

# Launch of a New Working Group on Multicore System Validation and Verification

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# Why do we need to create this working group

- Multicore systems are becoming common in space missions, bringing new computational capabilities and power efficiency but also challenges due to their complexity.
- Some targets that are becoming usual in missions:
  - GR712RC (Dual core Leon 3)
  - GR740 (Quad core Leon 4)
  - Coming GR765 (Octo core Leon 5 / Noel V)
- Software RTOS and Hypervisors also enable its use:
  - RTEMS SMP QDP (CAT-B).
  - Pikeos (CAT-B).
  - Xtratum (CAT-B).
- ESA guidelines does not cover multicore system as the ECSS-E-HB-40A.
- Even though we have the building blocks:
  - Are we prepared to use multicore systems broadly in ESA missions with all the warranties we had for uniprocessors?
  - In what kinds of units are they effective? (Avionics, Payloads, PDHU) Could we use them for what critical functionality?
  - In what targets? With what configuration?
  - What requirements need to be addressed or carefully considered during the system software definition and flowdown in a multicore software specification? What are the new verification and validation activities that need to be performed in the software development cycle?
  - Do we need to stick to the scheduling analysis and WCET? Is this approach still feasible? And what about the software lifecycle?

We have a question that is related to both hardware and software, and we need to provide an answer from top to bottom, considering a digital perspective.

- **G1: Scope Definition**
  - Focus on **homogeneous** multicore systems; defer heterogeneous systems.
  - Develop **guidelines** for a European roadmap on validation.
  - Refine **ECSS-E-HB-40A** to include multicore activities.
- **G2: Validation & Verification**
  - Create guidelines for **hardware/software architectures (digital prespective)**.
  - Ensure methods are **state of the art** and implementable.
  - Assess **risks** of multicore systems in missions.
- **G3: Standardization**
  - Establish compliant **V&V activities** to mitigate risks.
  - Analyze techniques from other sectors for **adaptation**.

# Multicore Systems Goals in Space 2

- **G4: Technological Advancement**
  - Identify technologies to enhance **multicore performance**.
  - Develop a roadmap for an effective **software toolchain**.
- **G5: Risk Management**
  - Categorize V&V based on **mission criticality** and risks.
  - Provide **examples** to clarify recommendations.
- **G6: Vision for Multicore Use**
  - Highlight technologies aligning with ESA's **multicore roadmap**.
  - Outline a roadmap for the next **decade** in space exploration.

- **Objective:** Establish a dedicated working group to address validation and verification topics for multicore systems.
- **Where:**
  - **Contribute** to the **ECSS-E-HB-40A** as an initial step to consolidate a common view, particularly focusing on **Chapter 7** regarding **real-time systems**.
  - Define the **hardware and software multicore architectures** that can be **reliably** utilized for **space applications**.
  - Identify and build a **common ESA roadmap** for the **validation and verification of multicore systems**.
  - **Share experiences** and lessons learned from **multicore system projects**.

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