DEP technical architecture report

Work package: WP T2
Activity A.T2.1
Deliverable: D.T2.1.2

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This is a report of the analysis, which outlines the best possible solution for the long-term architectural backbone of the DEP.

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1. DEP functionalities

This section presents the results of the analysis of the key functionalities the DEP should and may provide, depending on the planned project's results.

The **key functionalities** of DEP identified by the WP T2 team are **Matchmaking of Content and Region**, **Partner collaboration**, **Broadcasting of news**, and **Self-assessments**. These functionalities are connected and built one atop another as depicted in the illustration on the right.
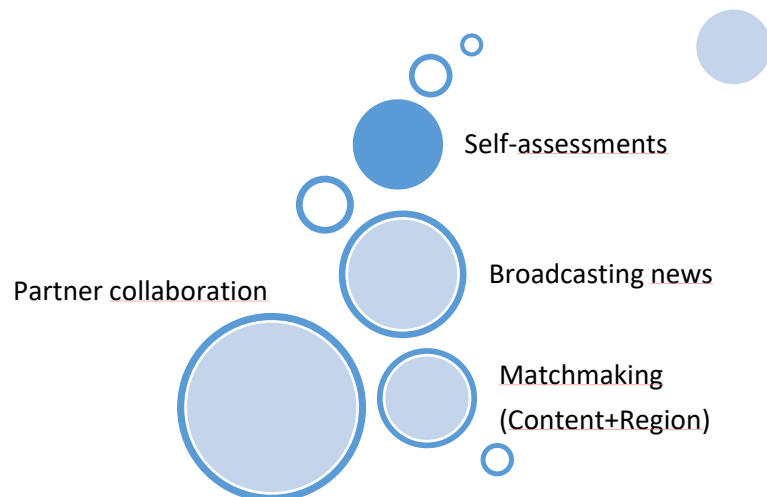

Figure 1: Depiction of key functionalities.

Partner collaboration key functionality will provide the project's consortium partners the option to easily exchange documentation online, as well as provide them with a mechanism to easily collaborate.

Self-assessment will provide an online public service for interested parties in connection with alpine space villages, which will enable a guided analysis of the smartness level (smart identification) of the involved party. The service will give a result, which could help the interested parties with the starting steps of the smart and digital transformation.

Matchmaking will provide an online public service for interested parties, possibly connected with the Self-assessment service, which will match the interested party with its counterpart, be it based on the content, requirements, region or smartness level. This will provide the party an option to have a reference for its starting steps of the smart and digital transformation (who had similar problems, who has a possible solution, who can help etc.).

News broadcasting will provide all the necessary news about the DEP and its usage principles, new features etc.

Based on the analysis of other similar digital platforms and on the collaboration between project WP T2 members, a list of all possible functionalities was prepared. Some, but not all, of these functionalities will be implemented in the DEP throughout the project's lifetime.

The full **functionality list** encompasses further possible elements:
- Partner presentation.
- Multi-language (English and local languages).
- Collaborative writing.
- Criteria enabled search (e.g. to integrate best practices, data collections, and toolbox elements).
- Adding a reference – external resources.
- Self-assessment (since the degree of smartness of villages needs to be determined).
- Matchmaking – enabling a search for services and products provided by external companies.
- Visualized data.
- Managing common calendars with events of interest (news broadcasting).
- Communities or groups of interest, e.g. kind of thematic forums.
- TAG based search where Tags are e.g. mobility, agriculture etc.
- Forums where topics as Tags mentioned above are defined.
- Restricted/Personalized area.
- Login with Google+, Facebook, or Twitter.
- Export functions for all data and metadata.
- External service for online training between partners.
- External service for Distance meetings.
- The capability to editorialize contents for a wide public.
- Multilanguage support needed on the public perspective.
- Identifying external services for collaborative writing, distance meetings, visualization (charts), data plotting / visualizing, and online training (DEP with data).
- Hosting, managing, and maintaining the DEP.

2. Existing digital platforms

An SV approach for mountain areas could unlock the potential of local actors to make their region a more attractive place to live and work. Building on top of knowledge from the existing EU digital platforms and most effective ways to connect, this digital platform list is identified:

- Digitalsocial.eu Platform
- European Platform for Rehabilitation
- Europeana – Europe's Digital Platform for cultural heritage
- Cloud-Based Digital Health Monitoring Platform With EU Privacy
- Entrepreneurial innovation & education driving Europe's digital transformation
- NEM Initiative – New European Media Initiative
- Cboe Europe
- Intesi internal platform
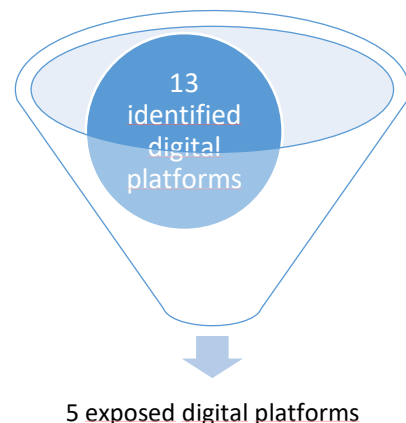- Common European Sustainable Built Environment Assessment

Figure 2: Exposing five digital platforms for detailed analysis.

We further on identified five platforms as specifically appropriate for our analysis report. A short presentation of each is presented below.

1. ***S3 Smart Specialization Platform (*http://s3platform.jrc.ec.europa.eu*)***
The S3 Platform provides advice to EU countries and regions for the design and implementation of their Smart Specialization Strategy (S3). The functionalities include: providing guidance material and good practice examples; informing on strategy formation and policy-making; facilitating peer-reviews and mutual learning; supporting access to relevant data; and training policy-makers.

2. ***The Platform of the Alpine Think Tank on services of general interest (*https://servicepublic.ch*)***
The Alpine Think Tank is a platform for the exchange of experiences on service of general interests (SGI) provision across the Alps. It identifies upcoming challenges for SGI in the Alps

and the searches for (transnational) solutions. It includes a database of existing strategies, good practices, News, Events, and elements for policy recommendations.

3. *EMYNOS - nExt generation eMergencY communication (*https://www.emynos.eu/*)*
The main objective of the EMYNOS project is the design and implementation of a Next Generation platform capable of accommodating rich-media emergency calls that combine voice, text, and video, thus constituting a powerful tool for coordinating communication among citizens, call centers and first responders.

4. *European Digital Forum (*http://www.europeandigitalforum.eu*)*
The European Digital Forum is a think tank led by the Lisbon Council and Nesta, in collaboration with the European Commission's Startup Europe Initiative. Founding partners include Banco Bilbao Vizcaya Argentaria (BBVA) and the European Investment Fund. Accenture serves as a partner.

5. *European Platform for Rehabilitation (*https://www.epr.eu*)*
EPR is a network of service providers to people with disabilities committed to high-quality service delivery. EPR's mission is to build the capacity of its members to provide sustainable, high-quality services through mutual learning and training.

Regarding foreseen tools for implementation of DEP, orientations are given regarding following software components to be included: Content Management System (Wordpress, Joomla, or similar), Wiki (YesWiki or MediaWiki), Collaboration Team Platform (e.g. PBWorks), Training System (e.g. Moodle).

3. DEP architectural backbone

After identifyingall the possible functionalities of the DEP and analyzing existing digital platforms a solution had to be presented on which the SmartVillages DEP will be built upon. After the analysis of existing digital platforms, it was identified that none suits the majority of DEP envisioned functionalities, thus a decision was made that a new DEP will be implemented. For this purpose activities followed, which analyzed the possible architectural backbone of the DEP. There were two options for it: building from scratch or using possible existing and proven systems. After analysis and considering the list of possible functionalities of the DEP it was chosen to build the architectural backbone of the DEP based on a Content Management System.

Choosing the right Content Management System (CMS) platform for the project is an important decision. Not only because changing one CMS to another is not an easy thing to do, but there is also a problem with available functionalities or features of the chosen CMS if we highlight just the two of them. Because of that, we have conducted short research of the available CMS platforms, analyzed their functionalities, and selected the optimal CMS platform for the SmartVillages project. In the following paragraphs, our findings are collected and discussed in detail.

In the first phase of our research, we identified twelve plausible CMS platforms (as well as web frameworks) for the SmartVillages project, i.e., WordPress, Joomla, Drupal, Django, Plone, e107, Hippo, Portal Alfresco, Magento, Orchard Core, and Fork (See Table 1).

Mentioned CMS platforms are broadly used in many companies, but during the search, we tried to focus on the following requirements:

- Does a CMS platform support news broadcasting?
- Does a CMS platform support the development of new plugins?
- Does a CMS platform support document exchange and collaboration with partners?
- Does a CMS platform support matchmaking?
- Does a CMS platform support self-assessment?
- Does a CMS platform have a huge community?
- Does a CMS platform have a smooth migration to another server?

- Are there available security updates and system upgrades?
- Where to host our platform?

Nevertheless, that does not mean that we did not take into account the ease of installation and use, available documentation and support of the CMS platform, flexibility, and scalability.

Majority of the analyzed CMS platforms are developed in the PHP programming language, e.g., Joomla, Drupal, and Magento, following by Python, e.g., Django, and the combination of different programming languages like PHP, JavaScript, HTML, and Python, C# e.g., WordPress and Plone. The reason for checking with what programming language a CMS platform is written lays in the possibilities for its further custom extensions. As it is visible from Table 1, all the analyzed CMS platforms allow custom plugin development.

List of available extensions or plugins for each CMS is found on their official websites, but the difference in the amount of the plugins that are available for each CMS is quite noticeable. Furthermore, documentation for mentioned plugins is on some CMS pages almost non-existing. Anyhow, all the analyzed CMS platforms enable news broadcasting by default, document exchange and collaboration with partners is partly supported, but there are no available plugins for the matchmaking and self-assessment. Thus, we should implement custom solutions at least for that.

Based on the obtained information, we decided to choose WordPress as our CMS platform. The main reasons for that are the following. Firstly, WordPress is an open source solution and allows simultaneous use of the platform by many users. A big plus is also its simple use. Thus, it can be quickly adopted by people who do not have any experience with it beforehand. WordPress also has one of the most well-written documentation of the available plugins and allows development of new ones. The latter is mainly done in the PHP programming language. An important part is also stable update cycle of the plugins to stay on top of the security issues and one of the newest advantages - REST API (https://developer.wordpress.org/rest-api/).

Nowadays, we are almost every week a witness of data breaches. Our website will also host very personal information that is related to the project or project members. For that reason, CMS must be free of security issues. From our observation, bugs and security problems are solved in the WordPress community with the highest priority. There is also not so many security holes in WordPress according to the other CMS.

How to migrate a website along with the database to
another web server is an evergreen question for many system administrators. During our investigation, we have identified crucial points for migration of particular CMS. It seems that WordPress has a very simple way for migrating the website as well as databases. According to community forums, a lot of WordPress users specified that migration was simple and straightforward.

How to efficiently conduct backups was also considered in our identification of the best CMS. According to documentation and experience of some project members, we found that conducting backups in WordPress is very painless and effective.

An essential aspect of WordPress is also a possibility to buy professional layout templates. Nowadays, many companies invest a lot of money and effort into the layout of their websites. Attractive and beautiful layouts easily attract more visitors compared to poorly designed websites. In the case of WordPress, we can buy professionally designed layout templates. We have already analyzed many providers of professional templates as well as identified their prices. From our investigation, we found that there is a significant portion of professional templates that are very cheap (mostly about 50 EUR and even less). In contrary, most of other CMS systems lack professional templates. Therefore, the possibility to buy professional layout is another advantage of WordPress for our use.

A lot of devotion was also given to the investigation of the most appropriate hosting platform. In fact, we took some container platforms into account on the one hand, whilst we analyzed some cloud providers on the other hand. We analyzed Cloudron that is a perfect tool for people that are not developers. It offers a very intuitive UI that allows users to install and maintain some well-known applications. In line with this, we have also tested some Docker instances that fully met our expectations. Due to the intensive development of new plugins and additional features that will be developed at our institution, we decided to host a server at our institution. Therefore, we decided to use a Docker as a container platform on Linux powered server machine. Anyway, we might change hosting provider after the end of this project.

4. Structure, themes and plugins of the architecture

Selecting WordPress as our CMS platform and a solution for the DEP brought additional challenges, related to the architecture of the platform. While WordPress is most commonly associated with blogging, it has grown into a platform that supports many other types of web content, including the more traditional mailing lists and forums, media galleries, online stores etc. WordPress is based on a plugin architecture and a template system. More specifically, its architecture is a front controller which routes the requests to a single PHP file that parses the URI and identifies the target page. One of the several challenges was selecting the proper theme and plugins that can provide the functionalities that are needed for the DEP to function as intended.

Themes/templates - Themes support changing the look and functions of the website, without changing either the code or the content. WordPress websites commonly requite at least one theme, designed using WordPress standards. Considering the requirements for the DEP and after proper examination of the available WordPress themes, we selected the CityLogic theme. The theme offers a modern website design, which makes it a preferred choice for creating websites for various domains, e.g., travel, business, and lifestyle. The theme supports the ability to have a transparent header, which allows displaying either a static header image or a slider.

Plugins – Selecting the proper plugins that would fulfill the requirements of the project and would easily integrate with the selected theme was an additional challenge that we managed to complete successfully. In this light, the following plugins were selected:
- Asgaros forum – provides basic forum features, that can restrict the access based on the user's role.
- Envira Gallery – responsive WordPress gallery plugin (lite version).
- Simple File List – plugin to list files in a given directory using a predefined shortcode.
- Polylang – multilingual capability.
- Really Simple SSL - lightweight plugin for site's SSL protection.
- Smallerik File Browser –the plugin enables (authorized) users to embed a file repository inside a standard Wordpress page or post. Access level restrictions can be set for each user or set of users of the repository to support upload, delete, rename, unzip, etc.
- Super Socializer – a complete solution to provide all the social features, e.g., Social Login, Social Commenting, Social Sharing, and Social Media follow.
- The Events Calendar – extensible plugin that supports share the events.
- WP File Manager – plugin for managing WordPress files.
- WP Super Cache – cache management.

Table 1: CMS review.

CMS platform	Programming language	Existing CMS plugins	Supports the development of new plugins?	Support for "Document exchange and collaboration with partners"?	Support for "News broadcasting"?	Support for "Matchmaking"?	Support for "Self assesment"?
Wordpress	PHP, HTML, CSS, JavaScript	List of plugins	Yes (PHP)	Allows Google Docs integration	By default	Maybe using Match me for BuddyPress plugin	Maybe using Psychological tests & quizzes plugin
Joomla	PHP	List of plugins	Yes (PHP)	Allows Google Docs integration, e.g., Google Docs Viewer and forum, e.g., MediaWiki	By default	Maybe using People Suggest plugin	Maybe using QuizDeluxe plugin or surveys plugins
Moodle	PHP	List of plugins	Yes, but quite challenging	Quite few plugins	By default	No	Yes
Drupal	PHP	List of plugins	Yes (instructions)	Maybe using these plugins	By default	Maybe using ProfilePlus plugin	No
Django (framework)	Python	There are some packages that can be used.	Yes	Yes	Partly implemented	Maybe using Django match maker	No
Plone	Python, HTML, CSS, JavaScript	List of plugins	Yes	Recommended use of external DMS (link)	Maybe using some plugin from the list	No	No

Hippo	Java	List of plugins	Yes	Enterprise repository	By default	Maybe using relevance module or advanced search	Maybe using pools or forms plugins
Liferay	Java	List of plugins	Yes	Collaborating plugins, DMS, and possible integration with Alfresco and Google Docs	By default	No	Maybe using this plugin
Magento	PHP	/	Yes	Maybe using this plugins	By default	No	No
Orchard Core	C# (ASP .NET Core 2.1)	/	Yes	Azure Blob Storage	No	No	No
Fork	PHP	List of plugins	Yes	File manager	Newsletter	No	No
e107	PHP	List of plugins	Yes	File manager	Yes – many ways	No	No