

# FDSOI-Technology contributions from Europe for Europe

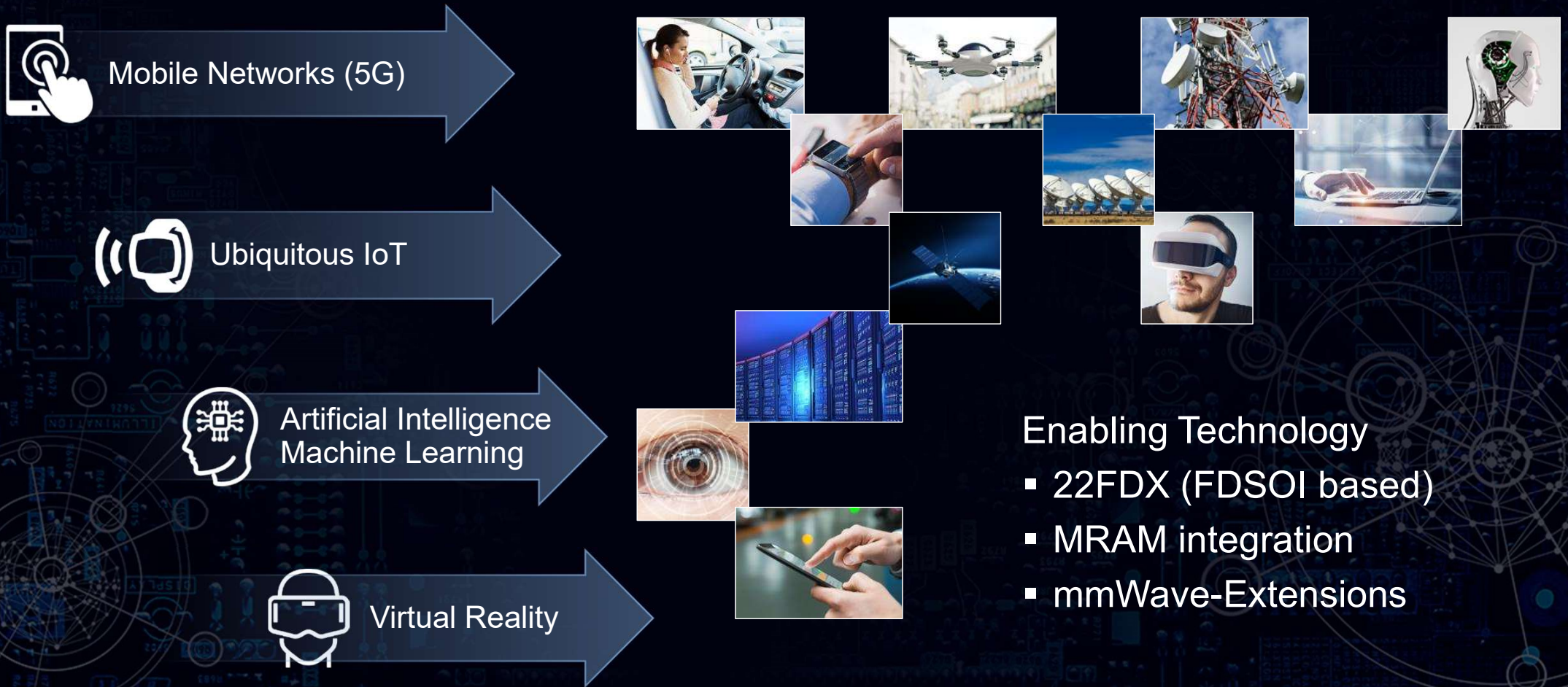
Dr.-Ing. Gerd Teepe, Director Marketing for Europe  
GLOBALFOUNDRIES, Dresden, Germany

Heterogeneous Technology Alliance Anniversary  
24. April 2018

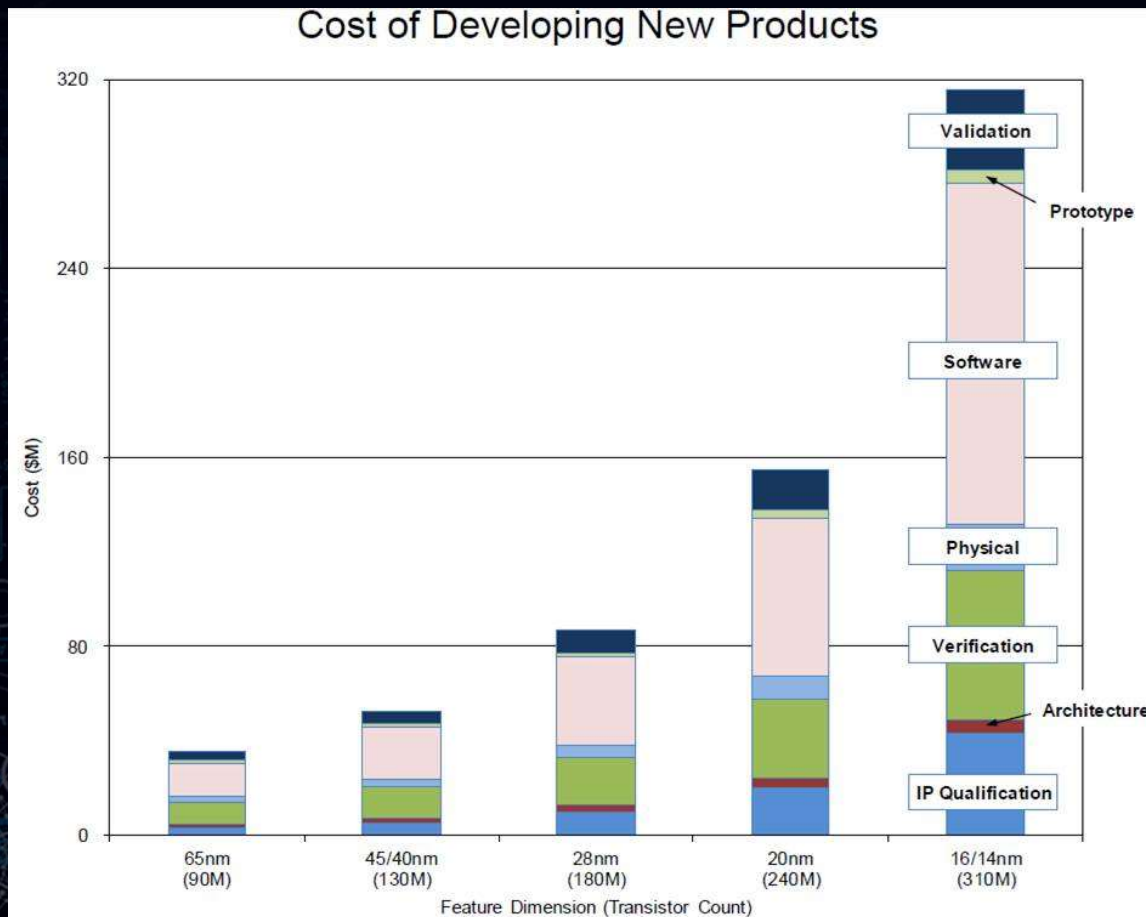


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# Capabilities are exploding



# SoC design costs are exploding



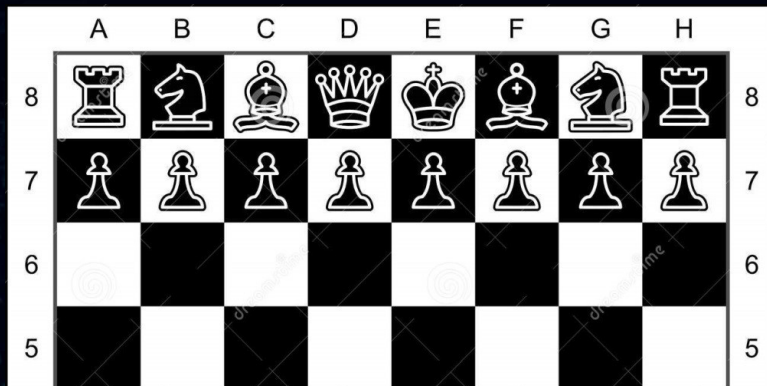
Source: Semiconductor Engineering  
"How Much Will That Chip Cost?" 27/3/2014  
Ed Sperling

and IBS

## Observations:

1. Half of the Design Cost are System Software Development
2. Hardware Design Cost influenced by Tooling Cost
  - i. Design Tools (EDA)
  - ii. IP
  - iii. Design Services

# Complexity is Exploding



$$2^{32} = 4 \text{ Giga } (4 \times 10^9)$$

## The Second Machine Age

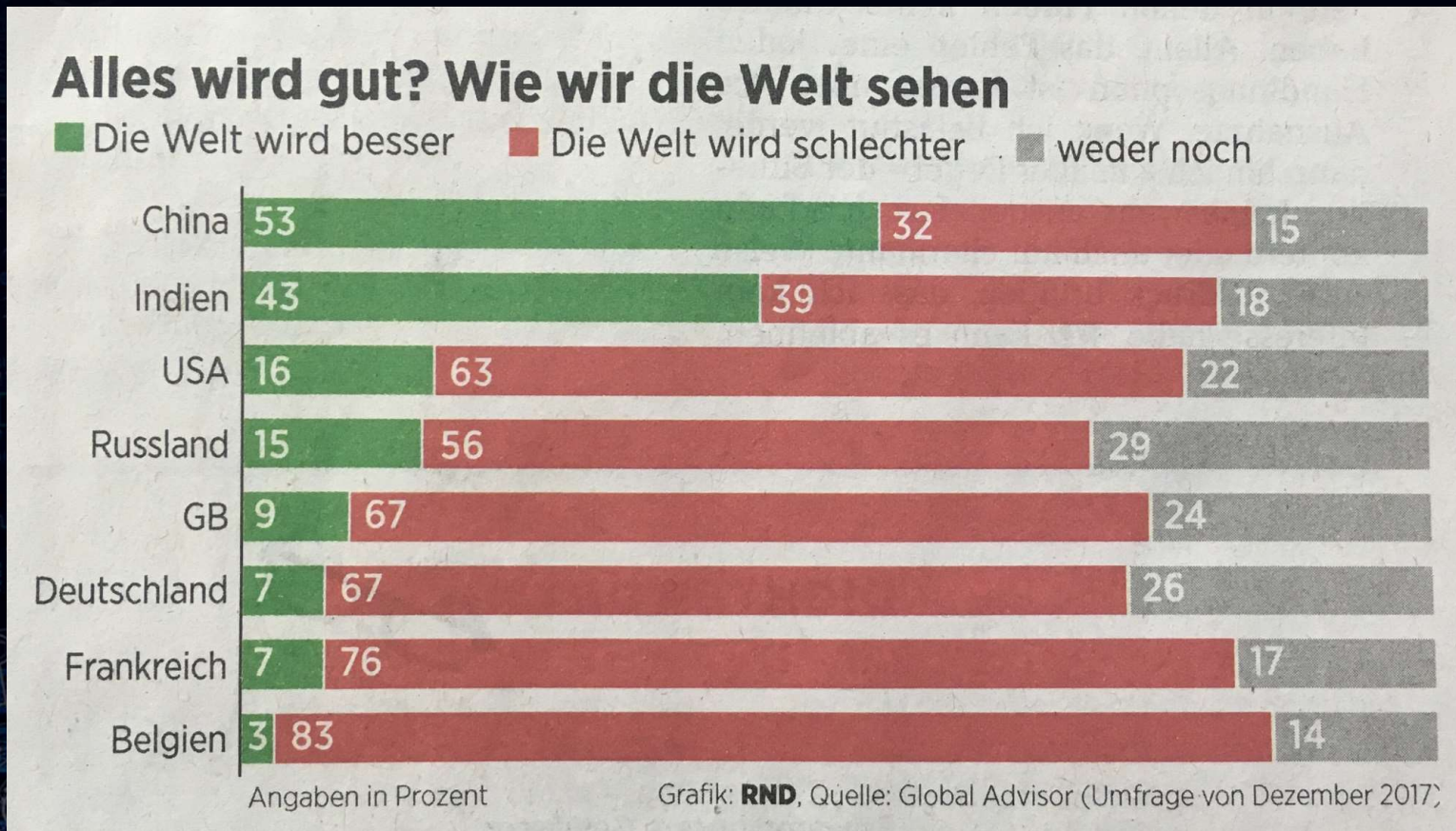
Eric Brynjolfsson, Andrew McAfee

# The world is improving – in general

	back in:	2016
Child Death	1800: 44%	4%
Alphabetism	1800: 10%	86%
Ozone	1970: 1663	22
Internet Access	2000: 5%	48%
Airplane Death	1929: 2100	1
Price of PV-module	1976: 66\$	0.6\$
% of national parks	1900: 0.03%	14%
Nuclear warheads	1986: 64T	15T
Hunger	1970: 28%	11%

	back in:	2016
Crop productivity	1961: 1.4	4
Fine Particle pollution	1970: 38kg	14kg
HIV Infections	1996: 549	241
Child Work	1950: 28%	10%
Mobile phone ownership	2000: 5%	65%
Death by natural disaster	1930: 791	72
Electricity at the home	1991: 72%	85%

## ... but perception is bad



Are we pessimistic because economy is bad?

Or is the economy bad because we are pessimistic?

Source: DNN, 21st of april 2018

## US-Stock dominated by „new economy“ - titles

#	Stock Market - USA	Market Value
1	Apple	854 B\$
2	Amazon	724 B\$
3	Microsoft	722 B\$
4	Alphabet (Google)	708 B\$
5	Facebook	438 B\$
6	JP Morgan Chase	463 B\$
7	Johnson&Johnson	341 B\$
8	Exon Mobile	316 B\$
9	Bank of America	301 B\$
10	Visa	270 B\$

#	Stock Market - Europe	Market Value
1	Unilever	191 B€
2	InBev (Anheuser Busch)	177 B€
3	LVMH	173 B€
4	TOTAL	164 B€
5	L'Oréal	131 B€
6	SAP	130 B€
7	Siemens	113 B€
8	Santander	109 B€
9	Allianz	106 B€
10	Volkswagen	105 B€

Actuals from 20.4.2018

# EU - Leadership in Telecom is lost



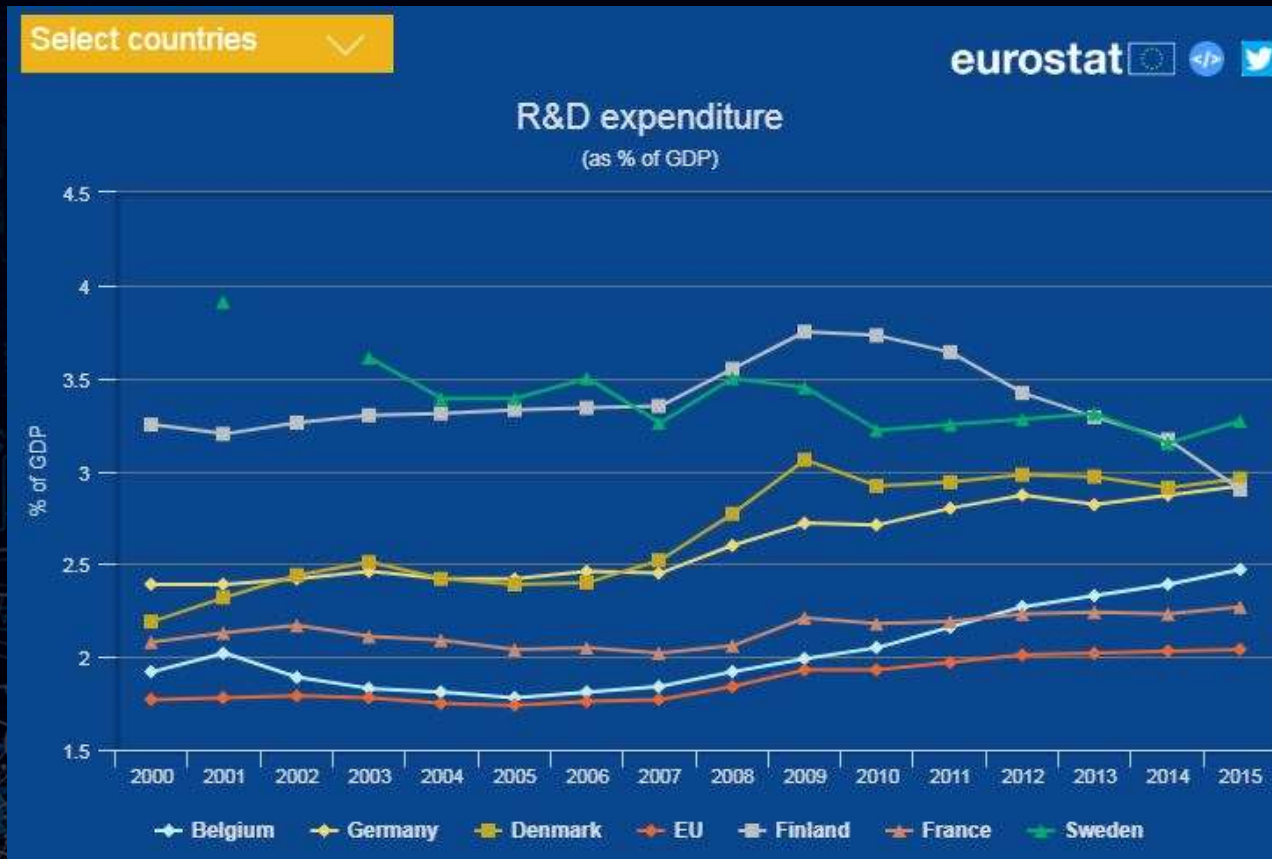
Source: A.T. Kearney, IDATE, Alexa, Financial Times

Source: Wirtschaftswoche 2017

- Shrinking Profit Pool in the EU
- Eroding Market Capitalization in the EU
- Highly fragmented EU-market and insufficient scale
- Lack of investment in next generation Networks
- Europe is challenged by hard regulation and competition policies
- European regulatory Focus is on low consumer prices and competition



# R&D expenditure in Europe is low

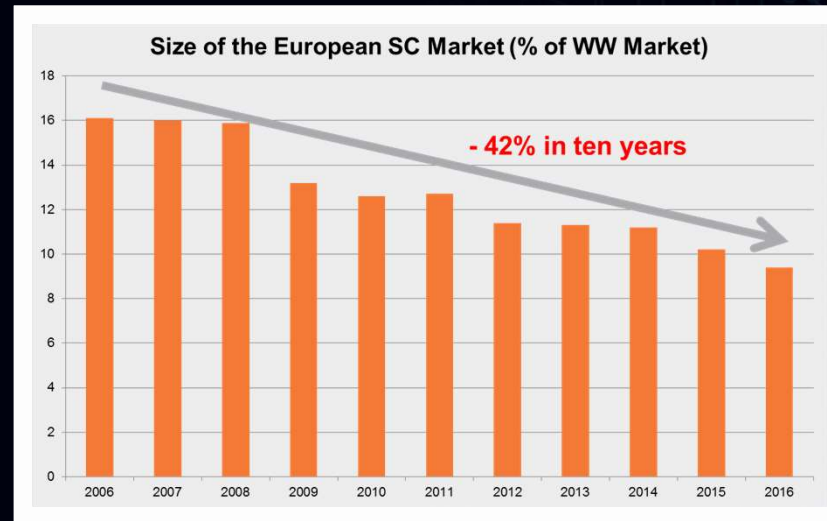
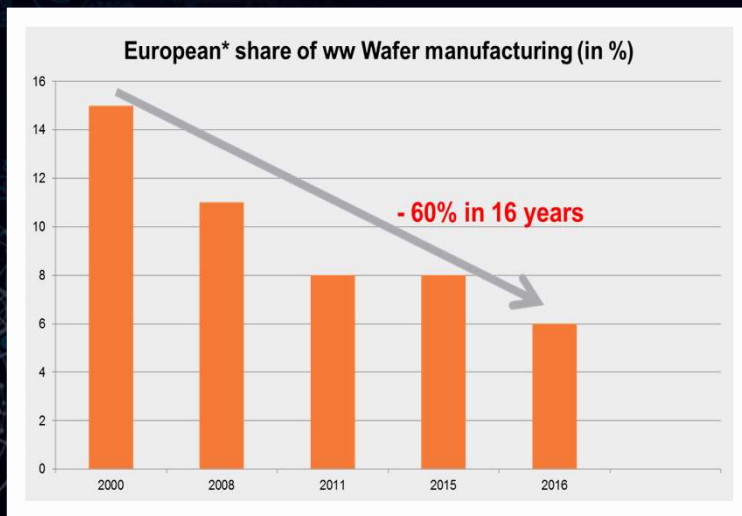


The Lisbon Agenda was formulated in the year 2000 to make Europe the most innovative region in the world with 3% R&D of GDP by the year 2010.

Source: Eurostat 4/22/2018

# Semiconductor Sector in Europe is weak

- Underestimation of the Semiconductor Market
  - Germany classified semiconductors as „consumer“ until 2013
  - Energy considered more important than semiconductors (EU imports oil for 338 B€ in 2017)
- No or slow growth
  - GDP CAGR (2017/2000) was 1.4% (2017 over 2018 was 2.6%) (Eurostat)

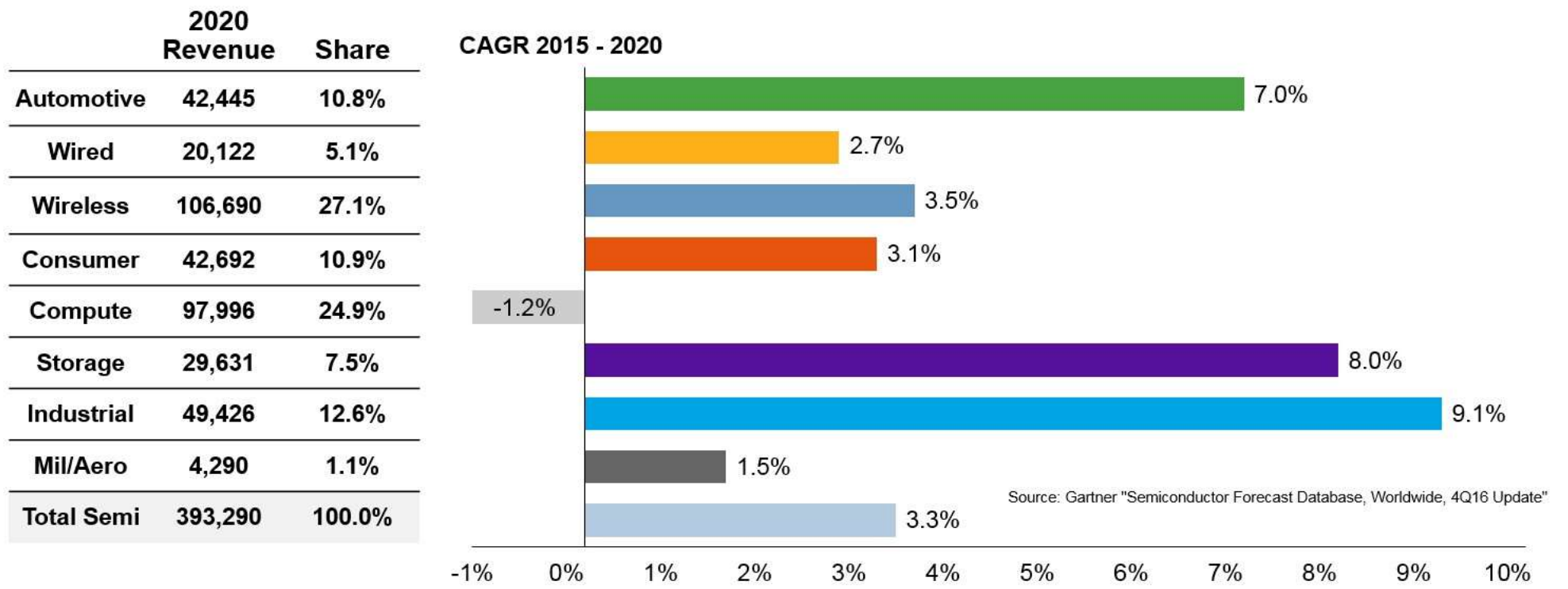


# There is hope

The IoT-Wave is coming



# Europe has proven strength in growth markets, particularly Automotive and Industrial



# CMOS Roadmap of GLOBALFOUNDRIES is focussing EUROPE

## Applications:

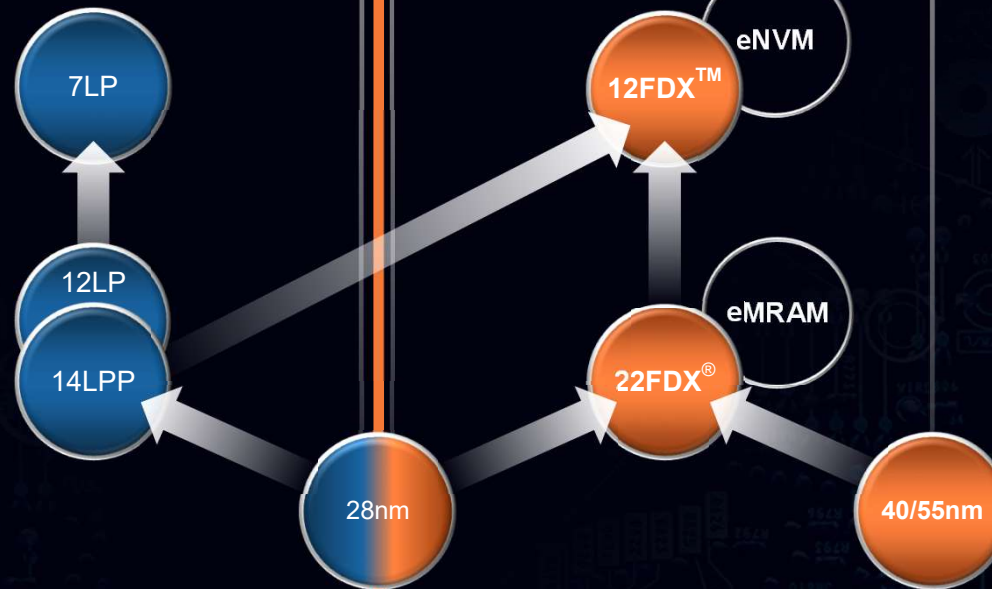
- Servers
- HPC
- Graphics
- High-end AP
- Core networking
- Auto high-end ADAS

## Premium Tier

## Features:

- High-performance
- Balanced-cost

## High Performance Computing FinFET



## Wireless, Battery-Powered Computing FD-SOI

## Applications:

- Low & mid AP
- IoT
- Autonomous vehicles
- Mobile camera

## Volume Tier

## Features:

- Low-power
- Cost-effective performance
- High Performance RF and mmWave
- Embedded memory

# Building Global Scale for FDX™

GF and SOITEC Partnership

## Dresden, Germany Fab 1

- Expanding 22FDX® FD-SOI capacity by 40% by 2020
- Developing 12FDX™ FD-SOI technology



## Pasir Ris, Singapore

- FD-SOI substrates
- SOI HVM qualified in 2007
- FD-SOI production line started in Sept. 2017
- End customer qualification planned in 1H 2019
- Full capacity of 800kw/ year



## Bernin, France

- FD-SOI substrates
- 400kw/ year capacity
- Already qualified with customers for mass production



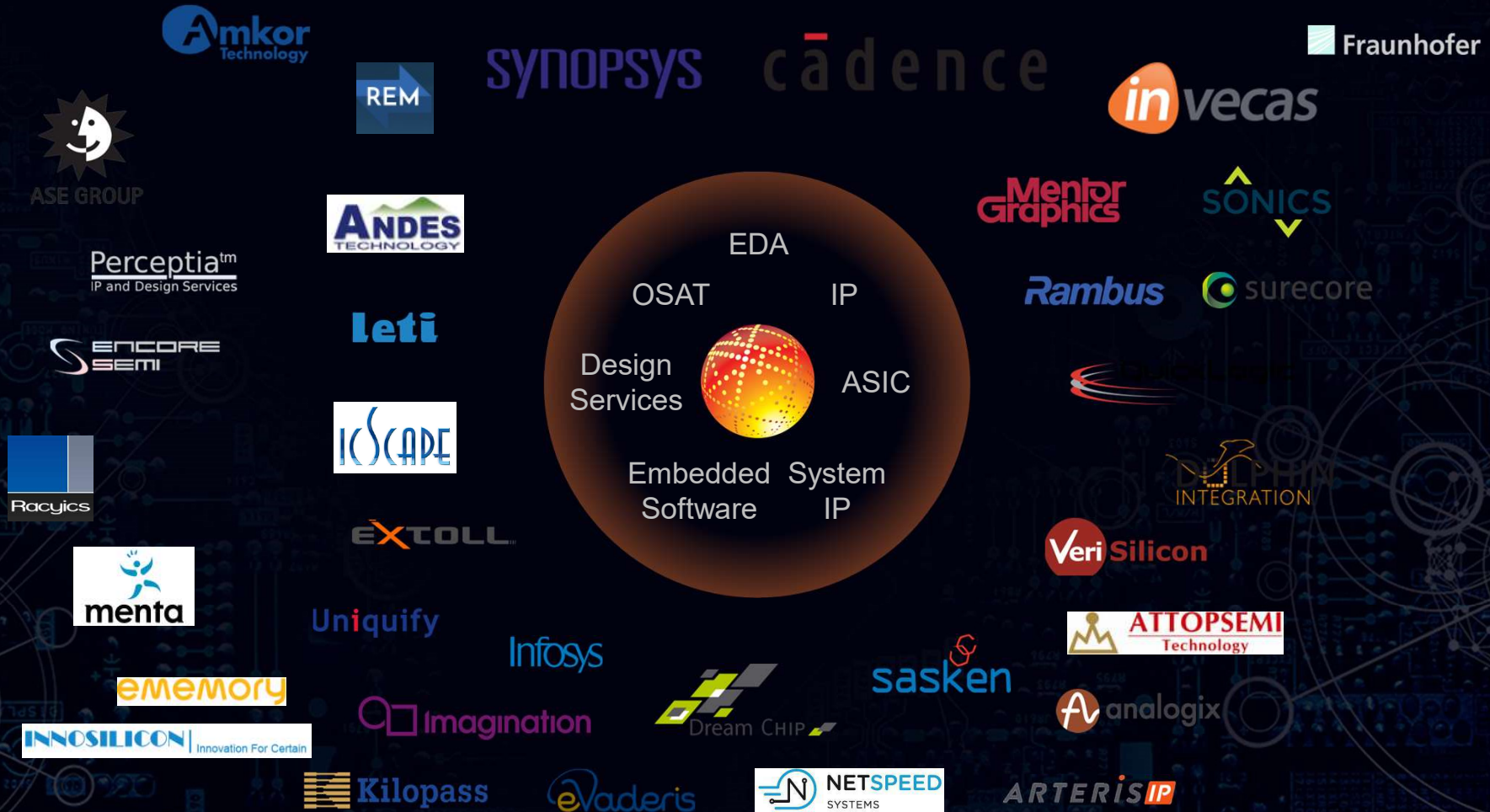
## Chengdu, China Fab 11

- New 300mm fab in partnership with Chengdu Municipal Government
- Existing 180 / 130nm technologies, 22FDX ramp in 2H 2019



# FDXcelerator™ Ecosystem Partnering

## Comprehensive design platform including IP and design flows



# 22FDX - THINGS2DO Project Demonstrator

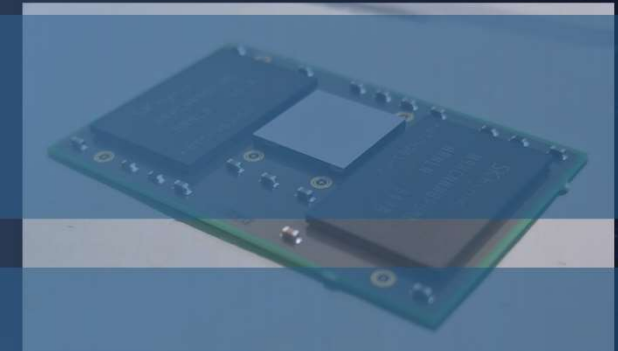
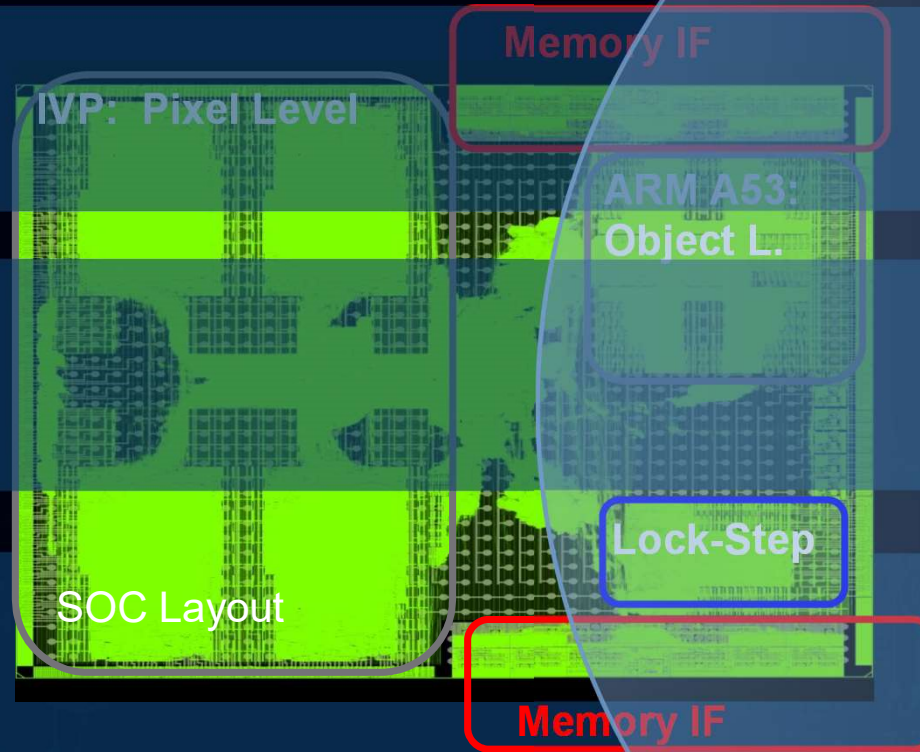
ADAS Demonstrator for image recognition / classification, image warping and Real-Time Processing

## Collaboration Partners:

DREAMCHIP, CADENCE, INVECAS, GF, Arm, ArterisIP

## Targeted Use-Cases:

- In-vehicel Image Processing
- Image recognition
- ADAS Development Platform
- Industrial Automation



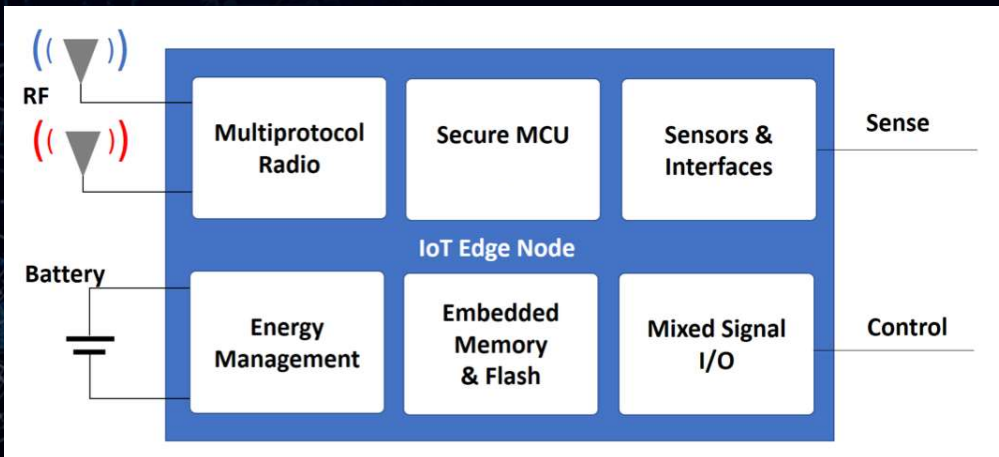
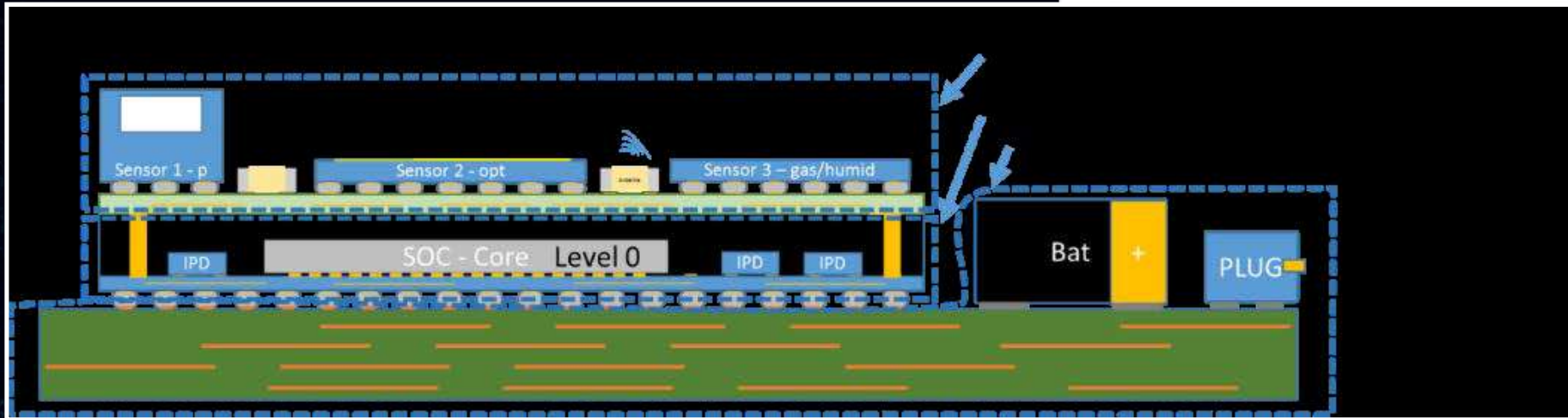
System-Module (Chip + LPDDR4)



360° Surround View Demo Setup  
Demo-Car with 4 cameras



# Universal Sensor Platform



## Platform System

- Configurable Hardware
- Configurable Software
- Highly Secure
- Multi-Sensor
- RF-Networking

# Collaborations within the European Semiconductor Cluster



# Thank You



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