AiDANT Queue User Guide

1. Overview

The **AiDANT Queue** application developed by AiDANT.ai is an AXIS ACAP application that can be used to monitor a queue and notify the user if any of the following conditions arise:

- the queue is too long
- the queue is too slow
- the cashier is absent for too long
- the cashier is absent but customers are present in the queue

The application can monitor queues comprised of people and/or various vehicles, and optionally serviced by a cashier (or equivalent resource). Thus AiDANT Queue is suitable to monitor for example, queues of customers waiting to pay for retail purchases, persons waiting to be serviced by a bank teller, or queues of vehicles in drive-through restaurant.

This application can be installed into any supported AXIS camera with a DLPU processor, ARTPEC-7 or ARTPEC-8.

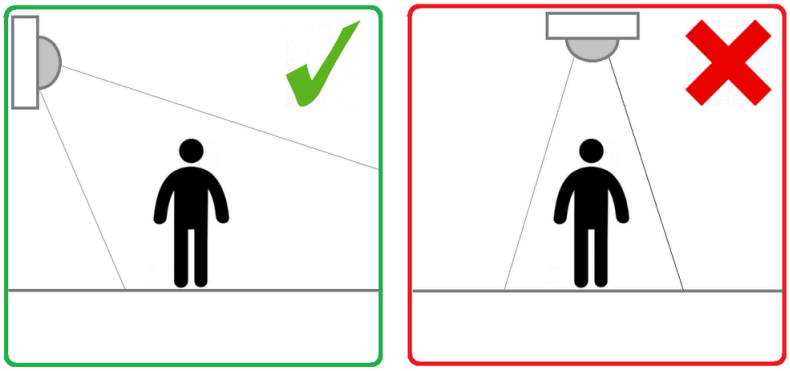
2. Glossary

Queue Area	A user-defined area within the camera's viewport that defines where customers are expected to queue up.
Cashier Area	A user-defined area within the camera's viewport that defines where the cashier is expected to be present.
Report	A comma separated values (CSV) file containing historical information gathered by the camera.
Entrants	The number of persons/vehicles who have entered the queue.
Throughput	The number of entrants who have exited the queue.
Average Duration	The average amount of time each entrant has spent waiting in the queue.
Report Interval Time	How often to calculate a new entry in the report. See section "Report Interval and Compute Statistics".
Compute Statistics Time	For user interface only: How far back to calculate Entries, Throughput and Average Duration. See section "Report Interval and Compute Statistics".

3. Requirements

In order to run the AiDANT Queue application, you will need:

1. An AXIS camera with a DLPU chip and a non-fisheye lens.
2. The latest version of the AXIS camera firmware installed in the camera. Firmware 10.6 and later is required.
3. A valid software license key file for the AiDANT Queue application for the camera. Please contact AiDANT to obtain a software license key file.
4. A copy of the AiDANT Queue software application. Download and extract (unzip) the eap application file through the link https://downloads.aidant.online/.
5. The minimum Pixel Per Foot requirements are: 20 PPF.
6. **Important!** Camera positioning: The camera needs to be positioned in such a way that it can see as much of the human body/object as possible. The software is **not intended to be used in top-view** (ceiling mounted, facing straight down).



4. Effective Ranges

Artificial intelligence applications demand a lot of hardware processing power. This application analyses an optimized internal video stream which is separate from the stream selected by the user for viewing or recording.

As a result, selecting a higher resolution viewing stream (more megapixels) will not affect the detection results nor range. This means that using the PPF (pixel per foot) unit of measure can be misleading.

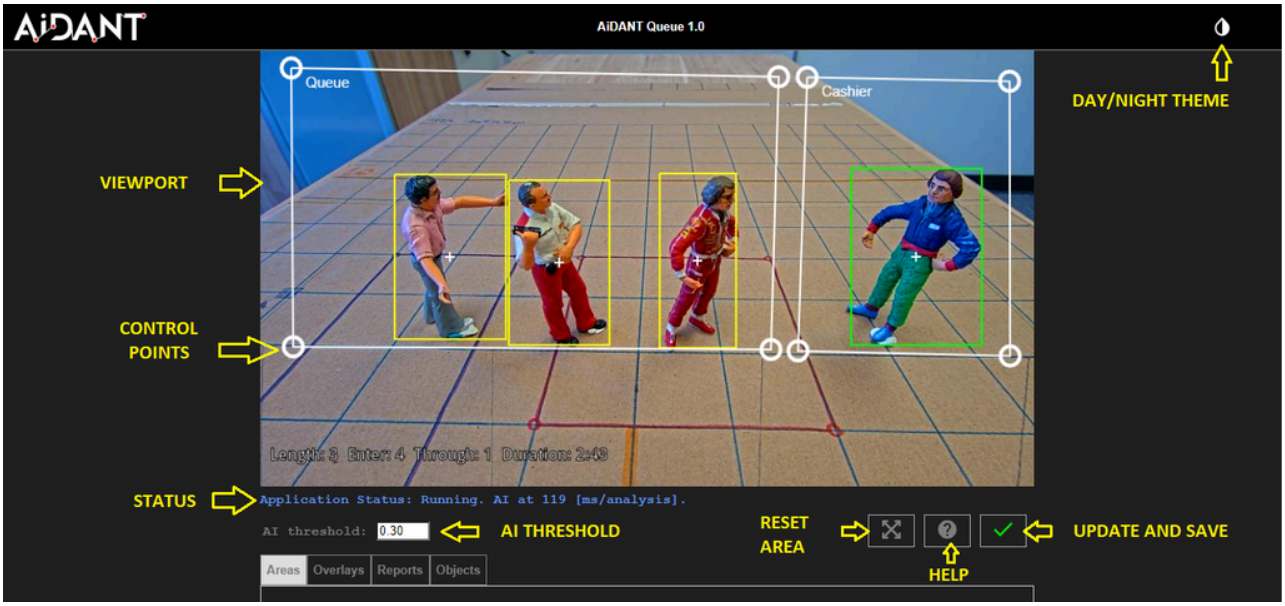
The effective detection range for **moving or stationary persons** will be, accordingly: 10 meters* (~30 feet) for no optical zoom, and a multiple of the optical zoom factor for zoomed streams. eg: 20 meters (~60 feet) for zoom x2.

5. Installation

Once all the requirements are satisfied, please do the following:

1. Access the camera through any web browser.
2. Go to *Settings→Apps* .
3. Click on *Add* and install the .eap application file.
4. Click on *AiDANT Queue* and install the license key file provided to you.

6. Main Controls



- The '*AI Threshold*' is a number between 0 and 1. It is used to specify how sensitive the AiDANT Queue application is in identifying a person/vehicle in the camera viewport. (i.e. the higher the AI Threshold the more selective the application is in identifying persons on the screen.). A value of 0.40 is the default as it generally provides good results. However every installation is different and you may have to adjust the value of the AI Threshold to obtain the best results for your environment.
- The '*Reset Area*' button is used to restore the Queue and the Cashier areas to their default positions.
- The 'Help' button is used to open the user guide.
- The '*Update and Save'* button is used to save your configuration changes.

7. Areas of Interest

- To configure the '*Queue*' and '*Cashier*' functionality, select an area to monitor by dragging the control points until the polygon shape covers the area of interest. The Areas of Interest can have 4, 6 or 8 control points.
- Queue: Indicate the minimum number of persons/vehicles in the queue needed to trigger the alarm by using the '*Notify only when queue count is at least*' field. The user can also indicate the average duration of time needed for a person/vehicle to wait in the queue by using the *"Notify when average duration is at least'*. The average is a running average, computed for the time specified in the "*Compute statistics for previous minutes*" field. eg: the last 60 minutes.
- Cashier: 'Enable Cashier' (optional) will turn on the cashier functionality. Use the "*Notify when unattended for*" functionality to trigger an event when cashier absent for a specific period of time. Use the "*Notify when unattended but queued customers"* to trigger an event when cashier absent for a specific period of time. Note: This functionality can be connected to an Axis loudspeaker through the Axis event system to summon a cashier when needed.
- Use 'Exclusion' zones to keep areas out of the analysis.
- The '*Maximum seconds a lost person/object is still tracked*' value enables the user to configure what happens to the tracking mechanism once a person/object is not detected anymore. For example, if a person/object goes behind a pillar in the field of view.
- Remember to save your changes by pressing the '*Update and Save*' button (the green checkmark).

Warning: If the value of '*Maximum seconds a lost person/object is still tracked*' is too high, then a person/object exiting the camera field of view might 'transfer' the tracker to a different person/object entering the field of view within a few seconds, affecting accuracy. It is recommended to keep this value below three seconds.

When a target is detected, a bounding box will be shown on the stream in the application. The default color for the markers is green. If a target enters the area of interest, then the marker color changes from green to yellow.

8. Overlays

- You can chose to display the bounding boxes as an overlay in a camera video stream by clicking "*Include detection overlays in this video stream*" and selecting the desired stream.
- You can chose to anonymize the bounding boxes as an overlay in a camera video stream by clicking "*Include anonymization overlays in this video stream*" and selecting the desired stream.

9. Reports

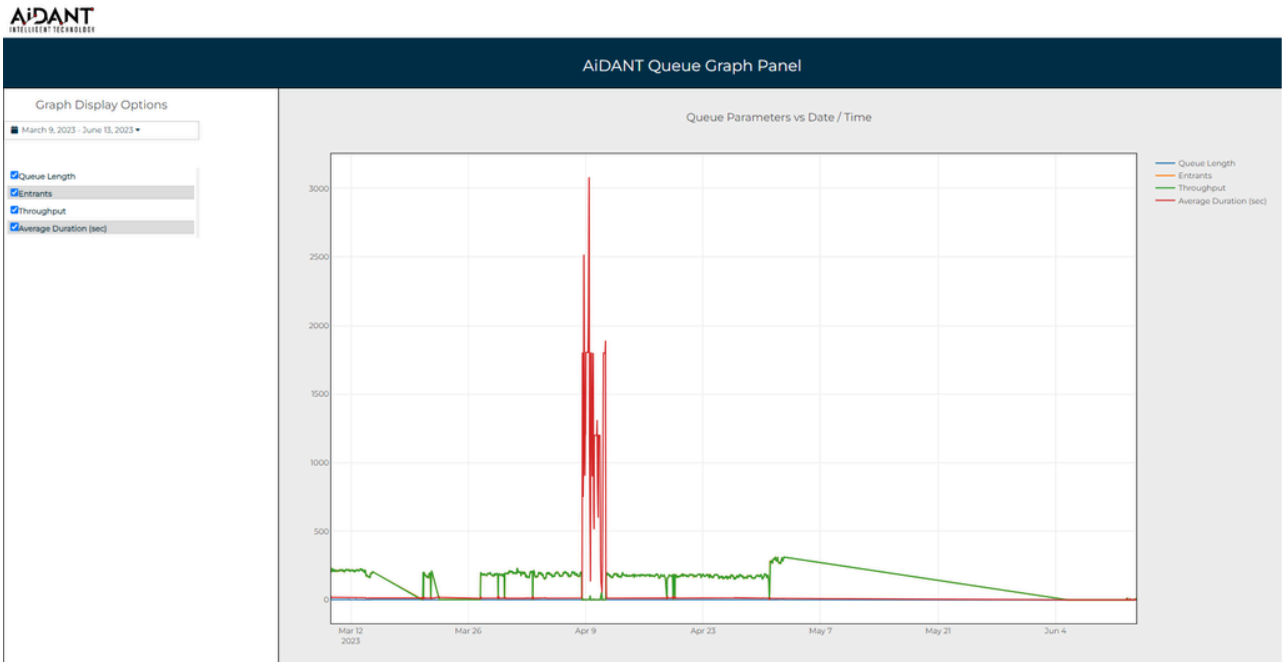
- The '*Report Interval*' value represents how often an entry (row) is added into the report file, in minutes. Default is sixty minutes.
- The '*Get Report*' button will allow for the download of a report file in csv format. The data will include record for the past two years. The report file will contain the Date, Queue Length, Entrants, Throughput and Average Duration.
- Open the csv report file in you software of choice such as Excel or MS Power BI to create graphs and analysis from the raw data.
- The report data accessed programmatically by using Axis Vapix commands. Please refer to Appendix '**Vapix**' for more details.

Important: Make sure to download your report periodically, as data prior to two years ago will not be kept.

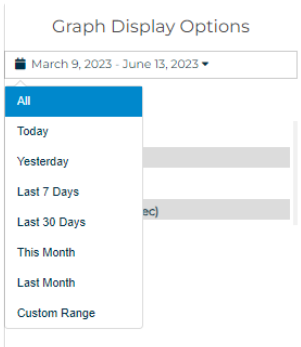
Important: If analyzing the data using Excel graphs, deleting rows might cause the horizontal (category) axis to **not use the date column**. To solve this, **save the file** after deleting rows, then proceed to create graphs.

10. Graph Panel

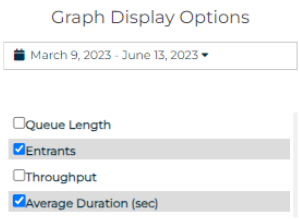
The downloadable report data feature provides the most flexible means of analyzing the archived data from the Queue application. However in some cases a user may just want to see a quick graph of the historical data, to observe changes over time. For these workflows AiDANT Queue provides a simple way to create powerful interactive graphs directly in the browser. Simply navigate to the "Reports" tab of the Queue application page and click the "Graph Panel" button. A new tab will open in the user's browser showing a graph of the currently archived data.



For the initial display of the Graph Panel all of the available archive data is displayed: all of the defined variables (Queue Length, Entrants, Throughput and Average Duration) and for all of the time periods. In order to select a different starting time and ending time for the graphed data, click on the calendar drop down in the Graph Display Options panel and choose an appropriate range of dates.



In order to show or hide particular variables from the graph check or uncheck the variable selection boxes in the Graph Display Options panel as appropriate.



Double-clicking on a variable name will select that variable for display and unselect all other variables.

Note that in the top right hand corner of the Graph panel is a tool bar to support interactive manipulation of the graph:

The meaning of the respective tool bar icons :

- Download a snapshot image of the current graph to the user's computer.
- Interactively zoom into a user-specified section of the horizontal axis (date range) of the current graph.
- Interactively pan of the current graph.
- Zoom in the display of the entire current graph.
- Zoom out the display of the entire current graph.
- Reset the display of the current graph.

11. Objects

The application can detect the following objects:

Persons, Motorcycles, Cars, Trucks, Buses, Bicycles, Trains, Boats, Airplanes.

12. Event Triggering

To setup event triggering:

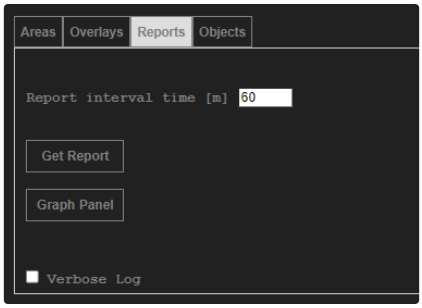
1. Go to *System→Events.*
2. Click on + under *Rules* and select *the Condition* under the *Condition* field.
3. Fill in the *Name* field and select an *Action.*

If you wish to set up email notification, click on the *Recipients* tab. Press the + button and fill in the fields.

Once done, you can go back to *Actions* under the *Rules* tab and select the appropriate action you want that requires a recipient.

13. MQTT Publishing

Queue supports the publishing of its current data counts using the MQTT messaging protocol. The application will publish a 'Data Event' every <Report Interval> minutes, where <Report Interval> is the value of the Report interval time setting (in minutes) in the Reports tab of the Queue application user interface:



Queue allows publishing the current data counts using JSON formatting or XML formatting for the payload.

13.1 JSON Formatting

To subscribe to the Queue MQTT data events using JSON formatting:

- In camera user interface, open System/MQTT.
- Click “Connect” to connect to MQTT, set Host IP address.
- In Tab MQTT Publication, add a new Condition: “AiDANT Queue JSON Data”. Click save or update as needed.

Now any MQTT subscriber can subscribe to the topic:

“axis/[MAC]/event/tns:axis/CameraApplicationPlatform/AiDANTQueueApplication/AiDANTQueueJSONData” where [MAC] represents the MAC Address (serial number) of the camera running Queue.

The Queue MQTT JSON data event will have the following format:

```
[MAC]/event
{
  "topic":"axis:CameraApplicationPlatform/AiDANTQueueApplication/AiDANTQueueJSONData",
  "timestamp":1689106396376,
  "message":
    {
      "source":{},
      "key":{},
      "data":
        {
          "queueLength":"2",
          "throughput":"4",
          "entrants":"5",
          "averageDuration":"11"
          }
    }
 }
```

In particular the data member is a sequence of key-value pairs where the keys are the names of the various items that Queue has tabulated for this reporting interval (following the same convention for variable names as used in the Reporting and Graph Panel sections above), and the values are the corresponding counts (represented as strings). For example, in the sample event above the data contains the key-value pair

```
"averageDuration":"11"
```

This key-value pair represents that during the current reporting interval each person that entered the queue remained in the queue for 11 seconds.

13.2 XML Formatting

To subscribe to the Queue MQTT data events using XML formatting:

- In camera user interface, open System/MQTT.
- Click “Connect” to connect to MQTT, set Host IP address.
- In Tab MQTT Publication, add a new Condition: “AiDANT Queue XML Data”. Click save or update as needed.

Now any MQTT subscriber can subscribe to the topic:

“axis/[MAC]/event/tns:axis/CameraApplicationPlatform/AiDANTQueueApplication/AiDANTQueueXMLData” where [MAC] represents the MAC Address (serial number) of the camera running Queue.

The Queue MQTT XML data event will have the following format:

```
[MAC]/event
{
  "topic":"axis:CameraApplicationPlatform/AiDANTQueueApplication/AiDANTQueueXMLData",
  "timestamp":1689106396381,
  "message":{
    "source":{},
    "key":{},
    "data":
      {
        "payload":"<analyticdata>
                        <queueLength>2</queueLength>
                        <throughput>4</throughput>
                        <entrants>5</entrants>
                        <averageDuration>11</averageDuration>
                  </analyticdata>"
      }
   }
}
```

In particular the data member is a single key-value pair with key name “payload” and value a string representation of the various items that Queue has tabulated for this reporting interval (following the same convention for variable names as used in the Reporting and Graph Panel sections above).

14. Connecting the events to VMS

Milestone

To receive events from AiDANT applications in Milestone XProtect:

1. In Milestone XProtect Management Client 'Site Navigation' panel, expand 'Servers/Recording Servers'.
2. In the 'Recording Server' panel select the desired camera and channel to open the 'Properties' dialog.
3. In the 'Properties' dialog', press the button 'Events' (at the bottom).
4. Press the button 'Add' for events to open the 'Select Driver Event' dialog.
5. In the dialog 'Select Driver Event', select the required events associated with your AiDANT product.
6. Create Alarms by selecting 'Alarms/Alarm Definitions', and configuring the definitions accordingly. Remember to save!

As events are 'Stateful', an 'on' event sent by the AiDANT application will appear in Milestone as 'Rising', while an 'off' event sent by the AiDANT application will appear in Milestone as 'Falling'.

Tip: If you cannot see the events associated to the camera, you might need to update the remote site hardware.

1. On the central site, expand Servers and select Recording Servers.
2. In the Overview panel, expand the required recording server, select the relevant remote system.
3. Right-click it.
4. Select Update Hardware. This opens the Update hardware dialog box.
5. The dialog box lists all changes (devices removed, updated and added) in the remote system since your Milestone Interconnect setup was established or refreshed last.
6. Click Confirm to update your central site with these changes.

Genetec

1. In 'Security Center' open the configuration tool and select the desired unit to configure.
2. In the properties tab, enable the desired AiDANT events by selecting the AiDANT application from the applications list, and choosing the events from the 'Application Events' list.
3. Configure your alarms or bookmarks using 'Genetec Actions': In 'General Settings', select 'Actions'. Configure your event-to-action accordingly.

Tip: If you cannot see the events associated to the camera, refresh the camera connection.

AXIS Camera Station

1. Select 'Recording and events/Action Rules'.
2. Click 'New'.
3. Click 'Trigger/Device Event/OK'.
4. Select Device and Event.
5. Filter Active Yes for the ON state and vice versa.
6. Press 'Next' and select your desired action. Finish.

15. Appendix

15.1 Troubleshooting

Question: How can I see the application log?

Answer: The application log can be accessed from the 'Advanced' Tab in the user interface.

Question: Why doesn't my application show the correct User Interface after I upgraded the application?

Answer: When upgrading from a previous version without uninstalling please press CTRL+F5 in your computer to refresh the browser contents. (in laptop: Function + Ctrl + F5)

Question: The application is not starting as expected, what can I do?

Answer: If the the installation completed successfully, please make sure that you have the latest AXIS OS firmware in your camera (in the camera user interface, select Maintenance from the lefthand menu panel, then choose AXIS OS Upgrade). Then restart the application and press Ctrl+F5 (in laptop: Fcn+Ctrl+F5) in your browser to clear the cache.

If the problem is not resolved:

1. Delete the application and install it again, apply license.
2. Start the application. Wait one minute before opening application page.

If the problem is still not resolved:

3. Restart the camera (in the camera user interface, select Maintenance from the lefthand menu panel, then choose Safe Restart). Then repeat steps 1 and 2.

If those steps do not resolve the issue, please contact us for a support meeting.

15.2 VAPIX

If needed, the queue status, application status code and application status string can be polled through Axis VAPIX commands as follows:

Queue Status

http://[IP]/local/aidant_queue/cgi/work.cgi?action=get_queue_status

Result: JSON response, eg: { "queue": 5, "cashier": 1 }

Application Status String

http://[IP]/local/aidant_queue/cgi/work.cgi?action=get_status_string

Result: Running

Application Status Code

http://[IP]/local/aidant_queue/cgi/work.cgi?action=get_status_code

Result: 500

15.3 Report Interval and Compute Statistics

- Report Interval Time: How often to add a new entry to the report.
- Compute Statistics Time: For user interface only, how far back to calculate entries, throughput and average duration.

	User Interface	**Report**
Entries	The number of people entered the queue in the last **Compute Statistics** minutes	The number of people entered the queue in the last **Report Interval** minutes
Throughput	The number of people who exited the queue in the last **Compute Statistics** minutes	The number of people who exited the queue in the last **Report Interval** minutes
Average Duration	Average time waiting during last **Compute Statistics** minutes.	Average time waiting during last **Report Interval** minutes.
Queue Length	Length now.	Length when entry added to the report.