



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

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

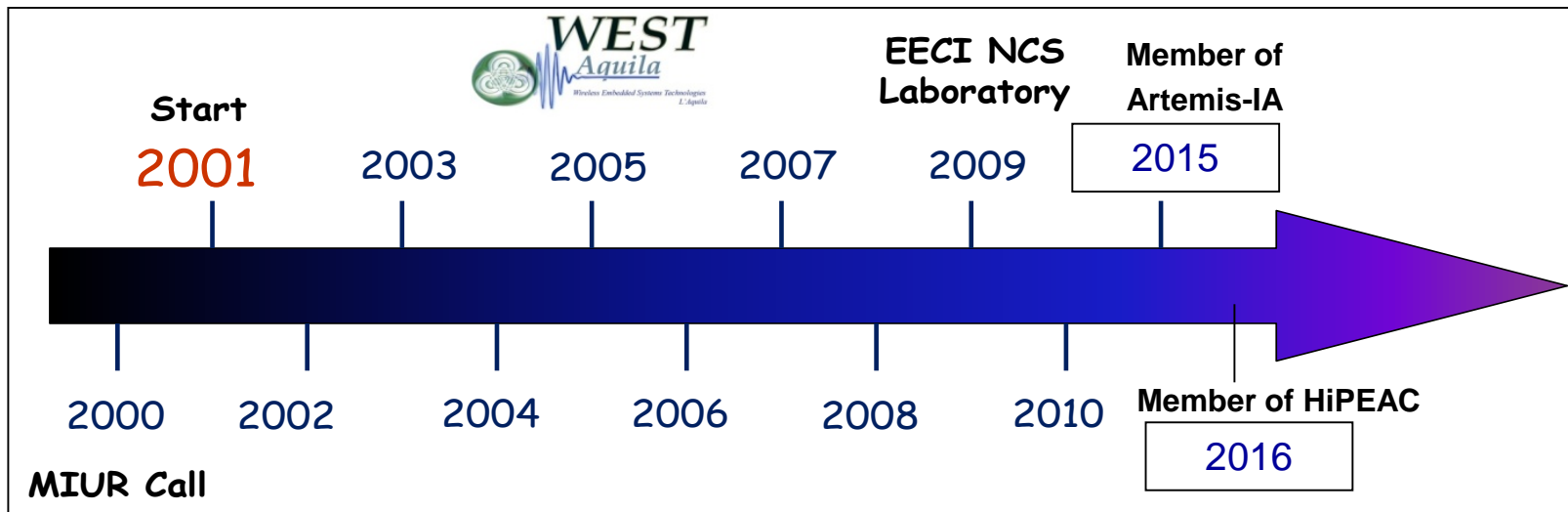
# Overview

- **Introduction**
- **Main Research Topics**
- **Main Research Projects**
- **Main Industrial Collaborations**
- **Memberships**
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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**
- **Embedded Systems Monitoring**
- **Mixed-Criticality Systems**
- **Wireless Sensor Networks**
- **ICT for New Arts**

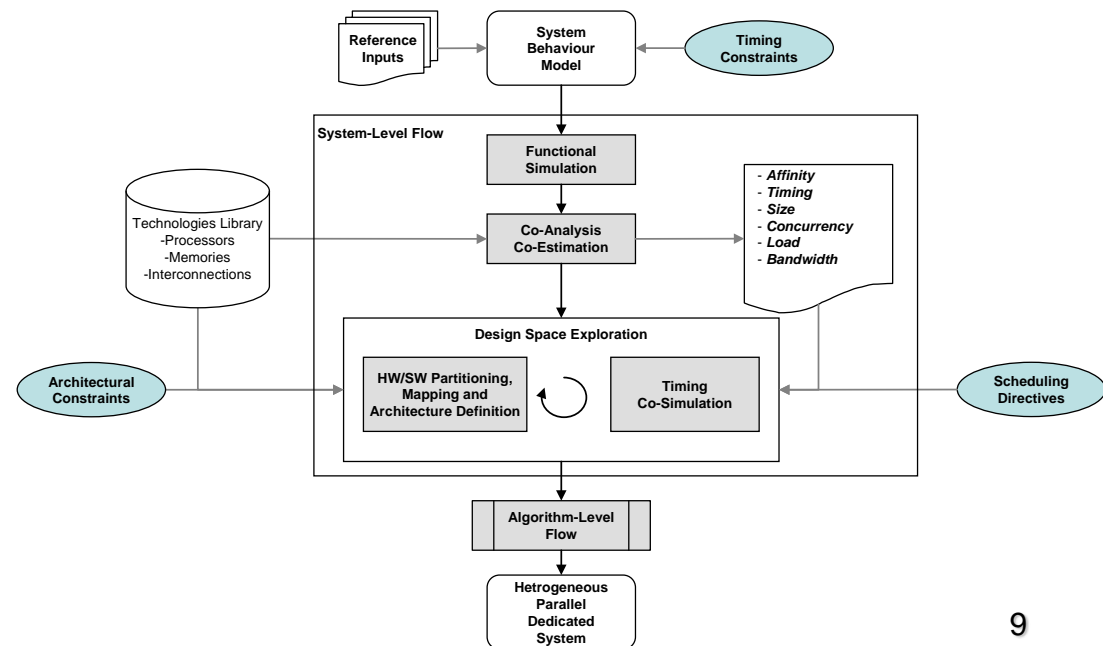
# **Main Research Topics (M3)**

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)

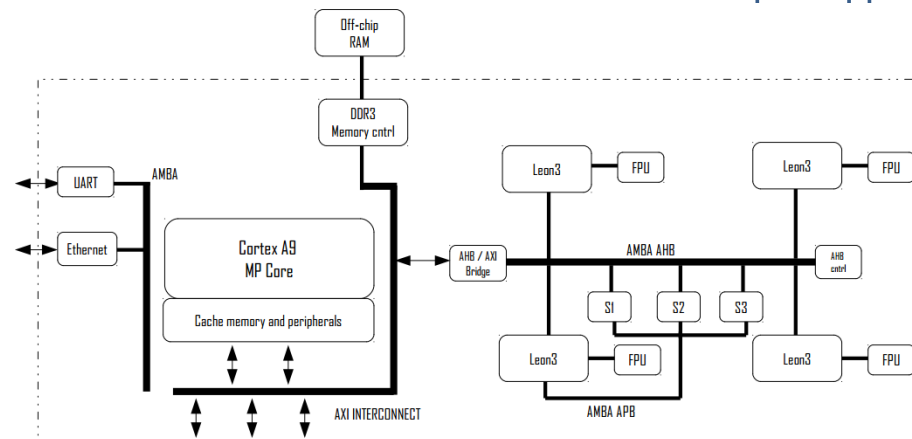
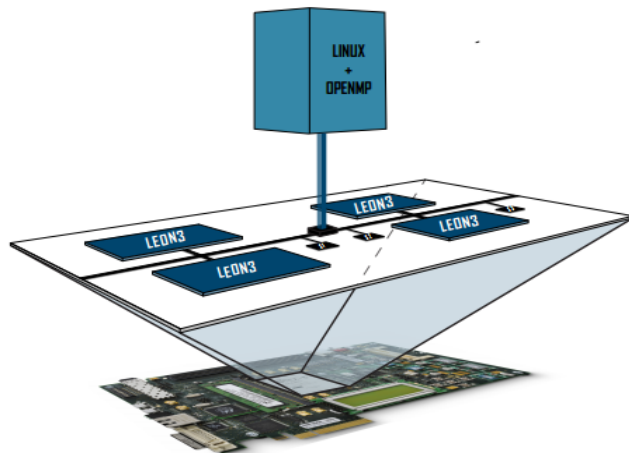
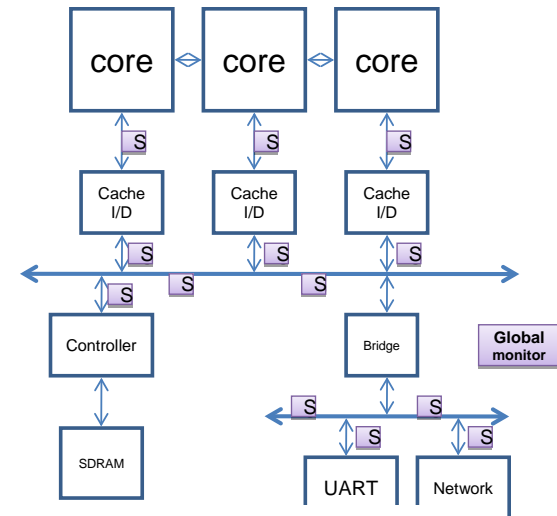
- **Embedded Systems Monitoring**

- 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*

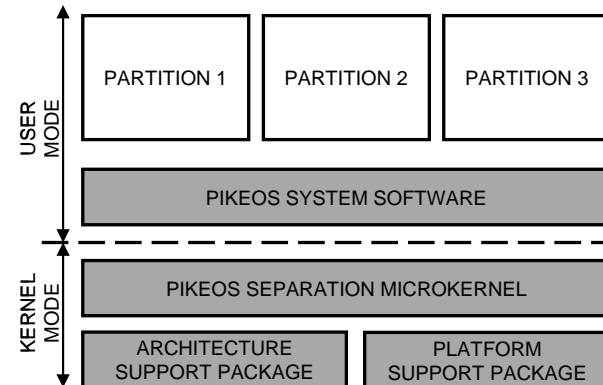
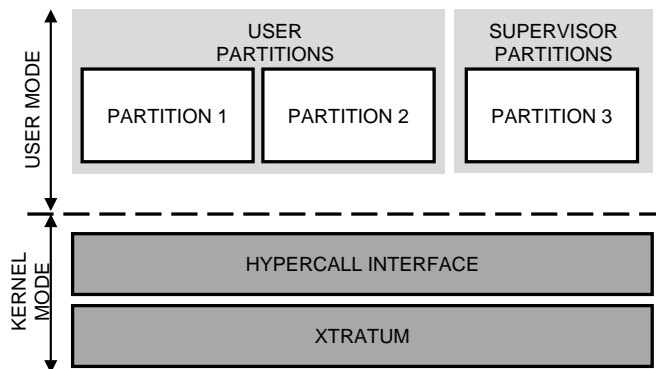


# **Main Research Topics (M3)**

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

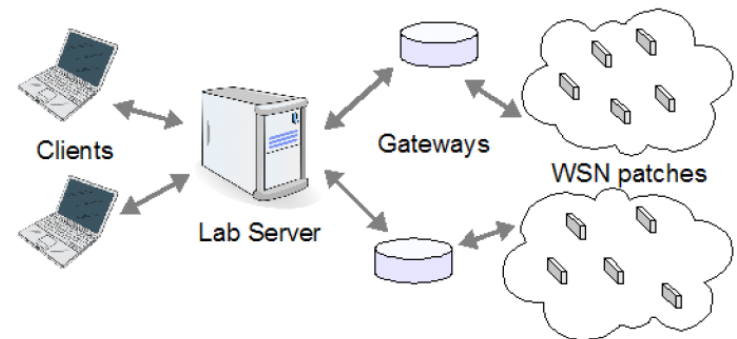


# **Main Research Topics (M3)**

Wireless Sensor Networks

# Main Research Topics (M3)

- **Wireless Sensor Networks**
  - Basic technologies
    - HW
      - *CrossBow/Memsic, Advanticsys, Texas Instruments, Atmel*
    - SW
      - *C/HAL, TinyOS, Contiki*
    - Communication protocols
      - *IEEE 802.15.4 (802.15.4e), OpenZB*
  - 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 Agilla2*
      - *IBM MoteRunner*
      - DEWS MW (WIP)

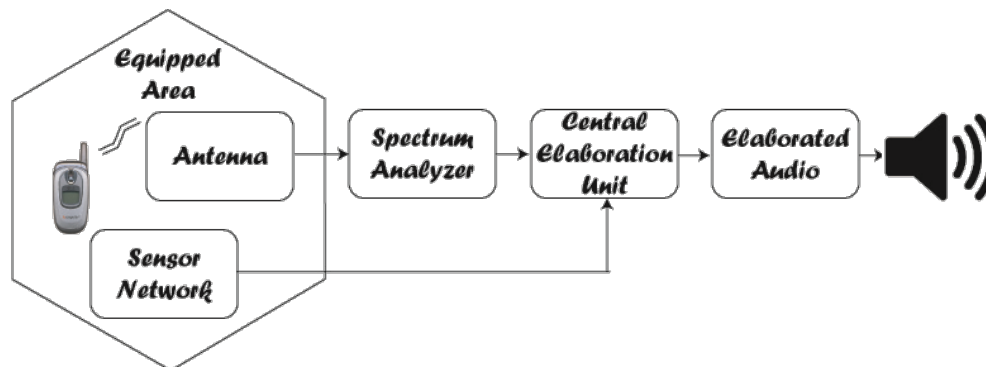


# **Main Research Topics (M3)**

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)**

# Main Research Projects (M3)

- **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<sup>2</sup>** (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@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*

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

# **Main Industrial Collaborations (M3)**

# Main Industrial Collaborations (M3)

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



# 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 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.consortio-cini.it/index.php/it/laboratori-nazionali/embedded-systems-smart-manufacturing>

# Main Contacts

**Luigi Pomante (Assistant Professor): [luigi.pomante@univaq.it](mailto:luigi.pomante@univaq.it)**

Claudia Rinaldi (Assistant Professor): [claudia.rinaldi@univaq.it](mailto:claudia.rinaldi@univaq.it)

Tania Di Mascio (Post-doc): [tania.dimascio@univaq.it](mailto:tania.dimascio@univaq.it)

Marco Santic (Post-doc): [marco.santic@univaq.it](mailto:marco.santic@univaq.it)

Paolo Giammatteo (Post-doc): [paolo.giammatteo@univaq.it](mailto:paolo.giammatteo@univaq.it)

Giacomo Valente (Post-doc): [giacomo.valente@univaq.it](mailto:giacomo.valente@univaq.it)

Vittoriano Muttillio (PhD Student): [vittoriano.muttillio@graduate.univaq.it](mailto:vittoriano.muttillio@graduate.univaq.it)

Walter Tiberti (PhD Student): [walter.tiberti@graduate.univaq.it](mailto:walter.tiberti@graduate.univaq.it)

Gabriella D'Andrea (PhD Student): [gabriella.dandrea@graduate.univaq.it](mailto:gabriella.dandrea@graduate.univaq.it)

Federica Caruso (PhD Student): [federica.caruso@graduate.univaq.it](mailto:federica.caruso@graduate.univaq.it)

Center of Excellence DEWS - Università degli Studi dell'Aquila

Via Vetoio-Coppito1, 67100 L'Aquila

ITALY

<http://dews.univaq.it>