

## [SPACE CoE: Scalable Parallel and distributed Astrophysical Codes for Exascale](#)

### Description

In Astrophysics and Cosmology (A&C) today, High Performance Computing (HPC)-based numerical simulations are outstanding instruments for scientific discovery. They represent essential tools and theoretical laboratories able to investigate, interpret and understand the physical processes behind the observed sky. For these laboratories, the efficient and effective exploitation of exascale computing capabilities is essential.

Exascale systems, however, are expected to have a heterogeneous unprecedented architectural complexity, with a significant impact on simulation codes. Consequently, the proposed SPACE CoE aims to extensively re-engineer the target codes to engage with new computational solutions and adopt innovative programming paradigms, software solutions, and libraries. SPACE aims to foster the reuse and sharing of algorithms and software components in the A&C application domain. The SPACE CoE will address this action through co-design activities that bring together scientists, code developers, HPC experts, HW manufacturers and SW developers, advancing lighthouse exascale A&C applications, codes, services and know-how promoting the use of upcoming exascale and post-exascale computing capabilities.

In addition, SPACE will address the high-performance data analysis of the data torrent produced by exascale A&C simulation applications, also with machine-learning and visualization tools. The deployment of applications running on different platforms will be facilitated by federating capabilities focusing on code repositories and data sharing, and integrating European astrophysical communities around exascale computing by adopting software and data standards and interoperability protocols.

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