BVMS AI Search - explained

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1 Version history

Date	Description
2025-12-18	Initial document release for BVMS 13.1.
2026-01-29	Updated performance values

2 Introduction

Free-text Search in BVMS is an advanced feature enabling operators to locate video events using natural, human language descriptions. Unlike traditional search technologies requiring pre-configured metadata or manual filtering, Free-text Search interprets open-form descriptions (e.g., "group of people fighting on the street") and rapidly retrieves visually relevant video segments.

The feature works fully on-premise and requires no cloud or internet connectivity. In most of the cases, it can work with existing camera infrastructures, including ONVIF-compliant devices.

3 Main advantages of BVMS AI Search

3.1 Highly intuitive operation

Operators simply describe the scene in plain language, eliminating the need for complex criteria selection. This significantly reduces investigation time and training requirements.

3.2 Search accuracy

The system uses AI capabilities to compare visual content with the user's description. This enables detection of highly specific or unusual objects, contexts, or actions.
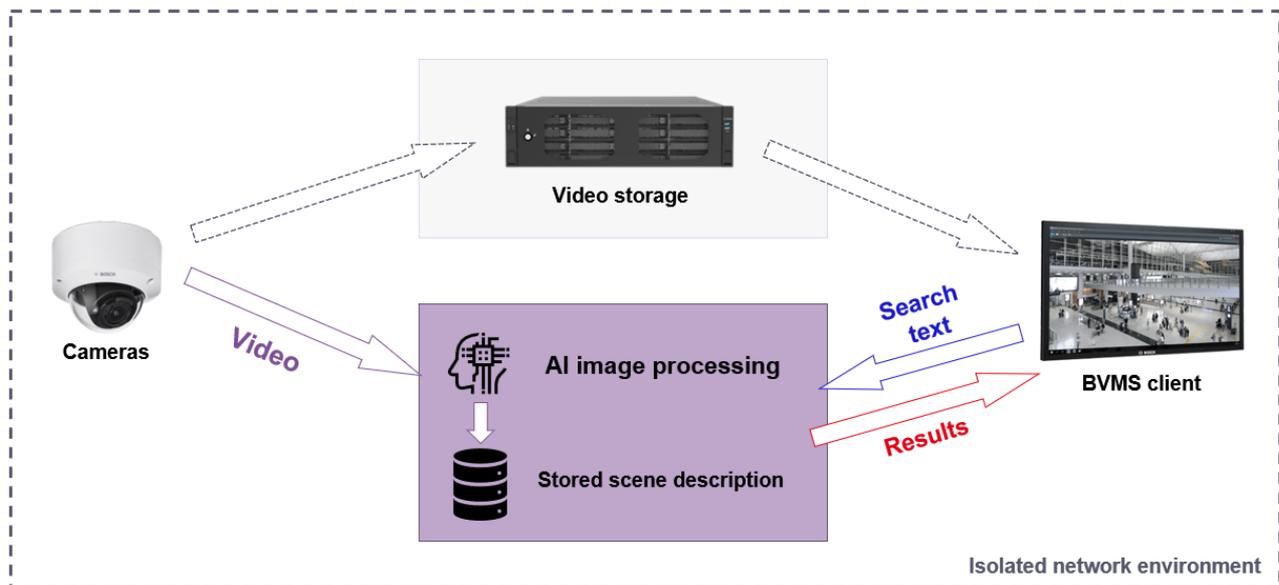
3.3 Works with existing installations

Free-text Search does not require specific camera types or firmware. It can be introduced into existing setups without major hardware replacement.

3.4 Fully on-premise

All processing occurs in the local IT environment, which ensures data privacy requirements even for high security systems.

4 How BVMS AI Search works?

4.1 Processing Pipeline Overview

1. Video streams are continuously captured from connected cameras.
2. The **AI Video Processor Service** is analyzing video streams and converts them into numerical vectors representing semantic content.
3. Vectors are stored in a dedicated **database**, along with thumbnails.
4. During search, the system converts the user's text query into a **search vector** using the same model.
5. The system computes similarity scores and returns possible matches.
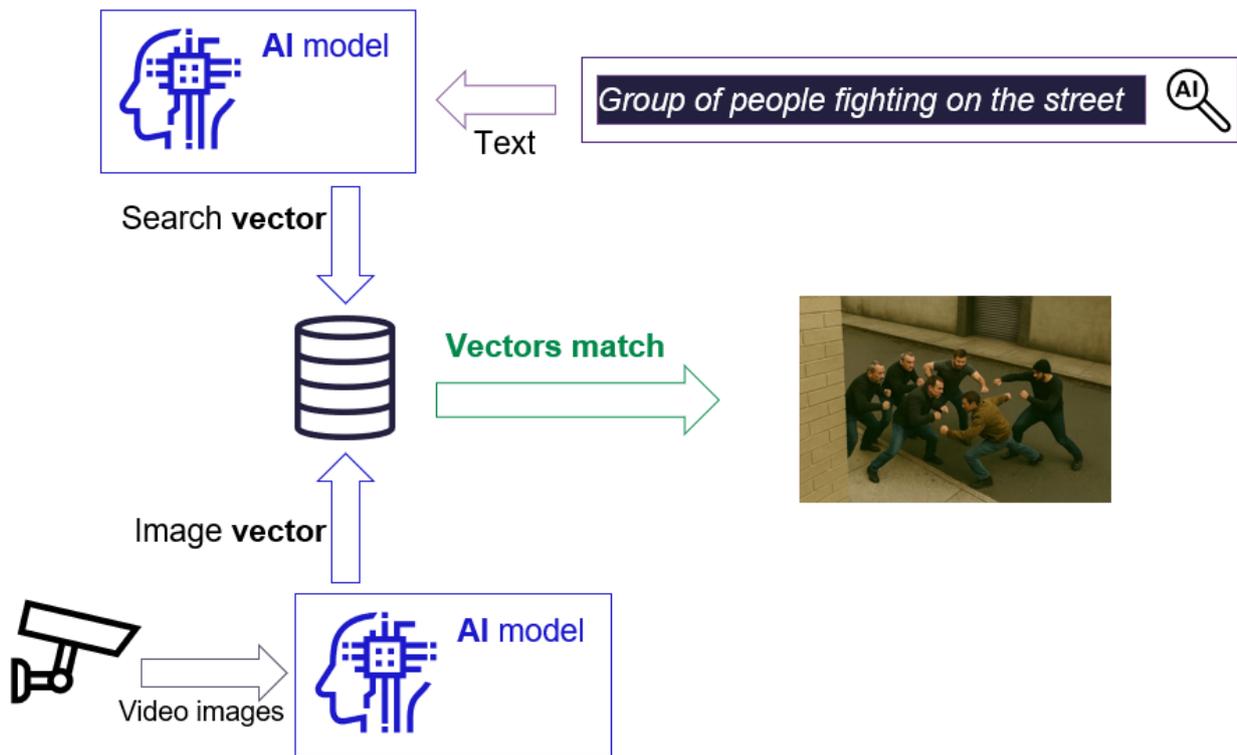
4.2 AI Model

BVMS uses an open-source visual-language model (VLM). As this is a third-party model, BVMS has limited influence on the model's internal performance but ensures predictable integration.

4.3 Model Updates

The AI processing service and model are packaged separately from BVMS, allowing future updates or model replacements without upgrading the entire BVMS system.

4.4 Language Support

Version 13.1 supports **English** queries only. Additional languages might be introduced via model updates at later point.

AI model

← Text

Group of people fighting on the street

Search **vector**

Vectors match →

Image **vector**

Video images →

AI model

AI model

5 Application areas

Free-text search and used model might be helpful for the following search tasks and targets:

- Larger objects (ie. box, ladder, suitcase, etc.)
- Various vehicle types (delivery van, ambulance, fire truck, etc.)
- Colors
- Animals (ie. person with a dog)
- Scene context description*

> ℹ️ *Please note, that model does not analyze movement patterns - scene context description might only work, if it can be clearly recognized based on still image (ie. visible fight between group of people or act of vandalism with person doing graffiti).

However, please be aware that due to some limitations of the model, for the following criteria most likely it will not be possible to get expected search results:

- Smaller objects (ie. trash, handheld objects, etc.)
- Detailed person characteristics (ie. glasses, tattoo, jewelry)
- Busy scene with a lot of details
- Understanding text or numbers
- Accurate counting

6 How to perform the search?

Search is performed using BVMS Operator Client and is available for all the cameras, which are properly assigned for video processing to one of the AI Video Processor Services within BVMS configuration.

AI Search is a new, additional search option, seamlessly integrated into available timeline search options:
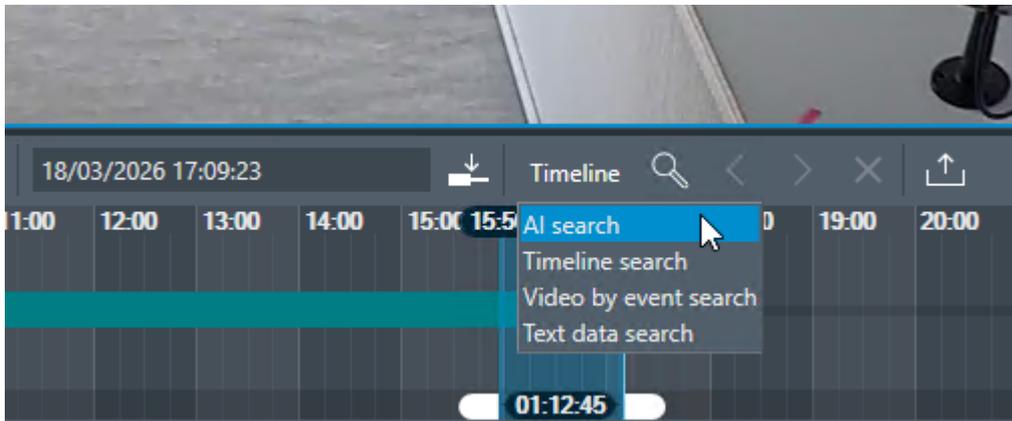
When opened, search query can be provided by typing-in any plain text:
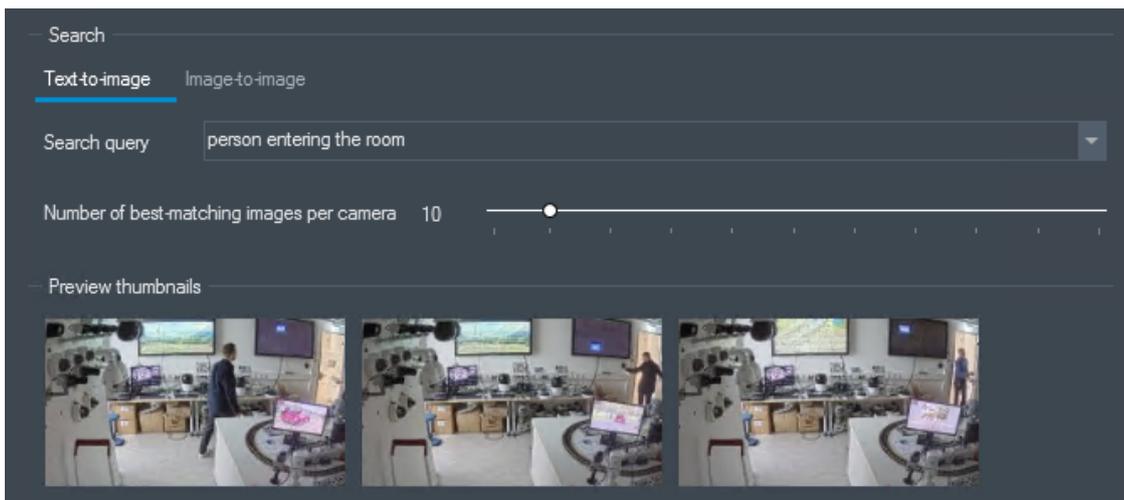
Additionally, it is possible to define expected number of results and the best-matching results are immediately shown below - this way it's possible to dynamically adjust the prompt to the actual requirements to get the best results.

> ❌ **Responsible use**
>
> Always ensure that this feature is used in a responsible, ethical, and compliant manner.

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7 Camera requirements

There are no special camera requirements. Free-text search is supported for any supported Bosch or ONVIF Profile S compliant camera added to BVMS

8 Performance

The following table indicates expected performance for the tested and supported hardware types:

Hardware	GPU type	Performance (images / s)	Cameras (max.)
DIVAR IP all-in-one 4000 (DIP-44xx)	Integrated	10	5
DIVAR IP all-in-one 6000 (DIP-64xx)	Integrated	10	5
DIVAR IP all-in-one 7000 (DIP-74xx)	Integrated	20	10
Z4G5 workstation	T1000	100	50
Z4G5 workstation	A1000	200	100
Z2G9 workstation	T400	50	25
Z2G1i workstation	A400	50	25
HPE Server	-	n/a	n/a

Performance: indicates total no. of images (frames) processed per second, from all the cameras connected to this service.

Cameras: indicates max. no. of cameras that can be continuously processed by the service, considering expected performance value, divided by 2 images processed / second / camera (min. value in BVMS setting).

⚠ Indicated values are only approximate and might vary, depending on multiple different factors, like resolution, scene complexity or other applications running on the same machine.

It is generally possible to run BVMS Operator Client on the same machine as the AI Video Processor Service. However, please consider GPU load - if GPU is used heavily for decoding (displaying in the Operator Client) a lot of camera simultaneously, it might reduce the actual performance of the AI Video Processor Service.

If no sufficient GPU capacity is available for image processing, the actual no. of images processed / second will decrease.

⚠ Correct operation of the AI Video Processor Service is only guaranteed for the GPUs listed above in the performance table. Please ensure, that the latest GPU driver version is used.

9 Required HDD space

Additionally, please consider required hard-drive space to store the analysis results on the machine where the AI Video Processor Service is running:

- **~1 GB / day / camera** if scene thumbnails are also stored
- **~0,5 GB / day / camera** if scene thumbnails are not used

⚠ Values for required storage space are approximate and averaged. In practice, those may be different depending on various factors, like scene complexity, lighting, movement, stream resolution, etc.

10 Additional hardware requirements

⚠️ **Supported GPUs**

Due to the specific SDK restrictions by used 3rd party components, AI Video Processor Service can only run on NVIDIA GPU with **Compute Capability 7.5 or higher**.

Please refer to the tables provided for further details.

In practice, it means that NVIDIA T- or A- series GPUs are supported and recommended. Please refer to **Performance** chapter above which provides an overview of tested and compatible GPUs.

11 Important configuration aspects

In order to ensure secure communication between the AI Video Processor Service and other BVMS components, trusted certificate chain is required. Therefore, additional deployment of proper certificates might be needed on a target machine where AI Video Processor Service is running.

Please refer to the Technical Introduction Training for further details.

12 Known limitations

- As of now, AI Search is available in **English** language only
- Alarm or schedule based recording is currently not fully supported - searching within the time period where recording was not active, might still produce search results, since video is processed in parallel to the standard recording path. Therefore, it is highly recommended to use it with continuous recording or limiting the search range to the periods, where recordings are available
- It is also not directly possible to remove specific thumbnails or for a specific period of time
- Configuration changes, like: changing the camera password or recording retention time settings might require AI Video Processor Service reconfiguration
- There's no status monitoring available for the AI Video Processor Service, so it has to be ensured that the service is constantly up and running so the image processing is done properly