Bosch Security Systems B.V.

From		Hildesheim
BT-VS/MKP-AIC	Product Management	16.10.2024

Release notes

Products:	***IVA Pro Buildings*** ***IVA Pro Perimeter*** ***IVA Pro Traffic*** ***IVA Pro Intelligent Tracking*** ***IVA Pro Visual Gun Detection*** ***IVA Pro Privacy*** ***IVA Pro PPE*** ***IVA Pro Appearance*** ***IVA Pro License Plate*** ***IVA Pro Vehicle Make Model*** ***IVA Pro Dangerous Good Signs*** ***Camera Trainer***
Version:	***Firmware 9.40 (CPP14),*** ***Configuration Manager 7.74***

1. General

Bosch cameras can be clustered by their common product platform (CPP). Newer generations of CPP offer more processing power, and thus also more options for video analytics. Therefore video analytics versions and capabilities differ with the different platforms:

- On CPP 13, IVA Pro Buildings and IVA Pro Perimeter are included by default, and IVA Pro Traffic and IVA Pro Intelligent Tracking are available as licensable option.
- On CPP 14 cameras of 3100i range, IVA Pro Buildings is included by default.
- On CPP 14 camera FLEXIDOME panoramic 5100i, IVA Pro Buildings and IVA Pro Perimeter are included by default.
- On CPP 14 camera FLEXIDOME multi 7000i, IVA Pro Buildings and IVA Pro Perimeter are included by default.
- On other CPP 14 cameras of 5100i range, IVA Pro Buildings is included by default, and other IVA Pro versions are available as licensable options.
- On other CPP 14 cameras of 7100i range, IVA Pro Buildings and IVA Pro Perimeter are included by default, and other IVA Pro versions are available as licensable options.

2. New Features

New features:

- **IVA Pro Perimeter**

  On CPP14 cameras w/o the panoramic, multi or 3000, IVA Pro Perimeter has been merged with an AI based object detector to significantly improve sensitivity and reduce false alarms while still keeping the detection of professional intruders which can be rolling, crawling or be camouflaged. This includes the tracking modes perimeter tracking (2D) as well as perimeter tracking (3D). Changes include:

  - Improved object detection sensitivity, especially for distant objects
  - Improved noise suppression
  - Object classes “person” and “vehicle” now available in perimeter tracking (2D)
  - Full detection distance for perimeter tracking (2D) and perimeter tracking (3D), independent of noise suppression configuration
  - New meaning for noise suppression parameter for both perimeter tracking (2D) and perimeter tracking (3D):
    - Off: Output all verified objects
    - Medium: Suppression of small animals
    - Strong: Output only upright persons and vehicles
  - 3D sizes available in perimeter tracking (3D)
  - Flexible shape removed as no longer necessary
  - Autocalibration based on persons available

  On all other cameras, IVA Pro Perimeter stays as before.

- **IVA Pro Privacy:**

  IVA Pro Privacy enables you to anonymize people and vehicles within the cameras field of view by blurring them for privacy conform surveillance solutions. IVA Pro Privacy is a free of charge software, included by default on all supported cameras, that is CPP14 cameras w/o multi, panoramic or 3000. It has the following features:

  - **Semi-transparent privacy mask**: IVA Pro Privacy uses a semi-transparent privacy mask, ensuring anonymization while still getting insights about moving objects in the area.
  - **IVA Pro behind privacy mask**: IVA Pro Privacy offers the option to mask the camera image fully or partially, but still allowing other IVA Pro versions to run in these areas, obtaining anonymized metadata, counting statistics and alarm events while protecting the privacy of the people involved.
  - **Masking IVA Pro objects**: IVA Pro Privacy offers to dynamically mask all of the objects detected by other IVA Pro variants, ensuring their privacy while giving the operator an unhindered view of the rest of the scene.
  - **Synchronized video & metadata**: IVA Pro Privacy synchronizes video stream and IVA Pro objects for best anonymization performance.
  - **Selectable per stream:** IVA Pro Privacy can be configured individually per encoder stream, allowing anonymization of people in the live view but still conserving

evidence in a recorded stream. All of the IVA Pro Privacy options can be combined in each stream to best suit the targeted application and required privacy levels.

- **Combinable with other IVA Pro versions:** IVA Pro Privacy can be used together with IVA Pro Buildings, IVA Pro Perimeter, IVA Pro Traffic, IVA Pro Intelligent Tracking, IVA Pro Visual Gun Detection, IVA Pro PPE and IVA Pro Appearance.
- **Class-based privacy protection**: Select which IVA Pro objects should be masked. Either mask all IVA Pro objects, or only faces, only persons or only vehicles. E.g. decide that in your application it is enough to mask the persons heads to preserve their anonymity, but show the rest of their bodies for production monitoring.

Configuration:

- A static half-opaque mask can be configured under Camera -> Privacy Masks by choosing the pattern “Blurr”. IVA Pro will automatically run behind this privacy mask.
- Dynamically masking IVA Pro objects is configured under Camera -> Encoder Streams by selecting the corresponding “Permanent metadata display” option.

Limitations include:

- Only available on CPP14
- 3000 series cameras are not supported
- FLEXIDOME multi is not supported
- Dewarped modes in FLEXIDOME panoramic are not supported
- 60fps is not supported. Note that while the encoder will automatically use 30fps instead, other parts of the camera may still use 60fps resulting in further limitations. Best set to 30fps directly.
- IVA Pro Privacy can be used together with IVA Pro Buildings, IVA Pro Perimeter, IVA Pro Traffic, IVA Pro Intelligent Tracking, IVA Pro Visual Gun Detection, IVA Pro PPE and IVA Pro Appearance.
- Head/face detection only available with IVA Pro Buildings, IVA Pro Traffic, IVA Pro PPE and IVA Pro Appearance
- Person and vehicle detection only available where IVA Pro supports these classes.
- The synchronization delays the video by 7 frames. If metadata is delayed more than 7 frames, then object-based blurring will not happen. Metadata may be send out before the video, and as live view shows what is available, will appear to “move” before the objects. This is similar to the delay of metadata which happens in the asynchronous normal modes.
- 4k / 9MP cameras are not able to deliver full frame rate with IVA Pro Privacy active, and their jpegs are not always anonymized correctly.
- 4/5 MP cameras may drop the framerate when 90/270° rotations are enabled.
- When burring is activated in the cameras installer menu, the following encoder stream limitations apply:

Input	Stream1	Stream2	Stream3	Stream4

1920 x 1080	1920 x 1080	1280x720	copy	copy
2592 x 1944	1920 x 1440	640 x 480	copy	copy
3840 x 2160	3264 x 1840	copy	copy	copy
	2688 x 1512	copy	copy	copy
	1920 x 1080	1280x720	copy	copy
2688 x 1520	2688 x 1520	768 x 432	copy	copy
	1920 x 1080	1280x720	copy	copy
2688 x 1520 60fps + rotate	1920 x 1080	copy	copy	copy
3008x3008	2112x 2112	copy	copy	copy
	1792 x 1792	1024 x 1024	copy	copy
2112x 2112	2112x 2112	copy	copy	copy
	1792 x 1792	1024 x 1024	copy	copy

- Privacy masks and other orientation-related parameters must be checked and eventually re-assigned after rotating a camera.
- With electronic image stabilization (EIS) enabled:
  - As privacy masks are applied to the sensor image, privacy masks may jump depending on the corrections induced by EIS and not exactly match with the drawn area.
  - Privacy masks might not match the drawn area depending on the EIS state since the masks are applied before image stabilization. It might be advised to slightly enlarge the privacy mask areas to ensure privacy.
  - The virtual movement of privacy masks and the resulting unveiling of background around the masks might cause false motion detection.

▶ **IVA Pro PPE**

IVA Pro PPE (Personal Protective Equipment) can reliably detect people analyzes them for wearing personal protective equipment. PPE items include

- safety vest
- hard hat

These attributes are added in the metadata stream, integrating them into the rule engine and allowing users to set specific alarms and events using our proprietary Configuration Manager.

IVA Pro PPE is a licensed option available on CPP14 cameras w/o 3000, multi or panoramic cameras.

IVA Pro PPE is based on IVA Pro Buildings and comes with its full functionality. In addition, a new task “PPE monitoring” is available, which checks for selected PPE items and alarms if they have not been seen at a person for a specified amount of time.

Metadata inspection has been extended to show the PPE items on a selected person.

Limitations:

- Available on CPP14 cameras w/o 3000, multi, corner or panoramic cameras.
- Object detection and tracking is running with 7.5 fps instead of the usual 15 fps. PPE attribute extraction is running roughly once every three seconds for each person.
- In the used video analytics resolution of 1280x720 or 1024x576 (8MP cameras), the person must have a height of at least the following pixels to properly detect PPE.
  - Safety vest: 48 pixel person height
  - Hard hat: 96 pixel person height
- PPE items should be clearly visible and presented to the camera
- The persons should be upright and either standing or walking.
- The persons should be clearly visible and not occluded by other persons or items. Ensure that persons walk through the monitored area single file with enough separation for best performance.
- Ensure that a minimal illumination of at least 200 lx is given in the scene.
- Safety vests includes safety jackets. Safety vests and jackets are defined, amongst others, by their reflective strips. Detection will be delayed until a reflective strip becomes visible.
- In case of white hard hats, ensure that no spotlight causes oversaturation of the hard hat in the video, as detection performance will otherwise drop.

▶ **IVA Pro Appearance**

IVA Pro Appearance detects and separates upright persons and vehicles, and extracts the appearance of persons for use in later forensic search. The following person attributes are available:

- Gender: male, female
- Top color: black, grey, white, brown, beige, green, red, blue, yellow, orange, pink, purple
- Top length: short, long
- Bottom color: black, grey, white, brown, beige, green, red, blue, yellow, orange, pink, purple
- Bottom length: short, long
- Hair color: black, grey, brown, blond, red
- Hair length: short, long
- Hat / no hat
- Glasses / no glasses
- Bag / no bag

- Backpack / no backpack

IVA Pro Appearance is a licensed option available on CPP14 cameras w/o 3000, multi or panoramic cameras.

IVA Pro Appearance is based on IVA Pro Buildings and comes with its full functionality. In addition, a new task “Appearance search” is available, which checks for the person attributes. This can be used for forensic search e.g. in the Bosch video management system (BVMS).

Metadata inspection has been extended to show the appearance attributes of a selected person.

Limitations:

- Available on CPP14 cameras w/o 3000, multi, corner or panoramic cameras.
- Object detection and tracking is running with 7.5 fps instead of the usual 15 fps. Appearance attribute extraction is running roughly once every three seconds for each person.
- In the used video analytics resolution of 1280x720 or 1024x576 (8MP cameras), the person must have a height of at least the following pixels to properly detect the respective attributes:
  - Gender: male, female: 64 pixel person height
  - Top color: 64 pixel person height
  - Top length: 64 pixel person height
  - Bottom color: 64 pixel person height
  - Bottom length: 64 pixel person height
  - Hair color: 96 pixel person height
  - Hair length: 96 pixel person height
  - Hat / no hat: 96 pixel person height
  - Glasses / no glasses: 256 pixel person height
  - Bag / no bag: 96 pixel person height
  - Backpack / no backpack: 96 pixel person height
- The persons should be upright and either standing or walking.
- The persons should be clearly visible and not occluded by other persons or items for more than 50%.
- Ensure that a minimal illumination of at least 200 lx is given in the scene.
- Attributes need to be visible to be detected correctly
- Glasses without a rim may not be detected properly.
- Hats includes helmets.

► **IVA Pro License Plate:**

Based on advanced deep learning techniques, IVA Pro License Plate excels in real-time identification of license plates in parking applications or city environments. It supports strategies that improve traffic flow, reduce congestion, and enhance safety at intersections, toll booths, and parking facilities.

Limitations:

- IVA Pro License Plate is only available on DINION 5100i IR and DINION 7100i IR.
- When the IVA Pro License Plate license is set, then the only other IVA Pros available will be IVA Pro Vehicle Make Model and IVA Pro Dangerous Good Signs.
- Tamper detection is not available.
- Maximum speed of the vehicle: 120km/h or 75 mph
- Maximum coverage of 2 lanes, best performance with single lane
- Requires min 16 pixel license plate height in 1280x720 or 1024x576 (8MP cameras)
- Supported countries:
  - Europe:
    - AL Albania
    - AT Austria
    - BA Bosnia and Herzegovina
    - BE Belarus
    - BE Belgium
    - BG Bulgaria
    - CH Switzerland
    - CY Cyprus
    - CZ Czechia
    - DE Germany
    - DK Denmark
    - EE Estonia
    - ES Spain
    - FI Finland
    - FR France
    - GB United Kingdom of Great Britain and Northern Ireland
    - GE Georgia
    - GR Greece
    - HR Croatia
    - HU Hungary
    - IT Italy
    - RKS Kosovo
    - KZ Kazakhstan
    - LT Lithuania
    - LU Luxembourg
    - LV Latvia

- ME Montenegro
- MD Republic of Moldova
- MK North Macedonia
- NL Netherlands
- NO Norway
- PL Poland
- PT Portugal
- RO Romania
- RS Serbia
- RU Russian Federation
- SE Sweden
- SI Slovenia
- SK Slovakia
- TR Turkey
- TR Turkmenistan
- UA Ukraine

▪ GCC (Gulf Cooperation Council)

- BH Bahrain
- KW Kuwait
- OM Oman
- QA Quatar
- SA Saudi Arabia
- AE Uited Arab Emirates

▪ USA all states

► **IVA Pro Vehicle Make Model**

Based on advanced deep learning techniques, IVA Pro Vehicle Make Model excels in real-time identification of vehicles in parking applications or city environments. It enables more refined forensic search for specific vehicles in places where license plate recognition is no option.

Limitations:

- IVA Pro Vehicle Make Model is only available on DINION 5100i IR and DINION 7100i IR.
- When the IVA Pro Vehicle Make Model license is set, then the only other IVA Pros available will be IVA Pro License Plate and IVA Pro Dangerous Good Signs.
- Tamper detection is not available.
- Maximum speed of the vehicle: 120km/h or 75 mph
- Maximum coverage of 2 lanes, best performance with single lane

- Requires min 16 pixel license plate height in 1280x720 or 1024x576 (8MP cameras)
- Supported countries:
  - Europe:
    - AL Albania
    - AT Austria
    - BA Bosnia and Herzegovina
    - BE Belarus
    - BE Belgium
    - BG Bulgaria
    - CH Switzerland
    - CY Cyprus
    - CZ Czechia
    - DE Germany
    - DK Denmark
    - EE Estonia
    - ES Spain
    - FI Finland
    - FR France
    - GB United Kingdom of Great Britain and Northern Ireland
    - GE Georgia
    - GR Greece
    - HR Croatia
    - HU Hungary
    - IT Italy
    - RKS Kosovo
    - KZ Kazakhstan
    - LT Lithuania
    - LU Luxembourg
    - LV Latvia
    - ME Montenegro
    - MD Republic of Moldova
    - MK North Macedonia
    - NL Netherlands
    - NO Norway
    - PL Poland
    - PT Portugal
    - RO Romania
    - RS Serbia
    - RU Russian Federation

- SE Sweden
- SI Slovenia
- SK Slovakia
- TR Turkey
- TR Turkmenistan
- UA Ukraine

- GCC (Gulf Cooperation Council)
  - BH Bahrain
  - KW Kuwait
  - OM Oman
  - QA Quatar
  - SA Saudi Arabia
  - AE Uited Arab Emirates
- USA all states

► IVA Pro License Plate + Make Model

IVA Pro License Plate + Make Model combines the licenses IVA Pro License Plate and IVA Pro Vehicle Make Model.

Limitations see IVA Pro License Plate and IVA Pro Vehicle Make Model.

► IVA Pro Dangerous Good Signs

Based on advanced deep learning techniques, IVA Pro Dangerous Good Signs is designed to deliver exceptional performance in detecting and reading ADR signs on trucks IVA Pro Dangerous Good Signs is specifically tailored for applications in urban traffic management and logistics, enhancing safety and operational efficiency. IVA Pro Dangerous Good Signs supports strategies that improve hazardous material transport monitoring, emergency response, and regulatory compliance.

Limitations:

- IVA Pro Dangerous Good Signs is only available on DINION 5100i IR and DINION 7100i IR.
- When the IVA Pro Dangerous Good Signs license is set, then the only other IVA Pros available will be IVA Pro License Plate and IVA Pro Vehicle Make Model.
- Tamper detection is not available
- Maximum speed of the vehicle: 120km/h or 75 mph
- Maximum coverage of 2 lanes, best performance with single lane
- Requires min 16 pixel height of ADR sign in 1280x720 or 1024x576 (8MP cameras)
- Only ADRs signs, which are commonly used in Europe, are supported.

► **Autocalibration**

Autocalibration based on persons is now available for IVA Pro Perimeter on CPP14 cameras w/o the panoramic, multi or 3000. With IVA Pro Traffic, on supported cameras, it can now use persons as input as well as vehicles.
Limitations:

- Please ensure that the person or vehicle samples are well distributed over the image for best performance.
- Reflections may cause false detections and decrease performance, therefore please remove reflective areas from the processing
- Does not work on top-down views

► **Tamper detection**

Image too dark / too bright and camera moved is now supported on CPP14 as well.

► **IVA Pro on FLEXIDOME panoramic 5100i**

- Added IVA Pro Buildings
  - Note that top-down perspective is only supported for persons. Normal surveillance perspectives support both vehicles and person.
  - IVA Pro Buildings resolution is 480x480 with a minimum object size of 256 square pixel, e.g. 16x16 pixel.
- Intelligent Video Analytics changed over to IVA Pro Perimeter.
  - IVA Flow and Crowd Density Estimation are removed.
  - IVA Pro Perimeter resolution is 480x480 with a minimum object size of 20 square pixel, e.g. 4x5 pixel.
- Autocalibration is not supported.

► **UX:**

- Reordered task list to show more often used tasks at the top
- Set stationary timeout default to 120 sec instead of 30 sec
- Set “stationary persons” default to off.

► **API: Snapshot extraction**

- Available on CPP14 cameras w/o 3000, multi, corner or panoramic cameras.
- Snapshots are delivered via metadata stream for use in 3rd party systems.
- Snapshots will be delivered every 3 seconds.
- Disabled by default.

- Enable via VCA->Metadata->Snapshot->snapshot extraction mode.
- Compatible with IVA Pro Buildings, IVA Pro Perimeter, IVA Pro Traffic, IVA Pro Visual Gun Detection, IVA Pro PPE & IVA Pro Appearance.

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Introduction

IVA Pro are software algorithms that detect behavior of objects within an environment monitored by a video camera and generate alarm events that can be processed further in a CCTV system. They make it possible to capture and evaluate directional movement of objects, apply configured filter rules and to combine these rules, thereby largely preventing false alarms. All algorithms adapt automatically to changing environmental conditions and are therefore non-sensitive to perturbing influences such as rain and small tree movements.

While IVA Pro Perimeter reacts to moving objects of any kind, IVA Pro Buildings, IVA Pro Traffic, IVA Pro Intelligent Tracking and IVA Pro Visual Gun Detection are AI-based and focused solely on upright persons and vehicles, both moving and stationary. Thus, they are inherently even more robust to headlights, shadows, shaking camera and background motion.

Intuitive configuration via graphical user interface is a part of an advanced wizard structure in the Task Manager. Improved with an intuitive configuration option it is possible to provide the complete property information (object type, size, speed, aspect ratio, direction, color) for an object just by clicking it in the live scene.

Camera Trainer is an extension of IVA Pro Perimeter. Based on examples of target objects and non-target objects, the Camera Trainer uses machine learning to allow the user to define objects of interest and generate detectors for them. In contrast to the moving objects detected in general by IVA Pro, Camera Trainer allows detection of both moving and non-moving objects, separates and immediately classifies them. Training can be done both on live video as well as on recordings available through the respective camera. The resulting detectors can be down- and uploaded for distribution to other cameras.

The generated metadata, transmitted to live video or to storage, is used to display overlay graphics and allow retrospective forensic search. Configuration Manager and Bosch Video Management System (BVMS) support forensic search for optimization of the configuration. The camera web page, the Video Security Client (VSC) and the Video Security Apps support a limited forensic search called smart search.

3. Features

General

- Robust object detection and tracking for indoor and outdoor usage in sparsely populated scenes.
- People tracking and counting in well-populated scenes.
- Built-in tamper monitoring detects camera hooding/masking, blinding, defocusing, and repositioning. An indication is shown if the reference image check works and when the alarm will be triggered.
- Two different VCA configurations (profiles) per DINION / FLEXIDOME allow for different settings of different conditions (like day and night)
- 16 different VCA configurations (profiles) for AUTODOME / MIC permit to combine a dome scene position with a certain VCA configuration (profile)
- Camera Trainer is an extension of Intelligent Video Analytics. Based on examples of target objects and non-target objects, the Camera Trainer uses machine learning to allow the user to define objects of interest and generate detectors for them. In contrast to the moving objects detected in general by IVA, Camera Trainer allows detection of both moving and non-moving objects, separates and immediately classifies them. Training can be done both on live video as well as on recordings available through the respective camera. The resulting detectors can be down- and uploaded for distribution to other cameras.

IVA Pro Buildings:

Tracking modes:

- Base tracking (2D)

Object classes:

- Person
- Vehicle

Tasks:

- Detect persons/vehicles within, entering, or leaving single or multiple (up to three) areas in a specified order
- Detect multiple line crossing from single line up to three lines combined in a specified order
- Detect persons/vehicles traversing a route
- Detect loitering in an area related to radius and time
- Detect persons/vehicles which are idle for a predefined time span
- Detect persons/vehicles that started moving
- Detect persons/vehicles who’s properties such as size, speed, direction, and aspect ratio change within a configured time span according to specification (for example something falling down)
- Count persons/vehicles crossing a virtual line

- Count persons/vehicles within an area and alarm if a predefined limit is reached.

Object Filters:

- Object class
- Object width
- Object height
- Object size
- Object direction (two different directions can be defined)
- Object aspect ratio
- Object color

IVA Pro Perimeter:

Tracking modes:

- Perimeter tracking (2D)
- Perimeter tracking(3D)
- People tracking (3D)
- Museum mode (2D)
- Ship tracking (2D)

Object classes:

- Perimeter tracking(3D): Person, bike, car, truck
- People tracking (3D): Person

Tasks:

- Detect objects within, entering, or leaving single or multiple (up to three) areas in a specified order
- Detect multiple line crossing from single line up to three lines combined in a specified order
- Detect objects traversing a route
- Detect loitering in an area related to radius and time
- Detect objects which are idle for a predefined time span
- Detect removed objects
- Detect objects who’s properties such as size, speed, direction, and aspect ratio change within a configured time span according to specification (for example something falling down)
- Count objects crossing a virtual line
- Count objects within an area and alarm if a predefined limit is reached.
- Detect a certain crowd level in a predefined field

Object Filters:

- Object class
- Object width
- Object height
- Object size
- Object speed
- Object direction (two different directions can be defined)
- Object aspect ratio
- Object color

IVA Pro Traffic:

Tracking modes:

- Traffic tracking (2D)
- Traffic tracking (3D)

Object classes:

- Person
- Vehicle
    - Bike
        - Bicycle
        - Motorbike
    - Car
    - Truck
        - Bus

Object classes are hierarchical. That means e.g. a bicycle is also a bike is also a vehicle, and a bus is also a truck is also a vehicle. Object class filters fully support this hierarchy, while visual class labels will only show the deepest level of classification, that is they will show person, bicycle, motorbike, car, truck, and bus labels. Bikes seen from the front can be confused with persons as they look very similar. Also, bus and trucks may be confused.

Tasks:

- Detect persons/vehicles within, entering, or leaving single or multiple (up to three) areas in a specified order
- Detect multiple line crossing from single line up to three lines combined in a specified order
- Detect persons/vehicles traversing a route
- Detect loitering in an area related to radius and time
- Detect persons/vehicles which are idle for a predefined time span
- Detect persons/vehicles that started moving

- Detect persons/vehicles who's properties such as size, speed, direction, and aspect ratio change within a configured time span according to specification (for example something falling down)
- Count persons/vehicles crossing a virtual line
- Count persons/vehicles within an area and alarm if a predefined limit is reached.

Object Filters:

- Object class
- Object width
- Object height
- Object size
- Object speed
- Object direction (two different directions can be defined)
- Object aspect ratio
- Object color

IVA Pro Visual Gun Detection

Tracking modes:

- Visual Gun Tracking (2D)

Object classes:

- Person
- Belongings
    - Weapon

Object classes are hierarchical. That means e.g. a weapon is also a belongings. Object class filters fully support this hierarchy, while visual class labels will only show the deepest level of classification.

Tasks:

- Detect persons or weapons within, entering, or leaving single or multiple (up to three) areas in a specified order
- Detect multiple line crossing from single line up to three lines combined in a specified order
- Detect persons or weapons traversing a route
- Detect loitering in an area related to radius and time
- Detect persons or weapons which are idle for a predefined time span
- Detect persons or weapons that started moving
- Detect persons or weapons who's properties such as size, speed, direction, and aspect ratio change within a configured time span according to specification (for example something falling down)
- Count persons or weapons crossing a virtual line
- Count persons or weapons within an area and alarm if a predefined limit is reached.

Object Filters:

- Object class
- Object width
- Object height
- Object size
- Object direction (two different directions can be defined)
- Object aspect ratio

IVA Pro PPE:

Tracking modes:

- PPE tracking (2D)

Object classes:

- Person
- Vehicle

Tasks:

- Detect people not wearing specified PPE equipment (safety vest, hard hat) within a specified amount of time
- Detect persons/vehicles within, entering, or leaving single or multiple (up to three) areas in a specified order
- Detect multiple line crossing from single line up to three lines combined in a specified order
- Detect persons/vehicles traversing a route
- Detect loitering in an area related to radius and time
- Detect persons/vehicles which are idle for a predefined time span
- Detect persons/vehicles that started moving
- Detect persons/vehicles who's properties such as size, speed, direction, and aspect ratio change within a configured time span according to specification (for example something falling down)
- Count persons/vehicles crossing a virtual line
- Count persons/vehicles within an area and alarm if a predefined limit is reached.

PPE Attributes:

- Safety vest
- Hard hat

Object Filters:

- Object class
- Object width
- Object height

- Object size
- Object direction (two different directions can be defined)
- Object aspect ratio
- Object color

IVA Pro Appearance:

Tracking modes:

- Appearance tracking (2D)

Object classes:

- Person
- Vehicle

Tasks:

- Detect people with specified appearance attributes
- Detect people who are similar to a specified person
- Detect persons/vehicles within, entering, or leaving single or multiple (up to three) areas in a specified order
- Detect multiple line crossing from single line up to three lines combined in a specified order
- Detect persons/vehicles traversing a route
- Detect loitering in an area related to radius and time
- Detect persons/vehicles which are idle for a predefined time span
- Detect persons/vehicles that started moving
- Detect persons/vehicles who's properties such as size, speed, direction, and aspect ratio change within a configured time span according to specification (for example something falling down)
- Count persons/vehicles crossing a virtual line
- Count persons/vehicles within an area and alarm if a predefined limit is reached.

Appearance Attributes:

- Gender: male, female
- Top color: black, grey, white, brown, beige, green, red, blue, yellow, orange, pink, purple
- Top length: short, long
- Bottom color: black, grey, white, brown, beige, green, red, blue, yellow, orange, pink, purple
- Bottom length: short, long
- Hair color: black, grey, brown, blond, red
- Hair length: short, long
- Hat / no hat
- Glasses / no glasses
- Bag / no bag

- Backpack / no backpack

Object Filters:

- Object class
- Object width
- Object height
- Object size
- Object direction (two different directions can be defined)
- Object aspect ratio
- Object color

Easy configuration:

- Wizard structure of task manager guides through the setup
- Broad range of predefined detection tasks available
- Up to 16 independent tasks for alarm generation can be created per channel
- Filters for object type, size, speed, two-way direction, aspect ratio and color are available to create more specific detection rules for every task
- All spatial information like detector lines, detector fields, sensitive area, configured object size, object aspect ratio, object direction and more are graphically drawn into the scene and can be manipulated there for flexible and easy configuration
- Enriched with intuitive “Click-object-in-scene” configuration of object filters
- Graphical statistics for more transparency regarding alarm results
- Guided camera calibration with direct feedback
- Task scripting offers the possibility to combine tasks and thus hugely extend the predefined tasks

Features which need calibration:

All 3D tracking modes, which track objects on the ground plane. These enable:

- Object filter for size and speed in metric or imperial system
- Geolocation, the output of the positions of tracked objects in relation to the camera position.
- Object filter by type “upright person, bike, car, truck via 3D tracking in Intelligent / Essential Video Analytics and via Perimeter tracking (3D) in IVA Pro Perimeter.
- Double detection distance for Intelligent Video Analytics and IVA Pro Perimeter.

Any 2D tracking mode will not make use of calibration at all.

Forensic Search allows to define any task / object filter computation as well as the task combinations available via the task script language.

Smart Search supports the following search tasks:

- Any object
- Line crossing
- Object in field

4. Specific Explanations and Limitations

General

- IVA Pro consist of two parts: The generation of metadata describing the detected objects, which will be stored together with the video, and live alarming or forensic search based on this metadata. In the configuration, all options in the tab “metadata generation” change the generated metadata. Therefore these options are not available for forensic search later on. All alarming as defined in “Tasks” as well as the inspection of metadata can be done both for live alarming and during forensic search.
- Only if IVA Pro is active can it create metadata for live viewing, alarming and for storage. Forensic search therefore just can deliver results in a retrospective search for moving objects in the database for cameras that have had one of these algorithms enabled for the recording.
- The forensic search function for the feature “crowd detection” is only working on the crowd fields you defined before in the camera or in the encoder. Metadata for crowd will only be generated in this crowd fields and cannot be changed for a different crowd fields in Forensic Search.

Limitations of IVA Pro Perimeter:

- Due to reflections, objects or motion might not be reliably detected or too many objects or motions might be detected. False alarms might occur due to:
    - reflective background
    - glass (glazed building frontages)
    - water as a background
    - cones of light moving in the dark
- Sudden appearance of spotlights, moving headlights or torch cones etc. are lightening up an area that might be detected as an “object”.
- Large areas of reflected light can also cause spurious motion detection. However, light reflections caused by falling raindrops, for example, are small enough to be ignored for statistical purposes and owing to the uniform nature of their motion.
- Motion of vegetation due to wind is covered for slow, continuous and uniform wind. If this movement overlaps with objects, false as well as missed detections are possible. To avoid this, adjusting the camera position.
- Strong wind, storms and heavy peak blasts from different directions, especially in the foreground of a scene, might trigger false alarms.
- Suddenly appearing sharp shadows of clouds, trees and buildings can be mistake as objects. Soft shadows are covered by the algorithm.
- An object in strong sunlight with crisp shadow may therefore be registered within its outlines including this shadow. This has to be taken into account for aspect ratio and object size configuration. Soft shadows are covered by the algorithm.
- A constant background is necessary in order to detect motion reliably and to assign that motion to a certain object. The more the background moves, the harder it is to distinguish moving objects from it. For instance, a person walking in front of a hedge that is moving heavily in the wind will very probably not be detected properly.

- Merging effects (outline bubble over more than one object) might occur with objects overlapping or passing-by close to each other. This means the occurrence of a new (bigger) object in the scene and the loss of the former already detected and tracked object IDs with all the consequences to the selected detection tasks. The same applies when these object separate again. To avoid this, please check your scene and camera position to the best and take it into account when setting up the configuration
- If the image consists to a certain extent of nothing but moving objects – in other words if objects cannot be distinguished from each other or from the background – the motion of an individual object cannot be detected (e.g. individuals in a large crowd, idle object in a large crowd).
- The detection and analysis of objects entering the image will be delayed until significant size and motion have been observed. To avoid this, center all evaluations in the image. With Intelligent Video Analytics, the sensitivity parameter allows you to additionally choose a trade-off between fast object detection and less false alerts due to insignificant motion.
- "Click-object-in-scene" configuration: The quality of the metric results provided (size, speed, aspect ratio) is very much depending on the correct calibration. Furthermore it has to be mentioned that the color filter used in the "click-object-in-scene" function is of course related to the outlined area of an object. In most of the cases this outlines include additional surroundings like background (e.g.: asphalt). To concentrate on the real object specification, it is recommended to delete these unwanted colors from the histogram using the "Clear" button.

Minimal object size & differences in processing resolution & frame rate

IVA Pro typically use less resolution than available, and different processing resolutions on different devices and for different image aspect ratios. If not stated differently, the video analytics runs with a framerate of 15 fps if the camera has 30/60 fps base rates, and 12,5 fps for 25 fps base rate. Here the processing resolutions for different video aspect ratios

- IVA Pro Perimeter, 3D tracking on, noise suppression OFF / MEDIUM, for moving / started / stopped objects, video base rate 25/30 fps
  - 4:3 - 512x384
  - 16:9 - 640x360
- IVA Pro Perimeter, 3D tracking off or noise suppression STRONG or placed/taken objects, video base rate 25/30 fps
  - 4:3 - 256x144
  - 16:9 - 320x180
- IVA Pro Perimeter, 3D tracking on, noise suppression OFF / MEDIUM, for moving / started / stopped objects, video base rate 50/60 fps
  - 16:9 - 512x288
- IVA Pro Perimeter, 3D tracking off or noise suppression STRONG or placed/taken objects, video base rate 50/60 fps
  - 16:9 - 256x144

In corridor mode, the height and width are switched. IVA Pro Perimeter can reliably detect objects that have at least 20 square pixel in this internal resolution, e.g. 3x8 pixel for an upright person.

IVA Pro Buildings, IVA Pro Traffic, IVA Pro Visual Gun Detection, IVA Pro PPE & IVA Pro Appearance, if available:

- CPP 13:
  - 16:9 - 640x360
- CPP 14 3100i range or FLEXIDOME multi 7100i
  - 16:9 - 640x360
  - 4:3 – 640x480
- CPP14 FLEXIDOME panoramic
  - 1:1 – 480x480
- CPP 14 & 25/30fps base rate:
  - 16:9 - 1280x720
  - 4:3 - 1024x768
- CPP 14 & 50/60fps base rate:
  - 16:9 - 1024x576

IVA Pro Buildings and IVA Pro Traffic need a minimum object size of 256 square pixels, e.g. 16x16 pixel. IVA Pro Visual Gun Detection needs a minimum object size of 1024 square pixel, e.g. 32x32 pixel.

No IVA Pro Buildings or IVA Pro Traffic available on CPP13 in corridor mode. IVA Pro Visual Gun Detection not available on CPP14 in corridor mode.

Limitations of automatic calibration:

- Calibration can only be done for a single, flat, horizontal ground plane.
- For MIC and AUTODOMES, a proper vertical mount is assumed, otherwise the global calibration will not work.
- The more horizontally the camera is looking, the more accurate calibration needs to be, and automatic calibration may not be accurate enough.
- The larger the focal length and covered distance, the more accurate calibration needs to be, and automatic calibration may not be accurate enough.

Limitations of automatic classification of object type in Perimeter tracking (3D), People tracking (3D):

- Camera must be calibrated and 3D tracking must be active
- No differentiation of crawling or rolling persons from animals. Only upright walking or standing persons are classified as persons.
- Persons and bikes seen from the front are easily confused. A bike from the front will only be classified as such if it is fast enough, otherwise it will be classified as a person.
- No differentiation between bicycle and motorbike.
- Small objects with only a few pixel can be confused (for example, objects far away from the camera).
- Object class may change over time.

- All objects start as an unknown object. They are only classified over the time if the object class can be determined sufficiently reliable.

Limitations of color configuration:

- An object is almost never displayed in a consistent color in the image data. Pixels on the outer edge of a detected object in particular often contain the color information of the background and not the object. Objects such as automobiles comprise a variety of parts (body, windows, tires). Each individual part of the object is displayed in a different color, for example the mudguards in red and the tires in black.
- The color properties of an object depend upon the lighting conditions. If the lighting conditions in a captured image changes, then the captured color of the object also changes. Objects on a street appear in different hues depending on the time of day and weather conditions.
- An object that changes its position or direction of motion may then appear with different color properties. For example, automobiles are often marked on the side in color but not on the back. When people are seen from the front, the hue of the face determines the color impression; however, if the person turns around, the color properties are then defined by the hair or headdress.
- Having a lot of different colors of the spectrum selected and low precision set nearly the entire color spectrum is selected to be detected. This means nearly all colors might trigger unwanted alarms. It is suggested to be more selective and/or precise in these cases.
- To define a specific color nuance, use the slider for saturation to select from more colors out of the spectrum. Up to five colors can be selected for one object. The importance of the colors in the search is from left to right: 25%; 20%; 15%; 10%; 5%. The reason to start with 25% is that objects normally consist of several colors, e.g. a car out of windshields (white or mirror effect), tires (black or dark grey), bumpers (black or dark grey) and finally the car paint we are actually looking for. The pure car paint might cover just 25% of the object therefore the algorithm starts with 25% as for the main color to guarantee realistic search results.
- With the slider precision you define the accuracy of the color match in alarm detection. With the slider being at the far left side (meaning “0”) the selected color is not detected at all. With the slider at the far right (“full”), the color has to match exactly to be detected. Be aware that this “selected range of accuracy” is shared across all several selected colors. This means: one color could take all range of accuracy for itself and the other colors hence have to match exactly or all of the colors share less accuracy for each of them.

Limitations of any 3D tracking modes:

- To activate any 3D tracking, a calibration of the scene is required. If the scene is not well calibrated the tracking may deliver wrong or no results. Both tracking modes assume that all objects move on a single flat ground plane. Multiple floors, staircases, vertical object motion etc. may lead to wrong results.
- 3D tracking requires a camera height of more than 2.5 meter (above 3 meter recommended) to work robustly. By using more elaborate algorithms and prior real-world knowledge, the 3D tracking mode can improve the object tracking robustness.
- In 3D tracking modes, objects that are located entirely above the horizon (e.g. flying objects) are not detected, since object motion here is restricted to the ground plane.

Limitations of People tracking (3D):

- For a top-down perspective: Heights of the camera more than 3 meter (recommended 4 meter). Lens to be chosen that head diameter of heads of persons is optimally between 7% and 14% of the screen width and 8% and 16% of the screen heights.
- Calibration of the scene is required, and tracking should be set to “3D people tracking”.
- Other moving objects, reflections on the ground, blinking lights, changing light conditions, shadows, trolleys or persons carrying bags or umbrellas can lead to wrong counting results.
- Children close to other persons may not be detected.
- The algorithm is not suitable to count persons in crowded areas, or to count persons that stand still for a very long time.
- The amount of people that can be tracked in real time is ~20
- If more than this amount of people is in the scene, there will occur more and more frames without metadata. The tracking will continue correctly nonetheless as long as possible.
- Line counting at the edge of the field of view may not work.
- It will not work in low lighting conditions.

Limitations of counting:

- In addition to the limitations of 3D people tracking, partly concealed objects, objects which cannot be tracked well, e.g. because of speed, background conditions or size will lead to wrong counting results.
- The counter can be reset by reloading the configuration or via a RCP+ command.

Limitations of Ship tracking (2D):

- Only available in IVA Pro Perimeter.
- The tracking mode “water vehicle tracking” needs to be enabled.
- This tracking mode should not be used to track people at a shore.
- Applications like a lock where water rushes in white foam into the lock once the doors are opened are not supported.
- False alerts may occur due to high waves.
- Two boats following each other closely will be detected as one boat only, as the wave of the first boat and thus the second boat as well will be suppressed.

Limitations of Base tracking (2D), Traffic tracking (2D), Traffic tracking (3D):

- Detection requires the object to be occluded by less than 50%.
- Top-down views (birds eye views) are not supported.
- Traffic tracking (3D) requires calibration in order to be activated. It corrects object detections based on size and location, providing more stable tracking, speed and geolocation.
- Bikes seen from the front can be confused with persons as they look very similar. Also, bus and trucks may be confused.

- Rolling, crawling and camouflaged persons will not be detected.
- Not available on CPP13 in corridor mode 90° / 270° image rotation.

Limitations of Visual gun tracking (2D):

- Detection requires the object to be occluded by less than 50%.
- Top-down views (birds eye views) are not supported.
- Objects need to be visible for at least 1 second.
- Not available in corridor mode with 90° image rotation.
- Object color not available.

Limitations on panoramic cameras:

- The algorithms run on the warped image only, though the results can be transformed into de-warped image views.
- The calibration wizards are not available as they are based on straight lines not available in the warped image.

Limitations of geolocation:

- The camera needs to be calibrated and given a geolocation itself. Tracking is only possible on a single ground plane.
- Performance will be better if 3D tracking mode is enabled.
- A viewer to show the geolocations on a map is needed.

Limitations of idle/removed object detection in IVA Pro Perimeter:

- Placed / taken object detection is most robust if the object placed or taken is much smaller than the object which handles it.
- If a person places or removes a bike, the bike can be detected as placed / taken or as started / stopped as the bike is similar in size to the person. Therefore check for all idle / removed objects if this is of interest.
- Cars should always be detected as started / stopped objects as they are much larger then persons entering or leaving them.
- In regions with much background movement only stopped objects will be detected. Activation of the detection all other idle / removed object types in these regions is only possible by deactivating the noise suppression.

Limitations of Camera Trainer:

- Training is only possible via the Configuration Manager. Minimum Configuration Manager version: 6.20
- Training samples are stored in the Configuration Manager. When needing to configure the Camera Trainer detectors from another computer, the samples need to be transferred by hand by saving the VCA configuration under VCA -> Main Operation on the computer with the samples, and loading the VCA configuration from the other computer. The Configuration Manager adds the samples to the VCA configuration and recovers them from there.

- Target objects must have distinct edge patterns which are different to anything else in the scene.
- Objects that are too similar to each other in their edge patterns cannot be separated. This includes not being able to distinguish different car models, person identification, wearing hard hats or safety vests.
- Target objects in the image must have a similar size in pixels, similar perspective from the camera to them, similar pose and similar background.
- The object color filter is not available nor used for Camera Trainer objects.
- No 3D evaluation including geolocation or speed for Camera Trainer objects.
- Not usable for intrusion detection
- Minimum FW version: 7.10
- Depending on the camera and overall camera load, the results from Camera Trainer can “flicker” as they will not be processed on every frame anymore. Reduce frame rate to 25 fps as well as overall camera load in that case.

Limitations of Autocalibration

The Autocalibration uses AI technology to detect and analyze cars in the scene in order to determine calibration parameters. It cannot work if there are no cars in the scene
The following cameras are supported:

- FLEXIDOME 5100i:
  - NDV-5702
  - NDV-5703
  - NDV-5704
- FLEXIDOME 8100i:
  - NDE-8702
  - NDE-8703
  - NDE-8704
- DINION 5100i IR
  - NBE-5702
  - NBE-5703
  - NBE-5704
  -
- DINION 7100i IR:
  - NBE-7702
  - NBE-7703
  - NBE-7704

- Please ensure that the person or vehicle samples are well distributed over the image for best performance.
- Reflections may cause false detections and decrease performance, therefore please remove reflective areas from the processing

- Does not work on top-down views

Limitations of auto-distortion handling in the calibration

The following cameras are supported:

- FLEXIDOME 5100i:
  - NDV-5702
  - NDV-5703
  - NDV-5704
- FLEXIDOME 8100i:
  - NDE-8702
  - NDE-8703
  - NDE-8704
- DINION 5100i IR
  - NBE-5702
  - NBE-5703
  - NBE-5704
  -
- DINION 7100i IR:
  - NBE-7702
  - NBE-7703
  - NBE-7704

Limitations of IVA Pro Privacy:

- Only available on CPP14
- 3000 series cameras are not supported
- FLEXIDOME multi is not supported
- Dewarped modes in FLEXIDOME panoramic are not supported
- 60fps is not supported. Note that while the encoder will automatically use 30fps instead, other parts of the camera may still use 60fps resulting in further limitations. Best set to 30fps directly.
- IVA Pro Privacy can be used together with IVA Pro Buildings, IVA Pro Perimeter, IVA Pro Traffic, IVA Pro Intelligent Tracking, IVA Pro Visual Gun Detection, IVA Pro PPE and IVA Pro Appearance.
- Head/face detection only available with IVA Pro Buildings, IVA Pro Traffic, IVA Pro PPE and IVA Pro Appearance
- Person and vehicle detection only available where IVA Pro supports these classes.
- The synchronization delays the video by 7 frames. If metadata is delayed more than 7 frames, then object-based blurring will not happen. Metadata may be send out before the video, and as live view

shows what is available, will appear to “move” before the objects. This is similar to the delay of metadata which happens in the asynchronous normal modes.

- 4k / 9MP cameras are not able to deliver full frame rate with IVA Pro Privacy active, and their jpegs are not always anonymized correctly.
- 4/5 MP cameras may drop the framerate when 90/270° rotations are enabled.
- When burring is activated in the cameras installer menu, the following encoder stream limitations apply:

Input	Stream1	Stream2	Stream3	Stream4
1920 x 1080	1920 x 1080	120x720	copy	copy
2592 x 1944	1920 x 1440	640 x 480	copy	copy
3840 x 2160	3264 x 1840	copy	copy	copy
	2688 x 1512	copy	copy	copy
	1920 x 1080	120x720	copy	copy
2688 x 1520	2688 x 1520	768 x 432	copy	copy
	1920 x 1080	120x720	copy	copy
2688 x 1520 60fps + rotate	1920 x 1080	copy	copy	copy
3008x3008	2112x 2112	copy	copy	copy
	1792 x 1792	1024 x 1024	copy	copy
2112x 2112	2112x 2112	copy	copy	copy
	1792 x 1792	1024 x 1024	copy	copy

- Privacy masks and other orientation-related parameters must be checked and eventually re-assigned after rotating a camera.
- With electronic image stabilization (EIS) enabled:
    - As privacy masks are applied to the sensor image, privacy masks may jump depending on the corrections induced by EIS and not exactly match with the drawn area.
    - Privacy masks might not match the drawn area depending on the EIS state since the masks are applied before image stabilization. It might be advised to slightly enlarge the privacy mask areas to ensure privacy.
    - The virtual movement of privacy masks and the resulting unveiling of background around the masks might cause false motion detection.

Limitations of IVA Pro PPE:

- Available on CPP14 cameras w/o 3000, multi, corner or panoramic cameras.
- Object detection and tracking is running with 7.5 fps instead of the usual 15 fps. PPE attribute extraction is running roughly once every three seconds for each person.

- In the used video analytics resolution of 1280x720 or 1024x576 (8MP cameras), the person must have a height of at least the following pixels to properly detect PPE.
    - Safety vest: 48 pixel person height
    - Hard hat: 96 pixel person height
- PPE items should be clearly visible and presented to the camera
- The persons should be upright and either standing or walking.
- The persons should be clearly visible and not occluded by other persons or items. Ensure that persons walk through the monitored area single file with enough separation for best performance.
- Ensure that a minimal illumination of at least 200 lx is given in the scene.
- Safety vests includes safety jackets. Safety vests and jackets are defined, amongst others, by their reflective strips. Detection will be delayed until a reflective strip becomes visible.
- In case of white hard hats, ensure that no spotlight causes oversaturation of the hard hat in the video, as detection performance will otherwise drop.

Limitations of IVA Pro Appearance:

- Available on CPP14 cameras w/o 3000, multi, corner or panoramic cameras.
- Object detection and tracking is running with 7.5 fps instead of the usual 15 fps. Appearance attribute extraction is running roughly once every three seconds for each person.
- In the used video analytics resolution of 1280x720 or 1024x576 (8MP cameras), the person must have a height of at least the following pixels to properly detect the respective attributes:
    - Gender: male, female: 64 pixel person height
    - Top color: 64 pixel person height
    - Top length: 64 pixel person height
    - Bottom color: 64 pixel person height
    - Bottom length: 64 pixel person height
    - Hair color: 96 pixel person height
    - Hair length: 96 pixel person height
    - Hat / no hat: 96 pixel person height
    - Glasses / no glasses: 256 pixel person height
    - Bag / no bag: 96 pixel person height
    - Backpack / no backpack: 96 pixel person height
- The persons should be upright and either standing or walking.
- The persons should be clearly visible and not occluded by other persons or items for more than 50%.
- Ensure that a minimal illumination of at least 200 lx is given in the scene.
- Attributes need to be visible to be detected correctly
- Glasses without a rim may not be detected properly.
- Hats includes helmets.

Limitations of IVA Pro License Plate, IVA Pro License Plate + Make Model, IVA Pro Vehicle Make

Model and Dangerous Good Signs:

- IVA Pro License Plate, IVA Pro Vehicle Make Model, IVA Pro License Plate + Make Model and IVA Pro Dangerous Good Signs are only available on DINION 5100i IR and DINION 7100i IR.
- When the license of one of IVA Pro License Plate, IVA Pro Vehicle Make Model, IVA Pro License Plate + Make Model and IVA Pro Dangerous Good Signs is set, then the only other IVA Pros available will be the respective others from IVA Pro License Plate, IVA Pro Vehicle Make Model, IVA Pro License Plate + Make Model and IVA Pro Dangerous Good Signs.
- Tamper detection is not available
- Maximum speed of the vehicle: 120km/h or 75 mph
- Maximum coverage of 2 lanes, best performance with single lane
- Requires min 16 pixel height of license plate respective ADR sign in 1280x720 or 1024x576 (8MP cameras)
- Supported dangerous good signs: All ADR signs
- Supported countries for license plate and vehicle make model:
  - Europe:
    - AL Albania
    - AT Austria
    - BA Bosnia and Herzegovina
    - BE Belarus
    - BE Belgium
    - BG Bulgaria
    - CH Switzerland
    - CY Cyprus
    - CZ Czechia
    - DE Germany
    - DK Denmark
    - EE Estonia
    - ES Spain
    - FI Finland
    - FR France
    - GB United Kingdom of Great Britain and Northern Ireland
    - GE Georgia
    - GR Greece
    - HR Croatia
    - HU Hungary
    - IT Italy
    - RKS Kosovo
    - KZ Kazakhstan
    - LT Lithuania
    - LU Luxembourg

- LV Latvia
- ME Montenegro
- MD Republic of Moldova
- MK North Macedonia
- NL Netherlands
- NO Norway
- PL Poland
- PT Portugal
- RO Romania
- RS Serbia
- RU Russian Federation
- SE Sweden
- SI Slovenia
- SK Slovakia
- TR Turkey
- TR Turkmenistan
- UA Ukraine

- GCC (Gulf Cooperation Council)
  - BH Bahrain
  - KW Kuwait
  - OM Oman
  - QA Quatar
  - SA Saudi Arabia
  - AE Uited Arab Emirates
- USA all states

5. System Requirements

- Configuration Manager 7.74 or newer

Additional information:

- The software functionality is part of the firmware release 8.90 / 9.40 and higher, for the products listed to support it.
- Set-up of IVA Pro, Intelligent Video Analytics and Essential Video Analytics is achieved using Configuration Manager 7.74, which is available for download via the Bosch Website.
- IVA Pro consumes CPU power – please check chapter 4 (Specific Explanations and Limitations) for details.
- Forensic Search is a system feature of Bosch Video Management System (BVMS) and BVMS Viewer.