COSEDA Technologies
Delivering Unique Value in a Rapidly Changing Market

Ellie Burns, COSEDA Technologies GmbH
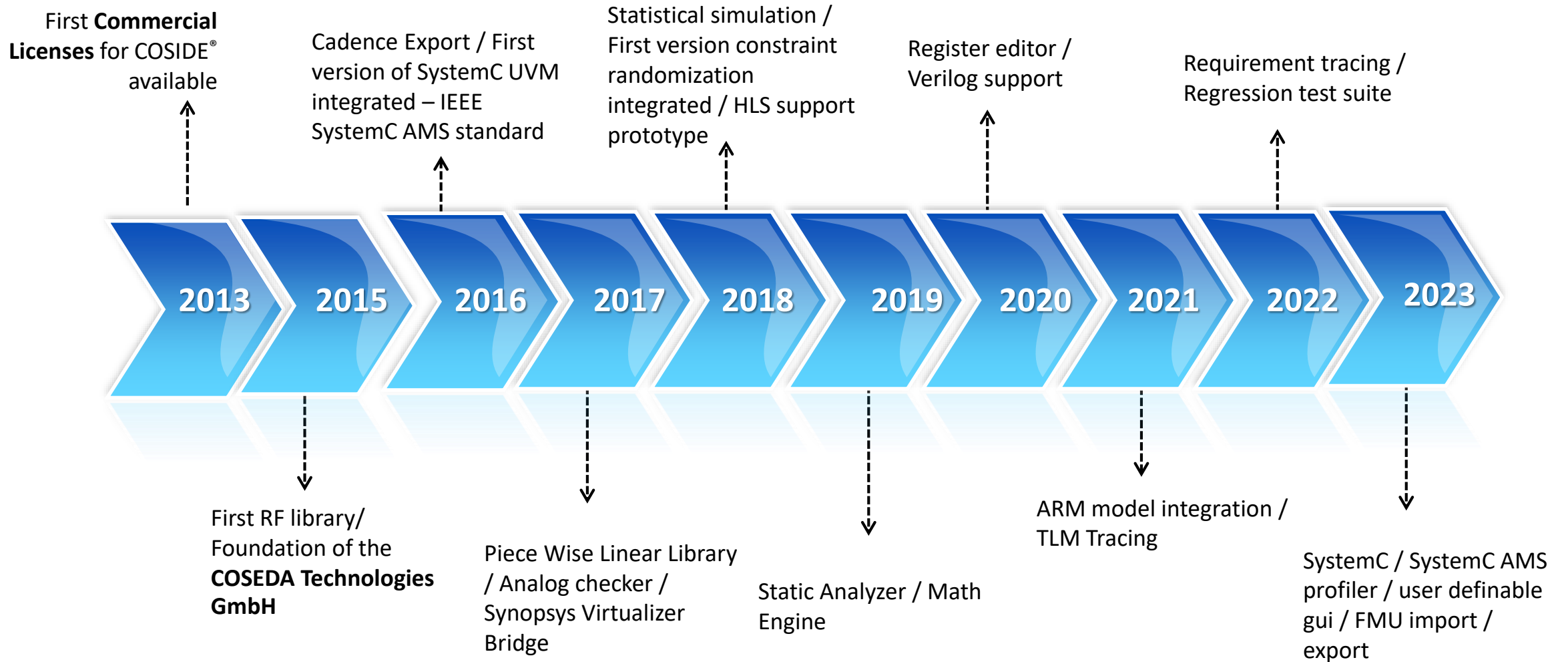
COSEDA | 2023
usergroupmeeting

THE ANALOG AND DIGITAL SYSTEM LEVEL COMPANY

Celebrating 10 Years

Customer driven capabilities

First **Commercial Licenses** for COSIDE® available

Cadence Export / First version of SystemC UVM integrated – IEEE SystemC AMS standard

Statistical simulation / First version constraint randomization integrated / HLS support prototype

Register editor / Verilog support

Requirement tracing / Regression test suite

2013 **2015** **2016** **2017** **2018** **2019** **2020** **2021** **2022** **2023**

First RF library/ Foundation of the **COSEDA Technologies GmbH**

Piece Wise Linear Library / Analog checker / Synopsys Virtualizer Bridge

Static Analyzer / Math Engine

ARM model integration / TLM Tracing

SystemC / SystemC AMS profiler / user definable gui / FMU import / export

COSEDA technologies

Resulting in New Customers and Significant Year over Year Growth

Thank You!!
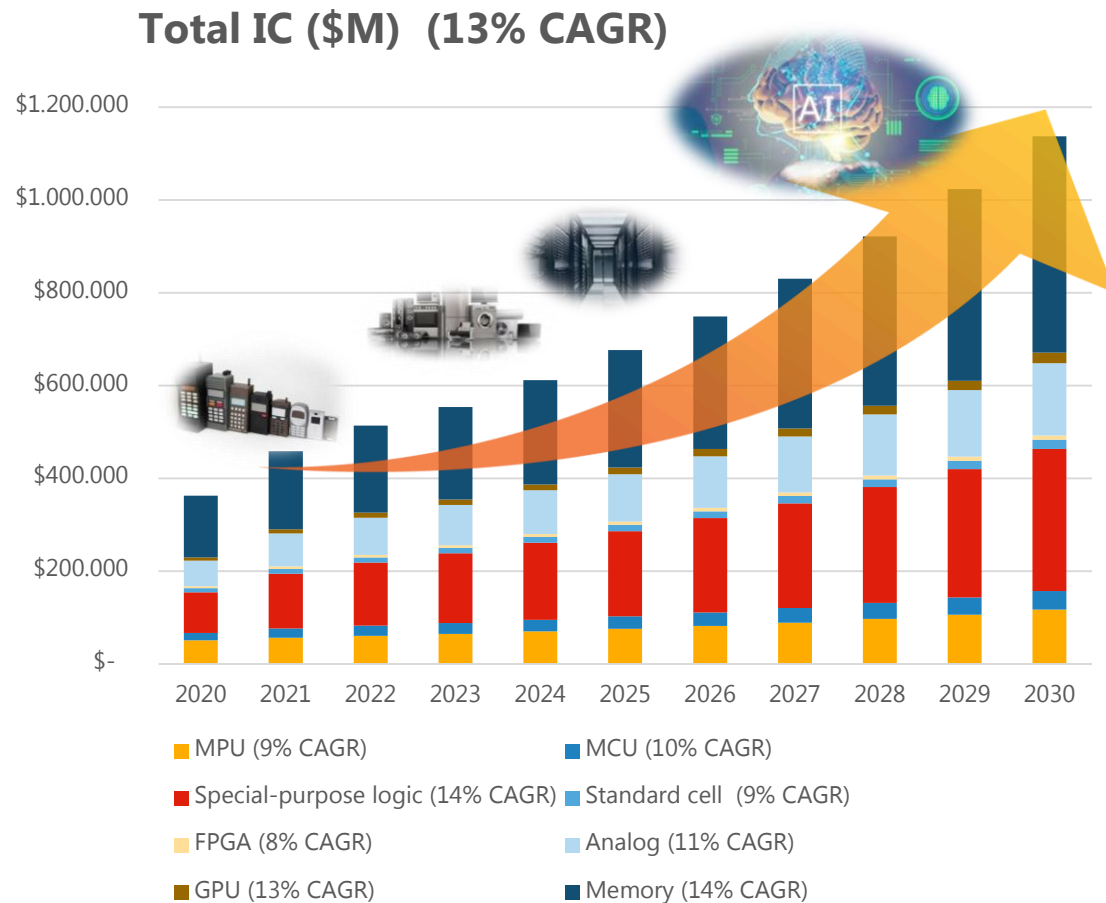

COSEDA 17.2%

EDA 7.7%

CAGR

2016   2023
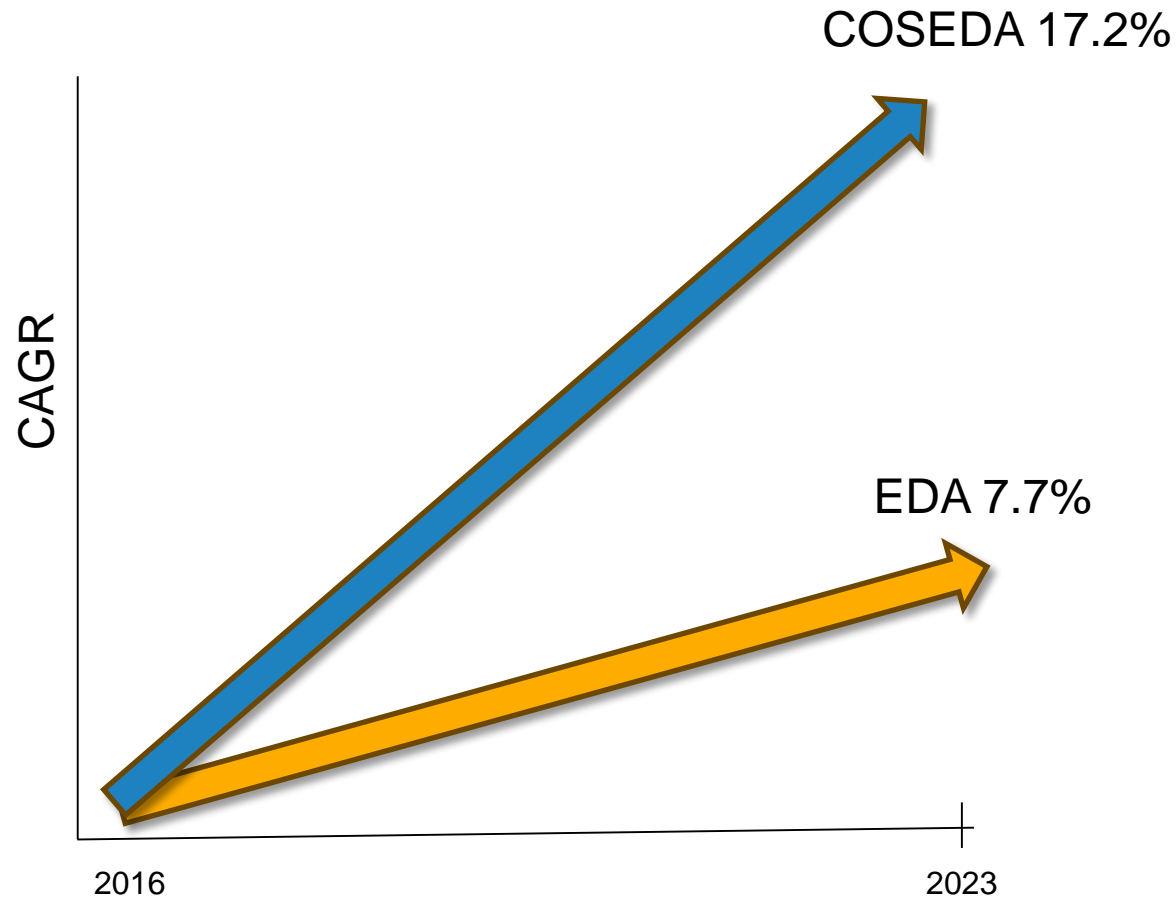
- COSEDA 7-year CAGR 17.2%

- Over double growth rate of EDA tools!

Semiconductor Market Dynamics and Opportunities

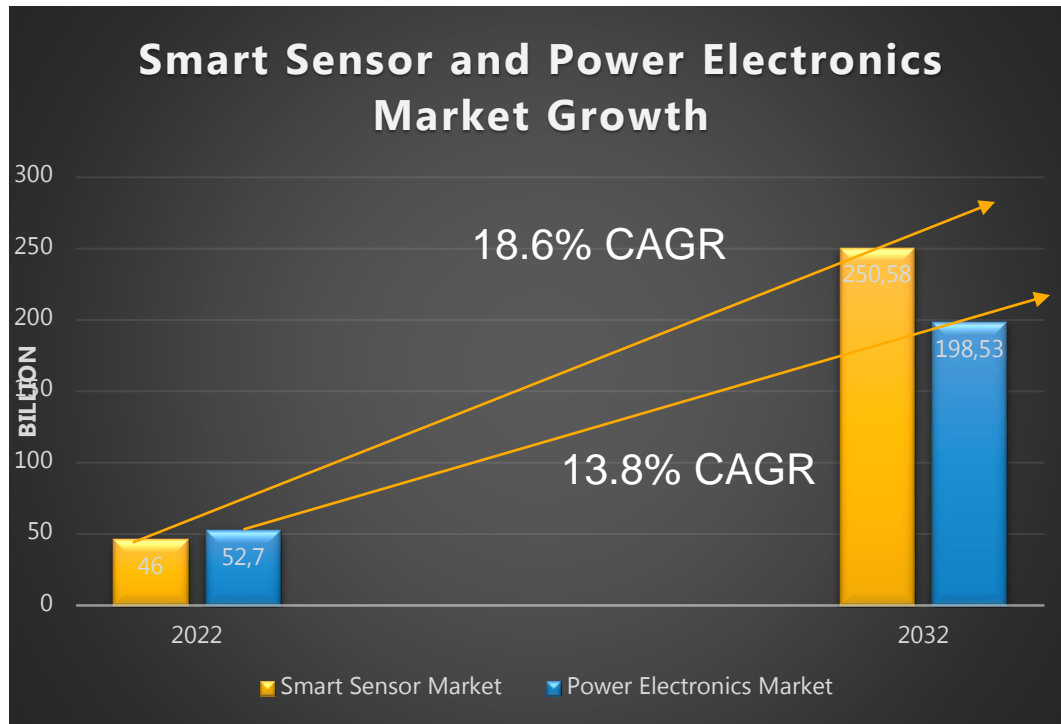## Substantial Growth in HW Design Driven by New Compute Requirements

Total IC ($M) (13% CAGR)

Legend:
- MPU (9% CAGR)
- MCU (10% CAGR)
- Special-purpose logic (14% CAGR)
- Standard cell (9% CAGR)
- FPGA (8% CAGR)
- Analog (11% CAGR)
- GPU (13% CAGR)
- Memory (14% CAGR)

- **$1.1 Trillion IC semiconductor market by 2030***

- **Driven by digitalization and Smart Everything markets**
  - AI/ML and Computer Vision
  - Communication and 5G
  - Internet of Things, Edge devices
  - Aerospace and Defense

- **Seeing the end of traditional CPU compute acceleration**
 - Currently 5% chips have custom accelerators – By 2030 (6 years!) it is predicted that it will be 90%**

COSEDA
technologies

Rapidly Changing Market With Key Technology Trends

Seeing growth and opportunity that we have not seen in a long time

Smart Sensor and Power Electronics Market Growth

18.6% CAGR

13.8% CAGR

250,58

198,53

46

52,7

2022

2032

■ Smart Sensor Market   ■ Power Electronics Market

- **High growth markets smart sensors, smart IoT, Automotive, consumer electronics, Smart cities/infrastructure**

  - Smart Sensor to 250.58 billion by 2032*

  - Power Electronics to 153.30 billion by 2030**

- **AI everywhere – especially at the edge**

- **3D IC/chiplets – Disaggregate and use different technology nodes**

Confidential

Many Applications driving Change in Mixed Signal Design
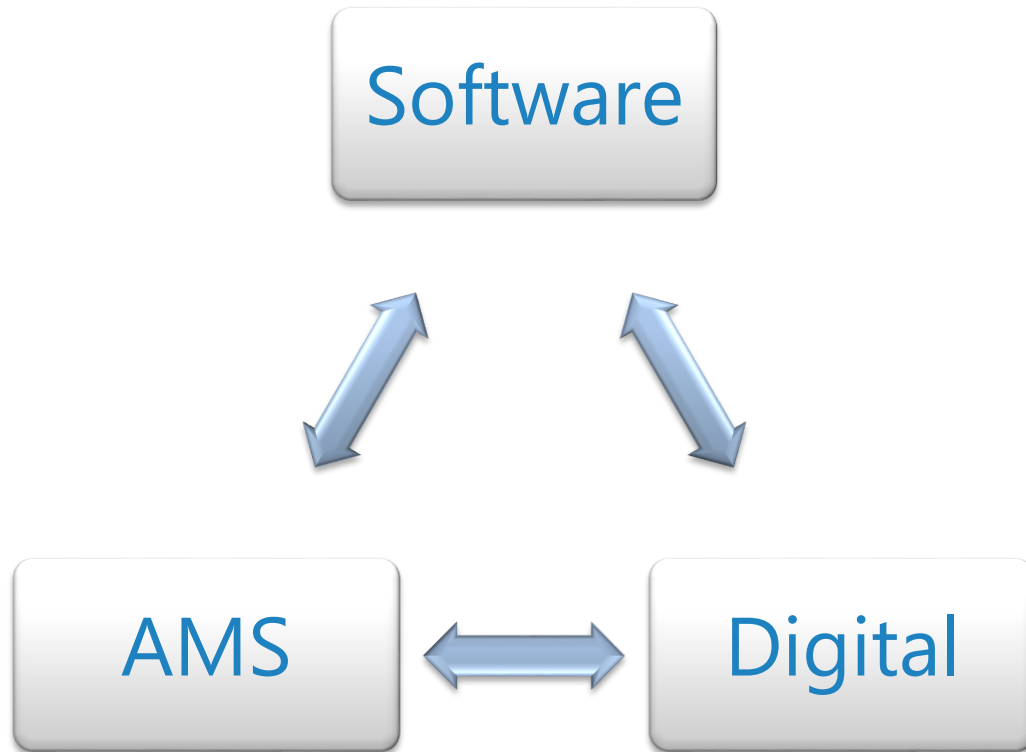
- Rapidly growing digital and SW content

- Tighter/more constant feedback between Digital, SW and AMS – not just at start up

  - Digital and SW controlled/calibrated analog

- Communication/modeling one-way is no longer sufficient

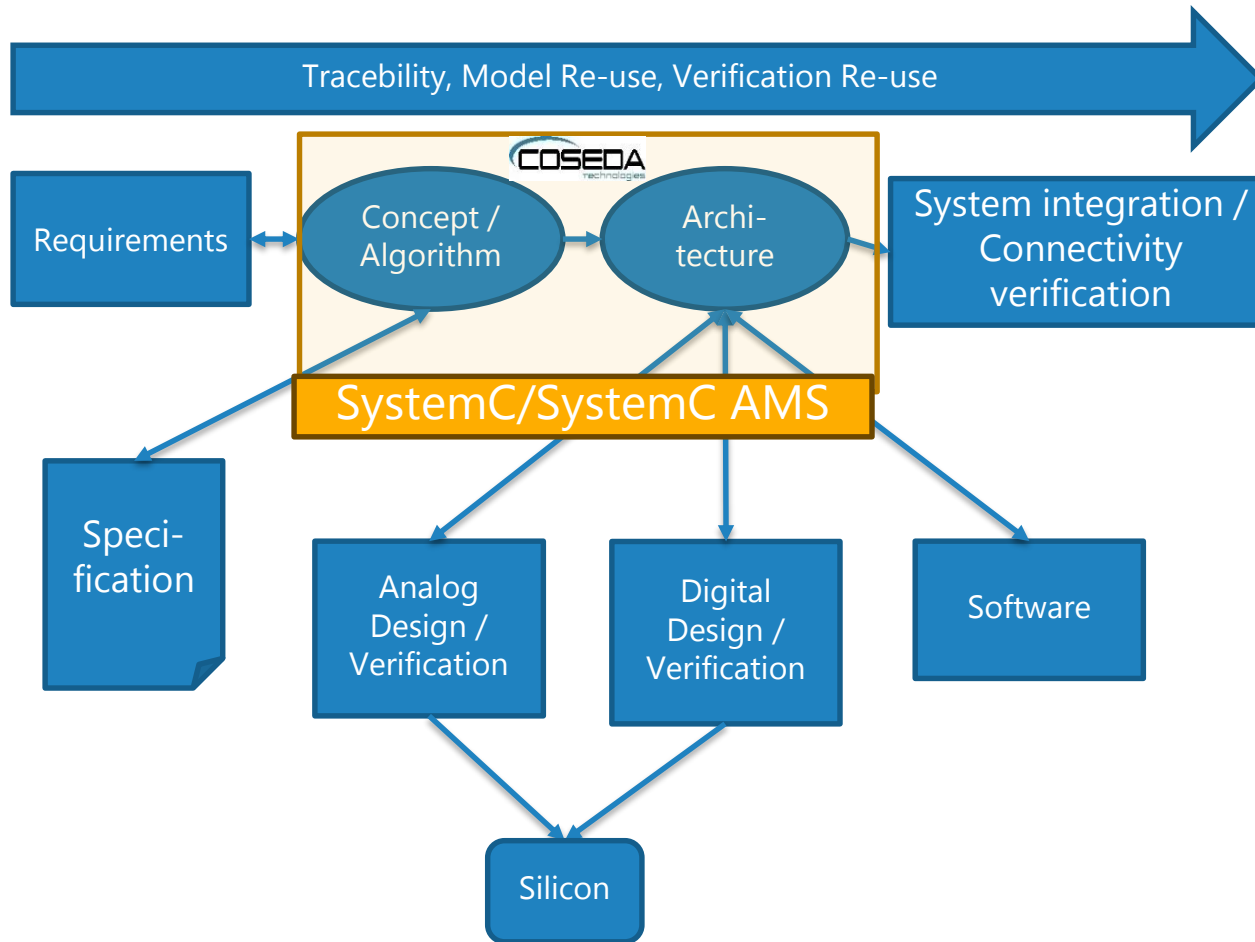- Requires high-speed simulation to run SW and application scenarios

For System Design – A Different Approach is Needed – a bit of a "re-think"

With all of these changes, what does your system design methodology need to look like?

You can't just make "tweeks" to your last design

COSIDE - Built on powerful system modeling foundation of SystemC/SystemC-AMS

Tracebility, Model Re-use, Verification Re-use

COSEDA technologies

Requirements

Concept / Algorithm

Archi-tecture

System integration / Connectivity verification

SystemC/SystemC AMS

Speci-fication

Analog Design / Verification

Digital Design / Verification

Software

Silicon

- Only SystemC/SystemC AMS enables
  - modeling and fast simulation of digital HW, SW and analog components
  - model different domains at different abstraction levels within the same language
  - And build Virtual System Prototypes of complete systems

- COSEDA/COSIDE makes it easier to use, build, analyze and integrate in system design flow and environment

COSEDA technologies

Radar Design

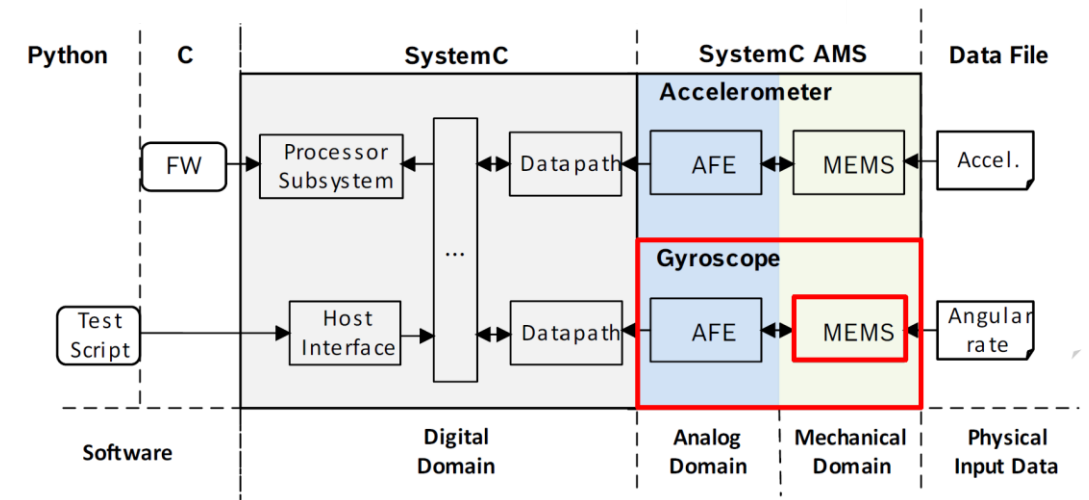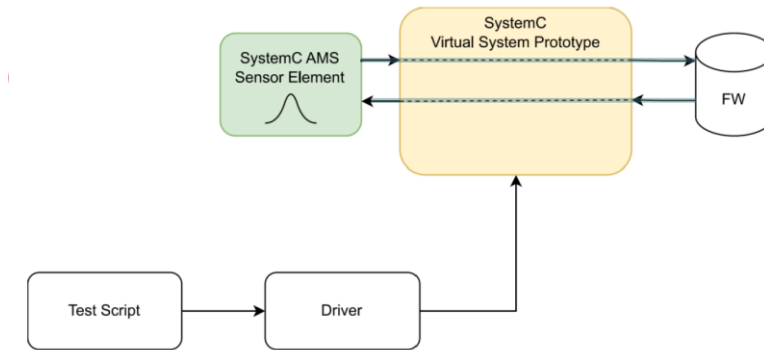## System has critical interactions between RF, digital and software

- **Challenges**
  - Difficulties with multiple tools, multiple vendors, etc.
  - Multiple domains and abstractions required for full system simulation – Digital, AMS, RF, Software
- **What they did**
  - COSIDE/SystemC AMS - Proof of concept, reference model, development and re-use of test-cases for verification, interface with Matlab for configuration and analysis
- **Value/Results**
  - Unified Feasibility to Verification – Single source of executable concept and reference model
  - Fast simulation for full system - 10X improvement simulation time with negligible performance vs Simulink
  - Re-usable and consistent testbench through design flow
  - Only tool/language that can model full system interactions of RF, Digital, AMS and Software…for complete RADAR and external environment

Bosch Automotive electronics - Federico Passerini
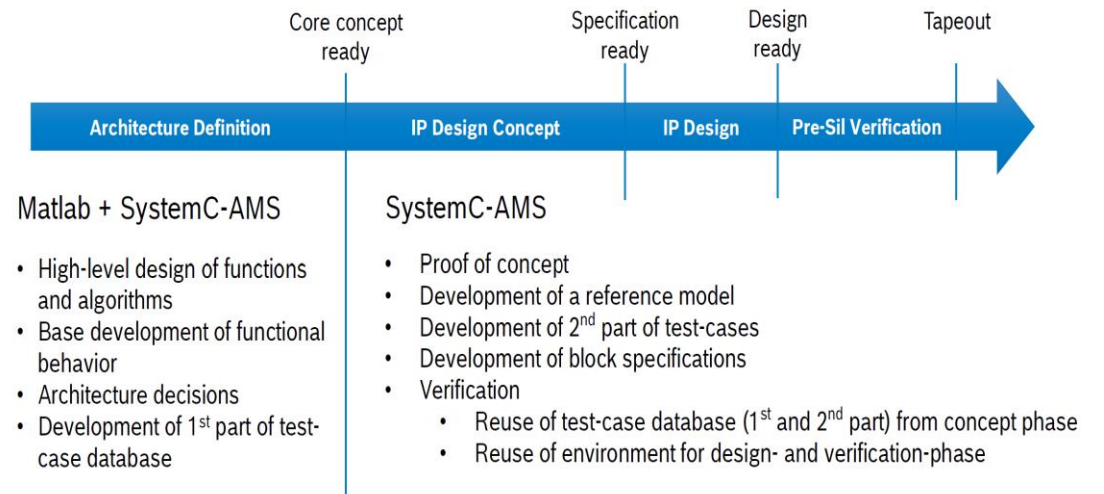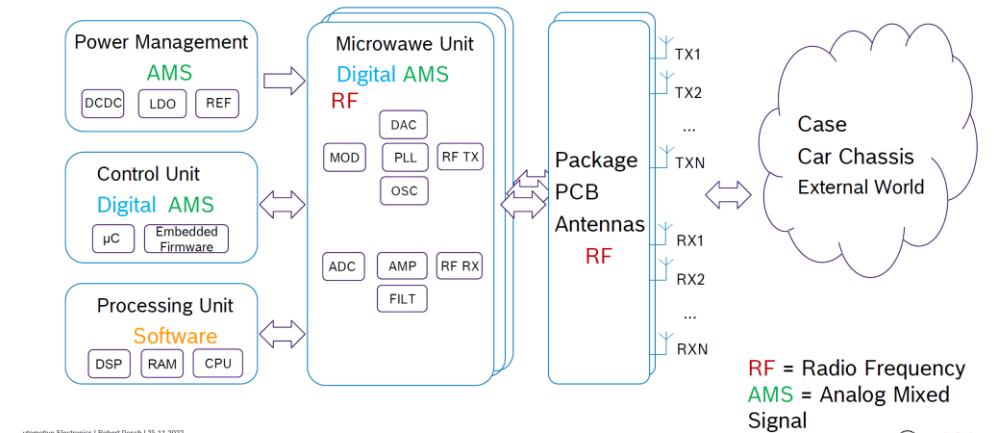
Smart Sensor Design

Interaction between sensor and software is unidirectional and needs a tight coupling

- **Challenges**
  - Current SystemC Virtual Prototype could only model MEMS and SW interaction unidirectionally
  - Caused testing to be complicated, error-prone, hard to maintain and also could not be re-used on the real device
- **What they did**
  - Added a model of the MEMS in SystemC-AMS to their Virtual Prototype
- **Value/Results**
  - The overall confidence in the test result increases significantly
  - Timing errors can be found
  - Firmware developers gain better insights into the sensor's behavior
  - Simulation and hardware tests can be reused

Bosch Sensortech GmbH - Alexandra Kuster/Rainer Dorsch
Christian Haubelt - Univeristy of Rostock/COSEDA

GTM(Generic Timer Module) IP for Automotive

Need a scalable processor for multiple application domains in automotive

- Challenges
  - Their system design customers were having to rewrite/update timing critical SW every time the MCU changed
  - Needed a generic MCU independent GTM model and a method of model delivery that can work with multiple vendors/tool environments.

- What they did
  - SystemC model of GTM delivered as a block in COSIDE
  - Applications/examples independent of planned MCU's
  - COSIDE integration delivers GTM model to multiple environments/vendors (Simulink, EDA simulation, etc)

- Value/Results
  - Enabled early firmware development and development of timing critical algorithms independent of processing unit

Bosche Automotive Electronics - Jürgen Hanisch
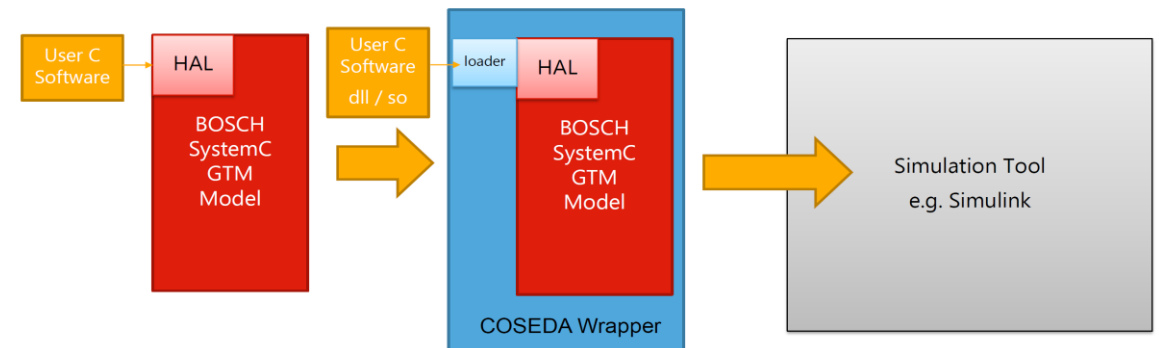
Summary

- Key markets and applications in semiconductor are seeing tremendous growth and opportunities

- COSEDA/COSIDE is uniquely positioned to deliver System Design and Virtual System Protypes that require fast simulation speed for HW, SW and Analog together

- COSIDE has proven to deliver value solving critical customer needs with ease of deployment – GROWTH will continue!

Thank you for Your Attention

Contact Information

Ellie Burns

- Market Development Manager
- ellie.burns@coseda-tech.com
- Mobile +1 503 329 5544

Thomas Hartung

- Marketing & Sales
- thomas.hartung@coseda-tech.com
- +49 351 321490-31

COSEDA Technologies GmbH

Koenigsbruecker Str. 124

01099 Dresden

Germany

www.coseda-tech.com