PrismArch

Deliverable No D8.3

IPR Plan

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Main Authors:	Dimitrios Ververidis (CERTH), Valia Margariti (CERTH)

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Abstract	The deliverable reports on the activities performed in the project for the purpose of managing the knowledge and protecting the intellectual property of the results generated within PrismArch.
Keywords	IPR, intellectual property, IP assets

Deliverable history

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List of abbreviations and acronyms

Abbreviation	Meaning
CA	Consortium Agreement
GA	Grant Agreement
DoA	Description of Actions
IP	Intellectual Property
IPR	Intellectual Property Rights
EPO	European Patent Office
ROAR	Registry of Open Access Repositories

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1.   Executive summary

Deliverable D8.3 serves as PrismArch's IPR plan. The goal of the deliverable is to discuss protection of valuable IP that may result from the project. More specifically, the goal of the deliverable is to record all knowledge assets that could potentially lead to valuable IP with commercial prospect and, on the other hand, to establish the rules of ownership, protection and management of the generated results to balance the need to disseminate the project results without discarding the opportunity to commercially exploit valuable knowledge.

This deliverable starts by specifying the IPR strategy adopted in PrismArch. The strategy describes the adopted methodology and the knowledge management framework. The latter identifies the project's Grant Agreement and Consortium Agreement as the main document sources regulating the management of knowledge and intellectual property.

Next, the deliverable provides PrismArch's IPR Plan, which starts with a description of the PrismArch platform to set the context where the new knowledge is expected to emerge. Subsequently, the deliverable describes the most widely used instruments for protecting IP. Finally, the deliverable presents a set of tables (one for each work package) summarizing the IP assets that have been identified by all consortium members.

PrismArch's framework for knowledge management provides a review of all IPR-related clauses that are included in PrismArch's GA and CA. By going through these clauses, the goal is to translate them into clear and comprehensible rules for all consortium members to follow. In establishing these rules, our main concern has been to balance the trade-off between the need to adequately disseminate the project results, without discarding the opportunity to timely protect and commercially exploit valuable IP.

Finally, the deliverable provides an analysis of using third party, open source software as part of PrismArch platform to identify the precautions that need to be taken to avoid infringing a future patent or license agreement.

2.   Introduction

The purpose of this deliverable is to report activities in Task 8.3 that focuses on management of knowledge and intellectual properties' protection of assets generated by the PrismArch consortium. The task also aims to develop rules and processes that will be put into practice for protecting, accessing and transferring the produced assets. The role of D8.3 is to serve as the IPR plan of PrismArch. The goal is twofold: a) to describe the methodology that will be employed for collecting and analysing the key IP assets generated by PrismArch consortium, and b) determine the rules and processes for protecting, accessing and transferring the project results that falls under IPR protection.

Concerning the first goal, it should be highlighted that the technology developed in the project has yet to reach its full maturity. Nevertheless, it is considered useful to predict the expected IP assets so as to plan for an appropriate protection. In particular, such planning requires identifying in advance where the project might generate IP. The conducted identification does not entail specific actions to be taken in well-defined dates. Instead, prospects of IP generation are examined with a view of setting up appropriate processes that would allow translation of the IP into concrete benefits. For this reason, deliverable D8.3 provides an initial assessment of PrismArch IP opportunities and highlights promising areas for IP protection. The aim is, therefore, to alert PrismArch partners on the need to take steps and avoid early disclosure of valuable intellectual property before it has been properly protected.

Concerning the second goal, the intention of the deliverable is to translate the IPR-related terms and conditions as they appear in PrismArch Grant Agreement (GA) and Consortium Agreement (CA), into a comprehensive framework for protecting, accessing, transferring and exploiting the IP assets generated within the project. Therefore, the deliverable discusses issues related to access rights, results ownership (i.e., joint ownership, transfer of results, granting licenses), protection of results (patents, trademarks, publications), the notification procedure for publications and the strategy for the open-source distribution of PrismArch results.

Finally, the deliverables analyses the pros and cons of bringing in open source and third party IP into PrismArch activities. Any technology brought into the project runs the risk of infringing a competitor patent or licence agreement. Thus, it is important to carefully analyse the open-source software tools that are incorporated into PrismArch platform in each development step.

Deliverable D8.3 follows the subsequent structure.

Section 3 describes the IPR strategy by providing an overview of the methodology followed for compiling the IPR plan, as well as the approach taken for establishing the PrismArch framework for knowledge management.

Section 4 elaborates on the IPR plan and the IP assets that have been identified by the consortium as more prominent and describes the clauses constituting the PrismArch framework for protecting and managing the project results.

Section 5 analyses the precautions that have to be taken when using third party, open-source software.

Section 6 concludes the deliverable.

3.   PrismArch IPR Strategy

The cardinal objective of PrismArch is to shift the existing paradigm of AEC workflow by combining AEC's industry various functional tools into a common platform that will facilitate decision-making and ultimately reshape the design process. By supporting the major disciplines that are typically engaged in an architectural project - namely architects, structural and MEP engineers - PrismArch will enhance the overall decision-making process through an action and reaction paradigm. The dynamic collaboration that PrismArch aims to offer, will allow them to iteratively co-decide, preview and evaluate the result of their decisions towards a joint optimal solution. Through advanced simulations embedded within the collaborative 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. The introduced AI-assisted design capabilities of PrismArch aim to take designers even closer to their common goal by suggesting scientifically sound design options with respect to quantitative evaluation criteria. Finally, the photorealistic representations of PrismArch will allow the designers to gain insights and obtain a visceral feeling of their creation way long before their actual construction through intuitive interfaces tailored to their individual needs and expertise.

PrismArch has been designed to foster the exploitation of its results, which requires clear IPR agreements and flexible ownership schemes. Furthermore, PrismArch requires mixing knowledge and competences across the entire spectrum of consortium partners. In order to succeed in exploiting the project results, therefore, the consortium needs to answer the following questions: a) What kind of results are expected in PrismArch? b) How will the background and results be managed? c) How will the joint ownership be treated? d) How will the results of the project be protected? e) How will the results be made public and disseminated? and f) How will the results be exploited? The following sections provide answers to these questions.

3.1   Intellectual property plan methodology

In assembling the list of potential IP assets the following steps were taken:

- Partner discussion to define and agree the terms used to describe IP;
- Development of a questionnaire to collect information from the PrismArch partners about their IP expectations;
- Collecting information from partners on their IP assets and their expectations for protecting the IP;
- Consolidation of the responses and analysis of the outcomes;
- Exploration of IP issues;
- Reporting in D8.3.

PrismArch partners provided the requested information around M12, which was considered the appropriate period for initial data collection. It is halfway through the project lifetime, therefore, the research process is sufficiently advanced for all partners to have made substantial technical progress, providing a reasonable idea of future IP. At the same time, it is early enough to employ the necessary means for protection. This methodology allowed securing the contribution of PrismArch partners and making a list of IP assets reflecting the competences and achievements of the entire consortium.

3.2   Knowledge management framework

Next to identification of the IP assets, the goal of this deliverable is to define the framework for managing the knowledge. To achieve this, the deliverable defines a set of clear and comprehensive rules covering aspects such as: a) access rights (to background and results), b) results ownership (i.e., joint ownership, transfer of results), and c) protection of results.

The defined rules are based on the information included in three different documents: a) The model Grant Agreement H2020 (GA), which gives general principles and rules for a number of IPR-related issues by establishing the rights and obligations of beneficiaries towards the European Commission regarding IPR management, b) The Consortium Agreement (CA) that was agreed among the partners and defines (among others) the background knowledge that was brought to the project by each partner, and c) the Description of Actions that has already made a set of strategic decisions with respect to knowledge management and IPR.

For all three documents the IPR-related sections were analysed and discussed to clarify their implications in the context of PrismArch.

4.   IPR Plan

The protection of IPR is central for the success and protection of project outcomes. IPR plan and management will aim to protect all innovations developed within the project. IPR protection may be needed in the following cases: (a) innovative technological solutions or other exploitable project outputs created by the consortium members within the duration of the project; (b) publications, presentations, exhibitions, contributions to standards. The active dissemination and communication of project outcomes is expected to assist in the economic success of IPRs, towards which work will be carried out in WP8. The importance of innovation and exploitation management in PrismArch is evident from the establishment of an Innovation and Exploitation Manager (IM) in the project management team. The IM will ensure the innovation and exploitation potential of PrismArch will be appropriated by project members, designing and updating the corresponding exploitation and IPR protection plans.

4.1   PrismArch platform and generated knowledge

With PrismArch, the use of interactive technologies will become mainstream in the AEC industry, fulfilling the necessity for an interdisciplinary tool capable to address the unique requirements of architects and engineers from each construction level- namely architects, structural and MEP engineers - enabling them to work on the same architectural project and perceive it in their own different way that best suits their needs.

The principal objective of PrismArch is to achieve a "prismatic blend" between aesthetics, BIM notations and CAE-Simulation results and meta-information that can be presented in a contextualized and comprehensive manner in VR in order to allow collaborative manipulation of the design and accurate assessment of new design decisions. This objective passes through intuitive interactions in a VR world with blended graphics across various types of simulation software that satisfies the needs of all types of designers in parallel.

To achieve this goal, PrismArch develops knowledge and achieves results in the following areas:

- Eliciting the user and functional requirements of PrismArch and identifying the limitations of existing solutions and workflows in architecture. Defining the main principles that govern the disciplines of architectural, structural and MEP design as well as their interconnections; and concluding with the conceptualization of a VR-aided design environment blending cross-disciplinary aspects of architecture and simultaneously embedding multiple simulation results. Sphereing is also introduced as a novel conceptual framework for realistic co-presence and collaboration inside VR; this approach to unified data addresses issues of authorship, IP and access privileges within the singular VR aided design space.

- Development of an AI assistance and content generation in VR-aided authoring tasks which will search across the parameters of the design space, presenting suggestions that satisfy functional constraints and improve efficiency and aesthetic diversity, without causing item collisions and erroneous designs. The authoring procedure will be enhanced by user models based on the needs of different disciplines and individual preferences.
- Conduction of 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, make decisions, and be productive in the VR environment.
- Establishing the seamless integration of BIM notations and CAE-Simulations results within the VR-aided design environment; documenting all requirements of a high-speed two-way communication between Unreal, as adopted in PrismArch and existing software packages handling BIM information and CAE-generated simulations.
- Defining PrismArch's architecture and the integration protocol to facilitate the smooth integration of the platform's components. Contributions to OpenXR will be made by a bottom-up PrismArch system architecture definition in order to enhance OpenXR specifications with the ability to support the interconnection with CAD/BIM/CAE software.
- Design and implementation of PrismArch's demonstrations in specified architectural projects, concerning the design of company and residential buildings.

The above results are likely to lead to valuable knowledge and exploitable results that should be protected using one of the instruments mentioned below.

4.2   Instruments for protecting results

The standard forms of protection relevant for PrismArch are a) copyright, b) patents, c) trademarks and d) trade-secrets. Distinction is made between intellectual property rights (IPRs) such as patents, copyright and trademarks, and trade secrets since trade secrets are generally not recognized as IPRs. Overall, IPRs confer exclusivity to their holders to prevent third parties from using a protected work for a limited period of time on a given territory. The following section provides a brief explanation of each form of protection.

Copyrights confer exclusivity to authors of works considered original. The protection does not extend to ideas, procedures, methods of operation or mathematical concepts as such. The list of works which may benefit from copyright protection is rather extensive. It includes books, music, paintings, sculpture, films, computer programs, software, databases, maps, etc. The requirement of originality essentially means that a work must reflect the author's personality, i.e., whether he/she has been able to express his/her own creativity by making free choices. It also implies an intellectual effort from the author. Contrary to patents and trademarks, copyright protection is automatic and not granted by a particular governmental institution. It should be kept in mind that copyright law is not

harmonized, which means that the principle of territoriality applies. As a result, protection in one region or country does not automatically extend to the rest of the world. In Europe, copyright protection lasts for the lifetime of the author of the work, plus an additional 70 years after the death of the author.

Patents confer exclusivity to right holders on inventions (i.e., products or processes), in all fields of technology, which are new, inventive and are capable of industrial application. Patent holders may prevent third parties not having their consent from the acts of making, using, offering for sale, selling, or importing a protected invention. Patents must be applied for and are granted by national or regional patent offices (e.g., the European Patent Office (EPO)). The application for a patent at a national or regional office means that the geographical scope of protection of the invention will differ. Application for a European Patent at the EPO still requires validation at national offices to actually benefit from the protection. A patent applicant must disclose the invention to the Office in a manner sufficiently clear and complete for the invention to be carried out by a person skilled in the art (in so-called "patent claims"). The term of a patent is of 20 years from the date of filling in the application.

Trademarks confer exclusive protection to any sign, or any combination of signs, capable of distinguishing the goods and services of one undertaking from those of other undertakings. The list of signs which may benefit from trademark protection is rather extensive. It includes words, personal names, letters, numerals, figurative elements and combinations of colours as well as any combination of such signs. Trademark owners may prevent third parties not having their consent from using, in the course of trade, identical or similar signs for goods or services which are identical or similar to those registered for a trademark, when such use would result in a likelihood of confusion. Similar to patents, trademarks must generally be registered at national or regional offices (e.g., the European Intellectual Property Office - ex-OHIM). The application for a trademark at a national or regional office means that the geographical scope of protection of the sign will differ. Trademark protection lasts for as long as the trademark is used and registration fees are paid at the office.

The notion of **trade secret** includes information which (1) is secret in the sense that it is not generally known among or readily accessible to persons within the circles that normally deal with the kind of information in question, (2) has commercial value because it is secret and (3) has been subject to reasonable steps under the circumstances, by the person lawfully in control of the information, to keep it secret. Trade secrets encompass two broad types of information, i.e., information of technical nature (e.g., drawings, formulas, genetic material…) and information of commercial nature (e.g., customer lists, cost and price lists, market analysis…). Contrary to IPRs, trade secret protection does not grant exclusive prerogatives to trade secret holders. The latter are nonetheless allowed to take action against unlawful acquisition, use and disclosure of trade secrets.

4.3   Record of IP assets

The goal of this sub-section is to present the list of IP assets, as solicited by all consortium members.

All PrismArch partners involved in tasks that may result in the generation of IP are required to consider their own work **within each WP** and fill-in the corresponding tables. More specifically, all partners are asked to answer the following two questions relating to their IP: a) what IP have they already generated within PrismArch tasks so far, and b) what IP they anticipate generating during the duration of the project. The answers received by all partners are summarized in the tables below that will be regularly updated during the project lifetime. In this way, by maintaining and updating these tables, PrismArch may track important IP and prepare for its protection and exploitation.

Ethical assessment of PrismArch will be closely performed with bearing in mind that the PrismArch platform provides design and development tools for assisted generation of content with a reduced cognitive load. Thus, PrismArch will have a strong focus on the privacy of the generated content as well as the collected data (including platform usage analytics, psychometric tests and physiological signals) is ensured, which if not taken into account would impose risks of IPR breach.

4.3.1 WP1 - Requirements of a cross-disciplinary, collaborative environment for VR-aided design in architecture

Partners	Subtask number	Description of IP created /expected	Date	IP type	IP form
AKT II	T1.1	Structural Engineering overview: responsibilities, liabilities and authorship.	M4-5	requirement analysis	document
AKT II	T1.1	Structural Engineering Case Study of Project - One Park Drive.	M4-5	requirement analysis	document
AKT II	T1.1	Structural Engineering Case Study of Project - Bankside Yards West Bldg 3.	M4-5	requirement analysis	document
AKT II ZHA SWECO	T1.1	Shared contribution to PrismArch Framework description.	M4-5	requirement analysis	document
ZHVR	T1.1	PrismArch Concept Brief	M4-5	requirement	document

ZHVR	T1.1	AEC project discipline assemblies with design stages	M4-5	requirement analysis	document, diagrams
ZHVR	T1.1	Architecture overview: responsibilities, liabilities and authorship.	M4-5	requirement analysis	document
ZHVR	T1.1	Current communication means for architectural design with respect to concept phase	M4-5	requirement analysis	document, diagrams
ZHVR (with AKT II and SWECO)	T1.1	Discipline - Tool relationship, illustrating software distribution with respect to AEC project growth	M4-5	requirement analysis	document, diagrams
ZHVR	T1.1	Market analysis: Existing Immersive AEC and Collaboration Tools	M4-5	precedent analysis	document, diagrams
ZHVR	T1.1	Case Study 1: Architecture, Private Residential Villa	M4-5	requirement analysis	document, project information, diagrams, geometry assets, renders
ZHVR	T1.1	Case Study 1: Architecture, Private Residential Villa, Project Info Sheet	M4-5	requirement analysis	Datasheet (excel)
ZHVR	T1.1	Case Study 3: Architecture, One Thousand Museum, Zaha Hadid Architects	M4-5	requirement analysis	document, project information, diagrams, geometry assets, renders
ZHVR	T1.1	Case Study 3: Architecture, Private Residential Villa, Project Info Sheet	M4-5	requirement analysis	Dataset Sheet (excel)

ZHVR	T1.1	PrismArch Framework: Virtual Reality Aided Design Blending	M4-5	requirement	document, diagrams
ZHVR (with AKT II and SWECO)	T1.1	Requirements methodology collection and functionality list	M4-5	requirement	document
AKT II	T1.2	Precedent Study - Existing AEC Ontologies.	M11	precedent analysis	document
AKT II	T1.2	Technical requirements for various PrismArch functionalities: Textures, geometry Optimisation, Tagging, Database Integration, etc.	M11	requirement	document
AKT II	T1.2	Technical specification for various PrismArch object schemas: Tag, Texture, UVMap, Str_Eng_Results, etc.	M11	requirement	document and software code.
AKT II	T1.2	Precedent Study - Existing AEC VR environments and interfaces.	M11	requirement	document
AKT II	T1.2	User Interviews and Analysis of existing Structural Engineering workflows.	M11	precedent analysis	document
AKT II	T1.2	Proposed VR interfaces for Structural Engineering.	M11	requirement	document
ZHVR	T1.2	Ontology Requirements Outlined for Architectural Requirements	M11	requirement	document
ZHVR	T1.2	Core Requirements for the VR Interface	M11	requirement	document, geometry assets and renders

ZHVR	T1.2	Discipline-Specific Requirements for the VR Interface: Architecture	M11	requirement	document, geometry assets and renders
ZHVR	T1.2	Proposals for the VR Interface, Cross-Disciplinary Interface:User Interface Design for On-boarding, Personal Work Sphere, Meeting Sphere, Content Query and Demarcation, Query User Interface	M11	requirement	document, geometry assets and renders
ZHVR	T1.2	Proposals for Architecture-Specific UI Elements	M11	requirement	document, geometry assets and renders
SWECO	T1.1	MEP Engineering overview: responsibilities, liabilities and authorship.	M4-5	requirement analysis	document
SWECO	T1.1	MEP Engineering Case Study of Project - One Park Drive.	M4-5	requirement analysis	document
SWECO	T1.1	MEP Case Study of Project - Bankside Yards West Bldg 3.	M4-5	requirement analysis	document
SWECO	T1.2	Ontology Requirements Outlined for MEP Engineering Requirements	M11	requirement	document
SWECO	T1.2	Technical specification for various PrismArch object schemas: Tag, CLassification data, etc.	M11	requirement	document and reference links
SWECO	T1.2	Discipline-Specific Requirements for the VR Interface: MEP Engineering.	M11	requirement	document
SWECO	T1.2	Proposed VR interfaces for MEP Engineering.	M11	requirement	document

4.3.2 WP2 - Computational architecture design for automated content creation and design suggestions

Partners	Subtask number	Description of IP created /expected	Date	IP type	IP form
AKT II	T2.1	Responses to questionnaire on current issues with AEC, and potential ML solutions.	M8	requirement analysis	document
ZHVR	T2.1	PrismArch AI guidance levels	M8	requirements	Diagram
ZHVR	T2.1	Responses to questionnaire on current issues with AEC, and potential ML solutions.	M8	requirement analysis	document
ZHVR	T2.1	Vision arising from Workshops with AEC partners: Envisioning QD in PrismArch, Context of constraints and Context of optimisation	M8	requirement analysis	document
UoM	T2.2	ARCH-Elites: a new method of urban design based on evolutionary computation and MAP-Elites	M3	software, publication	document
UoM	T2.3	AffRooms: a dataset and computational model for the impact of spatial navigation	M9	software, publication	document, dataset
UoM	T2.3	SuSketch: a paradigm and tool for machine-learned models as critics for level/layout design tasks	M3	software, demonstration, publication	document

| SWECO | T2.1 (section 4) | Responses to questionnaire on current issues with AEC, and potential ML solutions. | M8 | requirement analysis | document |

4.3.3 WP3 - Cognition aspects of collaborative VR-aided design environments

Partners	Subtask number	Description of IP created /expected	Date	IP type	IP form
UOM	T3.1	Interview Recordings (Transcripts)		requirement	document
UOM	T3.1, T3.2	Experiment Data		method	dataset/document
UOM	T3.1, T3.2	Research/Modeling Approaches		requirements / methodology	dataset / document
UOM	T3.3	Analytic Graphics and Diagrams for UX Modelling		method / software	Document/ Software code
AKT II	T3.1 (Section 5.0 and Appendix A)	Cognitive Task Analysis interviews with AKT II Structural Engineers.	M8	requirement analysis	document (text and sketches, images)
AKT II, ETH, ZHVR, CERTH, MINDESK, SWECO	T3.1	Contribution to concept of change recording, merging, committing	M8	requirement analysis	document

4.3.4 WP4 - Blending multi-simulations and BIM notations within a VR-aided design environment

Partners	Subtask number	Description of IP created /expected	Date	IP type	IP form
CERTH	T4.1	Speckle Unreal Connectors	M20	Software	Software code
CERTH	T4.2	Navigation and digital tagging in VR-aided design environment	M20	Method	Document
CERTH	T4.3	Advanced simulations in VR environments	M20	Software	Software code
CERTH	T4.1	Semantic integration and interoperability	M20	Web service	Web service
AKT II	T4.1	Speckle SAP-results Connector	M20	Software	Software code
AKT II	T4.1	Speckle Sofistik-results Connector	M20	Software	Software code
AKT II, ZHA, CERTH	T4.1	Contribution to Review of existing CAD, CAE, BIM and VR software	M7	precedent analysis	document

4.3.5 WP5 - System integration and development of the collaborative VR-aided design environment

Partners	Subtask number	Description of IP created /expected	Date	IP type	IP form
CERTH	T5.1	System architecture for interconnecting with BIM/CAE Simulation software	M20	Architecture	Document
CERTH	T5.2	PrismArch Prototype Implementation	M22	Software	Software code
CERTH	T5.3	Unit testing protocol in VR-aided design systems.	M22	Method	Document

AKT II	T5.1	Contribution to description of database integration - commits, version changes, etc with Speckle/ GH/ etc.	M(	precedent analysis	document
MINDESK	T5.1	System architecture for interconnecting with CAD/ BIM / CAE Simulation software	M20	Software Architecture	Document
MINDESK	T5.2	Integration of Mindesk platform in Prismarch architecture via Mindesk SDK. First SDK deliverable with minimal set of methods including basic solid creations and basic transformations (i.e., move)	M22	Software	Software code and libraries

4.3.6 WP6 - Demonstrate and evaluate PrismArch in different architectural projects

Partners	Subtask number	Description of IP created /expected	Date	IP type	IP form
AKT II	T6.1	User Scenario 1 - Structural Engineering	M12	requirement analysis	document
AKT II	T6.1	User Scenario 2 - Structural Engineering	M12	requirement analysis	document
ZHVR	T6.1	The Four Root Classifications inside the PrismArch World	M12	requirement	document
ZHVR	T6.1	Sphereing Concept and diagrams	M12	requirement and method	document and diagram
ZHVR	T6.1	Prism Arch Onboarding Sequence and diagrams	M12	requirement	document and diagram
ZHVR	T6.1	Residential Project User Scenario - Architecture	M12	requirement analysis	document
ZHVR	T6.1	Commercial Project User Scenario - Architecture	M12	requirement analysis	document

SWECO	T6.1	Residential Project User Scenario - MEP	M12	requirement analysis	document
SWECO	T6.1	Commercial Project User Scenario - MEP	M12	requirement analysis	document

4.3.7 WP7 - Dissemination, exploitation and innovation management

There are no IPR issues pertaining to WP7.

4.3.8 WP8 - Project Management and Coordination

There are no IPR issues pertaining to WP8.

4.3.9 WP9 - Ethics requirements

There are no IPR issues pertaining to WP9.

4.4   Management of knowledge and protection of results

The following key items are considered as part of PrismArch's framework for the management of knowledge and the protection of the results: a) Access rights (to Background and results), b) Results ownership (i.e., Joint ownership, Transfer of results), c) Protection of results, and d) Relation to exploitation and dissemination.

PrismArch's Grant Agreement includes one full Section of IP-related issues that need to be taken into account during the development of the project. In particular, the relevant excerpts are in Chapter 4 – "Rights and obligations of the Parties"; Section 3 – "Rights and obligations related to Background and Results" (Articles 23 – 31); General principle: Article 23(a) – "Management of Intellectual Property".

PrismArch's Consortium Agreement specifies and agrees on relevant IP issues that were taken into consideration at the proposal stage. More specifically, PrismArch's Consortium Agreement devotes two Sections on IPR – related issues: a) Section 8: Results, and b) Section 9: Access Rights. The following sections elaborate on the PrismArch partners' obligations derived from the aforementioned excerpts.

4.5   Types of knowledge

Knowledge generated within the project will be encapsulated in various forms, such as project documents, publications, presentations and software. The overarching principle is to provide the widest possible access to this knowledge to maximize the positive impact of the project during and after its duration.

The detailed strategy for the management of knowledge follows:

- **Project Documents:** The project will prepare a number of formal documents related to the project's deliverables and milestones. All of these documents will be posted on the project's website and systematically archived in an open-access document repository. After being finalized, they will be publicly available and released under a Creative Commons license to allow maximum re-use of the content.
- **Project Reporting:** The project will prepare periodic progress reports as required by the EC. For tracking its technical progress, it will also prepare concise summaries after each development's iteration ("sprint"), which will be included directly or by reference in these reports. As these documents may contain financial or other sensitive information, they as a whole will not be made public. However, the sprint summaries will be available through the website.
- **Open access:** PrismArch recognizes the importance of making the research output of the project accessible as widely as possible. To this end, the consortium has taken an active approach to the open access policy in Horizon 2020 in order to promote diffusion of knowledge and dissemination. More specifically, Open Access, i.e., free on-line access, such as the 'green' or 'gold' model will be provided for the peer-reviewed scientific publications that relate to the project scientific results. To realize Open Access publishing, research partners have reserved adequate budget.

- **Presentations:** All presentations by project participants about the project will be made publicly available through the project's website and will be posted in a public service like SlideShare. These will all be licensed via a Creative Commons license, like the project documents.

Regarding the types of knowledge, the following were specified for PrismArch:

- **Foreground**: The project results and their protection policies, related to copyright; design rights; patent rights; plant variety rights; or similar forms of protection;
- **Background**: We define as Background information and software which is held by Parties prior to their accession to the Grant Agreement, as well as copyrights or other IPRs pertaining to such information, the application for which has been filed before their accession to the Grant Agreement, and which is needed to carry out the Project or for using the Foreground. Each Party shall remain the owner of its own background. Participants will define a list of background assets that is excluded from obligations to grant access rights to other partners.

The basis for IPR aligns to Commission policies. In addition: a) All consortium partners will bring in their expertise and background knowledge without charging cost and will retain full ownership of the IPR of this expertise and knowledge; b) All newly developed expertise, knowledge and technologies will be owned by the participant(s) in the project that were involved in development. In case several participants have jointly carried out work generating foreground and where respective shares of work cannot be ascertained, joint ownership shall be arranged; c) Specific IPR agreements will be instead released later in the project but before its end to ensure the exploitation strategy is identified before the exploitation activities will begin.

4.6   Access Rights

The treatment of Access Rights is foreseen in: a) Grant Agreement - Articles 25 and 31.

Based on these articles, during the implementation of the project, all partners need to give access rights to their Background and Results being created in order for other partners to carry out their work on the project and/or exploit their results.

The Grant Agreement model that has been adopted in H2020 obliges the beneficiaries to "identify and agree" upon the Background Knowledge that is available before entering the project, in order to be able to give access to it.

Following this rule, all partners in PrismArch consortium have already identified their background knowledge in "Attachment 1" of the Consortium agreement. Thus, any other piece of knowledge or information that has not been included in this Attachment 1 cannot be considered as background. However, partners may further add their own background to the list in Attachment 1 by written notice to the other partners, upon approval of the Project Management Board.

Table 1: Background Included

Partners	Background	Specific limitations and/or conditions for implementation	Specific limitations and/or conditions for Exploitation
CERTH	Web-based authoring tool for VR applications (WordPress Unity3DEdit Unreal)	Access rights for the other parties of PrismArch to implement their tasks using code from the virtual experiences authoring tool developed by CERTH is provided on a royalty-free basis under the condition that any further re-use of the software source code or the tool as a service will mention CERTH under the restrictions of Apache 2.0 license for open source software.	Exploitation rights for the other parties of PrismArch to use the virtual experiences authoring tool developed by CERTH in any manner is provided under the condition that any further re-use of the software source code and the tool as a service will mention CERTH under the restrictions of Apache 2.0 license for open source software.
CERTH	Virtual Reality Cultural Experience source code	Access rights for the other parties of PrismArch to implement their tasks using code from the virtual experiences software projects developed by CERTH is provided on a royalty-free basis under the condition that any cultural 3D models of the experiences will not be used, and the software to be developed will mention CERTH under the restrictions of Apache 2.0 license for open source software.	Exploitation rights for the other parties of PrismArch to use the virtual experiences software projects developed by CERTH in any manner is provided under the condition that any cultural 3D models will be deleted and any further re-use of the software source code will mention CERTH under the restrictions of Apache 2.0 license for open source software.
MINDESK	Mindesk Real-Time CAD platform for VR visualization and authoring and for 2D real-time rendering	Access rights for the other parties of PrismArch to implement their tasks using Mindesk real-time platform developed by MINDESK (including the results of PrismArch project) is provided to the members of PrismArch consortium only, on a non-exclusive, non-distributable license, at no charge for the duration of PrismArch project under the condition that any further re-use of 3D models, pictures, video or other media created through the Mindesk software will mention MINDESK. Use of any Mindesk software is subject to Mindesk EULA.	Exploitation rights for the other parties of PrismArch to use Mindesk real-time platform developed by MINDESK (including the results of PrismArch project) is provided on a non-exclusive, non-distributable license, at no charge for the duration of PrismArch project under the condition that any further re-use of 3D models, pictures, video or other media created through the Mindesk software will mention MINDESK. Use of any Mindesk software is subject to Mindesk EULA.
SWECO	Expertise related to created 3D elements, their	For use within the project only and unless published in a public forum/journal, not to be passed	Will require legal consent of Sweco.

	data, workflows, other scripts and Programs developed by Sweco for the benefit of the consortium.	outside to third parties without explicitly granted permission	

The access rights on background knowledge (including conditions and scope of access) are distinguished between access for the implementation of the project and access for the exploitation of the owned project results. Access for the implementation of the project is royalty-free, while for exploitation of the owned project results access rights align with the specific limitations and conditions for Exploitation as set in CA. For any other purposes, access shall be granted on Fair and Reasonable conditions.

4.7   Results ownership

The ownership of the generated Results is addressed in: a) Grant Agreement - Article 26 "Ownership of results", and b) Consortium Agreement - Section 8: Results.

The general rule derived from the relevant excerpts is that results belong to the beneficiary that generated them. All consortium members also verified this principal as part of the Consortium Agreement. Nevertheless, it is important to clarify that "Results" do not only refer to any kind of outputs of the project, tangible (prototype) or intangible (know-how) but also their related rights (e.g., the Intellectual Property Rights).

4.8   Joint ownership

In general, the results of the project belong to the partner that generated them. Given the collaborative nature of PrismArch, however, some results can be jointly developed by several partners. In such cases the so –called "joint ownership" might arise. This is the case for most of the foreground generated in WP6, for instance.

As stated in the Grant Agreement – Article 26.2, two or more beneficiaries' own results jointly if: (a) they have jointly generated them, and (b) it is not possible to: (i) establish the respective contribution of each beneficiary, or (ii) separate them for the purpose of applying for, obtaining or maintaining their protection.

Article 26.2 of the Grant Agreement introduces a contractual obligation to agree in writing on the allocation and terms of execution for the joint ownership.

PrismArch partners realize that joint ownership is relevant in the context of any results with commercially valuable IP. For this reason, it is strongly recommended for interested parties to establish a further joint ownership agreement, to properly capture the value and agree on issues, such as: a) division of the ownership, b) protection of the joint results,

including issues related to the cost of protection or to the sharing of revenues or profits, c) exploitation and dissemination of the joint results. In this case, there will be a need for detailed agreements on the division of protection related cost, countries to be covered etc., which will typically be covered by a separate Joint Ownership agreement on a case by case basis. This will override the Consortium Agreement and allow for adequate provisions of each individual case.

If a joint ownership agreement is not reached, the following will apply as specified in the DoA: a) In the case of "Joint Foreground", each of the joint owners shall be entitled to use their jointly owned Foreground on a royalty-free basis, and without requiring the prior consent of the other joint owner(s), and b) each of the joint owners shall be entitled to grant non-exclusive licenses to third parties, without any right to sub-license, subject to the following conditions: (i) at least 45 days prior notice must be given to the other joint owner(s); and (ii) fair and reasonable compensation must be provided to the other joint owner(s).

4.9   Transfer of results

The transfer of the project results is foreseen in: a) Grant Agreement – Article 30: Transfer and licensing the results, and b) Consortium Agreement – Section 8: Results.

PrismArch partners, as any other partner participating in H2020 projects, may transfer ownership of their results. This rule is linked with the joint ownership rule, since any joint owner will have the chance to transfer the ownership of results to one of the joint owners or even third parties.

According to the Grant Agreement, a beneficiary that intends to transfer ownership of results must give at least 45 days advance notice to the other beneficiaries that still have (or still may request) access rights to the results. This notification must include sufficient information on the new owner to enable any beneficiary concerned to assess the effects on its access rights.

Any other beneficiary may object within 30 days of receiving notification, if it can show that the transfer would adversely affect its access rights. In this case, the transfer may not take place until agreement has been reached between the beneficiaries concerned.

4.10   Granting licenses

All PrismArch Partners may grant licenses to their results. However, they must ensure that access rights can be exercised and that any additional exploitation obligations are complied with. Exclusive licenses for results may be granted only if all the other beneficiaries concerned have waived their access rights.

4.11   Protecting results

Protection of the results is addressed in the Grant Agreement Article 27 – "Protection of results. The article specifies that:

Each beneficiary must examine the possibility of protecting its results and must adequately protect them — for an appropriate period and with appropriate territorial coverage —if: (a) the results can reasonably be expected to be commercially or industrially exploited and (b) protecting them is possible, reasonable and justified (given the circumstances).

When deciding on the protection of the generated results, the beneficiary must consider its own legitimate interests and the legitimate interests (especially commercial) of the other beneficiaries. Article 27 implies that the consortium is required to consider the possibility of providing for an adequate protection of the results that can reasonably be expected to be commercially or industrially exploited. Although IP protection is vital for a prospective commercial or industrial exploitation, it is not mandatory.

In order to secure an efficient exploitation of the project outcomes, the consortium has to choose the kind of IP protection. The most suitable form of IP protection, as well as the duration and geographical coverage will depend on the results at stake but also on the Business Plan for their exploitation and legitimate interests of the consortium partners. In protecting its results, the consortium can use any of the instruments mentioned in Section 4.2.

4.12   Exploitation of results

Provisions addressing the exploitation of the generated results are included in the Grant Agreement – Article 28 – "Exploitation of results". The general rule that derives from these clauses is that the consortium must take the measures aiming to ensure the exploitation of their results. All consortium partners must be proactive and take specific measures to ensure that the results are used to the extent possible and justified, up to four years after the beginning of the project (November 2020). The exploitation of results in PrismArch is part of the activities foreseen in WP7 and described in the deliverables D7.3 "*Market analysis and exploitation plan*" (M12) and in D7.6 "*Market analysis and exploitation plan (Update)*" (due M24).

4.13   Dissemination of results

Provisions addressing the dissemination of the generated results are enshrined in: a) Grant Agreement – Article 29 – "Dissemination of results", and b) Consortium Agreement, Section 8.4 – "Dissemination" and Section 10 – "Non-disclosure of information".

Dissemination refers to the public disclosure of results by any appropriate means, except those resulting from protecting or exploiting the results. Examples of dissemination activities include scientific publications, general information on web sites, participation in

conferences or trade fairs. The consortium has the obligation to disseminate as soon as possible, unless it goes against legitimate interests of any partner.

No dissemination may take place if: a) the results need to be protected as a trade secret (i.e., confidential know-how), and b) dissemination conflicts with any other contractual obligations such as personal data protection.

The dissemination of results in PrismArch is part of the activities foreseen in WP7, and described in the deliverable D7.2 "*Dissemination and communication plan*" (submitted in M7).

4.14 Publication Notification Procedure

PrismArch's DoA explains that the consortium has taken an active approach to the open access policy in Horizon 2020 by establishing and promoting measures for open access publications. PrismArch partners are given the freedom to choose any of the two main open access publishing modalities: a) "Gold" model in either full or hybrid open access journals, or b) "Green" model through self-archiving journal articles in open access repositories. In the latter model, researchers will be offered the option of publishing in journals contained/registered in the Registry of Open Access Repositories (ROAR).

Prior to any dissemination, however, all other partners should be consulted in order for them to exercise their right to object in the case where such publication could cause significant harm to their background or results. In order to satisfy both academic partners' needs to publish and enterprise partners' needs to protect IP before public disclosure, PrismArch follows the notification procedure specified in the Grant Agreement Article 29.1 – Obligation to disseminate results.

A beneficiary that intends to disseminate its results must give advance notice to the other beneficiaries of — unless agreed otherwise — at least 45 days, together with sufficient information on the results it will disseminate.

Any other beneficiary may object within — unless agreed otherwise — 30 days of receiving notification, if it can show that its legitimate interests in relation to the results or background would be significantly harmed. In such cases, the dissemination may not take place unless appropriate steps are taken to safeguard these legitimate interests.

4.15 Open Source Distribution of PrismArch IP

A GitLab repository has been set up to depose the software developed within the PrismArch project. The consortium partners who wish to open source their results can use the shared GitLab repository for the storage of their source code. As it was stated in GA, all software deliverables of PrismArch are Confidential. However, some modules such as the Voice Recognition interface and the Projects Browser using cartography maps can be published as open source given that all members of the consortium will agree to it. As

highlighted in Section 5.10, all publications related to PrismArch will also be uploaded to open repositories.

The open-source components will be uploaded to GitHub as it provides better visibility than GitLab. When uploading content on GitHub, consortium partners grant two kinds of licences that are explained in more details in the GitHub Terms of Service.

- A licence to GitHub (point D.4). '*We need the legal right to do things like host Your Content, publish it, and share it. You grant us and our legal successors the right to store, parse, and display Your Content, and make incidental copies as necessary to render the Website and provide the Service. This includes the right to do things like copy it to our database and make backups; show it to you and other users; parse it into a search index or otherwise analyze it on our servers; share it with other users; and perform it, in case Your Content is something like music or video. This license does not grant GitHub the right to sell Your Content or otherwise distribute or use it outside of our provision of the Service*'.
- A licence to GitHub users (point D.5). '*Any User-Generated Content you post publicly, including issues, comments, and contributions to other Users' repositories, may be viewed by others. By setting your repositories to be viewed publicly, you agree to allow others to view and "fork" your repositories (this means that others may make their own copies of Content from your repositories in repositories they control). If you set your pages and repositories to be viewed publicly, you grant each User of GitHub a nonexclusive, worldwide license to use, display, and perform Your Content through the GitHub Service and to reproduce Your Content solely on GitHub as permitted through GitHub's functionality (for example, through forking).*

Of course, consortium partners may also grant further rights if they adopt a specific license (*e.g.,* Apache License 2.0, GNU General Public License 3.0, MIT License, etc.). If they are uploading content they did not create or own, they are also responsible for ensuring that the said content is licensed under terms that grant these permissions to other GitHub Users.

As explained in D.7, GitHub users retain all moral rights to the content they upload, publish or submit to any part of the service, including the rights of integrity and attribution. However, they waive these rights and agree not to assert them against GitHub, to enable the service to reasonably exercise the rights described in D.4, but not otherwise.

5.   External IP

Bringing in open source and third-party IP into PrismArch entails both benefits and risks. Any external technology brought into the project runs the risk of infringing a competitor patent or license agreement, therefore, needs to be adequately assessed. On many occasions, ideas, algorithms, software etc. can be used within a research project, as long as they are not commercially exploited. The use of such external IP may be, however, limited to academic partners, and only for research purposes. In these cases, its integration into a subsystem, which is then transferred to an industrial partner's site for further development, could infringe the usage conditions.

5.1   Third party IP

There is a certain risk of unintentional infringement of a third party's IPRs by implementation of a method, algorithm or system owned by the third party. Normally, an error of this type should be discovered early enough in the project, in time to find an adequate substitute technology. There is a risk, however, of discovering the problem only after commercial development was in progress. Normally, there should be still enough time to seek a license from the IP owner. There is always, however, a small possibility of failing to recognize the third party IPR on time. Detection of unauthorized use by the IP owner could occur when products based on this component are already on the market. The situation could lead to significant legal penalties, and also a prohibition from continuing to sell the affected products. To avoid the problem, PrismArch partners regularly verify the ownership and usage rights of technologies introduced into the project. However, this approach does not solve the problem of undeclared IP that is sometimes present in standards. The only available solution is continual tracking of external developments, and regular patent scans. For this reason, PrismArch partners regularly scan competitor announcements and patent publications to assess possible technology risks.

Library	Type	License	URL
Advanced VR Library	Template for Unreal Engine for easier creation of Online Multiplayer ArchViz VR and Desktop projects	Private	https://humancodeable.org/
Epic online service plugin	Online Server that can support the creation of online applications for multiple players	Public	https://dev.epicgames.com/en-US/home

Cesium maps plugin	Open platform for software applications designed to unleash the power of 3D geospatial data.	Public	https://cesium.com/
Speckle Unreal plugin	Plugin for Unreal Engine 4 to import objects from Speckle v2	Apache License	https://github.com/specklesystems/speckle-unreal
Speckle Database and API	Database server for storing objects	Apache License	https://speckle.xyz/
Force directed graph plugin	Graph exploration in 3d space showcasing relationships between prismarch objects (e.g. speckle commits)	Public	http://graphics.unibas.it/www/UE4-Graph3D/index.md.html
Mozilla DeepSpeech code	DeepSpeech is an open source text-to-speech mechanism, using a model trained in machine learning techniques based on Baidu Deep Speech research. Project DeepSpeech uses Google's TensorFlow to facilitate application. Its purpose is conversion of speech to a text format file	Mozilla Public License	https://github.com/mozilla/DeepSpeech
Mozilla Voice AI data	Database for voice recognition and helping machine learning AI for realistic human	Mozilla Public License	https://commonvoice.mozilla.org/

	speak		
Node JS in Unreal plugin	Unreal plugin that allows users to use javascript inside unreal engines blueprints	MIT License	https://github.com/getnamo/nodejs-ue4
Victory	Blueprints library that allow user to import png and jpg files inside an unreal project in runtime mode	MIT	https://github.com/EverNewJoy/VictoryPlugin
Jersey Client	Maven dependency	CDDL 1.1, GPL 1.1	https://mvnrepository.com/artifact/com.sun.jersey/jersey-client
Jersey Servlet	Maven dependency	CDDL 1.1, GPL 1.1	https://mvnrepository.com/artifact/com.sun.jersey/jersey-servlet
Java Servlet API	Maven dependency	CDDL, GPL 2.0	https://mvnrepository.com/artifact/javax.servlet/javax.servlet-api
GraphDB Free Runtime	Maven dependency	GraphDB Free License	https://mvnrepository.com/artifact/com.ontotext.graphdb/graphdb-free-runtime
GraphDB Free	RDF database	Freeware	https://www.ontotext.com/products/graphdb/graphdb-free/
junit	Maven dependency	EPL 1.0	https://mvnrepositor

			y.com/artifact/junit/j unit
RDF4J: Runtime	Maven dependency	EDL 1.0	https://mvnrepositor y.com/artifact/org.e clipse.rdf4j/rdf4j-runtime
Gson	Maven dependency	Apache 2.0	https://mvnrepositor y.com/artifact/com. google.code.gson/gs on
Apache HttpCore	Maven dependency	Apache 2.0	https://mvnrepositor y.com/artifact/org.a pache.httpcomponen ts/httpcore

5.2   Open Source IP

Use of Open Source software in PrismArch allows benefiting from existing technologies and making faster progress in reaching PrismArch's research objectives. There are, however, certain risks involved. Depending on the type of the Open Source license, the software may be used only during the development phases of the project. In such a case, a separate commercial license for exploitation could be required.

Additionally, many Open Source licenses require the developer to release back into the research community any improvements or derivatives they have created, based on the original library. The need to do so and the definition of what must be shared depend on the individual license conditions. Nevertheless, the use of such software entails the risk of losing the key competitive advantage by the need to share improvements. For this reason, many commercial organisations do not favour use of Open Source software in research and development projects.

6.   Conclusions

Deliverable D8.3 does not constitute a plan in the management sense since it does not incorporate a set of defined actions with specific dates and expected outcomes. Instead, its goal is to make a list of existing or predicted IP assets in order to activate the appropriate protection measures in time. All partners of PrismArch provided information about their IP assets.

The provided IPR plan addresses the necessity to balance the need to adequately disseminate the project results without discarding the opportunity to derive commercial benefits from the generated knowledge. In this respect, lightweight processes have been put in place so as to minimize the risk of publicly disclosing information that could be subject of IPR protection.