Luxriot Vero Face Recognition Administration Guide

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1   Introduction

General

Luxriot Vero Face Recognition (further referred to as FR) is a biometric face recognition application designed to work with Luxriot EVO video management platform. Leading-edge technology assures optimal system performance and reliability with real time face detection, concurrent multiple face recognition and instant face matching in 1-to-1 and 1-to-many modes.

Key features:

- Efficient and accurate face recognition engine with low error rate
- Face liveness detection preventing cheating with a photo in front of camera
- Estimation of face attributes: age, gender, sentiment
- Simultaneous multiple video stream processing
- Processing of multiple faces in the frame
- No imposed limitation on the number of processed video channels
- User friendly interface for easy setup, monitoring and data retrieval
- Simple installation with a built-in database
- Seamless integration with Luxriot EVO giving access to all its tools
- Variety of supported IP cameras, encoders and analog CCTV devices

Luxriot Vero Face Recognition is perfectly suited for HR control systems as well as for security and enforcement applications.

This document will guide you through the process of product installation, configuration and usage, as well as provide basic troubleshooting procedures.

Architecture

Luxriot Vero Face Recognition operates based on video streams provided by one or multiple Luxriot EVO servers. It does not work directly with streams from IP cameras. Each recognition event is then sent back to Luxriot EVO, allowing you to react to these events and search the result history.

- The recognition results are stored on the FR server: result database + frame archive.
- Notifications about live recognition events are sent to Luxriot EVO Console for E&A rules, and also to Luxriot EVO Monitor for live popup in the FR channel notification area.
- Luxriot EVO Monitor allows searching recognition history based on time, subject's name and/or image.

For Luxriot EVO Global, FR can work either with the whole system at once (connected to the central server), or with any of the Luxriot EVO Recording Server machines directly.

Licensing

Luxriot Vero Face Recognition license defines the maximum number of subjects in the matching database.

Features	Figures
Number of faces in the subjects' database	from 100 to 10 000 000, or unlimited**
Number of connected servers and channels*	Not limited
Number of connected channels*	Not limited

*Server hardware must comply with recommendations
**Only limited by database size

2   Prerequisites

FR relies on the Luxriot EVO server and does not operate independently. All video streams are provided by your Luxriot EVO servers. Recognition results are sent back to Luxriot EVO alongside with recognition scores and related metadata.

Supported Luxriot EVO editions are Luxriot EVO S and Luxriot EVO Global.

You can install Luxriot Vero Face Recognition on a dedicated PC, or on the same machine that is running your Luxriot EVO server. The latter is only recommended if Luxriot EVO server is only recording a few channels, and the load produced by it is insignificant. For instance, this is possible on Luxriot EVO Recording Server machines, which record 1-4 video channels without motion detection or video analytics. Such architecture will save the network load and time required to send the video streams.

Supported OS

Microsoft Windows 64-bit versions only, **no** 32-bit (x86) version support.

Supported editions: Windows 8.1, Windows 10, Windows Server 2012 R2, Windows Server 2016, Windows Server 2019.

FR requires that **.NET 4.5 and 4.7** frameworks is installed on the server. Please also ensure that the target OS has all the latest **updates.**

> ⚠ There is **no support** for 32-bit OS versions.

System Hardware Requirements

We **strongly recommend** using Intel CPUs with **AVX/AVX2** support (produced after 2011). Also, single CPU machines are preferable (utilized more efficiently) at the moment.

> ⚠ For CPUs without AVX/AVX2 support, an addition to the installation package with extra files is provided (improving CPU performance). However, we do not guarantee [good] operation on such CPUs and strongly recommend using newer ones.

The following recommended hardware specifications refer solely to the FR software; other modules like Luxriot EVO and OS load are NOT included into this estimation.

Minimum hardware requirements per channel: 2 physical cores 2.4GHz, 2GB RAM, per ~1080@20FPS channel with average people flow.

Specifications	Hardware for 1 channel
Connected video streams	1
CPU*	2 CPU cores 2.4GHz+
RAM	2GB
Storage	~1GB** per 1000 recognition results

*Single CPU systems are recommended
**Calculated for a FullHD stream. Exact size depends on actual video stream resolution.

> 💡 Note that Luxriot Face Recognition license is bound to the server hardware set.
>
> ONLY activate FR on the ultimate hardware set, and **do not remove the hardware components after activation.** This includes HDDs, NICs, graphics cards etc.

Recommendations

Face recognition result precision greatly depends on the quality of input image quality; therefore, sufficient attention should be paid to the camera installation and preliminary work with FR configuration. Please consider the recommendations below and use them as a checklist when deploying your FR system.

Utmost attention is required at the subjects' enrolment stage. The input image is converted into a set of facial features, forming a template, which is saved into the database and used for identification and verification of people. Therefore, it is crucial to provide the highest possible **quality of the enrolment images**:

- Use clear, sharp images with distinct facial lines with no blurring effect and normal to high contrast range
- Use near-frontal, full face view with minimum rotation (less than 15°) in any direction
- Do not upload images with side face views
- Make sure the face image does not have any distortions or artefacts
- Neutral face expression during enrolment is recommended: avoid frowned faces, closed eyes or eyes looking away from camera, raised eyebrows, broad smiles
- For people wearing glasses, select a picture that corresponds to their most regular style, or the one without glasses
- Keep in mind that glasses with thick, heavy frames and sunglasses decrease recognition accuracy
- Same recommendations are applicable to people who are likely to have changes in appearance because of facial hair like beards and moustache, or due to seasonal variations – hats, makeup etc.
- Person should occupy 50 to 100% of the screen height
- Minimum distance of 40 pixels between eyes is recommended, and 50 is advisable in order to obtain better recognition rate (note that this distance should be native and not obtained by stretching the image)
- Minimum stream resolution is VGA (640x480 pixels), and you need to make sure that it is also native resolution, not a scaled-up low quality image
- Avoid scenes where extraneous objects can distort the face, e.g. glass, rain , mirrors

During recognition, if **light conditions** of the scene can be controlled:

- Direct frontal light or diffused lighting is recommended in order to have minimum shadowing within the face region, so that light is evenly distributed on each side of the face (both left to right and top to bottom) and face does not coalesce with background
- Make sure that amount of light does not depend on the hour and other environmental factors
- Avoid additional illumination that can appear unpredictably, sunlight and flares in the first place
- Use such light sources and position them so that will not produce bright shiny reflections and glares on glasses and skin

Camera choice:

- Use cameras of similar quality (or the same camera) for both enrolment and identification images
- If camera is set up to mirror the image, make sure that faces have the same orientation across all images because facial features' template is different for the mirrored and non-mirrored pictures of the same person
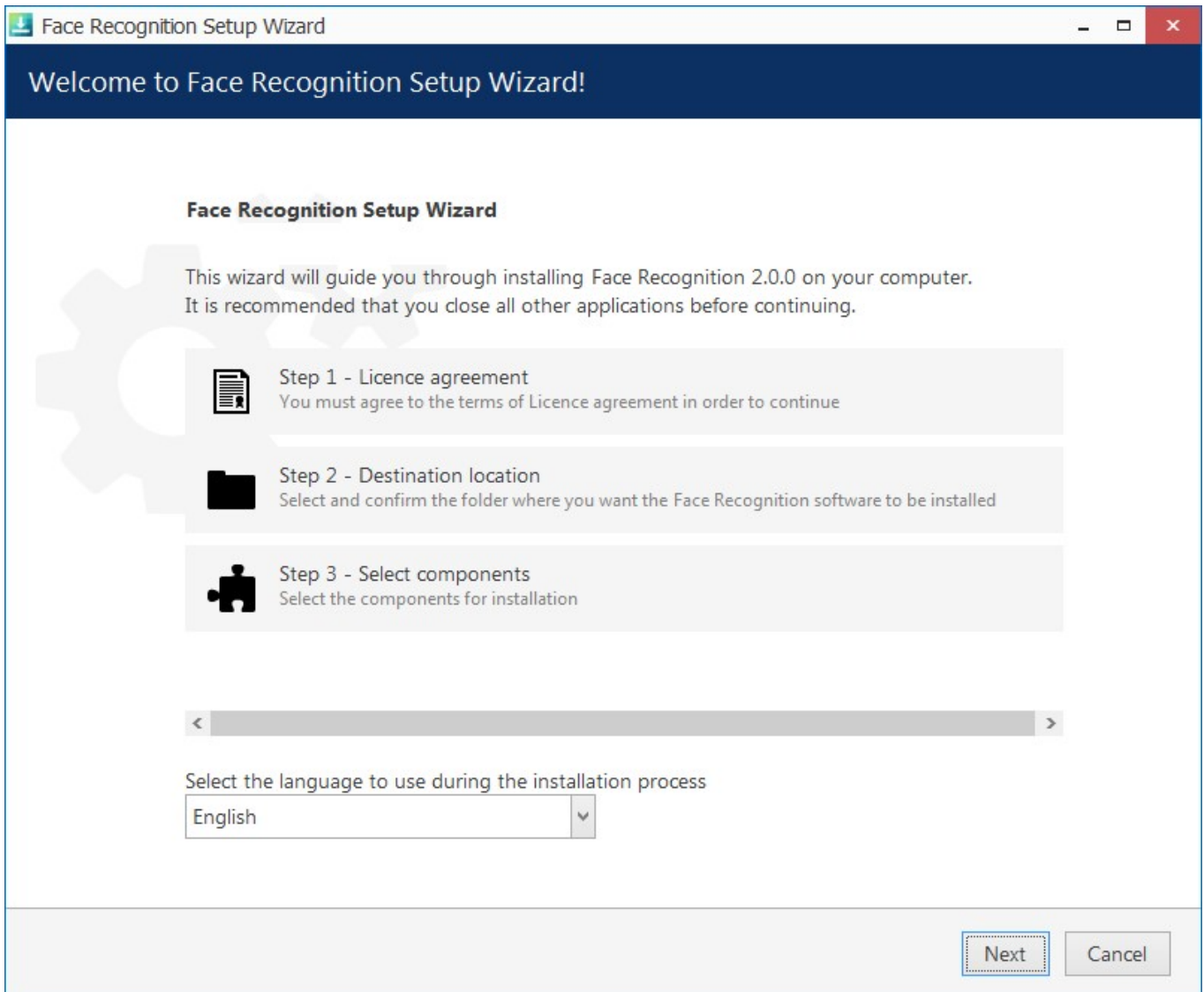
When **deploying** the system:

- Train operators to check if the person is facing camera the right way

3   Getting Started

Product Installation

Run Luxriot Vero Face Recognition installation package and go through the steps to set it up on your system. You will be offered to choose the installation language and the target directory.

Run the Face Recognition installation wizard

When the installation is complete, you will see a summary page: if everything has gone smoothly, the steps in the summary will be marked green. If something goes wrong during the installation:

- make sure the host OS meets the [system requirements](#)
- ensure you have the latest FR release version

Click *Finish* to close the wizard.

As a result, Luxriot Vero Face Recognition will appear in the list of Windows services. Immediately after the setup is complete, the FR service will be started automatically and you will be able to run FR as described below.

First Run

Start the FR service shell by launching the *Face Recognition Service Tray Tool* **shortcut** from your Desktop. FR icon will then appear in your system tray, allowing you to **start and stop** the service simply by right-clicking the

tray icon and choosing the corresponding option.

The Face Recognition server itself has no graphics user interface, running silently as a Windows service, but has a Web based management console, easy to access and to use.
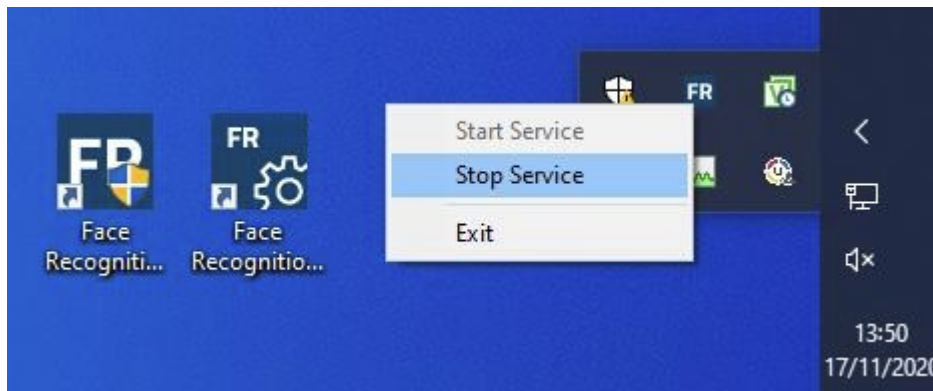
FR shortcuts and tray tool

Having installed and launched the FR service, you can access its control UI either by clicking the *Face Recognition Service Configuration* icon or your Desktop, or by typing in the address manually in the Web browser using the following **default parameters**:

> *Address*: localhost or local IP address
> *Port*: 8085
> *Username*: **admin**
> *Password*: **admin**

You will be able to change these settings later via Service Settings.

For the parameters above, the FR Web UI access link will look like *http://localhost:8085*.

License Activation

When you open the FR Web management console for the first time, you will be asked to activate your license key in order to proceed.
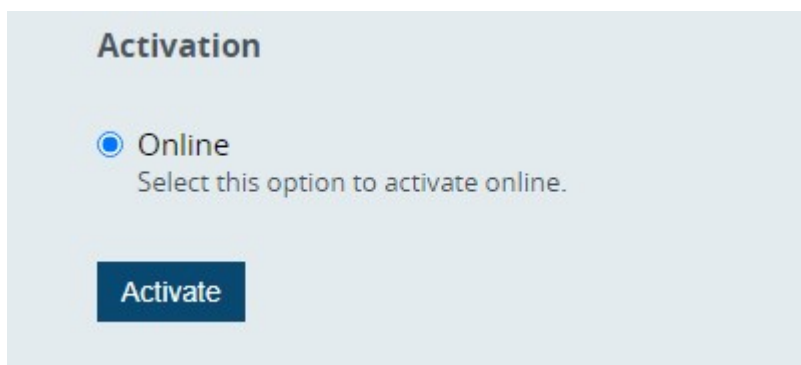
FR license activation options

When navigated away from the Web Management console main page, you will still see your license information and a link to the license manager in bottom left corner of the page.

The following options are available:

> *Online activation*: Internet access is required at the activation stage, but will not be necessary for further FR operation.

> 💡 Note that Luxriot Vero Face Recognition license is bound to the server **hardware** set.
>
> ONLY activate FR on the ultimate hardware set, and **do not remove the hardware components after activation.** This includes HDDs, NICs, graphics cards etc.

Simply enter your FR license key and click *Activate*: the form will automatically connect to the activation server and

get back to you with a confirmation and license info. FR license limits the number of faces in the subjects' database, so you will see the maximum number of subjects in the summary.

License summary

Offline activation is not available at this point.

Trial License

If you wish to obtain an demo license for preliminary testing, kindly contact our support engineers at support@luxriot.com.

Interface Overview

The FR service homepage offers quick access links to the **service settings** and subjects' **database** management, as well as the license activation status. If your FR service is already configured, you can go directly to the subjects' database for editing. For FR setup, go to *Service settings*.

From any page in FR interface, click the FR name in the upper left corner to return to the homepage.
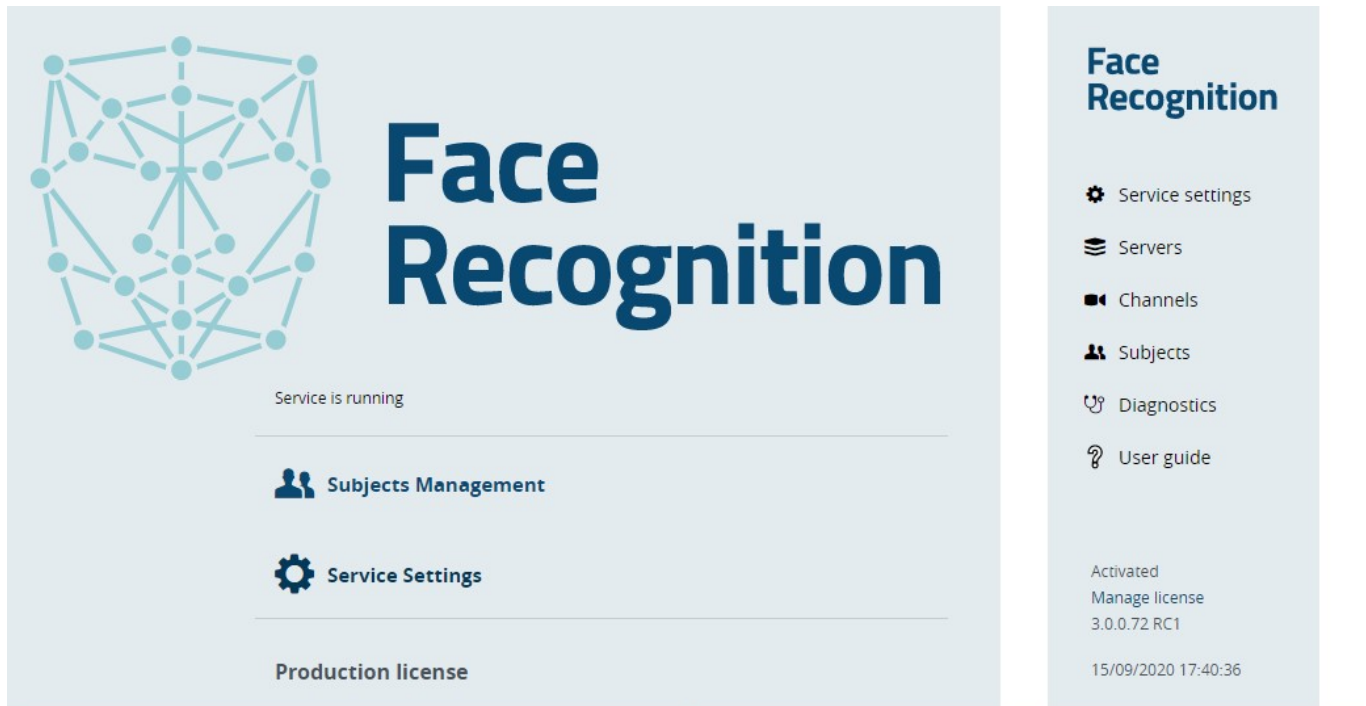
FR main menu

The *Service settings* section has several subsections:

- **Service settings**: FR interface and service parameters
- **Servers**: connected Luxriot EVO servers
- **Channels**: video channels from connected %%product% servers
- **Subjects**: subject's database management
- **Diagnostics**: FR service log
- **User guide**: FR documentation in PDF format

In the bottom left corner, you will have the license summary and a link to the license management.

4 Configuration

Setup in Brief

Briefly, the procedure of FR deployment always consists of the following steps:

1. Install and configure Luxriot EVO server so that it has channel(s) for FR (in this document, we assume this has been already done)
2. Install FR and activate your license (see previous topics for a detailed description)
3. Configure FR service (see below): local storage, engine parameters, events
4. Add Luxriot EVO server into FR configuration (see below)
5. Add recognition channels and set recognition parameters (see below)
6. In Luxriot EVO, add FR to an external service group to subscribe to the recognition results (see below)

These steps are to be used when adding a new FR server. If you already have FR running with one Luxriot EVO server, and want to add channels from another Luxriot EVO server, simply omit steps 1-3.

The next sections of this document describe the corresponding FR settings in the relevant order.

Service Management

Service homepage offers quick access links to the **service settings** and subjects' **database** management. Subjects are also accessible from within *Service Settings*; once you are done with the server/camera setup, you do not have to browse the settings but rather use the quick access link to open the subjects' gallery.
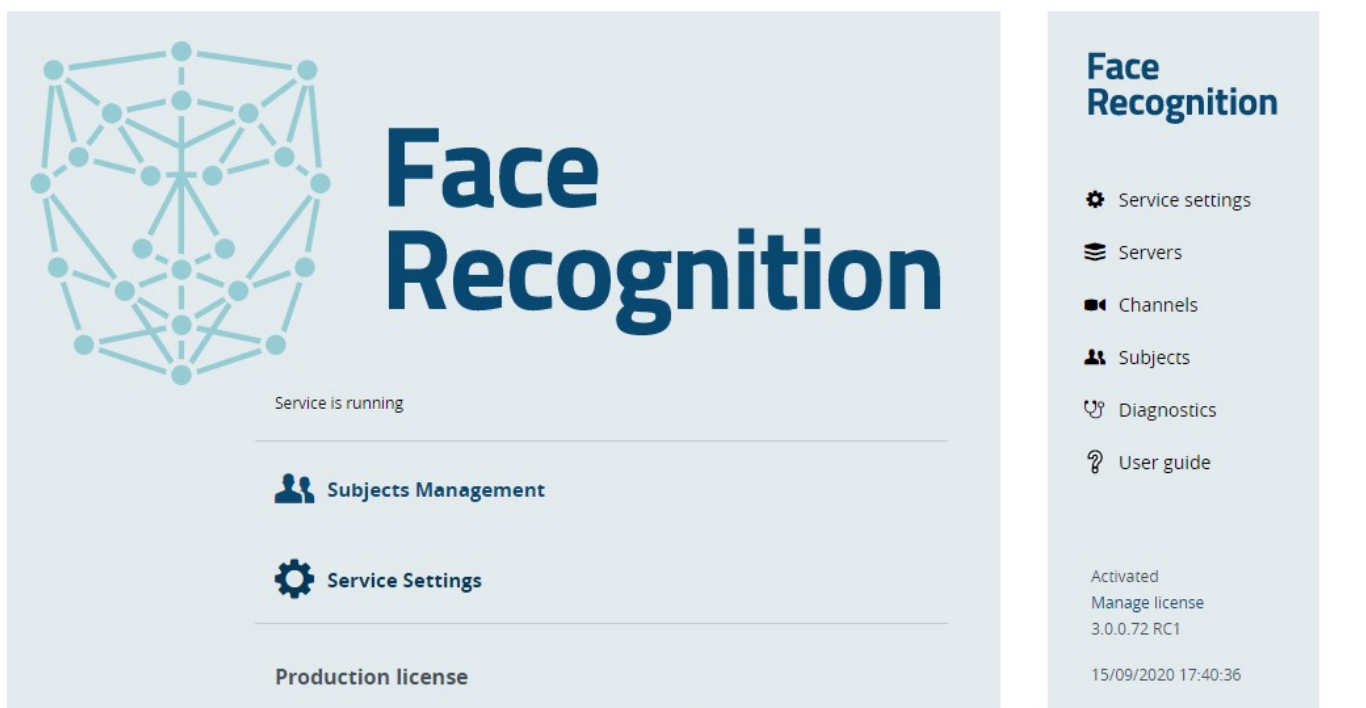
FR main menu

Service homepage summary also shows brief information about the registered license and offers an opportunity to upgrade the license (if applicable).

Service Settings

You can change **connection** settings and **administrative** details here. Initial parameter values are listed below. Note that these values will also be used if server configuration is corrupt or has been deleted.

Most of these may be left as default; however, we recommend that you review the **frame archive** quota, change the **password**, and also choose what **events** you wish to receive back in Luxriot EVO Monitor.

FR service settings

- **HTTP Interface Settings**: FR connection settings and user account
  - *HTTP username and password**: user account to access FR settings, default: **admin/admin**
  - *HTTP port***: port to be used to access FR configuration from local and remote stations (for remote connections, open this port on your firewall)
  - *Language*: FR interface language
- **Frame Archive Settings**: FR storage configuration for keeping the snapshots of recognized people
  - *Frame Archive Location*: path to local directory, default: *C:\Face Recognition*
  - *Frame Archive Quota***: maximum total allowed size of the data on the target disk
- **Engine Settings**: system-wide face detection&recognition engine parameters
  - **FaceDet1** (secondary: only switch to this engine if FaceDet3 is not working properly)
    - *Scale factor*: downscale all frames with this factor, [0.0-1.0]
    - *Min size*: minimum face size in pixels, smaller faces will be ignored
  - **FaceDet3** (default, **recommended**)
    - *Image size*: downscale all frames to this size in pixels (0 = original, without downscaling). Recommended value: 800.
- **Live Event Fields**: event properties that will be sent back to Luxriot EVO with recognition results
  - *Subject similarity*: similarity score of the matching result when comparing the detected face to the subjects' database
  - *Picture*: extracted face

- *Subject*: recognized person's match in the subjects' database
- *Face Quality (Ags)*: estimated quality of the input image
- *Score*: estimated face quality score
- *Roll, Pitch, Yaw*: detected face angles
- *TrackID*: internal face tracking parameter
- *Tag*: subject's tag from the database, if applicable
- *LatencyMs*: difference between detection frame time and current Luxriot EVO Monitor time (large latency indicates slow FR work)
- *DetectMs*: amount of time required to detect the face
- *ExtractMs*: amount of time required to extract the face from the detected frame
- *MatchMs*: amount of time required to match the extracted face against the subjects' database
- *Age, gender, sentiment*: estimate of the corresponding face attributes (will be absent if impossible to estimate)
- **Search Fields**: fields provided for Luxriot EVO Monitor search based on image or other parameters
  - *Subject*: the best match for the input image in the known subjects' database
  - *Search similarity*: similarity score for the input search image when comparing it to known subjects
  - *Subject Similarity*: original similarity score of the search result (when the detected face was matched to the subjects' database)
  - *Tag*: subject's tag from the known subjects' database, if applicable
  - *Age, gender, sentiment:* estimate of the corresponding face attributes (will be absent if impossible to estimate)

*A single **user** profile is available, but you can pick any username and password you like, considering that it is allowed to use uppercase and lowercase Latin characters A-Z and a-z, and digits 0-9. No special characters are permitted.

**The port change will take effect after manual FR service restart. Until then, you will have access to the FR Web interface via old port. This has been done done intentionally: in this way, you do not lose remote access to the FR server if the new port is occupied, closed on the firewall etc. If you are sure the new port is OK, simply restart FR service and its Web will become accessible on the new port.

***The **storage limitation** is 90% of the total disk size by default. This means, a maximum total of 90% of disk is allowed to be full. If your disk is already 93% full even **without** FR archive, and you set quota to 90%, **no frames** will be saved. Storage quota mechanism does not know about any other quotas applied to the same disk: e.g., if Luxriot EVO is set to use the same storage location and it fills up the storage so that FR quota is exceeded, no frames will be recorded as well. For instance, if your disk is currently 20% full and you set quota to 50%, FR will use a maximum of 30% of disk space.

Server Setup

To start actually using the recognition engine, it is necessary to connect to a Luxriot EVO **server** that contains **channels** pre-configured for FR, and then add desired channels to FR. If you have not set up your Luxriot Luxriot EVO server yet, proceed with its setup and get back here when you are ready. Video management server configuration instructions can be found in the corresponding supporting documentation.

Choose a Luxriot EVO server to connect to and enter its connection details.

> 💡 Important notice for Luxriot EVO Global systems: prior to Luxriot EVO version 1.15.0, external services only operate via central management server.
>
> Starting with 1.15.0, you can link FR **directly to any recording server** (Luxriot EVO Recording Server instance). Note, however, that in that case FR will stop functioning in case the target Luxriot EVO Recording Server goes offline and is replaced with a failover node. When your external service is linked to Luxriot EVO Global, streaming will automatically switch from/to failover.

< Servers

Add Server

Server Settings

Server:

192.168.1.83

Port:

8080

User:

admin

Password:

[Add Server]

Add Luxriot EVO server into FR configuration

Server: Luxriot EVO server IP address or hostname.

If you are connecting to a Luxriot EVO Global system, use the address of the central management server if you wish to use FR globally, for the channels from different recording servers. Direct connections to Luxriot EVO Recording Server are also possible in case your FR instance will only work with one dedicated recording server. If you enter a direct Luxriot EVO Recording Server address, you will only see channels from that server; recognition events from FR will also only be sent to that server.

Port: Luxriot EVO server port for HTTP connections (default port for the Luxriot EVO streaming server is 8080). When connecting to a remote server, make sure this port is allowed on all intermediate routers and firewalls.

User and password: Luxriot EVO server user account to connect with. Depending on the connection type, user must have corresponding privileges (connect via HTTP and manage external services) and must be allowed to receive video from the FR channels. For a full description on the Luxriot EVO security setup, please refer to the corresponding user manual.

Luxriot EVO server in the connected server list in FR

You can add one or more Luxriot EVO servers to a single Luxriot Vero Face Recognition server.

To **edit or delete** an existing server, simply move your mouse over the server name and corresponding controls will appear on the right side.

Recognition Setup for Video Channels

Server setup only establishes a connection between FR and the Luxriot EVO server on the service level. In order to start recognizing people, you now need to choose **video streams** and define **recognition parameters** for each one. It is strongly advisable that you read and follow recommendations regarding camera positioning, which are available within this document.

FR channel list

Add Channel

To begin the **new channel** setup, click the *Add Camera* button below the channel list. To **edit** any of the existing channel's settings, as well as **disable/enable** face recognition for specific device, simply click *Edit* for the desired channel – this is similar to editing server settings. These options, along with the *Recycle bin* to **delete** channels from FR permanently, are displayed when you hover the mouse over the target channel.

Select a server from the list of your connected servers and then select one of the available channels. Note that the

channels must be enabled in Luxriot EVO Console and the server must be connected to FR (server status must be *Connected*).

Add new FR channel for recognition

By default, **recognition is enabled** for each new channel being added, so that face detection engine can start working at once right after you connect the channel to FR. However, you can deselect this option if you wish to start recognition manually later.

The settings below affect the process of face recognition, that is, the identification of human faces based on the set of specific features.

The recognition engine is based on neural networks, and it relies on the input **face size**, **angles**, and desired accuracy settings. For one and the same video stream (i.e., same resolution, FPS, and people flow) the recognition and matching results may differ depending on these parameters. Also, these settings affect how much server resources are required, so it is important to understand what face sizes the system will be working with on each particular channel, and limit the parameters so that the CPU and memory resources are spent wisely.

> 💡 Some of the settings have both a **slider** and an **input window**. You can use either but you cannot enter a value that is out of the slider's range. Incorrect values are highlighted **red**: note the correct ranges for each setting below.

Face Detection Settings

Detection settings affect the face detection phase, i.e., when the video stream is analysed to find and extract faces from the video frames. By modifying these, you can make FR extract more faces from the people flow ("face harvesting", wide face size and angle range), or, on the contrary, only make it detect faces that meet certain requirements ("access control" use case, where people should walk closer to the camera).

- **Face tracking sensitivity**: engine sensitivity to smaller faces. The higher the value, the smaller faces will be detected, increasing server load. Lower value means only larger faces will be detected, with less server resources spent. Range: 0.05-1.0
- **Face size threshold**: minimum pixels between eyes for the face to be detected. All smaller faces will be ignored. Minimum value is 40 pixels.

> ⚠️ The **face size** parameter is calculated for the video frames when they are fed to the detection engine. Therefore, if the engine settings (see *Service Settings* above) include image **downscaling**, take it into account when estimating the face size. (See examples below)
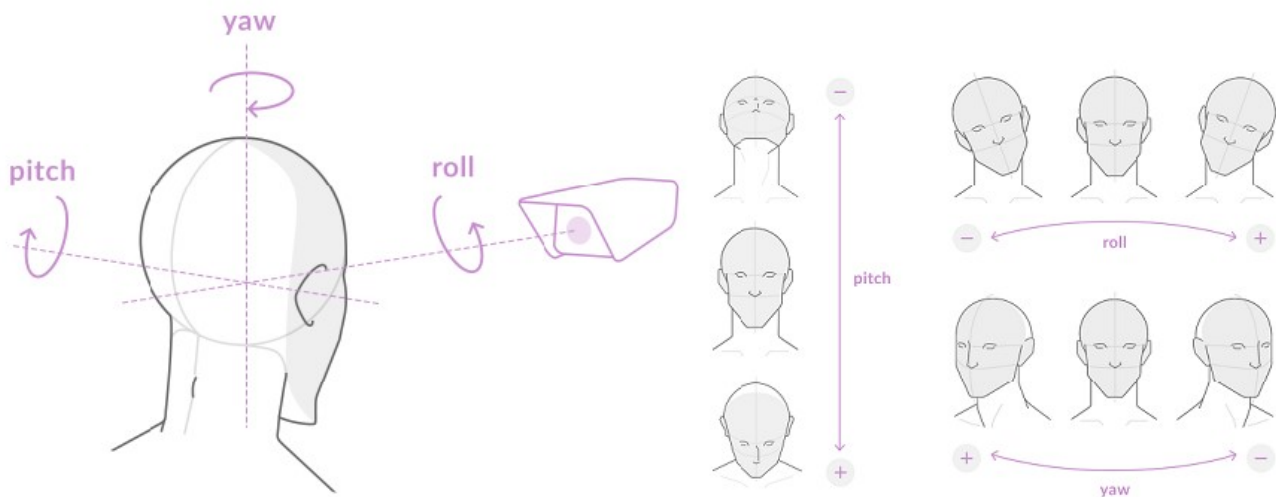
Face detection settings

The best way to measure the **face size** is to save several snapshots from the target channel in Luxriot EVO Monitor, open them for editing in MS Paint or other graphics editor, and measure the distance in pixels between the eyes. It is best to use frontal face shots for this purpose. If engine parameters include image downscaling, first resize your snapshot so that its longer side is equal to the engine *Image Size* parameter.

Examples for a 1080p stream with a 120px face:

1) Engine type is set to *FaceDetV3* and *Face Engine V3 image size* is set to 0. Face size is then equal to 120px, as no scaling is taking place.

2) Engine type is set to *FaceDetV3* and *Face Engine V3 image size* is set to 800 (px). Face size is then proportionally equal to ~89px.

3) Engine type is set to *FaceDetV1* and *Face Engine V1 scale factor* is set to 0.7, resulting in image size = 756 px. Face size is then proportionally equal to 84px.

- **Face quality threshold**: internal engine estimate of the extracted face quality (i.e., how "good" the face is) based on angles etc. All faces having lower quality will be ignored. For face harvesting, lower quality is acceptable; for access control, use higher quality threshold.
- Face deviation from frontal view:
    - **Roll**: maximum accepted +/- roll angle of a face (head movement when touching shoulder with ear, see picture). Range: 1-90 degrees
    - **Pitch**: maximum accepted +/- pitch angle of a face (head movement with nose up-down, look down vs look up, see picture). Range: 1-90 degrees
    - **Yaw**: maximum accepted +/- yaw angle of a face (head movement with nose left-right, head from the side, see picture). Range: 1-90 degrees

The default angle threshold for each axis is 33.3 degrees. For thresholds above 45 degrees, the recognition error rate may increase, so we do not recommend setting these parameters above 45 degrees if you want to achieve certain detection accuracy.

Head orientation in the 3D space

Face Matching Settings

Settings in this subsection instruct the engine what to do with the detected faces.

- **Matching similarity**: this parameter should be set according to the desired false acceptance rate. The higher probability of false rejection is required, the higher threshold should be set: increase similarity level for access control like scenarios. Range: 50-99.
- Turn ON **storing results for unknown persons** if you want to save every single recognized face. With this setting OFF, only persons matching one of your subjects will be available in the search, and other recognition results will be ignored. If you know that no unknown persons should be there – e.g., when FR is used as an additional security check for access control – it may be advisable to disable this option in order to eliminate cases when a subject present in the database is detected as unknown because of unusual facial expression or rapid head movement.

Settings for face matching

By default, all known faces (i.e., having a match in your database) are saved to the frame archive when the recognition policy is set to *Everyone*. If you choose to store recognitions of unknown faces, all recognition results will be saved to the frame archive, and will be therefore available for search.

- **Recognition policy**: choose what results will be saved and sent to Luxriot EVO as events (all other results will be ignored!)
  - *Everyone*: any recognized face will trigger event
  - *Known only*: only faces having a database match will trigger events (unknown faces will be disregarded)
  - *Unknown only*: only faces without database match will trigger events (known faces will be disregarded)

So, five combinations are possible for the recognition policy (events) + storage:

> 1) Recognition policy: everyone + DO store results for unknowns: events for all faces, search for all faces
>
> 2) Recognition policy: everyone + do NOT store results for unknowns: events for all faces, search for known faces
>
> 3) Recognition policy: known + NO option to store results for unknowns: events for known faces, search for known faces (unknown results are ignored). In this case, storing results for the unknowns makes no sense, as all unknown faces will be ignored, and there will be no such results.
>
> 4) Recognition policy: unknown + DO store results for unknowns: events for unknown faces, search for unknown faces
>
> 5) Recognition policy: unknown + do NOT store results for unknowns: events for unknown faces, search empty

Advanced Matching Settings

These settings allow a more delicate adjustment of the matching process. We recommend to keep these default, and only change them last, if other settings do not provide good recognition results.

- **Tracking timeout**: the amount of time (in ms) for the FR engine to collect face detection data before initiating the matching process. Default value: 1000 milliseconds, range: 500-10000. Higher values may delay matching, and are not recommended for intense people flow. Lower values may affect matching accuracy.
- **Recognition attempts**: max number of times the engine will try matching different detection results of the same face. Default: 3, range: 3-15. Higher values may be required for poor video quality and/or more angled faces.

Estimators

Estimators are additional face properties, which FR is able to detect. Currently, there are two groups available (disabled by default), and you can turn ON the estimation by marking the options:

- Enable **attributes** estimation: turn ON estimation of the person's **age** and **gender** (male/female)
- Enable **sentiment** estimation: turn ON estimation of the person's **emotion** (anger, disgust, fear, happiness, surprise, sadness, neutral)

Please keep in mind that these attributes are approximate (that is why they are called estimators) and not 100% accurate. Better image quality and subject cooperation lead to better results.

Estimation results may not be available if there is not enough information in the image, for example, if the face is covered with a medical mask: there's is enough information to detect and match a face, but not enough to estimate the attributes.

Detection Debugging

Settings in this section are useful for troubleshooting the detection, e.g., when there are no detections, or the results do not have sufficient accuracy.

- **Detect faces below threshold**: send results filtered by thresholds (face quality, angles). This feedback will help you calibrate the thresholds.
- **Show unsuccessful detections**: send results if a face was detected but FR was unable to extract face metrics from the image. This usually happens due to low video quality.

When finished with the setup, click *Apply changes* to save and return to the channel list.

You can get back to these settings any time you want simply by clicking the *Edit* button. Correspondingly, the recycle bin icon will delete the channel from the list with all existing settings: an attempt to add the same camera again will not restore its previous parameter set. So, if you only need to stop the recognition for a channel **temporarily**, open the channel settings and deselect the *Enable recognition* setting, then save.

View Recognition History

While in the *Channels* section, hover your mouse over desired channel and click *History*. You will see the list of

recent recognition results for the given channel with the following details:

- recognition timestamp (date and local time)
- face frame, cropped
- matched subject name, if any

History

DATE/TIME ▾	FRAME	PROPERTY
28/09/2020 12:37:53		Drews
28/09/2020 12:36:47		Carrie
28/09/2020 12:26:38		Steve

Recognition history

Use *History* to check FR **operation status** without launching the Luxriot EVO Monitor application. The recognition results appearing here are the same that go to live results in Luxriot EVO Monitor.

5 Connecting to the Video Management System

After you have set up recognition in the FR Web interface, follow the instructions below to pair FR with Luxriot EVO in order to ensure the two-way event flow.

So far, you have configured FR to run recognition on video streams received from Luxriot EVO servers and save recognition results in the FR database. The final step is to add FR as an **external service** for the target Luxriot EVO server(s) to send the recognition events back to Luxriot EVO and enable investigation on the Luxriot EVO Monitor side.

The following functionality will then become available in Luxriot EVO:

- real time recognition results paired with the live video stream in Luxriot EVO Monitor
- recognition history investigation in Luxriot EVO Monitor and FR result search across all channels
- recognition events available for automated scenarios in the Event & Action management of Luxriot EVO Console

This chapter describes the external service configuration from the point of view of Luxriot EVO. Configuration is made via Luxriot EVO Console locally or remotely. For details on the Luxriot EVO Console application, please refer to the full Luxriot EVO administration guide, which is supplied together with Luxriot EVO.

Add FR as an External Service

For each Luxriot EVO server, complete the steps below. If you pair FR with a Luxriot EVO Global system, you only need to do this once for the Luxriot EVO Global server itself. For Luxriot EVO S, do this for every server separately.

In Luxriot EVO Console, go to the *Configuration* section and choose *External Services* from the left-hand-side menu. On the upper panel, press the + *New external service group* button; in the dialog box, enter a group name and click *OK* to save. The newly created group will appear in the item list. The **group is necessary for permission management**, as the FR service itself appears automatically and does not have any settings for user permissions.

If you have already configured this Luxriot EVO server in FR, the corresponding entry will appear in the list of external services **automatically**. Double-click the FR service in the list and assign it to the group.

FR with its corresponding external service group

From now on, FR configured as an external service will become available in the *Event & Action Configurator*, and the recognition results will also become available for live and investigation in the Luxriot EVO Monitor application.

Once an external service becomes unnecessary, you can remove it by clicking the recycle bin button on the upper panel.

External Service Properties

Apart from the group assignment, external services in Luxriot EVO Console have several other properties. You do **not need** to change any settings, apart from the group, for FR to work with your Luxriot EVO server.

General

In the *Details* tab, you can assign external service to groups (for permissions), to servers (for connection), and also change the service title (as it will appear in Luxriot EVO Console).

Set server to none to run FR external service with the Luxriot EVO Global server

For Luxriot EVO Global systems only:

You can assign FR services to dedicated Luxriot EVO Recording Server machines. FR will then work with the target Luxriot EVO Recording Server directly and will not rely on the management server availability. Such setup is favorable if all video channels intended for facial recognition are kept on the same server. In case FR channels scattered across the Luxriot EVO Global system, leave the *Server* setting to none, allowing FR to work via Luxriot EVO Global.

- Server set to *none*: FR will work with the whole Luxriot EVO Global system, with channels from any Luxriot EVO Recording Server. FR events will work for any server in the system.
- Server set to any particular Luxriot EVO Recording Server: FR will work directly with channels from that Luxriot EVO Recording Server even if the central management server fails or switches to mirroring. Events will be limited to the target Luxriot EVO Recording Server.

By default, this setting depends matches the Luxriot EVO server address used in FR. Thus, if you have added Luxriot EVO Global server in FR, FR connection will appear with the *Server* filed set to *none*. If you have used any of the dedicated recording server addresses, the *Server* field will have the corresponding Luxriot EVO Recording Server name.

The server setting must **match** on FR side and on Luxriot EVO side. To **change** from Luxriot EVO Global to Luxriot EVO Recording Server mode or vice versa, you need to change the settings in both FR Web and Luxriot EVO Console.

> ⚠ Prior to Luxriot EVO version 1.15.0, external services only operated via central management server.
>
> Starting with 1.15.0, you can link external services **directly to recording servers** (Luxriot EVO Recording Server instances). Note, however, that this functionality will **not** be covered for **failover** servers in case the target Luxriot EVO Recording Server goes offline. When your external service is linked to Luxriot EVO Global, streaming will automatically switch from/to failover.

Example 1: Luxriot EVO Global.

- When adding server in Luxriot Vero Face Recognition Web, enter the central management server address.
- FR will appear in Luxriot EVO Console with *Server* setting set to *none*.
- FR will work with the whole Luxriot EVO Global system, as described above.

Example 2: Luxriot EVO Recording Server.

- When adding server in Luxriot Vero Face Recognition Web, enter the Luxriot EVO Recording Server machine address.
- FR will appear in Luxriot EVO Console with *Server* setting set to *Luxriot EVO Recording Server name*.
- FR will solely work with that dedicated recording server in the terms of channels and events, and will not require Luxriot EVO Global or mirror server connection.

Events and Actions

The next tab summarizes the events and actions, which are available for the target FR service.

Events: the list of all available subject tags (aka black/white lists), plus *Known* (any tag) and *Unknown* (no tag, subject not present in the database).

Actions: the list of available service-related actions. Currently, the FR service does not accept any actions from Luxriot EVO servers, so this list is empty.

Related Resources

Here, all resources related to the target service are displayed. Primary FR resources are video channels, so using this tab you can quickly see what **channels** are in use by FR.

Configure Events

Luxriot EVO software has a powerful and flexible built-in tool for creating automated scenarios - Event&Action Configurator. With facial recognition events, you can automatically open doors and gates for your staff, or, on the contrary, inform the security staff about suspicious people in the premises. This is achieved by creating rules - combinations of events and desired target actions. Additionally, special rule modifiers are available, such as action delays and rule schedules.

To access the rule management in Luxriot EVO, open your Luxriot EVO Console and select the *Events & Actions* section in the bottom left corner. The idea is to create events, define actions, and then combine the two into rules.

Create FR Events

Click *Events* in the left-and-side menu to switch to the event management. Click the + *New event* button on the top panel and fill in the settings in the dialog box:

- **Event type**: external service
- **Title**: user-defined event name
- **Source**: FR video channel
- **Service group**: FR service group you have created earlier
- **Target event**: select a tag from FR tags to trigger the event

New event based on FR recognition

The event type you need to select is the *External service* event. The rest of the events represent other Luxriot EVO functionality; you will find a detailed description of these in the Luxriot EVO administration guide.

Tags created earlier in the FR Web interface will appear here in the tag list. In addition to your defined tags, there are two extra groups: known and unknown. **Known** means that the recognition result matched any existing tag. **Unknown** means that the recognized face did not match any of the defined tags.

Create Desired Actions

Created events can be combined with any actions, which are available in the *Event & Action Configurator*. Luxriot EVO supports all kinds of alerts - email, push notifications, pop-ups in the Luxriot EVO Monitor application, - as well as interactions with internal and third-party components.

Some actions already exist by default: for example, live and playback video pop-up. Other types of actions need to be created with specified parameters. To add new actions of different types, select the *Actions* section from the left-hand-side menu and click the *+ New action* button on the upper panel.

Here are several action types, which are particularly useful for FR.

Open Doors

A frequent use case for facial recognition is automatic **opening and closing of doors** or gates. Typically, the door is wired to the relay output of a camera (or a DI/DO module). The digital outputs can be then controlled in several ways:

- for cameras, where DO is supported*, use the *Control digital output* action type
- use *Send HTTP request* action type for triggering DO of any device that supports HTTP/CGI commands, even if not supported in Luxriot EVO
- the *Run program* action allows you to build more complex scenarios using shell scripting (e.g., for multiple triggers)

*For supported camera functionality, see http://www.luxriot.com/support/supported-cameras/. Also, DO is typically supported for ONVIF Profile S conformant devices.

Automatically open the door using camera digital output

For each action you create, fill in the details according to the available options in the dialog box. For DO triggering, these are:

- **Action type**: control digital output
- **Title**: user-defined action name to be used in rules
- **Target**: select a channel that will accept the relay output trigger command*
- **Digital output**: DO interface (multiple may be available)
- **Digital output mode**: choose if the target DO should be activated or deactivated

*In order to use the relay outputs of the target channel, you must first enable them in the channel settings.

Open Doors Using Access Control Connection

As Luxriot EVO is integrated with multiple **access control** software suites, the doors can be controlled via access control software. If Luxriot EVO is paired with the access control system, its doors will appear in Luxriot EVO Console, allowing you to create a special action type named *Door action*.

Door action for the connected access control

Settings:

- **Action type**: door action
- **Title**: user-defined action name to be used in rules
- **Target**: select an access control entry from the list
- **Code:** door state to be set (lock, unlock, temporarily unlock)

Send Live Recognition Results to Luxriot EVO Monitor

Once FR is paired with Luxriot EVO as described above, it will automatically **send the recognition results to the client application** and display live recognition results in the channel notification area**.**

However, you can **additionally set up other types of client notifications.** For this, the *Send event to client* action type is used. This action can send text and sound notifications to the Luxriot EVO Monitor application, and also push notifications to the Luxriot EVO Mobile app. Here, we will only consider the example with sending a text notification with details from FR.

> 💡 Note that FR real-time recognition results **automatically appear with live video of the corresponding FR channel** in the live view and you do not need to configure any rules for this. Use the rules for sending the text notifications elsewhere, e.g., to different channels or Luxriot EVO Mobile.

- **Action type**: send event to client
- **Title**: your desired action name
- **Message**: any text you want plus text macros to pass information from FR
    - {EVENT_SOURCE_TITLE} - if the base event is FR recognition, this macro will produce the channel name
    - {ADDITION_INFORMATION} - FR recognition result
- **Checkboxes**: select the ones you want
    - *Display event in alerts*: the text message will appear in the *Alerts* section of Luxriot EVO Monitor
    - *Display a warning message box*: the notification will **pop up** and stay on top
    - *Display event in notification panel*: message will be displayed in the **notification area of the target channel** (channel is defined at the rule creation step). Select this option if you wish to see the recognition results with the **live video** of a channel that is different from the source channel
    - *Display event in mobile application*: this will send an alert to Luxriot EVO Mobile
    - *Play audio notification*: mark this option if you want the recognition event to arrive with **sound**. Here, you can choose the audio notification number, and the actual sound is defined on the Luxriot EVO Monitor application side.
- **Send event to specific user or user group**: limit the recipients of the target notification; leave [none] if you wish to send the notification to all connected client applications

Send recognition results to the Luxriot EVO Monitor application

Note that this type of action will only work via Luxriot EVO Global server or its mirror, and will not function if the central management server goes offline.

For other actions, you may be asked to provide additional details. When all the required actions are ready, you can proceed with the rule creation.

Manage Rules

Switch to the *Rules* section. Here, you can combine your events and actions to build automated scenarios.

If you are using a Luxriot EVO Global system, first choose the server where you wish to add the rules. Then click the *Open configurator* button on the top panel to access the rule management.

Event & Action Configurator

To combine events, actions and additional controls into rules, simply follow this scheme:

- find your desired **event** in the *Events* list - use search filter on the top panel, if required
- use the < and > arrows or double-click events to add/remove them to/from the *Rules* list
- click free space of the target rule in the *Rules* list (use CTRL or Shift to select multiple ones) - the selected rows will then become highlighted green
- find your desired **action** in the *Actions* list - use search filter on top, if required
- use the < and > arrows or double-click actions to add/remove them to/from the *Rules* list, and the + button to add more than one action for a single event
- select desired actions and add auxiliary controls by clicking buttons on the bottom panel (see description below for details)

> 💡 **Useful tips:**
>
> - double-click an source to add **all** its events to the rule map
> - to **add** an action to an existing rule, use the + button instead of the < button: the original event will be duplicated and new action will be added to the copy
> - use the + button between *Rules* and *Actions* lists to add **multiple actions** of the same type to the selected rule(s)
> - to clear the *Rules* list, select all rules using Shift or CTRL+A, then press < button on the left to remove all events

The rule header displays the event source and event itself; below, related actions are listed, each with its own set of special controls. Actions of the same type are listed under the same rule header; for all other cases, the events are duplicated, resulting in a separate rule. One condition, one schedule and one delay timer can be attached to **each action**.

Once the rule map has been created, click the *OK* button in the bottom right corner to **save and exit**.

Rule Modifiers

There are three rule modifiers available in the central column of the *Event & Action Configurator*: **schedules, delay timers and conditions**. Additionally, other elements may appear in this section: for example, if the target action requires a channel to be defined, a corresponding option will appear. A good example of this is the action described above - *Send event to client* - you need to define the channel for the recognitions to appear with.

You can read more about these elements in the Luxriot EVO administration guide.

Live Results

Once FR has been added as an external service in Luxriot EVO Console, **real-time recognition results will appear in the live view section**, in the notification area of the target FR channel. This will happen **automatically**, provided that FR is paired with Luxriot EVO via grouping. If you wish to send other notifications (e.g., show recognition results in the notification area of another channel), use rules as described above.
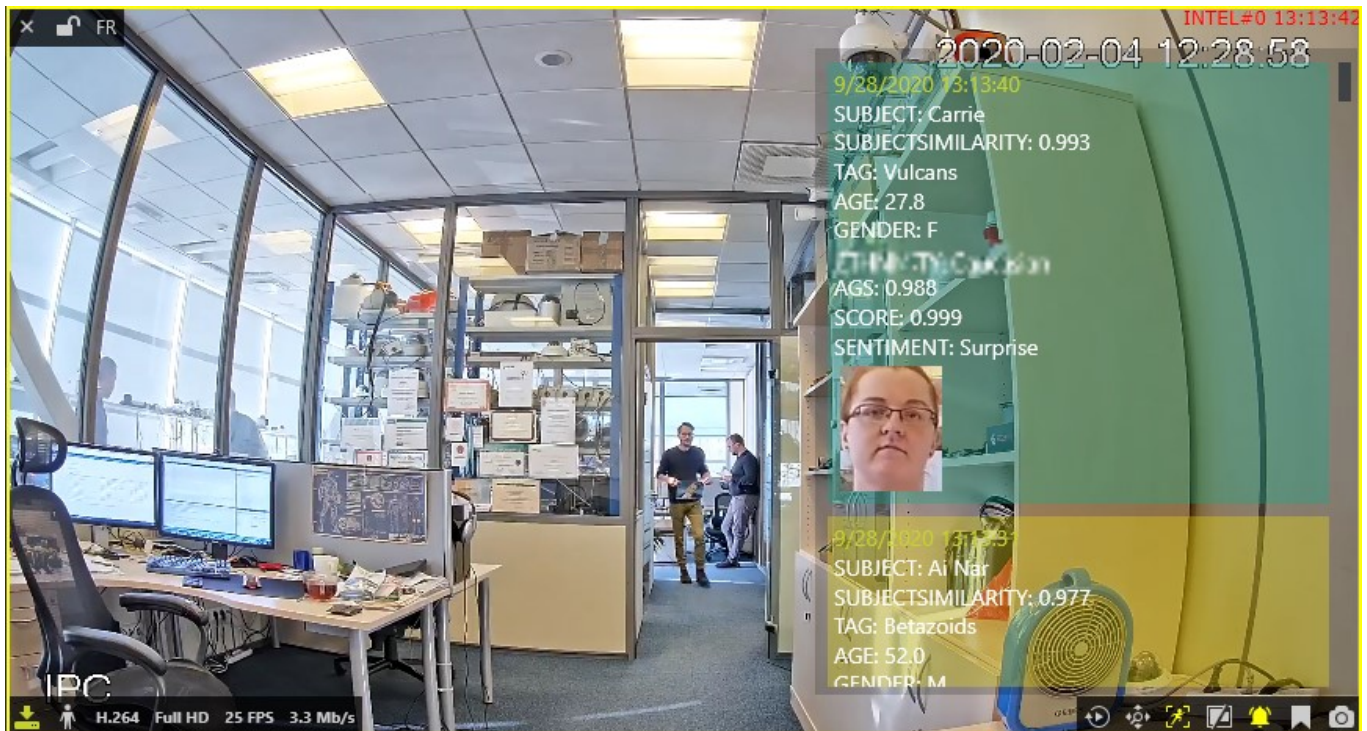
FR live recognition results

The set of recognition [attributes will depend on the properties](#) you have selected in the FR service settings in the FR Web UI. These may include the face image, subject name, estimators (age, gender, etc.) and other information related to recognition.

Investigation

For every external service type, a corresponding tab appears on the topmost panel of Luxriot EVO Monitor. For the face recognition, the tab will be named FR. Here, you can search for the past recognition results. If the target FR channel has recording enabled, you will also be able to play back the moments in time when the recognized face was detected.

FR tab in Luxriot EVO Monitor

In order to start searching for the recognition results, you need to **specify the target channels** first. To do this, click the + (plus) next to the channel, service group, or server name in the *Resources* pane on the left; you can add multiple channels from different external service groups. Use the - (minus) next to the channel, group or server name to deselect and exclude it from the search. Selected items will be marked blue.
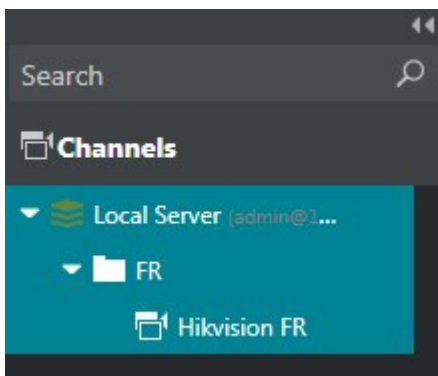

FR channel selected in the Resources pane

Next, enter your search parameters in the search field on the right. The following search adjustments are available:

- upload a **photo** and draw a region to contain a face to search for

- specify search accuracy (higher accuracy is recommended to avoid false positives, but too high may filter out valid results)
- enter the person's **name or a part of the name** if you know it is present in the FR database
- use **tags** to refine the search: tags are available only when **at least one channel** has been selected for search
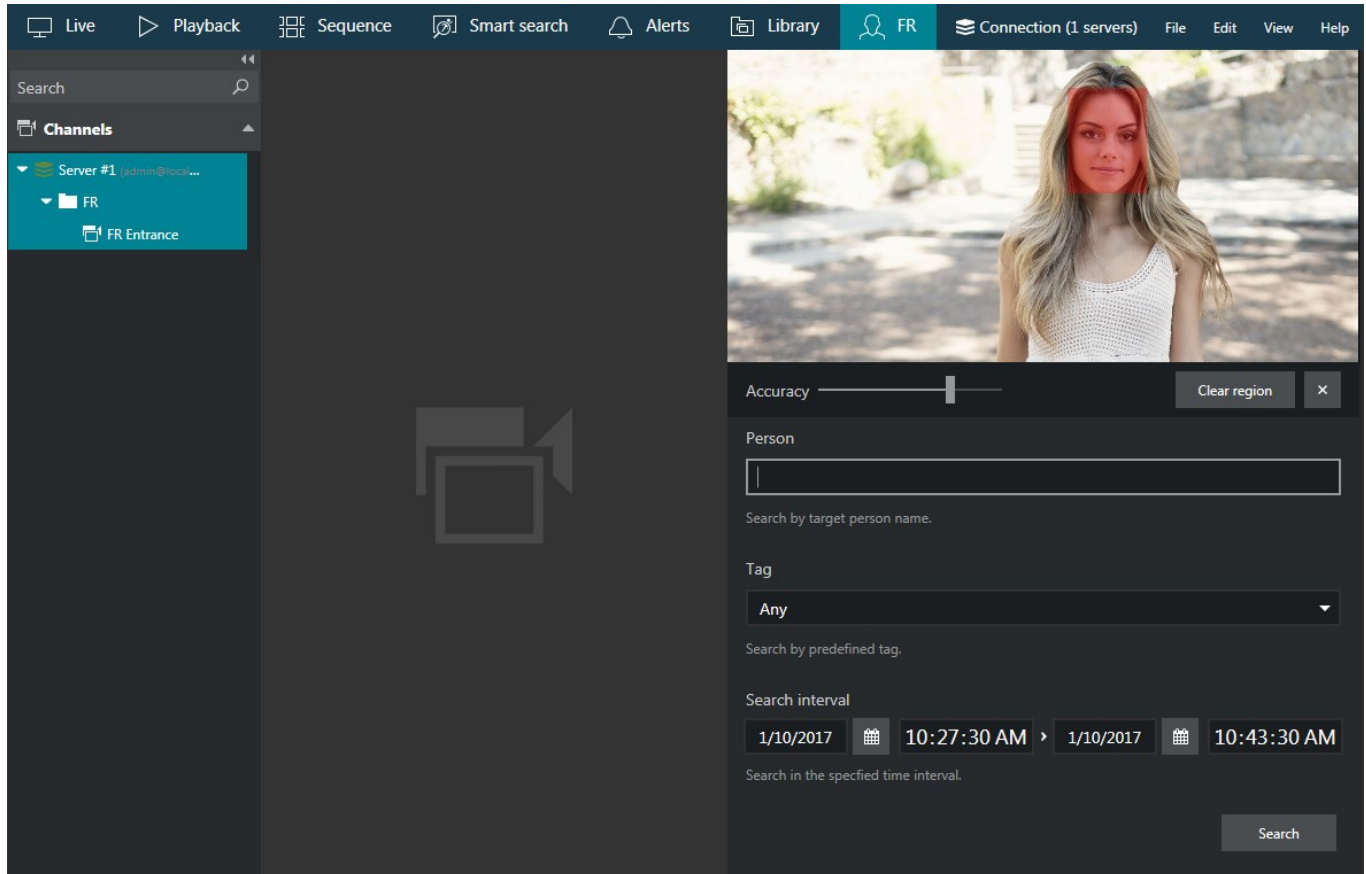
Investigation of the face recognition results

- specify the **target date and time range**: the date can be either entered manually from the keyboard or selected using the calendar control; the time can be also either entered manually or adjusted using your mouse wheel after clicking the digits and holding your mouse cursor over the time element.

After that, click the *Search* button to view the **results**. Please note that, depending on the selected time range and number of channels, the search **may take some time**; the results will be listed in the bottom-right-hand area after they have been found. Do **not** press the *Search* button repeatedly: this will re-initiate the search process. The results will appear gradually, starting from older ones (closer to the start date).

The search results may have different fields, depending the properties you have defined in the FR Web in the service settings. Some pre-selected fields may not always be available; for example, if the recognition results have a match in the database, you will see the subject's name, tag, and similarity score. Unknown results will not have these fields.

Viewing the Results

Click any specific search result and it will be opened in the central viewing area in the grid view or in the instant playback mode, the recognition moment (plus some seconds before and after) being looped. The video will only be available if the target FR channel has recording enabled.

Video preview **grid** can have different sizes from 2x2 to 6x6. You can change the grid size in the bottom by selecting the desired size from the prop-down list. Each grid element is played on loop and has several controls in the bottom right corner (similar to other places in Luxriot EVO Monitor with grid output):

- *Go to playback*: switch to the regular playback mode
- *Bookmark*: create a bookmark for this moment with desired severity level and custom comments
- *Export*: save this fragment as a common format video file

Click the |< arrows >| below the grid to load the previous/next portion of the search results. You can also browse the result list by scrolling the list on the right and clicking any item in it.

Grid size 1x1 corresponds to the **instant playback** mode. It some standard Luxriot EVO Monitor controls and also an option to switch to the regular playback mode.

- Use the semi-transparent *Play* viewport overlay control in the centre of the picture to play faster, slower or pause the playback: simply drag the arrow to the left/right/centre position
- Timestamp in the upper-right-hand corner of the picture shows server time
- The small *Play* icon in the bottom-right-hand corner will take you to the *Playback* mode
- The *Clock* overlay control allows you to go to any particular moment in time in the same playback window
- The *Flag* icon will open the *Add new bookmark* dialog box, allowing you to add a bookmark to this specific moment
- Pressing the *Camera* icon will export a snapshot
- Pressing the *Video clip* icon will automatically export the piece of video, which is currently being played
- The timeline contains the recognition related time interval but you can also adjust the boundaries by clicking and dragging the arrows on the left and right sides of the timeline (minimal interval is ten seconds)

You can switch to other tabs while investigating and you can return to the exact place where you left off by switching back to the FR tab, provided that you do not close the Luxriot EVO Monitor application. If you do, all your search results will be discarded.

Found data can be saved into a **CSV** file (comma-separated values) that can be later parsed or opened with MS Excel-like applications. To do this, simply click the *Export CSV...* button below the search result list and specify your desired file name and path.

6 Subject Management

Manage Subjects

You can create your own face **database** that will be used for comparison and identification (matching) of detected persons. The **maximum size** of the database is determined by your FR license.

Each subject can have **one** face picture for matching. Once you have entered the initial set of subjects, and FR has been deployed and operating for some time, it is possible to get back to the subjects management to update their face galleries with better (more up-to-date) images. In such a way, recognition engine is trained to identify the person more precisely and easily, and also allows you to keep up with the changes in the persons' appearance.

> ⚠️ **Important note:** Please consider the Recommendations section of this document to develop best techniques for adding subject pictures. Better image quality at the enrolment stage lead to more accurate results.

Open the *Subjects Management* section from the FR homepage, or switch to *Subjects* in the main FR menu. By default, the list is empty.

Start creating **new entries** by clicking the *Add Subject* button.

Each entry has the following attributes:

- **Name**: typically, the person's title/name/surname or other ID used to distinguish them from others, and also to enable text-based subject search
- **Face gallery**: browse for and add a single face picture, then click *Add subject*. If there are none or multiple faces in the picture, you will get a warning. If the database already contains similar subjects, you will have them listed below after clicking *Add subject*.
- **Tag**: subject's attribute based on the access level, which can further be used for white/black lists or other subject categories. You can pre-create tags or add them on the fly.
- **Similarity**: similarity level [50-99] to be used to compare the current subject against existing database (in order to avoid duplicate entries).

For the face gallery, please use face images that comply with the recommendations provided earlier in this document. If you have an opportunity to choose between several images, select the best one according to the best enrolment practices.

< Subjects
Edit Carrie

Subject Details

Subject name

Carrie

Face Gallery

Tag

Vulcans   [Manage Tags]

Similarity

Threshold to use to warn about similarity with known subjects

60.00

[Apply Changes]

Edit/add subject

When you try adding a new subject, FR automatically checks if the target person already exists in the list. Use the **similarity threshold** to avoid duplicate entries in the subjects' database. Higher threshold will guarantee there will be no duplicated, yet too high similarity threshold applied to a super large database may prevent you from adding a legit new subject. If there are **matches** with the current similarity level, you will get a *Matched* list for review before the target new subject is added. In such case, you will have two options:

- adjust the similarity level and try clicking the *Add subject* again to see the new matches, if any
- click *Add anyway* to ignore the duplicate warning and add the current entry

Adding **tags**: select one of the previously created tags from the drop-down list or click *Manage Tags* to add/change existing ones. Select one of the suggested colours for the tag or pick your own one, and click *Add* to create a new tag.

When finished with the details, click *Add subject* to create the new item and return to the list.

Subjects database

To **change** any pre-created subject entry, click the *Edit* button in the corresponding subject's row. Use the recycle bin button to permanently **remove** any subject.

Buttons in the upper part of the page allow you to **show/hide** images, and perform text **search based on** the subject **name**.
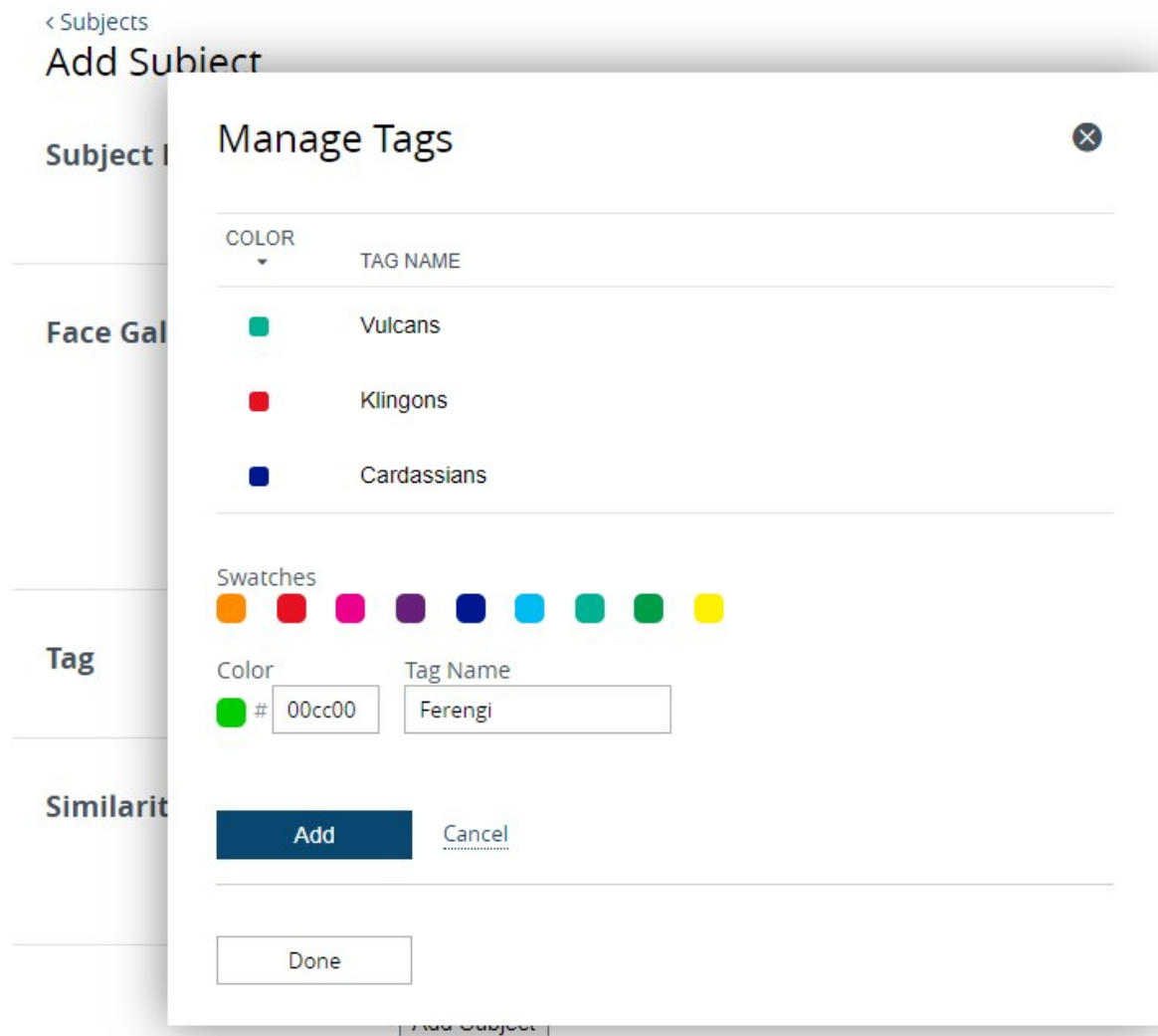
Manage Tags

Tags are subjects' attributes characterized by **name** and **colour**. Using tags, you can create black/white lists, subjects' access levels, or any other classification to suit your project specialty. Tags are returned to Luxriot EVO servers together with recognition results in the following ways:

- tags appear in **live results** the Luxriot EVO Monitor application
- tags can be used in **search** (FR tab) to facilitate investigation
- you can use tags as **event basis** in the Event&Action Configurator in Luxriot EVO Console

To create tags, click *Add subject* under FR subject management, or open any existing subject for editing, then click *Manage tags*.

Select a **colour** from the palette or enter your desired colour HEX code, then type the tag **name** and click *Add*. The newly created tag will appear above. Repeat to add as many tags as you need. Click *Cancel* to discard the unfinished tag entry and return to the subject properties.

When finished creating tags, click *Done*. All the tags you have added will appear in the **drop-down list**, allowing you to choose one for the current subject.

Manage tag list

Use the recycle bin icon in the tag list to **remove** them permanently. Note that this action is immediate and **cannot be undone**! If you remove tags, which are currently assigned to any of the subjects, these subjects will become tagless (but will still count as *Known* in Luxriot EVO).

7   Troubleshooting

Backup

At this point, automatic database backup is not supported. Manual procedure:

From *C:\ProgramData\Luxriot\Luxriot Vero Face Recognition*, copy the following files and store them securely on a different disk:

- *Config.json* - FR service and recognition configuration
- *FaceRecognition2.db* - subjects' database
- *Tags.db* - tag database

We strongly recommend making a backup after significant changes to FR configuration.

Diagnostics

The diagnostics page provides you with important server events like information about FR service start, license check, server and camera connection. In the example here, FR service has successfully started, connected to its database and validated the license, but Luxriot EVO server on localhost is not running so connection could not be made.

Alerts (7)			Search
DATE/TIME ▾	**TARGET**	**ALERT**	**PROPERTY**
3/31/2015 10:08:24 AM	Database	Information	ODBC data source connected
3/31/2015 10:08:25 AM	RecognitionEngine	Information	face recognition engine component licenses obtained
3/31/2015 10:08:25 AM	Service	Information	connecting to admin@localhost:60554
3/31/2015 10:08:28 AM	Service	Information	server admin@localhost:60554 disconnected (8007274D)
3/31/2015 10:08:32 AM	Service	Information	server admin@localhost:60554 disconnected (8007274D)
3/31/2015 10:08:34 AM	Service	Information	service started
3/31/2015 10:08:35 AM	Service	Information	server admin@localhost:60554 disconnected (8007274D)

Rows per page: 50 ▼   <   1 of 1   >

FR diagnostics

You are kindly requested to provide information from this page when applying for technical support.

FAQ

Q: During installation, setup shows errors or takes forever to finish.

A: Abort installation. Make sure you have installed all the latest OS updates and required .NET versions. Reboot your server computer, then try installing Luxriot Vero Face Recognition again. If the issue persists, contact Luxriot support at support@luxriot.com, providing exact error messages and/or snapshots.

Q: I try activating the license key but the activation page spends a long time loading and then produces a "Failed to activate FaceEngine license" error.

A: Unable to reach activation server. Make sure you have Internet connection. If the issue persists, contact Luxriot support with this description and log file data.

Q: I have activated my license key, connected a channel but but no faces are being detected.

A: Try adding the channel anew with default parameters, then try adjusting the parameters to match your scenario according to the parameter explanation. Also, try switching the engine type (V3<>V1) in the FR service settings.

Q: I have trouble uploading pictures in *Subjects Management*, engine says *No faces detected*.

A: Please refer to the Recommendations section of this document and go through all steps carefully, making sure that pictures' quality is suitable. Engine requirements for sharp facial lines and no inclination are strict. Use a graphics editor to make sure that distance between eyes (in pixels) satisfies the required minimum of 40 pixels. Also, make sure there is only one face in the picture.

Q: I set archive quota to <percentage> but no frames are saved.

A: Check your disk space. Defined quota refers to total disk space, not just space used by the Face Recognition software: for example, if your disk is already 60% full even without FR archive, and you set quota to 50%, no frames will be saved.

Q: Server status shows *Disconnected* in the servers list.

A: Make sure your video management server is running and reachable and has incoming HTTP remote connections enabled. If you are able to connect via telnet <VMS IP/hostname><VMS HTTP port>, FR will successfully connect as well. Then double check server settings in the FR, making sure you are using correct HTTP port. You can also try reaching the target Luxriot EVO server via browser with the same IP, port, and user account: you should be able to connect and log into the Luxriot EVO Web UI from the FR machine.

Q: Some of the [recognition] settings are highlighted red and are not saved.

A: Values out of range or having incorrect format will not be saved. If entered value is highlighted red, verify its format (e.g., 0.50 vs 50) and range validity (e.g., angle values must not be less than 1.0).

Q: Some of the [recognition] settings are not saved, although are not highlighted red.

A: Make sure you have **period** (full stop) symbol, not comma, set as the decimal symbol for **all** users in your OS settings. To do so in Windows 10: go to Region setting (click *Change date, time, or number formats* under *Region* section in the Control panel) > click *Additional settings* > in the *Numbers* tab, set *Decimal symbol* to . >click *OK* but do not close the *Region* dialog box > switch to the *Administrative* tab > click *Copy settings* > copy your current settings to Welcome screen and system accounts > click *OK* to save and *OK* again to save and exit the dialog box.

Having **comma** set as your decimal symbol may lead to other **issues** during FR operation. If you have a **Cyrillic language** set as the interface language in Windows, comma is most likely your default delimiter. We recommend that you follow the steps above and replace it with a period in order to avoid miscellaneous issues.

Q: FR search history has some recognition results but nothing is displayed live in Luxriot EVO Monitor.

A: Make sure you have added FR as an external service in Luxriot EVO Console. To do so, go to the *Configuration* section of Luxriot EVO Console and choose *External services* on the left, then create a service group and put FR into that group. If there are still no live results, restart Luxriot EVO and Luxriot Vero Face Recognition services.

Q: FR service is stuck after PC start, does not send results or events back to Luxriot EVO server.

A: Restart Luxriot Vero Face Recognition service via Windows services.

Q: FR service starts but it cannot connect to the target Luxriot EVO server, showing its status as *Disconnected*.

A: Make sure the target service is running and reachable (the easist way to check this is to try opening the target address in your Web browser on the FR PC: you should be able to see Luxriot EVO streaming server login page). Check that no other service (including antivirus) is not blocking any of the ports. Try changing FR and Luxriot EVO HTTP port.

Errors

This section contains details about common FR service errors.

Luxriot EVO Monitor Errors

FR search errors are displayed in the *Alerts* tab. They have *Error* level (marked red) and start with *{servername} responded with an error.*

External service encountered an error during a search for external events: Could not extract descriptor. The image provided for search contains no faces. Try replacing the search image with one with better quality, or a different one.

The service isn't connected. The FR service that runs recognition for the selected channel is currently not connected to the Luxriot EVO server. This may happen because FR service is stopped, FR machine is offline, or there is no connectivity between Luxriot EVO server and FR.

External service encountered an error during a search for external events: Database image is malformed. The target FR database (*FaceRecognition2.db* in ProgramData) is corrupt. FR search, as well as channel history on FR Web will not work. Quick fix: stop the service, remove the file, start FR service again (all recognition history will be lost).

External service encountered an error during a search for external events: Result record limit is exceeded (1). The maximum number of search results in Luxriot EVO Monitor is 10 000. Please refine your search criteria, e.g, shorten the search period, and try again.