



BETTER FACTORY

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SME and artists co-creation space 2.0 version 1.0

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Panagiotis Bouklis

European Dynamics S.A.
209, Kifissias Av. & Arkadiou Str.
15124 Maroussi
Athens, Greece

panagiotis.bouklis@eurodyn.com
+30 210 8094500



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Abstract

RAMP aims to accelerate production in Manufacturing SMEs by providing access to services and tools for digitization and collaboration. In the Better Factory project, RAMP aims to enhance the co-creation of automation solutions and novel product design services.

A 'cocreation space' is implemented in RAMP in order to enhance the collaboration of Manufacturing SMEs with their service providers, and especially with the artists. The cocreation space provides a coherent online, web-based environment, that allows the integration of different applications in a desktop-like experience, and enabling the users to access the different tools that they need for their daily job in a one-stop, unified environment.

Project Coordinator contact Päivi Mikkonen VTT Technical Research Centre of Finland Ltd Visiokatu 4, PL 1300, 33101 Tampere, Finland E-mail: paivi.mikkonen@vtt.fi Tel: +358 40 820 6139	Technical Coordinator contact Ali Muhammad European Dynamics SA E-mail: ali.muhammad@eurodyn.com Tel: +358 400 560 851
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TABLE OF CONTENT

HISTORY OF CHANGES	4
EXECUTIVE SUMMARY	6
1 INTRODUCTION	7
1.1 Scope and purpose of this document	7
1.2 Document structure	7
2 JUSTIFICATION FOR AND NATURE OF CHANGES	8
2.1 Justification for changes	8
2.2 Description of changes	8
3 SYSTEM CONCEPT	10
3.1 Background and scope	10
3.2 Description of the system	11
3.3 Modes of operation	13
3.4 User classes	13
3.4.1 Organizational structure	14
3.4.2 Profiles of user classes	14
4 ACCESSING APPLICATIONS AND BENEFITS	16
4.1 Standard RAMP-wide workspace	16
4.2 Adding an application to the RAMP-wide workspace	16
4.3 Dedicated workspace	16
4.4 User and applications management	16
4.5 Benefits	17
4.6 Concerns and limitations	17
5 CONCLUSIONS	18

EXECUTIVE SUMMARY

In the initial planning for the RAMP co-creation space 2 main tools were considered and developed: 1) 'Tenders' and 2) 'Projects'. An additional 'Online CAD' tool was implemented. These tools are described in the Better Factory deliverable D2.2. These tools were tested during the first open call round. While the tools were developed to address different foreseen needs, the actual engagement of users for their intended use was not what the RAMP development team initially was expecting.

Based on this feedback from the first round of open calls, new solutions were investigated, and additionally the other activities within Better Factory were considered. The new solution aims to facilitate the collaboration between manufacturers and artists, by providing a more coherent online cocreation space, in a more user-friendly web desktop-like environment. The cocreation space is a part of an overall RAMP offering which encompasses the ability to offer different kinds of services to users. The new 'co-creation' space, enables the following new features:

- Web-based environment with desktop-like user experience. It allows the use of different web-based tools under one 'desktop' like they were applications installed on the users' personal computer.
- Per-user access to applications.
- Integration of applications, regardless of where they are deployed, without disrupting the user experience.
- User Interface-level interaction (software messaging) between applications.
- Basic level of authentication and authorisation for applications that do not have such functions.

1 Introduction

1.1 Scope and purpose of this document

RAMP, the Robotics and Automation marketplace, aims to accelerate production in manufacturing SMEs, by facilitating access to automation and digitization technologies. In the first round of KTEs there were two main tools that were developed to facilitate the collaboration between manufacturing SMEs and artists, 'Tenders' and 'Projects'. An additional online CAD tool was also developed. However, the engagement of the KTE parties and the perceived value was not sufficient for the RAMP objectives. An updated concept of co-creation space, which is also more closely connected with the other RAMP-focused outcomes of Better Factory, namely access to cloud infrastructure and the RAMP IoT platform, is described in this document. While the overall concept is described, this document focuses on the 'co-creation space' aspect.

1.2 Document structure

Chapter 1 introduces this document.

Chapter 2 describes the justifications and rationale of the changes.

Chapter 3 describes the overall concept and focuses on the 'co-creation space' tool.

Chapter 4 introduces how applications can be added in the co-creation space, what are the benefits of this tool, as well as the concerns and limitations.

Chapter 5 concludes this document and describes the follow-up.

2 Justification for and nature of changes

In the initial planning for the RAMP co-creation space 2 main tools were considered and developed: 1) 'Tenders' and 2) 'Projects'. An additional 'Online CAD' tool was implemented. These tools are described in the Better Factory deliverable D2.2. These tools were tested during the first open call round.

2.1 Justification for changes

While the tools were developed to address different foreseen needs, the actual engagement of users for their intended use was not what the RAMP development team initially was expecting. More specifically:

- 'Tenders' tool was developed to assist in finding appropriate partners, or more in general in the matchmaking and contracting process. However, it was identified that users would mostly address this need by doing matchmaking by other means (e.g., with the supporting service from the Better Factory consortium, direct contact with potential partners), and not fully exploiting the capabilities of the tool.
- 'Projects' tool was developed to facilitate the collaboration between different parties. However, users would still prefer to use the other similar solutions that they had been already using previously, posing a hard-shelled resistance to change.
- 'Online CAD' tool, was developed especially for assisting in the collaboration with artists. However, the majority of the artists had their own tools already using, and identified no value in using this tool.

The reasons for this low engagement can be summarised as follows:

- 'Tenders' tool was based on providing a full tendering process. It included inviting potential partners to submit proposals to a manufacturing challenge. Even though the implementation was based on providing a quick transition across the different tendering phases, manufacturers usually need more insight on what are the competences of service providers and expertise of artists before deciding on who they need to invite on their challenges. Hence, a lot of off-RAMP activities still took place.
- 'Projects' tool provided a space to collaborate, with the exchange of files and common use of tools. While the file exchange was adopted to a limited manner, the common use of tools was deemed useful.
- The 'Online CAD' tool was not used by any of the targeted artists. All of the artists have different kinds of their own specialised design tools, and some of them even have customised versions of such software.

Based on this feedback from the first round of open calls, new solutions were investigated, and additionally the other activities within Better Factory were considered. The new solution aims to facilitate the collaboration between manufacturers and artists, by providing a more coherent online cocreation space, in a more user-friendly web desktop-like environment. It aims to allow a seamless UX-integration of using different web tools, packing together both RAMP-offered tools, but also custom applications. This aims to increase the online collaboration between the manufacturers and the artists, using RAMP as a facilitator.

The close link between this new solution to the 'Access to cloud' and the 'RAMP IoT platform' brings together the different Better Factory outcomes under a common user experience path, while it also creates new exploitation opportunities.

2.2 Description of changes

A 'web-based desktop-like environment' will implement the new 'cocreation space'. This is based on an ED's software module of the 'QLACK' suite, the QLACK WebDesktop¹.

The new 'co-creation' space, enables the following new features:

- Web-based environment with desktop-like user experience. It allows the use of different web-based tools under one 'desktop' like they were applications installed on the users' personal computer.
- Per-user access to applications.

¹ <https://qlack.com/webdesktop>

- Integration of applications, regardless of where they are deployed, without disrupting the user experience.
- User Interface-level interaction (software messaging) between applications.
- Basic level of authentication and authorisation for applications that do not have such functions.

3 System concept

3.1 Background and scope

The main aim of the new cocreation tool is to enable the closer collaboration between manufacturers artists. The cocreation tool is a part of an overall RAMP offering which encompasses the ability to offer different kinds of services to users, depicted in Figure 1.

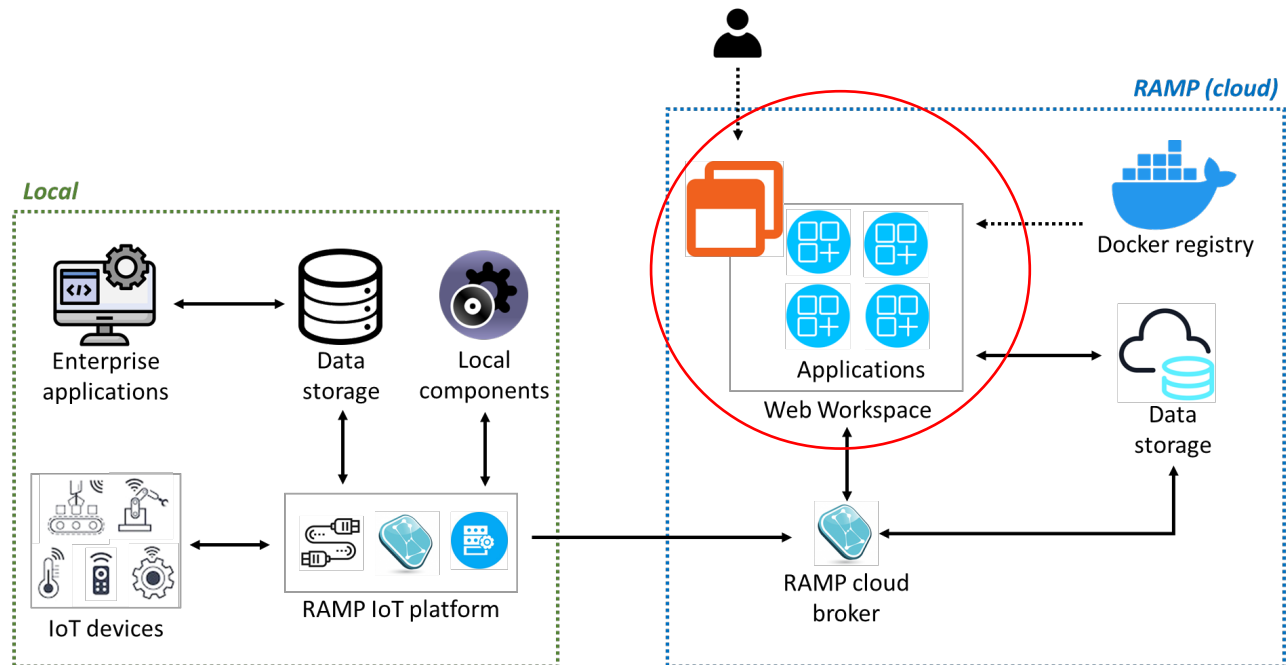


Figure 1: Composite RAMP offering.

The composite RAMP offering consists of several different tools:

- A local part, intended to be deployed on the premises of the manufacturer, which consists of:
 - Enterprise applications: the applications that the manufacturer has already in place, and may continue to use.
 - Data storage: local database that is already used by the manufacturer, and may be utilised for additional data that the local installation of the RAMP IoT platform may require.
 - Local components: any components (e.g., APPS) that the user acquires through RAMP and are deployed locally.
 - RAMP IoT platform: the RAMP IoT platform which provides mainly a) the FIWARE Orion Context Broker as a message broker, b) QuantumLeap, as an adapter for the persistent storage of data that pass through the FIWARE Orion Context Broker, c) any other adapters needed for connecting to the specific local infrastructure (databases, devices, etc.)
 - IoT devices: local devices, like sensors, machinery, robots, that are connected to the RAMP IoT platform through the FIWARE Orion Context Broker.
- The RAMP-cloud part, which consists of:
 - Web Workspace: a desktop-like web environment that integrates the use of different web-based tools under a common user interface providing a seamless user experience.
 - Docker registry: a registry for storing and deploying docker images, public and private.
 - Data storage: cloud data storage for manufacturers and cloud applications.
 - RAMP cloud broker: a cloud broker that manages the communication between the cloud applications, but also with the local part (RAMP IoT platform deployed on premises).

It should be noted that the above-mentioned solution is not meant to be used only as a whole, but can be utilised partially, depending on the user case and the desired applications that are needed per user.

While the above are summarised for a better understanding of the overall RAMP solution, this document focuses on the 'Web Workspace' as the 'co-creation space'.

The co-creation space is based on the ED's QLACK WebDesktop, which is an application simulating a virtual desktop environment in one single browser window by allowing the seamless integration of multiple web applications under the same environment. The following features are available through utilising this tool:

- Application Menu. All integrated applications are displayed under a compact pop-up menu as tiles, defined by their title and icon and can be categorized based on their defined usability (system management, communication, etc.).
- Application Windows. Clicking on the tile of one application will lead to opening an iframe window which will display the front page of the web application and will provide us with the ability to use it exactly the same way we would do on a separate browser window.
- Configurable Features. Each application window can support, based on the initial configuration, every common desktop application feature, i.e. resize, minimize, maximize, drag, close and having multiple instances at the same time.
- Messaging System. Integrates a messaging broker, which assists the exchange of messages between the applications with the user of a custom JavaScript/Angular library.
- Reverse Proxy. Operates as a reverse proxy for each integrated application, providing the ability of having applications running in hidden and non-accessible servers.
- Easy Integration. Applications can be integrated in the system with 3 different ways, providing the option of adding new applications or editing existing ones, during the steps of deployment or on-the-fly while the system is running in production.

3.2 Description of the system

The co-creation space is accessible through the relevant entry in the RAMP menu. Upon launching it, a desktop-like environment appears (Figure 2), providing a menu-based access to the applications that the user is able to use (Figure 3). Applications are presented in 'windows' giving the user experience that they are just different programs in the user's desktop, instead of siloed components developed and being available in different places. The applications may be deployed anywhere, be it on RAMP servers or other, external sources, without however the user experiencing any disruption in their work.

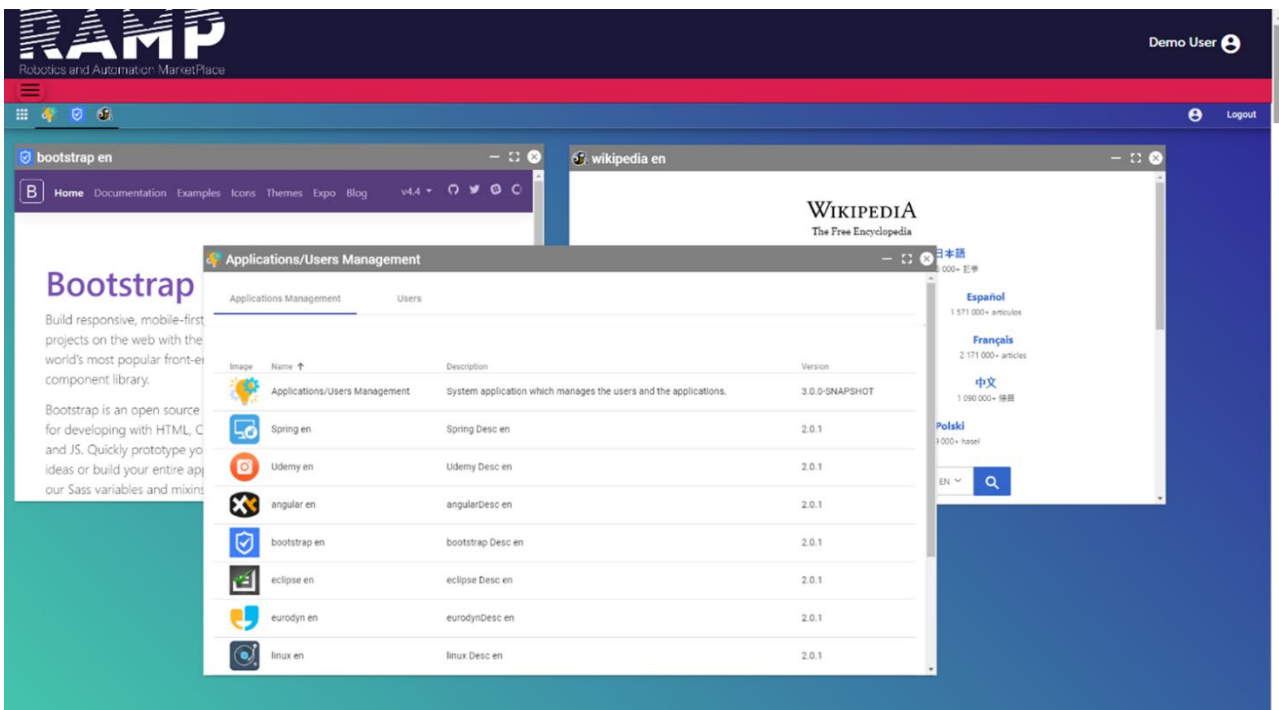


Figure 2: How the different applications look like within the cocreation space

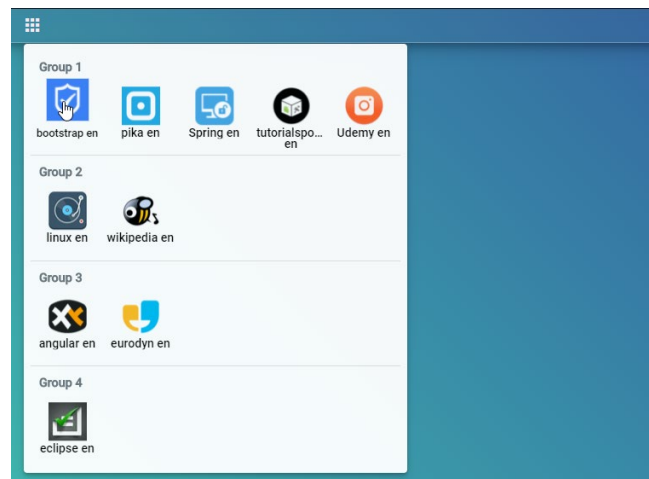


Figure 3: Example menu to access applications

The cocreation space is integrated with the RAMP authentication and authorization module, and the access to the different applications can be defined per user.

While this cocreation space can take care of access management to each application instance, the authorization at application-level needs to be handled by the application itself. The application should also use the RAMP authentication and authorization, in order to ensure the seamless user experience. That means, that for one application instance to be able to manage different rights for different users using it, it should have multi-tenancy capabilities.

Nevertheless, even for applications that do not have multitenancy, or even authentication in the first place, this tool can offer a basic level of access management by means of an integrated 'Reverse proxy'. For this, different application instances (one for each user or users' group) need to be deployed. When a user opens the cocreation space, the tool itself does the authentication, and decides which application instance the user is authorized to access (Figure 4).

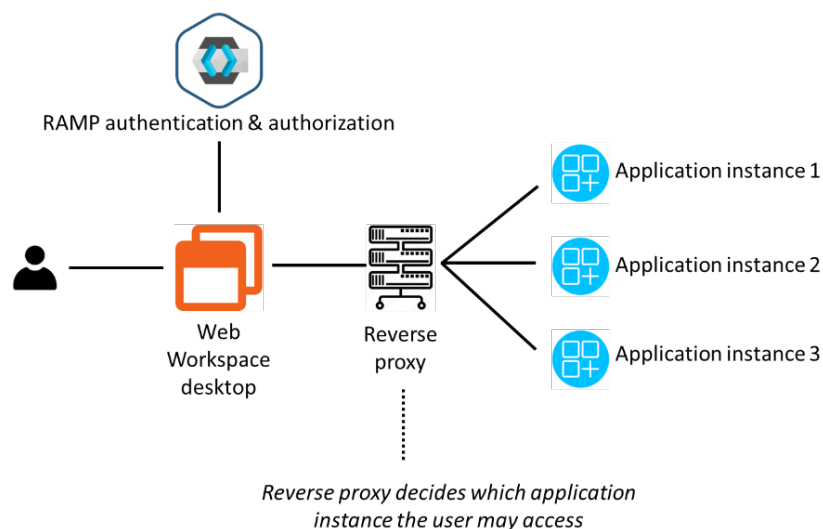


Figure 4: How the integrated reverse proxy works for access management to application instances

A level of interaction between the user interfaces of the applications in the user's web desktop is possible using the integrated messaging system. For example, a user action in application A can trigger a function in another open application B.

The web desktop supports any kind of application that has a web-interface, hence supporting the use of custom per-user applications, or even integrating different external web tools under a common workspace. This way, all different tools a user may use in their daily work, either hosted on RAMP or not, can be used by one 'desktop-like' environment and with a 'being-in-the-same-place' feel.

3.3 Modes of operation

Based on the opportunities of exploiting this tool, as well as to address different levels of need of users (from simple needs to more complex), different modes of offering this tool are considered. In practice, the service is offered in a 'freemium' strategy, where basic functionality is offered for free to all RAMP users, on top of which premium services can be offered based on the specific user's need.

The following table summarizes the different foreseen modes of operation of offer model, based on the following attributes:

- Web desktop deployment
 - One web desktop instance, with multi-tenancy, and access to a standard range of applications.
 - Dedicated customer-specific web desktop instance, with user management, and the ability to use custom applications.
- Applications
 - Standard range of applications that are made available by RAMP and its partners.
 - Standard range of 3rd-party applications that are made available by 3rd-parties. Multitenancy is handled by the application.
 - Standard range of 3rd-party applications that are made available by 3rd-parties. Multitenancy is handled by RAMP.
 - Customer-specific applications.

The following matrix consolidates the compatibility between the above-mentioned attributes and the potential business model that is foreseen to be utilized.

	RAMP and partner applications	3rd-party applications (free)	3rd-party applications (non-free apps or multitenancy needed)	Customer-specific applications
RAMP-wide web desktop (directly accessible after registration)	Free	Free – application added by RAMP administration, on condition & agreement with the 3 rd -party	Free for users, 3 rd -parties may add their application with a fee	Not available
Dedicated/customer-specific web desktop	Premium	Premium	Premium	Premium

3.4 User classes

The following user classes, i.e., categories and subcategories of users that use the system, are identified:

- RAMP administrator
- RAMP development
- Application provider
 - RAMP partner application provider
 - 3rd-party application provider
 - Custom application provider
- Solution provider
 - RAMP partner solution provider
 - 3rd-party solution provider
- Manufacturing SME user
 - Manufacturing SME user – direct RAMP customer
 - Manufacturing SME user – indirect RAMP customer

3.4.1 Organizational structure

The organization of the user classes and their relationship with the co-creation space are illustrated in Figure 5.

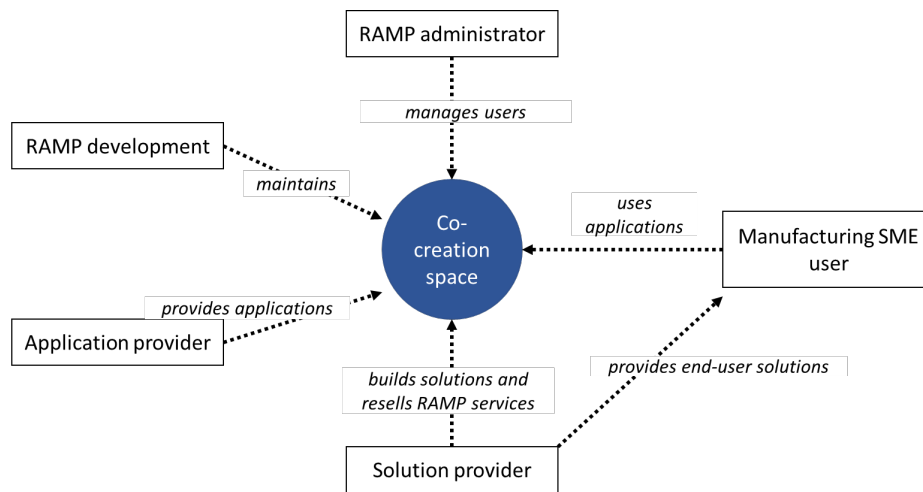


Figure 5: Organisation of user classes and relationship with the co-creation space

3.4.2 Profiles of user classes

The profile of each user class, along with its subclasses, is described below:

- **RAMP administrator:** It is the administration team of RAMP. RAMP administrator manages the access of users to the different applications, approves the addition of applications and the setting up of dedicated workspaces.
- **RAMP development:** RAMP development maintains the software side of the tool, setups and configures dedicated workspaces, supports application providers in integrating their tool, and provides technical support to users.
- **Application provider:** Develops web-based applications and makes them available on the RAMP co-creation space. 3 subclasses are identified:
 - **RAMP partner application provider:** Application provider that has a partnering contract with RAMP. Some of the 'premium' RAMP services to application providers (e.g., inclusion in the RAMP-wide application inventory, authentication & authorization add-on feature) may be provided as part of the partnering contract.
 - **3rd-party application provider:** A 3rd-party (external) application developer that wishes that their application is added to RAMP, either in the RAMP-wide application inventory, or to dedicated customer-specific workspaces. Inclusion of these application is subject to approval by the RAMP administrator, and fees for the application provider may apply.
 - **Custom application provider:** An application developer that wishes that their application becomes available to a limited number of dedicated customer specific workspaces. This kind of applications are hosted outside the RAMP infrastructure/servers. The addition of custom application is subject to verification of legal use and RAMP administrator approval.
- **Solution provider:** An organization that provides complete solutions to manufacturing SMEs, and of which solution, RAMP co-creation space may be a composite part of. There are two subclasses, **RAMP partner solution provider** and **3rd-party solution provider**, the difference being that certain fees, similar to application providers, may apply, but which may be free/part of contract for the RAMP partners.
- **Manufacturing SME user:** The end user of the co-creation space, that uses the integrated applications which they have access to.
 - **Manufacturing SME user – direct RAMP customer:** It's an end user that uses or accesses directly the RAMP services as a customer. It is expected that it will be usually a manufacturing SME, but a technology-related organization is also possible. Artists also belong in this subclass.

- **Manufacturing SME user – indirect RAMP customer:** It's an end user that does not directly access the RAMP services as a customer, but gets access in them as being part of an overall solution, of which the RAMP services/co-creation space is a composite part of.

4 Accessing applications and benefits

4.1 Standard RAMP-wide workspace

A standard, RAMP-wide workspace, and free-of-charge, is provided to all users that are registered on RAMP. A range of free applications is directly available. This range is subject to change, and constantly evolving. No action is required by the user; the standard RAMP workspace is accessible by going to the relevant menu item in RAMP, after logging in, and applications are accessed through the application menu. The RAMP administrator configures the applications to which each user has access to.

4.2 Adding an application to the RAMP-wide workspace

Application developers are able to add their web-based application to the RAMP-wide workspace. This is subject to approval by the RAMP administrator, and entails that application developers meet certain organizational, quality and technical requirements. These (requirements and RAMP interface) are elaborated in the SHOP4CF project's public deliverable, "D6.17 Interface specification for integrating support tools in the Marketplace"².

The application may be hosted in the RAMP server, or may not. Additionally, the application may be free or paid. The availability of each 3rd-party application in the RAMP workspace is subject to provider-specific agreement with the RAMP administrator, and fees may apply.

Application providers may negotiate with the RAMP administrator on whether the application will be available to all RAMP users or only to specific ones.

For legal reasons, Manufacturing SME users themselves are not yet able to add 3rd-party applications, for which they do not own the IP rights.

4.3 Dedicated workspace

A Manufacturing SME user may request a dedicated workspace. This enables a tailored user management and access to applications. A dedicated workspace also entails that the accompanying/linked infrastructure, including the applications, cloud broker, data store, etc., is siloed from the other RAMP users, in order to enhance security and trust. Customer-specific applications, i.e., applications which are not provided by application providers with which RAMP has a contract agreement, but are licensed directly by the application provider to the Manufacturing SME user, are available only in dedicated workspaces, and subject to legality check.

Solution providers may pre-purchase dedicated workspace instances or sign a resale contract with the RAMP administrator.

Dedicated workspaces are always provided on a fee.

4.4 User and applications management

The web workspace has integrated tools for administering the applications and users. The following functions are available:

- Browse the system users (Figure)
- Create user groups and add or remove users in the groups (Figure)
- Delete existing user groups
- Create and upload applications (Figure)
- View and update the properties of an application (Figure)
- Disable the access to an application for specific users or user groups
- Disable completely the access to an application for all users

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<https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5dd542fae&appId=PPGMS>

- Restrict the access to an application only for system administrators
- Lastly, the option of integrating a new application by uploading a yaml configuration file is available. (Figure)

4.5 Benefits

The co-creation space, branded as the RAMP Web Workspace, allows users to access different web-based applications through a common, desktop-feeling environment. Combined with the integration of the applications with the RAMP authentication and authorization, this creates a seamless user experience where all these different applications are used in a manner of like-being programs in one desktop environment, regardless of where they are deployed/hosted. Also, regarding practicality, this makes the RAMP Web Workspace the one-stop unified environment that the user may access for their daily job, without the need to visit and remember different places where various kinds of web applications are made available.

For artists, it allows them to use their own preferred tools for the collaboration with the Manufacturing SMEs. Hence, RAMP is not now limiting on what the specific tools and applications should be, but gives them a unified environment to have all the different collaboration tools in one place.

For application providers, the possibility to add their application within the RAMP Web Workspace enables them to access to a wider customer base, and ensure that their application becomes seamlessly part of the daily user's work, without disrupting their customers' established or desired experience.

For solution providers, it allows them to offer to their customer unified solutions, which are composed by a range of different tools, not only those developed by these providers themselves, but enriched with applications developed by other parties. The unified user experience they can provide to their customers through the RAMP Web Workspace, gives higher value to their offering, while it allows to quickly extent with new applications or combine solutions in the future.

4.6 Concerns and limitations

There are some concerns that need to be taken into account, especially by the application and solution providers:

- Applications should be configured appropriately to use the RAMP authentication and authorization.
- When the application is not hosted on the RAMP infrastructure, the server where the application is deployed should be configured appropriately to allow the iframe integration within the RAMP servers.
- Certain graphical modifications may be asked by the RAMP administrator.
- RAMP provides the authentication and authorization information to the application, but the application itself needs to have in place mechanisms to handle the access to its own functions and generated data.
- In the case of customized applications, legal issues may arise, as to the licensing and the shared use of this application. For this reason, currently the integration of customized applications is provided only after legal/licensing thorough check, or by the application developer themselves.
- In the case of providing basic access management through the included reverse proxy, the server where the application instance is hosted should be configured appropriately (e.g., to allow connection only by the RAMP Web Workspace), according to the ad-hoc guidance given by the RAMP development and administrator.
- Desktop (Microsoft Windows) applications are not supported.

5 Conclusions

In order to address the drawbacks and the feedback from the KTEs, a new web-desktop environment has been implemented in RAMP. It allows users to have a one-stop, unified environment to use all their different applications in a common, shared workspace, without the need to visit different locations. The desktop-like user interface provides a seamless user experience, while access to applications is easily managed. At the same time, artists, application and solution providers have a tool for composing integrated solutions, including in their offers 3rd-party applications, and exploiting the RAMP services.

The co-creation space, branded as 'RAMP Web Workspace', will be tested in the follow-up round of KTEs, and feedback will be collected. Dedicated workspaces will be setup, giving the freedom to artists to select their application-of-choice for sharing their work and collaborating with the manufacturing SMEs. At the same time, the later will have in this unified environment, not only access to their collaboration tools with the artists, but also all the tools they need for their daily work, including for example web interfaces of applications and components related to the digitization solutions deployed in their factory, even their own, custom applications that are applicable only to their sector. Additionally, in the same environment, they will access the RAMP services, like the RAMP visualization dashboard.

The feedback that will be collected after the KTEs testing will be used to improve and refine the co-creation space's features, as needed. Additionally, even though business and exploitation aspects are already considered earlier in this document, it will provide valuable insight on the visibility of the considered exploitation methods, and more specific data to be used from the more concrete business plan (for example, fees that would reasonable for the different additional services to be provided).



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