

Real-Time Location System (RTLS)

Demo Application



ZEBRA

User Guide

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Revision History

Changes to the original guide are listed below:

Change	Date	Description
Rev A -01	Feb 2020	Initial Release.

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About This Guide

This guide provides information on the RTLS Demo Application, a visualization tool that facilitates locating and tracking Radio-Frequency Identification (RFID) tags within a facility using Zebras ATR7000 hardware and Configuration and Location Analytics Software (CLAS).



NOTE: Screens and windows pictured in this guide are samples and can differ from actual screens.

Chapter Descriptions

Topics covered in this guide are as follows:

- [Getting Started](#) provides an overview of the RTLS Demo Application and general features of how to launch and navigate through the views.
- [Using Live View](#) describes how to visualize and obtain tag data within the coverage area of an RTLS deployment.
- [Tag History](#) describes the historical data of tag location and movement over time.
- [Configuring the Application](#) provides information about tag association, visualization, facility configuration, and alerting.
- [Advanced Functions](#) provides information about recording, exporting data, static and dynamic tag location analysis, how to obtain ATR and RTLS diagnostics, and statistics.

Notational Conventions

The following conventions are used in this document:

- **Bold** text is used to highlight the following:
 - Key names on a keypad
 - Button names on a screen.
- Bullets (•) indicate:
 - Action items
 - Lists of alternatives
 - Lists of required steps that are not necessarily sequential
- Sequential lists (for example, those that describe step-by-step procedures) appear as numbered lists.

Related Documents

- CLAS Server and Software Installation Guide.

For the latest version of this guide and all guides, go to: www.zebra.com/support.

Service Information

If you have a problem using the equipment, contact your facility's technical or systems support. If there is a problem with the equipment, they will contact the Customer Support Center at: www.zebra.com/support.

When contacting support, please have the following information available:

- Serial number of the unit
- Model number or product name
- Software type and version number.

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If your problem cannot be solved by support, you may need to return your equipment for servicing and will be given specific directions. Zebra is not responsible for any damages incurred during shipment if the approved shipping container is not used. Shipping the units improperly can possibly void the warranty.

If you purchased your business product from a Zebra business partner, please contact that business partner for support.

Provide Documentation Feedback

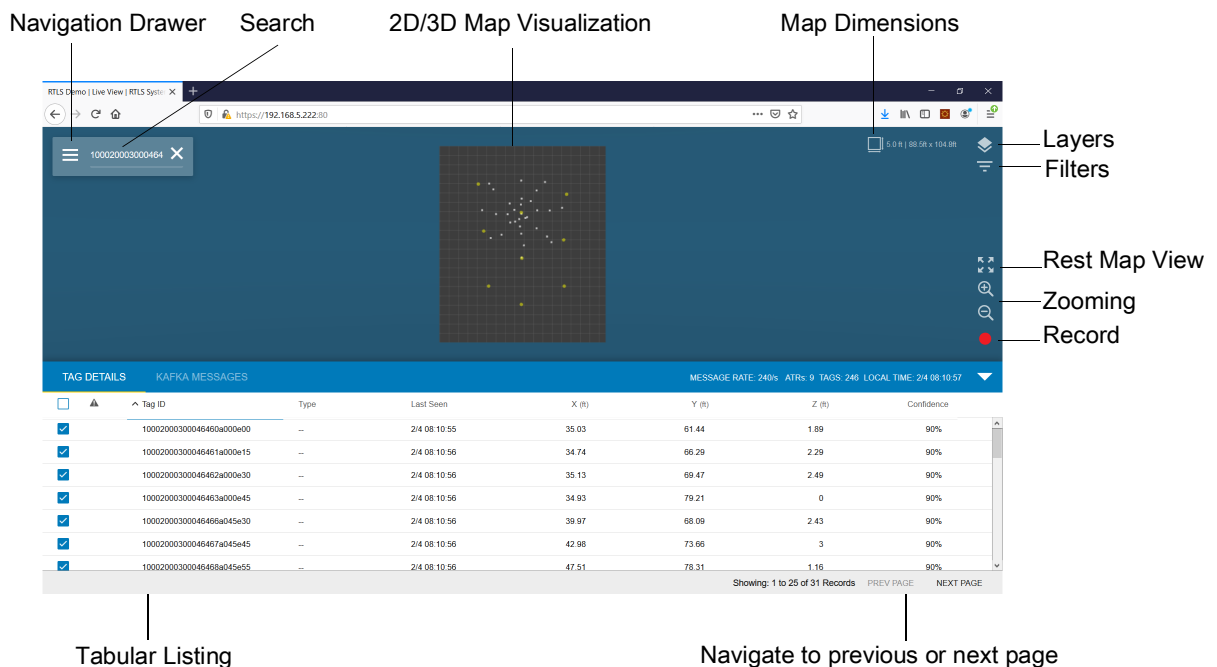
If you have comments, questions, or suggestions about this guide, send an email to EVM-Techdocs@zebra.com.

Getting Started

Overview

The Real-Time Location System (RTLS) demo application is a visualization tool that provides locationing insights for RFID tagged assets within the coverage area of a facility where ATR7000 readers and CLAS software are deployed. The tool consists of a real-time engine that consumes up to 1000 location messages per second and visualizes RFID tags in a 2D or 3D space. The application can also record and replay tag location history and movement during a user-defined time frame.

Figure 1 Landing Page



Installing the RTLS Demo Application

The RTLS Demo Application is automatically included in every RTLS/CLAS software installation. For installation instructions, refer to the CLAS Server and Software Installation Guide (see [Related Documents on page 6](#)).

Launching the Application

The RTLS Demo Application consists of a real-time backend engine that is a consumer of the Kafka messages (tag location updates) published by the CLAS software and a frontend accessed through a browser. Prior to launching the demo you must ensure that the backend engine is enabled. This is described in the Starting and Stopping RTLS section in the CLAS Server and Software Installation Guide (see [Related Documents on page 6](#)), using the -d switch in the command line when starting RTLS.

1. Ensure that the RTLS is stopped prior to starting.
2. To start RTLS including the backend engine, type one of the following commands:
 - `./rtls.sh -ndk start` - To use the embedded NTP server and Kafka broker.
 - `./rtls.sh -nd start` - To use the embedded NTP server when running an alternative Kafka broker.
 - `./rtls.sh -dk start` - To use the embedded Kafka broker with an upstream NTP server.
 - `./rtls.sh -d start` - To use the demo application with an upstream NTP server and alternative kafka broker.
3. Open an Internet browser.
4. In the address bar type the URL of the RTLS Demo Application `https://<rtls_server_ip>:<port>/`, and press **Enter**.
The variables in the URL must be substituted with appropriate values assigned during RTLS deployment. The port variable must also be replaced with the port specified in the `.env` file during RTLS deployment described in the CLAS Server and Software Installation Guide (see [Related Documents on page 6](#)).



NOTE: The default deployment of RTLS enables https. If RTLS Services software is deployed with https disabled (SSL_ENABLE option set to NO), then https must be changed to http.

The RTLS Demo Application is compatible with a wide range of browsers, however, for best performance, Zebra recommends using Firefox, Google Chrome, or Microsoft Edge.

Page Navigation

Navigate the RTLS Demo application using the Navigation Drawer .


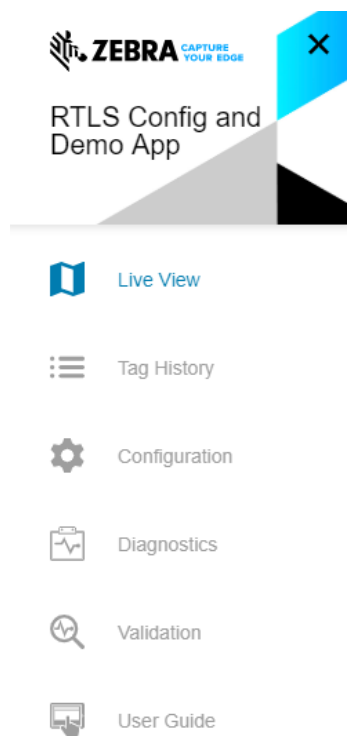
Click  and a fly-out menu displays. From the navigation menu, you can access the Live View, Tag History, Configuration, Diagnostics, Validation screens, and the User Guide. Click **X** to close the menu.

Figure 2 Fly-Out Navigation Menu



After launching the application, the landing page is in Live View. Live View provides a real-time visualization of tags within the coverage zone of a facility. In Live View you can select a tag and query information about its Electronic Product Code (EPC) ID and location, search for specific tags via EPC ID, filter by tag type, and a number of other functions. In Live View the screen is divided into two areas; the Map View and Tabular List View. The Map View visualizes all tags within the coverage zone of a facility, and the Tabular View provides tag details in spreadsheet format that includes location, timestamp, and confidence.

Searching

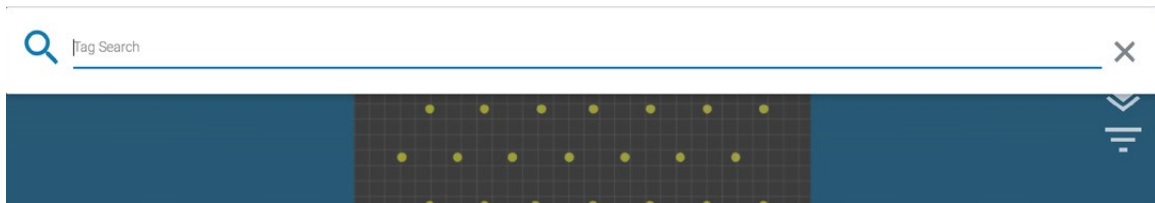
To search for a specific tag in Live View, locate the **Tag Search** box in the upper left portion of the Map View. Enter any contiguous portion of an EPC, and press **Enter**. The tags visualized in the Map View and Tabular View are limited to those tags where any portion of the EPC matches the entered string.

Figure 3 Search Icon




Figure 4 Clear Search


Click **X** to clear the search and reset the dataset.



Map Layers and Filtering

The appearance of the map stage and the content displayed on the map can be filtered using the icons located in the upper-right of the map area.

Click  to launch a menu to apply simple, pre-defined filters that display only those tags in specific states. When a filter is active, it displays as a glowing icon.

Click  to launch the Layers menu. The Layers menu allows pre-defined images to appear on the screen. The most common images uploaded are an image showing ATR location and an image of the facility map.

The Filter and Layers menu are described in [Layers and Filtering on page 14](#).

3D Navigation

The map stage in Live View can be rotated from an overhead (2D) view to a 3D tilted perspective, using the right mouse button. Similarly, the left mouse button is used to pan the scene in a horizontal and vertical orientation. Zooming in or out is accomplished using the scroll wheel.

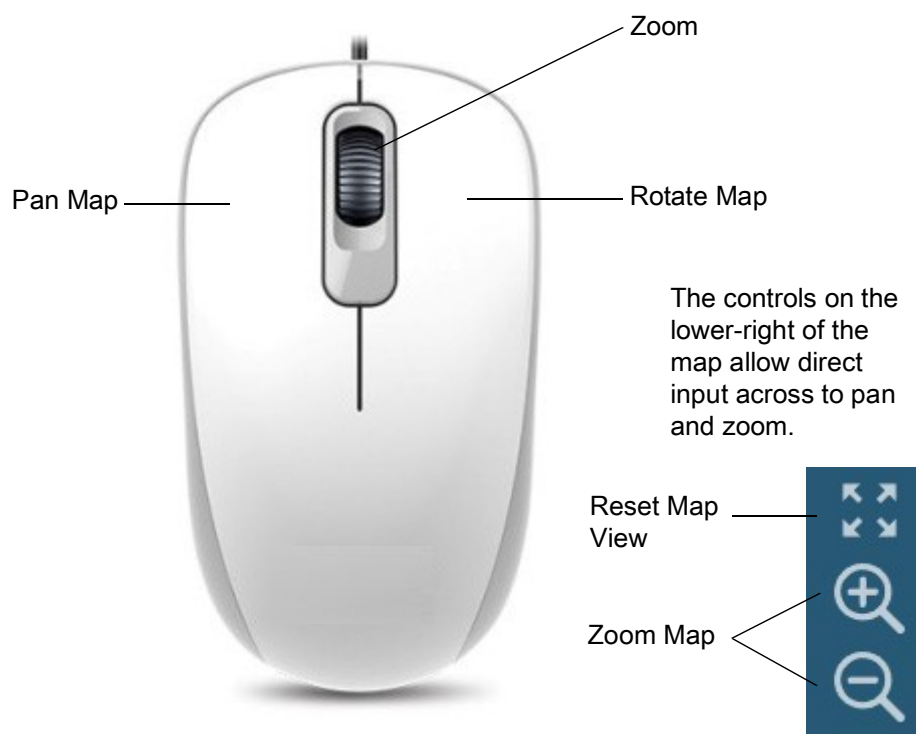
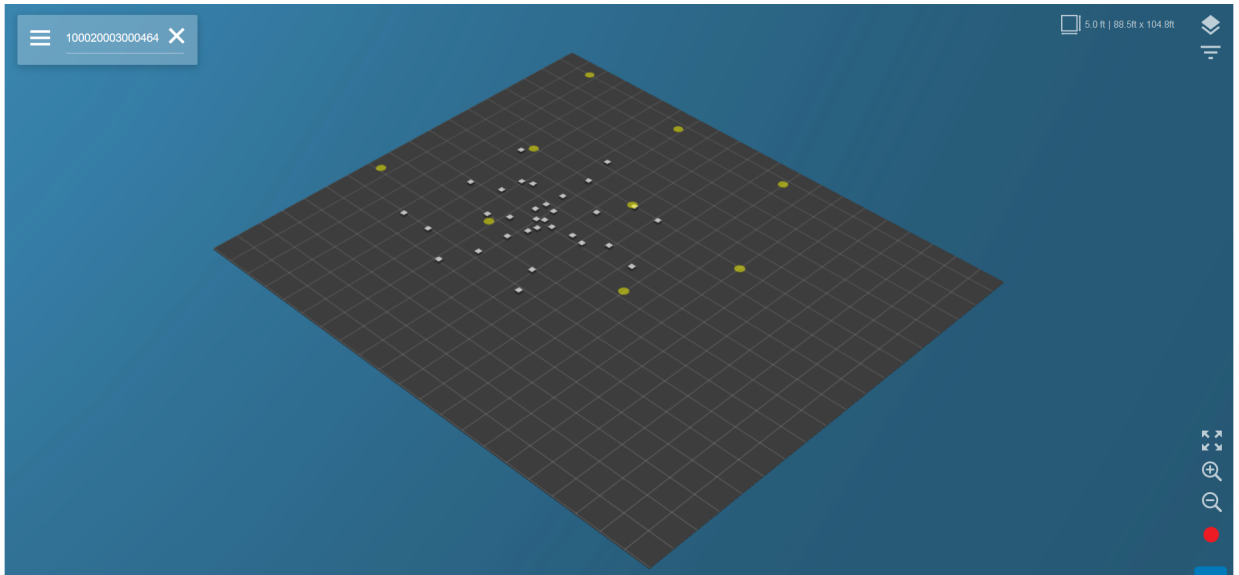
Figure 5 3D Navigation

Figure 6 Zooming to view Tag Rendering



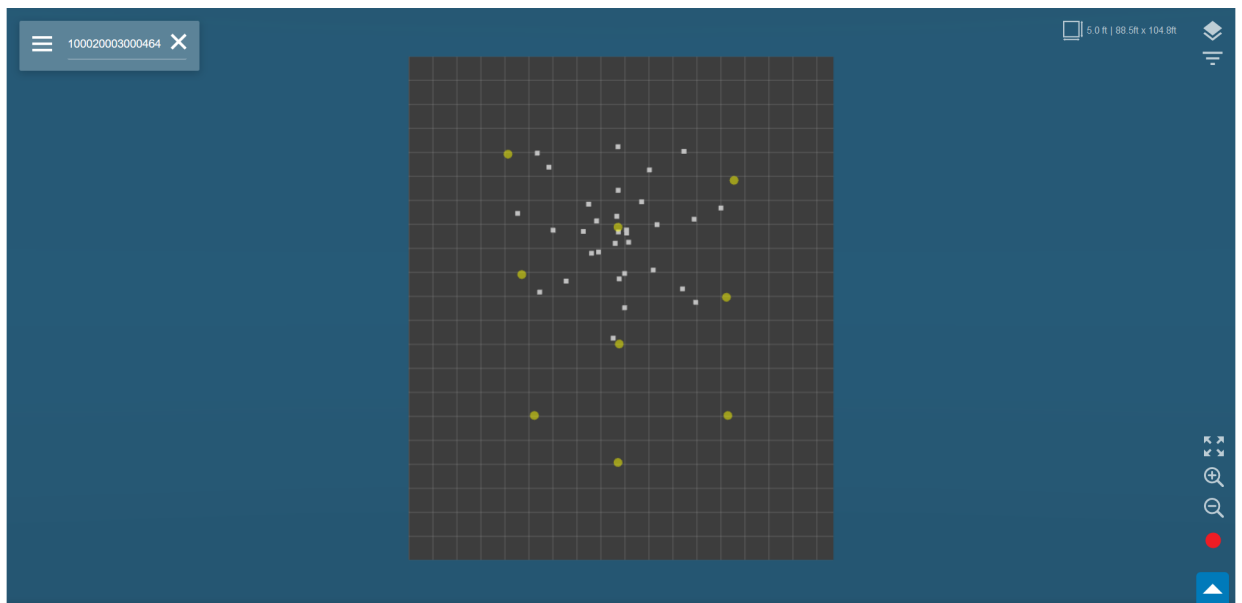
Maximum zoom in and out constraints are built into the interface. To maintain a good field of view for rendering the tags, these constraints prohibit zooming too far out or too close.

Using Live View

Overview

In Live View, the top panel of the screen provides a real-time 2D or 3D visualization of all RFID tags within the coverage area of a deployed RTLS system, consisting of one or more ATR7000 readers and CLAS software. The map panel is refreshed 10 times per second.

Figure 7 Live View



In Live View, the lower panel of the screen below the map stage, is a tabular representation of the same displayed tags. All tags filtered in map view are also filtered in the tabular listing. The tabular view provides detailed information about each tag without needing to click the tag object on the map.

By default, the tabular listing is configured to display tag details. The tabular listing section can also be configured to display raw location messages or only moving tags.



NOTE: The tabular listing is updated two times a second, regardless of the rate that the messages are being ingested from the CLAS software.

Figure 8 Tabular Listing View

Live Kafka Messages

Message Consumption Rate

Tags within the Facility

Moving Tags

Tag Count and Number of Moving Tags

Expand/Contract Map View

Tag Details	KAFKA Messages	Tags on the Move	MESSAGE RATE: 90/s	ATR: 9	TAGS: 119	MOVING TAGS: 0	LOCAL TIME: 4/2/19 08:55:58		
<input checked="" type="checkbox"/>		Tag ID	<input checked="" type="checkbox"/>	Type	Last Seen	X (ft)	Y (ft)	Z (ft)	Confidence
<input checked="" type="checkbox"/>		2016072808726a01105005f7	<input checked="" type="checkbox"/>	Pallet	4/2 08:55:58	73.24	44.42	3	90%
<input checked="" type="checkbox"/>		e280689400005000fa220c5	<input checked="" type="checkbox"/>	Pallet	4/2 08:55:57	60.29	48.42	0	90%
<input checked="" type="checkbox"/>		e280689400004000fa220c2	<input checked="" type="checkbox"/>	Pallet	4/2 08:55:58	59.08	45.69	0	90%
<input checked="" type="checkbox"/>		e280689400004000fa2245a	<input checked="" type="checkbox"/>	Pallet	4/2 08:55:58	59.89	43.96	3	90%
<input checked="" type="checkbox"/>		e280689400005000fa2245d	<input checked="" type="checkbox"/>	Pallet	4/2 08:55:58	4.87	3.81	3	90%
<input checked="" type="checkbox"/>		e280689400004000fa21cb3	<input checked="" type="checkbox"/>	Pallet	4/2 08:55:58	9.16	25.21	0	90%
<input checked="" type="checkbox"/>		e280689400005000fa21caa	<input checked="" type="checkbox"/>	Pallet	4/2 08:55:58	8.47	21.95	0.03	90%
<input checked="" type="checkbox"/>		2016072808726a01105001f4	<input checked="" type="checkbox"/>	Pallet	4/2 08:55:58	69.9	22.78	3	90%
<input checked="" type="checkbox"/>		e280689400004000fa21cb0	<input checked="" type="checkbox"/>	Pallet	4/2 08:55:49	6.42	23.73	3	90%

Showing: 1 to 25 of 119 Records [PREV PAGE](#) [NEXT PAGE](#)

Tag Data for each Item

Table Pagination

Show/Hide tag on the Map

Viewing Tag Details

Clicking a tag object on the map focuses (zoom) the map on that specific tag and follows it as it moves. The highlighted tag also displays an information card with its EPC ID, real-time location, a last seen (timestamp), and a list of ATR readers that are reading the tag (if enabled in the **Configuration > Reporting Thresholds** menu).

While in this view you can also access the tag location history. Clicking **View Location History** exits map view and displays the history page of the tag. More information about the features available when viewing location history are described in [Tag History](#).

You can also view tag details by clicking a tag line item on the tabular view to focus the map on that specific tag, and follow it as it moves. Selecting that same row in the table again de-selects the tag, and hides the information card.



NOTE: Only one tag can be focused on at one time.


Figure 9 Single Tag View

Click **View Location History** to display the history page with this tag detail selected.

Layers and Filtering

The RTLS Demo Application allows importing a facility map that can be displayed on the map stage in Live View. See [Importing a Facility Map on page 23](#) on how to import a facility map. In addition, the location of the ATR7000 readers as defined by the RTLS system configuration files is included as a pre-defined layer.


Two other special cases that utilize the layer function are described in [Advanced Functions on page 27](#) to define reference tag locations and a walking path, which can be used to validate an RTLS deployment. Once these (and other) layers are defined, the map stage and content displayed on the map can be filtered using the icons located in the upper-right of the map area.

Click  to reveal the Layers menu. On the Layers Menu you can show or hide all defined layers by selecting or de-selecting the corresponding check boxes.



NOTE: [Figure 10](#) shows an example of the map and ATR objects being hidden from the 2D and 3D view.

Selecting specific EPC types also shows or hides them from the tabular listing in [Figure 17](#).

Similarly, the RTLS Demo Application allows you to define tag (asset) types that can be selectively displayed or hidden. Click  to reveal the **Filters** Menu. On the **Filters** Menu, show or hide the specific product types by selecting or de-selecting the corresponding check box. These selections are also reflected in the tabular view.

The process of defining custom tag types is described in [Creating a Tag Association and Tag Type](#).

Figure 10 Layers Menu

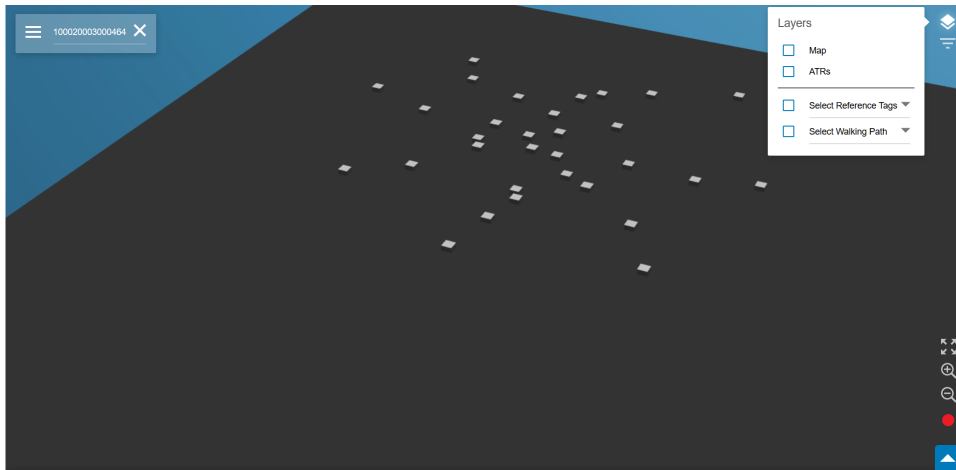
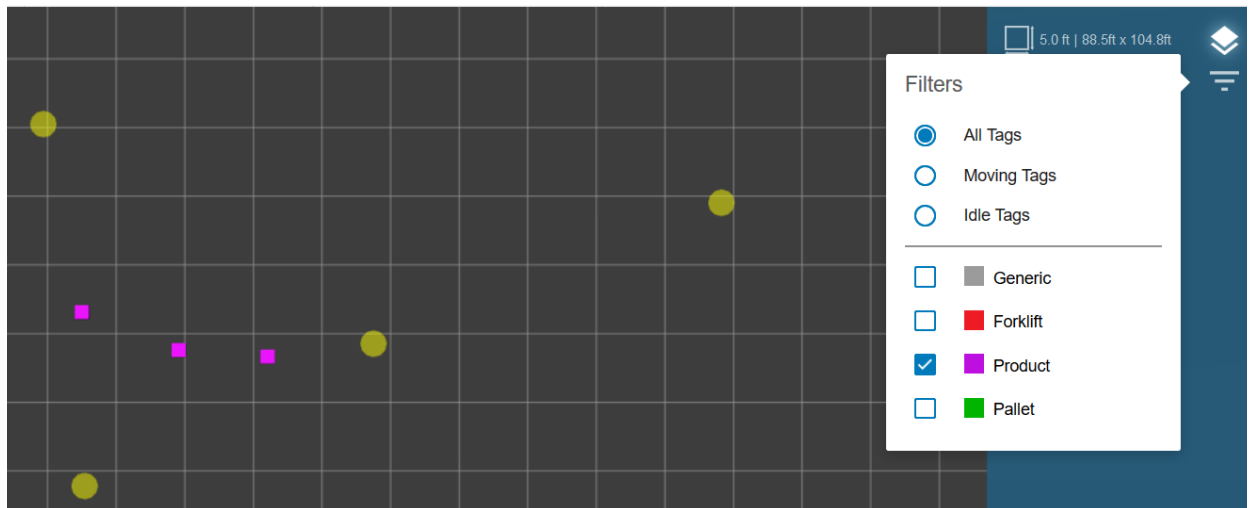


Figure 11 Filters Menu – Example showing Selecting on specific Product Tag Types to View



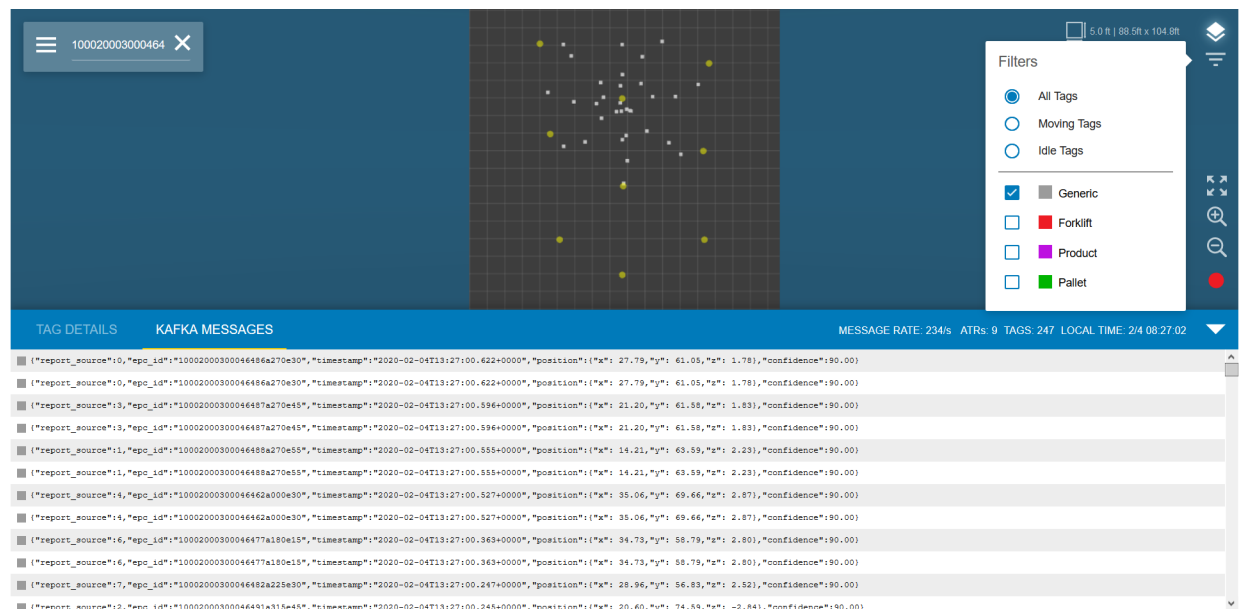
Viewing Kafka Messages

The Kafka messages panel displays the raw messages from the RTLS server. Any filtering parameters that have been applied in previous steps also apply to messages that are displayed. When no filtering is enabled, the location messages for all visible tags are displayed.

Figure 12 Kafka Messages Panel

Tag Details	KAFKA Messages	Tags on the Move	MESSAGE RATE: 88/s ATRs: 9 TAGS: 119 MOVING TAGS: 1 LOCAL TIME: 4/2/19 09:01:31
	<pre> {"report_source":2,"epc_id":"cccccccccccccccc2a00e30","timestamp":"2019-04-02T13:01:30.670+0000","position":{"x": 26.28,"y": 64.45,"z": 1.22},"confidence":90.00,"static_or_dynamic":"static","read {"report_source":1,"epc_id":"351111222000011aaaabbbbc","timestamp":"2019-04-02T13:01:30.510+0000","position":{"x": 12.49,"y": 3.19,"z": 3.06},"confidence":90.00,"static_or_dynamic":"static","read {"report_source":8,"epc_id":"300833b2ddd9014000000b95","timestamp":"2019-04-02T13:01:30.532+0000","position":{"x": 4.68,"y": 15.11,"z": 3.00},"confidence":90.00,"static_or_dynamic":"static","read {"report_source":4,"epc_id":"300833b2ddd9014000000c57","timestamp":"2019-04-02T13:01:30.531+0000","position":{"x": 5.33,"y": 9.81,"z": 0.14},"confidence":90.00,"static_or_dynamic":"static","read {"report_source":7,"epc_id":"cccccccccccccccc2a180e45","timestamp":"2019-04-02T13:01:30.507+0000","position":{"x": 27.38,"y": 38.97,"z": 3.59},"confidence":90.00,"static_or_dynamic":"static","read {"report_source":3,"epc_id":"cccccccccccccccc2a045e30","timestamp":"2019-04-02T13:01:30.468+0000","position":{"x": 33.76,"y": 64.83,"z": 2.94},"confidence":90.00,"static_or_dynamic":"static","read {"report_source":6,"epc_id":"cccccccccccccccc22220052","timestamp":"2019-04-02T13:01:30.462+0000","position":{"x": 29.60,"y": 7.42,"z": 1.67},"confidence":90.00,"static_or_dynamic":"static","read {"report_source":5,"epc_id":"cccccccccccccccc22220053","timestamp":"2019-04-02T13:01:30.439+0000","position":{"x": 29.01,"y": 10.70,"z": 2.21},"confidence":90.00,"static_or_dynamic":"static","read {"report_source":5,"epc_id":"cccccccccccccccc22220042","timestamp":"2019-04-02T13:01:30.415+0000","position":{"x": 22.69,"y": 14.77,"z": 2.87},"confidence":90.00,"static_or_dynamic":"static","read {"report_source":6,"epc_id":"300833b2ddd9014000000b02","timestamp":"2019-04-02T13:01:30.412+0000","position":{"x": 10.28,"y": 40.57,"z": 3.00},"confidence":90.00,"static_or_dynamic":"static","read {"report_source":1,"epc_id":"351111222000013aaaabbbbc","timestamp":"2019-04-02T13:01:30.392+0000","position":{"x": 12.50,"y": 3.18,"z": 1.59},"confidence":90.00,"static_or_dynamic":"static","read {"report_source":3,"epc_id":"e209a8080017af000000980","timestamp":"2019-04-02T13:01:30.400+0000","position":{"x": 71.14,"y": 47.25,"z": 3.00},"confidence":90.00,"static_or_dynamic":"static","read </pre>		

Figure 13 Kafka Messages from Tags on Map

Tag Details	KAFKA MESSAGES	MESSAGE RATE: 234/s ATRs: 9 TAGS: 247 LOCAL TIME: 2/4 08:27:02
	 <pre> {"report_source":10,"epc_id":"1000200030004666a270e30","timestamp":"2020-02-04T13:27:00.422+0000","position":{"x": 27.79,"y": 61.05,"z": 1.78},"confidence":90.00} {"report_source":10,"epc_id":"1000200030004666a270e30","timestamp":"2020-02-04T13:27:00.422+0000","position":{"x": 27.79,"y": 61.05,"z": 1.78},"confidence":90.00} {"report_source":13,"epc_id":"1000200030004666a270e45","timestamp":"2020-02-04T13:27:00.396+0000","position":{"x": 21.20,"y": 61.58,"z": 1.83},"confidence":90.00} {"report_source":13,"epc_id":"1000200030004666a270e45","timestamp":"2020-02-04T13:27:00.396+0000","position":{"x": 21.20,"y": 61.58,"z": 1.83},"confidence":90.00} {"report_source":11,"epc_id":"1000200030004666a270e55","timestamp":"2020-02-04T13:27:00.355+0000","position":{"x": 14.21,"y": 63.59,"z": 2.23},"confidence":90.00} {"report_source":11,"epc_id":"1000200030004666a270e55","timestamp":"2020-02-04T13:27:00.355+0000","position":{"x": 14.21,"y": 63.59,"z": 2.23},"confidence":90.00} {"report_source":4,"epc_id":"1000200030004666a200e30","timestamp":"2020-02-04T13:27:00.527+0000","position":{"x": 55.06,"y": 69.66,"z": 2.87},"confidence":90.00} {"report_source":14,"epc_id":"1000200030004666a200e30","timestamp":"2020-02-04T13:27:00.527+0000","position":{"x": 55.06,"y": 69.66,"z": 2.87},"confidence":90.00} {"report_source":13,"epc_id":"1000200030004666a270e45","timestamp":"2020-02-04T13:27:00.396+0000","position":{"x": 21.20,"y": 61.58,"z": 1.83},"confidence":90.00} {"report_source":16,"epc_id":"1000200030004666a270e15","timestamp":"2020-02-04T13:27:00.363+0000","position":{"x": 34.73,"y": 58.79,"z": 2.80},"confidence":90.00} {"report_source":6,"epc_id":"1000200030004666a270e15","timestamp":"2020-02-04T13:27:00.363+0000","position":{"x": 34.73,"y": 58.79,"z": 2.80},"confidence":90.00} {"report_source":17,"epc_id":"1000200030004666a225e30","timestamp":"2020-02-04T13:27:00.247+0000","position":{"x": 28.96,"y": 56.83,"z": 2.52},"confidence":90.00} {"report_source":12,"epc_id":"1000200030004666a213e45","timestamp":"2020-02-04T13:27:00.245+0000","position":{"x": 20.60,"y": 74.59,"z": -2.84},"confidence":90.00} </pre>	

Tag Movement


Click the **Tag Movement** tab to display only those tags that are currently moving within the facility. The tag movement status is a parameter included in each location message and is determined based on thresholds configured in the CLAS software. Each tag is listed here in card format, where you can click to get additional details on the tag.



NOTE: In order to display moving tags in the Tags on the Move panel, the CLAS software must be configured to report movement metadata in the location messages. Otherwise, tags that are moving do not display. Refer to [Reporting Thresholds on page 24](#) to configure the CLAS software to report movement metadata in the location messages.

Tag History

Displaying Historical Tag Data

In addition to live data, the RTLS Demo Application allows you to view tag history. Tag History allows you to search for a tags' EPC ID values, filter by recent tag activity, or filter by type (project, pallet or forklift). You can also filter by time by clicking  in the right corner of the tab.


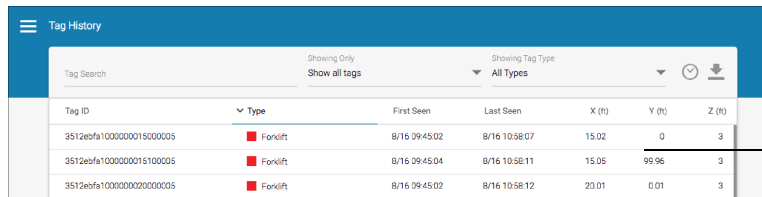
1. Click  > **Tag History**. By default, all tags are displayed in the bottom panel of the screen.
2. To view a subset of the data, enter any portion of a Tag EPC ID in the **Tag Search** field.
3. From the **Showing Only** drop-down list select whether to **Show All Tags**, **Tags that are moving**, or **Tags that have never moved**.
4. From the **Showing Tag Type** drop-down list select whether to **All Types** or other tags that you have defined in the system.

Figure 14 Tag History



Tag ID	Type	First Seen	Last Seen	X (ft)	Y (ft)	Z (ft)
3512e9fa1000000015000005	Forklift	8/16 09:45:02	8/16 10:58:07	15.02	0	3
3512e9fa1000000015100005	Forklift	8/16 09:45:04	8/16 10:58:11	15.05	99.96	3
3512e9fa1000000020000005	Forklift	8/16 09:45:02	8/16 10:58:12	20.01	0.01	3

As messages continue to come in real-time, the last seen data, along with the most recent location data, is constantly updated.

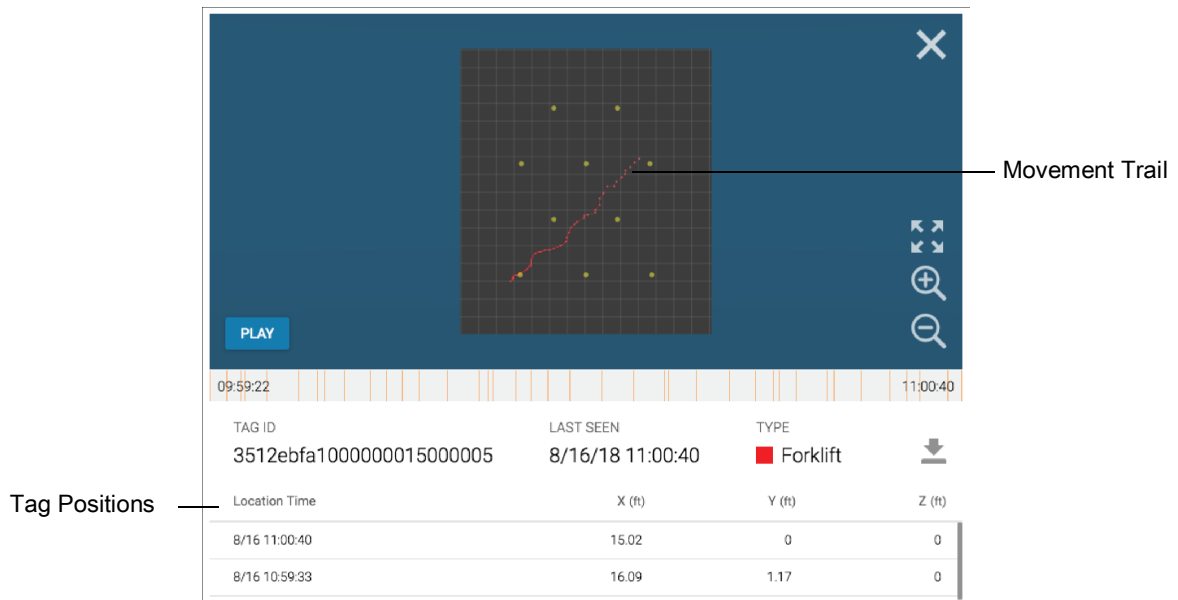
Viewing Tag History Details

Selecting a row on the Tag History table opens up a panel that displays all the movement positions over time for the history of that tag. Due to database limitation, the amount of historical tag data stored is limited to one hour. If a tag has never moved, there will only be two entries in the table in tag playback view, the first time seen, and the last time seen.

Historical Playback

Click **Play** in the History Playback View to animate the tag's position over time. To view a time of interest, the timeline can be moved forward or backward. If configured (refer to [Setting Show Tag Movement on page 21](#)), then a movement trail will follow the tag indicating historical tag location over the course of the recorded time frame.

Figure 15 History Playback View

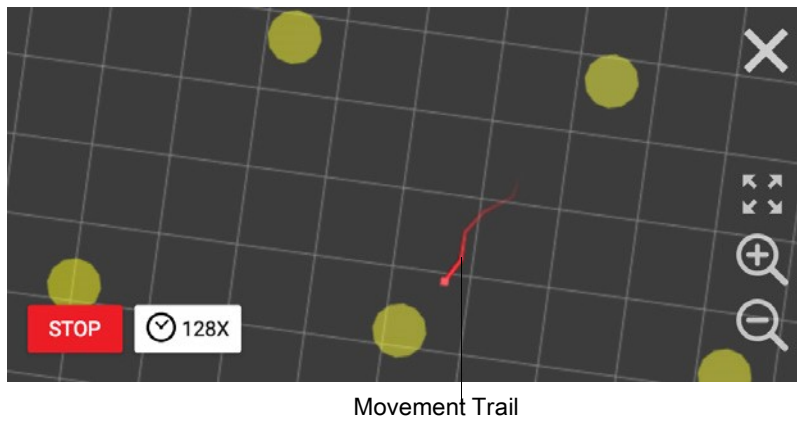


NOTE: The timeline illustrates the starting and ending time of a historical timeframe. Timeframes with active location updates are illustrated as tick marks on the timeline.

Click **Clock** to speed up or slow down the playback. The default speed is 32x. The speed can be in real-time, for example, 1s = 1s, or 512x normal time. As the tag moves, a movement trail is shown behind it. This trail length is configured through the [Visualization on page 21](#) menu. Click **Stop** to stop the playback at any time. The blue playback bar displays the current time stamp of the playback, with the current time indicated in white.

As the tag moves, a movement trail is shown behind it. This trail length is configured through the Visualization panel using the Configuration feature. Once animating, you can stop the playback by clicking **Stop**. The blue playback bar displays the current time stamp of the playback, with the current time indicated in white.

Figure 16 Playback with Movement Trail



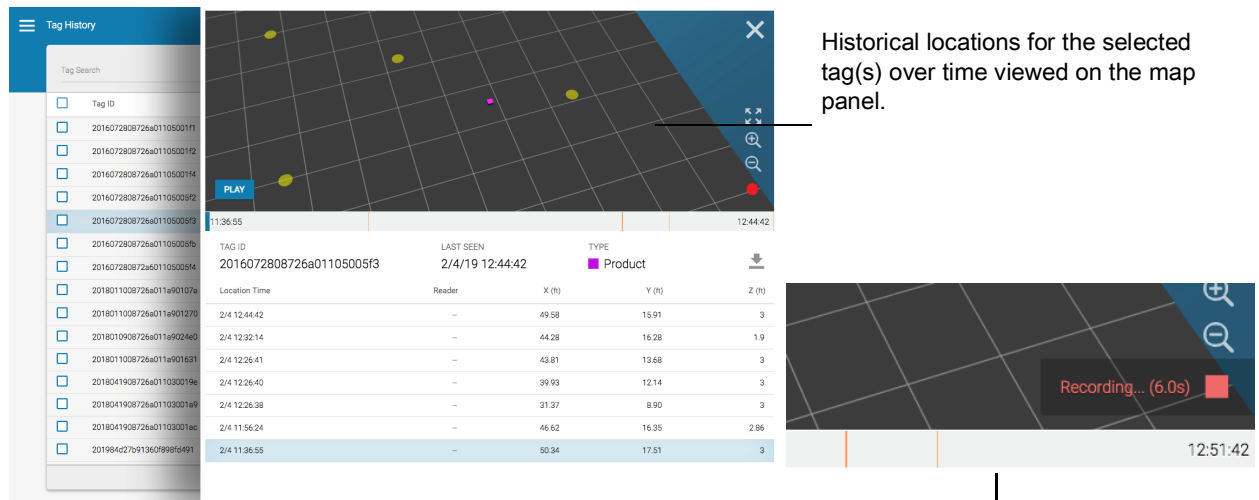
Multiple Tag Playback

From the Tag History screen, you can select individual or multiple tags by selecting or de-selecting the check boxes to the left of the Tag ID column. Selecting multiple check boxes allows you to view the playback of multiple tags simultaneously.

Playback Selected Tag History

Click **Playback Selected History** to launch a panel where you can select or de-select tags to play back. You can also manage the time line of the tags to view a specific timeframe of interest.

Figure 17 Playback Selected Tag History



Historical locations for the selected tag(s) over time viewed on the map panel.

Historical locations for the selected tag(s) over time in tabular format.


You can also record the Tag History panel, similar to the Grouped Tag History and Live View pages.



NOTE: If a tag has never moved, there are only two entries in the table in tag playback view, the first time seen, and the last time seen.

Exporting Tag History

To export data:

1. Click .
2. Select to either export **Current Tag Location Data** or **All Historical Location Data**.
3. Select to either export to **CSV**, **EXCEL**, or **PDF**.

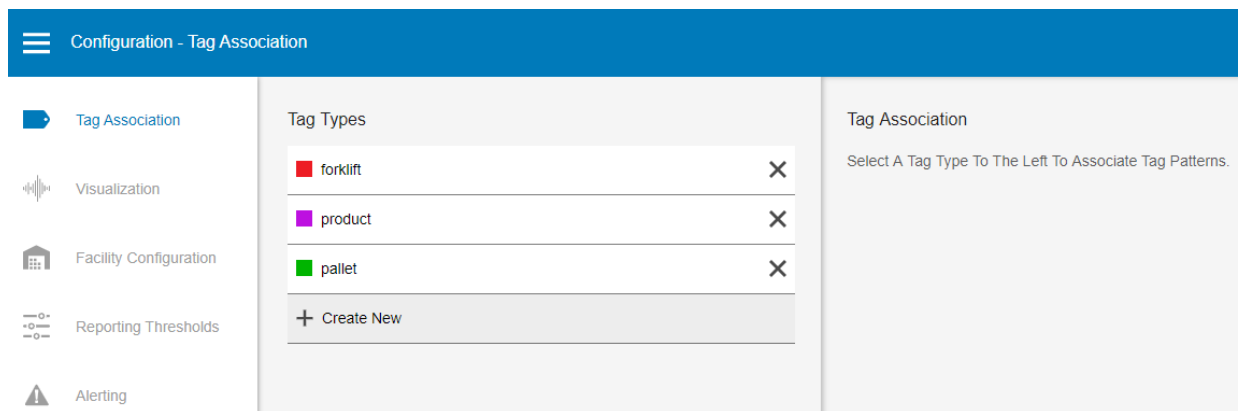
Configuring the Application

The RTLS Demo Application can be configured to create unique visual attributes customized to suit a variety of applications. At a high level the menu allows you to configure Tag Association, Visualization, Facility Configuration, Reporting Thresholds, and Alerting.

Through the Configuration menu you can specifically:

- Define specific attributes to create various tag types.
- Set parameters and thresholds that determine how tags are displayed in Live View and Tag History view.
- Define facility information and import maps.
- Set reporting thresholds.


Figure 18 Configuration Landing Page



Creating a Tag Association and Tag Type

The **Tag Association** option allows you to associate specific EPC patterns with a variety of pre-defined and custom tag types. Once you select a tag type, an EPC association of that type appears, along with its associated color.

To create a new Tag Type and add corresponding tag associations:

1. Click  > **Configuration**, and then **Tag Association**. The screen displays three pre-defined tag types (forklift, product, and pallet), and any other custom defined tag types that have been previously defined.
2. In the **Tag Types** area, click **Create New** to create a new tag type.

3. Enter a new tag name, and press **Enter**.
4. In the **Tag Association** area:
 - a. Under **EPC Association**, click **Create New**.
 - i. Enter an **EPC Pattern** that will uniquely define this tag type, and press **Enter**. Adding a pattern here now associates any EPC ID that contains this string to this Tag Type.
 - b. In the **Type Color** drop-down list, select a color to associate to this tag type to annotate tag objects with a specific color, if desired. If no color is selected, the default color is white.
 - c. In the **Icon** area drop-down list, select an icon to associate to this tag type.

Visualization

This section describes how to configure various tag visualization features. You can configure how to monitor tag movement by selecting to highlight tags on the move, set the number of recorded positions in the tag's movement trail, and configure the time threshold that tags are removed after they cease being reported by the RTLS system.

Setting Show Tag Movement

The RTLS system sends location messages with metadata that indicate when a tag is on the move. By enabling this setting in the configuration, the rows in the tabular listing Live View are highlighted when a corresponding tag is on the move.

To enable tag movement visual effects:


1. Click  > **Visualization**.
2. In the **Show Tag Movement** area, check the **Highlight tags on the move** box.
3. In the **Show Movement Trail** area, specify the time (in seconds) to display last reported position of the tag. The value must be between 2 and 10 seconds. Once enabled, the path of the tag being played-back (in Tag History) has a trail the length of its last 10 positions.

Figure 19 View Movement Trail

Turning tag movement trail off displays a single datapoint without movement.

Turning on the movement trail and adding a larger value shows the trail of the tag in the playback.

Figure 20 Tags on the Move Parameters


When these boxes are not checked, the Tag Movement tab will not show up in Live View.

Tag Details		KAFKA Messages						MESSAGE RATE: 90/s ATRs: 9 TAGS: 119 LOCAL TIME: 4/2/19 09:00:22	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Tag ID	Type	Last Seen	X (ft)	Y (ft)	Z (ft)	Confidence	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2016072808726a01105005f7	Pallet	4/2 09:00:02	72.97	44.27	3	90%	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	e280689400005000faf220c5	Pallet	4/2 09:00:01	59.22	46.76	0	90%	

Setting Remove Tag Threshold

If a tag is not reported after a user-specified amount of time, it is removed from the map. Objects on the map are not updated until a new message for that specific tag comes through the message (Kafka) queue, this option allows for the removal of tags after a user-specified amount of time if the tag has gone out of view or is no longer being read by the RTLS system.

To remove a tag threshold:

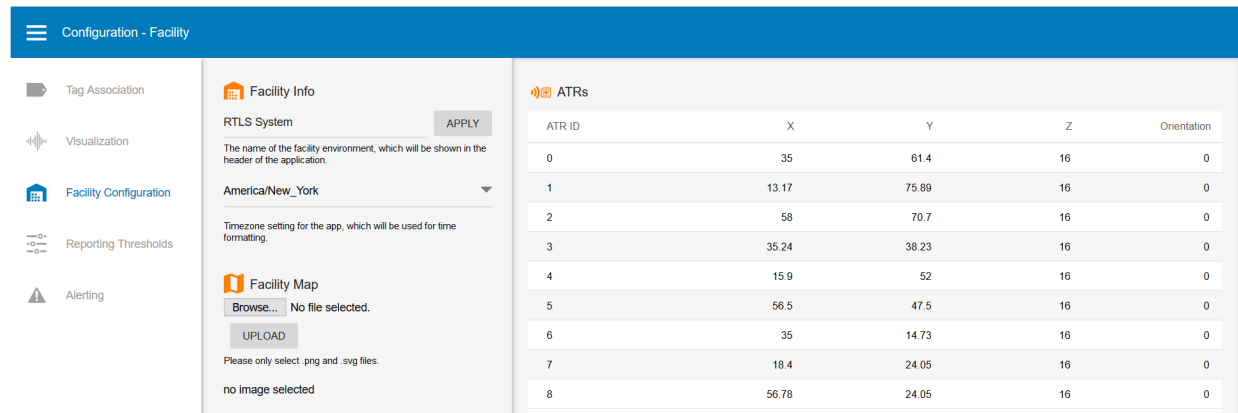
1. Click  > **Visualization**.
2. In the **Remove Tag Threshold** area, specify the time (in seconds) to remove tags from the Live View.

Facility Configuration

This section explains how to configure the facility name, map image, and timezone of an RTLS deployment.

1. Click  > **Facility Configuration**.

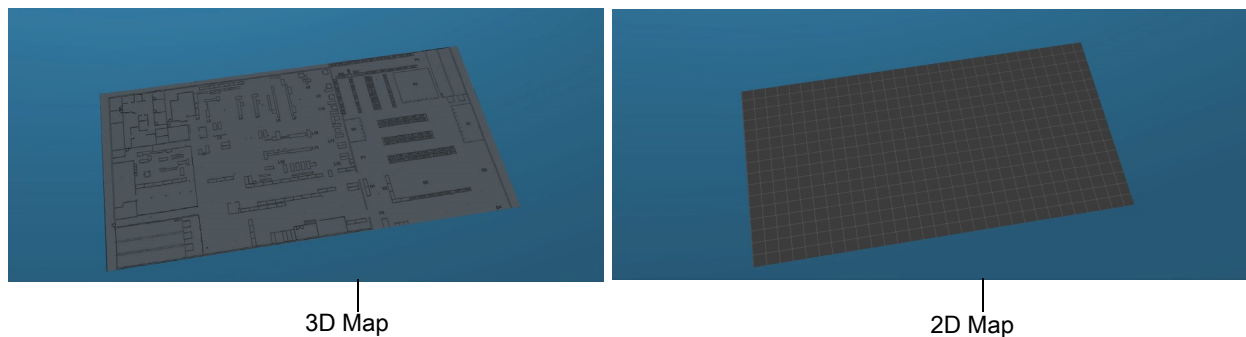
Figure 21 Facility Configuration Page



ATR ID	X	Y	Z	Orientation
0	35	61.4	16	0
1	13.17	75.89	16	0
2	58	70.7	16	0
3	35.24	38.23	16	0
4	15.9	52	16	0
5	56.5	47.5	16	0
6	35	14.73	16	0
7	18.4	24.05	16	0
8	56.78	24.05	16	0

2. In the **Facility Info** area, specify the name of the facility environment to be shown in the header of the application, and click **APPLY**.
3. From the drop-down list, select the timezone setting for the application to use for time formatting.

Figure 22 Example Facility Map



Importing a Facility Map

The application supports the capability to import a facility map as a layer that can be viewed or hidden using the Layers menu. The extent of the Map view is based on the locations of the ATRs and is computed to ensure that all ATRs is visible. A margin around the perimeter of the ATRs approximately equal to the half of average spacing of the ATRs is added. The total x-y dimension of the map stage is shown in the Map Dimensions section of the map stage in Live View.

Before importing a facility map, it is important that the dimensions of the map are as close as possible to the dimensions of the map stage in Live View, otherwise there is a slight distortion between the visualization and the actual facility. Therefore, it is strongly recommended to crop the facility map image using a graphics editor (for example, Microsoft Paint) to match the map layer to the ATR layer as closely as possible.

To import a facility map:

1. In the **Facility Map** area, click **Choose File** to upload an image of the facility. Only `.png` and `.svg` formats are supported. The selected map changes the texture used on the 2D/3D stage. This map represents the actual facility.
2. Click **UPLOAD**. The ATRs area displays the RTLS ATR hardware units and locations for this facility.




NOTE: Facility maps using only `.png` and `.svg` formats are supported.

Reporting Thresholds

This section explains how to configure miscellaneous CLAS software parameters and reporting thresholds, and how to revert to RTLS Demo Application default settings.

The **Reporting Thresholds** area allows you to configure the CLAS software for two reporting thresholds. One threshold limits how often the CLAS software sends a location message for each tag, regardless of movement status. The second threshold sets the distance that a tag must move to send a tag location update message. Together these thresholds can manage the frequency of the messages sent by the RTLS system.

1. Click  > **Reporting Thresholds**.
2. In **Report bearing**, specify the time (in seconds). Regardless of movement activity, the CLAS software sends a location message update based on this timer. Setting this parameter to 0 causes CLAS to send a location update message every time a tag is read.
3. In **Report bearings when tag moves**, specify the distance (in feet). When a tag moves this distance, a message is sent separate from the time-based reporting threshold message. Setting this parameter to 0 causes CLAS to send a location update message every time a tag is read.
4. Click **APPLY THRESHOLDS**.

Miscellaneous Configuration Parameters

- Check the **Enable static or dynamic metrics in feed**. Once this option is selected, the messages from the CLAS software contains movement information that is required to show tags on the move.
- Check the **Enable reader reporting in feed**. Once this option is selected, the messages from the CLAS software contains the reader IDs that reported the tag location, and it annotates which readers or ATRs reported a selected tag.

Figure 23 Reporting Thresholds Configuration Page

The screenshot shows the 'Reporting Thresholds' configuration page. On the left is a sidebar with a 'Configuration' header and five menu items: 'Tag Association', 'Visualization', 'Facility Configuration', 'Reporting Thresholds' (which is highlighted), and 'Alerting'. The main content area is titled 'Reporting Thresholds' and contains the following settings:

- 'Report bearing every' set to '-1' seconds, with a note: 'Regardless of movement activity, the ATR will send a message for the tag based on this timer.'
- 'Report bearings when tag moves' set to '-1' feet, with a note: 'When the tag moves this configured distance, it will send an updated message, separate from the time-based reporting threshold.'
- An 'APPLY THRESHOLDS' button.
- A checkbox 'Enable static_or_dynamic metrics in feed.' with a note: 'When this is toggled on, the messages from the RTLS server will contain movement information, which is required to show tags on the move.'
- A checkbox 'Enable reader reporting in feed.' with a note: 'When this is toggled on, the messages from the RTLS server will contain the reader ids that reported the tag location.'
- A warning message: 'Warning: The thresholds can only be turned on or off together at this current time. The threshold updates could take several minutes to execute.'
- A 'RESET TO FACTORY DEFAULTS' button.

Resetting to Factory Defaults

Click **RESET TO FACTORY DEFAULTS** to revert the application to the original default settings.

The **ATRs** area displays the RTLS ATR hardware units and locations for this facility.

Alerting

There are two configurable alerts for the RTLS Demo Application:

- If the tag is not seen in a set amount of time.
- If there is no movement for a set length of time.

Configuring Alerts

To configure alerts:


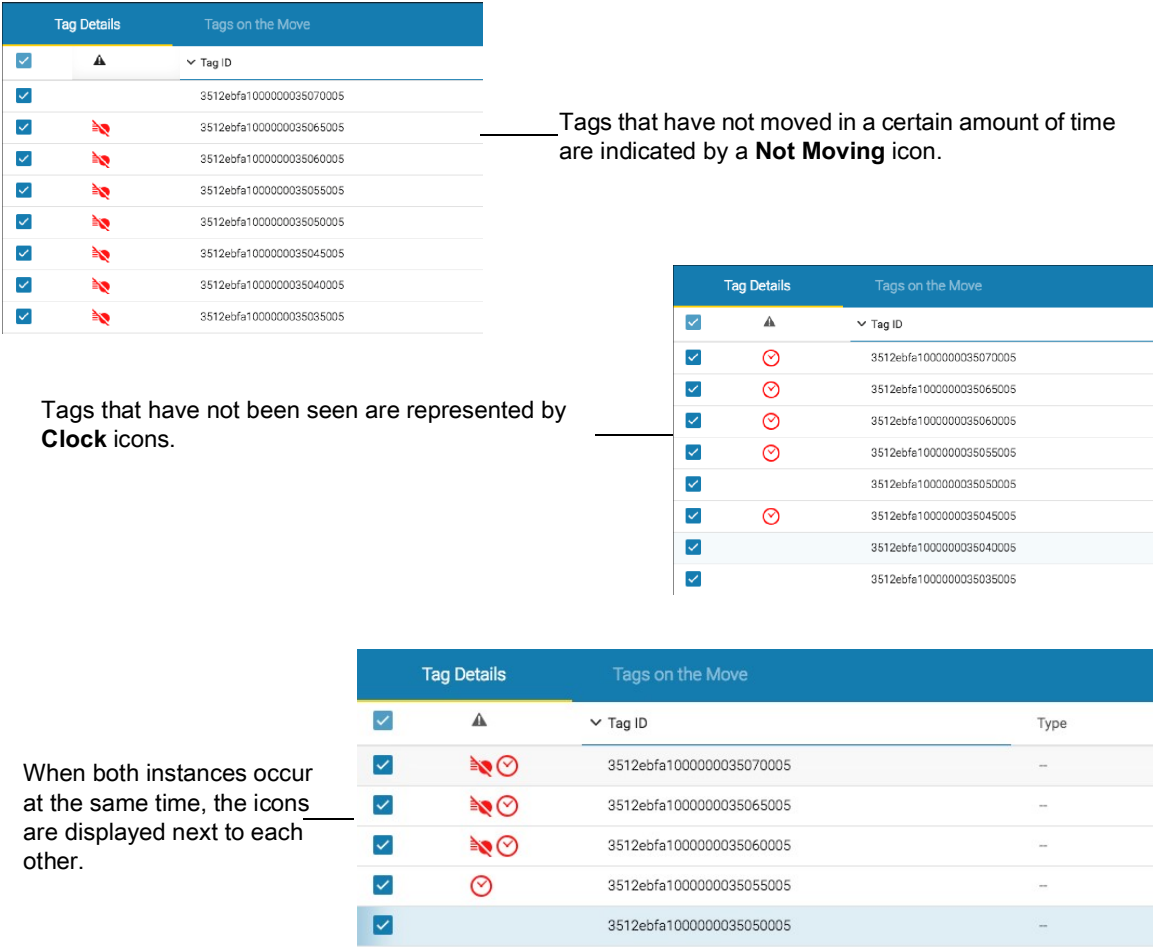
1. Click  > **Configuration > Alerting**.
2. Check the **If the tag as not been seen in ____ seconds** box, and enter the time (in seconds). Once this option is selected, the Live View and Tag History panel annotates tags that have not been seen within the last 60 seconds.
3. Check the **If the tag as not been moved in ____ seconds** box, and enter the time (in seconds). Once this option is selected, the Live View and Tag History panel annotates tags that have not been moved within the last 60 seconds, based on the system's movement thresholds.

Figure 24 Configuration - Alerting

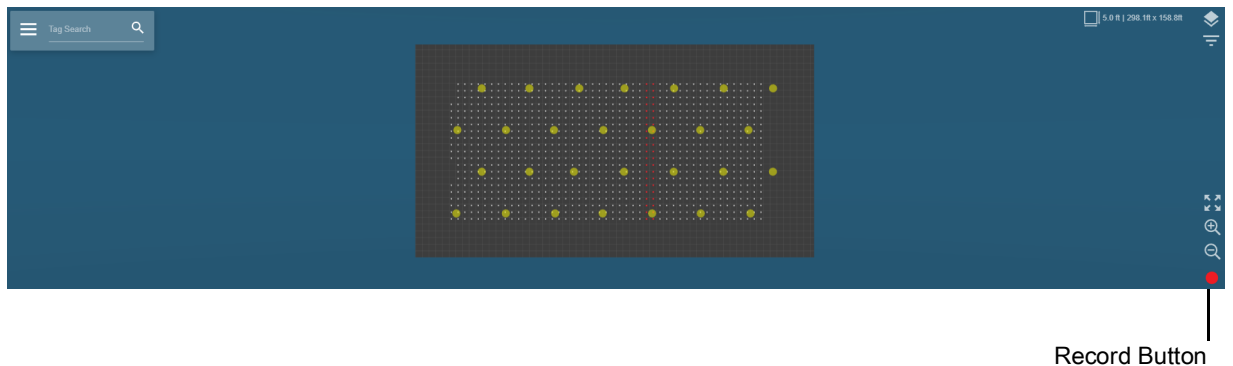


Advanced Functions

Recording a Map

Video recording is a useful tool for capturing walking tests when deploying an RTLS system. Using the capture function is also useful when highlighting events in the system for off-line presentation. Click **Record** in the lower-right corner of the page on the Live View panel to start a screen capture of the map in view. The system records the tracking and rotation of the map, and the movement of the tags in real-time up to 8 fps, and a maximum length of 120 seconds. Once you click **Record**, the circle turns into a square to indicate that a recording is in progress.

Figure 25 Live View Video Recording

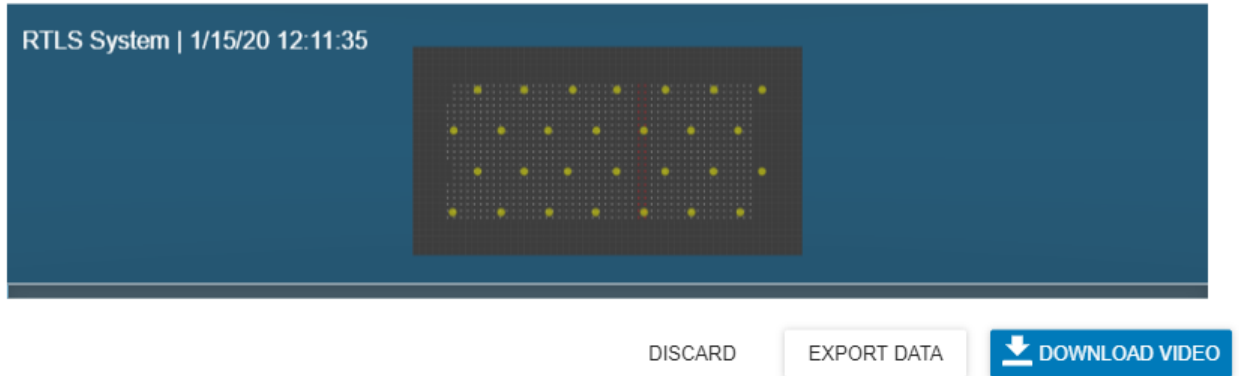


Click **Stop** to stop the recording, and the frames are processed. A preview dialog displays, where you can playback the video that you just captured.

Figure 26 Video Recording Preview

Save Video Capture

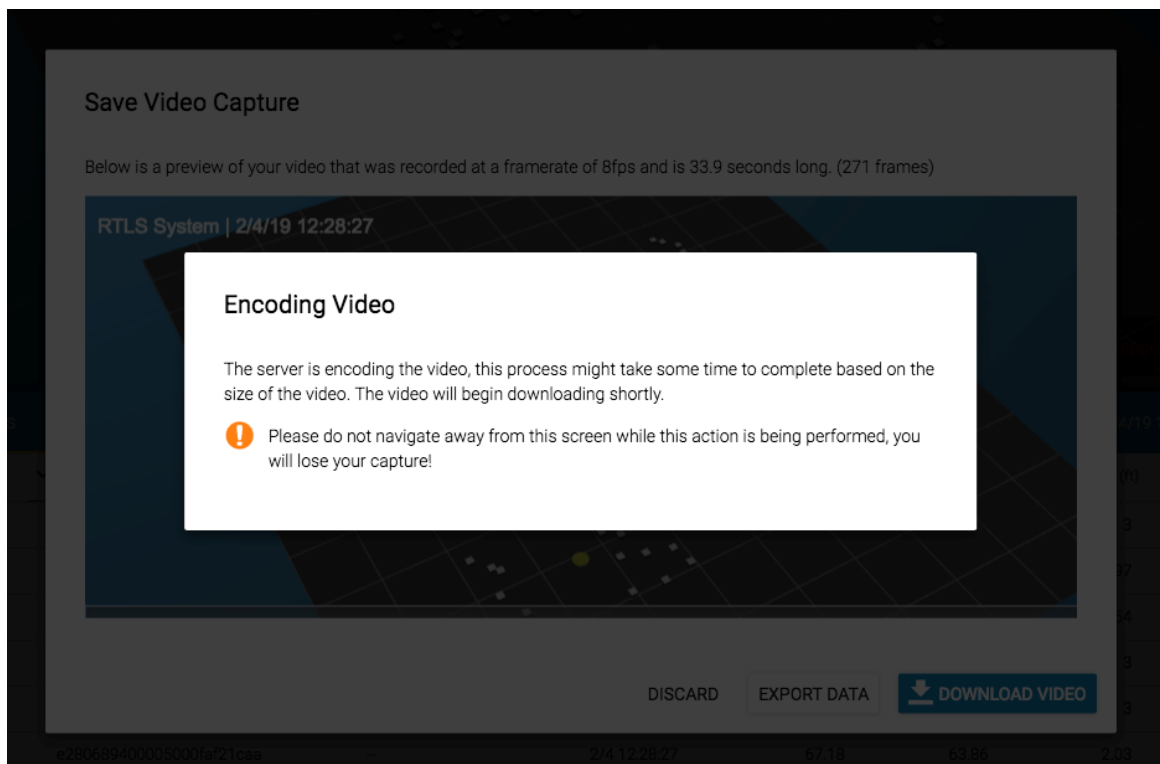
Below is a preview of your video that was recorded at a framerate of 8fps and is 7.2 seconds long. (57 frames)



Downloading a Video

Click **Download Video** to encode the video frames and initiate a download in MP4 format.

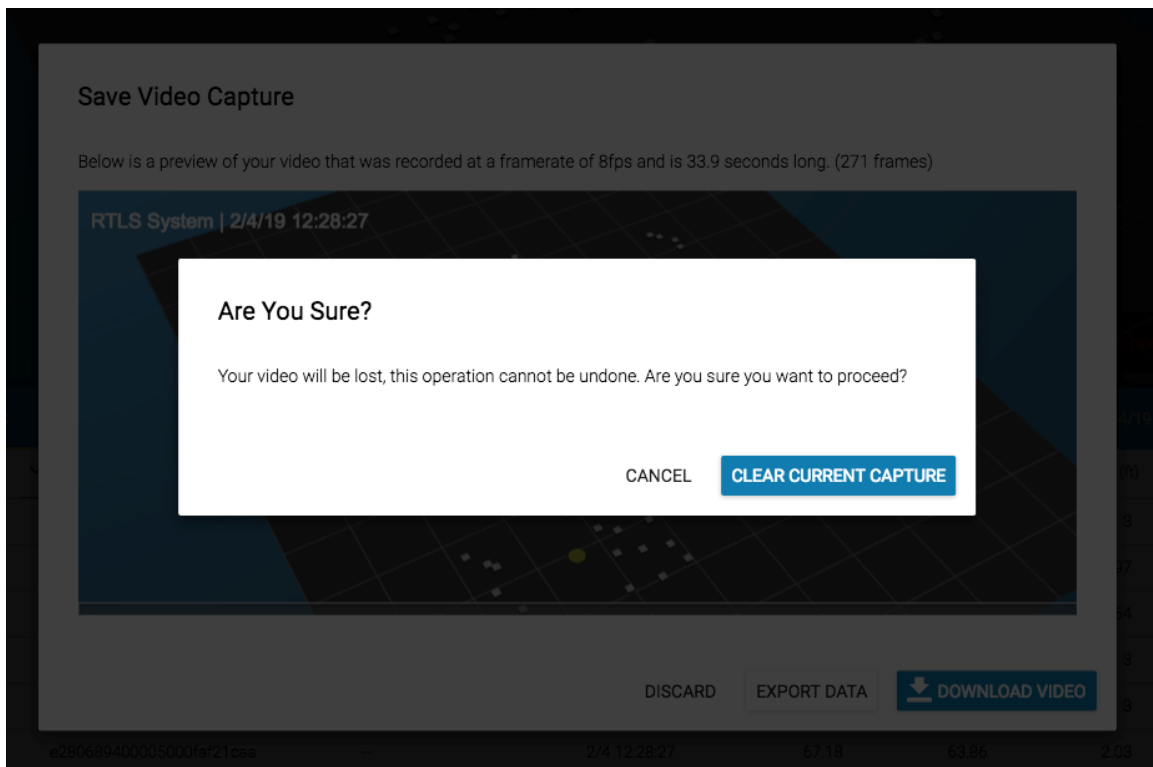
Figure 27 Encoding Video



Discarding a Video Recording

When **Discard** is selected, the system displays a warning that the data capture is lost without the possibility of retrieval. To proceed, select **Clear Current Capture**.

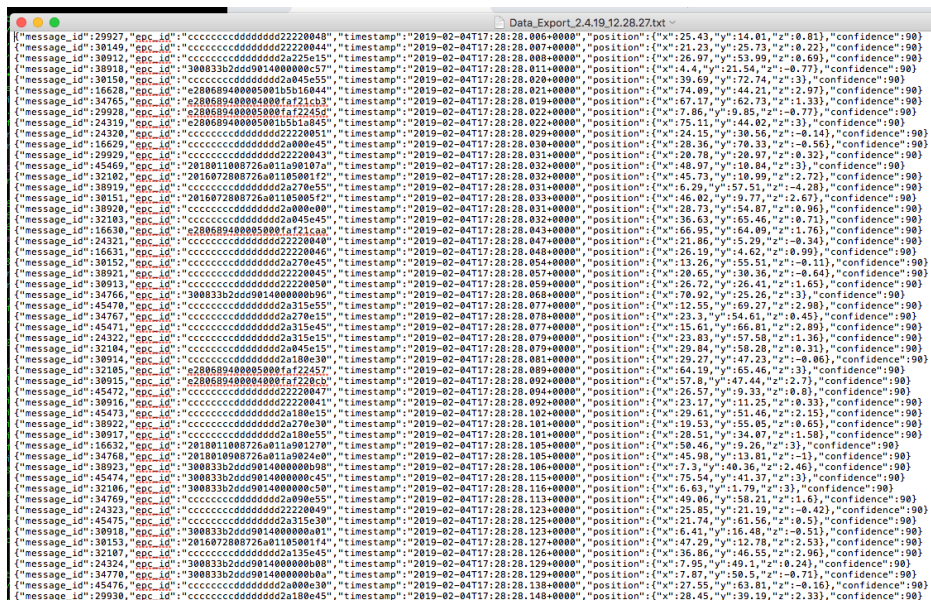
Figure 28 Discard Video Recording



Exporting Data

Every tag location message that was received during the recording is also captured. Click **Export Data** to download these messages into a .txt file onto your computer. The downloaded file contains raw messages that reflect the video capture.


Figure 29 Messages Received During Recording



Static (Reference) Tag Analysis

Reference Tags are a feature that can be used as a validation mechanism after an RTLS system has been deployed. Reference tags are fixed RFID tags at known locations in a facility, which serve as reference points for calibration and system validation. Known reference tags are statically placed in the facility at absolute positions to test the accuracy of the detection algorithm. Multiple tags can be referenced in a reference tag data set.

Uploading a Reference Tag

1. Click  > **Validation**. By default, the **Walking Paths** page displays.
2. On the left pane, click **Reference Tags**.
3. Enter a name for the reference.
4. Enter a description for the reference. (Optional)
5. Paste the CSV data for the reference tags in the following format:
epc_id, x, y, z
6. Click **UPLOAD TAG LIST**. Once uploaded, the reference tag list appears in the lower panel. The reference tags are now available from the **Layers** menu on the **Live View** page.
7. To remove a reference tag list, click **Remove Reference Tag File**.



NOTE: You cannot edit a reference tag once it is uploaded.

Viewing Reference Tags


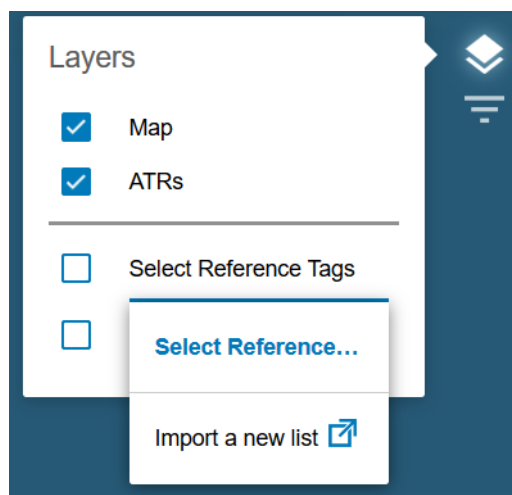
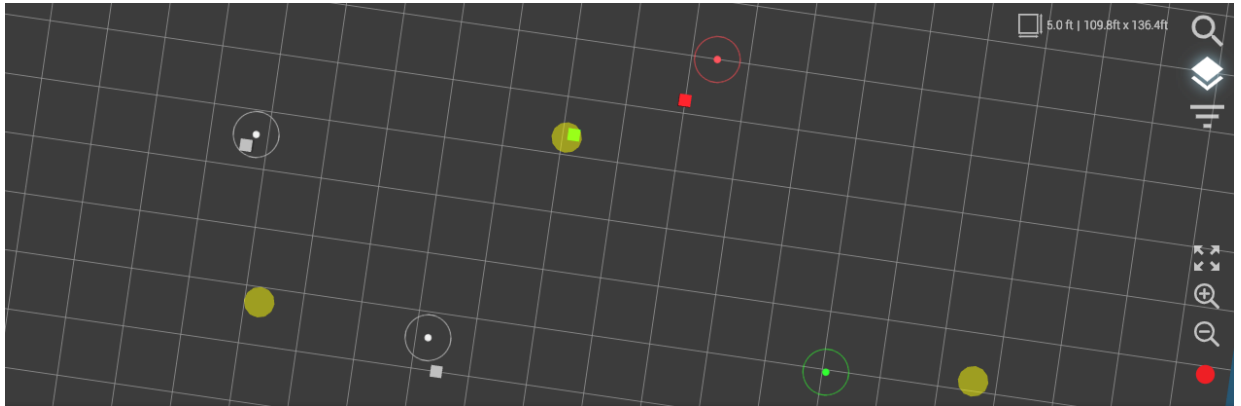
1. On the Live View page, click  and check **Select Reference Tags**.
2. Click the arrow to **Select Reference Tags**.

Figure 30 Live View - Layer Menu



Circles mark the spot for which a tag should be positioned, the circles match the tag type color.

Figure 31 Live Map



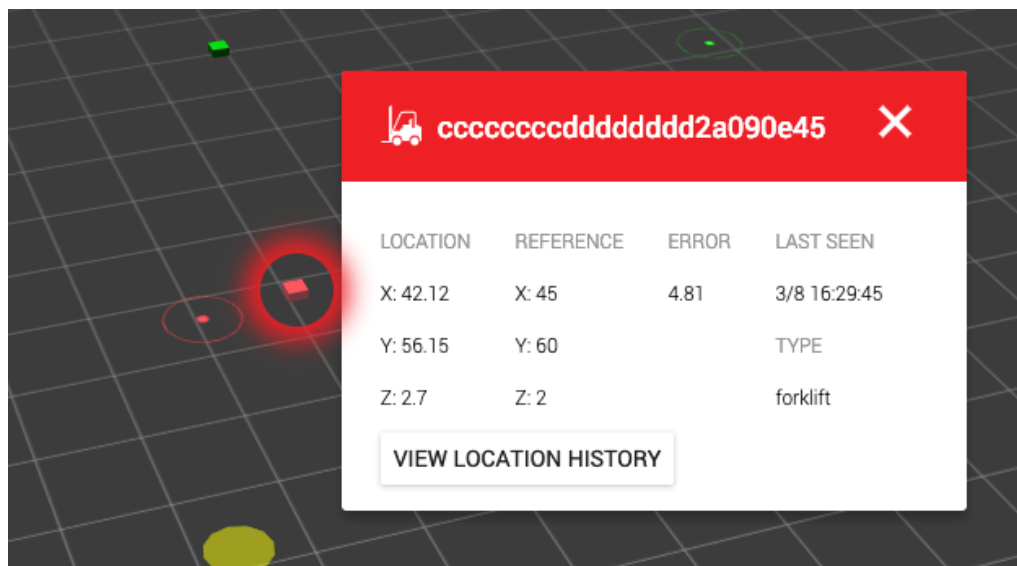
The live table shows only the tags referenced in the import. Any deviation from the tags reference point are displayed as the error value.

Figure 32 Live Table

Tag Details		KAFKA Messages	Tags on the Move		MESSAGE RATE: 106/s AARs: 9 TAGS: 124 MOVING TAGS: 0 LOCAL TIME: 3/8/19 16:29:13					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Tag ID	Type	Last Seen	ACTUAL X (ft)	REFERENCE X (ft)	ACTUAL Y (ft)	REFERENCE Y (ft)	Error	Confidence
<input checked="" type="checkbox"/>	<input type="checkbox"/>	e28068940004000fa220cb	Pallet	3/8 16:29:08	36.17	58	50.29	35	26.65	90%
<input checked="" type="checkbox"/>	<input type="checkbox"/>	ccccccccdddddd2a090e45	Forklift	3/8 16:29:13	42.33	45	56.56	60	4.35	90%
<input checked="" type="checkbox"/>	<input type="checkbox"/>	ccccccccdddddd22220051	--	3/8 16:29:14	25.45	24	30.26	33	3.10	90%
<input checked="" type="checkbox"/>	<input type="checkbox"/>	300833b2ddd9014000000b06	--	3/8 16:29:13	7.2	7	46.5	48	1.51	90%

When one of the rows is selected, the tag detail panel displays the error and reference tag's x and y position in real-time, enabling you to track the accuracy of the recorded tag.

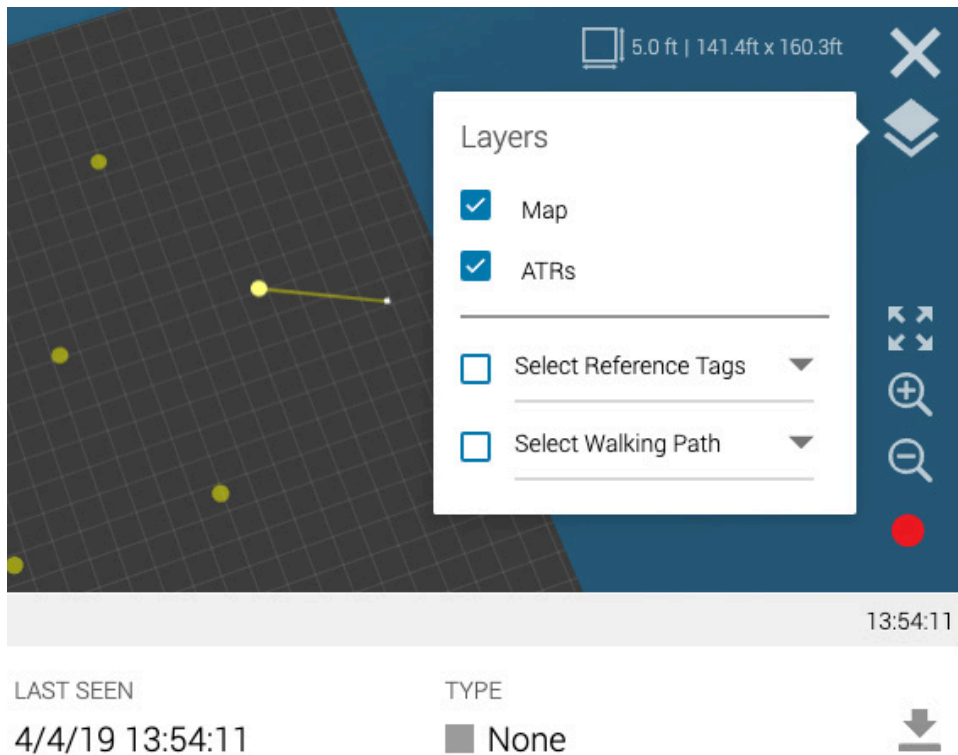
Figure 33 Reference Point Error



The error of 4.81 means that the tag is 4.81 feet away from the expected reference point. Only x and y are considered when calculating the error value.

The Layers menu is visible on the Tag History panel giving you the ability to show or hide reference tag and walking path data sets on the playback map.

Figure 34 Layers Menu

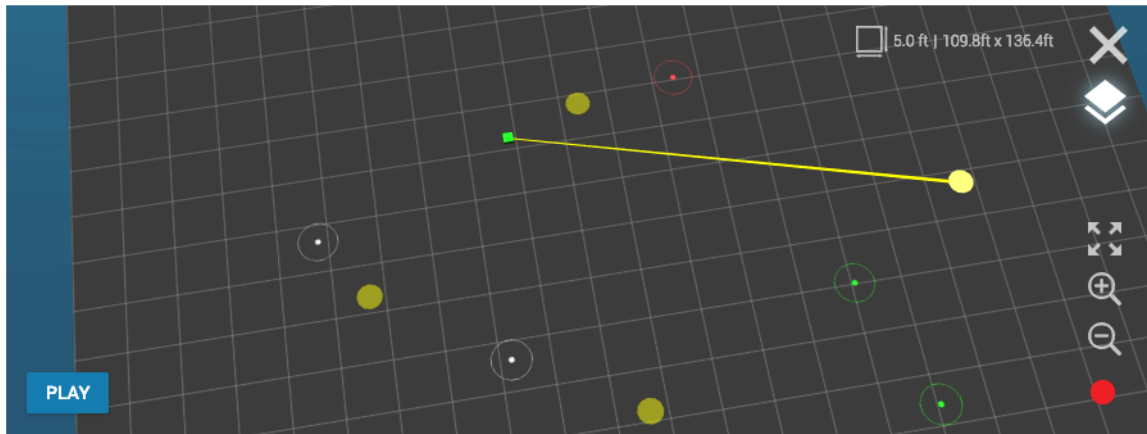


Historical Playback

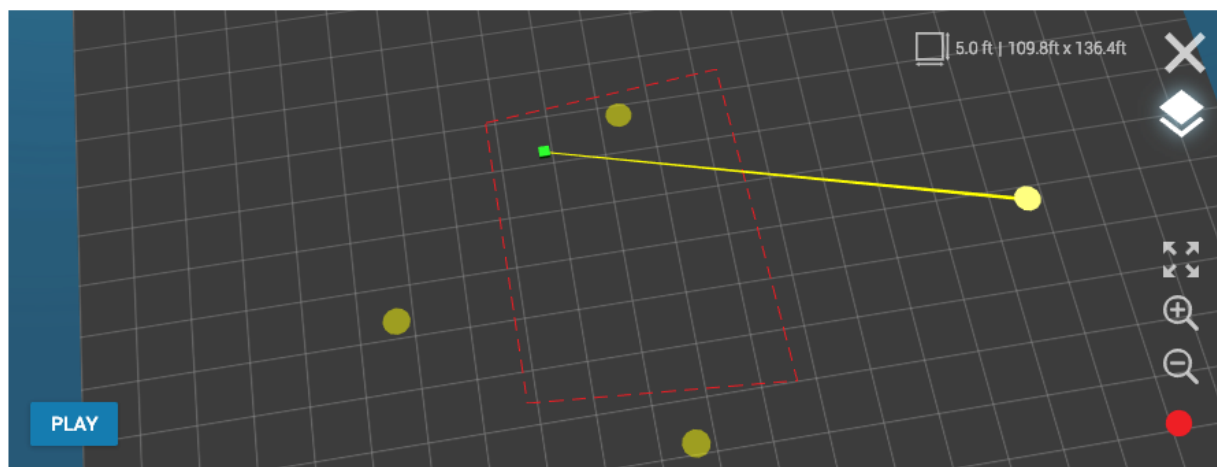


NOTE: The tags on the historical playback map are only used for reference and do not filter the data based on layer selection as it does on the Live View page, where the validation layers are used for real-time analytics.

Figure 35 Historical Playback Map




When a walking path is selected, the visualization appears as shown in [Figure 36](#).

Figure 36 Historical Playback - Walking Path View

Dynamic Tag Analysis (Walking Paths)

A Walking Path is a feature that can be used as a validation mechanism after an RTLS system is deployed to perform dynamic tag analysis, it is also a series of paths in CSV format that forms a pre-determined route, which a tag moves over a specified period of time. This feature can be used to determine the accuracy of a real-life tag while in motion along a known path.

Uploading a Walking Path

1. Click  > **Validation**. By default, the **Walking Paths** page displays.
2. Enter a name for the path.
3. Enter a description for the path. (Optional)
4. Paste the CSV data for the walking path in the following format:
epc id, start time, start_x, start_y, start_z, end_time, end_x, end_y, end_z
5. Click **UPLOAD PATH**. Once uploaded, the path appears in the lower panel. The walking path is now available from the **Layers** menu on the **Live View** page.
6. To remove a path, click **Remove Reference Tag File**.



NOTE: You cannot edit a path once it is uploaded.

Viewing a walking path


1. On the Live View page, click  and check **Select Walking Path**.
2. Click the arrow to select a walking path. Once you select a Walking Path from the drop-down, the system renders the path as a dotted line on the 3D map. The tag inherits the color of the tag type, and displays only the associated tag or tags on the map. In the lower pane, the table displays the associated tag with the walking path dataset, and also provides a live error reading that shows how far from the line the tag is.

Figure 37 Select a Walking Path

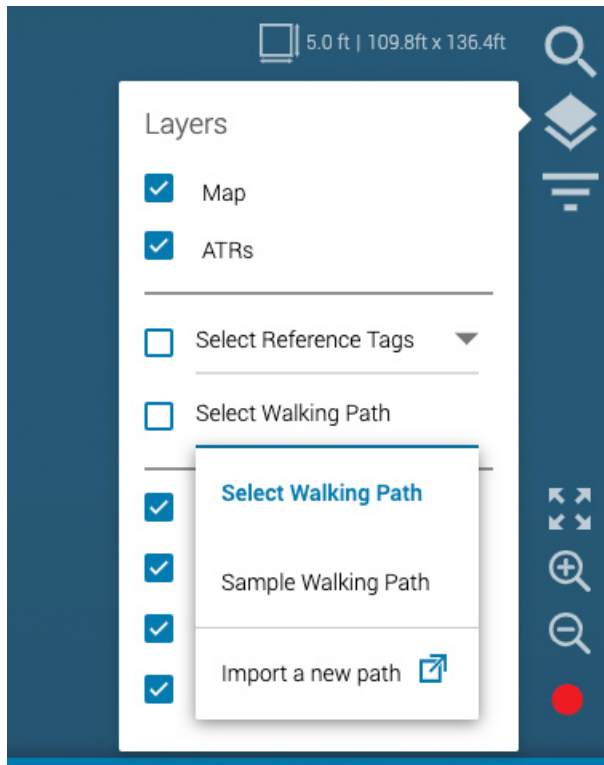


Figure 38 Walking Path Visualization

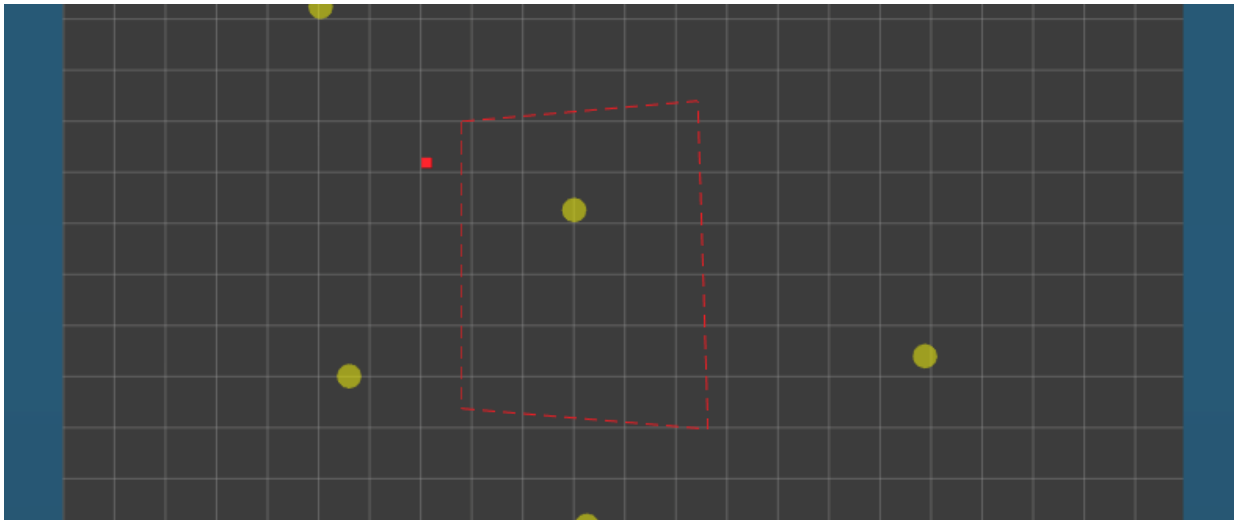



Figure 39 Tag Details Table



Tag Details		KAFKA Messages	Tags on the Move	MESSAGE RATE: 103/s AARs: 9 TAGS: 124 MOVING TAGS: 0 LOCAL TIME: 3/8/19 16:19:01						
<input checked="" type="checkbox"/>		Tag ID	Type	Last Seen	ACTUAL X (ft)	REFERENCE X (ft)	ACTUAL Y (ft)	REFERENCE Y (ft)	Error	Confidence
<input checked="" type="checkbox"/>		cccccccd2a270e30	 Forklift	3/8 16:19:01	19.67	19.32	55.77	59.77	4.01	90%

For walking paths, the actual x and y coordinates are shown next to the reference x and y coordinates. Ideally, the real tag should be on the line with an error reading as close to 0 as possible.



RTLS and ATR Diagnostics

You can view the RTLS system-wide server status, versions, and configurations, as well as the ATR device versions, and health status. You can view specific tags searching or filtering by type or recent movement history.

Viewing and Downloading RTLS System Information

1. Click  > **Diagnostics**. By default, the **CLAS Status** page appears, displaying server memory, CPU usage, tracked tags, error counts, and warning count information. In addition, similar statistics are displayed for the ATR-based components: Radio C&D and Location Analytics.
2. Click the **CLAS Versions** tab to view the Release Package or C&M versions, or the **CLAS Configuration** tab to view configuration, licensing, report filtering, and the associated Kafka broker addresses.
3. On any of the pages, to download a snapshot of the hardware status for the RTLS System, click .
4. Click **EXPORT DIAGNOSTIC SNAPSHOT**. A **.json** file is downloaded to your computer, and you can view the file offline.

Viewing and Downloading ATR7000 Device Information

1. Click  > **Diagnostics**. By default, the **CLAS Status** page appears.
2. On the left pane, click **ATR Devices**. The **ATR Status** page appears displaying hardware information. RAM and CPU performance is displayed by a dough nut graph, and is color coded based on utilization. To view networks, location, and versions, click the **ATR Versions** tab.
3. On either page, in the **Find ATR Hardware** field, you can search for specific ATR's by host address
4. On any page, to download a snapshot of the hardware status for ATR Devices, click ,
5. Click **EXPORT DIAGNOSTIC SNAPSHOT**. A **.json** file is downloaded to your computer, and you can view the file offline.

