Drone Tracking JSON Format

General

The JSON drone tracking structure contains three sets of information:

- Timing: the start and end time of the current interval
- Antennas: name, location, orientation and current state of the antennas used
- Detections: drone detections including directions relative to the antennas and global position

Positions and Directions

Positions can be either given as global coordinates in degrees or relative to another object in 3D meter coordinates with X being E/W, Y for N/S and Z for vertical distance.

Directions are given in radians, where azimuth is the angle relative to north and altitude the angle relative to the plane (https://en.wikipedia.org/wiki/Azimuth)

Antenna

Name	Type	Unit	Meaning
antennaID	I64		A unique ID for the antenna, referenced by the detections in the tracking struct
antennaName	String		Name given to the antenna block
antennaType	String		Type of the antenna/detector, can be "radar", "camera", "transponder", "antenna" or "multiantenna"
antennaUUID	UUID		Global unique identifier for the physical antenna
latitude	F64	Degree	Latitude of the global antenna position
longitude	F64	Degree	Longitude of the global antenna position
elevation	F64	Meter	Meters above sea level
baseAzimuth	F64	Degree	Azimuth of the antenna installation
baseDeclination	F64	Degree	Declination of the antenna installation
azimuth	F32	Radians	Current direction of a "rotating" antenna
segments	F32[]	Radians	Orientation of the antenna sectors
(xyz)pos	F32	Meter	Position of this antenna relative to the reference antenna

Detection

Name	Type	Unit	Meaning
antennaID	I64		The unique ID of the antenna reporting this detection
detectionID	I64		Unique ID of this detection
detectorIndex	I32		Internal index of the detector that follows the target
detectorName	String		Internal name of the detector that follows the
detectStartTime	F64	Seconds	Start time of this detections in seconds since the start of the epoch
detectStopTime	F64	Seconds	Last time the detection was made in seconds since the start of the epoch
azimuthValid	Bool		True if the azimuth measurement is valid
altitudeValid	Bool		True if the altitude measurement is valid
azimuth	F32	Radians	Azimuth of the target detected relative to the antenna

altitude	F32	Radians	Altitude of the target detected relative to the plane
rawAzimuth	F32	Radians	Azimuth prior to Kalman filtering
rawAltitude	F32	Radians	Altitude prior to Kalman filtering
devAzimuth	F32	Radians	Standard deviation for the azimuth
devAltitude	F32	Radians	Standard deviation for the altitude
distance	F32		Relative distance factor of the target for this detection
probability	F32	Percent	Probability of the detection
maxProbability	F32	Percent	Maximum probability of the detection since the start of the detection
energy	F32	dBm	Energy of the detected source
maxEnergy	F32	dBm	Maximum energy of the detected source since the start of the detection
directionalEnergy	F32[]		Energy of the detected source split into the individual sectors of the antenna

Tracking

Name	Type	Unit	Meaning
trackID	I64		Unique ID of the tracked target
detectorIndex	I32		Internal index of the detector that follows the target
detectorName	String		Internal name of the detector that follows the
startFrequency	F64	Hz	Start frequency of the signal tracked
stopFrequency	F64	Hz	Stop Frequency of the signal tracked
detections	Detection[]		List of the detections for this tracking
trackValid	Bool		True if this track is considered real and not just some temporary glitch or duplicated due to frequency hopping
positionValid	Bool		True if the position for this tracking is valid
velocityValid	Bool		True if the velocity for this tracking is valid
probability	F32	Percent	Probability of the track
maxProbability	F32	Percent	Maximum probability of the track since the start of the tracking
xpos	F32	Meter	Relative East/West position of the target to the reference antenna
ypos	F32	Meter	Relative North/South position of the target to the reference antenna
zpos	F32	Meter	Relative vertical position of the target to the reference antenna
raw(XYZ)Pos	F32	Meter	Relative position to the target of the reference antenna without Kalman filtering
dev(XYZ)Pos	F32	Meter	Standard deviation of the filtered position
(xyz)velocity	F32	Meter/s	Filtered velocity of the target
(xyt)accel	F32	Meter/s²	Filtered acceleration of the target
pred(xyz)pos	F32	Meter	Predicted position of the target in 5 seconds
trackStartTime	F64	Seconds	Time in seconds since the epoch when this track was first created

trackStopTime	F64	Seconds	Time in seconds since the epoch when this track was last updated
positionTime	F64	Seconds	Time in seconds since the epoch when the position was last updated
refLatitude	F64	Degree	Latitude of the reference antenna
refLongitude	F64	Degree	Longitude of the reference antenna
refElevation	F64	Meter	Meters above sea level of the reference antenna
latitude	F64	Degree	Latitude of the tracked target
longitude	F64	Degree	Longitude of the tracked target
elevation	F64	Meter	Meters above sea level of the tracked target
droneName	String		Public type name of the target
categoryName	String		Name of the targets category
callsign	String		Unique string assigned to the target for reference
alertLevel	String		Alert level raised by the target (unknown, ignore, friendly, info, warning, defend, panic)
zoneIDs	I64[]		Zones that the target is currently inside
areaPolygon	Polygon		Polygon covering probable area of target location
dominated	Bool		True if a different track might represent the same target but with a more specific detection
dominatingTrack	I64		Track ID of the tracking that might dominate this track
observerID	I64		Antenna ID of the closest observer type antenna
observerDistance	F64		Estimated time to reach the observer
observerPath	Coordinate[]		Estimated flight path to the observer

Zone

Name	Type	Unit	Meaning
zoneID	I64		Unique ID of the zone
name	String		User friendly name of the zone
action	String		Action to perform if zone is violated (ignore, exclude, info, warn, panic)
height	F32	Meter	Height of the zone
elevation	F64	Meter	Base height of the zone in meters above sea level
areaPolygon	Polygon		Polygon describing zone area

Polygon

Name	Type	Unit	Meaning
points	Coordinate[]		Geo coordinates of polygon vertices

Coordinate

Name	Type	Unit	Meaning
latitude	F64		Latitude of the coordinate
longitude	F64		Longitude of the coordinate

TrackState

Name	Type	Unit	Meaning
antennas	Antenna[]		Antennas active in the system
trackings	Tracking[]		Current tracked targets
zones	Zone[]		Areas of interest

Sample

Name	Type	Unit	Meaning
startTime	F64		Start time of the sample in seconds since the epoch
endTime	F64		End time of the sample in seconds since the epoch
data	TrackState		Tracking state

Category

Name	Type	Unit	Meaning
name	String		Name of the target category
type	String		Optional type of the category
icon	png		Base64 encoded PNG with category default icon
image	jpg		Base64 encoded JPG with category default image
colors	Array		Array of CSS colors for the category

Targets

Name	Type	Unit	Meaning
name	String		Name of the target
category	String		Name of the target category
icon	png		Base64 encoded PNG with target default icon
image	jpg		Base64 encoded JPG with target default image
info	String		Optional string with target information

HTTP Rest endpoints

http://drone.aartos.com:54664/sample

Extract a single and most recent json item, that represents the current tracking and detection state. This call is connectionless – calling it too frequent will result in the same sample returned multiple times.

http://drone.aartos.com:54664/samples?limit=nnn

Returns up to "limit" samples in an array. This call will eat up all samples, calling it too frequent will result in an empty array.

http://drone.aartos.com:54664/stream?limit=nnn

Sends a stream of json lines as HTTP chunks, separated by a record separator RS (ASCII 30). If no limit is given, the streaming will continue as long as the connection is maintained – otherwise it will stop after the number of samples has been sent.

http://drone.aartos.com:54664/dronesdb

Returns the drones database information for targets and categories.