

# Deploying Orthanc as a secured cloud PACS

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# Summary

- Orthanc Team presentation
- Goal
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- Machine configuration
- “A” record
- Nginx, Certbot and Let’s Encrypt
- Setup configuration
- Run and test
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- Labels
- Shares
- Q/A



## Community:

- Public support + doc
- Orthanc dev
- Plugin dev
- ~~Stone Viewer plugin~~

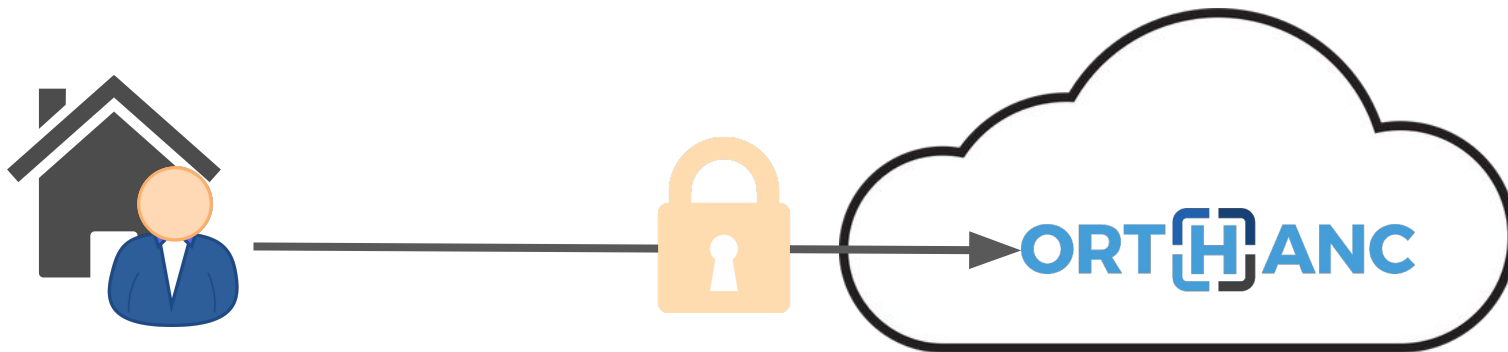
## Funding:

- Open Collective
- Customers

## Customers:

- Dedicated support/training
- Orthanc + plugin dev
- Inter-hospitals transfers + CD-ROM importer
- Orthanc as a mini-pacs - including:
  - Ability to share studies
  - Ability to modify studies
  - Ability to manage users
  - Ability to manage permissions (labels)



# Goal : Deploy a secured Orthanc in the cloud



- Dedicated domain name
- https
- Access control
- Permissions

# Prerequisites

## Cloud server

- Debian 11
- 2 cores CPU, 16GB RAM
- HD: 120GB + storage (SSD) 
- Admin rights
- Open ports: 443, 80, 22
- Use LVM 
- Fix IP

## Domain name

- orthanc.team

# Machine configuration

- `apt update && apt upgrade`
- `apt install git`
- Install Docker:  
<https://docs.docker.com/engine/install/debian/#install-using-the-repository>

## Install using the Apt repository

Before you install Docker Engine for the first time on a new host machine, you need to set up the Docker Apt repository. Afterward, you can install and update Docker from the repository.

1. Set up Docker's Apt repository.

```
# Add Docker's official GPG key:
sudo apt-get update
sudo apt-get install ca-certificates curl gnupg
sudo install -m 0755 -d /etc/apt/keyrings
curl -fsSL https://download.docker.com/linux/debian/gpg | sudo gpg --dearmor -o /etc/ap
sudo chmod a+r /etc/apt/keyrings/docker.gpg

# Add the repository to Apt sources:
echo \
"deb [arch=$(dpkg --print-architecture)] signed-by=/etc/apt/keyrings/docker.gpg htt
$(. /etc/os-release && echo "$VERSION_CODENAME") stable" | \
sudo tee /etc/apt/sources.list.d/docker.list > /dev/null
sudo apt-get update
```

### Note

If you use a derivative distro, such as Kali Linux, you may need to substitute the part of this command that's expected to print the version codename:

```
$(. /etc/os-release && echo "$VERSION_CODENAME")
```

2. Install the Docker packages.

Latest Specific version

To install the latest version, run:

```
install docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-compose-plugin
```

3. Verify that the installation is successful by running the `hello-world` image:

```
$ sudo docker run hello-world
```

# Machine configuration

```
root@orthanc-hetzner:~# sudo docker run hello-world
Unable to find image 'hello-world:latest' locally
latest: Pulling from library/hello-world
719385e32844: Pull complete
Digest: sha256:4f53e2564790c8e7856ec08e384732aa38dc43c52f02952483e3f003afbf23db
Status: Downloaded newer image for hello-world:latest
```

```
Hello from Docker!
This message shows that your installation appears to be working correctly.
```

To generate this message, Docker took the following steps:

1. The Docker client contacted the Docker daemon.
2. The Docker daemon pulled the "hello-world" image from the Docker Hub. (amd64)
3. The Docker daemon created a new container from that image which runs the executable that produces the output you are currently reading.
4. The Docker daemon streamed that output to the Docker client, which sent it to your terminal.

To try something more ambitious, you can run an Ubuntu container with:  
\$ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:  
<https://hub.docker.com/>

For more examples and ideas, visit:  
<https://docs.docker.com/get-started/>

Modify (or create) this file:

```
/etc/docker/daemon.json
```

And insert this:

```
{
  "log-driver": "journald"
}
```



Then, restart Docker daemon:

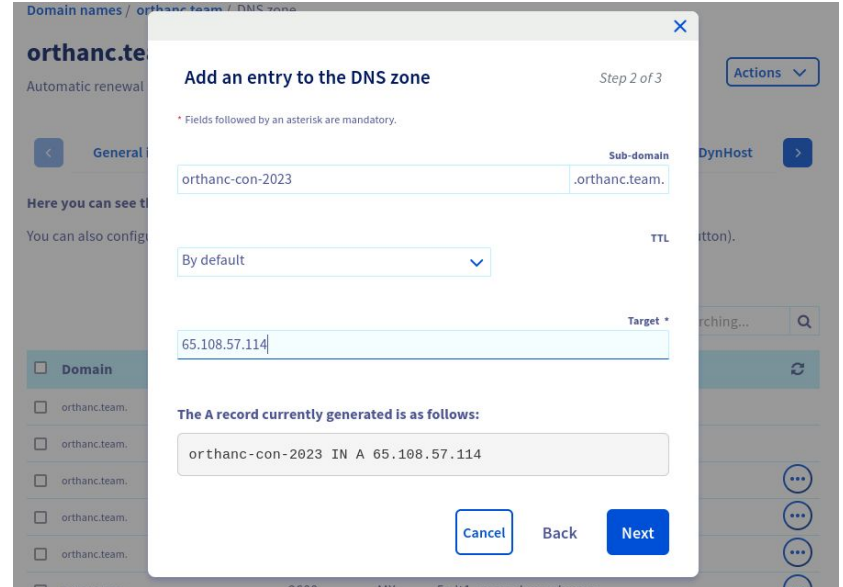
```
systemctl restart docker
```

# “A” record

- Get the public IP address of your cloud server:

```
root@orthanc-hetzner:~# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 96:00:00:d6:fe:b9 brd ff:ff:ff:ff:ff:ff
    altname enp0s3
    altname ens3
    inet 65.108.57.114/32 brd 65.108.57.114 scope global dynamic eth0
        valid_lft 83308sec preferred_lft 83308sec
    inet6 2a01:4f9:c011:4f1a::1/64 scope global
        valid_lft forever preferred_lft forever
    inet6 fe80::9400:ff:fed6:feb9/64 scope link
        valid_lft forever preferred_lft forever
3: docker0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default
    link/ether 02:42:13:11:11:cc brd ff:ff:ff:ff:ff:ff
    inet 172.17.0.1/16 brd 172.17.255.255 scope global docker0
        valid_lft forever preferred_lft forever
    inet6 fe80::42:13ff:fe11:11cc/64 scope link
        valid_lft forever preferred_lft forever
root@orthanc-hetzner:~# curl httpbin.org/ip
{
  "origin": "65.108.57.114"
}
```

- Add an “A record” in the configuration tool of your registrar:



Domain names / orthanc.team / DNS zone

orthanc.team

Automatic renewal

General

Here you can see the DNS zone configuration

You can also configure the DNS zone

Sub-domain

orthanc-con-2023

.orthanc.team.

TTL

By default

Target \*

65.108.57.114

The A record currently generated is as follows:

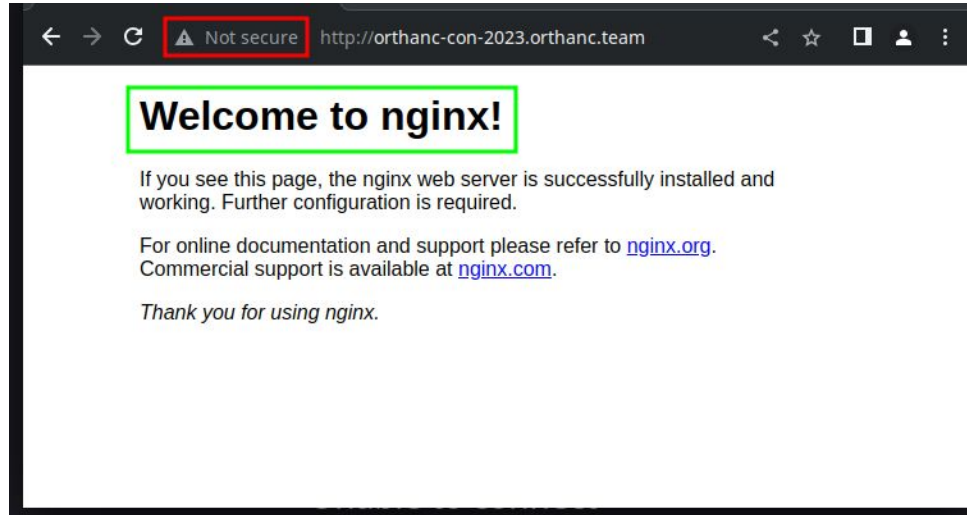
orthanc-con-2023 IN A 65.108.57.114

Cancel Back Next



# Nginx, Certbot and Let'sEncrypt

- `apt install nginx`



24 hours could be needed

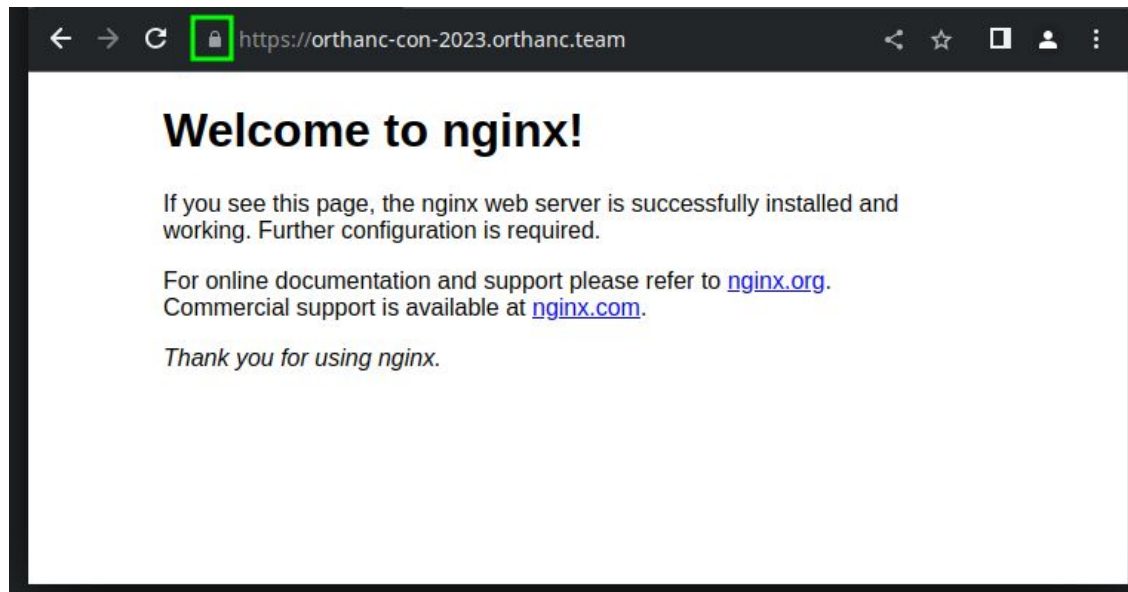
# Nginx, Certbot and Let'sEncrypt

- `apt install certbot python3-certbot-nginx`
- `certbot --nginx -d orthanc-con-2023.orthanc.team`

```
Account registered.
Requesting a certificate for orthanc-con-2023.orthanc.team
Performing the following challenges:
http-01 challenge for orthanc-con-2023.orthanc.team
Waiting for verification...
Cleaning up challenges
Deploying Certificate to VirtualHost /etc/nginx/sites-enabled/default
Redirecting all traffic on port 80 to ssl in /etc/nginx/sites-enabled/default

-----
Congratulations! You have successfully enabled
https://orthanc-con-2023.orthanc.team
-----
```

# Nginx, Certbot and Let'sEncrypt



# Nginx, Certbot and Let'sEncrypt (reverse proxy config)

- Clean `/etc/nginx/sites-available/default`

```
server {  
  
    server_name orthanc-con-2023.orthanc.team; # managed by Certbot  
  
    location / {  
        proxy_pass http://127.0.0.1:8080;  
        proxy_set_header Host $http_host;  
        proxy_request_buffering off;  
        proxy_max_temp_file_size 0;  
        client_max_body_size 0;  
    }  
  
    listen [::]:443 ssl ipv6only=on; # managed by Certbot  
    listen 443 ssl; # managed by Certbot  
    ssl_certificate /etc/letsencrypt/live/orthanc-con-2023.orthanc.team/fullchain.pem; # managed by Certbot  
    ssl_certificate_key /etc/letsencrypt/live/orthanc-con-2023.orthanc.team/privkey.pem; # managed by Certbot  
    include /etc/letsencrypt/options-ssl-nginx.conf; # managed by Certbot  
    ssl_dhparam /etc/letsencrypt/ssl-dhparams.pem; # managed by Certbot  
}  
  
server {  
    if ($host = orthanc-con-2023.orthanc.team) {  
        return 301 https://$host$request_uri;  
    } # managed by Certbot  
  
    listen 80 ;  
    listen [::]:80 ;  
    server_name orthanc-con-2023.orthanc.team;  
    return 404; # managed by Certbot  
}
```

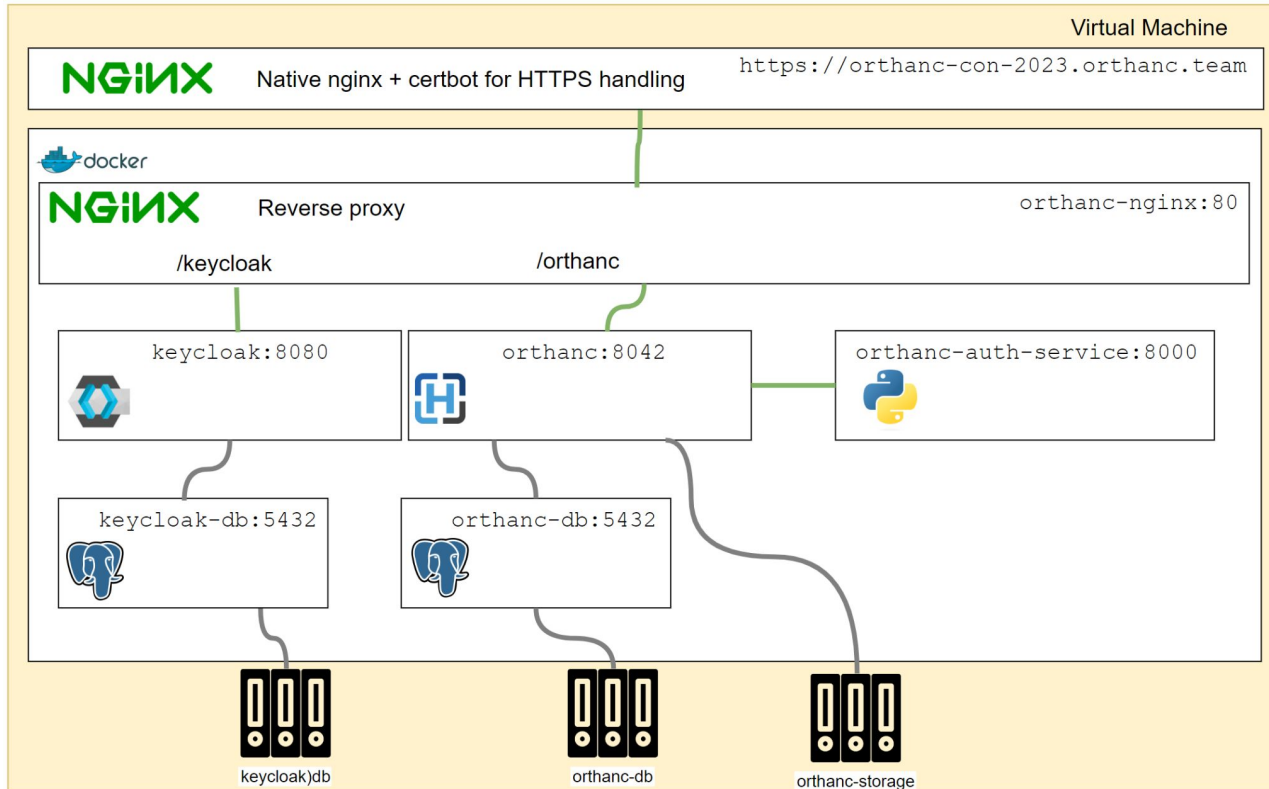
- Restart Nginx:

```
systemctl restart nginx
```

# Nginx, Certbot and Let'sEncrypt



# Architecture



# Setup configuration

- Clone the repo `git clone https://github.com/orthanc-team/orthanc-con-2023.git`
- Modify the passwords in the 2 files located in the `secret` folder:

**KEYCLOAK\_ADMIN\_PASSWORD** → Will be needed to manage the users

**SECRET\_KEY** → must have a very high entropy (but never typed)

# Setup configuration

- Edit `docker-compose.yml`:

```
13 orthanc:
14 image: osimis/orthanc:23.8.2
15 restart: unless-stopped
16 environment:
17   ORTHANC_NAME: "Orthanc CON 2023"
18   ORTHANC_AUTHENTICATION_ENABLED: "false"
19   ORTHANC_AUTHORIZATION_WEB_SERVICE_ROOT_URL: "http://orthanc-auth-service:8000/"
20   ORTHANC_AUTHORIZATION_WEB_SERVICE_USER_NAME: "share-user"
21   ORTHANC_AUTHORIZATION_STANDARD_CONFIGURATIONS: '["stone-webviewer", "orthanc-explorer-2"]'
22   ORTHANC_AUTHORIZATION_CHECKED_LEVEL: "studies"
23   STONE_WEB_VIEWER_PLUGIN_ENABLED: "true"
24   ORTHANC_DICOM_WEB_PUBLIC_ROOT: "/orthanc/dicom-web/"
25   ORTHANC_POSTGRESQL_ENABLE_INDEX: "true"
26   ORTHANC_POSTGRESQL_HOST: "orthanc-db"
27   ORTHANC_POSTGRESQL_INDEX_CONNECTIONS_COUNT: 10
28   ORTHANC_ORTHANC_EXPLORER_2_UI_OPTIONS_STUDY_LIST_SEARCH_MODE: "search-button"
29   ORTHANC_ORTHANC_EXPLORER_2_UI_OPTIONS_ENABLE_SHARES: "true"
30   ORTHANC_ORTHANC_EXPLORER_2_TOKENS_INSTANT_LINKS_VALIDITY: 3600
31   ORTHANC_ORTHANC_EXPLORER_2_TOKENS_SHARE_TYPE: "stone-viewer-publication"
32   ORTHANC_ORTHANC_EXPLORER_2_IS_DEFAULT_ORTHANC_UI: "true"
33   ORTHANC_ORTHANC_EXPLORER_2_KEYCLOAK_ENABLE: "true"
34   ORTHANC_ORTHANC_EXPLORER_2_KEYCLOAK_URL: "https://orthanc-con-2023.orthanc.team/keycloak/"
35   ORTHANC_ORTHANC_EXPLORER_2_KEYCLOAK_REALM: "orthanc"
36   ORTHANC_ORTHANC_EXPLORER_2_KEYCLOAK_CLIENT_ID: "orthanc"
37 volumes:
38   - /data:/var/lib/orthanc/db
39
40 orthanc-auth-service:
41 image: orthancteam/orthanc-auth-service:23.6.1
42 depends_on: [keycloak]
43 restart: unless-stopped
44 environment:
45   ENABLE_KEYCLOAK: "true"
46   PUBLIC_ORTHANC_ROOT: "https://orthanc-con-2023.orthanc.team/orthanc/"
47   PUBLIC_LANDING_ROOT: "https://orthanc-con-2023.orthanc.team/orthanc/ui/app/token-landing.html"
48   PERMISSIONS_FILE_PATH: "/orthanc_auth_service/permissions.json"
49 secrets:
50   - SECRET_KEY
51 volumes:
52   - ./permissions.json:/orthanc_auth_service/permissions.json
53
54 keycloak:
55 image: orthancteam/orthanc-keycloak:23.6.1
56 depends_on: [keycloak-db]
57 restart: unless-stopped
58 environment:
59   KEYCLOAK_ADMIN: "admin"
60   KC_DB: "postgres"
61   KC_DB_URL: "jdbc:postgresql://keycloak-db:5432/keycloak"
62   KC_DB_USERNAME: "keycloak"
63   KC_DB_PASSWORD: "keycloak"
64   KC_HOSTNAME_URL: "https://orthanc-con-2023.orthanc.team/keycloak"
65   KC_HOSTNAME_ADMIN_URL: "https://orthanc-con-2023.orthanc.team/keycloak"
66 env_file:
67   - ./secrets/KEYCLOAK_ADMIN_PASSWORD.env
68
```



# Run and test

- Run `docker compose up -d`
- Wait until all the containers are started:

```
[+] Running 0/0
[+] Running 9/9anc-con-2023_default Creating
  ✓ Network orthanc-con-2023_default          Created
  ✓ Volume "orthanc-con-2023_keycloak-db"     Created
  ✓ Volume "orthanc-con-2023_orthanc-db"      Created
  ✓ Container orthanc-con-2023-keycloak-db-1  Started
  ✓ Container orthanc-con-2023-orthanc-1      Started
  ✓ Container orthanc-con-2023-orthanc-db-1   Started
  ✓ Container orthanc-con-2023-keycloak-1     Started
  ✓ Container orthanc-con-2023-orthanc-auth-service-1 Started
  ✓ Container orthanc-con-2023-nginx-1       Started
```

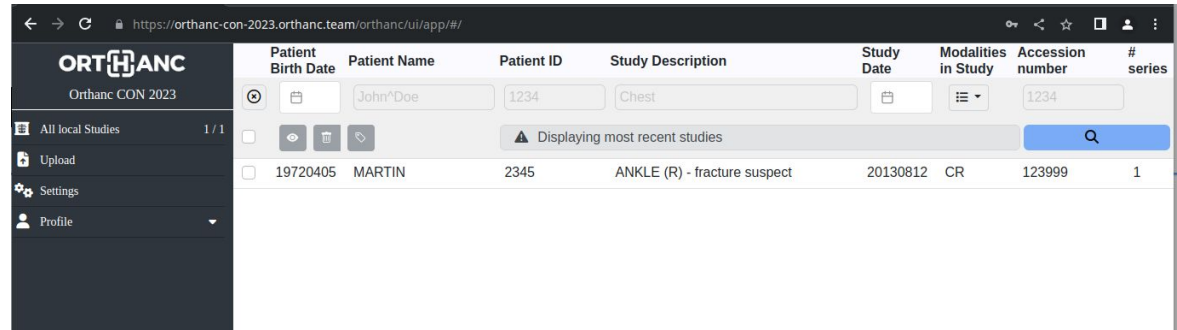
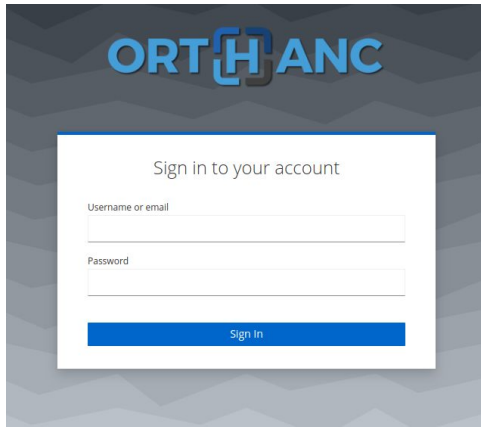


Even if Keycloak container is started, Keycloak itself could take some time to load... be patient!

# Run and test

- Try: <https://orthanc-con-2023.orthanc.team/>

orthanc change-me

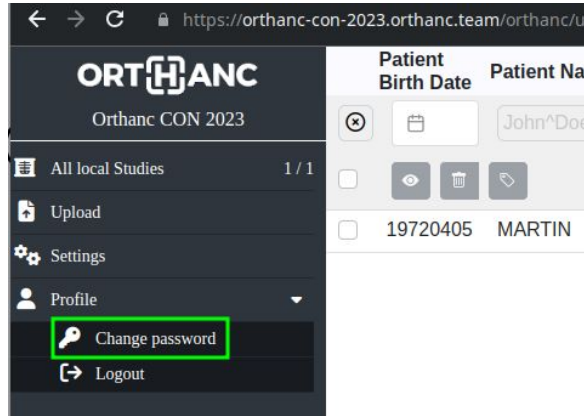


The image shows a screenshot of the Orthanc web interface. The browser address bar displays 'https://orthanc-con-2023.orthanc.team/orthanc/ui/app/#/'. The interface includes a dark sidebar with the 'ORT H ANC' logo and 'Orthanc CON 2023' text, and a main content area with a table of studies.

Patient Birth Date	Patient Name	Patient ID	Study Description	Study Date	Modalities in Study	Accession number	# series
	John*Doe	1234	Chest			1234	
⚠ Displaying most recent studies							
19720405	MARTIN	2345	ANKLE (R) - fracture suspect	20130812	CR	123999	1

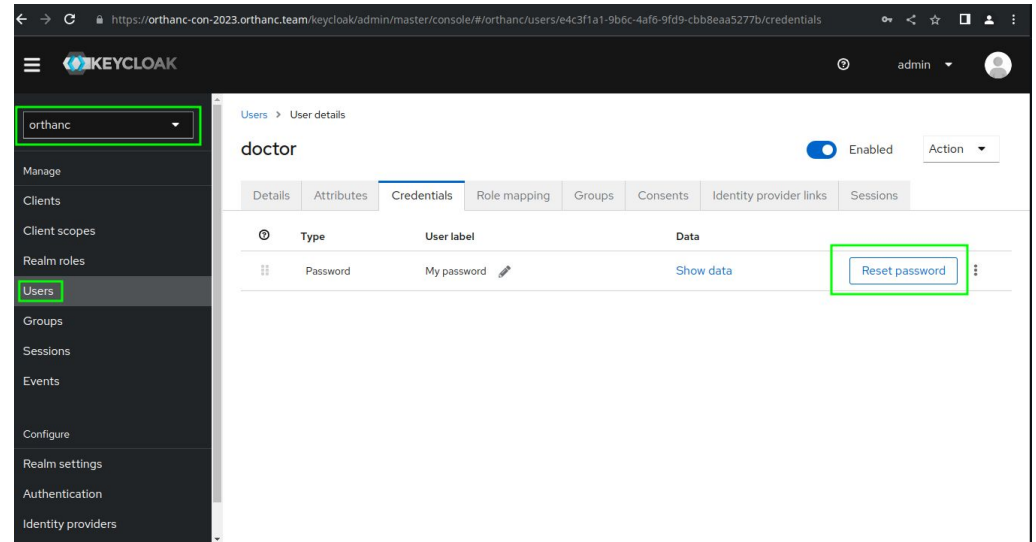
# Most important step: change the passwords

From Orthanc itself:



Via Keycloak:

- <https://orthanc-con-2023.orthanc.team/keycloak/>
- Administration Console



# Labels (admin)

The screenshot shows the Orthanc Explorer 2 admin interface. The left sidebar contains navigation options: 'All local Studies' (4 / 4), 'GNU-Health', 'Hannover', 'external', 'Upload', 'Settings', and 'admin' (highlighted). The main content area displays a table of studies with columns: Patient Birth Date, Patient Name, Patient ID, Study Description, Study Date, Modalities in Study, Accession number, and # series. The selected study (19540101) for John Doe (Patient ID: abcd) is shown in detail. A 'Labels' section is highlighted with a green box, containing a text input field with the placeholder 'Labels to add, press Enter to create a new one'. Below this, a metadata panel shows fields for Study Date, Study Time, Study Description, Accession number, Study ID, Study Instance..., Requesting Physic..., Referring Physicia..., and Institution Name. A right-side panel for the patient (abcd) shows icons for view, download, delete, share, edit, and refresh, which are also highlighted with a green box. At the bottom, a table lists series information:

Series number	Series Description	Modality	# Instances
16		CT	19

# Labels - Permissions

```
{} permissions.json > ...
1  {
2    "roles" : {
3      "admin-role": {
4        "permissions": ["all"],
5        "authorized_labels": ["*"]
6      },
7      "doctor-role": {
8        "permissions": ["view", "download", "share", "send"],
9        "authorized_labels": ["*"]
10     },
11     "external-role": {
12       "permissions": ["view", "download"],
13       "authorized_labels": ["external"]
14     }
15   }
16 }
```

# Labels (external)

The screenshot displays the Orthanc Explorer 2 web interface. The top navigation bar includes the Orthanc logo and 'Orthanc CON 2023'. The left sidebar shows a tree view with 'external' selected. The main content area features a table of studies and a detailed view for the selected study.

Patient Birth Date	Patient Name	Patient ID	Study Description	Study Date	Modalities in Study	Accession number	# series
19720405	MARTIN	2345	ANKLE (R) - fracture suspect	20130812	CR	123999	1

Labels: external

Study Date: 20130812  
Study Time: 104251  
Study Description: ANKLE (R) - fracture suspect  
Accession number: 123999  
Study ID: 010101  
Study Instance: 1.2.276.0.7230010.3.1.2.2344313775.14992.1458...  
Requesting Physician: THE^OTHER^DOCTOR  
Referring Physician:  
Institution Name: The Hospital

Patient ID: 2345  
Patient Name: MARTIN  
Patient Birth Date: 19720405  
Patient sex: M

This patient has no other studies.

Series number	Series Description	Modality	# Instances
1002	CHEVILLE droite	CR	1

# Shares

The screenshot displays the Orthanc Explorer 2 interface. A modal dialog titled "Share study abcd | | TAP" is open, showing the following details:

- Expires in: 7 days
- Link: <https://orthanc-con-2023.orthanc.tea>

The background interface shows a table of study series and a patient details section for John Doe.

Patient Birth Date	Patient Name	Patient ID	Study Description	Study Date	Modalities in Study	Accession number	# series
	John Doe					1234	
	TOTO			20230118	OT		1
	33Yr_female_fract			20160203	CR		1
19540101	John Doe				CT		1

Labels for Patient ID: abcd, Patient Name: John Doe, Patient Birth Date: 19540101, Patient sex: M.

This patient has no other studies.

Series number	Series Description	Modality	# Instances
16		CT	19

19720405 MARTIN 2345 ANKLE (R) - fracture suspect 20130812 CR 123999 1

# Shares

[https://orthanc-con-2023.orthanc.team/orthanc/ui/app/token-landing.html?token=eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJpZCI6bnVsbCwicmVzb3VyY2VzIjpibeyJkaWNvbV91aWQiOiJlLjluMjc2LjAuNzIzMDAxMC4zLjEuMi4yODMxMTU3NjE1LjEuMTY1NjgzMzQyMC42Nzc4MDkiLCJvcnRoYW5jX2IkljoiNjk1MjBjZWltZWJjZDdjYTMtZTU4ZDIjMmItMDBjMzM4YWYtMWMwMjA4YjAiLCJ1cmwiOiJm51bGwslmxldmVsljoic3R1ZHkifV0sInR5cGUiOiJzdG9uZS12aWV3ZXItcHVibGljYXRpb24iLCJleHBpcmF0aW9uX2RhdGUiOiJyMDIzLTA2VDA5OjUxOjI1LjgyNjc3NSswMDowMCIsInZhbGlkaXR5X2R1cmF0aW9uIjo2MDQ4MDB9.1ygn9YWD2Yv7BQi8BRLG2b2Nm\\_7Dy6opNqODxdGil](https://orthanc-con-2023.orthanc.team/orthanc/ui/app/token-landing.html?token=eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJpZCI6bnVsbCwicmVzb3VyY2VzIjpibeyJkaWNvbV91aWQiOiJlLjluMjc2LjAuNzIzMDAxMC4zLjEuMi4yODMxMTU3NjE1LjEuMTY1NjgzMzQyMC42Nzc4MDkiLCJvcnRoYW5jX2IkljoiNjk1MjBjZWltZWJjZDdjYTMtZTU4ZDIjMmItMDBjMzM4YWYtMWMwMjA4YjAiLCJ1cmwiOiJm51bGwslmxldmVsljoic3R1ZHkifV0sInR5cGUiOiJzdG9uZS12aWV3ZXItcHVibGljYXRpb24iLCJleHBpcmF0aW9uX2RhdGUiOiJyMDIzLTA2VDA5OjUxOjI1LjgyNjc3NSswMDowMCIsInZhbGlkaXR5X2R1cmF0aW9uIjo2MDQ4MDB9.1ygn9YWD2Yv7BQi8BRLG2b2Nm_7Dy6opNqODxdGil)



# Shares



# Questions ?

Using Orthanc as part of your commercial activity ?

Why not support us on



<https://opencollective.com/orthanc>