



**Università degli Studi dell'Aquila**  
*Center of Excellence DEWS*

*Design methodologies for **E**Embedded controllers,  
**W**ireless interconnect and **S**ystem-on-chip*

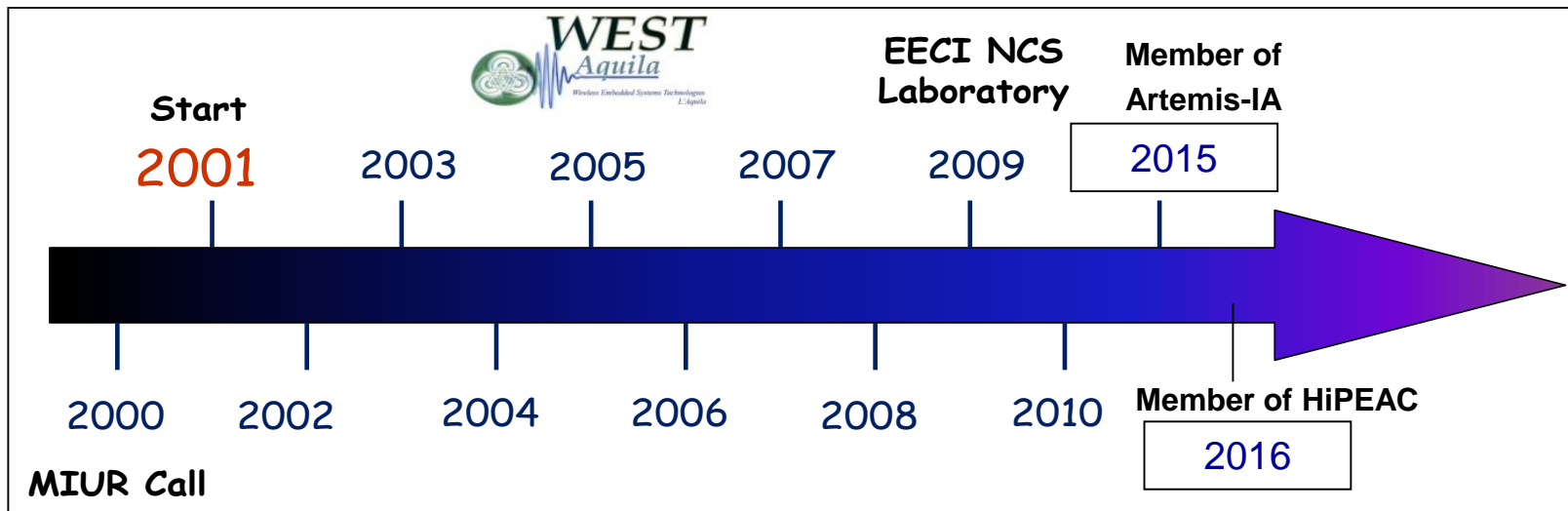
# Overview

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- **Main Research Topics**
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# Introduction

# Introduction

- **Center of Excellence DEWS**
  - Design methodologies for Embedded controllers  
Wireless interconnect and System-on-chip



# Introduction

- **Center of Excellence DEWS**
  - Research Lines

**M1: Modelling and control of heterogeneous distributed complex systems**

**M2: Communication and protocol design for pervasive and cognitive networks**

**M3: Design methodologies for embedded systems**

**A1: Intelligent Transportation Systems**

**A2: Energy**

**A3: Advanced monitoring and control**

# **Main Research Topics (M3)**

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- **Electronic System-Level HW/SW Co-Design**
- **HW Profilers for Parallel Architectures on FPGA**
- **Mixed-Criticality Systems**
- **Wireless Sensor Networks**

# **Main Research Topics (M3)**

Electronic System-Level HW/SW Co-Design



# Main Research Topics (M3)

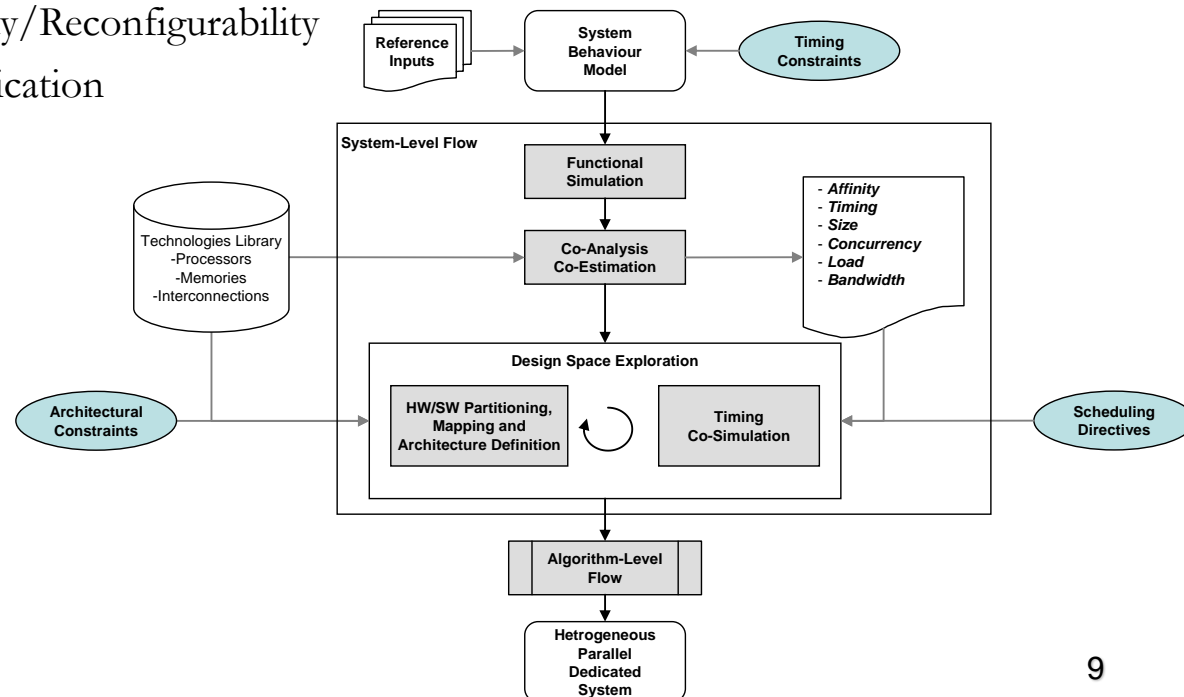
- **Electronic System-Level HW/SW Co-Design**

- **HEPSYCODE**

HW/SW Co-Design of Heterogeneous Parallel Dedicated/Embedded Systems

- System-Level Synthesis: Design Space Exploration

- Concurrent Error Detection
      - Real-Time Constraints/Mixed-Criticality
      - Monitorability/Reconfigurability
      - Formal Verification



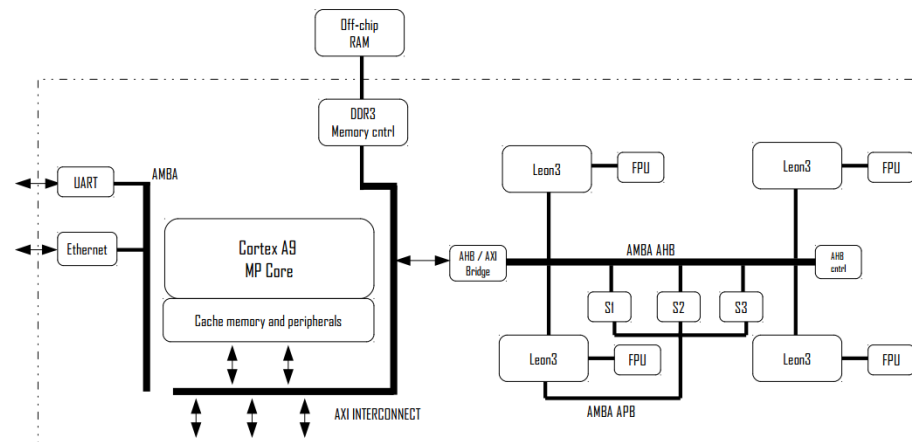
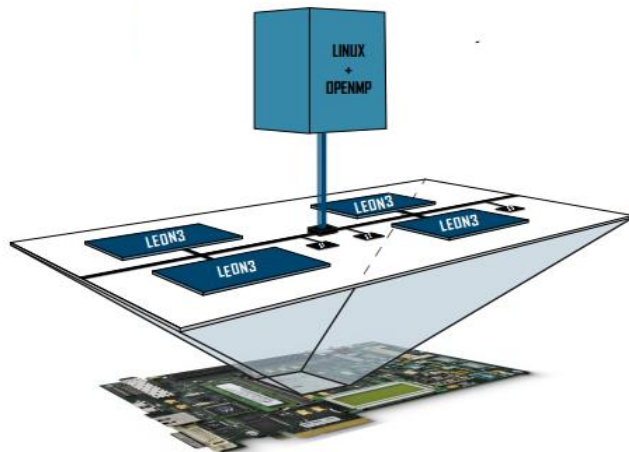
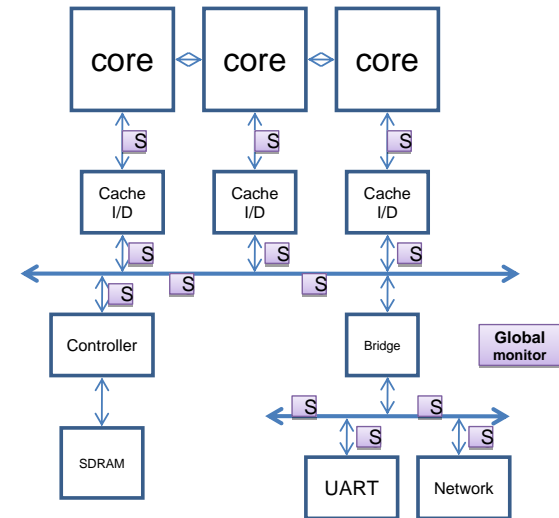
# **Main Research Topics (M3)**

HW Profilers for Parallel Architectures on FPGA

# Main Research Topics (M3)

- **HW Profilers for Parallel Architectures on FPGA**

- Distributed HW Profiling System
  - Support for offline/online monitoring and reconfigurability
- Platforms
  - *4-LOOP, A-LOOP*
    - *ARM, MicroBlaze, NIOS-II, LEON3*

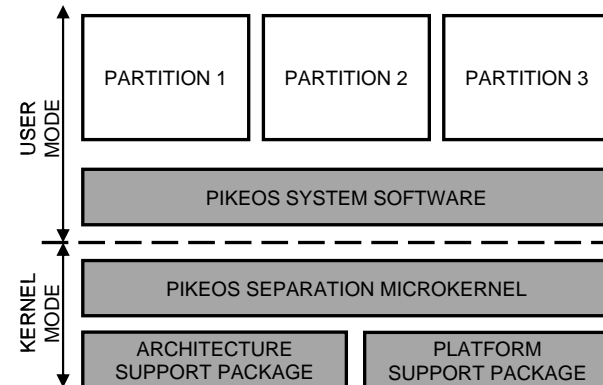
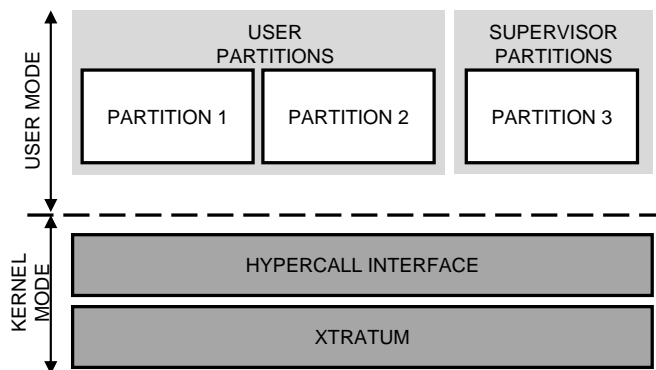


# **Main Research Topics (M3)**

Mixed-Criticality Systems

# Main Research Topics (M3)

- **Mixed-Criticality Systems**
  - Hypervisor technologies for mixed-criticality multi-core platforms
    - *PikeOS, Xtratum*
      - *ARM, LEON3, LEON4*
  - Mixed-criticality Network-On-Chip
    - Ad-hoc HW mechanisms to support isolation

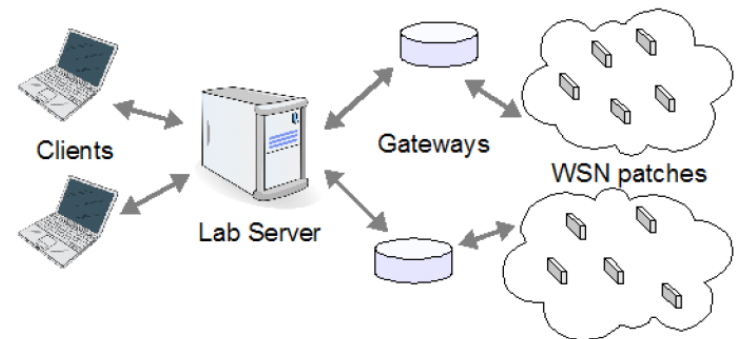


# **Main Research Topics (M3)**

Wireless Sensor Networks

# Main Research Topics (M3)

- **Wireless Sensor Networks**
  - Basic technologies
    - HW
      - *CrossBow/Memsic, Advanticsys, Texas Instruments, Atmel*
    - SW
      - *C/HAL, TinyOS, FreeRTOS, Contiki*
    - Communication protocols
      - *IEEE 802.15.4 (802.15.4e), OpenZB, TinyAODV*
  - Remote Lab and Testbed (*LabSMILING*)
    - Up to 100 nodes remotely programmable and monitorable
      - WSN data collection and analysis
      - Communication protocols assessment



# Main Research Topics (M3)

- **Wireless Sensor Networks**
  - Middlewares for WSN
    - Heterogeneous HW/SW/radio platforms
      - Mobile-agents based Virtual Machines
        - Support to IOT application development and deployment
    - Services
      - Indoor Localization
        - *TinyGIS*
      - Security
        - Cryptography
        - Intrusion Detection System
    - Technologies
      - *TinyOS Agilla/Agilla2*
      - *IBM MoteRunner*
      - DEWS MW (WIP)



# **Main Research Projects (M3)**

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- **VISION** (ERC-2009-StG 240555) [CLOSED]
  - *Video-oriented UWB-based Intelligent Ubiquitous Sensing*
    - <http://www.vision-ercproject.eu/>
- **SMILING** (RIDITT 2009, national project) [CLOSED]
  - *SMart In home LiviNG*
- **PRESTO** (Artemis-JU ASP 2010-269362) [CLOSED]
  - *ImProvements of industrial Real Time Embedded SysTems develOpment process*
- **CRAFTERS** (Artemis-JU ASP 2011-295371) [CLOSED]
  - *ConstRaint and Application-driven Framework for Tailoring Embedded Real-time Systems*
    - <http://www.ecsi.org/crafters>

# Main Research Projects (M3)

- **EMC<sup>2</sup>** (Artemis-JU AIPP 2013-621429) [CLOSED]
  - *Embedded Multi-Core systems for Mixed Criticality applications in dynamic and changeable real-time environments*
    - <http://www.artemis-emc2.eu/>
- **CASPER** (H2020-MSCA-RISE-2014) [RUNNING]
  - *User-centric MW Architecture for Advanced Service Provisioning in Future Networks*
    - <http://gain.di.uoa.gr/casper/>
- **SAFECOP** (ECSEL-JU RIA-2015) [RUNNING]
  - *Safe Cooperating Cyber-Physical Systems using Wireless Communication*
    - <http://www.safecop.eu/>

# Main Research Projects (M3)

- **MEGAM@RT<sup>2</sup>** (ECSEL-JU RIA-2016) [RUNNING]
  - *MegaModelling at Runtime - scalable model-based framework for continuous development and runtime validation of complex systems*
- **AQUAS** (ECSEL-JU RIA-2016) [RUNNING]
  - *Aggregated Quality Assurance for Systems*

# Memberships (M3)

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- **Artemis Industry Association (Artemis-IA)**
  - *Advanced Research & Technology for EMbedded Intelligent Systems*
    - <https://artemis-ia.eu/>
- **HSA Foundation**
  - *Heterogeneous System Architecture*
    - <http://www.hsafoundation.com/>
- **HiPEAC**
  - *European Network on High Performance and Embedded Architecture and Compilation*
    - <https://www.hipeac.net/>
- **TULIPP Advisory Board**
  - *Towards Ubiquitous Low-Power Image Processing Platforms*
    - <http://tulipp.eu/>

# Contacts

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