

Data challenges and opportunities for the European high-tech industry – ways towards Industry 4.0

Stefan Rohringer

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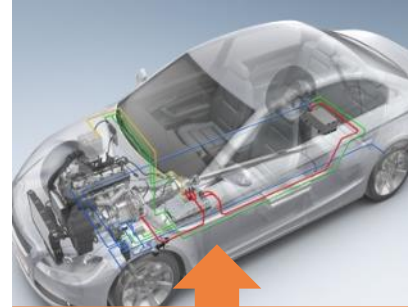
Increasing efficiency and security is key to address global challenges: we are the enabler



More yield on
less arable land



More energy
with less resources



More mobility
with less CO₂



More performance
with less energy



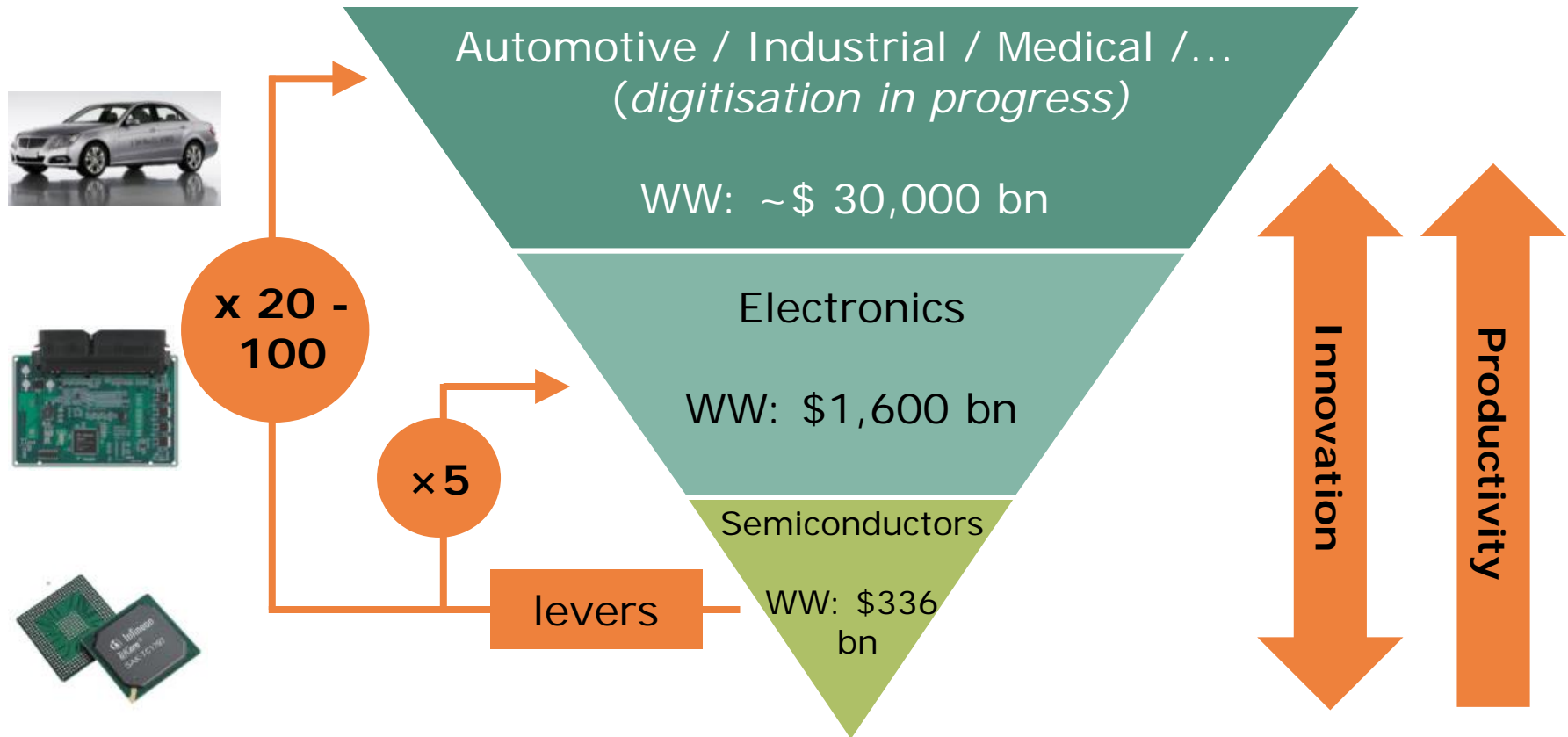
More security
with less user efforts



Courtesy: Bosch



Semiconductors are levers for innovation, productivity and economic growth

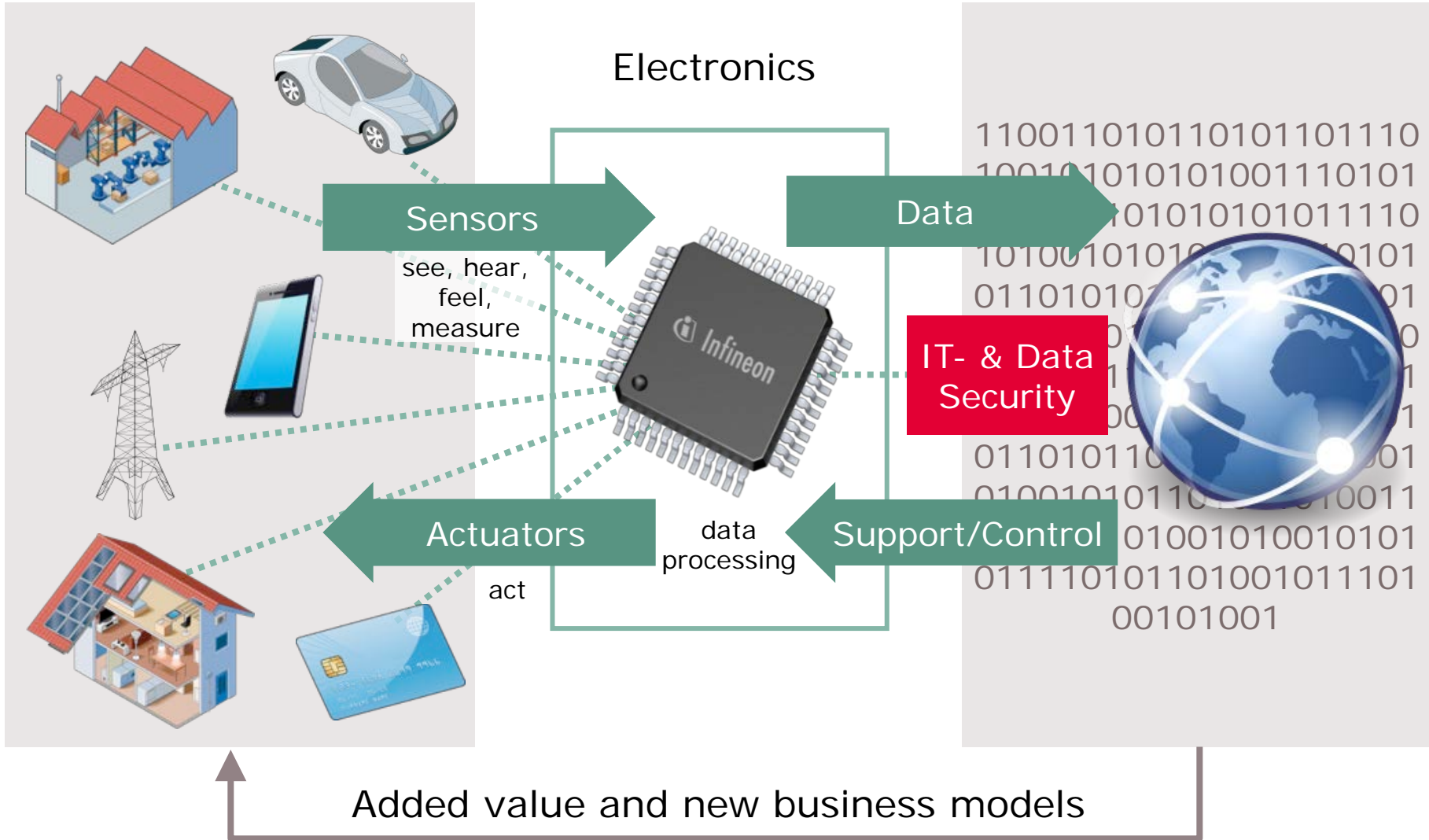



About 45% of the OECD Economic growth since 1985 comes from increased productivity; electronics is a key driver for this growth.

Up to 80% of innovation in automotive is enabled by semiconductors, even more when it comes to Hybrid and EV.

Source: DECISION, ESIA, Future Horizons, IMF, WSTS 2015, AUDI, OECD Factbook 2013

Semiconductors are the crucial link between the real and digital worlds



The background of the advertisement is a collage of three photographs. The top-left photo shows a close-up of a young child's face, sleeping peacefully. The top-right photo shows a woman with dark, curly hair, smiling broadly and looking towards the camera. The bottom-left photo shows a man wearing safety glasses and a white lab coat, working on a circuit board in a laboratory setting. The images are separated by white geometric lines and dots, creating a modern, interconnected look.

We make life easier, safer
and greener – with technology
that achieves more, consumes
less and is accessible to
everyone. Microelectronics
from Infineon is the
key to a better future.

Part of your life.
Part of tomorrow.

Infineon at a glance

- › Combined **pro-forma revenue of ~€5,150m*** (~\$6,950m) in Infineon 2014 fiscal year
- › About **35,000 employees worldwide*** (as of June 2015)
- › Strong technology portfolio with more than **22,800 patents and patent applications** (as of September 2014)
- › **33 R&D locations; 20 manufacturing locations**



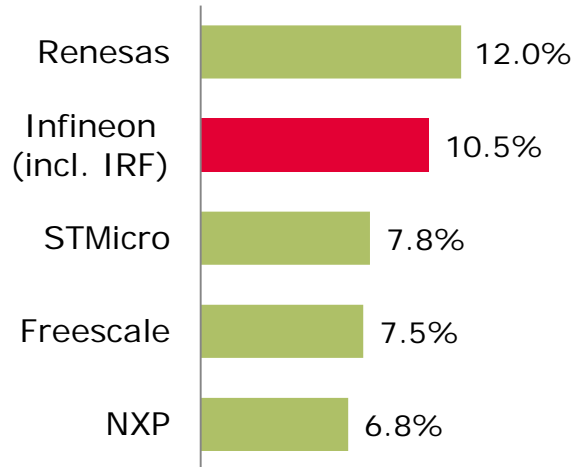
*non-audited figures

Top positions in all our major product categories



Automotive semiconductors

total market in 2014:
\$27.5bn

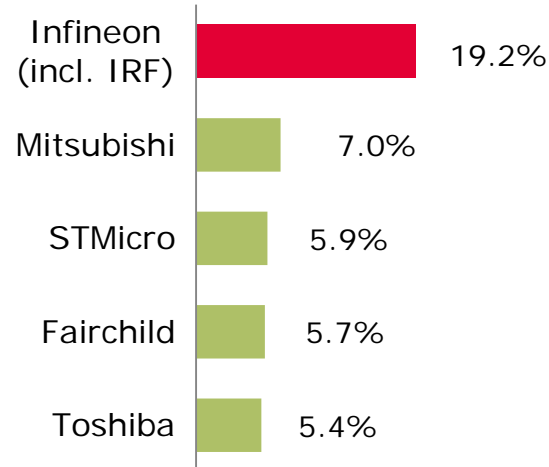


Automotive semiconductors incl. semiconductor sensors.

Source: Strategy Analytics,
April 2015

Power semiconductors

total market in 2014:
\$16.2bn

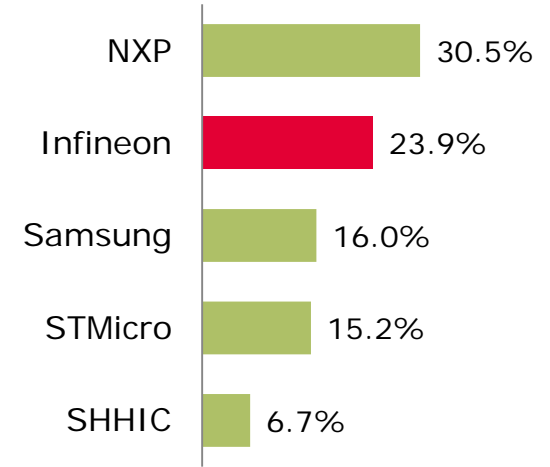


Discrete power semiconductors and power modules.

Source: IHS Inc., September 2015

Smart card ICs

total market in 2014:
\$2.63bn

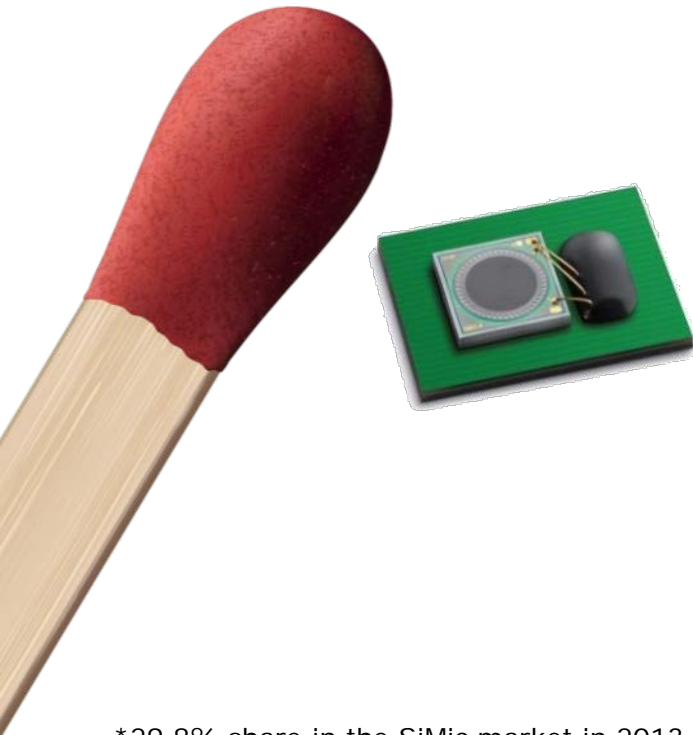


Microcontroller-based smart card ICs.

Source: IHS Inc., July 2015

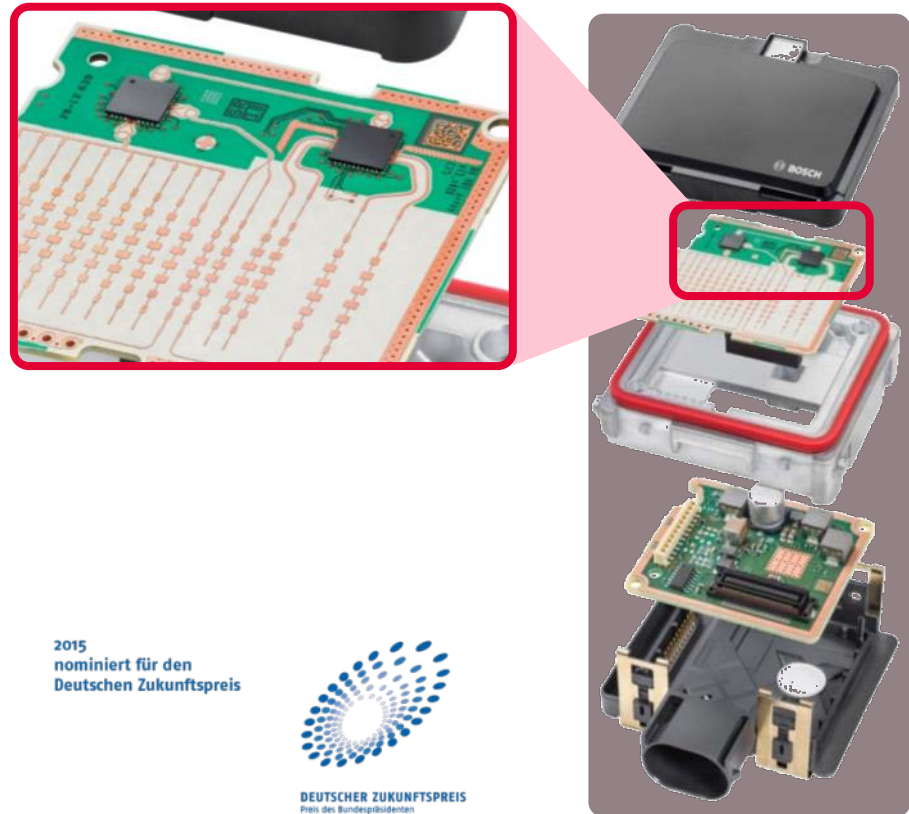
We make life easier, safer and greener – two examples

With products that provide steady growth*: Silicon Microphone



*29.8% share in the SiMic market in 2013 CY

With products that can save lives:
77 GHz Radar Chips for cars



2015
nominiert für den
Deutschen Zukunftspreis



Photo: Bosch

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Worldwide manufacturing sites will collect & exchange data in real time for optimization



Big data usage, interconnectivity and Industry 4.0 are essential for semiconductor manufacturers to successfully compete in the market.

Semiconductor frontend fabs are highly complex production systems

Furnace



Implant



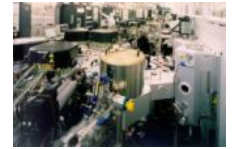
Defect Density



Etch



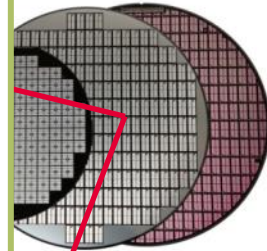
PVD / MCVD
(Physical Vapor
Deposition)



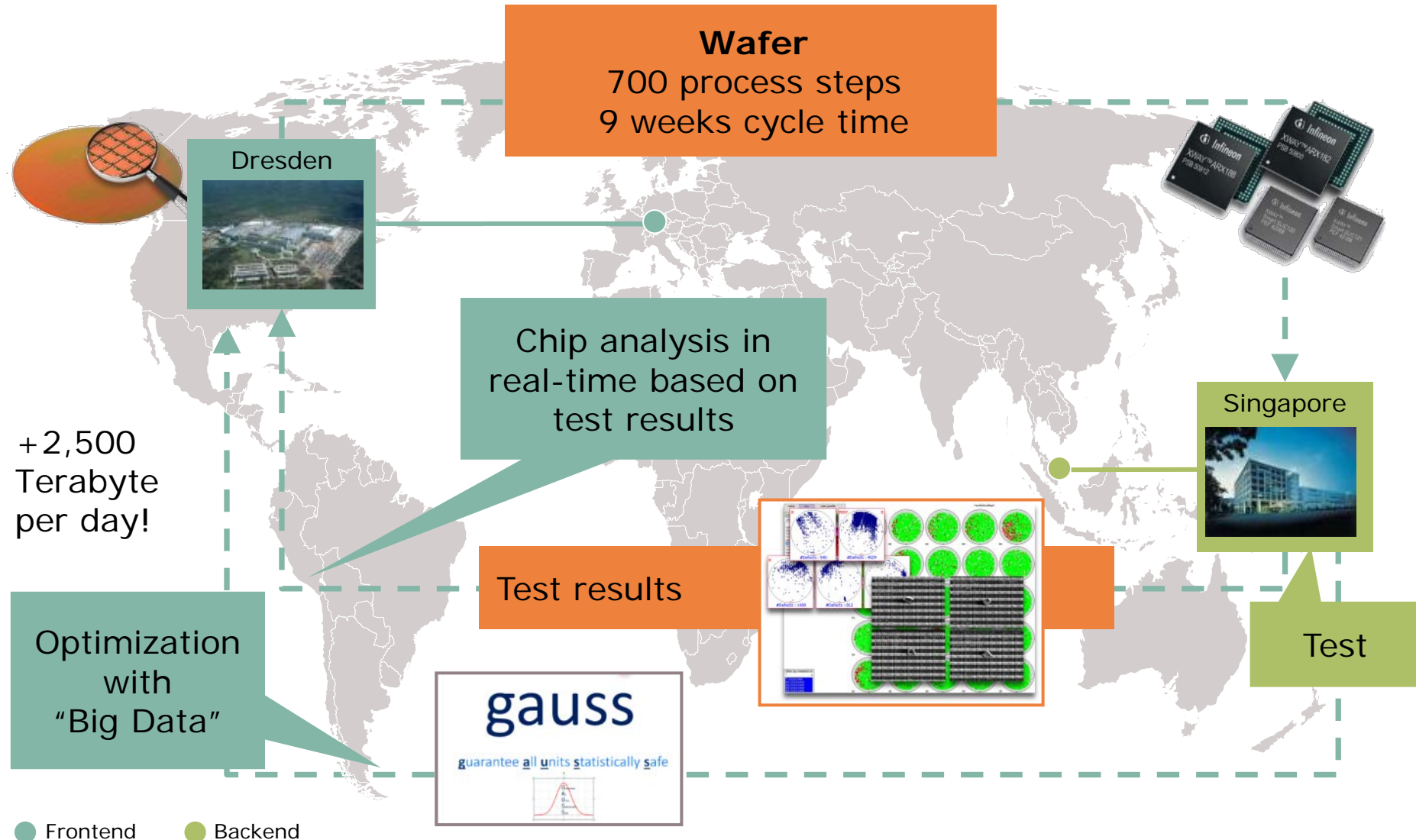
Start

Example of manufacturing site Villach:

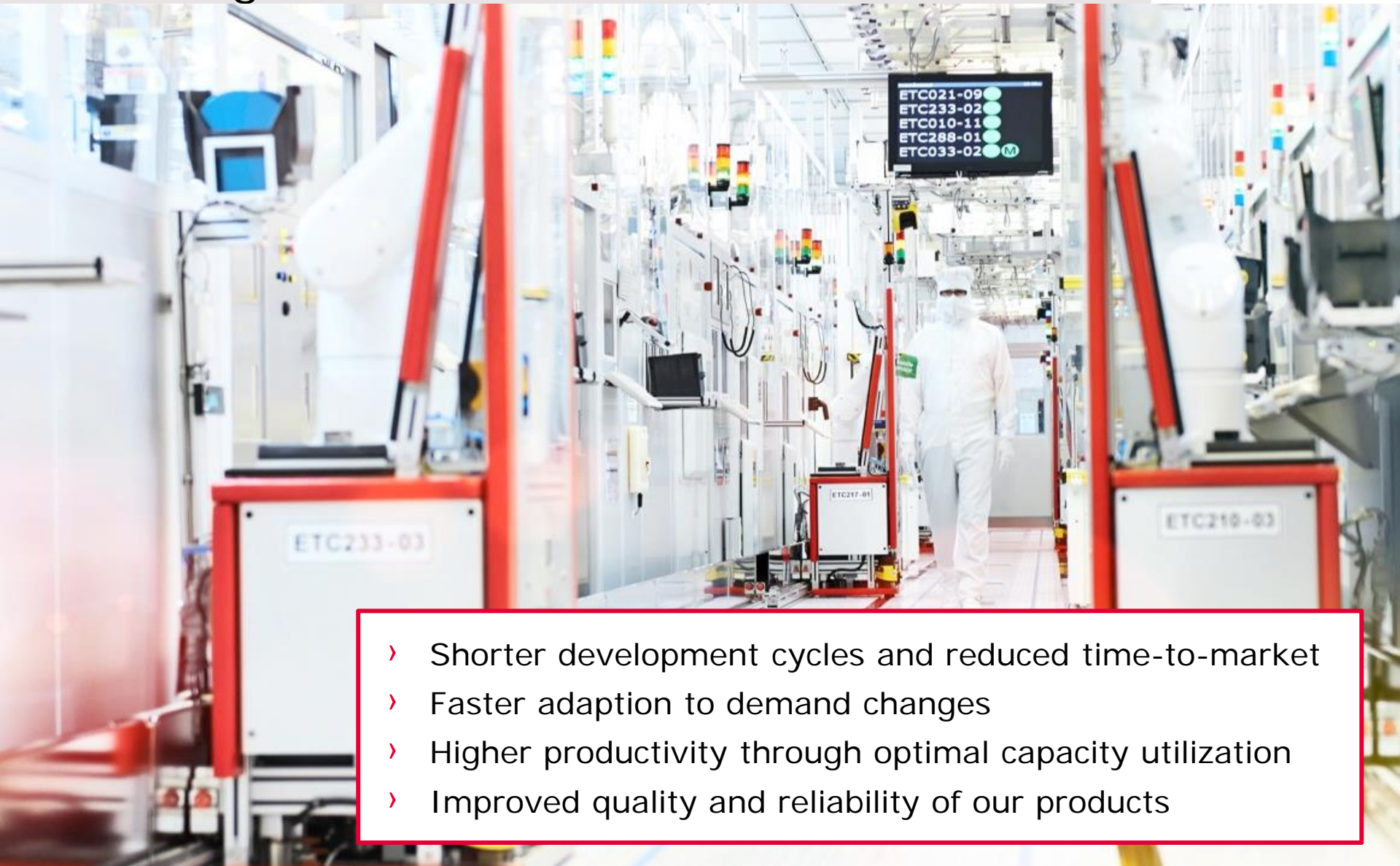
- › 22,000m² class 10+ clean room with more than 1,500 plants
- › About 1,500 products in process at the same time
- › Up to 1,200 individual process steps per wafer
- › 800,000 wafer movements per day
- › Up to 15 km distance covered per wafer
- › Production runs 24/7 and 365 days/year



A real-time integrated value chain improves learning speed and time-to-market

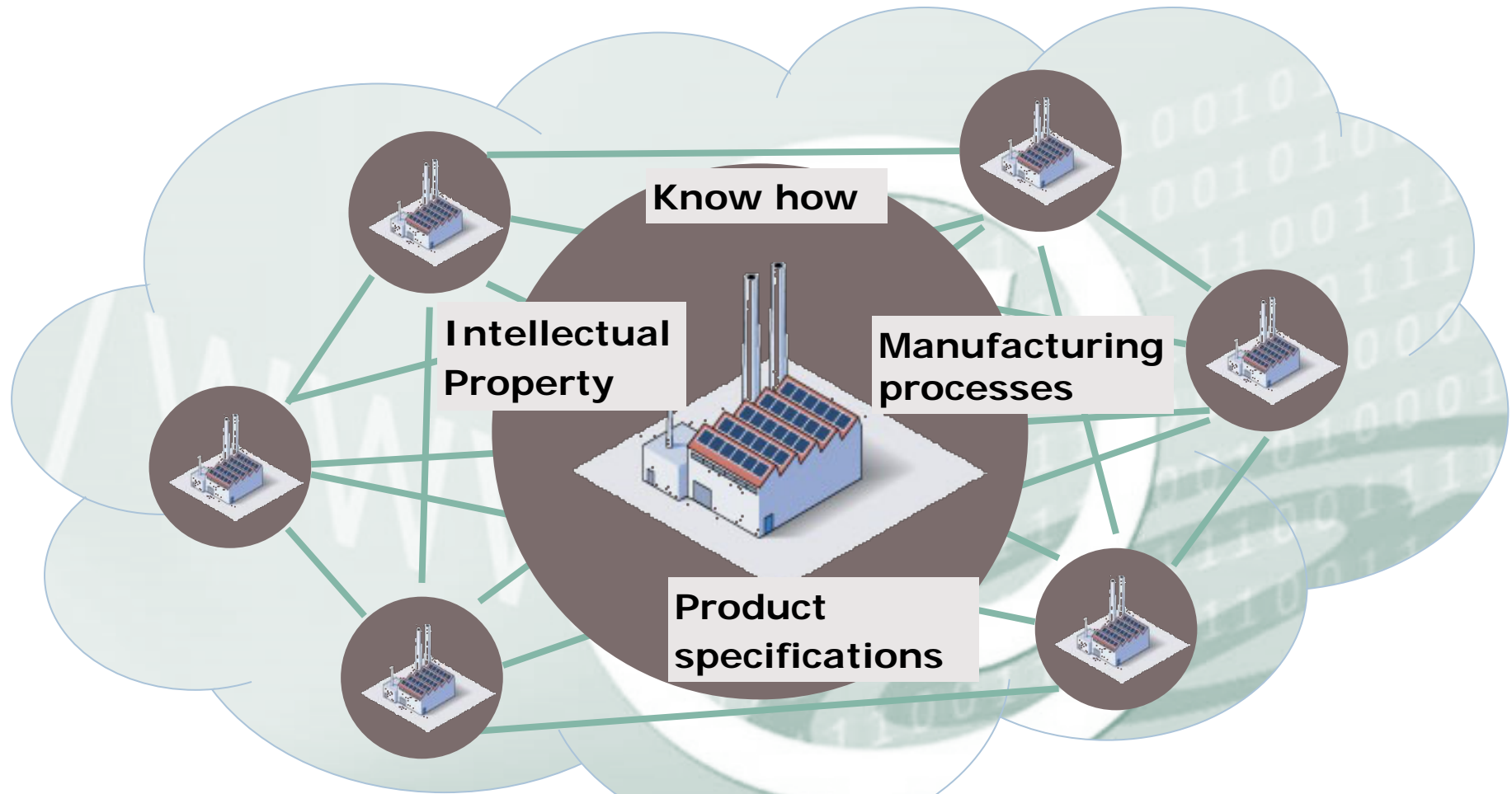


Advantages of real-time data evaluation



- › Shorter development cycles and reduced time-to-market
- › Faster adaption to demand changes
- › Higher productivity through optimal capacity utilization
- › Improved quality and reliability of our products

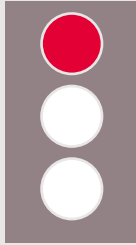
Interconnected manufacturing: Industry 4.0 requires a high level of security



Overall system security

Authentication – Encryption – Protection – Certification

Comprehensive “real” data security only with combined hardware and software approaches



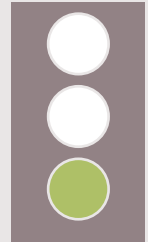
NO SECURITY

Everything open
for all to see



SOFTWARE ONLY

Secures against
casual intrusion
and basic
software attacks



HARDWARE SECURITY

Secures against
hardware attacks &
hardens against
software attacks

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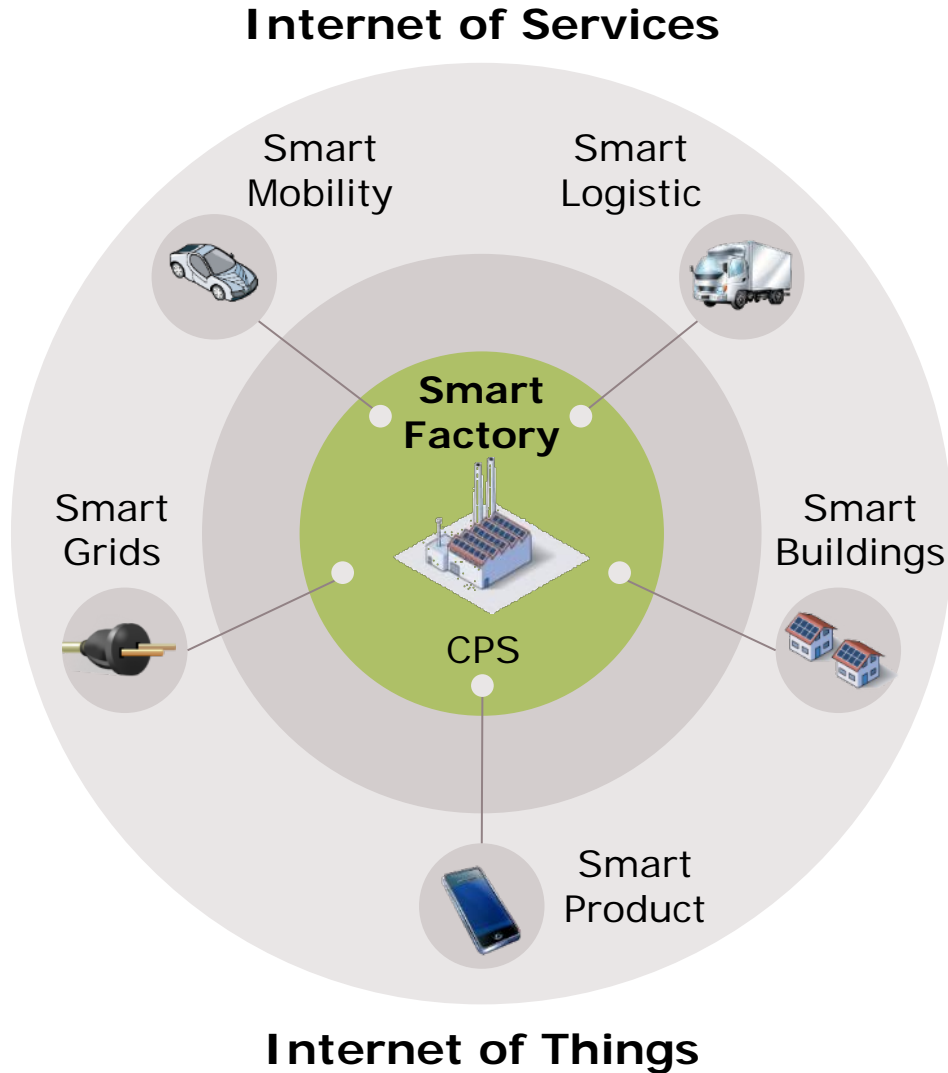
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Industry 4.0: Internet of Things goes factory production



Smart Factory: Intelligent products, methods and processes

- › Cyber physical systems enable Smart Factories
- › Intelligent products actively support the manufacturing process
- › With its interfaces the Smart Factory becomes the integral part of an intelligent infrastructure

Industry 4.0 in practice: the example of Infineon Austria in Villach



- › New Building Complex for Research, Development and Production
- › Investment and R&D Effort: €290 Millions bis 2017
- › 200 additional high-tech Jobs to be created
- › Implementation of a new building complex for research and knowledge-based production
- › Starting with the production of power semiconductors, R&D and value-added services
- › Contributes to increasing European competitiveness as part of a knowledge-based economy in the global context

Opened 29 October 2015



Data integration is realized in semiconductor manufacturing



Production information in real time



Paperless manufacturing



Localization and traceability



Collaborative man-machine interface

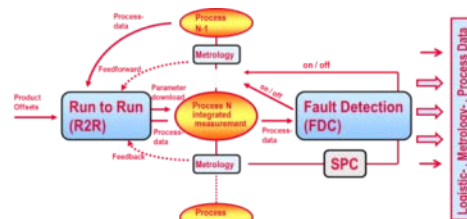
Big Data Applications @ Infineon Villach Fab

Product controls the production



- › Load & Go
- › Track & Trace
- › Paperless Documentation

Control by Run2Run – Feed Forward



- › Learn and adopt the machine
- › Learn for the product and adopt

Work area control makes data from 4 streams



- › Visible
 - › Manageable
 - › Meaningful
- for the employee

Dynamic Simulation instead of static simulation



- › Loading
- › Dispatching
- › Workflow
- › etc.

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A strong Europe is needed

- › **Excellent software and hardware know-how** is a major request to boost Europe's re-industrialization and digital sovereignty.
- › **Huge investments in digital infrastructures** by private and public stakeholders (5G, cloud, ...) are required for a data-driven economy.
- › **Reversing the downward trend of chip production in Europe** is a key objective from the semiconductor manufacturer's perspective.
- › **Funding programs for research, development and innovation** like the ECSEL Joint Undertaking and other PPPs are suitable measures.
- › **Important Projects of Common European Interest (IPCEIs)** are an additional and indispensable approach to stimulate the urgently needed large investments.
- › **EU competition law must be open to create more favorable site conditions.** As high governmental subsidies outside Europe continue to create a significant distortion of the global competition, European companies are under enormous increasing pressure.

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Summary: Big Data and Industry 4.0

- › Industry 4.0 is a **big opportunity for Europe**: We have to agree on strategies and programs and drive a straight implementation at European, national, and regional level with speed and agility.
- › Big Data and Industry 4.0 applications need **hardware security** right from the start.
- › **Collaboration with excellent partners in the value chain** including European universities and RTOs is required.
- › **Industry 4.0 needs competence**: Education is key for talent development and highly skilled work force.
- › New production facilities require high volume products, pilot lines, services & solutions for **generating economic growth**.
- › State aid rules have to be designed to foster **European competitiveness** in the global “match”.
- › Make **Europe the Industry 4.0 lead market** and strengthen “Made in Europe” supply chains.
- › **PLAY BIG!**



Part of your life. Part of tomorrow.

