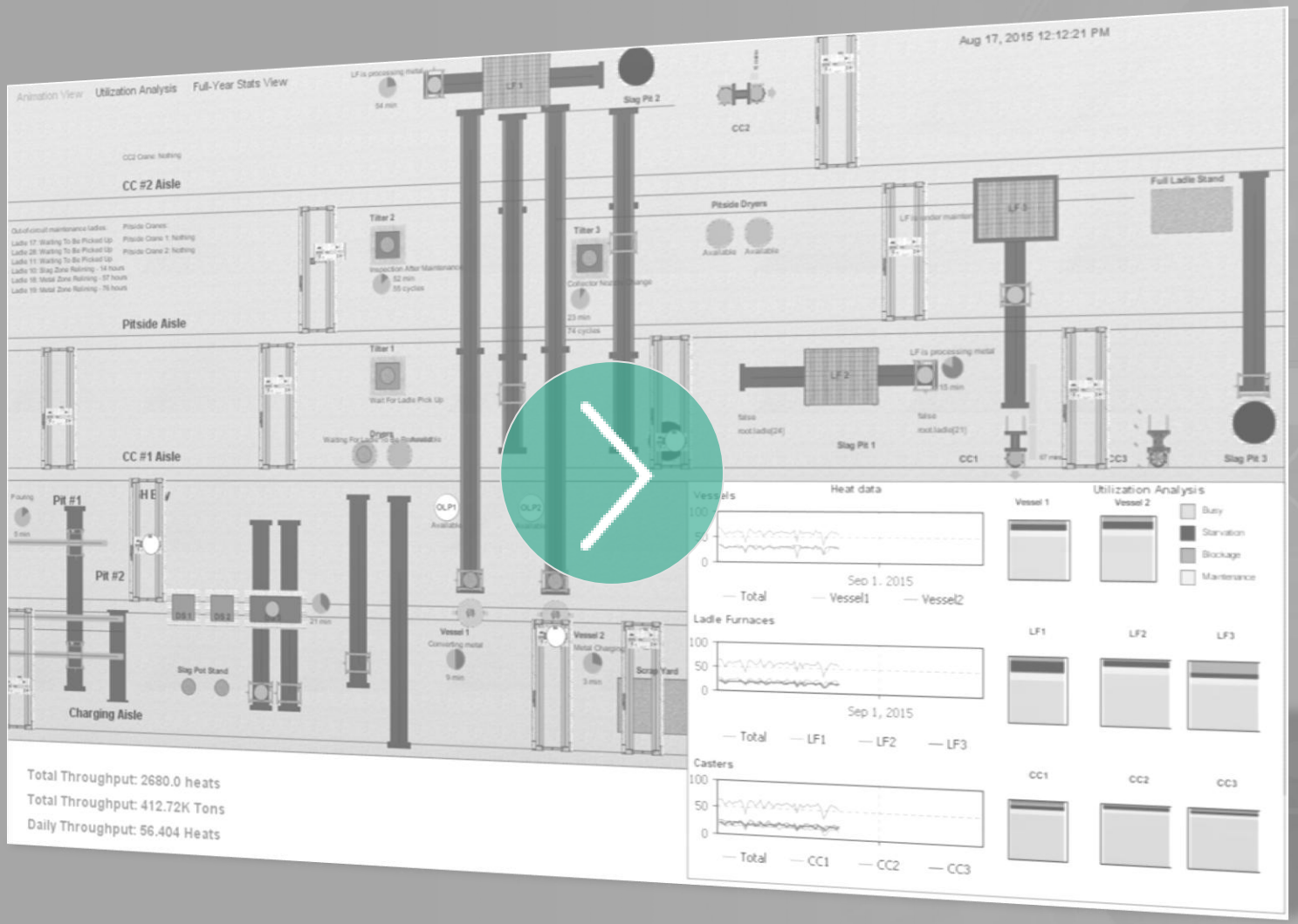


Simulation of plant performance

Optimization on plant level through simulation



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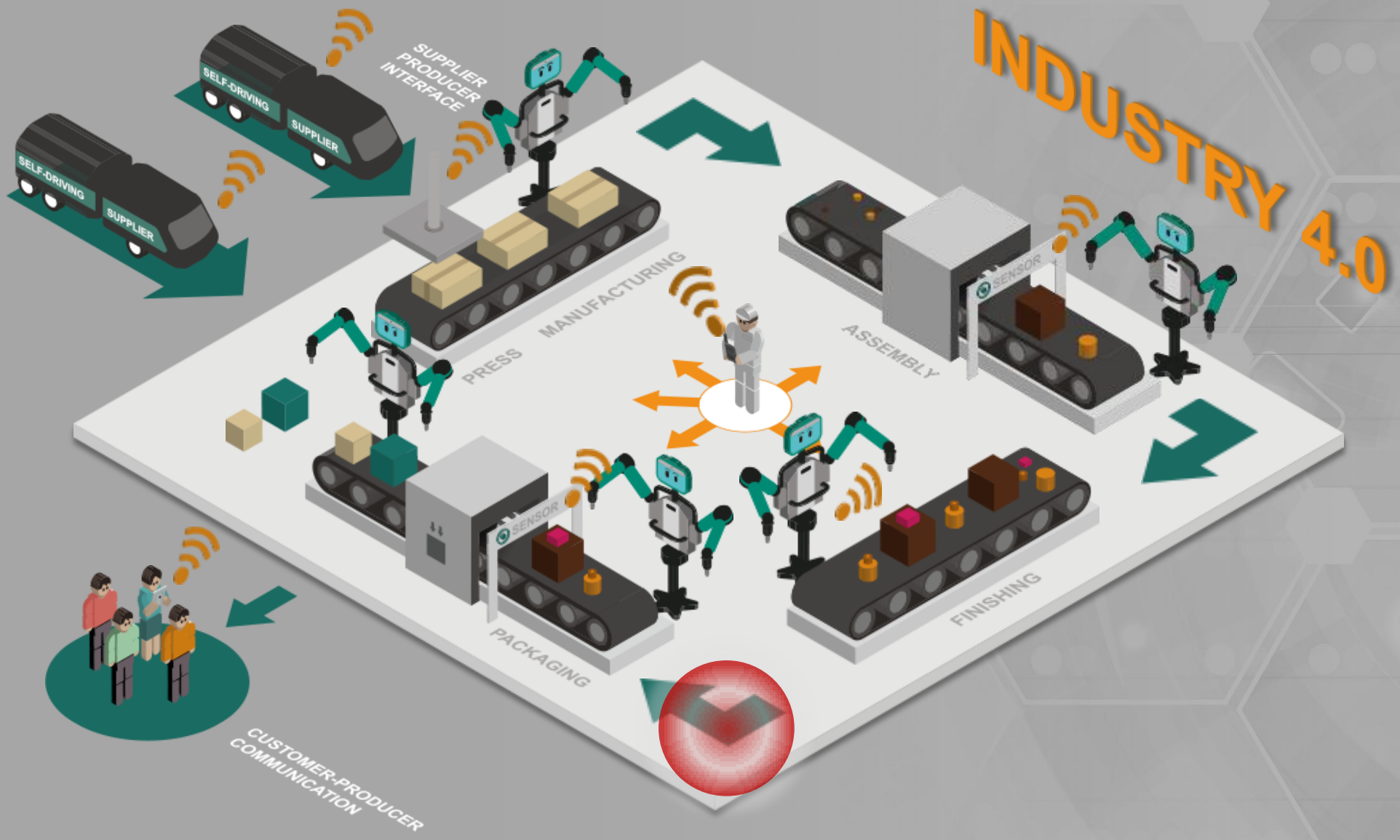
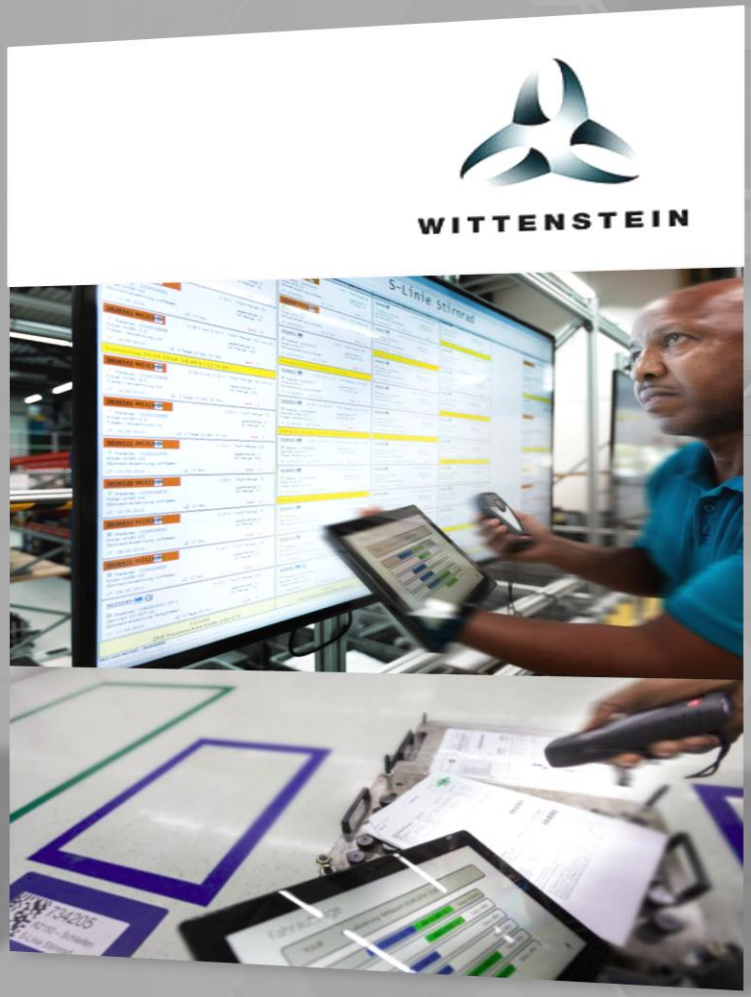


Milkrun I4.0

Optimization of intralogistic process



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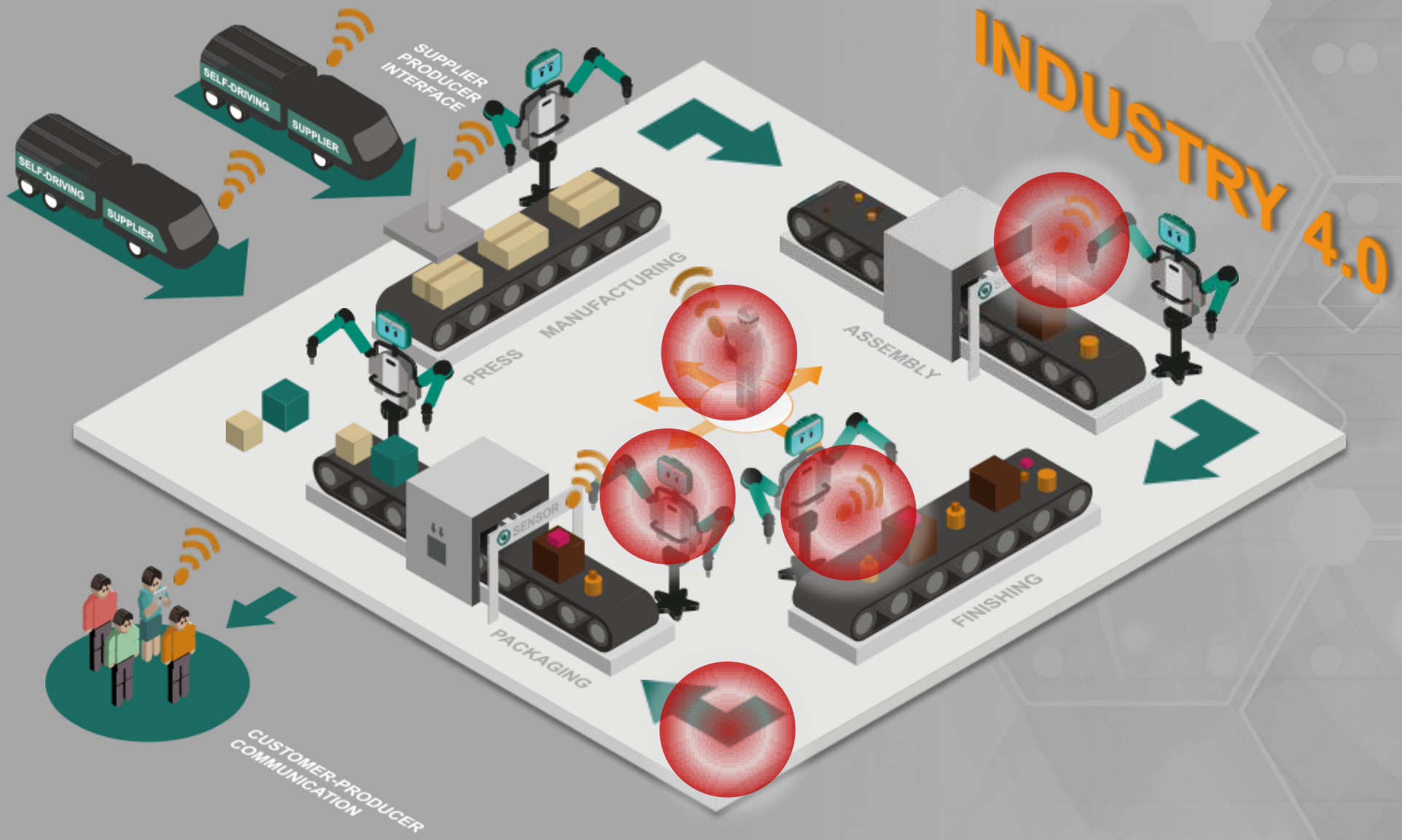
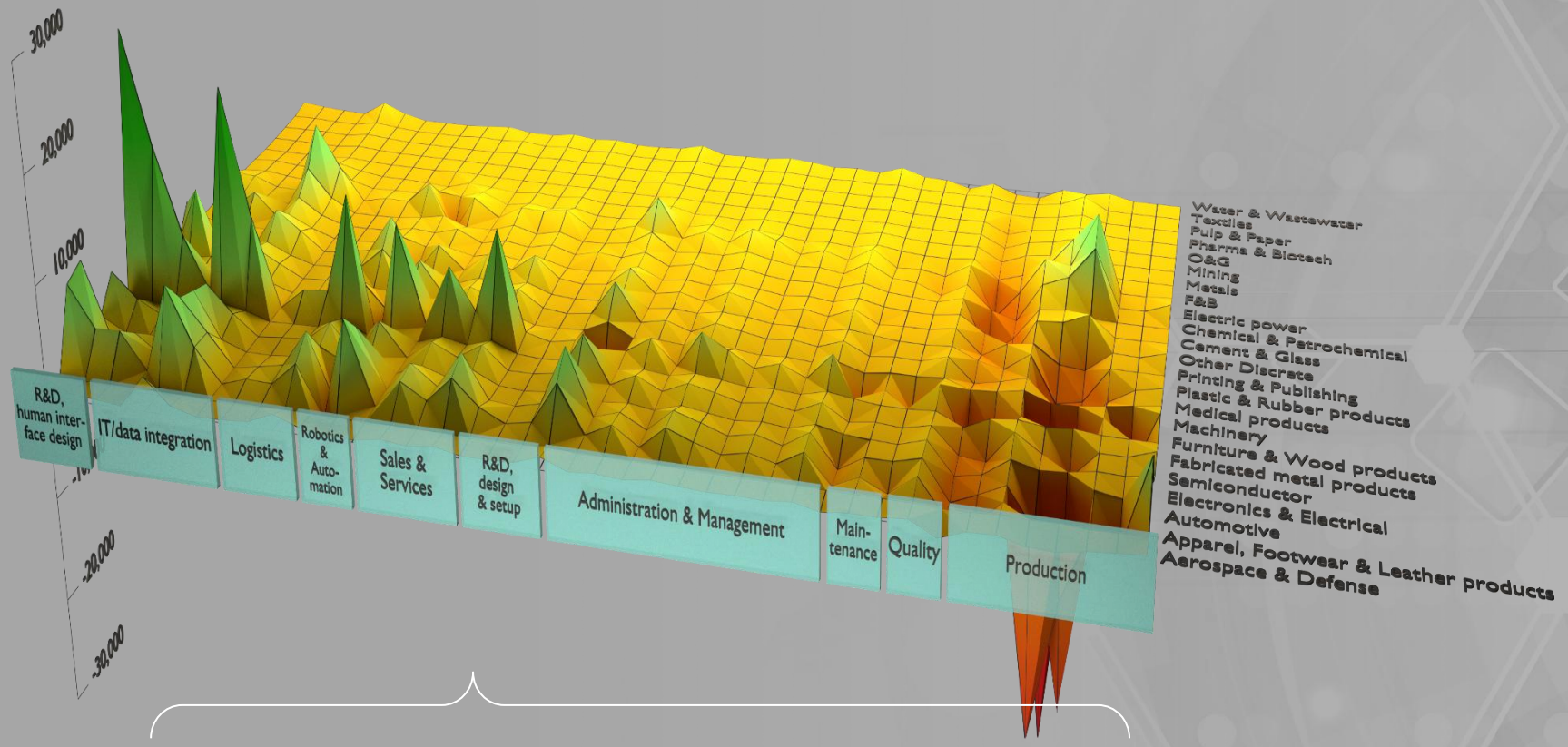


99.99885% quality through integrated data flows and automation

Optimization of complete production flow

Nature of jobs will change



Net 400.000 jobs created:
-600.000 lower skill labor +1.000.000 higher skill / IT

- Why is I4.0 relevant for Turkey?
- What is the I4.0 potential for Turkey?
- What is the impact on labor in Turkey?
- What are companies and government required to do to make I4.0 happen?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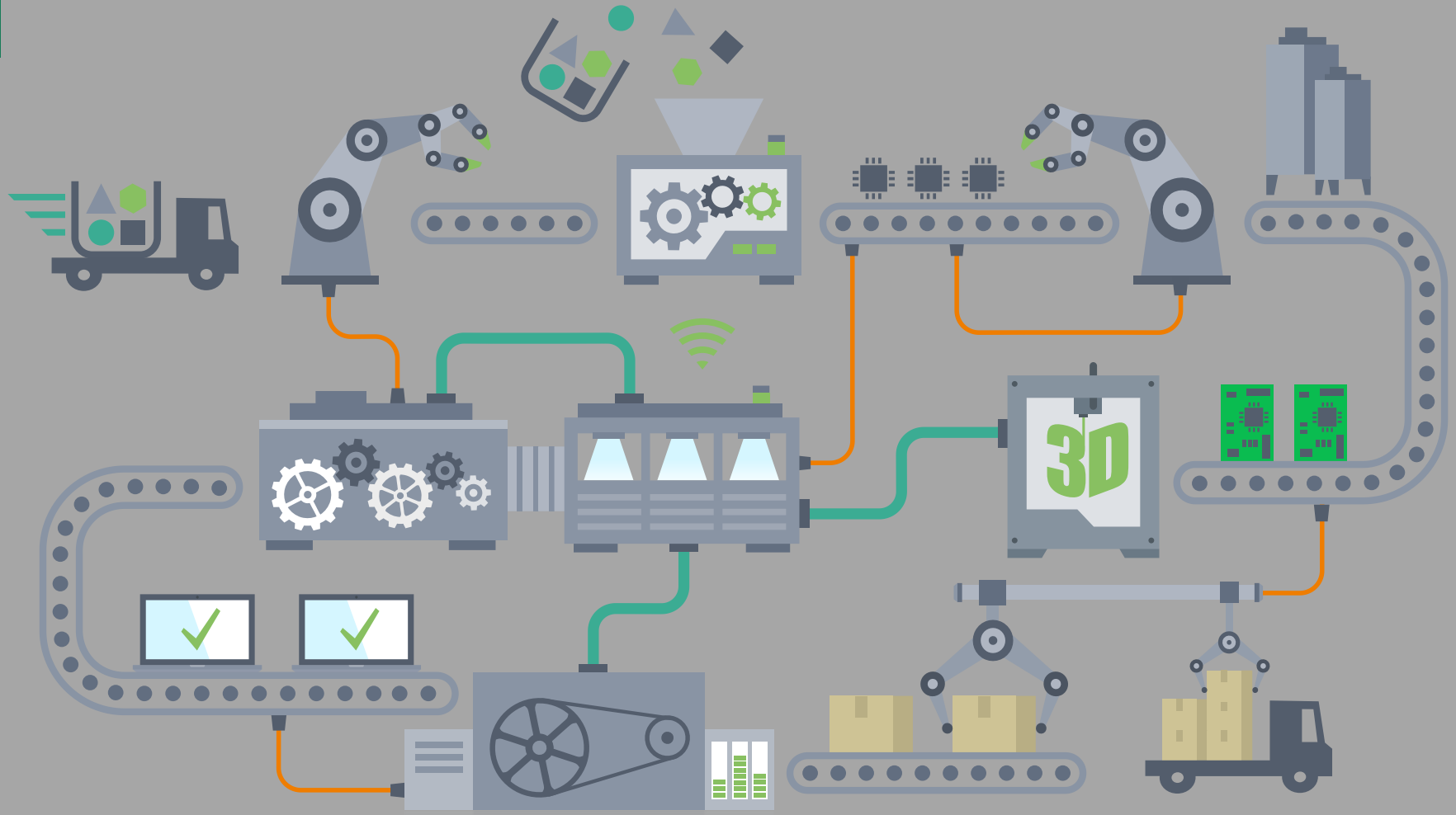

Thank you