Integration Guide
AXIS CAMERA APPLICATION PLATFORM
AXIS VMD 2.1

AXIS Video Motion Detection 2.1

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Introduction

This document describes how to use VAPIX® interface to integrate AXIS Video Motion Detection 2.1 (VMD 2.1) application into your own application step by step. Please refer to [1] for detailed information about each API call.

1 Application Overview

AXIS VMD 2.1 is a generic VMD application installable on Axis network cameras and encoders that support AXIS Camera Application Platform. The application is designed to work in most indoor and outdoor installations and in variable light conditions.

AXIS VMD 2.1 aims to reduce storage and bandwidth needs for cameras mounted in low-traffic areas, detecting objects such as persons and vehicles that enter an Area-of-Interest (AOI). The application is perfect for many types of scenarios that have long period of “static” (non-motion) scenes e.g. parking lots, garage, back yards, warehouse, corridors, rooms, etc.

1.1 Supported Products

VMD 2.1 can be used on Axis cameras and encoders using firmware 5.40 or later that also supports AXIS Camera Application Platform.

1.2 VMD 2.1 vs. Built-in Motion Detection

VMD 2.1 and the built-in Motion Detection in the cameras differ in algorithm, configuration, user interface and API.

1.2.1 VMD 2.1 Pros

- VMD 2.1 uses object detection, and not just detecting pixel changes. This reduces false triggers due to low light scenarios and global light changes, e.g. lights on/off and sun/cloud variations.
- VMD 2.1 allows more complex shape of an AOI (polygon with 20 points).
- VMD 2.1 has no additional parameters besides defining the AOI. This makes the installation and configuration very quick and easy, even for laymen.

1.2.2 Built-in Motion Detection Pros

- Built-in Motion Detection allows configuring multiple AOI. However, this has low practical value as multi windows are in most cases used to create a more complex AOI.
- Built-in Motion Detection allows possibility to fine tune sensitivity. However, this fine tuning takes a lot of time and may also make things worse when the light conditions changes over the day. It is very hard to find a configuration that works for variable light.
- Built-in Motion Detection algorithm is faster to detect scene variations (50ms), while VMD 2.1 may require 400ms to detect a moving object. This difference can be ignored if pre-event recording (1~10 seconds) is configured in the video management system.
- Built-in Motion Detection won’t be removed from the camera if a reset to factory default is performed, but VMD 2.1 will be.
1.3 Recommendations

It is not recommended to run VMD 2.1 at the same time as the camera’s included application Motion Detection or another Application Package installed in the camera, because it increases load on the processor, which might affect performance.

2 References

[1] AXIS Video Motion Detection 2.1 API
[2] AXIS Video Motion Detection 2.1 User’s Guide
[3] AXIS VAPIX® HTTP API

3 VMD 2.1 Setup

3.1 Prerequisites

Before you start, check if the Axis product you are using supports VMD 2.1. This means the following requirements must be fulfilled:

**Firmware:** 5.40 or later

**Embedded development version:** 1.10 or later

This can be done by checking these two properties with param.cgi (refer to [3]):

Properties.Firmware.Version
Properties.EmbeddedDevelopment.Version

3.2 Download Application

AXIS VMD 2.1 can be downloaded directly from [www.axis.com/applications](http://www.axis.com/applications).

3.3 Upload to Product

The application package file (*.eap) should then be uploaded to a compatible Axis product with a POST request in the following syntax:

**Syntax:**

http://<servername>/axis-cgi/applications/upload.cgi

**Example:**

```plaintext
POST //axis-cgi/applications/upload.cgi HTTP/1.1
Content-Type: multipart/form-data; boundary=-----------------------------
8ce7265c2922b14
Content-Length: 17717
Expect: 100-continue

-----------------------------8ce7265c2922b14
Content-Disposition: form-data; name="file";
```
3.4 Application Control

After the application is uploaded to the Axis product, you can start, stop, remove or restart it with a GET request in the following syntax:

Syntax:

http://<servername>/axis-cgi/applications/control.cgi?action=<value>&package=<value>&returnpage=<value>

Argument Description:

<table>
<thead>
<tr>
<th>Argument</th>
<th>Valid values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>action</td>
<td>remove, start, stop, restart</td>
<td>Used to remove an application package or to control an already installed application.</td>
</tr>
<tr>
<td>package</td>
<td>VideoMotionDetection</td>
<td>The application to operate on.</td>
</tr>
<tr>
<td>returnpage</td>
<td>&lt;path to return page&gt;</td>
<td>The page to return to after performing the action.</td>
</tr>
</tbody>
</table>

Example:

Start running the application:

http://<servername>/axis-cgi/applications/control.cgi?action=start&package=VideoMotionDetection

3.5 List Installed Applications

Under many circumstances, you may want to check all the installed applications on a product. This can be done by the following GET request:

http://<servername>/axis-cgi/vaconfig.cgi?action=list

3.6 Application Configuration

3.6.1 Get Configuration

The current configuration in VMD2.1 can be retrieved in the XML format via a GET request with the following URL:
3.6.2 Modify Configuration

The only thing you need to configure in VMD2.1 is your own AOI, which is defined by a polygon (refer to [2]). A list of at most 20 points can be used to define the edges of a polygon. The polygon will be drawn in the order the points are listed.

Each point is described as a pair of [X, Y] coordinates. The [1, 1] coordinate is the top right corner of the view field. The [-1, -1] coordinate is the bottom left corner. Each coordinate value is a real number. The coordinates will be converted and rounded to screen coordinates (by pixel) by the application itself.

In the configuration xml file, an AOI is defined by a “Detection Area” and an optional "Exclude Area", as in the following example:

```
<namedObjects>
  <namedObject name="Detection Area">
    <data knownTypeName="geometry.polygon">
      <polygon>
        <point x="0.153115311531153" y="0.264926492649265"/>
        <point x="0.962596259625963" y="-0.464946494649465"/>
        <point x="0.646964696469647" y="-0.62996299629963"/>
        <point x="-0.128112811281128" y="0.17991799179918"/>
      </polygon>
    </data>
  </namedObject>
  <namedObject name="Exclude Area">
    <data knownTypeName="geometry.polygon">
      <polygon>
        <point x="-0.168716871687169" y="2.49024902490249E-02"/>
        <point x="0.843784378437844" y="0.14991499149915"/>
        <point x="0.843784378437844" y="-0.24992499249925"/>
        <point x="-0.021902190219022" y="-0.4349349349349435"/>
      </polygon>
    </data>
  </namedObject>
</namedObjects>
```

The only thing needs to be done in order to configure your own AOI is to modify the coordinates in the above section in the configuration file and then send the file to Axis product via a Post request with the following syntax (Please note that for all POST method, the parameters must be included in the body of the HTTP request):

```
http://<servername>/axis-cgi/vaconfig.cgi?action=modify&name=VideoMotionDetection
```

Example:

```
POST http://<servername>/axis-cgi/vaconfig.cgi HTTP/1.0
Content-Type: application/x-www-form-urlencoded
Content-Length: <content length>
```
4 Event Handling
Whenever VMD2.1 detects a motion, it will be sent as an event notification in the event stream from the Axis product.

4.1 Get Event Declaration
In order to configure actions when a motion event is triggered, it’s important to get the motion event declaration first. Event declaration can also be used to construct an event filter expressions for notification subscriptions.

4.1.1 GetEventInstances
The VAPIX® Event Service provides a method GetEventInstances to fetch all the currently available events’ declarations from an Axis product.

The entry point of the event service is: http://SERVER/vapix/services

The event service WSDL file is located at: http://SERVER/wsdI/vapix/EventService.wsdl

4.1.2 Event Declaration Syntax
The event declarations retrieved via GetEventInstances are listed as a wstop:TopicSet tree containing MessageInstance elements in each leaf topic, which describes the contents of the event that can be emitted for the given topic.

The topic tree has the following syntax:

```
<aev:GetEventInstancesResponse>
<wstop:TopicSet>
<TOPIC1 aev:NiceName="topic1_nicename" wstop:topic="true">
<TOPIC2 aev:NiceName="topic2_nicename" wstop:topic="true">
<aev:MessageInstance aev:isProperty="true">
<aev:SourceInstance>
<aev:SimpleItemInstance aev:NiceName="key_nicename" Type="VALUETYPE" Name="KEYNAME">
<aev:Value aev:NiceName="value1_nicename">value1</aev:Value>
<aev:Value aev:NiceName="value2_nicename">value2</aev:Value>
...
</aev:SimpleItemInstance>
...
</aev:SourceInstance>
<aev:DataInstance>
<aev:SimpleItemInstance aev:NiceName="NICENAME" Type="VALUETYPE"
```

4.1.3 VMD2.1 Event Declaration

The declaration of motion event sent by VMD2.1 looks like this:

```xml
<tnsaxis:VideoMotionDetection aev:NiceName="VideoMotionDetection"
  <motion wstop:topic="true" xmlns:wstop="http://docs.oasis-open.org/wsn/t-1">
    <aev:MessageInstance aev:isProperty="true">
      <aev:SourceInstance>
        <aev:SimpleItemInstance aev:NiceName="Area ID" Type="xsd:string"
Name="areaid">
          <aev:Value>0</aev:Value>
        </aev:SimpleItemInstance>
      </aev:SourceInstance>
      <aev:DataInstance>
        <aev:SimpleItemInstance aev:NiceName="Polygon info"
Type="xsd:string" Name="areapolygon" />
        <aev:SimpleItemInstance aev:NiceName="Motion detected"
Type="xsd:boolean" Name="active" isPropertyState="true" />
      </aev:DataInstance>
    </aev:MessageInstance>
  </motion>
</tnsaxis:VideoMotionDetection>
```

The event named motion is sent every time a motion is detected or not detected any more.

areaid defines the id of an AOI. Currently 0 is the only valid value as only one AOI is supported by VMD2.1. However, more AOIs may be supported in the future versions.
Therefore, areaid can be used as event filter to e.g. trigger an alarm only when events are detected in a specific AOI.

areapolygon defines an AOI polygon. It should be treated as metadata and should not be used to as event filter.

The value of active defines if a motion is active or not. A motion is active until an event with active=0 is sent. It should be used as event filter.

4.2 Subscribe to Event Notification

To retrieve the motion event notification sent from VMD 2.1, you need to subscribe to the RTSP stream using the following URL (Set video = 1 if you want to retrieve video stream at the same time as event stream):

rtsp://<servername>/axis-media/media.amp?video=0&event=on&eventtopic=onvif:RuleEngine/axis:VideoMotionDetection/motion

The response is provided in XML format according to [4]. Everything specific to VMD2.1 is marked in bold:

Here UtcTime refers to the absolute time this event took place. Axis products use RTP timestamp when sending video stream, which is relative time. The conversion from absolute
time to RTP timestamp can be found in the RTCP packets which are used to synchronize event and video stream.