Università degli Studi dell'Aquila

Center of Excellence DEWS

Design methodologies for Embedded controllers, Wireless interconnect and System-on-chip

Overview

- Introduction
- Main Research Topics
- Main Research Projects
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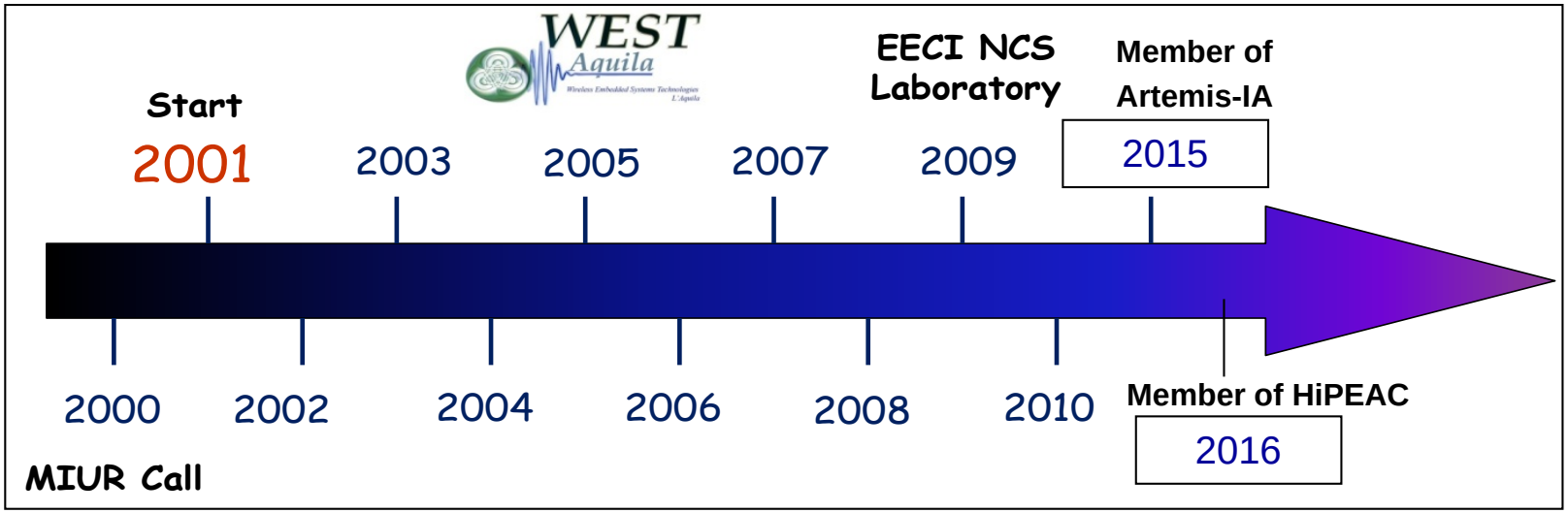
Introduction

Introduction

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

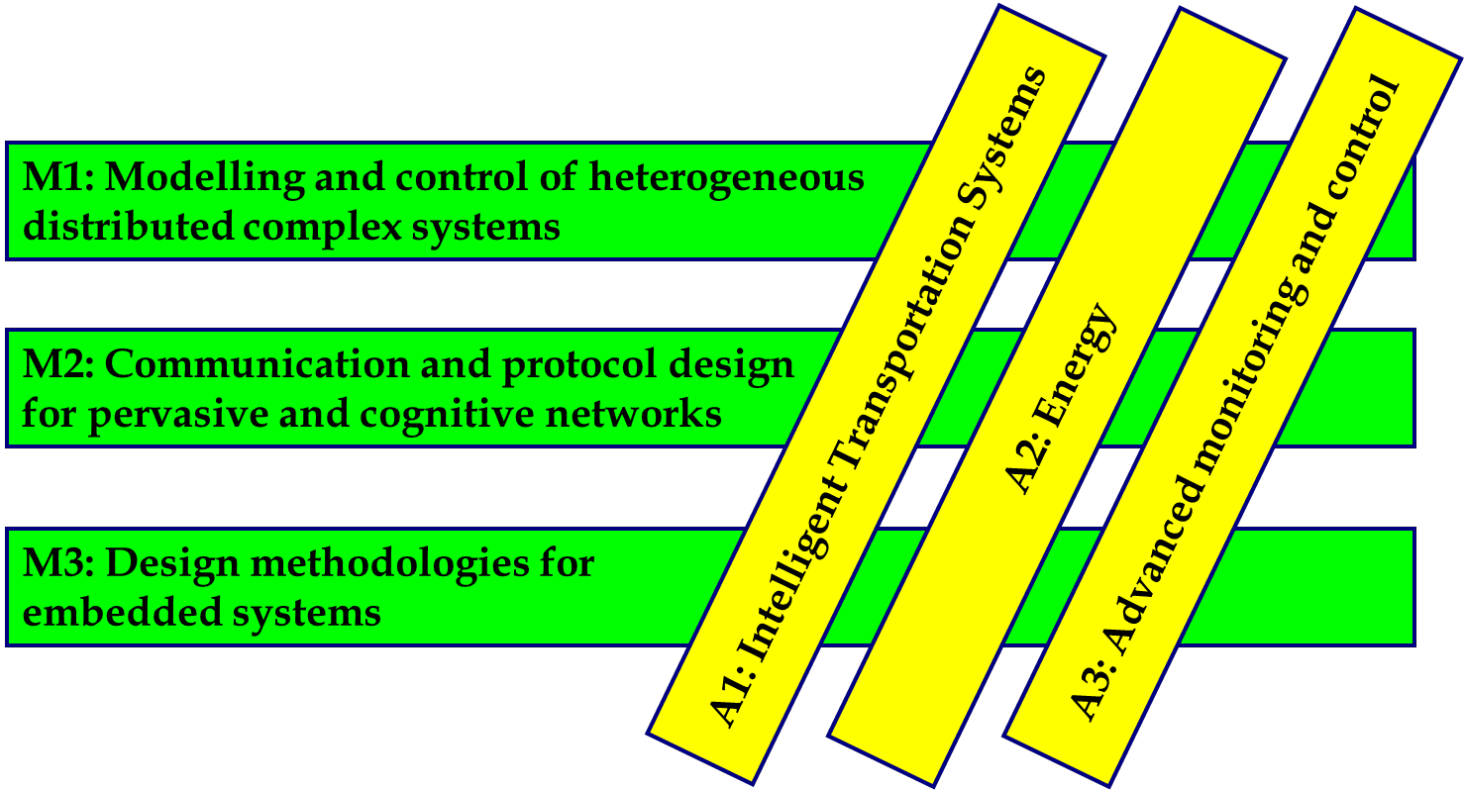
DEWS CENTER OF EXCELLENCE

http://dews.univaq.it



Introduction

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



Main Research Topics (M3)

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- Electronic System-Level HW/SW Co-Design
- Embedded Systems Monitoring
- Mixed-Criticality Systems
- Wireless Sensor Networks
- ICT for New Arts

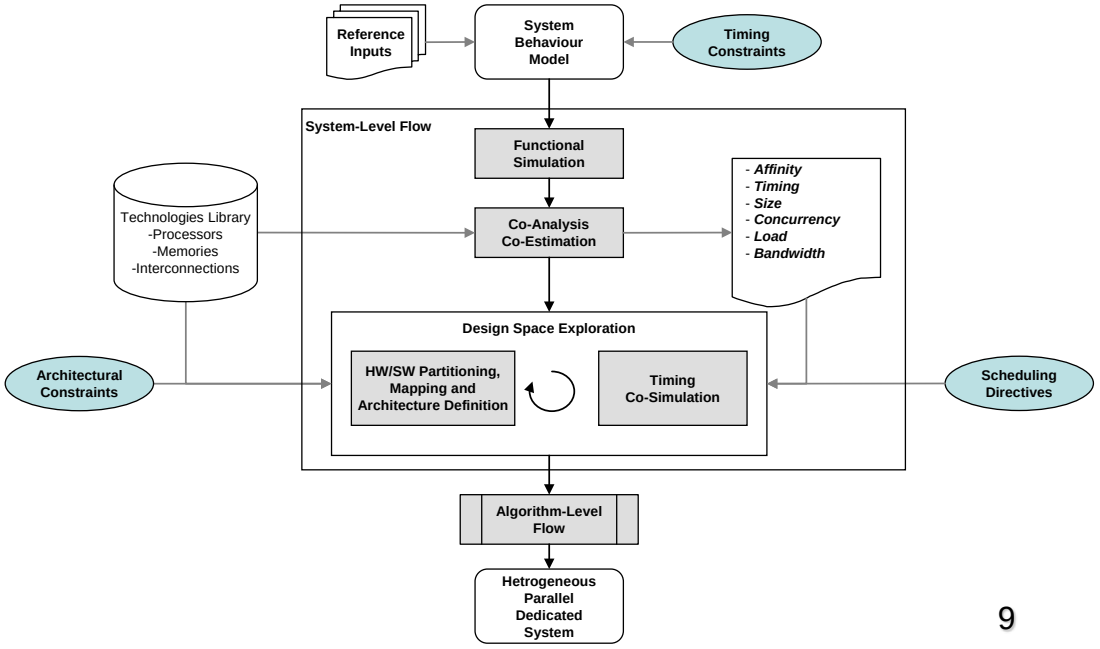
Main Research Topics (M3)

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
      - Real-Time Constraints
      - Mixed-Criticality
      - Monitorability

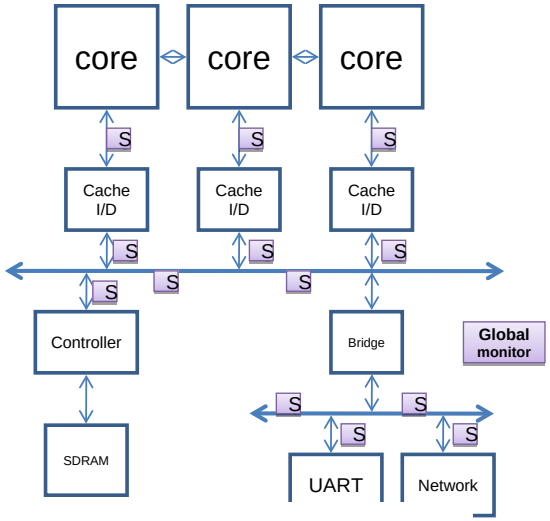


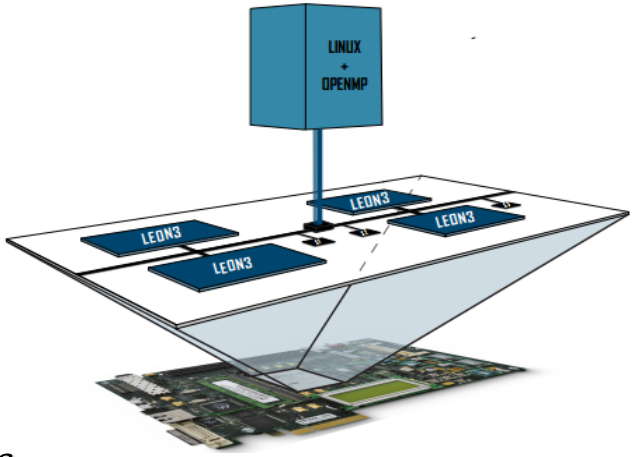
Main Research Topics (M3)

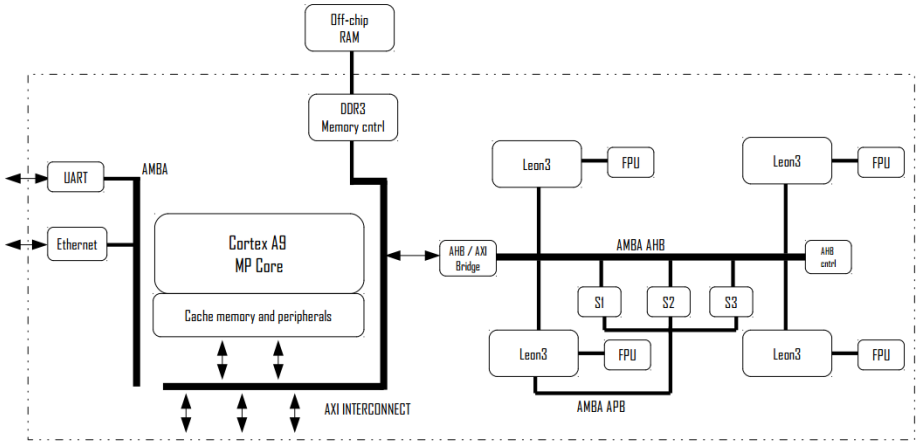
HW Profilers for Parallel Architectures on FPGA

Main Research Topics (M3)

- **Embedded Systems Monitoring**
  - HW/SW Profilers for Parallel Architectures on FPGA
    - Distributed HW Profiling System
      - Support for offline/online monitoring and reconfigurability
    - Platforms
      - *4-LOOP*, *A-LOOP*, *F-OMP*
        - *ARM*, *MicroBlaze*, NIOS-II, *LEON3*
        - *Bare-metal*, *Linux*, *OpenMP*





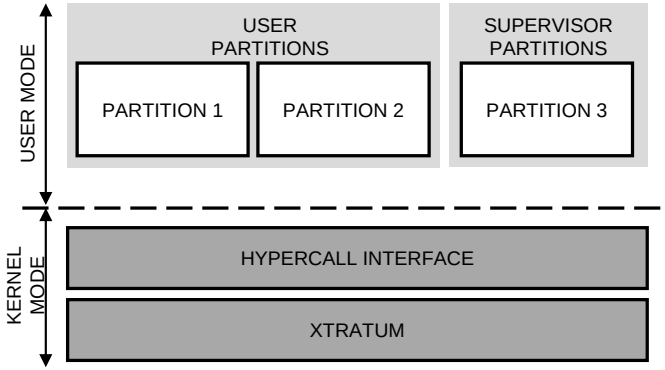


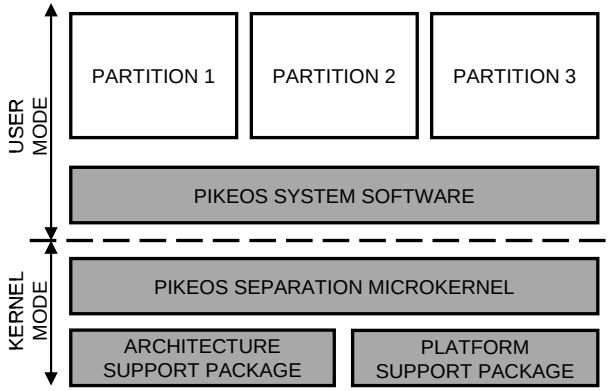
Main Research Topics (M3)

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



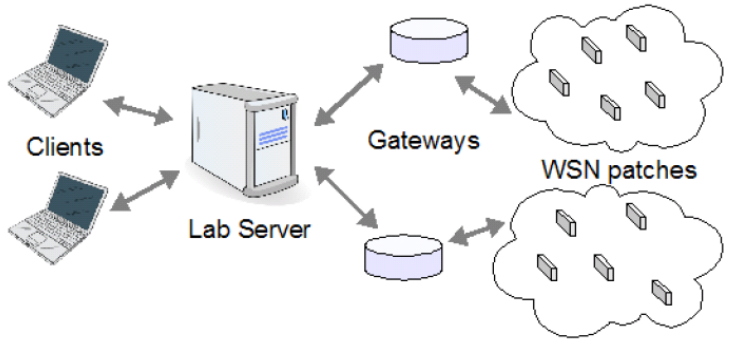


Main Research Topics (M3)

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)

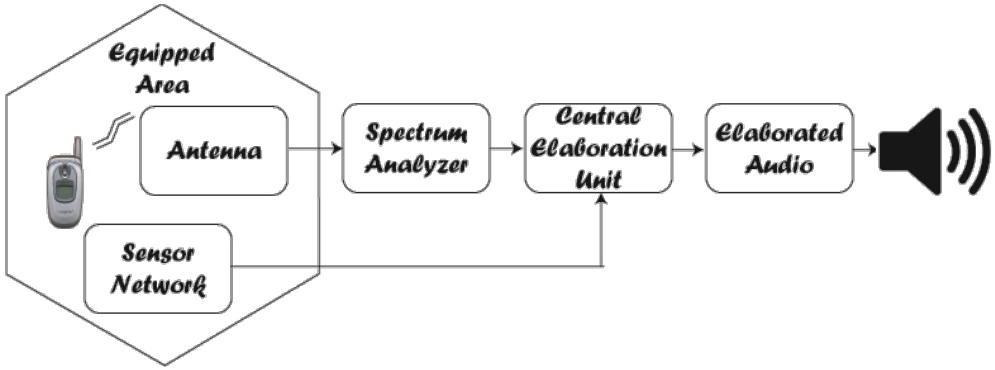
- **Wireless Sensor Networks**
  - Middlewares for WSN
    - Heterogeneous HW/SW/radio platforms
      - Mobile-agents based Virtual Machines
        - Support to IOT application development and deployment
    - Services
      - Indoor Localization
        - *TinyGIS*
      - Security
        - Cryptography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

Main Research Topics (M3)

ICT for New Arts

Main Research Topics (M3)

- **ICT for New Arts**
  - RF Sounding
    - Awareness of surrounding electromagnetic fields due to both base stations and users mobile terminals
  - Augmented Trumpet
    - Avoid any sensor and use a camera to gather data from a trumpet player
  - Crazy Square
    - E-learning music environment for digital natives



Main Research Projects (M3)

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- **VISION** (ERC-2009-StG 240555) [CLOSED]
  - *Video-oriented UWB-based Intelligent Ubiquitous Sensing*
- **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*
- **EMC^2** (Artemis-JU AIPP 2013-621429) [CLOSED]
  - *Embedded Multi-Core systems for Mixed Criticality applications in dynamic and changeable real-time environments*

Main Research Projects (M3)

- **CASPER** (H2020-MSCA-RISE-2014) [RUNNING]
  - *User-centric MW Architecture for Advanced Service Provisioning in Future Networks*
- **SAFECOP** (ECSEL-JU RIA-2015) [RUNNING]
  - *Safe Cooperating Cyber-Physical Systems using Wireless Communication*
- **MEGAM@RT²** (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*

Main Research Projects (M3)

- **FITOPTIVIS** (ECSEL-JU RIA-2017) [RUNNING]
  - *From the cloud to the edge - smart IntegraTion and OPtimization Technologies for highly efficient Image and VIdeo processing Systems*

- **AFARCLOUD** (ECSEL-JU RIA-2017) [RUNNING]
  - *Aggregate Farming in the Cloud*

Main Industrial Collaborations (M3)

Main Industrial Collaborations (M3)

- LE
  - Intecs
  - Thales Alenia Space Italy
  - Thales Italy
- SME
  - Aitek
  - IBTS
  - Kondor CS
  - RoTechnology
  - Tekne

Memberships (M3)

Memberships (M3)

- **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 Net 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/
- **National Laboratory (CINI)**
  - *Embedded Systems & Smart Manufacturing*
    - https://www.consorzio-cini.it/index.php/it/laboratori-nazionali/embedded-systems-smart-manufacturing

Main Contacts

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