cyclomedia

Atlas Panorama Rendering Service

Index

1. Introduction

1.1 Purpose

This document describes the Application Programmer's Interface (API) offered by the Atlas Panorama Rendering Service.
The Panorama Rendering Service is a service that creates cut-outs of Cyclomedia panoramic images in a central perspective. The result is an image in JPEG format.

The Panorama Rendering Service can also be used as an add-on of the Atlas recording service as it combines address information with recording information. This results in the ability to retrieve a list of recordings near an address.

1.2 Audience

This document is intended for developers that want to use the Atlas Panorama Rendering Service.

1.3 Prerequisites

To be able to use this service you need to obtain a Cyclomedia developer key. It can be requested via www.cyclomedia.com

2. Requests

2.1 Authentication

The HTTP Basic Authentication method is used to authenticate requests to the Panorama Rendering Service. A username and password can be obtained from CycloMedia.

2.2 Operations

The service is available from https://atlasapi.cyclomedia.com/api/panoramarendering. The HTTPS protocol is used to provide encrypted communication and secure identification of the web server.

The Panorama Rendering Service is a REST style service. The following operations are possible:

- Render, renders an image based on the id of a recording.

- RenderByLocation2D, renders an image based on the recording nearest to a given 2D location.

- RenderByLocation3D, renders an image based on the recording nearest to a given 3D location.

- RenderByAddress, renders an image based on the recording nearest to a specified address.

- RenderSurface, Returns an image of a flat surface as defined by a set of four coordinates.This is typically useful for creating surfaces on 3D models

- ListByAddress, Lists the recordings nearest to a given address location, includes historical recordings.

- ListByLocation2D, Lists the recordings nearest to a given 2D location, includes historical recordings.

- ListByCoordinates, Lists the recordings nearest to a given list of coordinates, includes historical recordings.

All parameters are in degrees if not specified otherwise.

2.3   Response format

The response of ALL methods is a jpeg for the runtime rendered image, if not specified otherwise.

Metadata is returned in HTTP response headers, example:

```
Recording-Id: 5D0G4E8O
Recording-Date: 2011-09-15T12:48:07.5900000+02:00
Render-Width: 1024
Render-Height: 786
Render-FocalLength: 512.000
Render-HFov: 90.000
Render-VFov: 75.018
Render-Yaw: 0.000
Render-Pitch: 0.000
Render-Roll: 0.000
RecordingLocation-SrsBase: EPSG:4258
RecordingLocation-Longitude: 5.089819277
RecordingLocation-LongitudePrecision: 0.008
RecordingLocation-Latitude: 52.109259974
RecordingLocation-LatitudePrecision: 0.004
RecordingLocation-Height: 46.918
RecordingLocation-HeightPrecision: 0.009
RecordingLocation-GroundLevelOffset: 2.01
```
```
RecordingLocation-YawPrecision: 0.0075
```

3.   Operations

3.1   Render

Renders an image based on the id of a recording

Request format
The request has the following format:

/Render/<recordingId>/?

width=<width>&height=<height>&srsName=<srsName>&yaw=<yaw>&pitch=<pitch>&hfov=<hfov>&apiKey=<apiKey>

With parameters:

Attribute	Default	Max	Description
recordingId	-		The id of the recording, e.g. 510M5HLV.
width	1024	8192	The width of the generated image in pixels. 0 = automaticly use the width that corresponds to the optimal resolution
height	768	8192	The height of the generated image in pixels. 0 = automaticly use the height that corresponds to the optimal resolution
srsName			Spatial reference system The definition of the srs is neccesarry to accomplish the "meridian convergence" correction for the given <yaw> If not defined, the native reference system (ETRS89) is used. epsg:28992 = RD
yaw	0		Horizontal direction in degrees in the centre of the generated image. The yaw is expressed and used as a global yaw in the given spatial reference system (srs) 0= north direction rendered in centre of image
direction	-		Horizontal direction in degrees relative to the RecorderDirection (driving direction). This parameter overrides the yaw parameter, when used.
pitch	0	-90 90	Vertical direction in degrees in the centre of the generated image. 0 = horizon rendered in centre of the image
hfov	90	<180	Horizontal field of view in degrees.
apiKey	-		The developer key obtained from CycloMedia to authorize access to this service

The complete url for a request is:
https://atlasapi.cyclomedia.com/api/PanoramaRendering/Render/{ recordingId }/?

Example:

> https://atlasapi.cyclomedia.com/api/PanoramaRendering/Render/5D2ZQNG7/?apiKey=
> <put _your_api_key_here>&width=1024&height=768&srsName=EPSG:28992&yaw=180

Parameters after the question mark "?" may be omitted. The default values as listed in the table will then be used instead.

The Vertical Field of view (VFov) is a result of the other parameters. To achieve a certain VFov a combination of the HFov and the width height ratio can be used.
i.e when the requested width and height are equal, the VFov is also equal to the HFov.

3.2   RenderByLocation2D

Renders an image based on the nearest recording to a given location. The image is automatically directed horizontally and vertically to the given location. The z system used is automatically related to the coordsystem <srs>

Request format
The request has the following format:

/ RenderByLocation2D/<srs>/<x | lon>/<y | lat>/ ?

width=<width>&height=<height>&hfov=<hfov>&apiKey=<apiKey>

With parameters:

Attribute	Default	Max	Description
srs	-		EPSG code of the spatial reference system, without prefix.
x or lon	-		X coordinate in metres for a projected coordinate system, in degrees for a geographic coordinate sysrtem.
y or lat	-		Y coordinate in metres for a projected coordinate system, in degrees for a geographic coordinate sysrtem.
width	1024	8192	The width of the generated image in pixels. 0 = automaticly use the width that corresponds to the optimal resolution
height	768	8192	The height of the generated image in pixels. 0 = automaticly use the height that corresponds to the optimal resolution
hfov	90	<180	Horizontal field of view in degrees.
index	-1	0,1,2	Not used of ommited or set to -1 Otherwise the images are based on views from a multiple of 3 nearby recording locations 0 = left 1 = central (same as when ommitted) 2 = right The views are directed to the requested location.

apiKey	-		The developer key obtained from CycloMedia to authorize access to this service

The complete url for a request is:

https://atlasapi.cyclomedia.com/api/PanoramaRendering/RenderByLocation2D/{srs}/{x}/{y}/?

Example:

https://atlasapi.cyclomedia.com/api/PanoramaRendering/RenderByLocation2D/28992/1614 07.23/383075.57/?width=1024&height=786&apiKey=<put_your_api_key_here>&index=0

Parameters after the question mark "?" may be omitted. The default values as listed in the table will then be used instead.

3.3   RenderByLocation3D

Renders an image based on the nearest recording to a given location. The image is automatically directed horizontally and vertically to the given location. The z system used is automatically related to the coordsystem <srs>

Request format
The request has the following format:

/ RenderByLocation3D/<srs>/<x | lon>/<y | lat>/ <z>/?

width=<width>&height=<height>&hfov=<hfov>&apiKey=<apiKey>

With parameters:

Attribute	Default	Max	Description
srs	-		EPSG code of the spatial reference system, without prefix.
x or lon	-		X coordinate in metres for a projected coordinate system, in degrees for a geographic coordinate sysrtem.
y or lat	-		Y coordinate in metres for a projected coordinate system, in degrees for a geographic coordinate sysrtem.
z			Z coordinate in metres.
width	1024	8192	The width of the generated image in pixels. 0 = automaticly use the width that corresponds to the optimal resolution
height	768	8192	The height of the generated image in pixels. 0 = automaticly use the height that corresponds to the optimal resolution
hfov	90	<180	Horizontal field of view in degrees.
index	-1	0,1,2	Not used of ommited or set to -1

			Otherwise the images are based on views from a multiple of 3 nearby recording locations 0 = left 1 = central (same as when ommitted) 2 = right The views are directed to the requested location.
apiKey	-		The developer key obtained from CycloMedia to authorize access to this service

The complete url for a request is:

> https://atlasapi.cyclomedia.com/api/PanoramaRendering/RenderByLocation3D/{srs}/{x}/{y}/ {z}/?

Example:

> https://atlasapi.cyclomedia.com/api/PanoramaRendering/RenderByLocation3D/28992/1 614 07.23/383075.57/35.30/?width=1024&height=786&apiKey=<put_your_api_key_here>&i ndex=0

Parameters after the question mark "?" may be omitted. The default values as listed in the table will then be used instead.

3.4   RenderByAddress

Renders an image based on the nearest most recent recording to a given address location.
The image is automatically directed horizontally to the given address location.

Request format
The request has the following format:.

/ RenderByAddress/ <country>/<address>/?

width=<width>&height=<height>&pitch=<pitch>&hfov=<hfov>&apiKey=<apiKey>

With parameters:

Attribute	Default	Max	Description
country	-		2 letter country abbrevation. i.e. NL
address	-		Address to be queried.
width	1024	8192	The width of the generated image in pixels. 0 = automaticly use the width that corresponds to the optimal resolution
height	768	8192	The height of the generated image in pixels. 0 = automaticly use the height that corresponds to the optimal resolution

pitch	0	-90 90	Vertical direction in degrees in the centre of the generated image. 0 = horizon rendered in centre of the image
hfov	90	<180	Horizontal field of view in degrees.
index	-1	0,1,2	Not used of ommited or set to -1 Otherwise the images are based on views from a multiple of 3 nearby recording locations 0 = left 1 = central (same as when ommitted) 2 = right The views are directed to the requested object.
apiKey	-		The developer key obtained from CycloMedia to authorize access to this service

The complete url for a request is:

> https://atlasapi.cyclomedia.com/api/PanoramaRendering/RenderByAddress/{country}/{add ress}/?

Examples:

> https://atlasapi.cyclomedia.com/api/PanoramaRendering/RenderByAddress/NL/Tramstra at% 2037,%20Eindhoven%205611CN/?apiKey=<put_your_api_key_here>

> https://atlasapi.cyclomedia.com/api/PanoramaRendering/RenderByAddress/ BE/Snoekstraat%2012,%20Gent/?width=1024&height=786&apiKey=<put_your_api_key_ here>

> https://atlasapi.cyclomedia.com/api/PanoramaRendering/RenderByAddress/ PL/Chorzowska%20ul.%205,%20Katowice/?width=1024&height=786&pitch=10&apiKey =<put_your_api_key_here>

Parameters after the question mark "?" may be omitted. The default values as listed in the table will then be used instead.

3.5   RenderSurface

Returns an image of a flat surface as defined by a set of four coordinates, which -as seen from an observer- respectively define the upper left, upper right, lower right and lower left corners of the surface. RenderSurface automatically selects potentially suitable recording location.

Selection of Suitable Recording Location
RenderSurface returns an orthogonal view that appears to be taken exactly in front of a specified surface, from a source recording location which was not. The quality of the output depends on the recording location that was used; steeper angles will negatively influence results.

RenderSurface considers the following when rendering a building facade:

- It will discount any recording that is not located in front of the surface. Similarly, any recording made too close to a tall building, is discounted.

- The remaining recordings are ordered by an index that represents the match on horizontal angle and distance, as per figure 1.
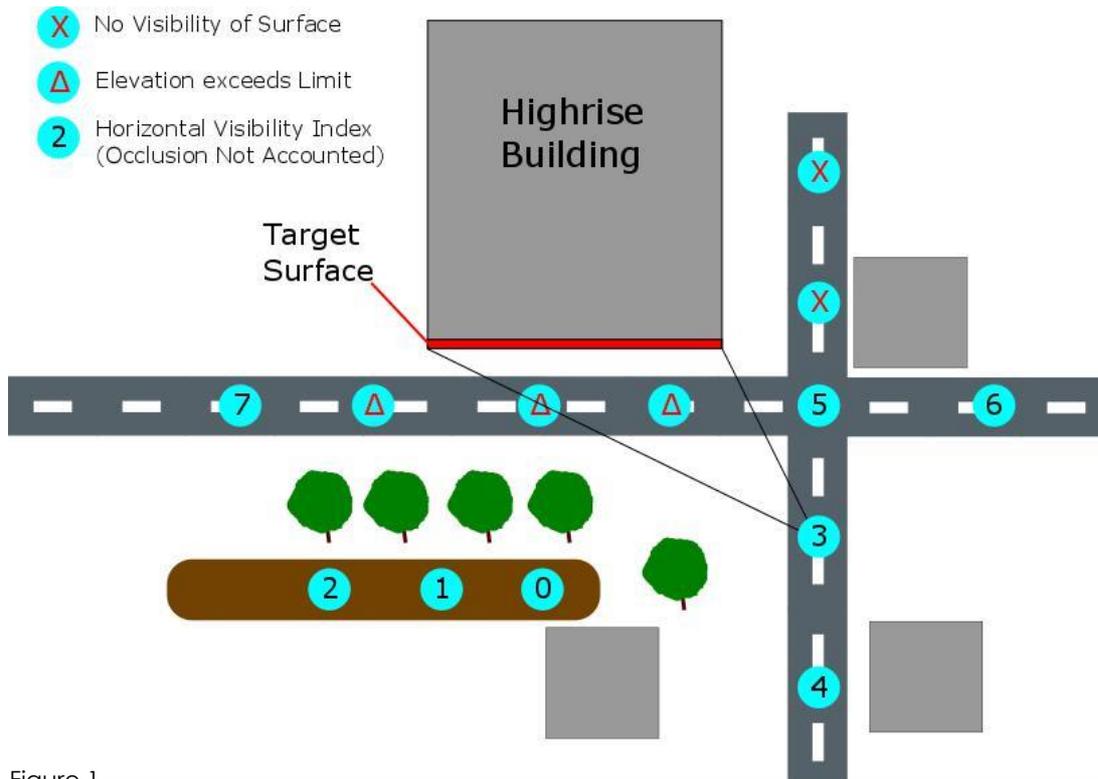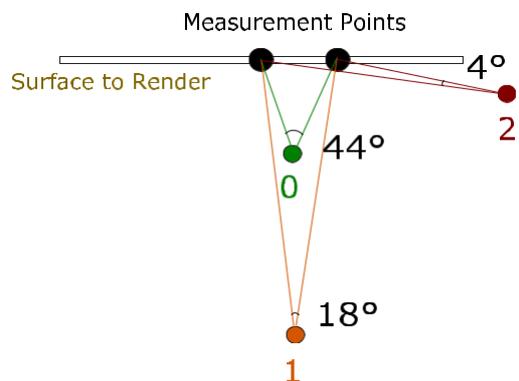

Figure 1

[1]Currently surfaces that are virtually completely horizontal, such as roofs or sections of road, are not supported and may result in an error code.

[2] A rectification takes place based on the normal of the surface, where the normal is found by using the first 3 coordinates.

[3] "maxElevation" is used to specify when recordings are deemed too close to be suitable.

In figure 1 we see that various recordings are not suitable for generating a view of the surface. The numbered dots represent recording locations that have been indexed based on their maximum horizontal theoretical image quality.

Measurement Points

Surface to Render

4°

44°

0

2

18°

1

This figure demonstrates how three fictional recording locations yield varying image resolution potential, as determined by the horizontal angles between the measurement points at the surface centre.
Recordings are automatically ordered by this theoretical horizontal image quality.

Figure 2

In general, one can expect index 0 to contain the highest resolution image with the least chance of occlusion. Conversely, higher indexes will produce higher incidence of occlusion and a lower overall resolution. (Note: In figure 1, the default "maxElevation" angle limit forced what would have been index 0 and 1 to be discounted out-of-hand; with a lower building or increased "maxElevation" tolerance this would not have happened).

In this example, for best results, the API user should choose index 3 to get an unobstructed view of the specified surface, as index 0 through 2 contain trees.

Occlusion and High Buildings
Due to the propensity toward occlusion with distance it is not prudent to automatically index recording locations for their quality based on the vertical angle towards the surface; This would prioritize recording locations that are further away, causing lower resolution imagery while also being more likely to produce occlusion.

Instead of taking the elevation angle into account when indexing images, a maximum desired elevation "maxElevation" can be used instead. A default value of 75 degrees is used.

With this knowledge an API user can take two distinct approaches in dealing with "RenderSurface" with regard to tall buildings:

   A. Increase the index until no occlusion occurs (trying possibilities #0,#1 and #2, before arriving at #3)
   B. Increase the maximum allowed elevation, such that index 0 is as close to the surface as possible, minimizing the chance of occlusion. (Doing so may however severely impact the quality the output image).

The parameters for achieving optimal results vary from situation to situation.

Note that when using source recordings which have a steep angle towards the defined surface, any errors that are present in either the surface coordinates and/or the orientation are amplified. To account for this influence, it may be advisable to specify a margin using the parameter "margin" to offer some required leeway.

Request format

The request has the following format:

/ RenderSurface/<srs>/<coordinates >/?

index=<index>&margin=<margin>&maxElevation=<maxElevation>&apiKey=<apiKey>

With parameters:

Attribute	Default	Max	Description
srs	-		EPSG code of the spatial reference system, without prefix. The SRS id determines the unit the coordinates and their margin are specified in.
coordinates	-		A semicolon seperated list of 4 coordinates in the format of: x;y;z;x;y;z; x;y;z;x;y;z These must be clockwise (as seen from the outside of the building)and should respectively denote the upper left, upper right, lower right and lower left corner, as seen from the observer.
Index	0	- Varies	When increased, switches to alternative recording locations that are theoretically less suited to render the surface, but may be free of obstruction by objects that are located between the recording location and the surface.
margin	0		Applies an outward margin both horizontally and vertically to the surface the coordinates describe. (Note: this does affect the returned image's aspect ratio compared to the actual surface) The margin may be negative, serving as an inward margin
maxElevation	75	<90	Sets a maximum elevation angle in degrees that any point of the surface may have from recording locations. A lower maximum elevation enforces a better resolution near the top of tall buildings. This parameter helps ensure a minimum in the quality of a view of high buildings and a more evenly distributed resolution.
maxDistanceToHeightRatio	-	-	A floating point value that bounds - relative to the surface height- the horizontal distance between the recording and the surface centre. (This

			can help minimize occlusion for automated calls e.g. the back sides of houses with backyards; where error responses may be favorable to occluded images)
apiKey	-		The developer key obtained from CycloMedia to authorize access to this service

The complete url for a request is:

> https://atlas.cyclomedia.com/RenderSurface/{srs}/{coordinates}/?

Examples:

A traffic sign on a Dutch highway:
> https://atlasapi.cyclomedia.com/api/PanoramaRendering/RenderSurface/28992/163939.296444;379550.768569;32.5940330406;163939.271713;379555.715094;32.5827216870;163939.232470;379555.677124;28.1069348311;163939.257536;379550.711447;28.1455324211/?apiKey=<put_your_api_key_here>&maxelevation=65

Side of a building:
> https://atlasapi.cyclomedia.com/api/PanoramaRendering/RenderSurface/28992/146221.595064;422841.765794;19.8390183574;146228.364368;422885.049088;20.0455430786;146228.391984;422885.111286;2.85253280443;146221.613937;422841.773320;2.83150864639/?apiKey=<put_your_api_key_here>&index=1&margin=1.5

Parameters after the question mark "?" may be omitted (with the notable exception of the apiKey). The default values as listed in the table will then be used instead.

Possible error messages

The following error messages may be returned when a call is made to RenderSurface that cannot be completed:

- There are no recordings that contain the front of the given surface.

  This error indicates there are no (authorized) recordings that are both within 300 metres and can contain the front of the surface.

- There are no recordings with an acceptable elevation towards the surface (current parameter 'maxElevation={'maxElevation }' degrees.)

  This error can occur for very tall surfaces or those located very high; it can be resolved by increasing the limit on maxElevation

- The Surface Rendering candidate at (zero based) index {index} does not exist. There are only {maxIndex+1} recordings enumerated within the radius currently defined. Occurs when trying to access an index that doesn't exist.

  This error indicates that an attempt was made to access an index that did not exist.

- There are no recordings within the specified distance of {Distance}. (Determined with maxDistanceToHeightRatio='{ maxDistanceToHeightRatio }' multiplied by the surface height which was calculated as being: '{surfaceHeight}')

  This error results when no recordings were within a maximum distance defined as:

  maximum distance = (SurfaceHeight × maxDistanceToHeightRatio)

Metadata Pertaining to RenderSurface

The XML and Header output of the RenderSurface method differs from the other methods in that it contains no fields that pertain to the yaw,pitch or roll. Here is the full example output of the call matching that of the url attribute:

```
<SurfaceRenderingMetaData
url="https://atlasapi.cyclomedia.com/api/PanoramaRendering/RenderSurface/28992/146146.2379
00;  420960.062190;15.5987216758;146151.119766;420960.550906;15.4933704670;146151.123472;42
0960.639873;10.4842588117;146146.163319;420960.143950;10.5556708197/?apiKey=abcdef1234
5&format=xml"
  recording-id="5D35XF24"
  recording-date="2015-02-18T10:40:41.98+00:00"
  width="666"
  height="680"
  recording-location-lon-precision="0.026"
  recording-location-lat-precision="0.018"
  recording-location-height-precision="0.023"
  recording-location-groundleveloffset="2.01"
  recording-location-srs="EPSG:28992"
  recording-location-x="146146.039"
  recording-location-y="420954.089"
  recording-location-z="5.152"/>
```

3.6 ListByAddress

Lists the recordings nearest to a given address location, includes historical recordings. The horizontal direction to the given address location is also returned. The result data is returned in XML format. The output list is ordered according to the distance to the given address location.

Request format
The request has the following format:.

/ ListByAddress/ <country>/<address>/?

IncludeHistoricRecordings=<IncludeHistoricRecordings>&apiKey=<apiKey>

With parameters:

Attribute	Default	Max	Description
country	-		2 letter country abbrevation. i.e. NL
address	-		Address to be queried.
IncludeHistoricRecordings	false		Boolean (optional)
apiKey	-		The developer key obtained from CycloMedia to authorize access to this service

The complete url for a request is:

> https://atlasapi.cyclomedia.com/api/PanoramaRendering/ListByAddress/{country}/{address} /?

Examples:

> https://atlasapi.cyclomedia.com/api/PanoramaRendering/ListByaddress/NL/Eindhoven%20M arkt%202/?apiKey=<put_your_api_key_here>

> https://atlasapi.cyclomedia.com/api/PanoramaRendering/ListByAdd
> ress/
> BE/Snoekstraat%2012,%20Gent/?apiKey=<put_your_api_key_here>

> https://atlasapi.cyclomedia.com/api/PanoramaRendering/ListByAddress/
> PL/Chorzowska%20ul.%205,%20Katowice/?apiKey=<put_your_api_key_here>

Output example:

```xml
<?xml version="1.0"?>
<imagedirection_list>
<imagedirection recording-id="WE1MVPWI" recording-date="2020-07-13T05:50:19.01Z" viewing-direction="74.204894532067854"/>
<imagedirection recording-id="WE1MVPWH" recording-date="2020-07-13T05:50:17.72Z" viewing-direction="91.604335450802481"/>
<imagedirection recording-id="WE1MVPWJ" recording-date="2020-07-13T05:50:20.24Z" viewing-direction="54.047856031296185"/>
<imagedirection recording-id="WE1MVPWG" recording-date="2020-07-13T05:50:16.34Z" viewing-direction="104.5687678586572"/>
<imagedirection recording-id="WE1MVPWK" recording-date="2020-07-13T05:50:21.42Z" viewing-direction="35.256608281308779"/>
<imagedirection recording-id="WE1MVPWF" recording-date="2020-07-13T05:50:14.83Z" viewing-direction="113.57958341028942"/>
<imagedirection recording-id="WE1MVPWL" recording-date="2020-07-13T05:50:22.58Z" viewing-direction="20.538756761279874"/>
<imagedirection recording-id="WE1MVPWE" recording-date="2020-07-13T05:50:13.32Z" viewing-direction="119.44395952694077"/>
<imagedirection recording-id="WE1MVPWM" recording-date="2020-07-13T05:50:23.75Z" viewing-direction="10.125145240637003"/>
<imagedirection recording-id="WE1MVPWD" recording-date="2020-07-13T05:50:11.85Z" viewing-direction="123.32239778718279"/>
<imagedirection recording-id="WE1MVPWN" recording-date="2020-07-13T05:50:24.92Z" viewing-direction="2.6377873001417886"/>
</imagedirection_list>
```

3.7 ListByLocation2D

Lists the recordings nearest to a given 2D location, includes historical recordings**.** The horizontal direction to the given given location is also returned. The result data is returned in XML format. The output list is ordered according to the distance to the given address location.

Request format
The request has the following format:.

/ListByLocation2D/<srs>/<x>/<y>/?

IncludeHistoricRecordings=<IncludeHistoricRecordings>&apiKey=<apiKey>

With parameters:

Attribute	Default	Max	Description
srs	-		EPSG code of the spatial reference system, without prefix.
x or lon	-		X coordinate in metres for a projected coordinate system, in degrees for a geographic coordinate sysrtem.
y or lat	-		Y coordinate in metres for a projected coordinate system, in degrees for a geographic coordinate sysrtem.
IncludeHistoricRecordings	false		Boolean (optional)
apiKey	-		The developer key obtained from CycloMedia to authorize access to this service

The complete url for a request is:

https://atlasapi.cyclomedia.com/api/PanoramaRendering/ListByLocation2D/{srs}/{x}/{y}/?

Examples:

https://atlasapi.cyclomedia.com/api/PanoramaRendering/ListByLocation2D/28992/16143 0.23 /383122.57?ApiKey=<put_your_api_key_here>

Output example:

```xml
<?xml version="1.0"?>
<imagedirection_list>
  <imagedirection recording-id="WE1MVQVE" recording-date="2020-07-13T06:42:34.12Z" viewing-direction="27.039731566719134" />
  <imagedirection recording-id="WE1MVQVD" recording-date="2020-07-13T06:42:32.88Z" viewing-direction="87.489799258846034" />
  <imagedirection recording-id="WE1MVQVF" recording-date="2020-07-13T06:42:35.35Z" viewing-direction="-7.1363913297243435" />
  <imagedirection recording-id="WE1MVQVC" recording-date="2020-07-13T06:42:31.54Z" viewing-direction="114.65125751547707" />
  <imagedirection recording-id="WE1MVQVG" recording-date="2020-07-13T06:42:36.6Z" viewing-direction="-19.297758869450028" />
  <imagedirection recording-id="WE1MVQVB" recording-date="2020-07-13T06:42:29.92Z" viewing-direction="124.53941776779132" />
  <imagedirection recording-id="WE1MVQV0" recording-date="2020-07-13T06:40:34.77Z" viewing-direction="-131.0337569541953" />
  <imagedirection recording-id="WE1MVQUZ" recording-date="2020-07-13T06:40:33.19Z" viewing-direction="-113.06074411578086" />
  <imagedirection recording-id="WE1MVQV1" recording-date="2020-07-13T06:40:36.74Z" viewing-direction="-148.34900787955416" />
  <imagedirection recording-id="WE1MVQVH" recording-date="2020-07-13T06:42:37.98Z" viewing-direction="-23.320715826942251" />
  <imagedirection recording-id="WE1MVQUY" recording-date="2020-07-13T06:40:31.7Z" viewing-direction="-97.820787612511822" />
  <imagedirection recording-id="WE1MVQVA" recording-date="2020-07-13T06:42:28.09Z" viewing-direction="131.08755986995766" />
  <imagedirection recording-id="WE1MVQV2" recording-date="2020-07-13T06:40:59.82Z" viewing-direction="-162.13231758690492" />
  <imagedirection recording-id="WE1MVPY3" recording-date="2020-07-13T05:52:01.98Z" viewing-direction="-172.418866770333" />
  <imagedirection recording-id="WE1MVQUX" recording-date="2020-07-13T06:40:30.23Z" viewing-direction="-86.59314271509021" />
  <imagedirection recording-id="WE1MVQVZ" recording-date="2020-07-13T06:44:37.19Z" viewing-direction="177.30424277778005" />
  <imagedirection recording-id="WE1MVQV9" recording-date="2020-07-13T06:42:26.09Z" viewing-direction="139.70948906852681" />
  <imagedirection recording-id="WE1MVPY4" recording-date="2020-07-13T05:52:04.11Z" viewing-direction="-160.508967669971" />
  <imagedirection recording-id="WE1MVQVI" recording-date="2020-07-13T06:42:39.51Z" viewing-direction="-23.116238265052615" />
  <imagedirection recording-id="WE1MVQW2" recording-date="2020-07-13T06:44:41.49Z" viewing-direction="131.5969312188935" />
  <imagedirection recording-id="WE1MVQVK" recording-date="2020-07-13T06:42:57.48Z" viewing-direction="-35.3952066469504" />
  <imagedirection recording-id="WE1MVQV8" recording-date="2020-07-13T06:42:24.37Z" viewing-direction="150.66206096196336" />
  <imagedirection recording-id="WE1MVQVL" recording-date="2020-07-13T06:42:59.68Z" viewing-direction="-46.822335828221469" />
  <imagedirection recording-id="WE1MVQW3" recording-date="2020-07-13T06:44:42.47Z" viewing-direction="120.40914216327059" />
  <imagedirection recording-id="WE1MVQUW" recording-date="2020-07-13T06:40:28.79Z" viewing-direction="-78.699861219657777" />
  <imagedirection recording-id="WE1MVQV7" recording-date="2020-07-13T06:42:22.63Z" viewing-direction="161.54871970402229" />
  <imagedirection recording-id="WE1MVQVM" recording-date="2020-07-13T06:43:01.89Z" viewing-direction="-57.45714429388476" />
  <imagedirection recording-id="WE1MVPY5" recording-date="2020-07-13T05:52:06.8Z" viewing-direction="-152.74733046336817" />
  <imagedirection recording-id="WE1MVQVJ" recording-date="2020-07-13T06:42:41.3Z" viewing-direction="-19.948406764153081" />
  <imagedirection recording-id="WE1MVQW4" recording-date="2020-07-13T06:44:43.41Z" viewing-direction="110.8666888970902" />
  <imagedirection recording-id="WE1MVQVN" recording-date="2020-07-13T06:43:07.53Z" viewing-direction="-66.734613011631552" />
  <imagedirection recording-id="WE1MVPY1" recording-date="2020-07-13T05:51:58.41Z" viewing-direction="-178.210395129065" />
  <imagedirection recording-id="WE1MVQUV" recording-date="2020-07-13T06:40:27.24Z" viewing-direction="-72.854409440317809" />
  <imagedirection recording-id="WE1MVPY6" recording-date="2020-07-13T05:52:08.93Z" viewing-direction="-145.54578361947236" />
</imagedirection_list>
```

3.8 ListByCoordinates

Lists the recordings nearest to a given surface, includes historical recordings. The horizontal direction to the given service is also returned. The result data is returned in XML format. The output list is ordered according to the distance to the given address location.

Request format
The request has the following format:.

/ListByCoordinates/<srs>/<coordinates>/?

IncludeHistoricRecordings=<IncludeHistoricRecordings>&apiKey=<apiKey>

With parameters:

Attribute	Default	Max	Description
srs	-		EPSG code of the spatial reference system, without prefix.

| coordinates | - | | A semicolon seperated list of 4 coordinates in the format of: x;y;z;x;y;z; x;y;z;x;y;z

These must be clockwise (as seen from the outside of the building)and should respectively denote the upper left, upper right, lower right and lower left corner, as seen from the observer. |
| IncludeHistoricRecordings | false | | Boolean (optional) |
| apiKey | - | | The developer key obtained from CycloMedia to authorize access to this service |

The complete url for a request is:

https://atlasapi.cyclomedia.com/api/PanoramaRendering/ListByLocation3D/{srs}/{x}/{y}/{z}?

Examples:

https://panoramarendering.cyclomedia.com/ListByCoordinates/28992/163939.296444;379550.768569;32.5940330406;163939.271713;379555.715094;32.5827216870;163939.232470;379555.677124;28.1069348311;163939.257536;379550.711447;28.1455324211?ApiKey=<put_your_api_key_here>

Output example:

```xml
<?xml version="1.0"?>
<imagedirection_list>
 <imagedirection recording-id="5D78FDRU" recording-date="2020-04-06T12:51:35.28Z" viewing-direction="-87.271155807144581" />
 <imagedirection recording-id="5D78FDVZ" recording-date="2020-04-06T12:51:35.06Z" viewing-direction="-88.752678029702309" />
 <imagedirection recording-id="5D2WLH52" recording-date="2014-10-02T10:23:24.32Z" viewing-direction="-92.649567735485675" />
 <imagedirection recording-id="5D2W8AAK" recording-date="2014-10-01T11:51:54.64Z" viewing-direction="-69.309654140038546" />
 <imagedirection recording-id="5D78FDVK" recording-date="2020-04-06T12:51:34.84Z" viewing-direction="-89.172295570204625" />
 <imagedirection recording-id="5D2WLH2C" recording-date="2014-10-02T10:23:23.98Z" viewing-direction="-91.29468241407" />
 <imagedirection recording-id="5D2W8AA8" recording-date="2014-10-01T11:51:54.32Z" viewing-direction="-77.877416924902619" />
 <imagedirection recording-id="5D78FDKT" recording-date="2020-04-06T12:51:34.62Z" viewing-direction="-89.397693985204853" />
 <imagedirection recording-id="5D2WLH5R" recording-date="2014-10-02T10:23:23.65Z" viewing-direction="-90.850266491751654" />
 <imagedirection recording-id="5D78FEDC" recording-date="2020-04-06T12:51:34.41Z" viewing-direction="-89.546281667215553" />
 <imagedirection recording-id="5D2W8A67" recording-date="2014-10-01T11:51:54Z" viewing-direction="-81.438601198201326" />
 <imagedirection recording-id="5D78FDUV" recording-date="2020-04-06T12:51:34.19Z" viewing-direction="-89.6419072608392" />
 <imagedirection recording-id="5D2WLH4G" recording-date="2014-10-02T10:23:23.32Z" viewing-direction="-90.6462525664902" />
 <imagedirection recording-id="5D78Y8K0" recording-date="2020-04-08T10:23:01.05Z" viewing-direction="-17.898005525331524" />
 <imagedirection recording-id="5D2WSAXM" recording-date="2014-10-04T09:59:58.64Z" viewing-direction="-26.778795134275715" />
 <imagedirection recording-id="5D78Y7YZ" recording-date="2020-04-08T10:23:01.27Z" viewing-direction="-30.32632714364544" />
 <imagedirection recording-id="5D78Y82W" recording-date="2020-04-08T10:23:01.49Z" viewing-direction="-40.2902047836939" />
 <imagedirection recording-id="5D2WSAZ4" recording-date="2014-10-04T09:59:59Z" viewing-direction="-42.03785787984782" />
 <imagedirection recording-id="5D78Y8Q2" recording-date="2020-04-08T10:23:01.71Z" viewing-direction="-48.009730181039956" />
</imagedirection_list>
```

4. Output modifiers

With the output format and functionalities parameters, the output can be modified. Instead of an image, xml data can be returned, containing the meta data related to the result.

Note: The RenderSurface method returns only a subset of the information below since yaw, pitch and roll are not applicable to its output; please see chapter 3.5.

This extra functionalities can be accessed with following parameters:

Attribute	Value	Description
format	xml	The output will be forced to be xml metadata.
filename	-	A download dialog will be forced with the suggested filename.

Output XML Metadata	Units	Description
width	pixels	Width of the rendered image
height	pixels	Height of the rendered image
recording-id		Id of the recording used to render the image.
recording-date	ISO date-time	Recording date-time
focal-length	pixels	Focal length
hfov	degrees	Horizontal field of view
vfov	degrees	Vertical field of view
yaw	degrees	Horizontal direction in the centre of the generated image. The yaw is expressed and used as a global yaw in the requested spatial reference system (recording-location-srs) 0= north direction rendered in centre of image
pitch	degrees	Vertical direction in degrees in the centre of the generated image. 0 = horizon rendered in centre of the image
roll	degrees	Always 0
recording-location-srs-base		EPSG code of the base spatial refence system of the recording location persisted values
recording-location-lon	degrees	Longitude
recording-location-lon-precision	metres	Longitude precision
recording-location-lat	degrees	Latitude
recording-location-lat-precision	metres	Latitude precision
recording-location-height	metres	Ellipsoïdal height, omitted if not defined
recording-location-height-precision	metres	Ellipsoïdal height precision
recording-location-groundleveloffset	metres	Groundlevel offset
recording-yaw-precision	degrees	Yaw precision
recording-location-srs		EPSG code of the requested spatial reference system

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recording-location-x	metres	X coordinate value in the requested spatial reference system
recording-location-y	metres	Y coordinate value the requested spatial reference system
recording-location-z	metres	Z value in the related spatial height system, omitted if height is not defined or if there is no related spatial height system
url		Corresponding URL that can be used to really render the image

Examples:

Generate XML data:

https://atlasapi.cyclomedia.com/api/PanoramaRendering/Render/5B0Q4X2T?width=1024&height=786&srsName=epsg:28992&yaw=0&pitch=0&hfov=90&format=xml&apiKey=<put_your_api_key_here>

```
<?xml version="1.0" ?>
<RenderingMetaData
    url="https://atlasapi.cyclomedia.com/api/PanoramaRendering/Render/5B0Q4X2T/" recording-id="5B0Q4X2T" recording-date="2011-04-07T12:13:35.29+02:00" width="1024" height="786" focal-length="512.000" hfov="90.000" vfov="75.018" yaw="0.000" pitch="0.000" roll="0.000" recording-location-srs-base="EPSG:4258" recording-location-lon="5.248527411" recording-location-lon-precision="0.012" recording-location-lat="51.832667432" recording-location-lat-precision="0.010" recording-location-height="48.788" recording-location-height-precision="0.016" recording-location-groundleveloffset="2.00" recording-location-yaw-precision="0.0077" recording-location-srs="EPSG:4258" recording-location-x="5.249" recording-location-y="51.833" recording-location-z="48.788" />
```

Download dialog for XML:

https://atlasapi.cyclomedia.com/api/PanoramaRendering/Render/5B0Q4X2T/?width=1024&height=786&srsName=epsg:28992&yaw=0&pitch=0&hfov=90&format=xml&filename=ABC&apiKey=<put_your_api_key_here>

Download dialog for JPG:

https://atlasapi.cyclomedia.com/api/PanoramaRendering/Render/5B0Q4X2T/?width=1024&height=786&srsName=epsg:28992&yaw=0&pitch=0&hfov=90&filename=ABC&apiKey=<put_your_api_key_here>

5. Error response format

5.1   Error message format

On input or processing error cases an XML error message is returned.

ResponseHeader:

```
Content-Type: application/xml; charset=utf-8
```

ResponseBody:

```
<Fault xmlns:i="http://www.w3.org/2001/XMLSchema-instance">
  <detail>The specified address was not found by ...</detail>
  <faultcode>404</faultcode>
  <faultstring>NotFound</faultstring>
</Fault>
```

5.2   HTTP response codes

The normal behaviour of REST web services is, to return HTTP status codes that correspond to the situation, if appropriate. This is also the case for this REST web service.

It is however possible to override this behaviour to make some integrations easier/possible.

When **"ReturnHttpErrors=0"** is defined, the service itself will always return a **200** response code. The original designated HTTP response code is always reflected in the "faultcode" field of the XML error message.

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