# PrismArch

## Virtual reality aided design blending cross-disciplinary aspects of architecture in a multi-simulation environment

**Motivation:**

The design process in architectural projects is characterized by high complexity which stems from the problem of "parallel worlds" (a term used to describe the fact that several disciplines -architects and a variety of engineers- coexist in an architectural project with distinct requirements and role). However, it is only the "intersection", by means of close collaboration, of these "parallel worlds" that can bring an architectural project to fruition. This "parallel world" aspect creates the necessity for an interdisciplinary tool capable to address the unique requirements of each discipline both individually and simultaneously, where all authors will be able to work on the same architectural project and perceive it in their own, different way that best suits their needs. This fact, dictates a necessity for "prismatic decomposition" of the architectural project into components that meet the needs of individual disciplines. Similarly, there is also a need for "prismatic composition", where individual designs, created separately, can be merged to form a unified architectural project.

**Goal:**

PrismArch aims to create a VR-aided design environment that will be able to host both architects and engineers towards a common goal, the effective realization of an architectural project. PrismArch will enhance the overall decision making process through an action and reaction paradigm. The dynamic collaboration that the PrismArch aims to offer, will allow designers to iteratively co-decide, preview and evaluate the result of their decisions towards a joint optimal solution. Through advanced VR-aided design environment, superimposed with physical and functional characteristics, the designers will be able to experience in-real time not only how their decisions affect their own discipline but also the other disciplines and consequently the overall architectural project.

**Scientific Objectives:**

- Requirements of a cross-disciplinary, collaborative environment for VR-aided design in architecture
- Computational architecture design for automated content creation and design suggestions
- Cognition aspects of collaborative VR-aided design environments
- Blending multi-simulations and BIM notations within a VR-aided design environment
- System integration and development of the collaborative VR-aided design environment
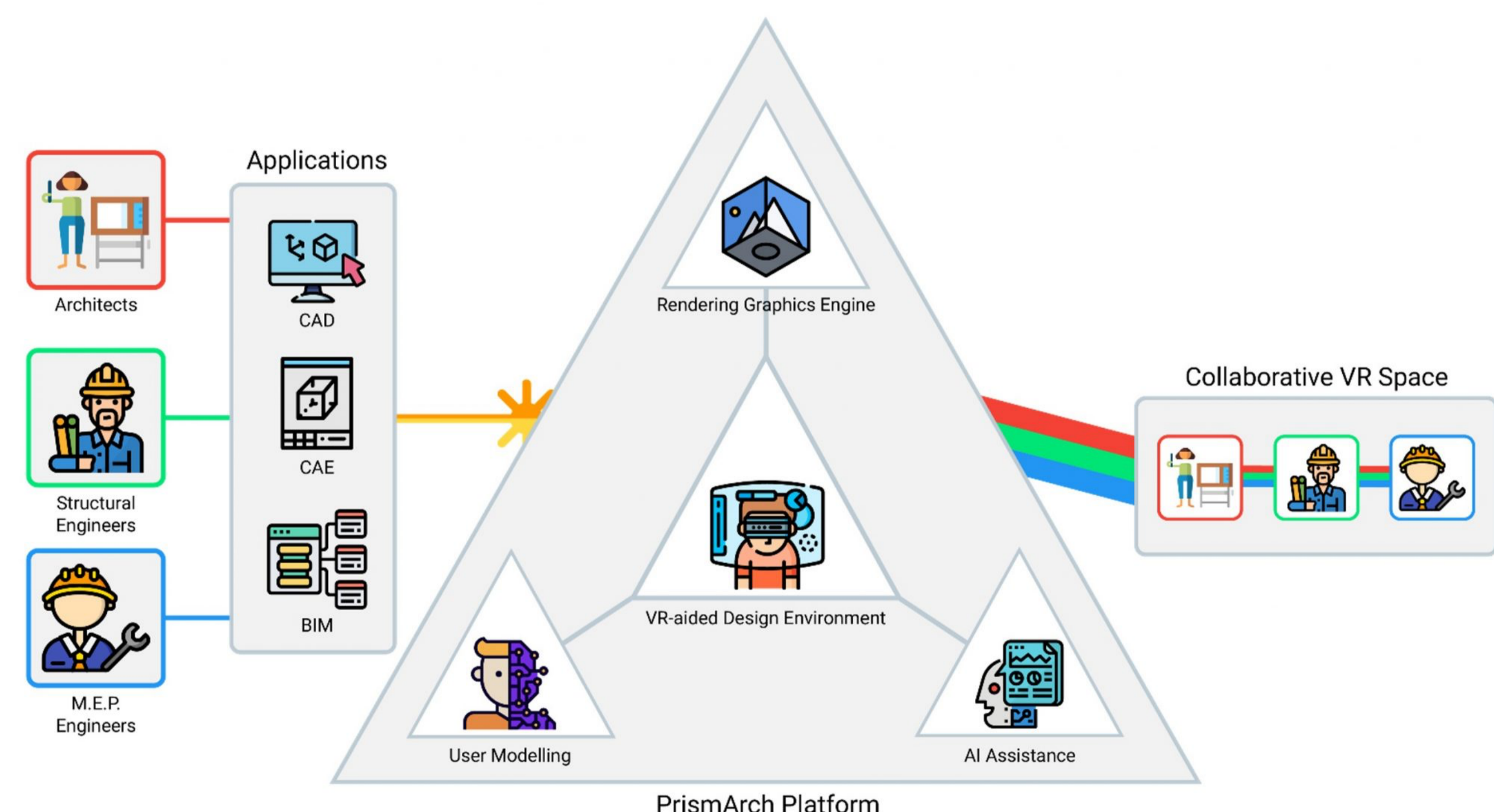- Demonstrate and evaluate PrismArch in different architectural projects

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**WP1. Requirements of a cross-disciplinary, collaborative environment for VR-aided design in architecture**
WP1 aims at eliciting the user and functional requirements of PrismArch by relying on experts' knowledge to, initially, identify the limitations of existing solutions and workflows in architecture; then move on with the main principles that govern the disciplines of architectural, structural and MEP design as well as their interconnections; and conclude with the conceptualization of a VR-aided design environment.

**WP2. Computational architecture design for automated content creation and design suggestions**
WP2 is focusing on AI assistance and content generation in VR-aided authoring tasks. In particular, AI will search across the parameters of the design space in real-time, presenting suggestions that satisfy functional constraints, and both improve efficiency and aesthetic diversity.

**WP3. Cognition aspects of collaborative VR-aided design environments**
The objective of this WP is to conduct behavioural experiments in VR on designers and engineers in order to measure the cognitive, spatial, and navigational stress induced, as well as the ability to author, take decisions, and being productive in the VR environment.

**WP4. Blending multi-simulations and BIM notations within a VR-aided design environment**
The objectives of this WP are to establish the seamless integration of BIM notations and CAE-Simulations within the VR-aided design environment. More specifically, WP4 will work out the details of establishing a high-speed two-way communication between the high-quality graphic engines (i.e. Unreal or Unity) and existing software packages handling BIM information and CAE-generated simulations.

**WP5. System integration and development of the collaborative VR-aided design environment**
The aim of WP5 is to integrate the PrismArch components into an overall platform, validate its proper functioning and fine-tune it for running the demonstrators.

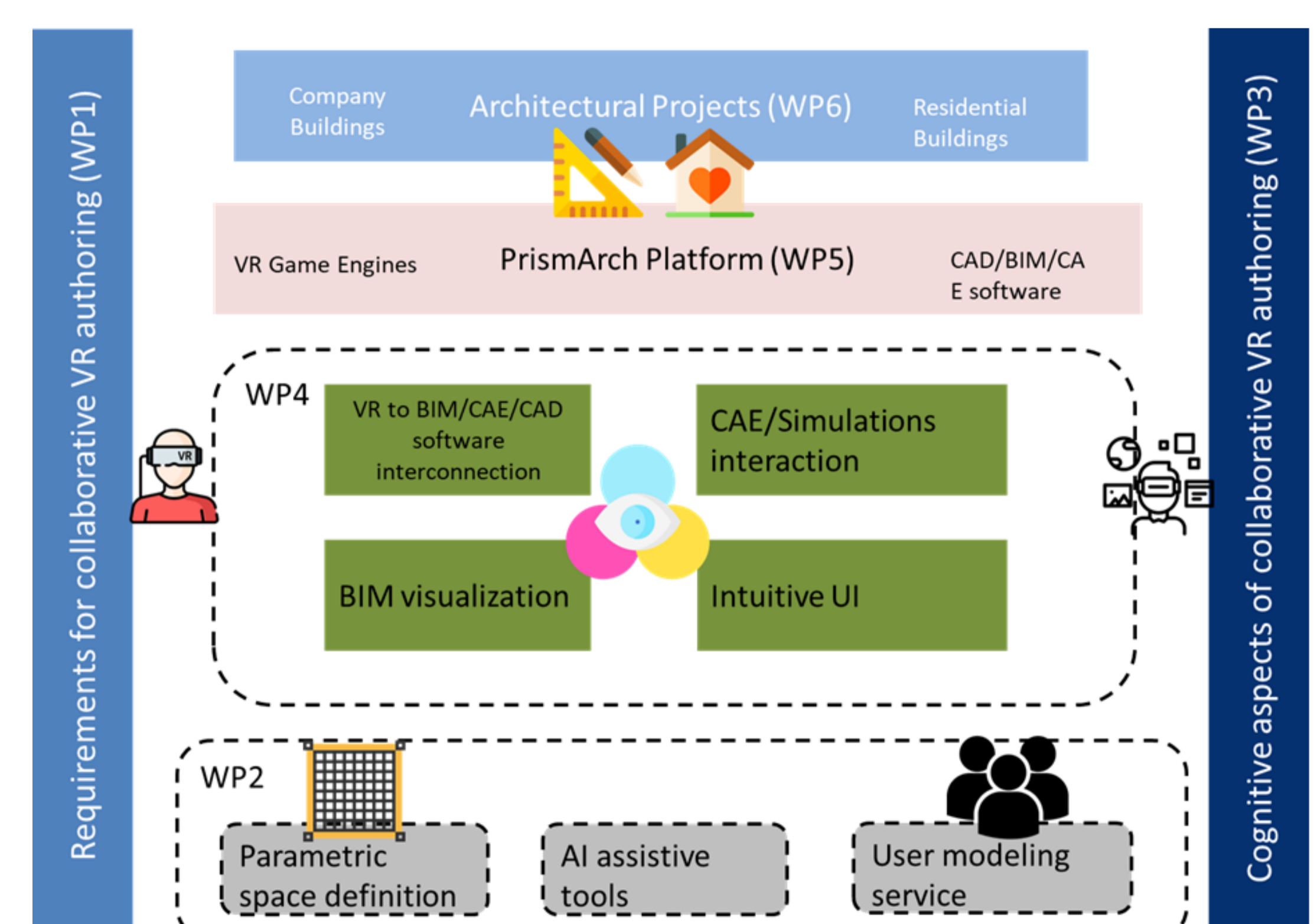**WP6. Demonstrate and evaluate PrismArch in different architectural projects**
WP6 aims to design and implement the demonstrations of the PrismArch platform in specified architectural projects. A methodology will be developed to design and execute two demonstrators concerning the design of company and residential buildings.

**WP7. Dissemination, exploitation and innovation management**
The objective of WP7 is to ensure that the technologies developed in the context of PrismArch enjoy the necessary level of dissemination, are exploited by the consortium partners and are sustainable beyond the end of the project.

**WP8. Project Management and Coordination**
The goal of WP8 is to plan and undertake all necessary activities for the project's effective coordination, to ensure the achievement of the project objectives on time, within budget and with a high degree of success.



# Partners