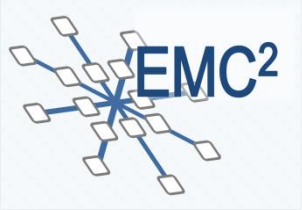# ARTEMIS 2013 AIPP5

EMC²

A Platform Project on Embedded Microcontrollers in Applications of Mobility, Industry and the Internet of Things

Werner Weber Infineon Technologies AG
Werner.Weber@infineon.com
+49 89 234 48470

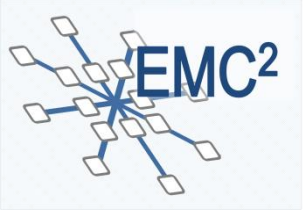… in cooperation with entire Project Management Team

Embedded Multi-core Systems for Mixed-Criticality Applications in Dynamic and Changeable Real-Time Environments – EMC²
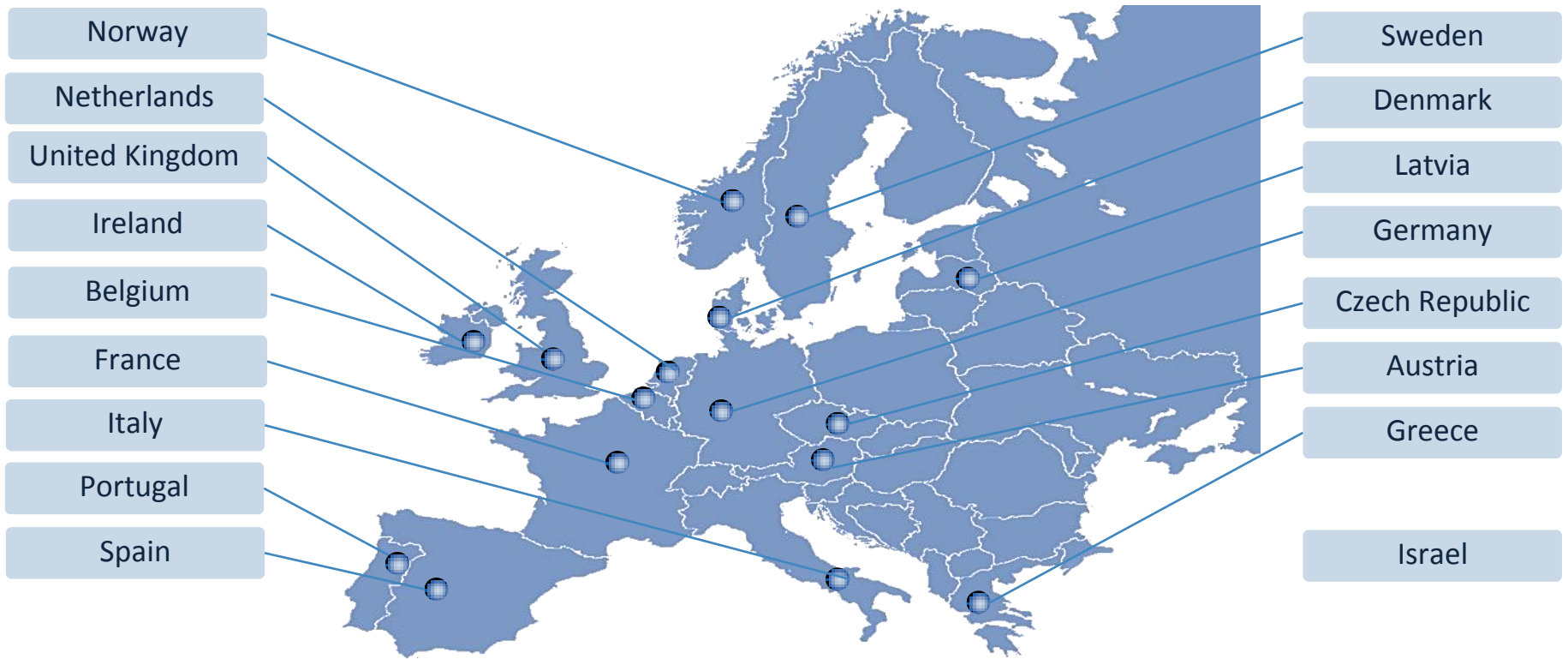
(Artemis Innovation Pilot Project (AIPP)

- ➤ AIPP 5: Computing Platforms for Embedded Systems
- ➤ Duration: 36 months, start April 1st, 2014
- ➤ Budget: 93.9 M€
- ➤ Funding: 15.7 M€ EU funding (Artemis)
  26.7 M€ National funding
- ➤ Resources: 9636 person months (803 person years)
- ➤ Coordination: Infineon Technologies AG
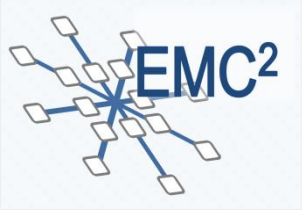- ➤ Consortium: 99 Partners, 16 EU Countries + Israel

→ **Largest ARTEMIS-JU project ever!**
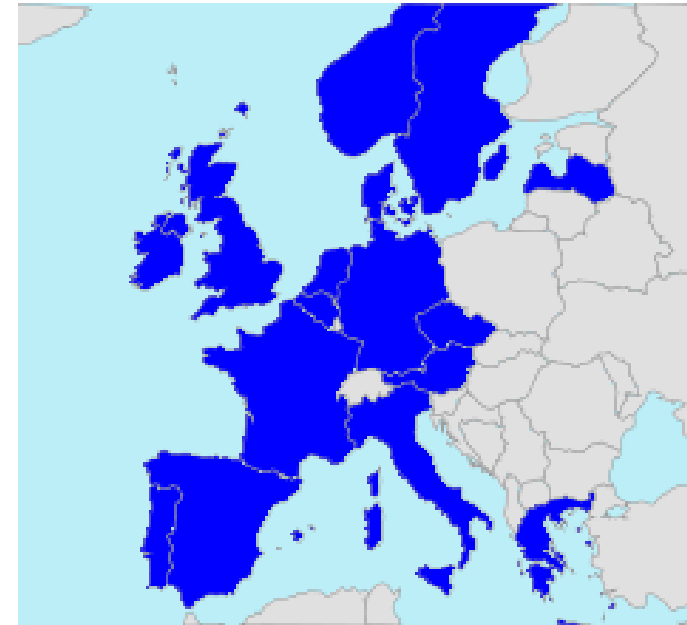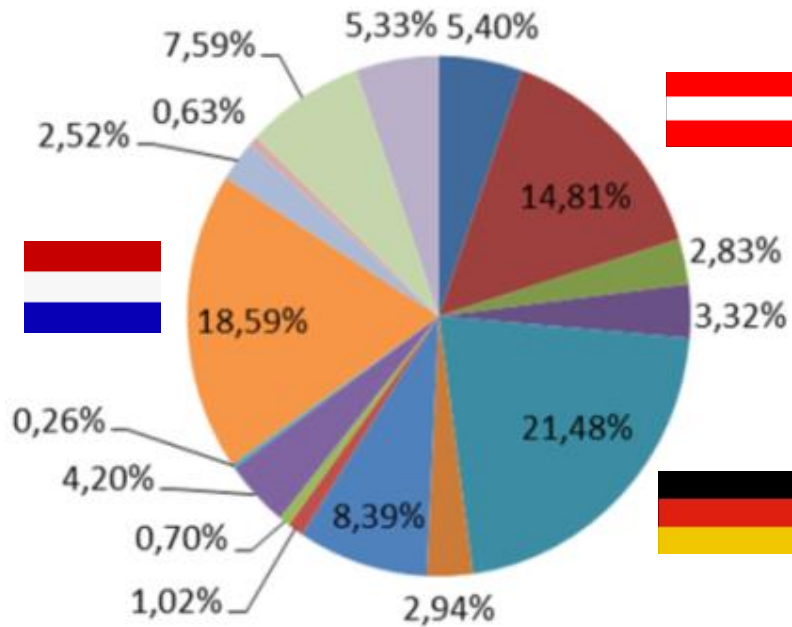
Project Overview
European Dimension

Norway

Netherlands

United Kingdom

Ireland

Belgium

France

Italy

Portugal

Spain

Sweden

Denmark

Latvia

Germany

Czech Republic
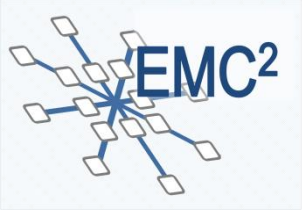
Austria

Greece
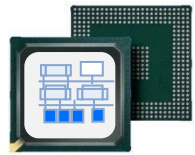
Israel

% of total costs per country

Country

FR · AT · BE · CZ · DE · DK · ES · GR · IRL · IT · LAT · NL · NO · PO · SE · UK
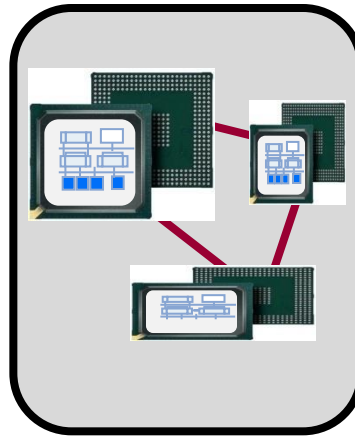
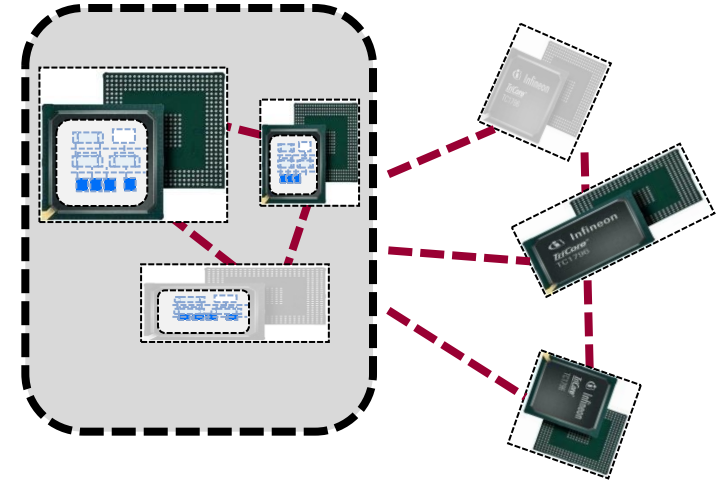# EMC² Embedded Systems in Terms of Complexity

C1: "Multi-Core SoC"

C2: "*closed* system of networked Multi-Cores"

C3: "*open* system of networked Multi-Cores"

- mixed criticality on SoC level bound to cores
- known and tested applications

- known number of control units and applications
- test before runtime

- variable number of control units and unknown applications possible

D1: "quasi static"

D2: "dynamic changes in a *closed* system"

D3: "dynamic changes in an *open* system"
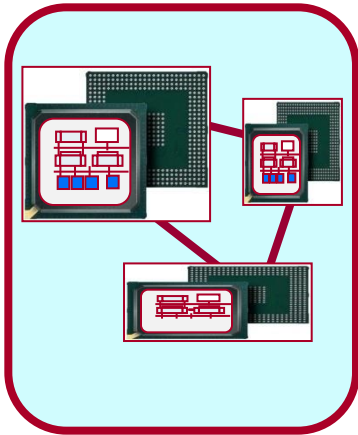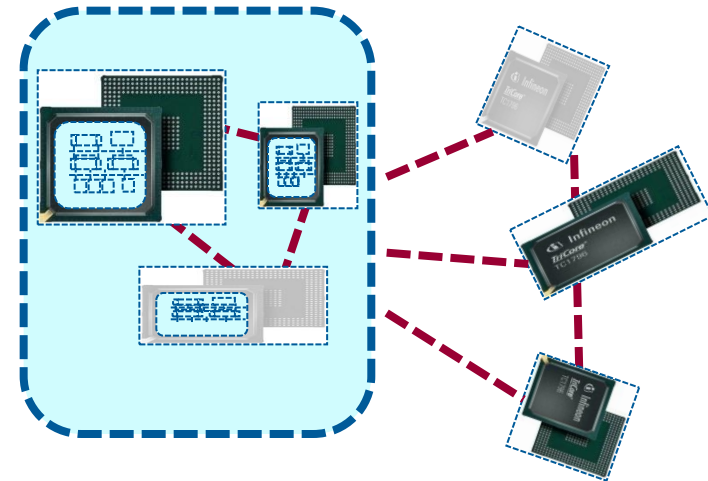

- ➢ static scheduling of cores
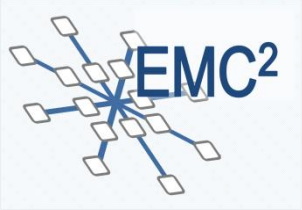- ➢ no dynamic changes at runtime
- ➢ uses already the new Service oriented Architecture
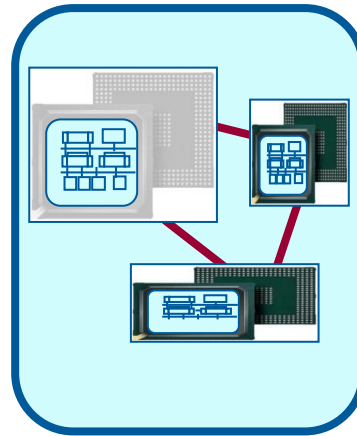
- ➢ known number of control units and applications
- ➢ dynamic changes possible: e.g. re-configuration, re-start, migration

- ➢ variable number of control units and unknown applications possible
- ➢ full range of dynamic changes possible

A System Approach –
All System Levels Addressed

➢ Addressed system levels / architecture:

  ➢ Heterogeneous Multi-core Hardware
  ➢ System software – dynamic runtime environment/networking
  ➢ Applications - cross domain
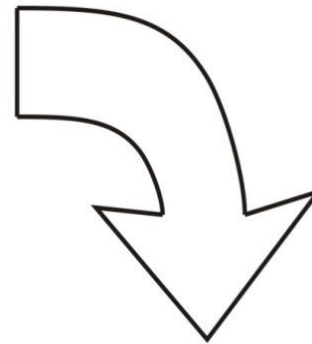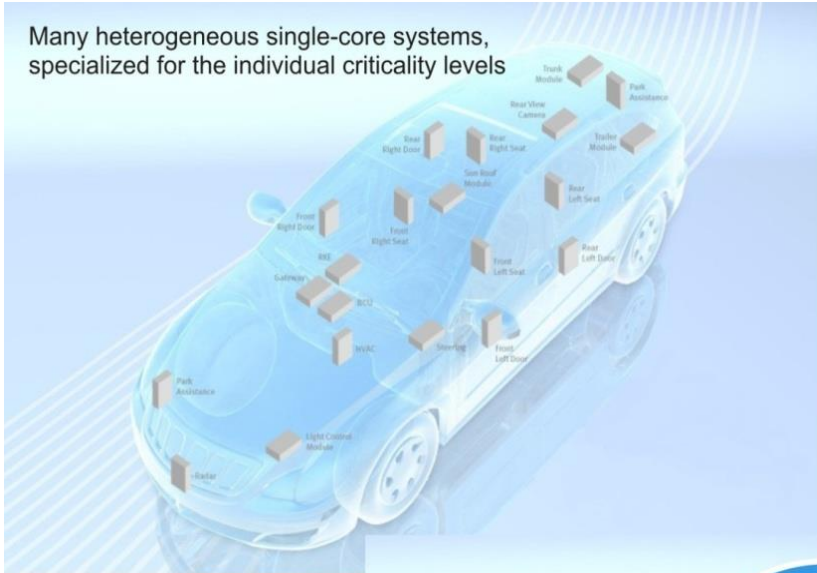 ➢ Design methodologies & tools

➢ … More specific aspects:

  ➢ Fault tolerance
  ➢ Energy management
  ➢ Security and Safety under real-time conditions
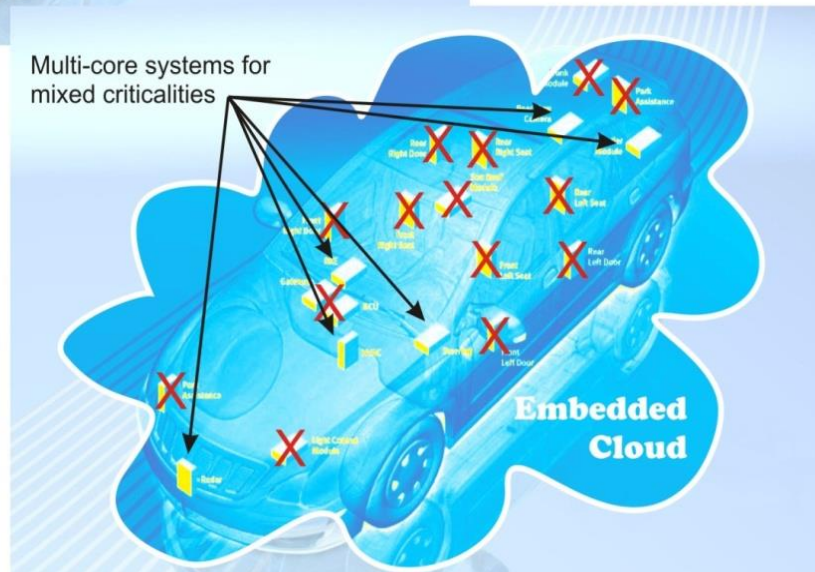 ➢ Qualification, Reliability
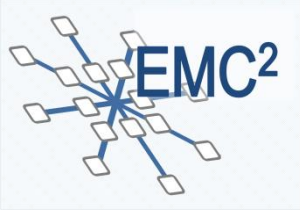
Reduce Number of Control Units

Many heterogeneous single-core systems, specialized for the individual criticality levels

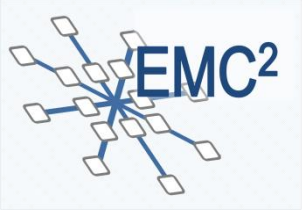Multi-core systems for mixed criticalities

Embedded Cloud

Vision

Aggregate resources (multi/many cores, ECU networks) in an "Embedded Encapsulated Cloud **E² Cloud**"

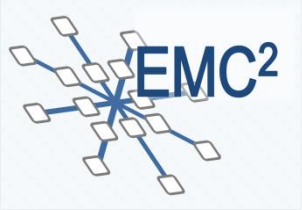Offer system properties as services and **NOT** built-in for the whole application perimeter

- Automotive

- Avionics

- Space

- Industrial manufacturing

- Logistics

- IT-infrastructure ('Internet of Things')

- Healthcare

- Railway

- Seismic surveying

Technical WP1-WP6

WP1: SOA Embedded system architecture

WP2: Executable Application Models and Design Tools for Mixed-Critical, Multi-Core Embedded Systems

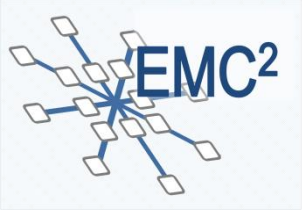WP3: Dynamic runtime environments and services

WP4: Multi-core hardware architectures and concepts

WP5: System design platform, tools, models and interoperability

WP6: System qualification and certification

WP7-WP12: Living Labs featuring use-cases

Living Labs WP7-WP12

WP1-WP6: Technical WPs providing technologies
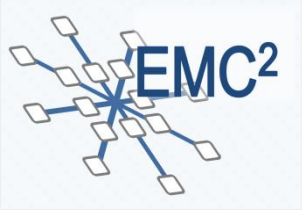
WP7 (LL1): Automotive Applications

WP8 (LL2): Avionics Applications

WP9 (LL3): Space Applications

WP10 (LL4): Industrial Manufacturing and Logistics

WP11 (LL5): Internet of Things
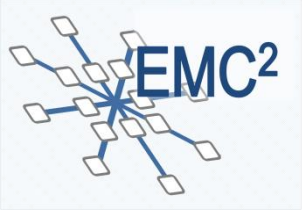
WP12 (LL6): Cross Domain Application
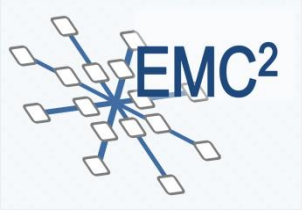
Large Size **platform project EMC2**
encourages and catalyzes new consortia on EU level
for product-oriented and successor funding projects

Project Management

➤ A project of this size can be technically managed although it requires significant dedication

➤ Project Management cares for
  ➤ the overall structure and organizational framework,
  ➤ the point of external contact,
  ➤ inter WP relations,
  ➤ the homogeneous look of the project

➤ A certain degree of de-centralization is necessary:
  two levels: WP management level; partner level

Two Clear Answers

> **Can a project of this size be successfully managed?**

Yes, it can !

> **Does a project of this size make sense?**

Yes, it does !