



Manual for the Implementation of a Remote Workshop in the VETWORc Network

Verssion_20241216



Network of remote control Workshops in Vocational Training Centers
2023-1-ES01-KA220-VET-000159278

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System overview

Objectives

Key design drivers

Student experience

Overall architecture

Workshop requirements

CMS requirements

Technologies

Workshop manager

IT Objective

The IT project aims to design and develop a robust infrastructure, integrating **both hardware and software** components, to facilitate **student access to remote services**. Emphasizing security, the infrastructure will **protect sensitive data** and maintain system integrity. It will also prioritize **user experience** for both students and administrators. Additionally, the design will incorporate scalability to **accommodate future enhancements** and adapt to evolving educational needs and technological advancements.

Key design drivers

1st Cibersecurity

2nd Data Privacy

Security

3rd User Experience

4th Workshop as a Full Provider

5th Assessment

User experience

6th Integration Capability

7th Flexibility and Scalability

8th Reduce Administration

**Maintenance and
evolution**

Security

Cibersecurity

Security is the most critical aspect, as it not only **protects the system itself** but also ensures it doesn't compromise the overall **security of the educational institution** where it operates. It involves securing data, protecting against vulnerabilities, and safeguarding the broader network infrastructure to maintain the integrity and safety of both the platform and the surrounding environment.

Data Privacy

Ensures that **sensitive information**, such as student and staff details, is stored and handled in compliance with legal regulations (e.g., GDPR).

User experience

User Experience

A seamless and intuitive user experience is crucial for **engagement and satisfaction**. An easy-to-use system reduces the learning curve for students and staff, ensuring high adoption rates and minimizing frustration.

Full Provider

Workshop as a full provider highlights that the system will provide not only the **necessary tools** but also the **information** and **documentation** for the student to interact with the remote equipment efficiently.

Assessment

Assessment tools are essential for measuring student progress and providing actionable feedback. A robust assessment system allows educators to track learning outcomes accurately and helps identify areas where students need improvement. It is central to the educational process, as it enables continuous improvement and personalized learning.

Maintenance and evolution

Flexibility and Scalability

Flexibility and scalability are vital for ensuring the system can adapt to growing numbers of users and evolving educational needs.

This allows the platform to **expand and integrate new features** or tools without major disruptions. By designing with scalability in mind, the system can remain relevant and efficient as it grows alongside the institution.

Integration Capability

Integration capability is important for ensuring the system can work seamlessly with other platforms and systems (e.g., LMS, video conferencing, authentication services). By offering smooth integration, the system enhances its functionality and versatility, allowing educational institutions to leverage existing tools and streamline their operations.

Reduce Administration

Reducing administrative overhead is valuable for minimizing operational costs and allowing educators and staff to focus more on teaching and supporting students. While important for efficiency, it is less critical compared to other drivers, as it enhances usability and convenience rather than directly impacting the core functionality or security of the system

Student experience

Student User Experience

LMS



Training resources

Resources on using the ROBOTICS workshop.

Qualification test

 **Robotics Qualification Test**

It is necessary to pass this test to be able to access the automation workshop.

Unit 2 - Automation Workshop

To carry out the tasks of this unit **you have 2 hours** of use of the automation workshop equipment. This time will begin to be available when you open the next package.

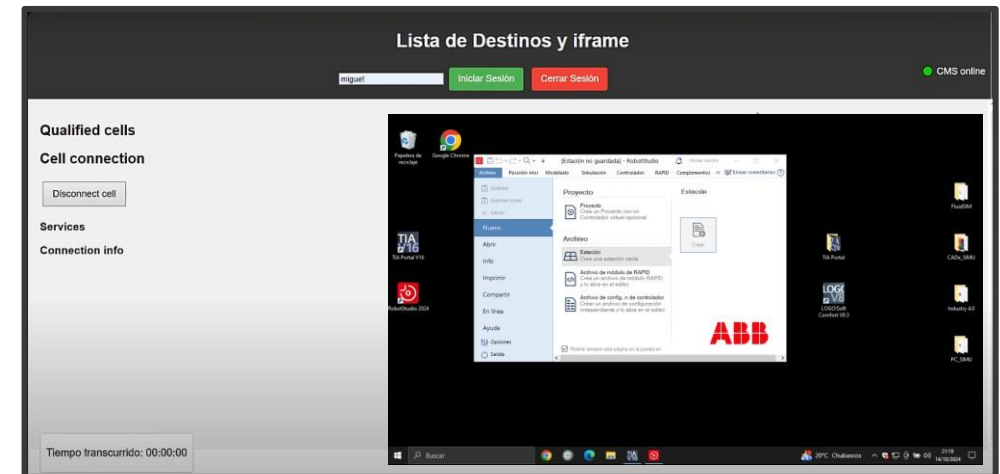
Read the task statement carefully, follow the guides provided and prepare them before connecting to the workshop. In this way you will optimize the use of the time you have.

 **Automation Time voucher (2 hours)**

This package will activate 2 hours for automation workshop use.

<https://aulavirtualxabec.es>

FRONT END



<https://bms.vetworc.com>

Learning management system

User Experience

Assessment

Reduce Administration

Integration Capability

Unit 3 - Robotics

To carry out the tasks of this unit **you have 3 hours** of use of the robotics workshop equipment. This time will begin to be available when you open the next package.

Read the task statement carefully, follow the guides provided and prepare them before connecting to the workshop. In this way you will optimize the use of the time you have.



Robotics Time voucher (3 hours)

This package will activate 3 hours for robotics workshop use.

Activities

Remember, in order to access the automation workshop equipment you need:

- Activate the **Robotics time voucher**.
- Pass the **Robotics qualification test**.



TASK01 - Programming ABB IRB120

Due 31 de diciembre de 2025

0 de 1 Enviados

Qualification test

The center that "owns" a workshop can decide that students must pass a test before the system allows them to connect. The qualification test authorizes you to use the workshop. It is equivalent to a "driver's license" that authorizes you to drive a car.

Time voucher

The access time to a remote workshop is limited. The student's instructor decides how much connection time is granted to the student. This is managed through a "Time voucher" that the student must activate.

Task

The instructor assigns tasks to the students. To complete them, they need to connect to the workshop. The system generates scores that are recorded in the task (currently, the time spent using the workshop).

Assessment

All student activity (qualification, task progress measured as connection time) is recorded in the grades book.

Progresss bar

Rol

Estudiante

Nombre

Todos

A

B

C

D

E

F

G

H

I

J

K

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Apellido(s)

Todos

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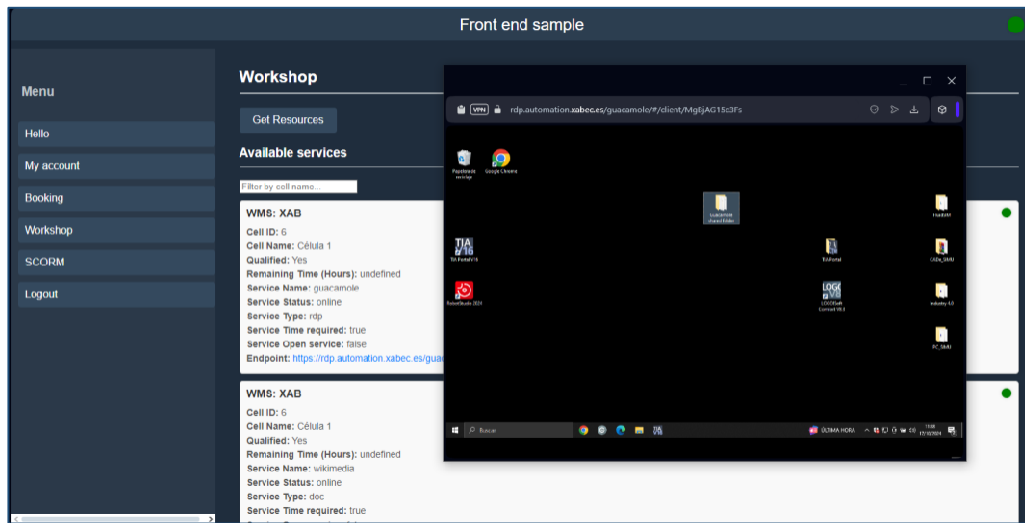
Z

☐	Nombre / Apellido(s)	Último en el curso	Estado de Finalización	Progreso
☐	Fernando Navarro Mas	jueves, 17 de octubre de 2024, 13:04	✓ ✓ ✓ ✓ ✓ ✓ Automation Qualification Test - II Finalizado	50%
☐	Gregorio Blanco Sáez	miércoles, 16 de octubre de 2024, 12:25	✗ ✗ ✗	0%
☐	Vicente Belenguer	Nunca	✗ ✗ ✗	0%

Connecting to the workshop and using its equipment

<https://bms.vetworc.com>

FRONT END



Account management

Students can manage their account, recover their password, check information, view reports, etc.

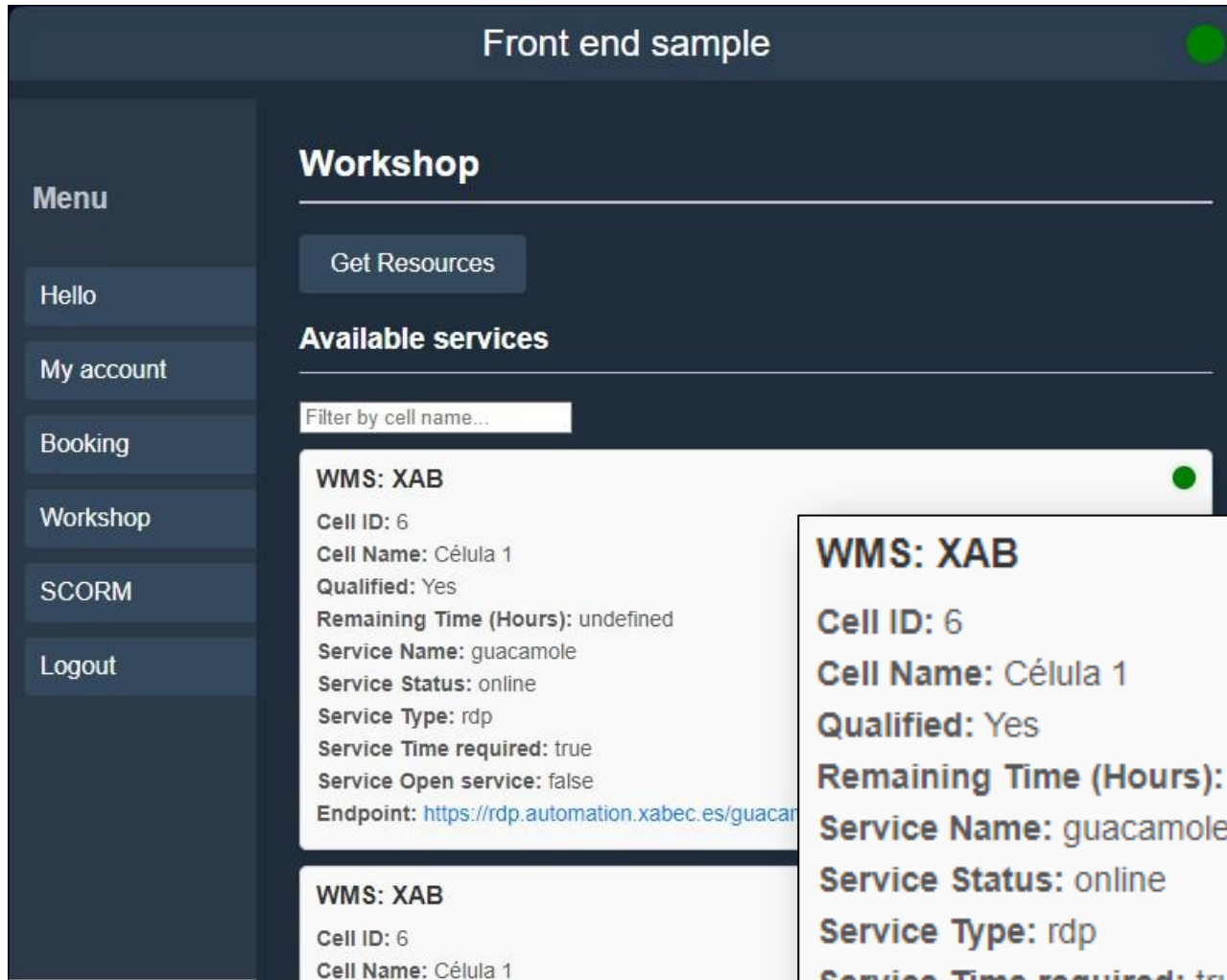
Reservation system

Students can reserve the use of resources offered by the network.

Services connection

Students can connect to and access the services offered by different centers, such as documentation services (wiki), remote desktop, video streaming, etc.

Services connection



Different services

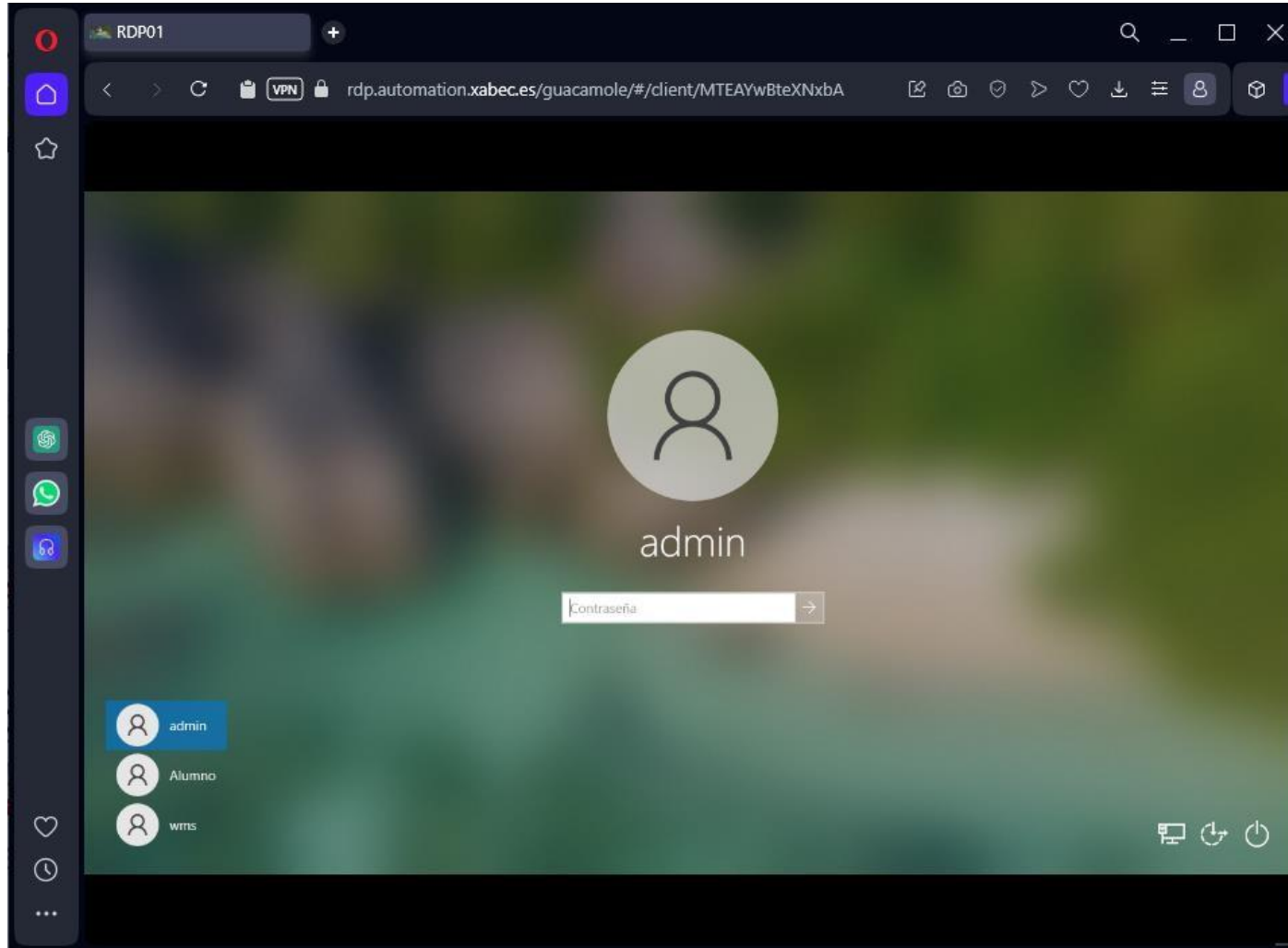
- Remote desktop.
- Documentation.
- Web.
- Streaming
- etc.

Remote desktop service

Security

User Experience

Workshop as a Full Provider

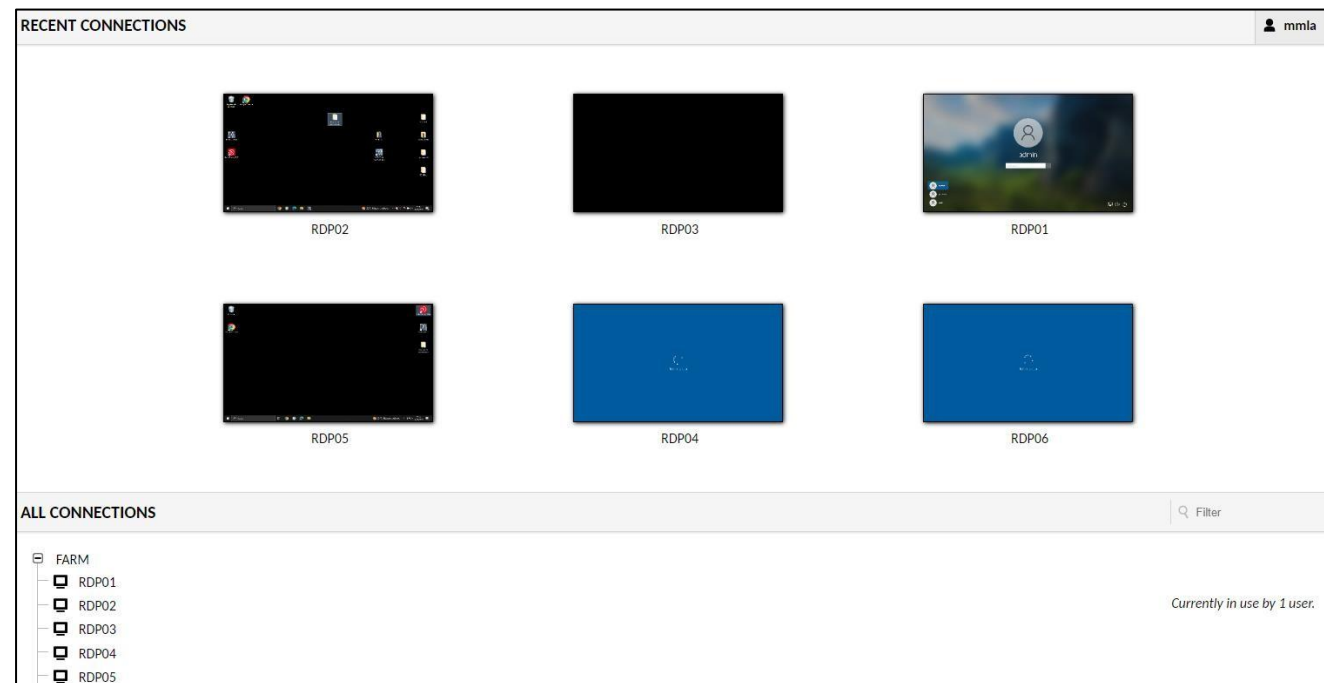


Remote desktop

Use of remote desktop through the web (HTML5), allowing a student to use any device to access a computer (laptop, tablet, smart TV, Chromebook, etc.).

The workshop as a global provider that offers the student all the equipment and software necessary to use the workshop's devices and resources.

Motivated also by security reasons, the option has been chosen for the workshop to offer "**remote desktops**" of configured and suitably isolated machines.



OMRON docummentation

ind004:equipos:omroncp1le

Omron CP1L-E

En lo que respecta a controladores compactos para máquinas, la serie CP1L le proporciona el tamaño compacto de un micro-PLC con las capacidades de un PLC modular. Ofrece todas las funciones que necesita para controlar su máquina, incluida una excelente capacidad de posicionamiento. Además, algunos modelos de CP1L cuentan con un puerto Ethernet integrado con funciones de servicios de socket, lo que le proporcionará una conectividad flexible para tareas de supervisión, funcionamiento, registro y acceso remoto. El CP1L se completa con una gama de placas opcionales para comunicación serie o E/S analógica y más unidades de ampliación si se necesitan más E/S. Como la serie CP1L usa la misma arquitectura que las CP1H, CJ1, y CS1, los programas son compatibles con las asignaciones de memoria e instrucciones.



 CP-series CP1L CPU Unit Datasheet

Documentación

-  CP1L - Guía rápida
-  Manual de introducción
-  Manual de programación
-  Manual de operación

Tabla de Contenidos

- Omron CP1L-E
- Documentación
- Software CX-One
- Direcciones

Software CX-One



El software CX-One permite a los usuarios elaborar, configurar y programar una serie de dispositivos como PLCs, Terminales Programables, sistemas Motion Control y redes con un solo paquete de software con una sola instalación y número de licencia. De este modo se reduce considerablemente la complejidad de la configuración y permite que los sistemas de automatización se programen o configuren con una mínima formación.

 [Software CX-One](#)

Direcciones

Modelo	Hostname	Dirección IP	Comentarios
CP1L	kit401	192.168.250.011	Kit
CP1L	kit402	192.168.250.012	Kit
CP1L	kit403	192.168.250.013	Kit
CP1L	kit404	192.168.250.014	Kit
CP1L	kit405	192.168.250.015	Kit
CP1L-E20	kit411	192.168.250.021	Kit
CP1L-E20	kit412	192.168.250.022	Kit
CP1L-E20	kit413	192.168.250.023	Kit
CP1L-E20	kit414	192.168.250.024	Kit
CP1L-E20	kit415	192.168.250.025	Kit
CP1L-E20	kit415	192.168.250.026	PLC Bancada 1
CP1L-E20	kit415	192.168.250.027	PLC Bancada 2
CP1L-E20	kit415	192.168.250.028	PLC Bancada 3
CP1L-EM30	kit416	192.168.250.031	Kit
CP1L-EM30	kit417	192.168.250.032	Kit
CP1L-EM30	kit418	192.168.250.033	Kit
CP1L-EM30	kit419	192.168.250.034	Kit
CP1L-EM30	kit420	192.168.250.035	Kit
CP1L-EM30	kit421	192.168.250.036	Kit

Flexibility

User Experience

Workshop as a Full Provider

Tablet



SmartTV



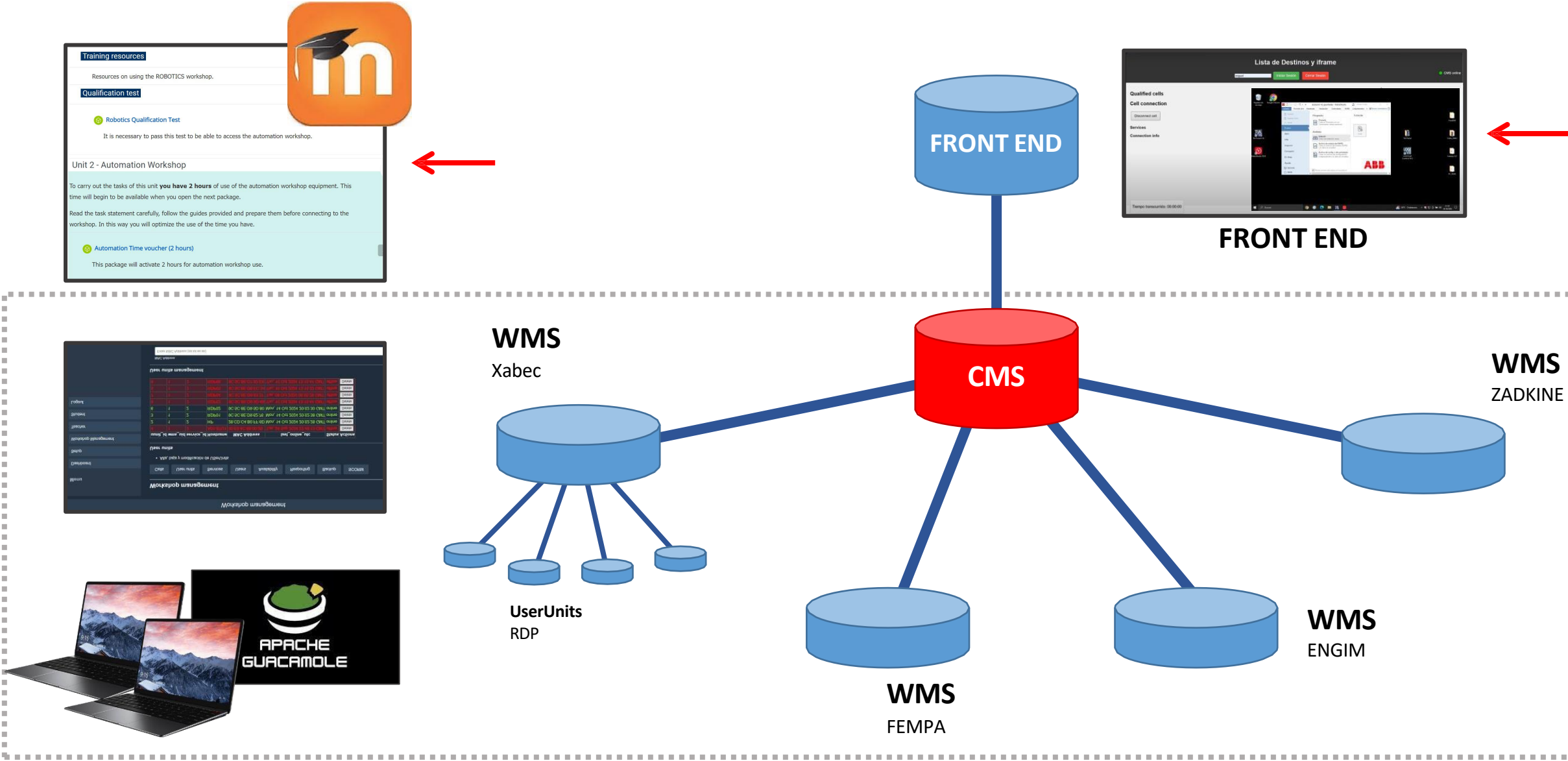
Overall architecture



Front-end
User experience

Topology and **architecture**.
Technology.
Security.
Flexibility.

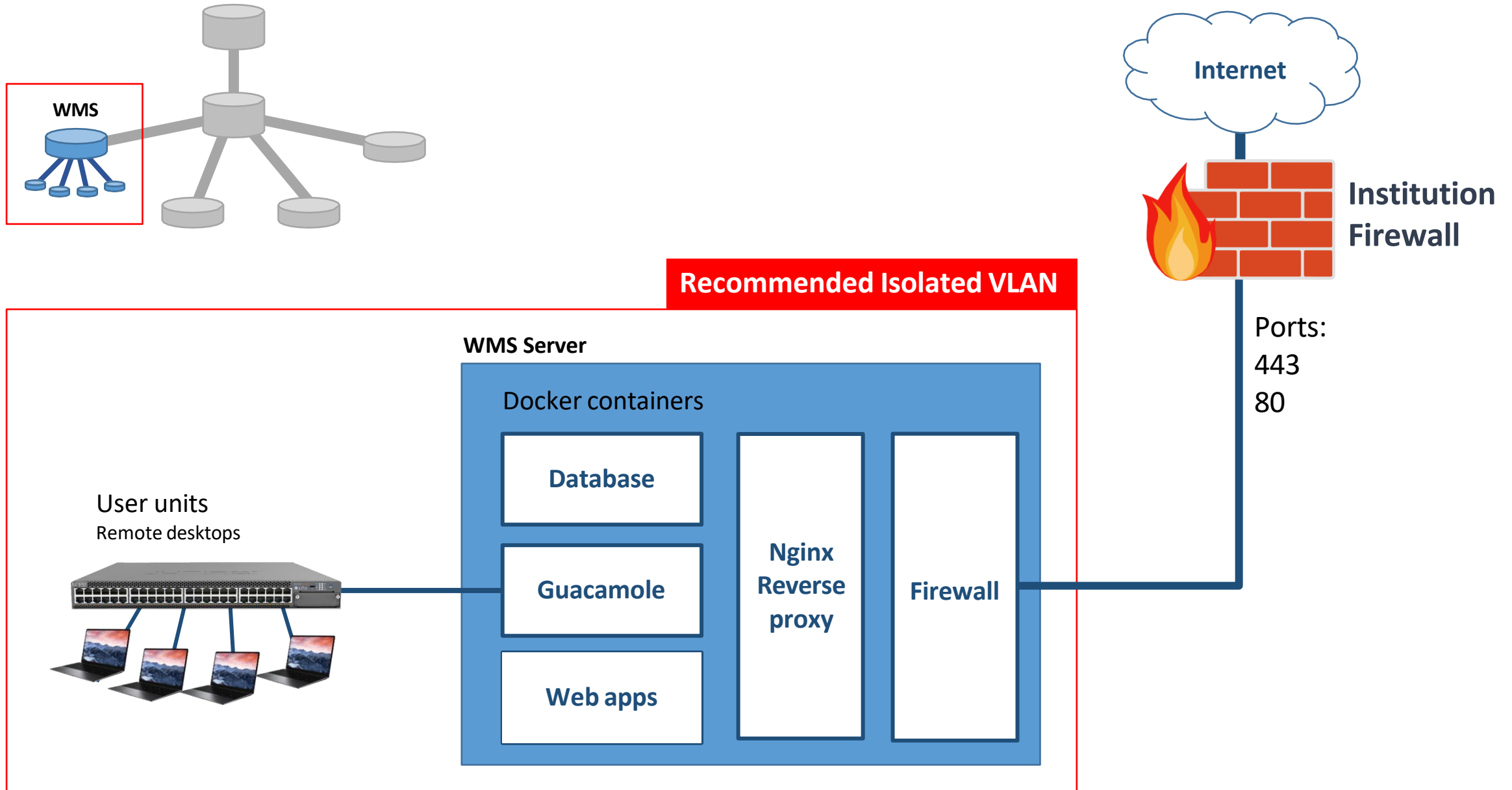
Overall architecture



Workshop requirements



Workshop management system (WMS) structure



Security

When networks are interconnected and external users are granted access, **security becomes critical**. Traditional methods like **VPNs expose networks to vulnerabilities** and require managing homogeneous IP addresses, complicating IT operations.

By implementing Apache Guacamole, remote desktops are provided via HTML5, which requires only a single external port, **minimizing the attack surface** and **simplifying firewall management**. Unlike VPNs, Guacamole isolates users from the core network, giving IT complete control over the environment and enabling tailored security policies.

This approach ensures users interact only with necessary resources in a controlled, monitored virtual environment, offering a more secure and manageable solution for external access.

IT requirements

Linux server

Recommendation for a Linux server running Docker with Guacamole to support **20-30 simultaneous VNC remote desktops**, as well as a web page with a database handling **10 transactions per second**:

Processor (CPU): Intel Xeon E3 or equivalent (or AMD Ryzen 5).
Minimum of **4 cores**
At least **2.5 GHz** for responsive performance.

Memory (RAM): At least **16 GB** of RAM.

Storage: SSD
Minimum of **500 GB**. (depends on the volume of metrics to be collected and retained over time)

**20-30 simultaneous VNC
remote desktops**

Nuevo Servidor rack PowerEdge R260

Código de pedido emea_per2602a

2.041,27 €

1.687,00 € excluyendo el IVA

[Ver fechas de entrega](#)

- CPU: Intel® Xeon® E-2414 2.6GHz
- RAM: 1x16GB DIMM
- Data: 1x2TB HDD SATA
- Support: 3años Basic NBD



IT requirements

Linux server

10 simultaneous VNC remote desktops

Recommendation for a Linux server running Docker with Guacamole to support **10 simultaneous VNC remote desktops**, as well as a web page with a database handling **10 transactions per second**:

Processor (CPU):

AMD Ryzen 5 5600G, Intel Core i5-11400.
Minimum of **4 cores**
At least **2.5 GHz** for responsive performance.

Memory (RAM):

16 GB of RAM.

Storage:

SSD
Minimum of **500 GB**. (depends on the volume of metrics to be collected and retained over time)

IT NETWORKC requirements: 1 tcp port.

Exposed surface is minimized. This is a fundamental principle in cybersecurity. It not only reduces the number of vulnerabilities but also enhances overall security posture by making it more difficult for malicious actors to find and exploit weaknesses in a network or system.

- **External HTTPS port (443)**
- Recommendations:
 - External HTTP port (80) for Let's Encrypt automatic renewal
 - Isolated VLAN or subnet (Recommendation)

CMS requirements



Linux server

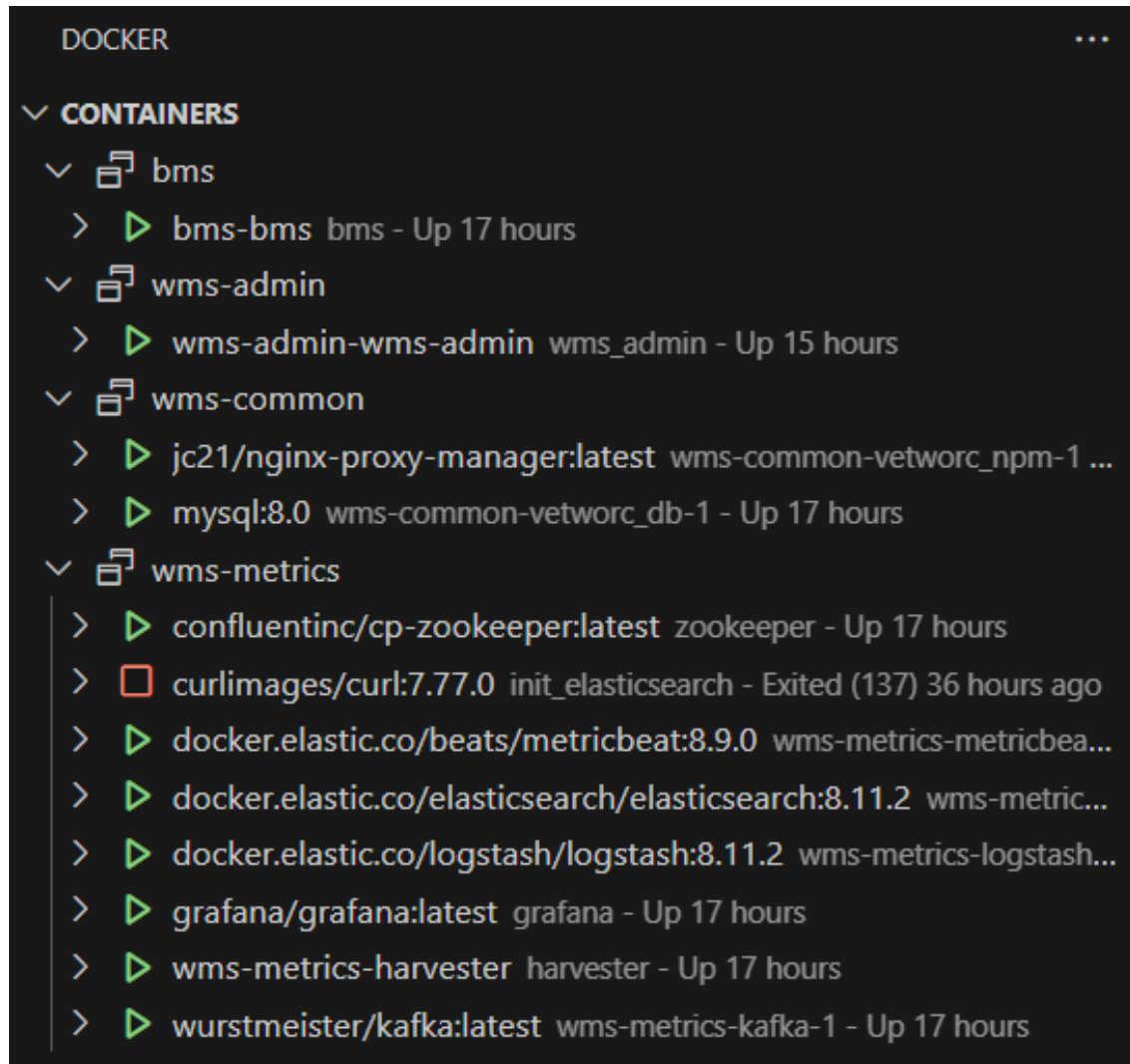
Recommendation for a Linux server running Docker:

Processor (CPU):	AMD Ryzen 5 5600G, Intel Core i5-11400. Minimum of 4 cores At least 2.5 GHz for responsive performance.
Memory (RAM):	8 GB of RAM.
Storage:	SSD Minimum of 500 GB . (depends on the volume of metrics to be collected and retained over time)

Technologies



¿Why Docker?



Ease of Deployment: Docker simplifies the deployment process, allowing applications to be quickly launched, updated, or rolled back as needed. This streamlines workflows and reduces downtime.

Scalability: Docker makes it easy to scale applications horizontally by launching multiple instances of containers based on demand. This is particularly beneficial for microservices architectures.

Isolation and Security: Docker provides a high level of isolation between containers, which enhances security by limiting the impact of vulnerabilities and preventing conflicts between applications.

Portability: Docker containers can run consistently across different environments, ensuring that applications work the same way on development, testing, and production systems.

¿How to install and exetute?

Download the installation file from internet

```
wget https://vetworc.com/software/wms.tar.gz -O wms.tar.gz
```

Decompress the file in /vetworc

```
mkdir -p /vetworc
```

```
tar -xzvf wms.tar.gz -C /vetworc
```

Change to the /vetworc directory

```
cd /vetworc
```

Edit the configuration to define WMS identifier

```
nano /vetworc/wms/config.json
```

Create and start docker containers

```
docker compose up -d
```

Open firewall ports

```
ufw allow https, http
```

Technologies

- Ubuntu
- Docker
- Nginx
- Kafka
- Elasticsearch
- Grafana
- Flask
- MySQL



Workshop Manager

SCORM generation:

Register SCORM

Time voucher SCORM

Task SCORM

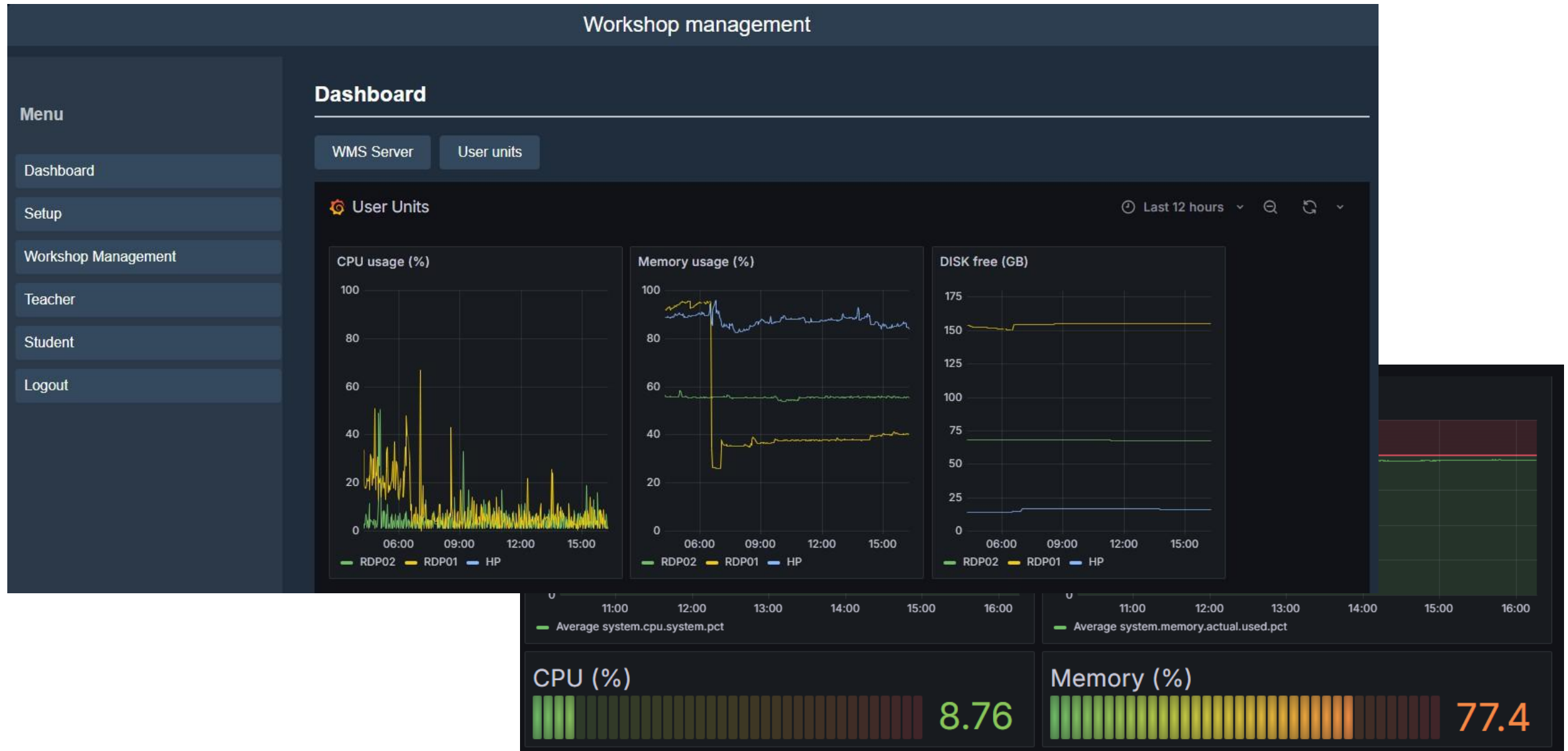
Monitoring

Reporting

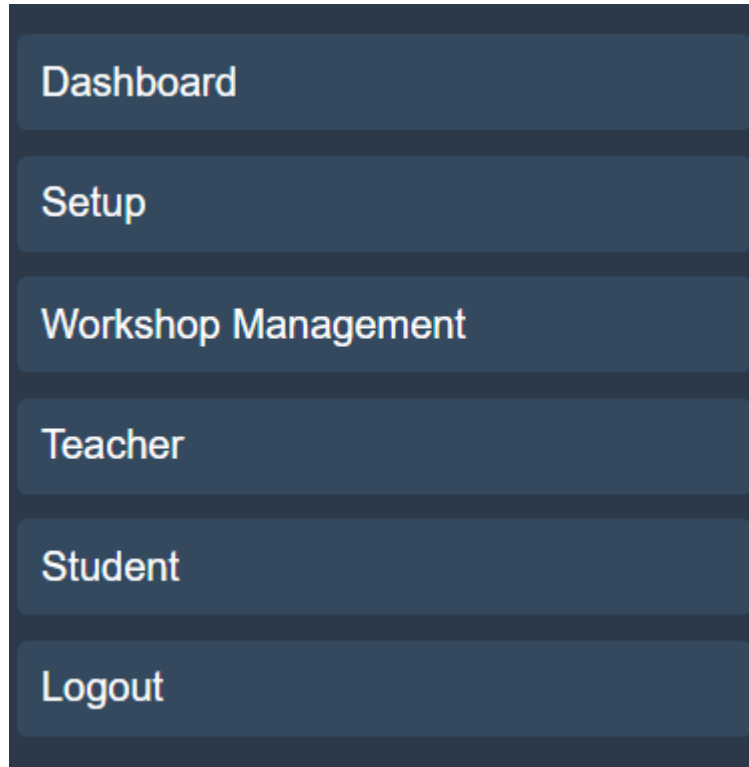
The server runs monitoring and management software. It also offers a web front end to configure the system.

Monitoring

<https://front.wms.xabec.vetworc.com>



User roles



Three different roles:

Workshop admin

Teacher

Student

Workshop admin: System configuration

Workshop management

Menu

Dashboard

Setup

Workshop Management

Teacher

Student

Logout

Setup

BackupRestart serverWMS Server

Save

Basic Information

wms_uid

1

Short Code

XAB

Name

Xabec

CMS Configuration

CMS API URL

https://cms.vetworc.com

Register Frequency (minutes)

30

WMS API configuration

```
{
  "wms-admin": {
    "wms_api_url": "https://wms.xabec.vetworc.com",
    "wms_public_api_key": "asdadasdafsssssf"
  },
  "wms": {
    "wms_uid": "1",
    "wms_hash": "B7S4WWINCI8F69IIPREEJ62K9DSL986U",
    "wms_api_url": "https://wms.xabec.vetworc.com",
    "wms_api_key": "asdkajshdlashdlaksh",
    "wms_public_api_key": "asdadasdafsssssf",
    "wms_scorm_api_key": "asdadasdaff",
    "wms_database_uri": "mysql+pymysql://root:root_password@localhost:33306/wms_db",
    "cms_api_url": "https://cms.vetworc.com",
    "cms_api_key": "xxxx",
    "register_frequency": "30",
    "cms_registration_api_key": "xxx",
    "es_api_key": "cc",
    "es_index": "user-units",
    "es_url": "http://localhost:9200",
    "keep_alive_sessions": "300",
    "name": "Xabec",
    "short_code": "XAB",
    "user_nodes_api_key": "mi_api_key_secretapa_usernodes",
    "user_nodes_keepalive": "300"
  },
  "cms": {
    "cms_uid": 1,
    "cms_hash": "xxxx",
    "cms_api_url": "https://cms.vetworc.com",
    "cms_api_key": "xxxx",
    "cms_scorm_api_key": "2342342342342341j2342134j",
    "external_user_creation_url": null,
    "external_user_creation_api_key": null,
    "cms_database_uri": "mysql+pymysql://root:root_password@localhost:33306/cms_db",
    "bms_front_end_url": "https://bms.vetworc.com",
    "cms_registration_api_key": "xxx"
  }
}
```

Workshop admin: User units and cells

User units							
uunit_id	wms_uid	service_id	Hostname	MAC Address	last_online_utc	Status	Actions
4	1	2	A01-STU1	00:E0:4C:68:00:2B	Tue, 24 Sep 2024 22:48:13 GMT	offline	Delete
2	1	2	HP	28:CD:C4:B0:FF:6D	Mon, 14 Oct 2024 18:15:26 GMT	online	Delete
3	1	2	RDP01	9C:5C:8E:D9:62:76	Mon, 14 Oct 2024 18:14:53 GMT	online	Delete
6	1	2	RDP02	9C:5C:8E:D9:5D:80	Mon, 14 Oct 2024 18:15:22 GMT	online	Delete
9	1	2	RDP03	9C:5C:8E:D9:5D:4B	Thu, 10 Oct 2024 13:15:44 GMT	offline	Delete
7	1	2	RDP04	9C:5C:8E:D9:63:37	Tue, 08 Oct 2024 06:55:29 GMT	offline	Delete
5	1	2	RDP05	9C:5C:8E:D6:EC:34	Thu, 10 Oct 2024 13:15:22 GMT	offline	Delete
8	1	2	RDP06	9C:5C:8E:D7:92:E8	Thu, 10 Oct 2024 13:15:44 GMT	offline	Delete

User units

User units are the computers that provide remote desktop services. These are machines accessed by Guacamole (an RDP proxy) using VNC. Optionally, we can install monitoring software (user unit daemon), which allows us to monitor their status from the WMS (Workshop Management System).

Cells management						
Create cell						
cell_id	Shortcode	Name	Description	Status	Actions	
6	undefined	Célula 1	Esto es una célula	online	Delete	Edit
7	undefined	Célula 2	Esto es una célula	offline	Delete	Edit
8	undefined	Célula 3	Esto es una célula	offline	Delete	Edit
9	undefined	Célula 4	Esto es una célula	online	Delete	Edit
10	undefined	Célula 5	Esto es una célula	online	Delete	Edit

Cells

Cells are essentially what we might consider actual workshops. The WMS (Workshop Management System) is equivalent to the school/center, and the cells are the workshops within this school.

A center can offer various cells (automation, robotics, printing, etc.)

Workshop admin: Services and users

Services

service_id	cell_id	Name	Type	Status	Config	Endpoint	
2	6	guacamole	rdp	online	null	https://rdp.automation.xabec.es/guacamole	Delete
3	6	wikimedia	doc	online	null	https://info.automation.xabec.es	Delete
4	6	xabec	doc	offline	null	https://xabec.es	Delete

Services

The workshop manager uses the WMS to configure the services offered by the different cells in the center. They can also define their availability.

Users management

user_uid	user	Alias	email	Active	Info	Actions
46	zzfwfffdaaa1d11eeaaaa	XAB000046	fffawaadfdeez11zzz@f.com	true	Info...	Delete
47	zzfwfffdasaa1d11eeaaaa	XAB000047	ffawsaadfdeez11zzz@f.com	true	Info...	Delete
48	miguel	XAB000048	miguel@xabec.es	true	Info...	Delete
49	asdasd	XAB000049	aa@asd.com	true	Info...	Delete
50	asdaasdd	XAB000050	asasd	true	Info...	Delete
77		XAB000077	asdasd a asda	true	Info...	Delete
85	fernando.navarro	XAB000085	fernando.navarrossss@xabec.es	true	Info...	Delete
88	fernando.navarro	XAB000088	sdf@asdasd.asdasd	false	Info...	Delete

Users

The workshop manager can access information about registered users and their usage of resources.

Teacher

SCORM generation:

Register SCORM

Time voucher SCORM

Task SCORM

Reporting

Teacher

Logout

Teachers

Registration SCORM



This SCORM package allows students to self-register on the platform.

Insert it into the online platform so that students can generate the username and password needed to access the Vetworc network. Configuring the SCORM package for a single attempt ensures that each student registers only once, preventing duplicate accounts and maintaining data accuracy.

Self-registration reduces the administrative burden on teachers, allowing them to focus on teaching rather than managing student enrollments, while also providing students quick and independent access to the platform.

Time voucher SCORM



This SCORM package allows the teacher to assign time for the use of a specific service.

If the student does not have allocated time, they will not be able to access the workshop to use its services.

To generate it, the teacher must decide how much time (in hours) and for which service.

Service: Hours:

Processes

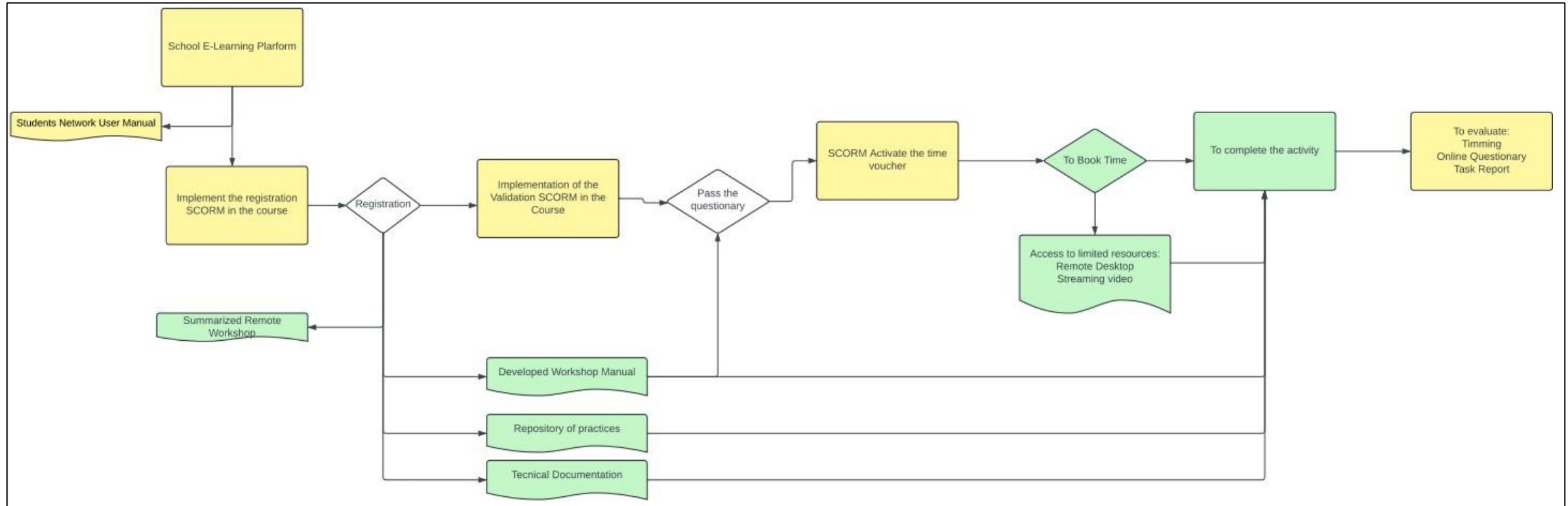
- 1 – Inventory management.
- 1 – Registration.
- 2 – Qualification.
- 3 – Time voucher.
- 4 – Assessment.

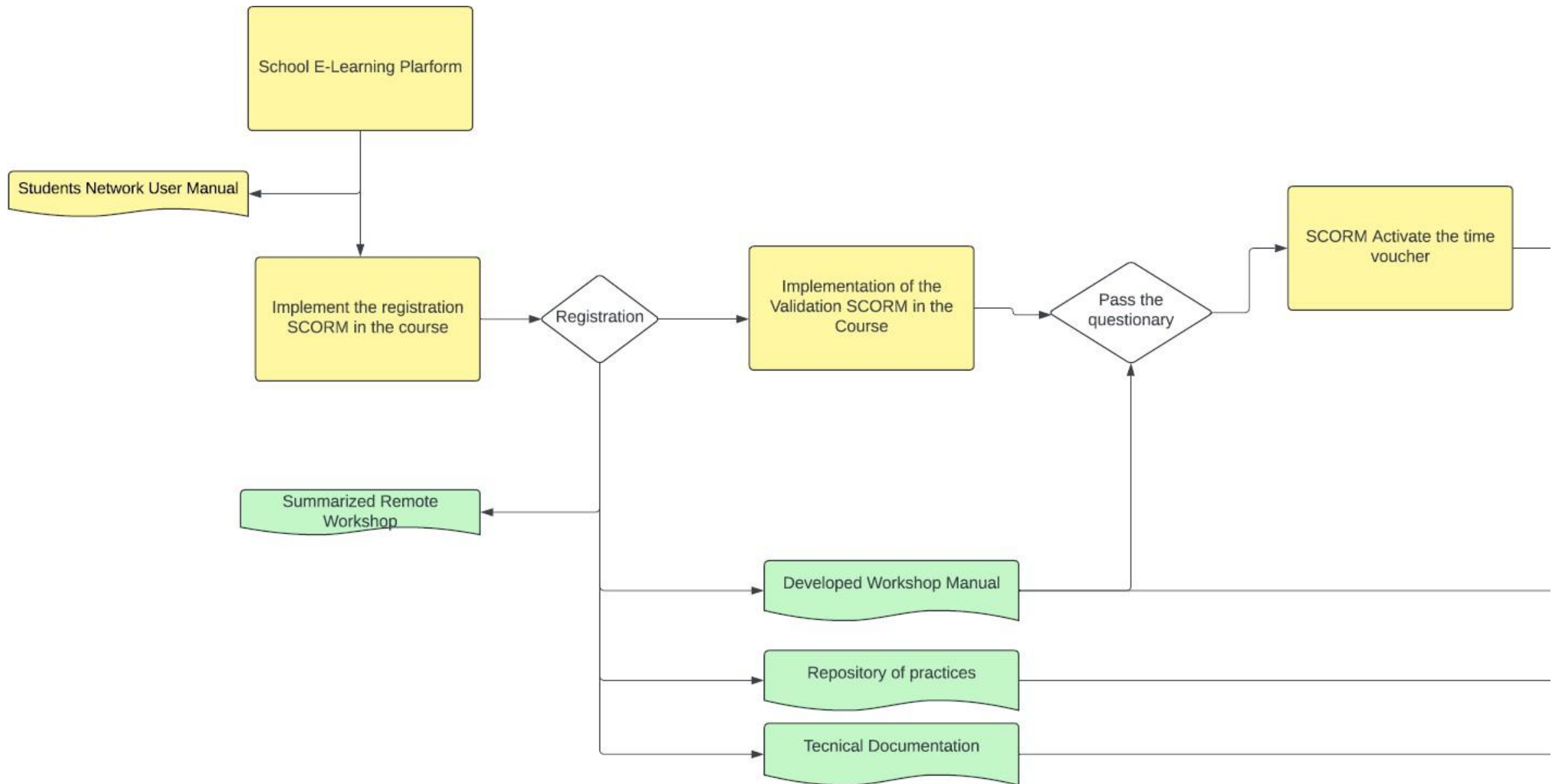
Registration

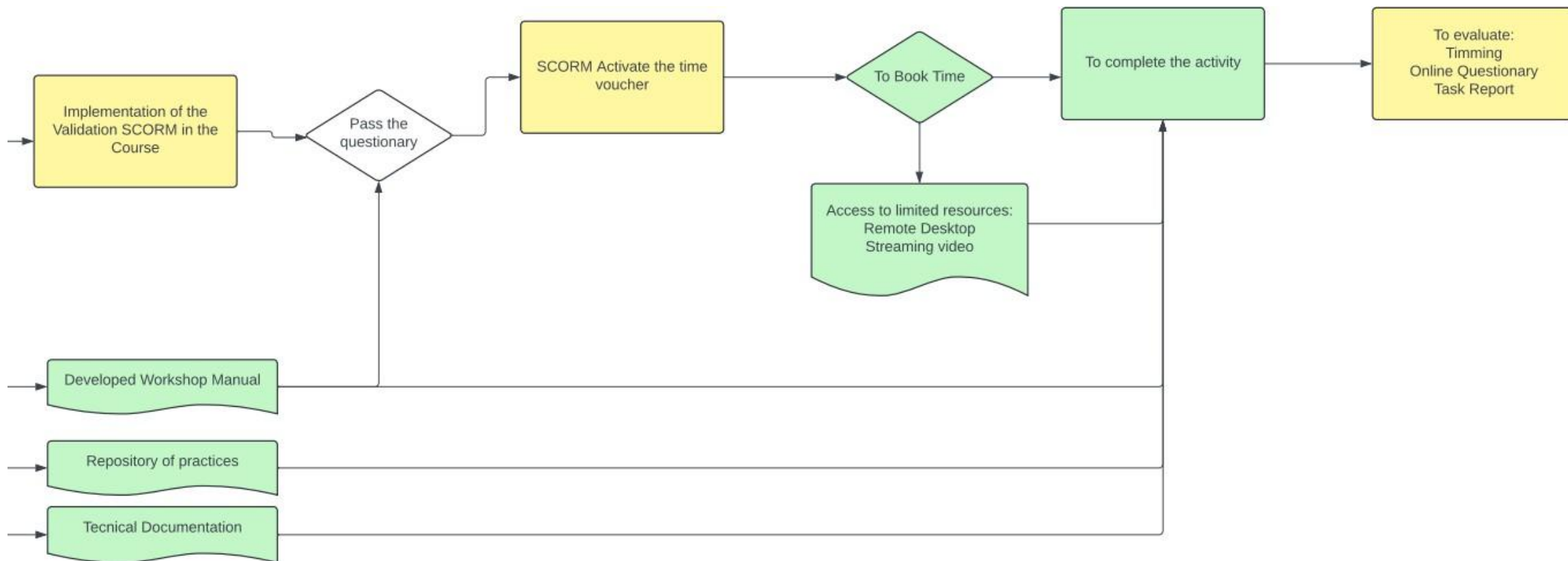
Qualification

Time voucher

Assessment







Processes: Inventory management

El sistema propaga y actualiza de forma dinámica el inventario de talleres, células y servicios. Detecta cuándo un recurso deja de estar disponible, o cuando un nuevo recurso es dado de alta en la red.

WMS: XAB

Cell ID: 6

Cell Name: Célula 1

Qualified: Yes

Remaining Time (Hours): undefined

Service Name: guacamole

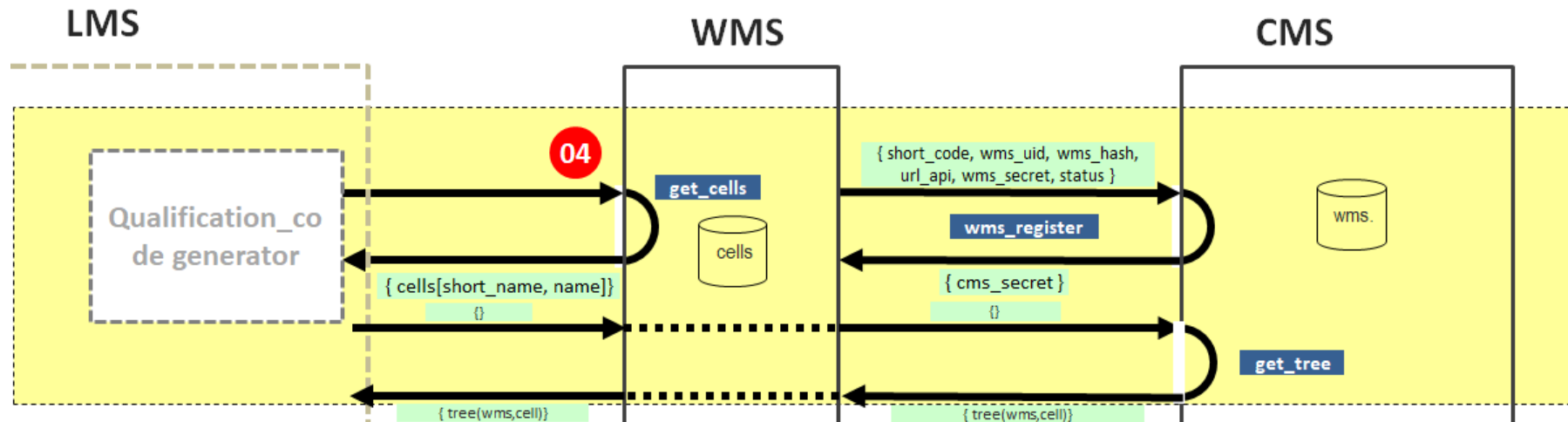
Service Status: online

Service Type: rdp

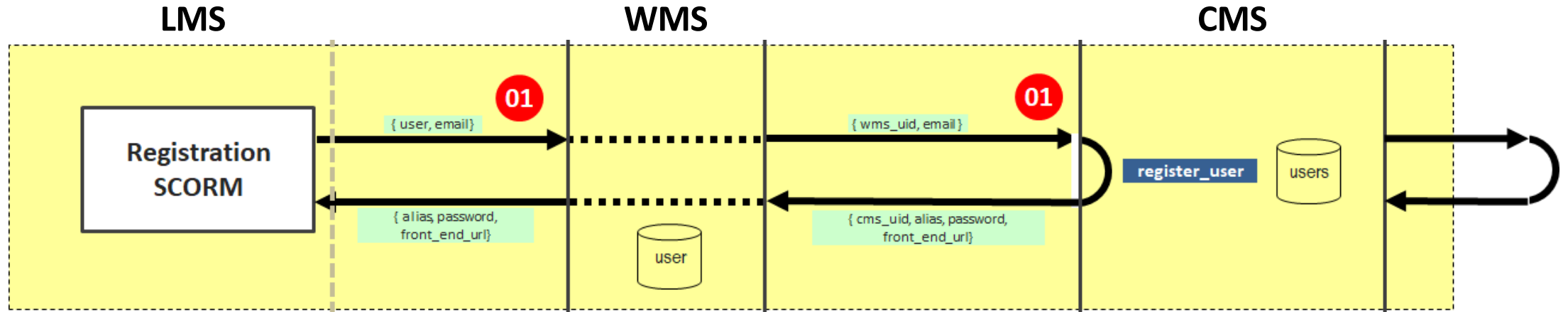
Service Time required: true

Service Open service: false

Endpoint: <https://rdp.automation.xabec.es/guacamole>



Processes: User registration



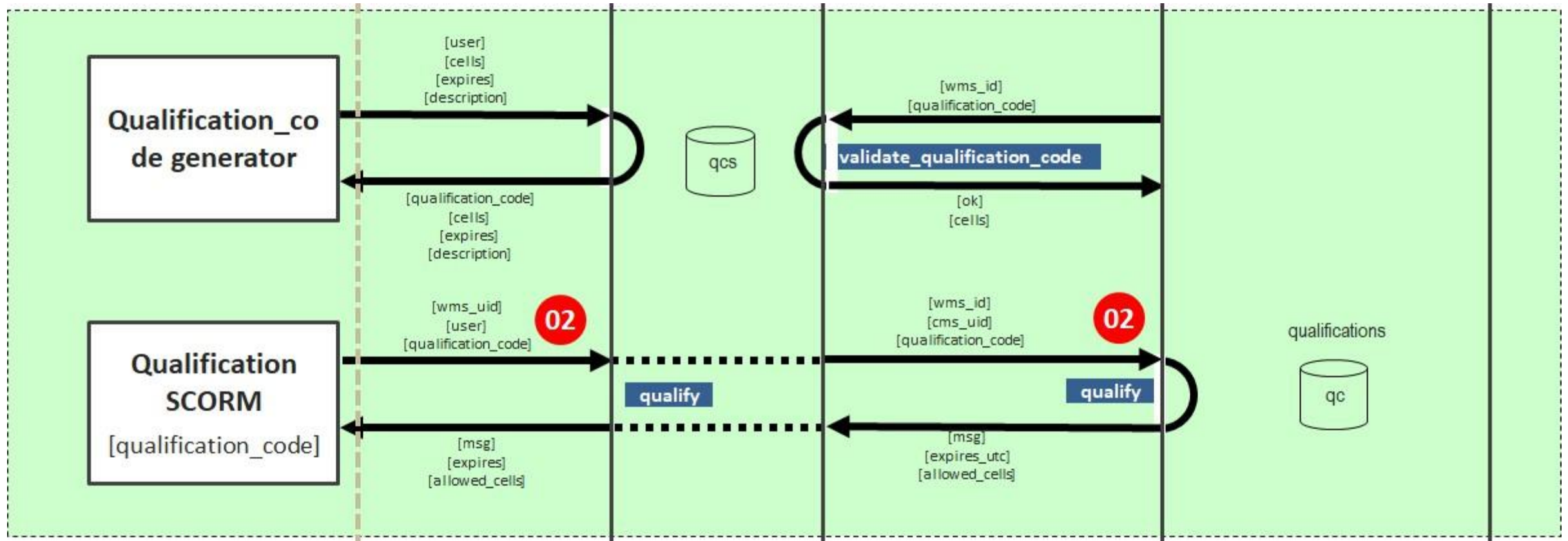
User registration

Email

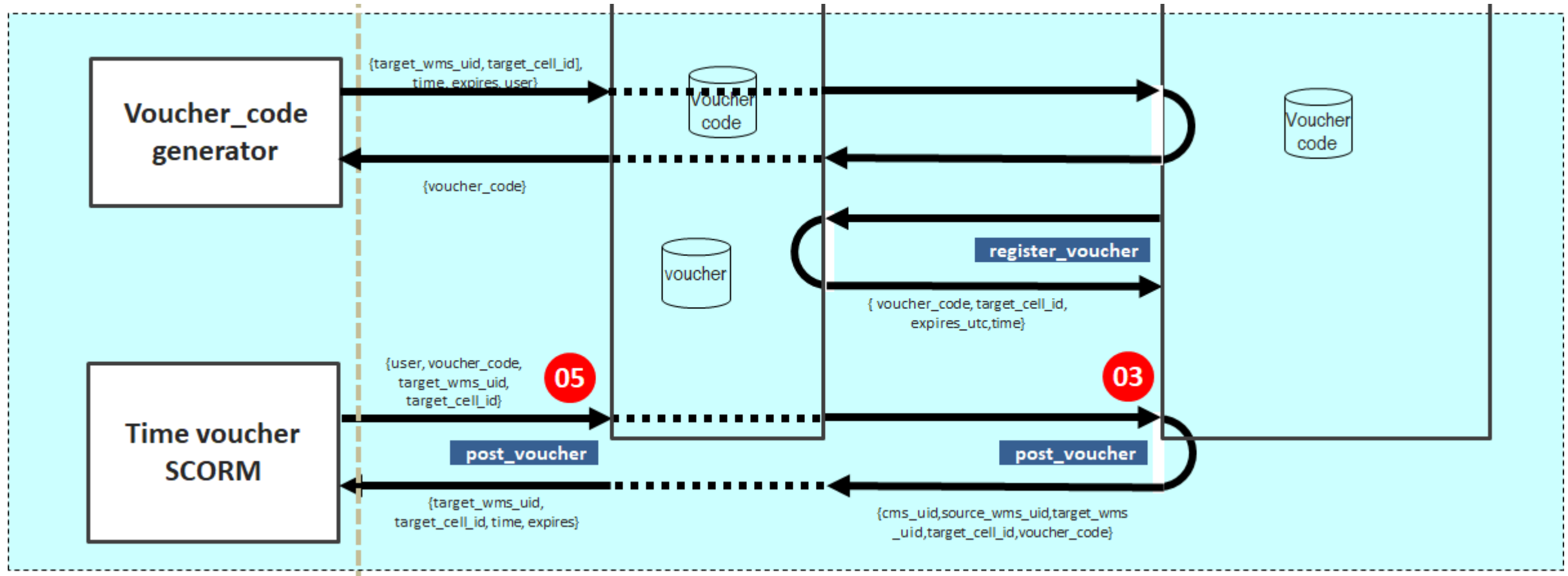
Register

Enter your email address to register in system.

Processes: User qualification



Processes: Time vouchers



Processes: Assessment

