MotionWorks Enterprise

2.0

User Guide

P1123395-03EN

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MotionWorks Enterprise 2.0

This user guide focuses on the features and functionality of the MotionWorks Enterprise 2.0 web client, the main tool for users to view and interact with the data provided by the real-time asset tracking MotionWorks Enterprise (MWE) system from Zebra Technologies Corporation.

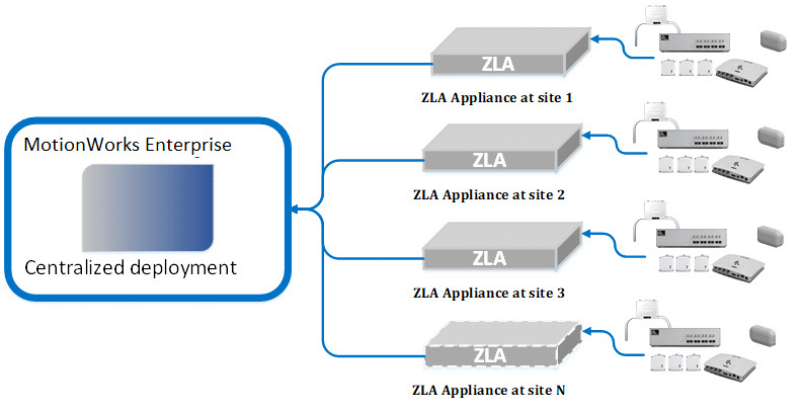
Zebra Technologies offers world-class real-time asset tracking and management software solutions to optimize the flow of goods in complex logistical operations, increasing productivity, lowering operational costs, and improving safety and security. Zebra Technologies uses a wide range of scalable RTLS (Real Time Locating Systems) technologies to generate accurate, on-demand information about the physical location and status of assets.

MWE is a software suite that provides tools for designing, configuring, operating, and troubleshooting RTLS solutions. MWE serves as the central repository for all the real-time location and communication data captured by the RTLS-tracking infrastructure. MWE also provides tools for integrating RTLS data with customers and third-party applications.

Some of the location and telemetry RFID technologies supported by MWE include:

- Passive RFID
- UWB
- Bluetooth Low-Energy
- WiFi
- ISO 24730
- GPS

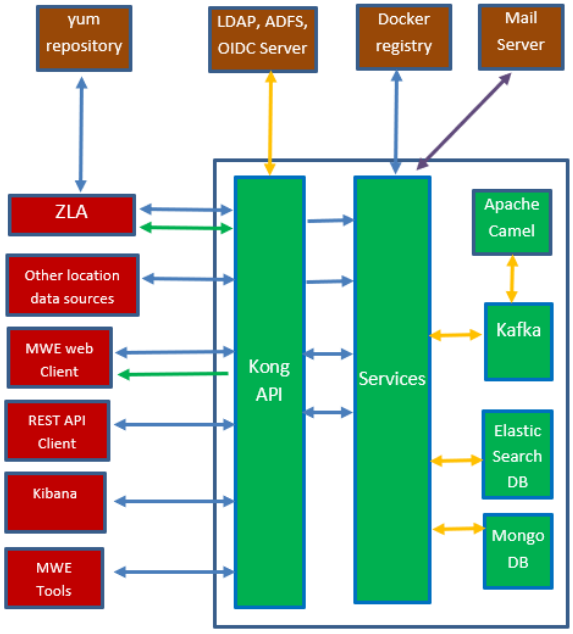
The diagram below provides an overview of some of the RTLS system components and data flow. The over-the-air RF transmissions from tags (RF transmitters) are detected by sensors connected to a network. This connection can be wired or wireless. The data generated by the sensors flow across the network to a Zebra Location Appliance (ZLA) and then to a MWE server. Multiple sites are supported, each with its own ZLA.



A ZLA can collect, process, and filter location and telemetry data from multiple sensing devices and can also run a variety of location algorithms. A ZLA can be a virtual appliance or physical appliance. A physical ZLA is 1U rackmount box installed on-site feeding tag blink and location data to MWE server installed on site or remotely at a data centre.

MWE 2.0 also supports direct communication from passive RFID readers to MWE running locally or in the cloud. No ZLA appliance is required in this case.

The MWE software is installed on a Linux server (Red Hat or CentOS). The diagram below illustrates the various MWE software components hosted on the MWE Linux server and their relation within the MWE software.



MWE Linux Server

This guide assumes that the MWE software is previously installed and properly configured. Consult the following documents for details on MWE installation and configuration:

- MWE 2.0 Installation Guide
- MWE 2.0 Configuration Guide

Term List

The table below provides a brief overview of the terms used in the MWE documentation:

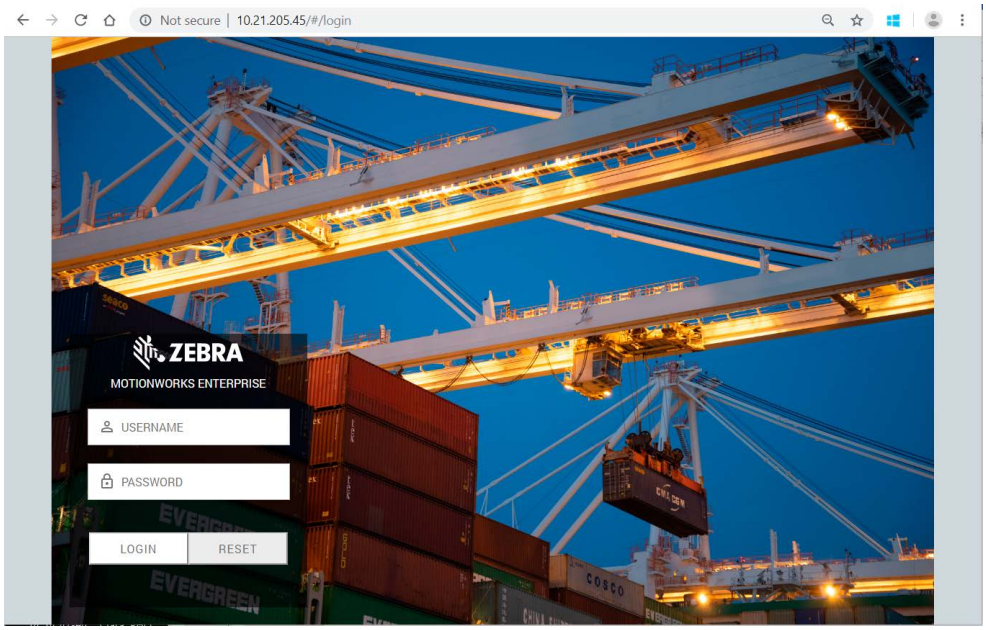
Table 1 MWE Definitions

Term	Definition
Tag	An active or passive RFID transmitter. It can be a WhereNet tag, DART (UWB) tag, GPS tag, EPC (passive RFID) tag, BLE tag.
Resource	An object, equipment, vehicle, etc. whose location and status is to be tracked.
Asset	Synonym with Resource.
Tag ID	A unique tag identifier that is included in every tag transmission.
Resource ID	A unique identifier that identifies the resource being tracked.
Asset ID	Same as Resource ID.
Resource Type	A type or category of resources as defined within the MWE software. Examples of resource types are printer, trailer, container, truck, airplane, etc. Every resource within the MWE software belongs to a resource type.
Tagged Resource	A resource whose Resource ID is associated with a Tag ID in the MWE software.
Unassigned Tag	A tag whose Tag ID is not associated with a Resource ID within the MWE software.
Tag Blink	A tag transmission (one or multiple bursts of electromagnetic waves in the RFID part of the spectrum).
Location Sensor	A device that captures tag blinks and forwards them across the network to a server or ZLA.
ZLA	Zebra Location Appliance. A physical or virtual appliance that receives data from a variety of sensors and runs location algorithms. The resulting coordinates x,y or latitude/longitude are forwarded to the MWE server.

Launching the MWE Web Client

To launch the client, open a web browser (Chrome, Edge, Firefox) on a client machine or server on the network, and point it to http://MWE_Server_Name or https://MWE_Server_Name, where MWE_Server_Name is the Linux (Red Hat) server name or IP address.

The login page is displays:



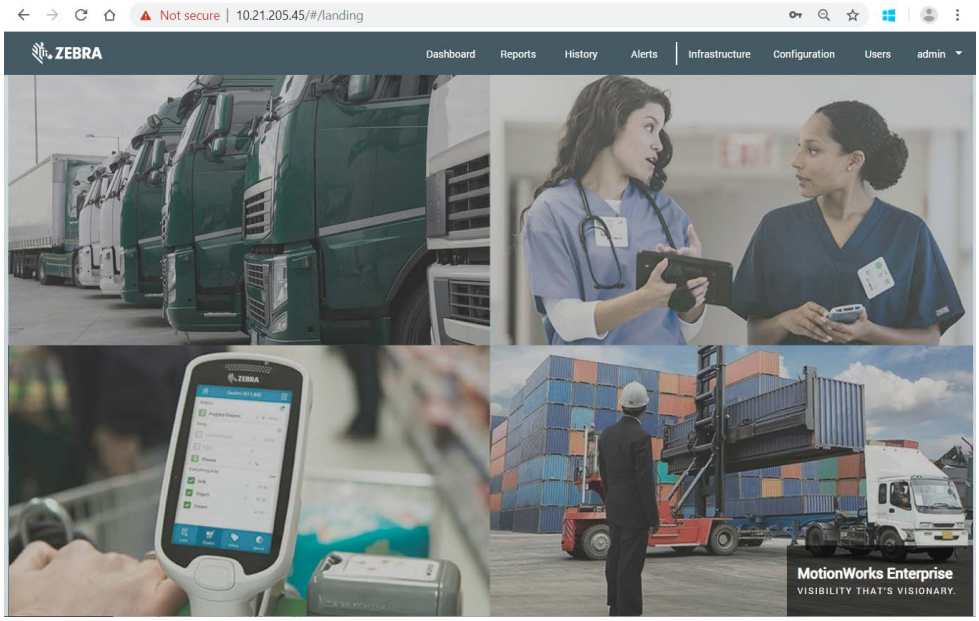
Next, enter the login credentials. This could be a local account created and stored in the local MWE SQL database, or it could be a domain account authenticated by an OpenLDAP, Active Directory, or ADFS server. See the MWE Configuration Guide on how to configure authentication modes and login accounts.

NOTE: Depending on the MWE version, you may see some differences between the screens depicted in this document and the screens in your MWE version.

Enter your login credentials. This could be a local account created and stored in the local MWE SQL database, or it could be a domain account authenticated by an OpenLDAP, Active Directory, OIDC, or ADFS server. Please see the MWE Configuration Guide on how to configure authentication modes and login accounts.

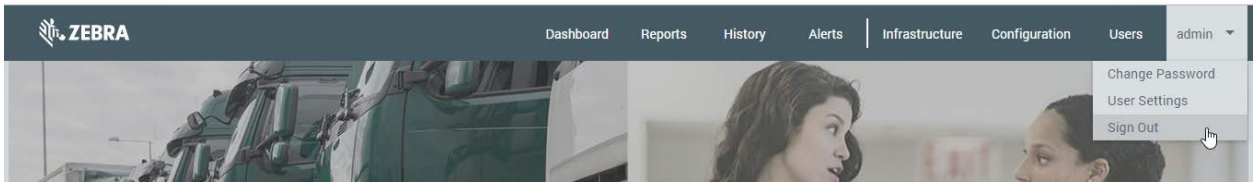
Note that the browser may display a not secure or certificate error or similar warning in the URL bar when using https. This is because the MWE installation script installs a default self-signed certificate on the MWE Linux server. Refer to the MWE Configuration Guide for instructions on installing your own valid certificate on the MWE Linux server.

After logging in, view the landing page with a menu bar at the top of the page containing several items: Dashboard, Reports, History, Alerts, Infrastructure, Configuration, Users, and admin (the name of the account currently logged in).



The menu items that are visible on menu bar depend on the access level granted to your login account. If you have full access, you should see the 8 menu items listed above.

To sign out, click the down arrow in the rightmost (account name) menu item and select **`Sign Out`**.

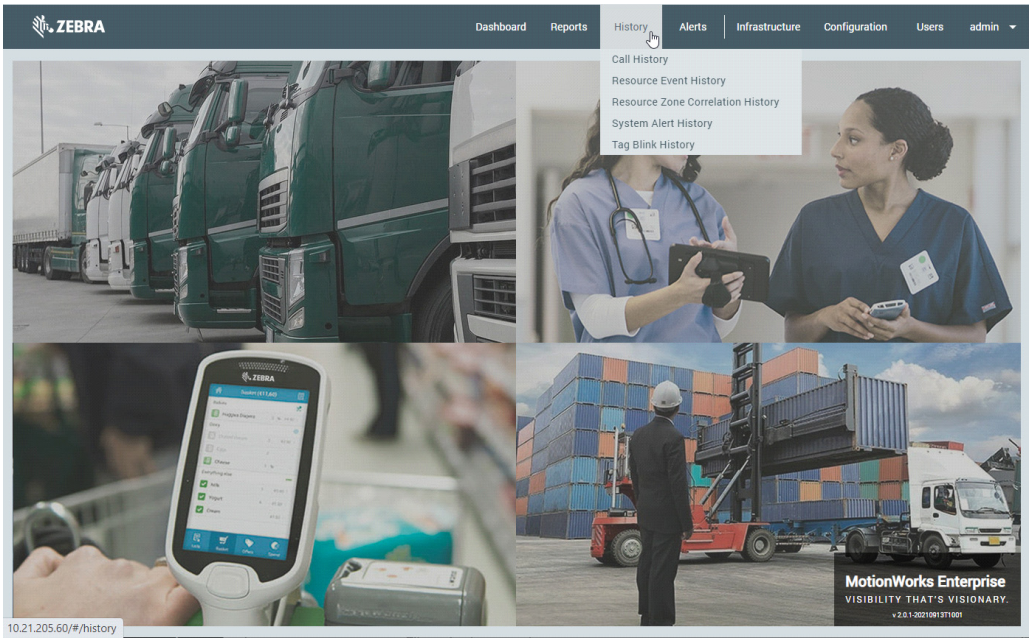


UI Basics

This section provides an overview of the MWE web client user interface. Note that depending on your MWE version, you may see some differences between the screens and menus depicted in this document and those in your MWE version.

Menu Items and Reports

Hovering the mouse over a menu item on the menu bar displays a list of available reports under that menu item in alphabetical order, as in the following figure.



The following table lists the reports under each menu item and a brief explanation for each report. These reports will be explained in greater detail later in this guide.

Table 2 Menu Items

Menu Item	Report	Description
Dashboard		This tab includes reports that present summary information in graphical form.
	Resources	Graphical summary of number of tracked resources, listed by type, site, zone, and custom properties.
	System Health	Graphical summary of open system alerts per site, including ZLA, sensor, tag, and other alerts.
	Alert Manager	Tool for configuring alerts related to the health of the MWE Linux server. It is meant only for advanced users and system administrators.
	Grafana - System Health	This tool presents pre-defined dashboards showing health and status of the MWE Linux server.
	Kibana - Application History Data	While the MWE web client offers out-of-the box reports that display application historical data, this tool allows direct access to the application historical data in the MWE Elastic Search database.
	Kibana - Application Logs	This page allows access to the different logs generated by MWE microservices. It is typically used for diagnostics and troubleshooting.
	Prometheus	Tool for building queries on the MWE Linux server health. It is meant only for advanced users and system administrators.
Reports		Includes reports (in table form) with status information on tags and resources being tracked at a site. It also includes a report on import data entry operations.
	Import	Includes the import data entry form and shows a history of import transactions done via the MWE web client
	Resources	Displays status information about each resource being tracked at a site.
	Tags	Displays status information about each resource or asset being tracked at a site, regardless of tag association.
History		Reports that provide historical data on tags, resources, locations, events, system alerts, and more. Each report has purging and/or archiving settings that are discussed later in this document.
	Call History	Shows shows every blink from any WhereNet Call Tag. These blinks have TagStatus=2 in the blink packet (as opposed to TagStatus=0 for blinks from regular WhereNet tags).
	Resource Event History	Displays all events generated by the MWE system related to resources being located and tracked, including Zone Change, Resource Alert, Pickup, Dropoff, Shipped, Received.
	Resource Zone Correlation History	Displays a history report that shows when 2 different resources were in the same zone over a specified time window. The report will show every occurrence and dwell time over that time window.

Table 2 (Continued)Menu Items

Menu Item	Report	Description
	System Alert History	Keeps a record of every system alert that has been opened and closed.
	Tag Blink History	Keeps track of every single tag blink processed by the system. Data is only kept for the most recent 7 days.
Alerts		This tab includes a single report.
	Alert Notifications Configuration	This report lists the people (from the Contacts report) that will be notified via email when a specified alert is triggered.
	Open System Alerts	Lists all system alerts that are currently open.
Infrastructure		The reports under this tab allow users to monitor and manage location appliances, define sites and site groups, and upload site maps.
	Appliances	Allows users to monitor and manage location appliances.
	Devices (Device Manager)	Allows adding, configuring, and managing devices directly from this page. No ZLA appliance is required for devices added in this page. In MWE 2.0, only passive RFID readers (FX7500, FX9600, ATR) are supported; must be running firmware v.3.7.26 or higher, and must have the R2C (Reader to Cloud) application installed.
	Hardware Devices	Lists all of the hardware installed at a site as part of the location infrastructure. This report gets populated when System Builder (a MWE system design tool) performs a publish operation. Refer to the MWE Configuration Guide for more details.
	Site Manager	This is where users define sites and site groups, and upload site maps.
	WherePorts	Lists all WherePorts defined in System Builder. WherePorts are also listed in the Hardware Devices report, however, this report provides additional information about the configuration of each WherePort.
Configuration		This tab lists reports that are used to configure different aspects of the MWE software. Entries in these reports can be created, modified, or deleted using data entry.

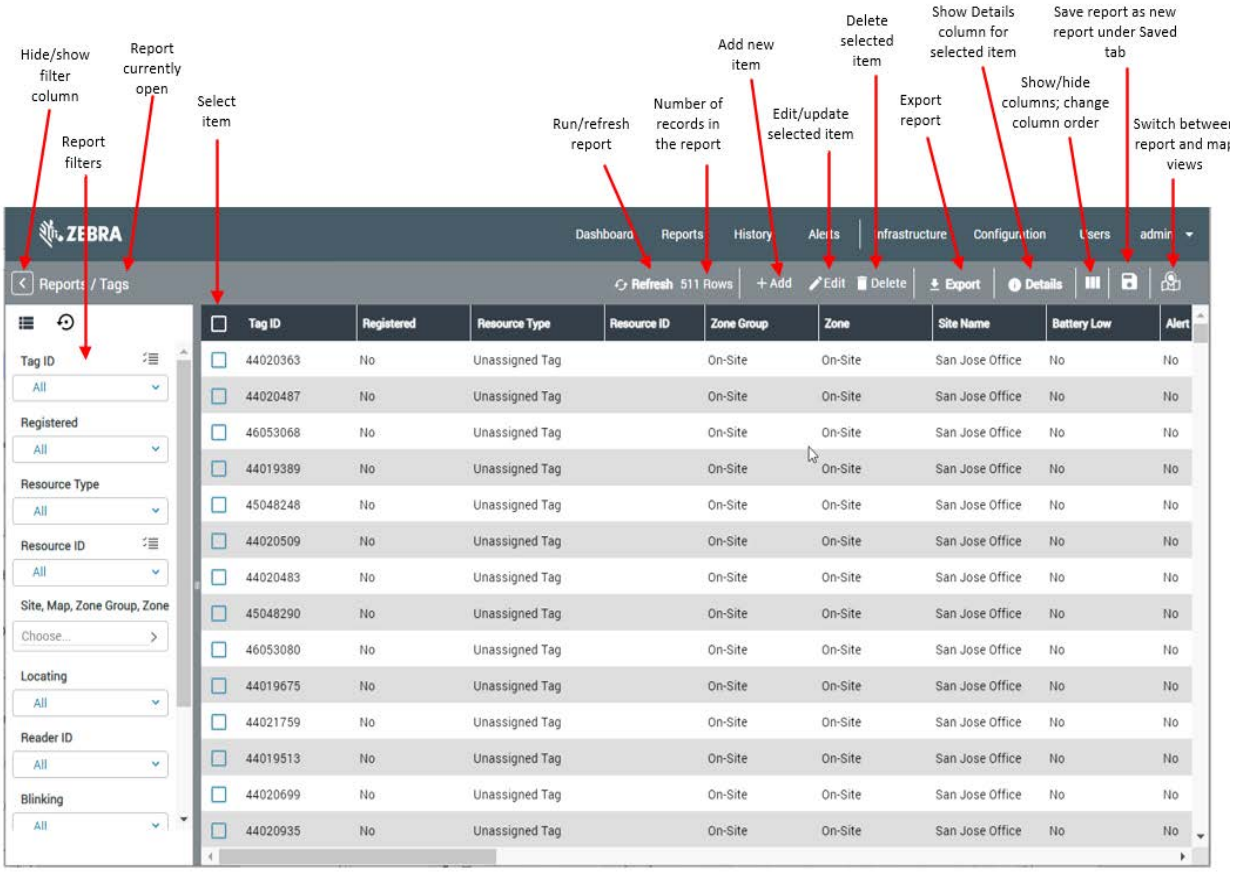
Table 2 (Continued)Menu Items

Menu Item	Report	Description
	Contacts	Users can manage the list of contacts to be used in emailing alerts and scheduled reports.
	Resource Alert Settings	This menu item opens a web page where one can define resource alerts (business rules).
	Resource Type Settings	This is where resource types are defined. Examples include car, trailer, printer, or any other resource type. Each resource type has a set of properties and filters that are specified in this report. Individual resource/asset of this resource type can then be entered into the system with unique resource ID and associated with a tag ID. This can be done using data entry in the Resources report (under Reports tab), data import, or via the API.
	System Alert Settings	Lists all available system alerts. This report allows customization of alert messages and the specification of email distribution list for each alert.
	Virtual Tag Settings	Define virtual tags using this setting. Several real tags can be associated with a virtual tag (in the Virtual Tag Assignment Settings report). The tag blink data reported by MWE for a virtual tag is a configurable combination of the data from the real tags associated to that virtual tag.
	WherePort Dissociate	Associating or dissociating tag ID's to or from asset ID's are done using data entry, data import, or the API. Tag dissociation can be done automatically when a tagged asset crosses the field of a WherePort device (a magnetic exciter). In this report, enter the WhererPort ID's that being used to perform this task.
	Zone Group Settings	Displays Zone Groups published by Zone Builder tool and provides data entry to change some zone group parameters.
	Zone Settings	Displays Zones published by Zone Builder tool and provides data entry to change some zone parameters.
Users		This tab includes two sub-tabs or pages, namely, USER GROUPS and USERS. The USER GROUPS page is the place where to add User Groups and specify the permissions for each group. If using a domain server for authentication, the name of domain groups can be added here. The USERS page is where one can create local user accounts (stored in a local MWE database) and assign them to User Groups. Domain login accounts do not need to be added here.
(logged in account)		The last tab shows the name of the account currently logged in to the web client, and includes items to change user settings and to sign out. A local account can also change password here.

Report Interface

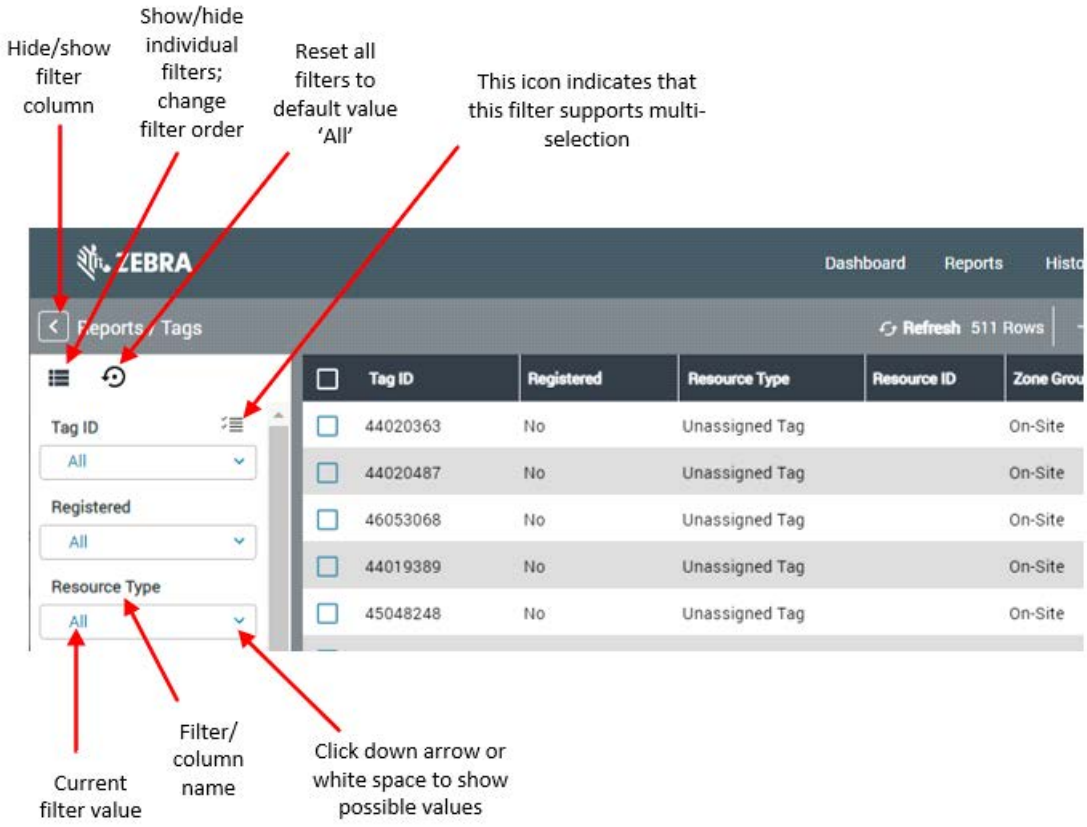
All reports under the **`Reports, History, Alerts,`** and **`Configuration`** menu items have a similar user interface. In addition to the main menu bar, there is a report tool bar in lighter gray color, a report/map window, and a filter's column. The following figure shows the **Reports > Tags** report.

NOTE: Depending on what version of MWE you are running, the name and order of menu items shown in the figures below may differ slightly from your version.



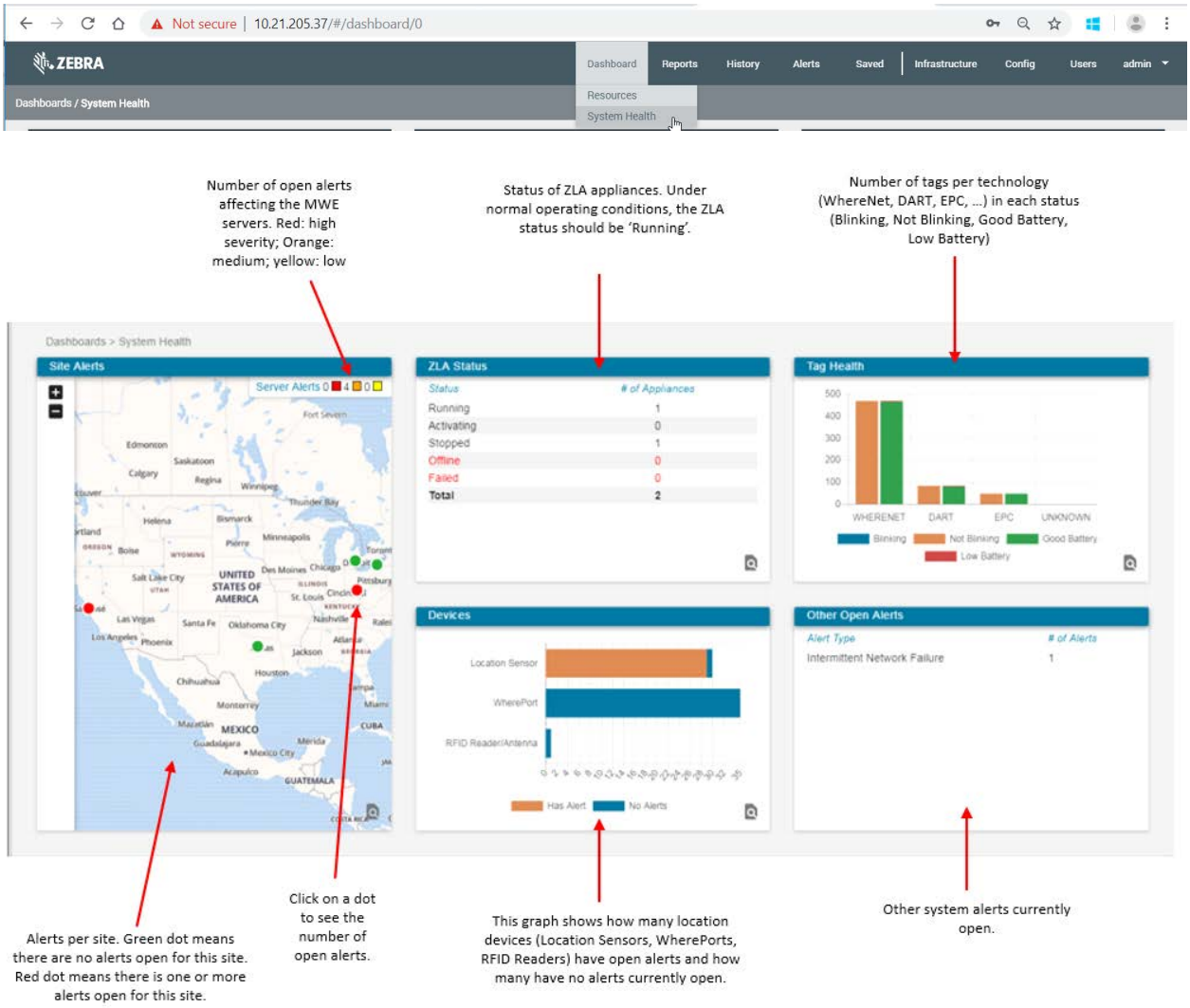
The following figure provides additional details on the filter's column.

NOTE: Not every column in a report has a filter associated with it.



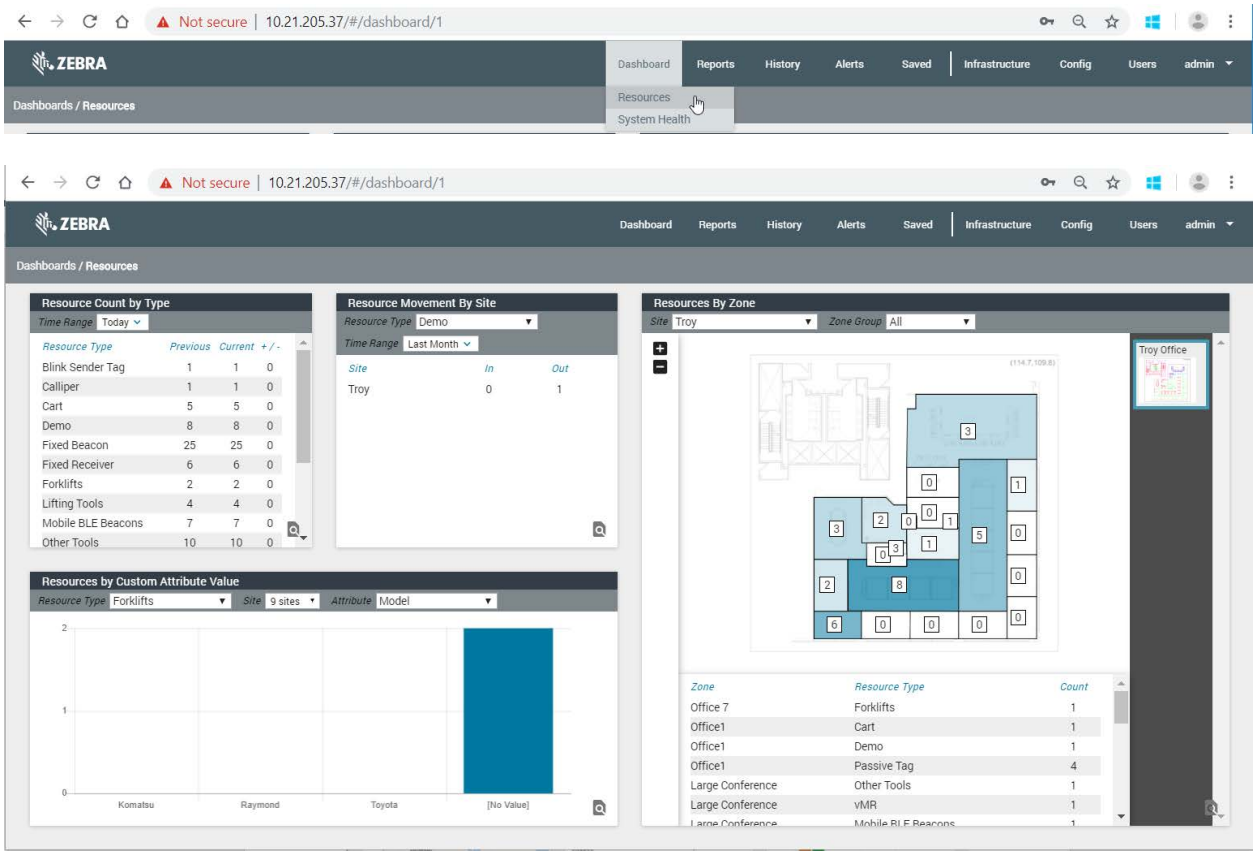
Dashboard

The **`Dashboard > System Health`** page presents a graphical summary of the health of the system, including servers, appliances, sensors, and tags.



NOTE: Depending on your MWE version, you may see a different version of this dashboard where the graphs have been replaced by tables, but the meaning of the panels is still the same.

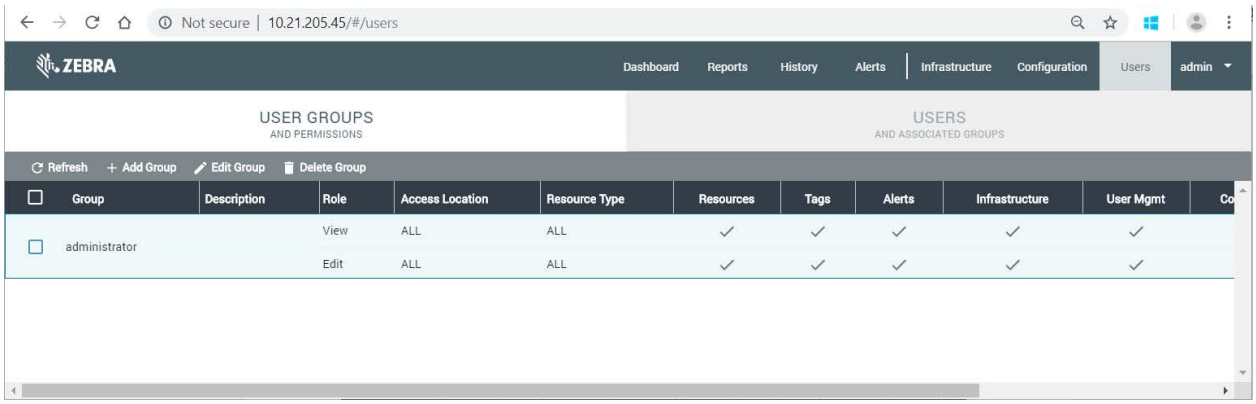
The **Dashboard** > **Resources** page provides several counters related to the location and status of resources being tracked across multiple sites.



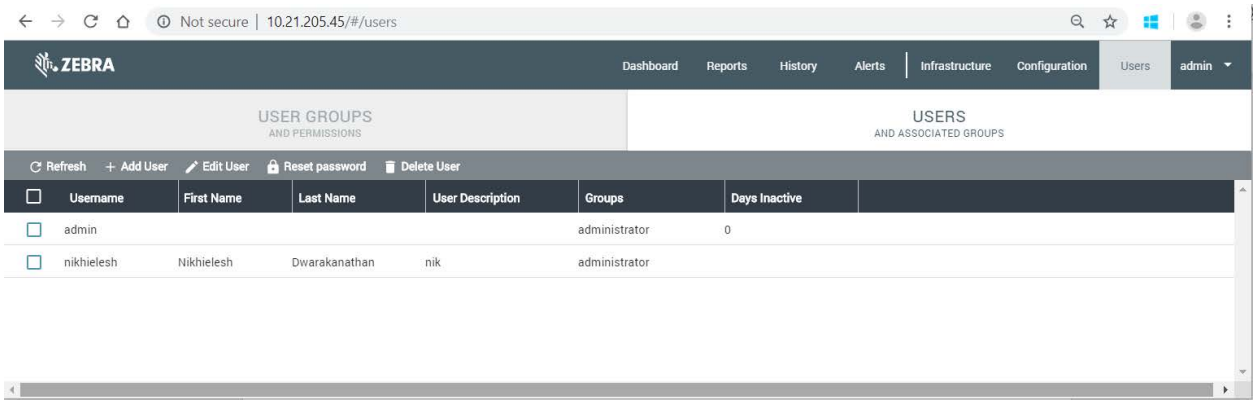
Users

The **Users** page includes two tabs, namely, User Groups and Users.

The **USER GROUPS** tab is the place where to add User Groups and specify the permissions for each group. Only the administrator user group is created at installation time. If using LDAP/ADFS/OIDC authentication, the name of groups on the LDAP/ADFS/OIDC server can be added here. If using MWE database authentication, newly added groups will exist only on the local MWE SQL database.



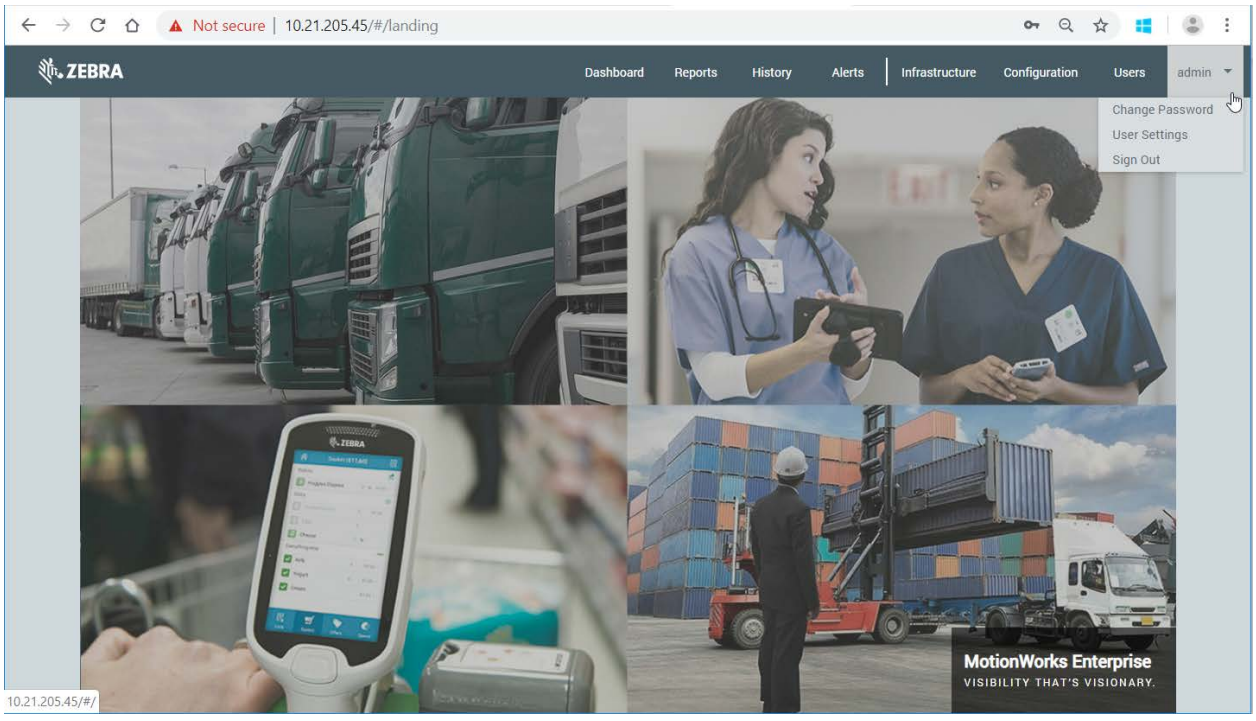
The **USERS** tab is where a user can create local user accounts (stored in the MWE database) and assign them to User Groups. Domain login accounts do not need to be added here.



It is possible to configure the system to do only LDAP or ADFS or OIDC user authentication, or only MWE local account (in MWE SQL database) authentication, or a mixed mode allowing both MWE local authentication and one of the LDAP/ADFS/OIDC authentication methods. This configuration is done in the **.env** configuration file on the MWE Linux server. Refer to the MWE 2.0 Configuration Guide for details.

Login Account Menu

The last item on the menu bar has the name of the login account currently logged into the web client. In the example below, it is **admin**:



In this example, a local user (a login account stored in the local MWE database) can change their password. The **Change Password** menu item is not enabled for domain accounts, which are controlled by a domain controller on the network.

The **User Settings** item provides web client settings that are applied only to the account currently logged in. Lastly, the **Sign Out** item allows a user to sign out.

Prerequisites

The MWE Installation Guide and MWE Configuration Guide explain the MWE software installation and configuration steps that must be completed before a user launches and uses the MWE web client.

The main installation and configuration procedures are listed below:

MWE Installation Procedures

1. Install MWE software on Windows server.
2. If deployment includes ZLA appliances:
   a. Register ZLA appliances with MWE Linux server.
   b. Upgrade ZLA appliance firmware.
3. Upgrade sensor (if any) firmware.
4. Upgrade MWE software.

MWE Configuration Procedures

1. Add Site Groups, Sites, and load site maps in the **Infrastructure** > **Site Manager** report.
2. Calibrate maps (define x,y coordinate system) in the Site Manager report.
3. If deployment includes ZLA appliances:
   a. Register ZLA appliances with MWE Linux server, if not done at installation time.
   b. Associate each ZLA appliance with a site.
   c. Use System Builder tool to add location sensor devices and define location algorithms.
4. Define zones on top of each map. This is done in the Configure Zones tab in the Site Manager report.
5. Configure authentication mode: local MWE database, LDAP, ADFS, OIDC, or a combination of these. This is done in the .env configuration file on the MWE Linux server.
6. Add LDAP/ADFS/OIDC User Groups to MWE for LDAP/ADFS/OIDC authentication
7. Create local User Groups and Users, and define permissions

Once the above steps are complete, a user can use the MWE web client to view and enter data about tags and resources being tracked by the RTLS (Real Time Location System) and perform many other tasks as listed in the following section.

Web Client Common Tasks

This document explains the most common tasks performed with the web client. The tasks listed below are explained in various sections of this guide.

- Launch MWE web client
- Navigate the MWE web client UI

- View sites on a world map where tags and assets are being tracked
- View site maps
- View appliances installed at each site, and their status
- Define location filters (rate filter, median filter, …) per appliance

- View tags status and current location
- View tag blink history
- View tag data in reports and on maps

- Define resource types
- Define location filters (rate filters, median filter, ….) per resource type
- Associate resource ID's to tag ID's
- View resource status, current location, and location history in reports and on maps

- Customize reports (columns displayed, column names, column order, filter data)
- Customize report filters (filters displayed, filter names, filter order)
- Save customized reports
- Export reports (CSV and HTML formats)
- Import data

- Define business rules alerts (resource alerts, pick-up/drop-off alerts)
- Configure automatic email notification or resource alerts

- Check system health
- Configure automatic email notification of system alerts
- Configure tag low battery alert
- View alert history and alert notification history
- Enable/disable system alerts

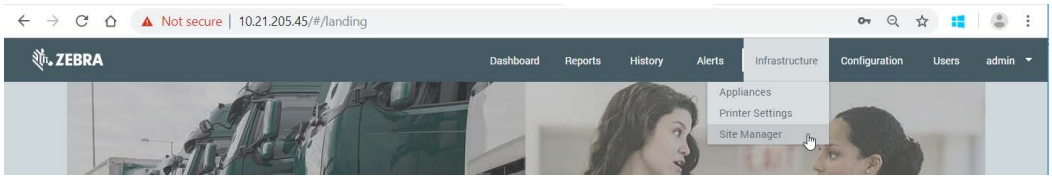
- View available system events (zone change, object association, alerts, etc)
- Specify system events to be stored

- View history of system events

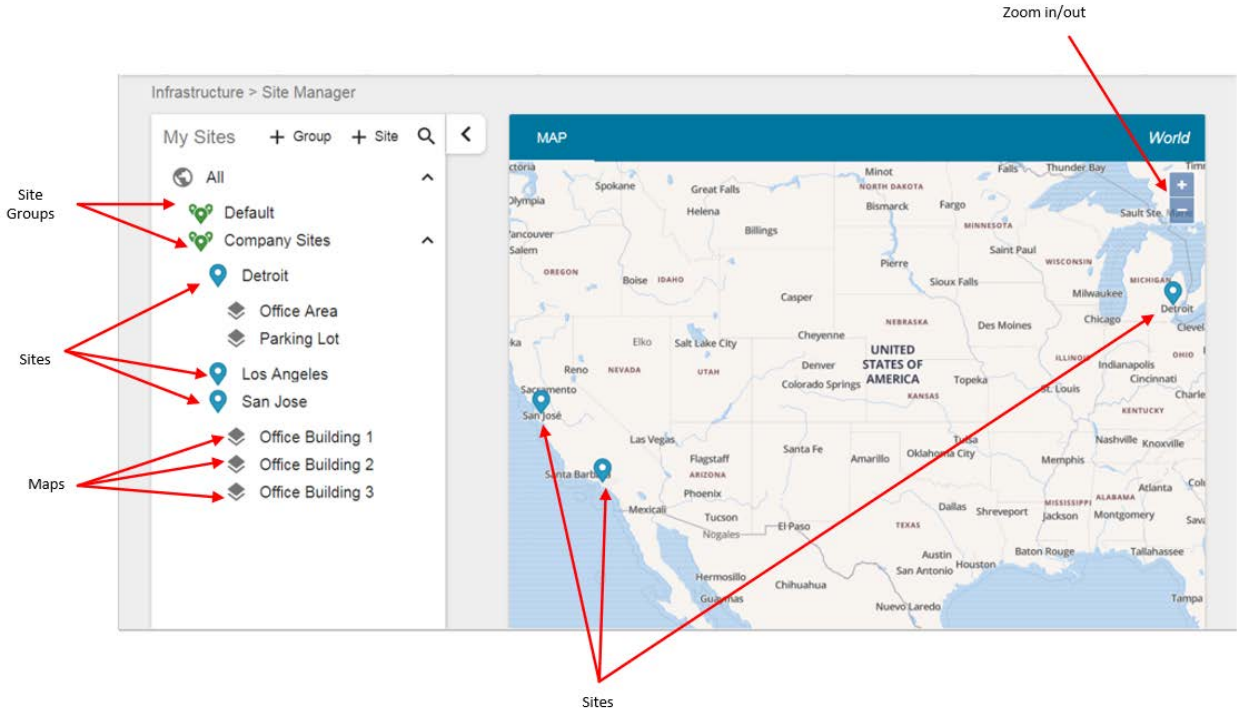
Viewing Sites and Site Maps

The sites and site maps where asset locations are being tracked can be viewed in the **`Infrastructure`** > **`Site Manager`** report, as shown in the following figure. After installing the MWE software, only the Default site group will be present. Refer to the MWE Configuration Guide for additional information on how to add site groups, sites, and upload site maps.

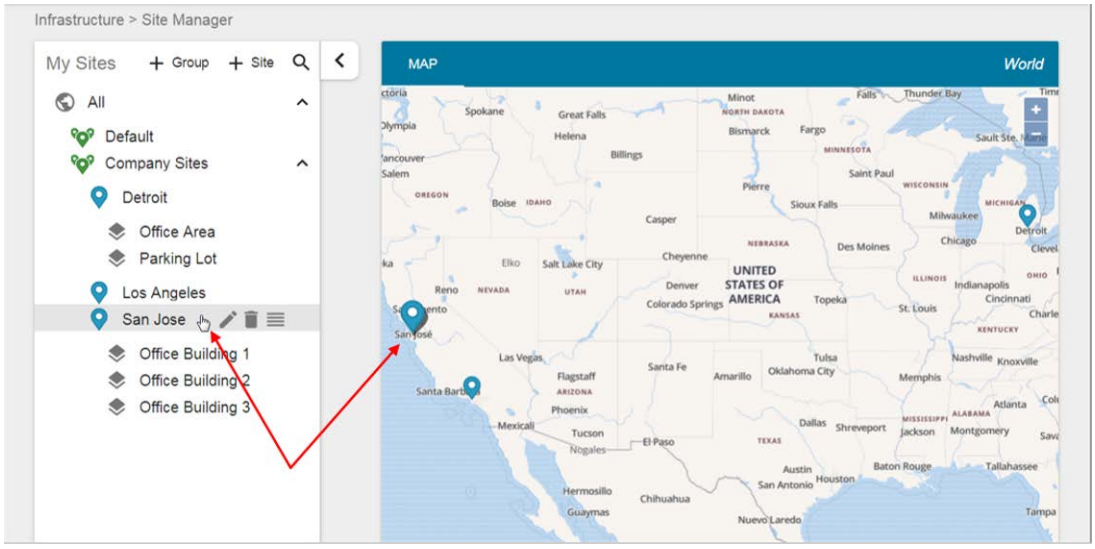
Clicking on a site group in the tree-view, such as `Company Sites` in the example below, displays a map in the map window containing all the sites under that site group. In our example the sites under the **`Company Sites`** group are **`Detroit, Los Angeles, and San Jose.`**



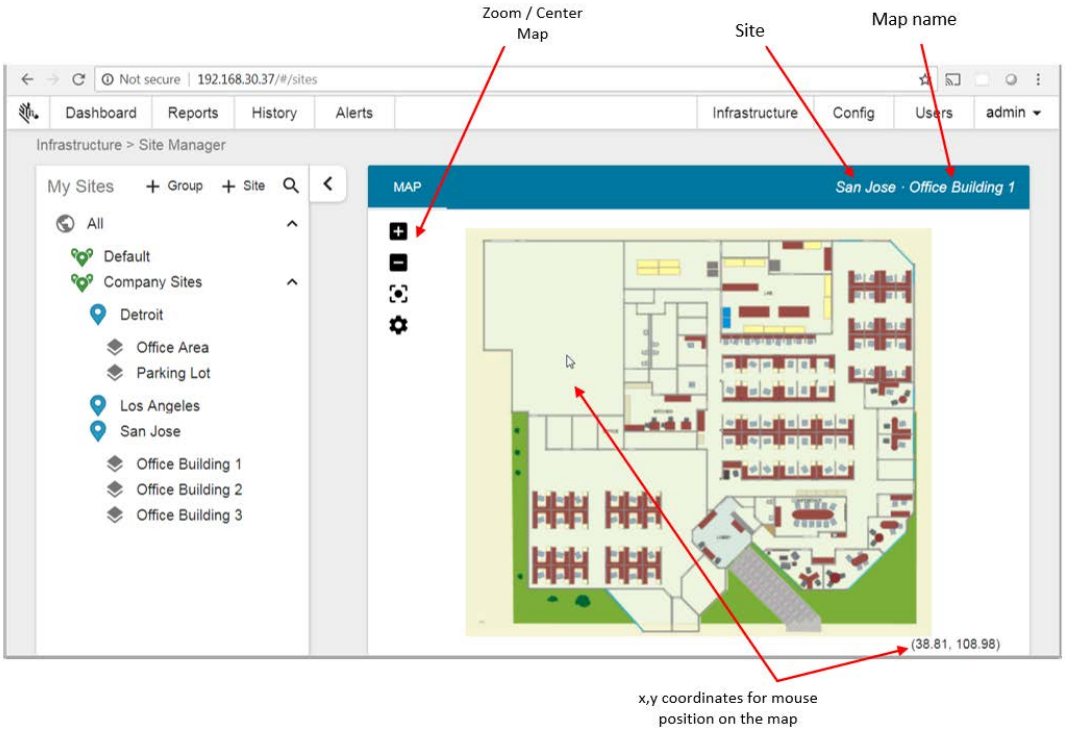
NOTE: Depending on your MWE version, you may see a different color scheme than the figures below show, but the meaning of the items is still the same.



Hovering over a site name in the tree view using the mouse causes the corresponding blue pin on the map to be highlighted by increasing in size:

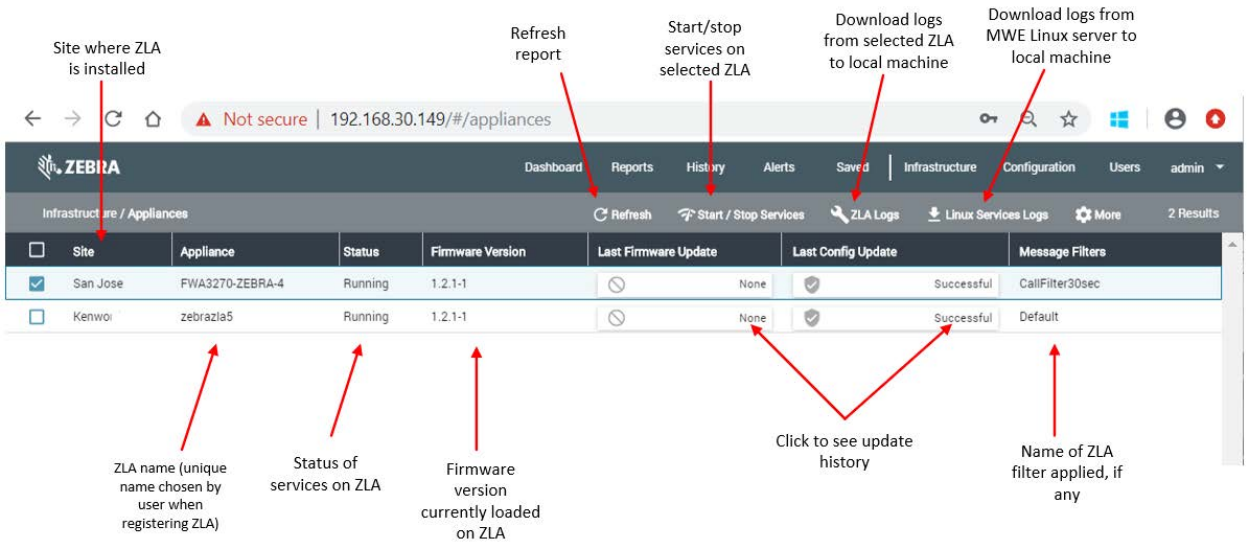


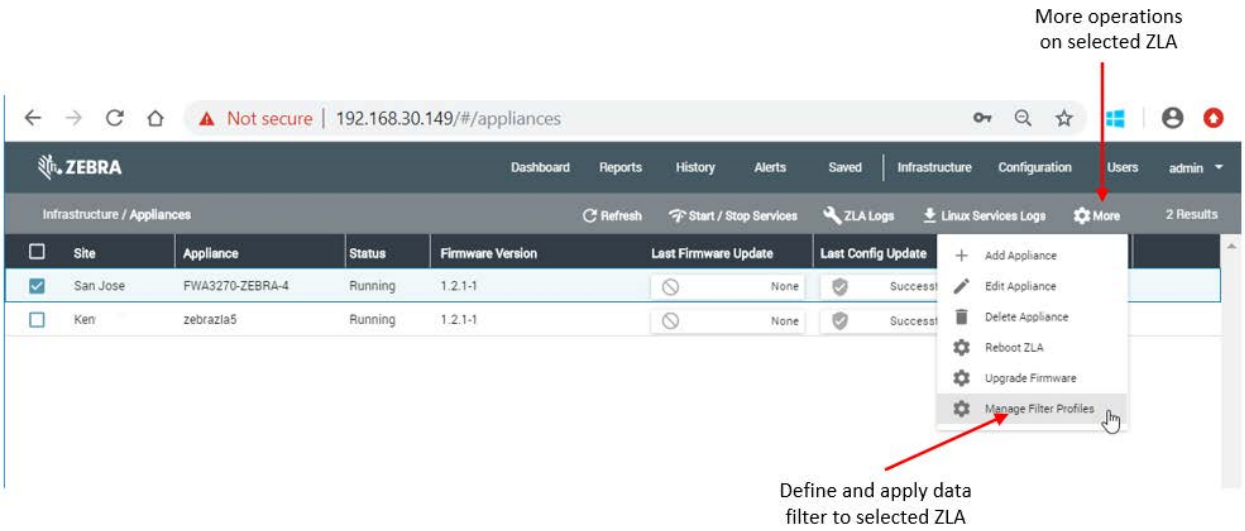
Clicking on a map name in the tree view displays the corresponding site map in the map window:



Managing ZLA Appliances

The status of the ZLA (Zebra Location Appliance) device deployed at multiple sites can be seen in the **`Infrastructure`** > **`Appliances`** report. This report also makes several tasks available for managing ZLAs.





Refer to the MWE Installation Guide and MWE Configuration Guide for additional details on this report.

Viewing Tag Status and Location

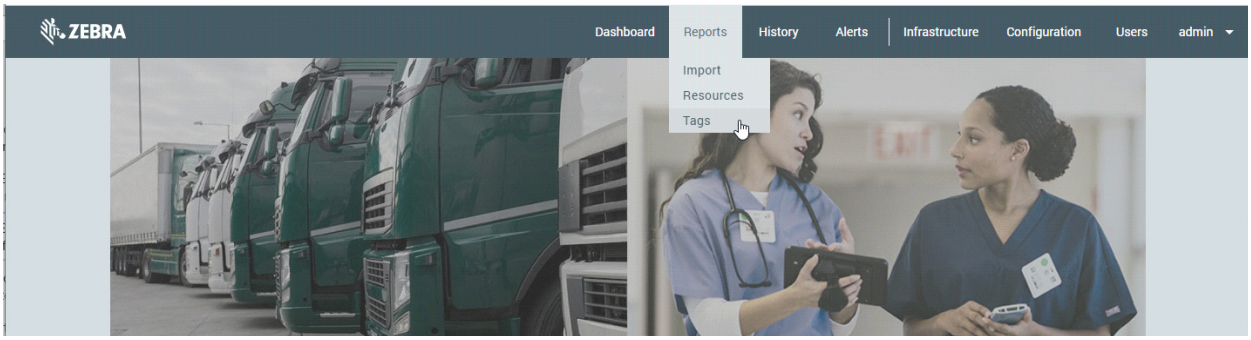
The status and location of tags blinking across multiple sites can be viewed in the **Reports** > **Tags** report. The data is displayed in table form on a map, and can be filtered, sorted, exported, and more. All supported tag types are seen here, regardless of technology, such as WhereNet tag, DART (UWB) tags, passive RFID (EPC) tags, GPS tags, and BLE receivers.

The information displayed for each tag ID may include x and y coordinates, latitude and longitude, zone and site where the tag is currently located, battery status, last time the tag blinked and last time it located, resource ID (if any) associated with the tag, telemetry data included in the tag transmission (temperature, speed, etc), and more.

Any tag blink (transmission) captured by a sensor feeding data to the MWE software causes the tag ID to be displayed in the Tags report. It is also possible to manually add a tag to this report before that tag has blinked; when the tag blinks, the data in the Tags report is automatically updated.

Open The Tags Report

Open the report by selecting **Tags** in the **Reports** tab:

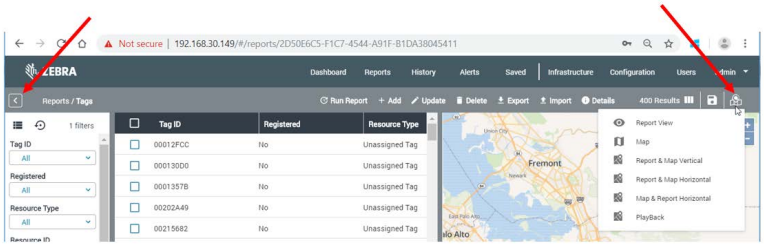


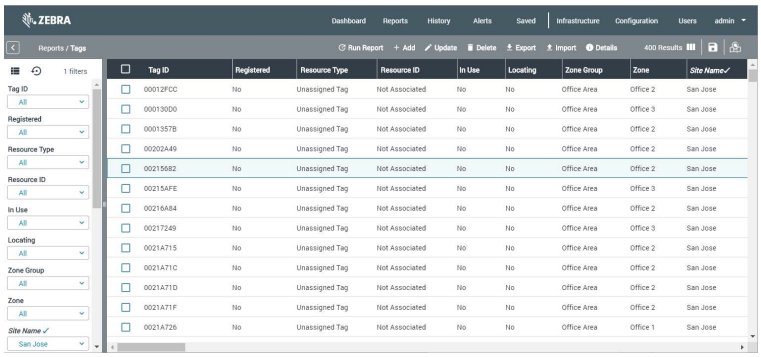
See UI Basics on page 6 for the meaning of each tool button on the report toolbar.

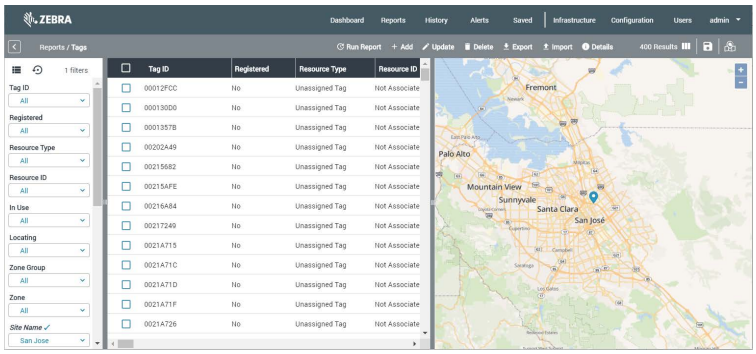
NOTE: Depending on your MWE version, you may see slight differences in the report menu bar and filter column between what the figures show and your MWE version.

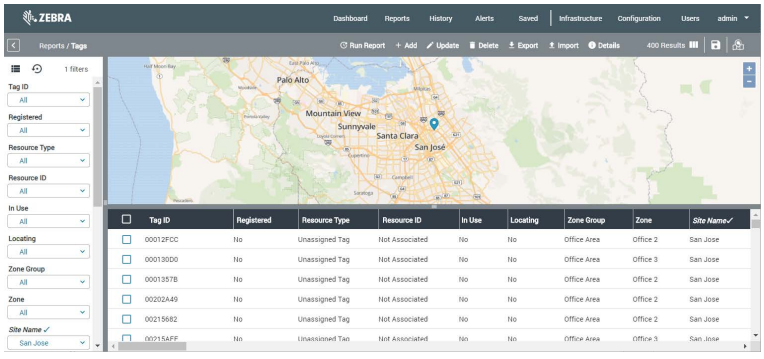
Select a View

Select different views, such as **`Report View`**, **`Report & Map Vertical`**, and **`Report & Map`** Horizontal by using the column filter. The column filter can be hidden, as shown in the following figures.



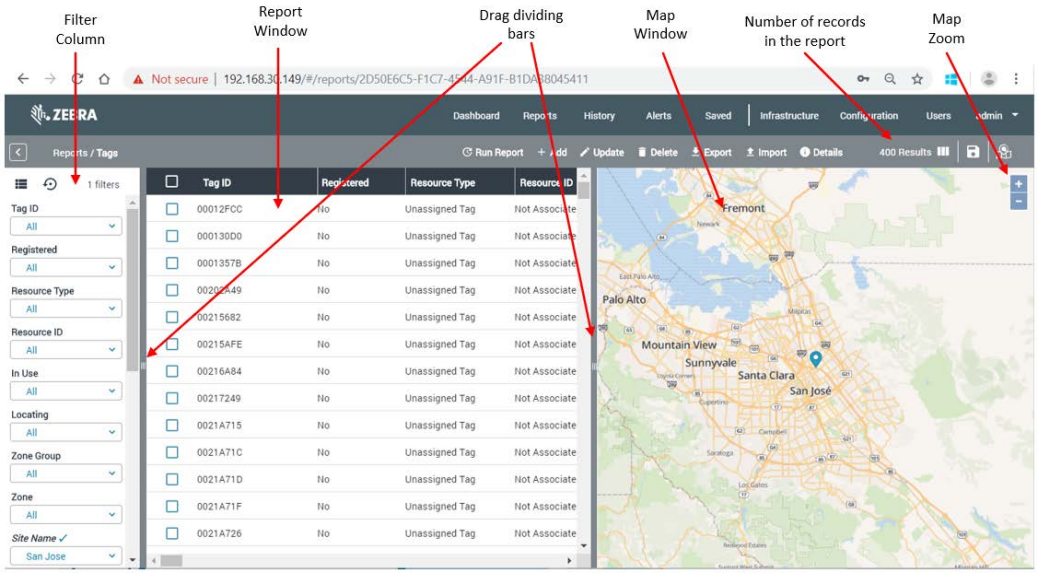






View Tag Data

When the Tags report is initially opened, the report window, the map window, and the filter column are displayed.



Scroll right and left in the report windows to view all the report columns, including the site and zone where each tag is being located.

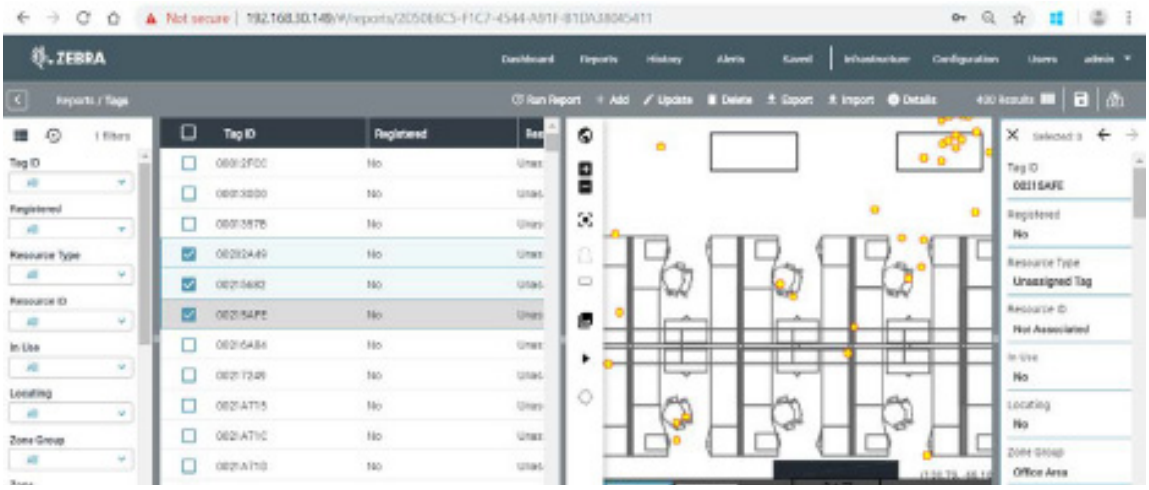
The map window displays a wide area map, each blue pin corresponds to a site where tags are being located.

When one or more tags are selected in the report window, the following occurs:

- A checkmark appears in the square checkbox in the first column for each selected tag.
- Each selected line is highlighted with a light blue background.
- If map autozoom is enabled, the map window automatically zooms into a smaller area containing the selected tags. See Map Autozoom for additional details.
- If map autozoom is not enabled, the map window does not show the full map for the site containing the selected tags, and the map window does not automatically zoom in. See Map Autozoom for details.

The Details Column

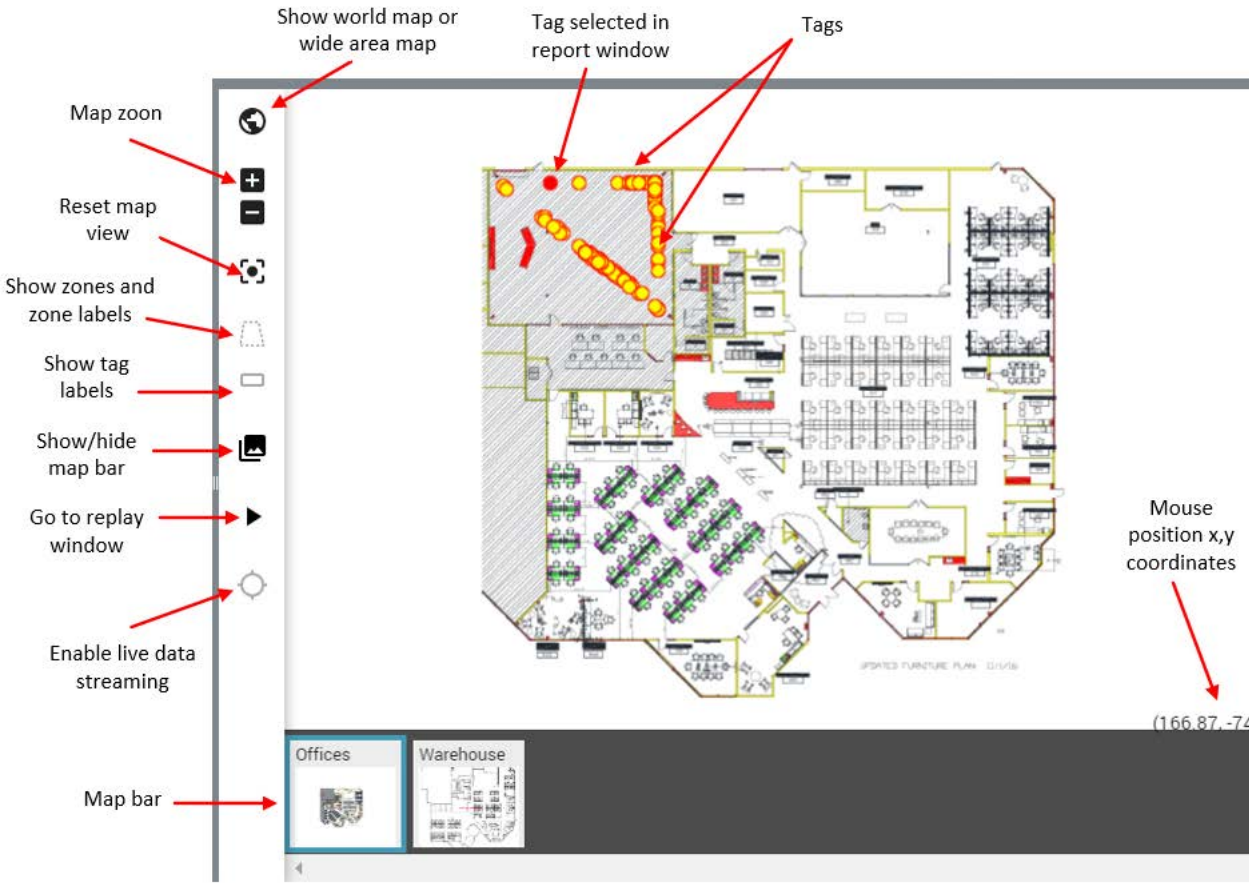
If one or more tags or resources are selected in a report window or in the map window, click **`Details`** on the report toolbar, to view a column on the right side of the web client window displaying information for the selected items.



The information displayed in the **`Details`** column is the same as in the lines in the report displayed in vertical form. The right and left arrows at the top right corner of the **`Details`** column allow the user to toggle between the selected items. The **`Details`** column can be closed by clicking the **`x`** at the top left corner of the column, or by deselecting the items previously selected in the report or on the map.

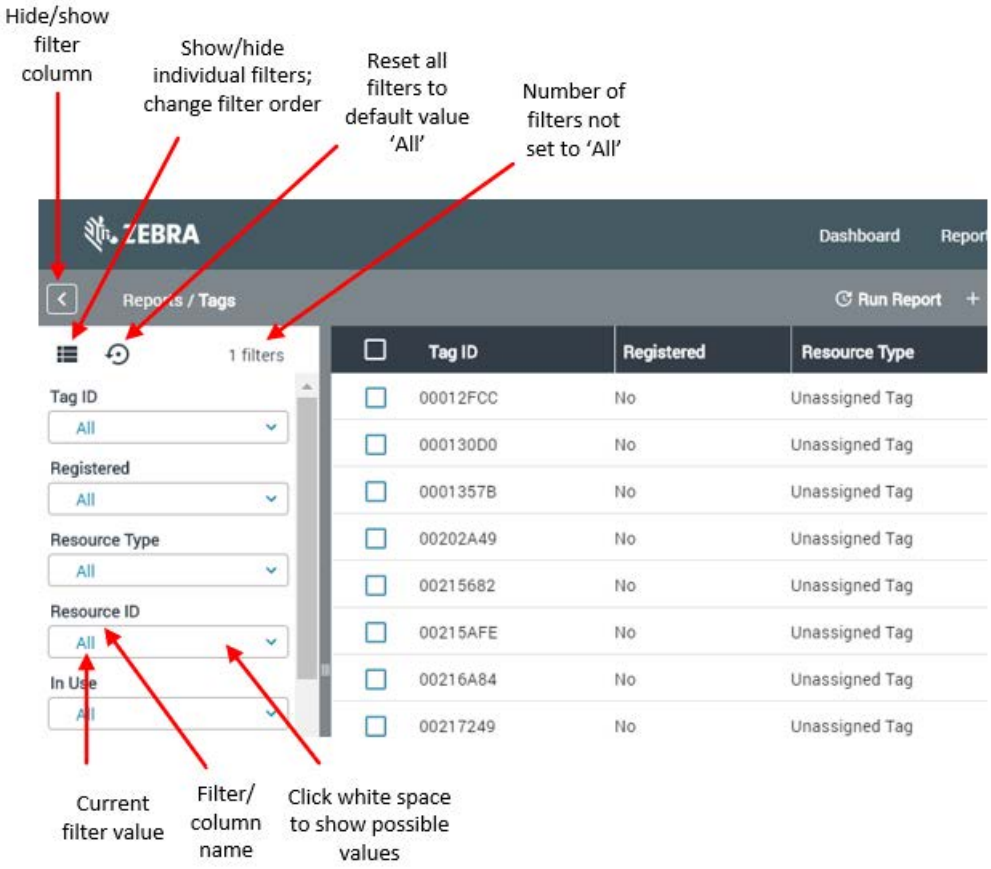
Map Window

The following figure lists the features and buttons on the map window.



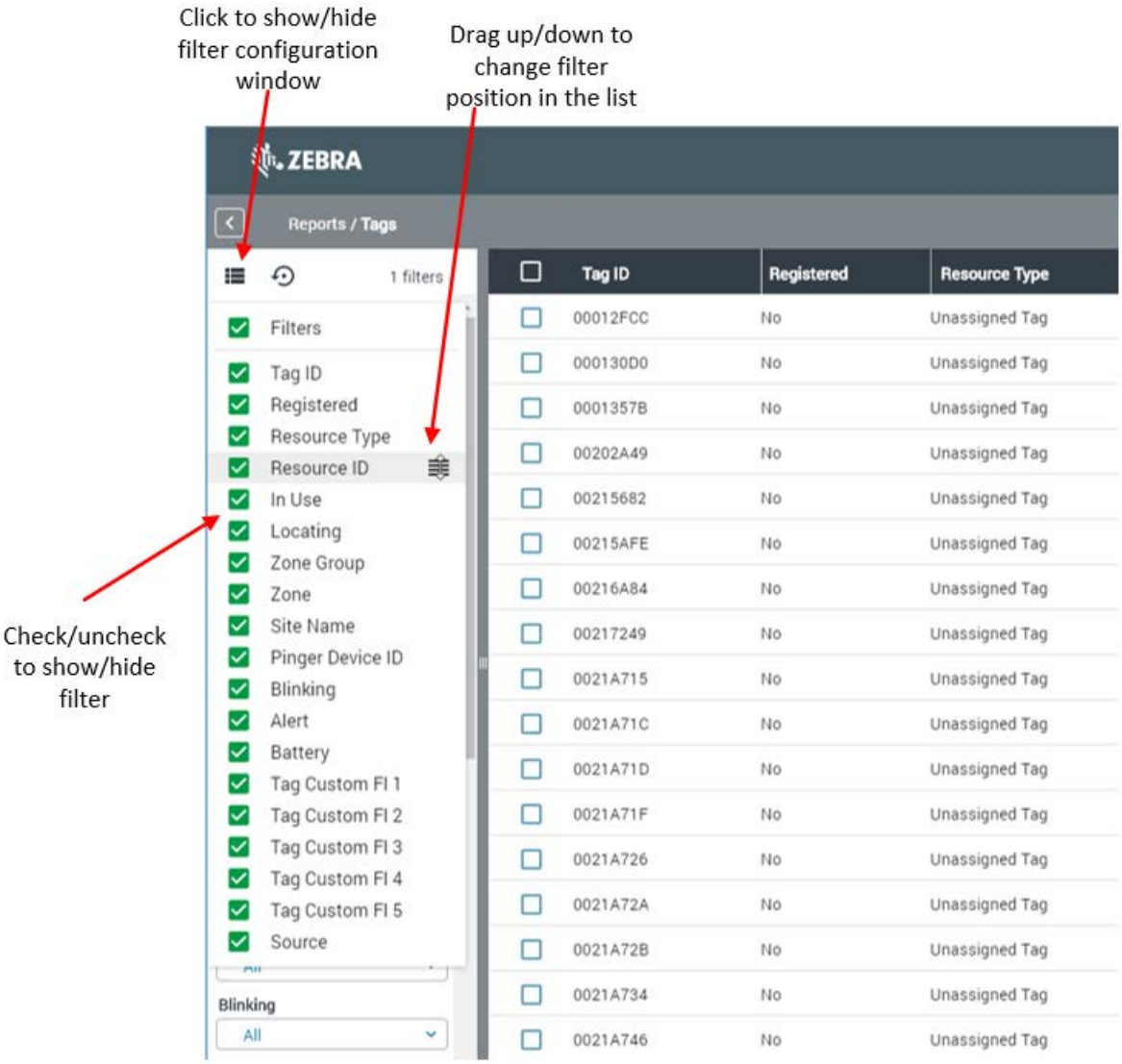
Report Filters

The reports under the **`Reports, History, Alerts,`** and **`Configuration`** items on the main menu bar include a filter column that allows filtering data in the report based on multiple columns or fields. Not every column in a report has a filter associated with it.



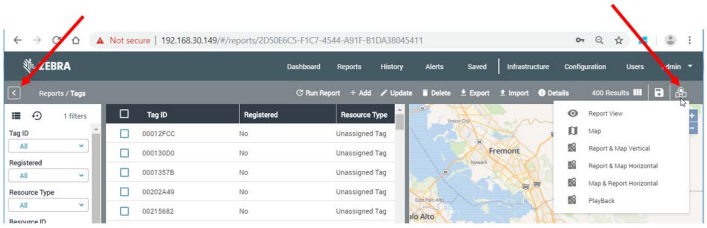
When a value is selected or typed in a filter box, the content of the report is automatically updated to match the filter value.

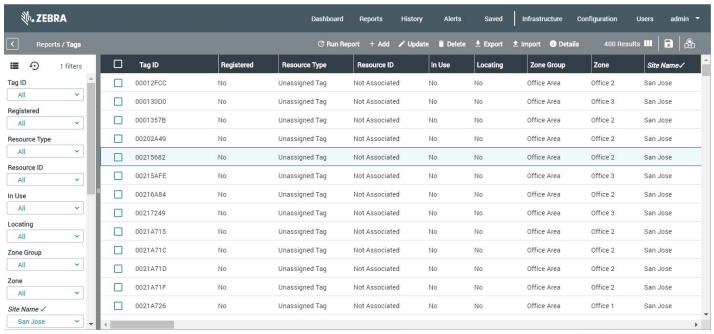
The filter column can be customized to show a subset of available filters and change the order of the list in the filter column, as shown in the following figure.

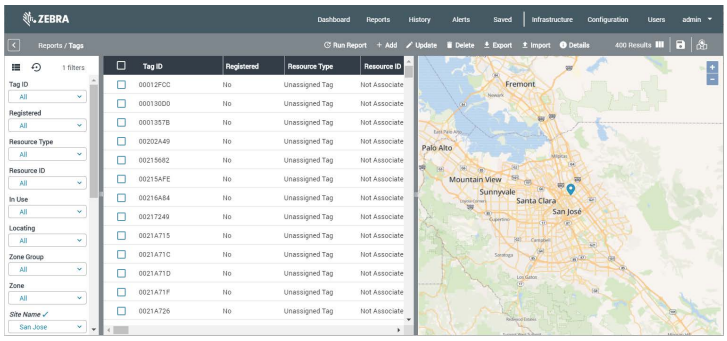


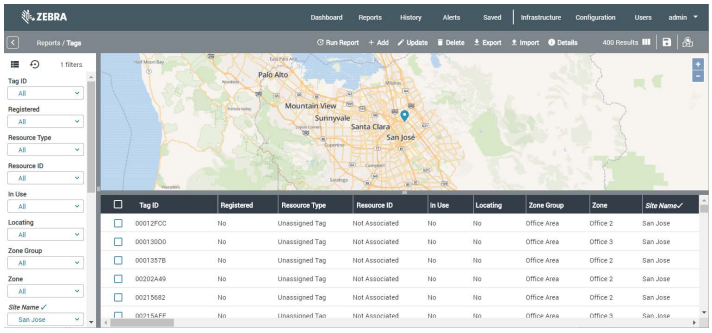
Customizing a Report

A report under the **`Reports, History, Alerts,`** and **`Configuration`** menu items can be customized in several ways. Users can choose to display the data only in table form (report window), or to display both the report window and the map window horizontally or vertically, and one may choose to show or hide the filter column.

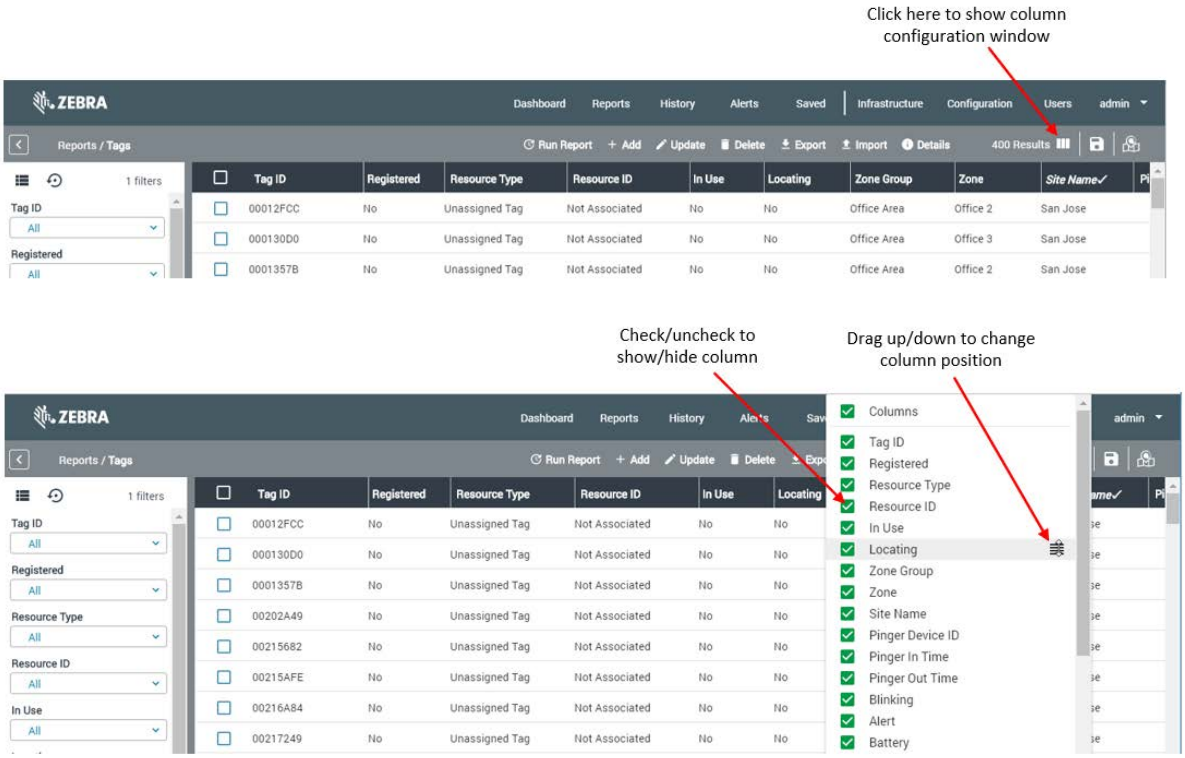




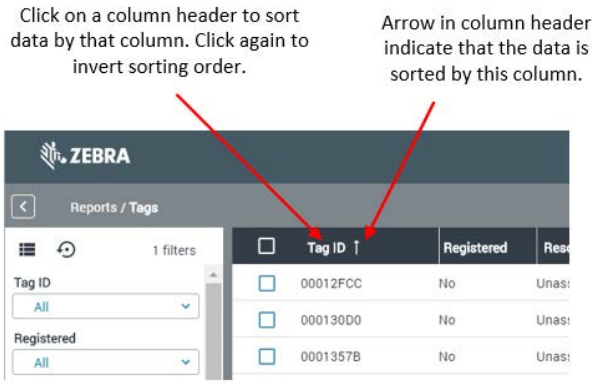




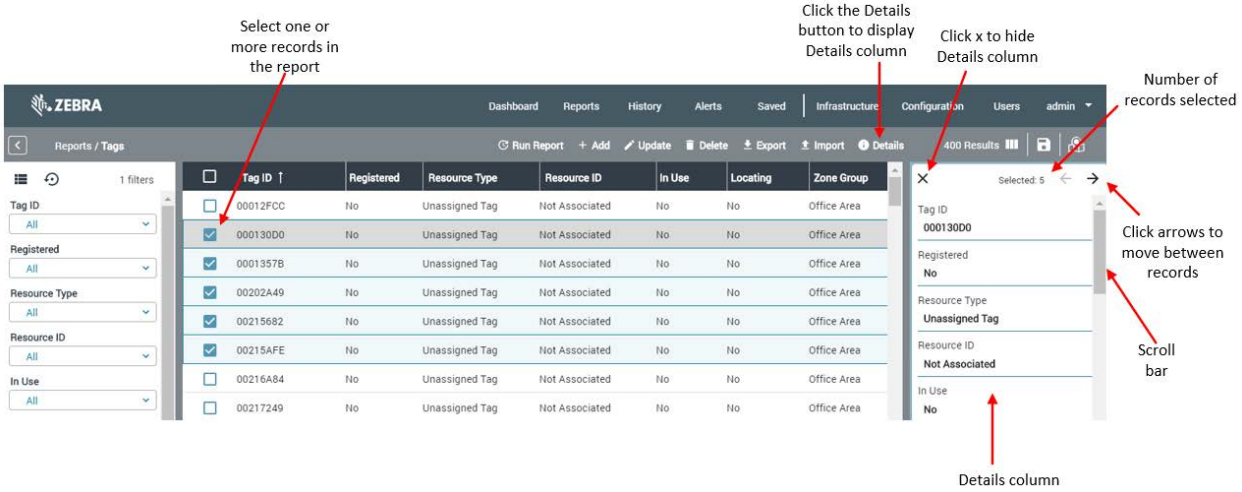
Additionally, select which columns to show in a report and the order in which these columns are displayed.



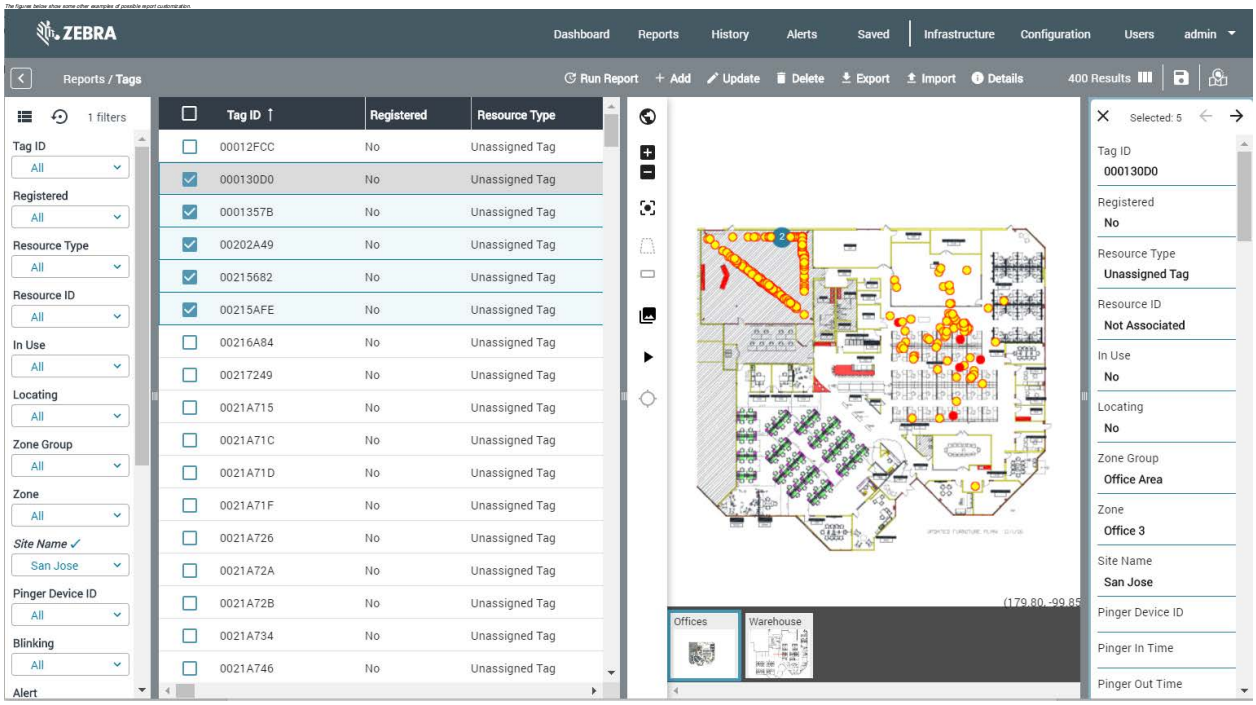
To sort the report records by a column, click the column header; an arrow displays showing the sort order (ascending or descending). To change the sorting order, click the column header again.

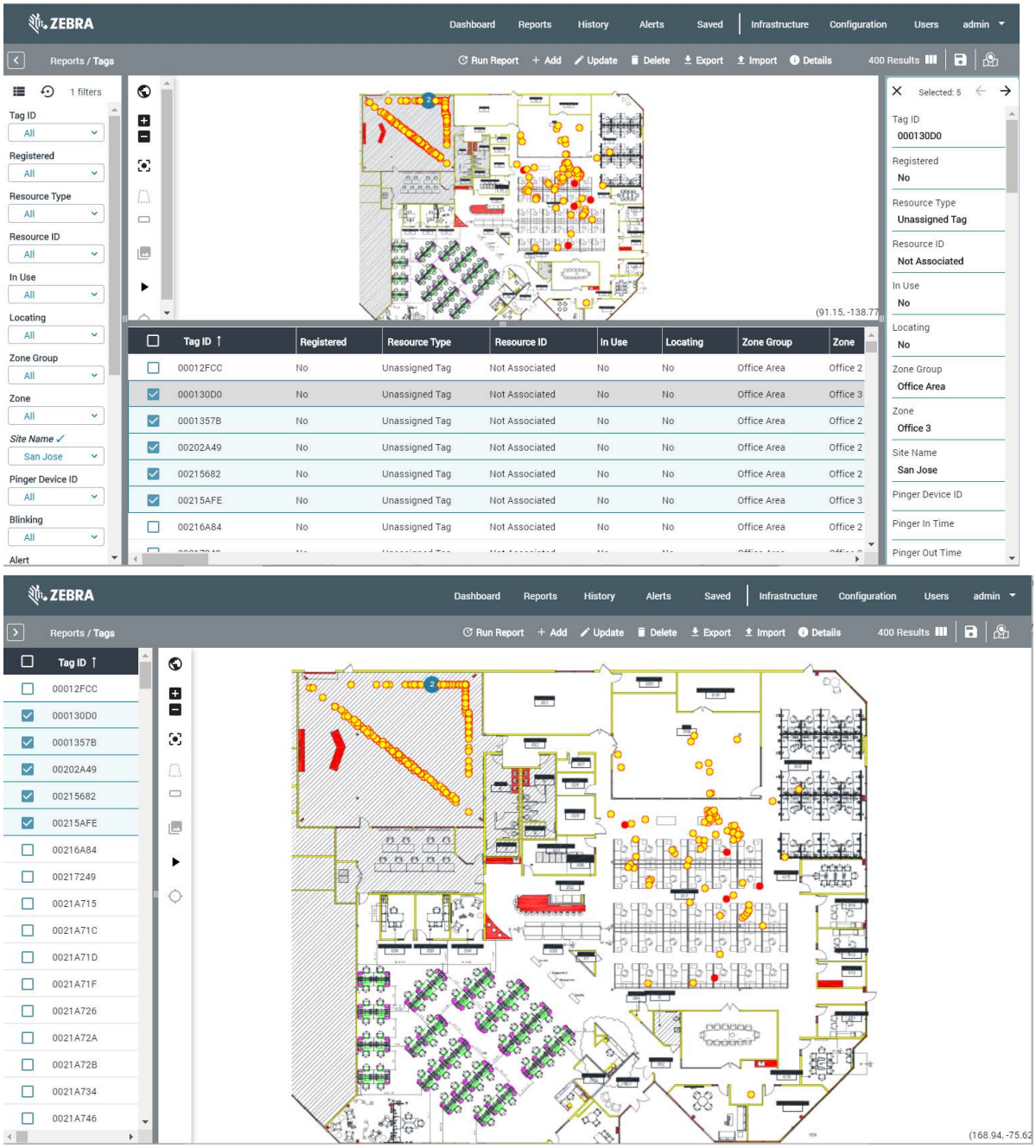


The **`Details`** tool-button allows displaying the horizontal records/lines in the report in a vertical format, as shown in the figure below.



The figures below show some other examples of possible report customization.

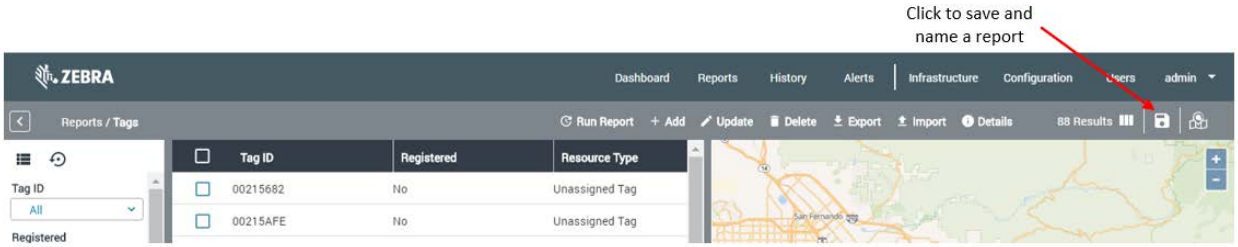


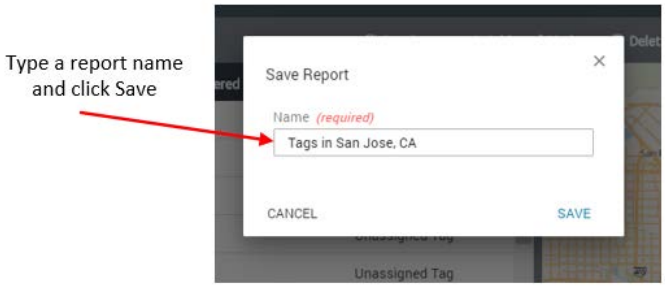


Use the browser zoom level to adjust the font size and number of records displayed in the report window.

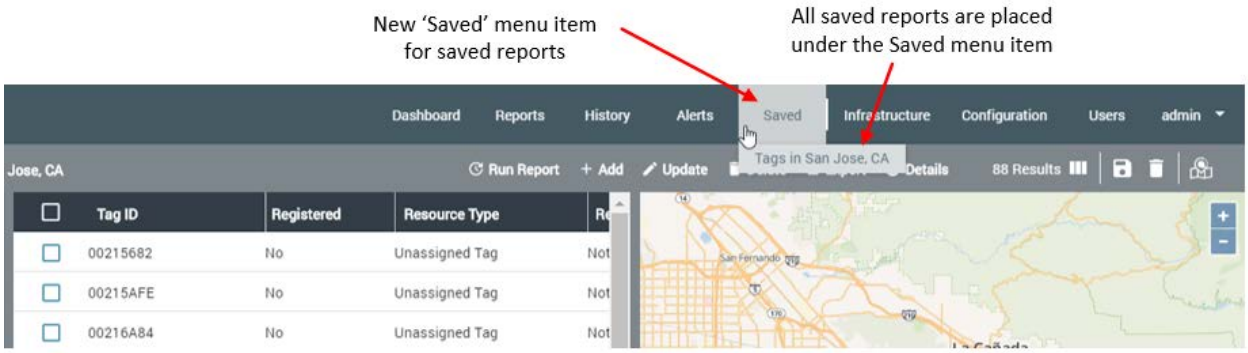
Saving a Custom Report

Once a customized report with a set of filters and filter values, a set of columns and column order, sorting column and sorting order is generated, it can be saved and named as illustrated below.



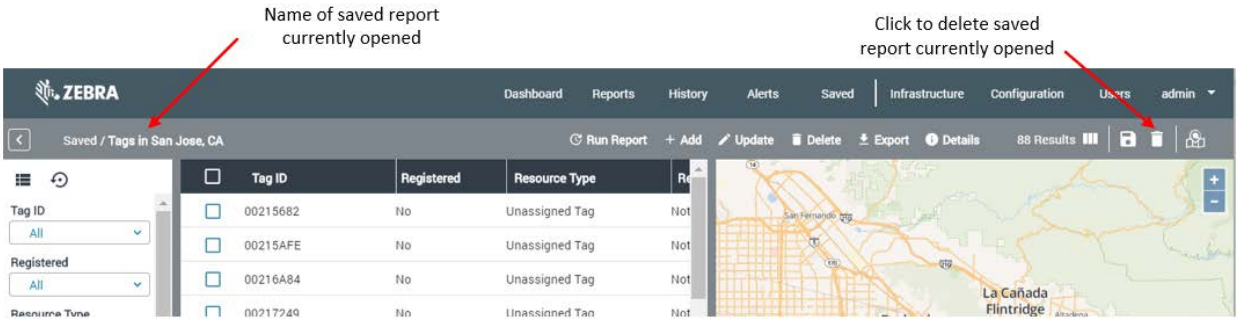


Click the **Save** button, to view a new menu item named **Saved** on the main menu bar. All saved reports are placed under the **Saved** menu item.



NOTE: In the Details column, the items selected in the report (the check marks in squares in the first column), and the view mode (report only, report and map vertical, etc.) are not saved as part of a saved report.

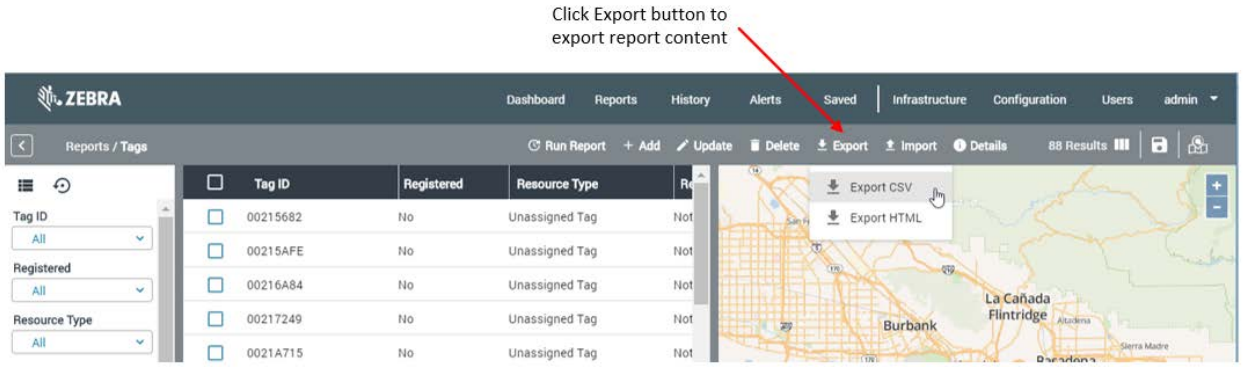
To delete a saved report, open the report and click the trashcan icon on the report toolbar, as shown below.



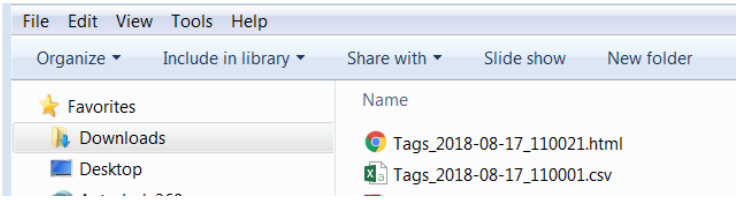
NOTE: Depending on your MWE version, you may see some differences between the screens depicted in this document and the screens in your MWE version.

Exporting a Report

To export the content of a report, click the **`Export`** tool-button on the report tool bar:



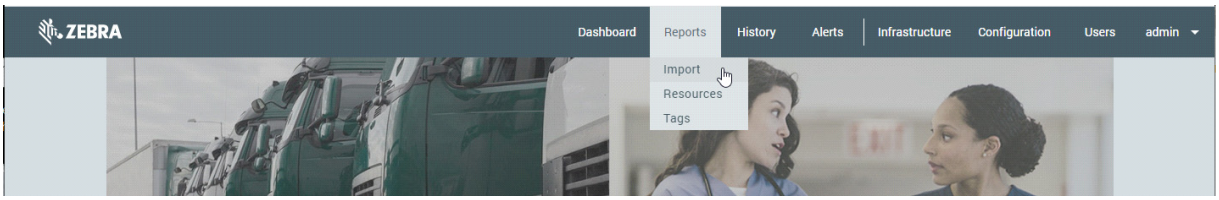
The data can be exported in CSV format or HTML format. A file is downloaded to the Downloads folder on the computer hosting the web client. The file name maintains the format `reportName_date_time`.



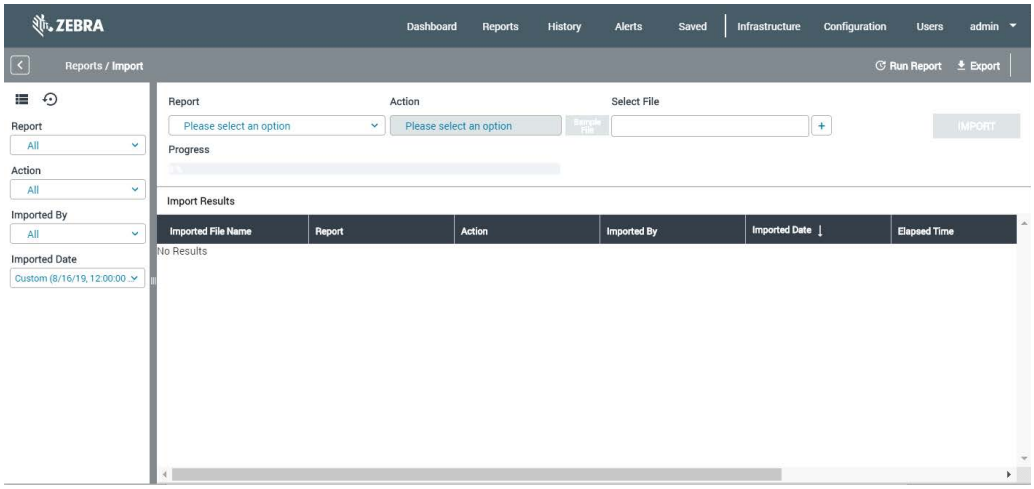
The report filter values are included at the top of the exported file to inform the user opening the file of the filter values that were applied when generating the report data.

Data Import

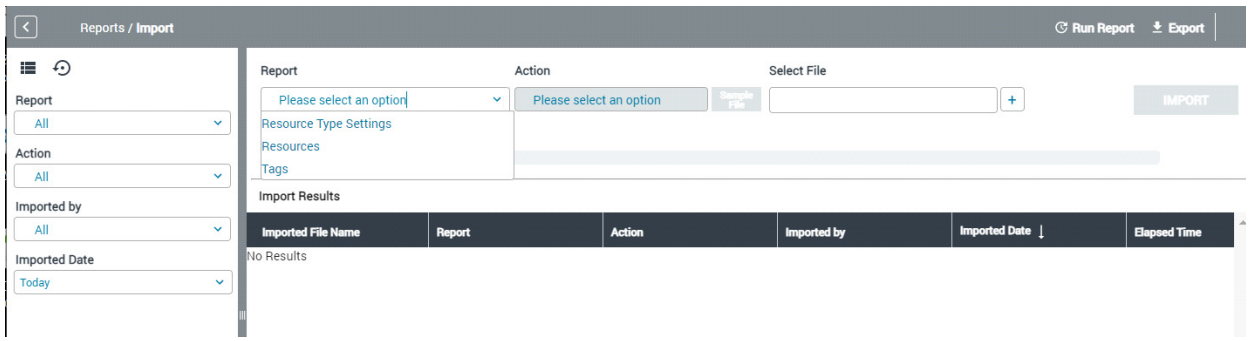
When in need to enter large amounts of data into MWE, rather than entering one item at a time using data entry, you can use data import transactions. Data Import is available via the **`Import`** report. To open this report, select **`Reports`** > **`Import`** from the MWE web client menu bar:



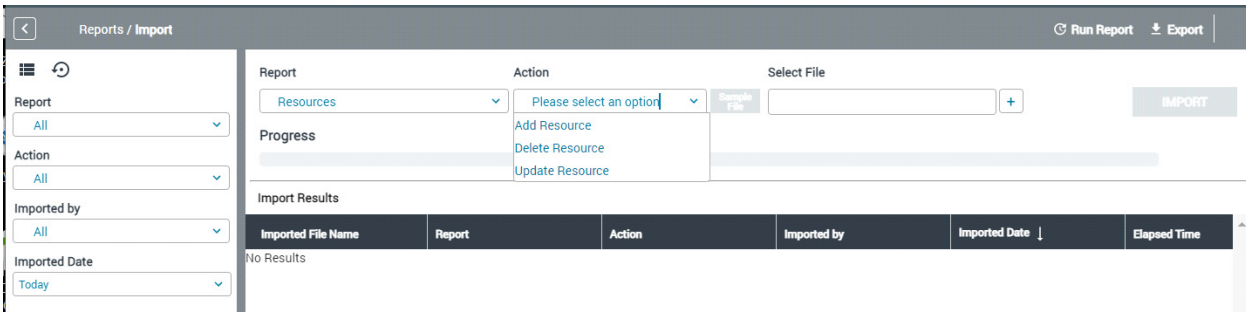
This report, shown in the figure below, both allows several different data import operations and shows a history of data import operations.



From the **`Report`** dropdown list, select a report to import data into. Available reports are: Resource Type Settings, Resources, and Tags.



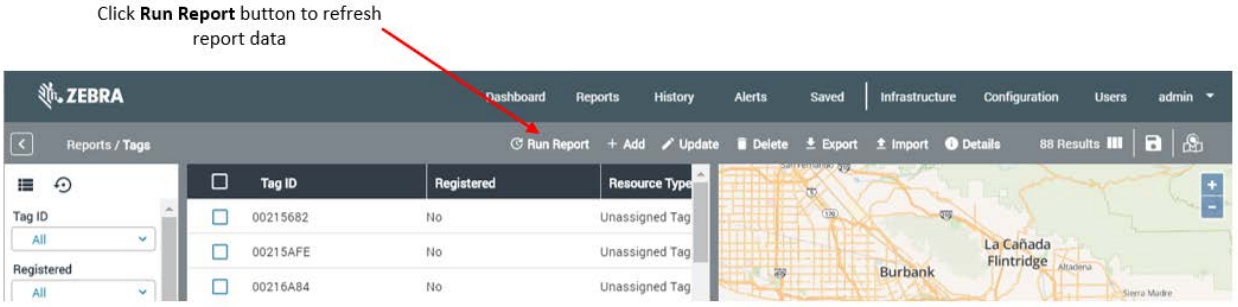
The **`Action`** dropdown list shows the types of data entry operations available for this report. Data entry operations include adding new resources to the report, modifying existing resources, or deleting resources from the report.



Once an action or data entry operation has been selected, use the **`Select File`** field to browse to and select a properly formatted file. Clicking the **`Sample File`** button will download a sample file that can be used as a template to build a properly formatted import file for the selected data entry operation.

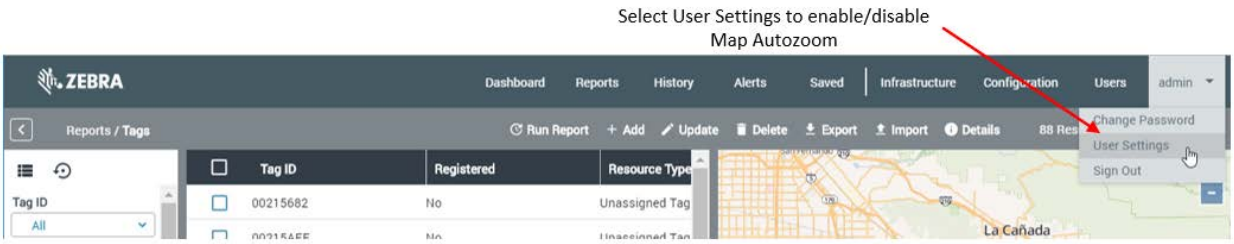
Report Auto-refresh

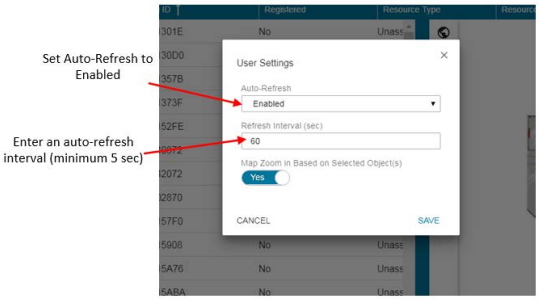
The data in a report is automatically refreshed every time the report is opened. Once the report is open, the data can be manually refreshed by clicking the **`Run Report`** tool button.



Users can also enable auto-refresh. This feature is disabled by default, as frequent auto-refresh queries by multiple clients can place an unnecessary load on the MWE database.

To enable report auto-refresh, select **`User Settings`** under the last menu item on the main menu bar (the menu showing the name of the account currently logged into the web client) and set **`Auto-Refresh`** to **`Enabled`**. Enter a refresh interval in seconds. Try to make this interval as large as the scenario allows. The minimum value supported by MWE is 5 seconds.





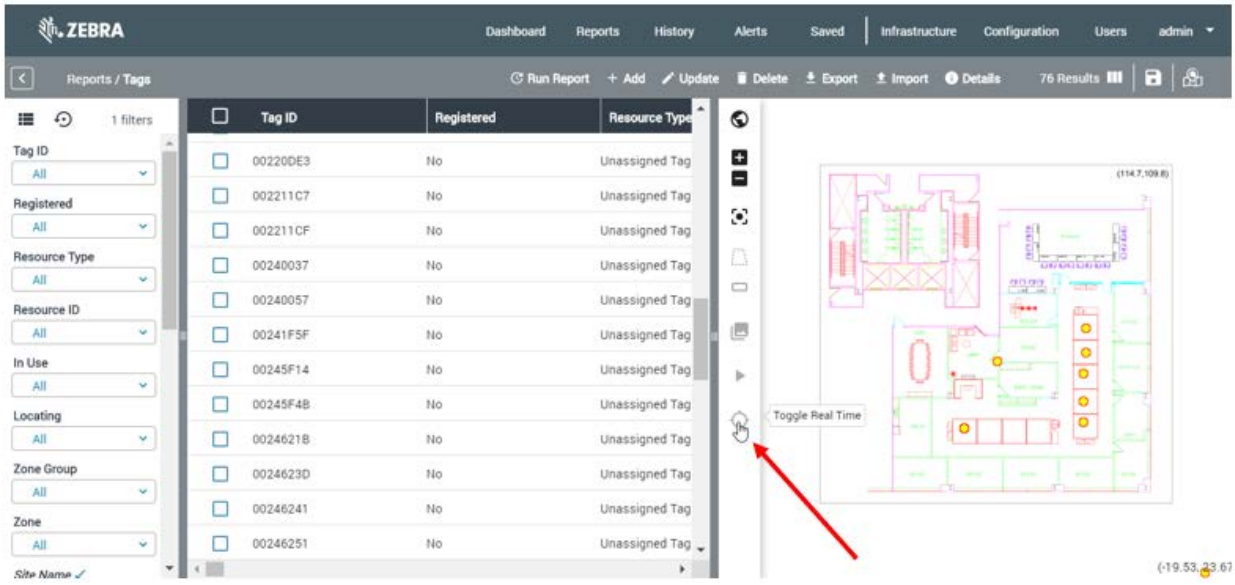
Live Data Streaming

The report auto-refresh feature can be set to a minimum refresh interval of 1 second. Each refresh performs a full query database tables to update all of the fields in the report. Therefore, having many web clients performing frequent queries can place an unnecessary load on the system.

An alternative is to enable live data streaming. This opens a web socket connection between the web client and the MWE server allowing tag blink (x, y, z) coordinates to be forwarded immediately from the server to the client in real time. In this case, the web client refreshes the display every second, without the database load generated by auto-refresh.

NOTE: Live data streaming updates the x, y, z coordinates of tags in the report and on the map, however, it does not update any other fields in the report. The next manual or automatic report refresh updates all fields in the report.

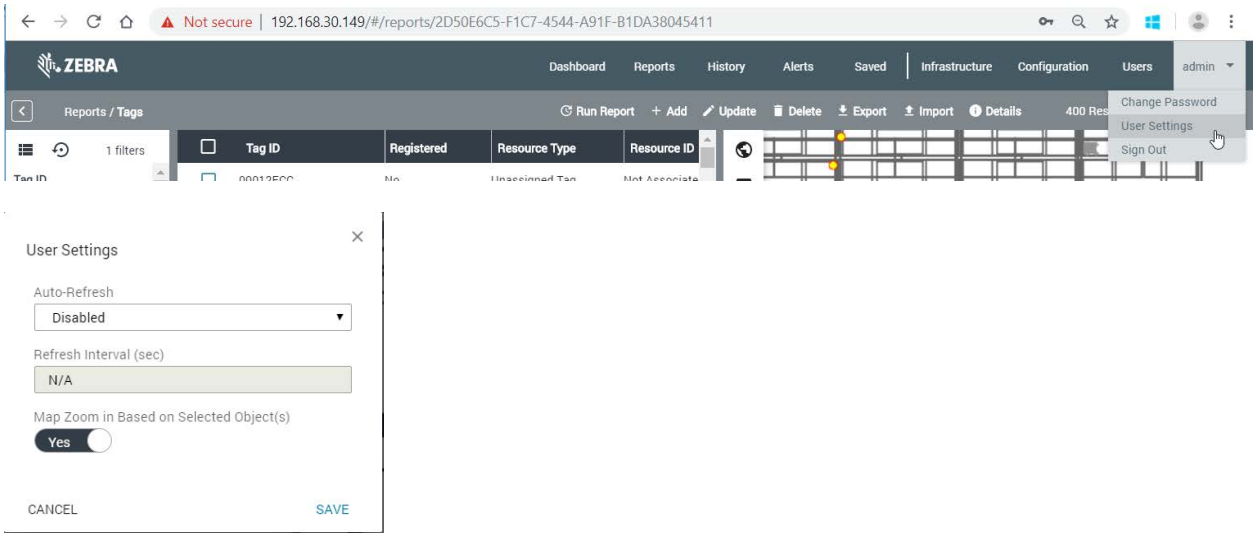
To enable live data streaming, click the **`Real Time`** button on the map's toolbar. The button changes color from light gray to dark gray. To disable live data streaming, click the button again.



Map Autozoom

When map autozoom is enabled, selecting one or more tags in the **`Tags`** report causes the map to automatically zoom in or zoom out to display an area that includes all of the selected tags. This area is typically a small part of the whole map, large enough to include the selected tags and neighboring area. The same is true for other reports that include the map window, such as the **`Resources`** report.

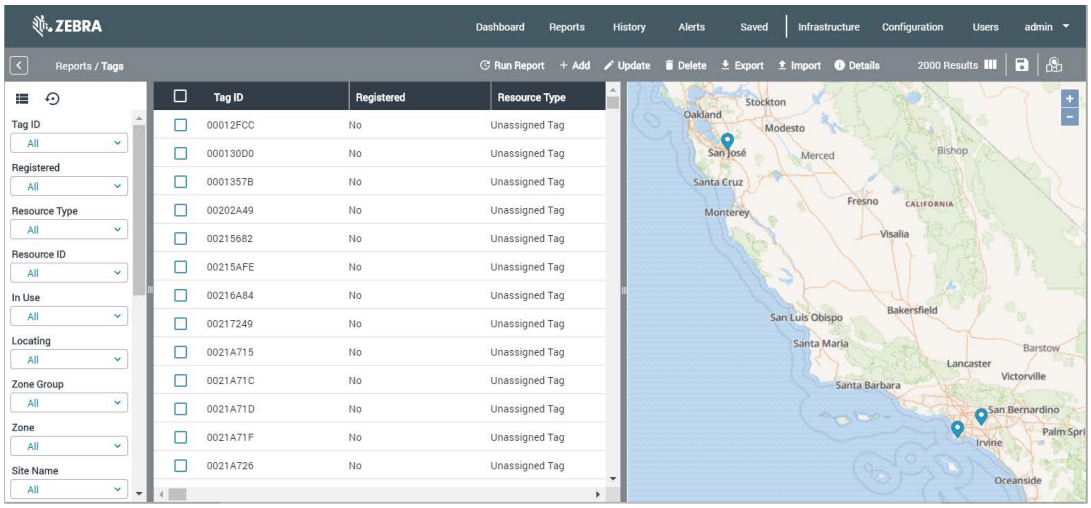
Map autozoom is enabled by default. To disable it, select **`User Settings`** under the item on the menu bar (the item showing the name of the account currently logged into the web client) and set the **`Map Zoom`** switch to no/yes.



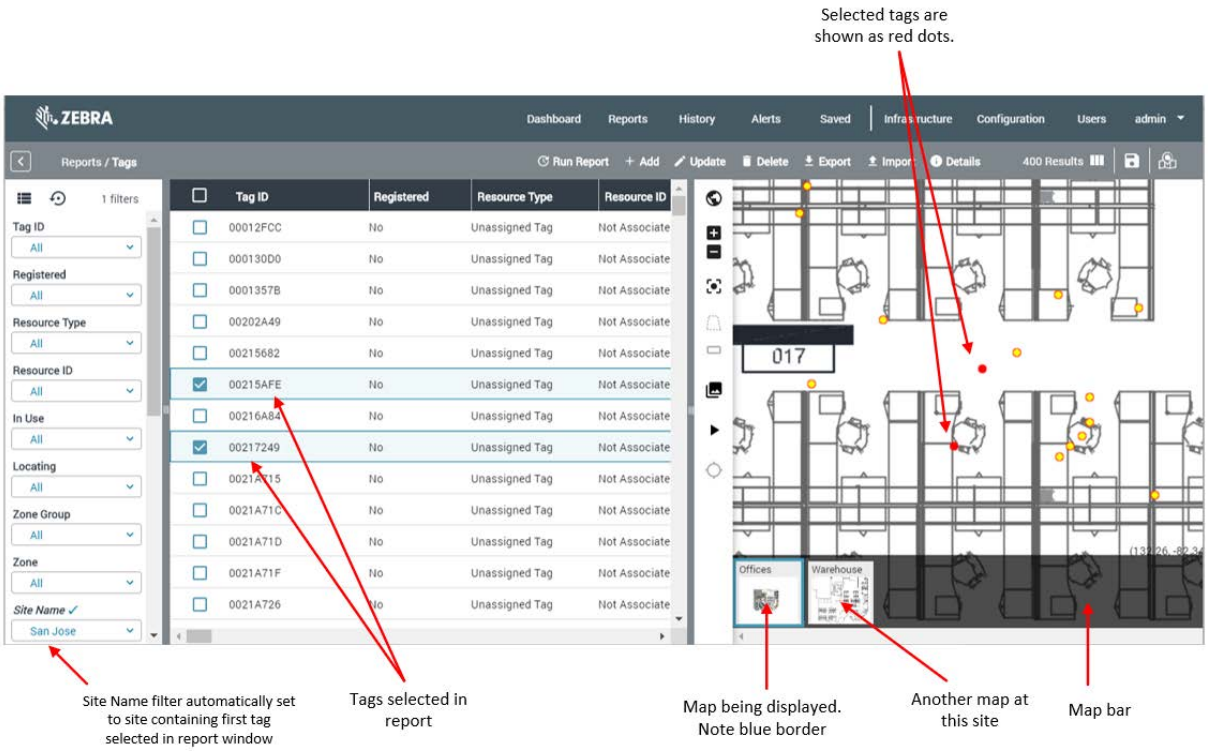
When a user selects one or more tags in the **`Tags`** report, or one or more resources in the **`Resources`** report, the map window responds in one of two ways:

- If Map Zoom is set to Yes, the map window automatically zooms into an area containing the selected tags or resources.
- If Map Zoom is set to No, the full map for the site containing the selected tags or resources displays in the map window. The map window does not automatically zoom in.

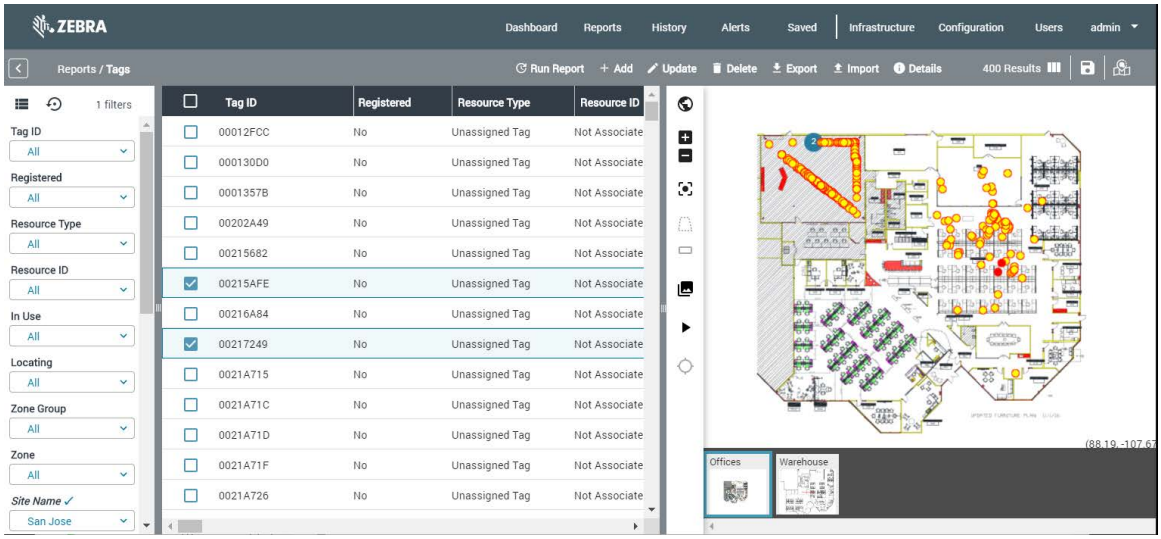
Upon initially launching the `Tags` report, observe a wide area map showing all of the sites that contain tags listed in the report.



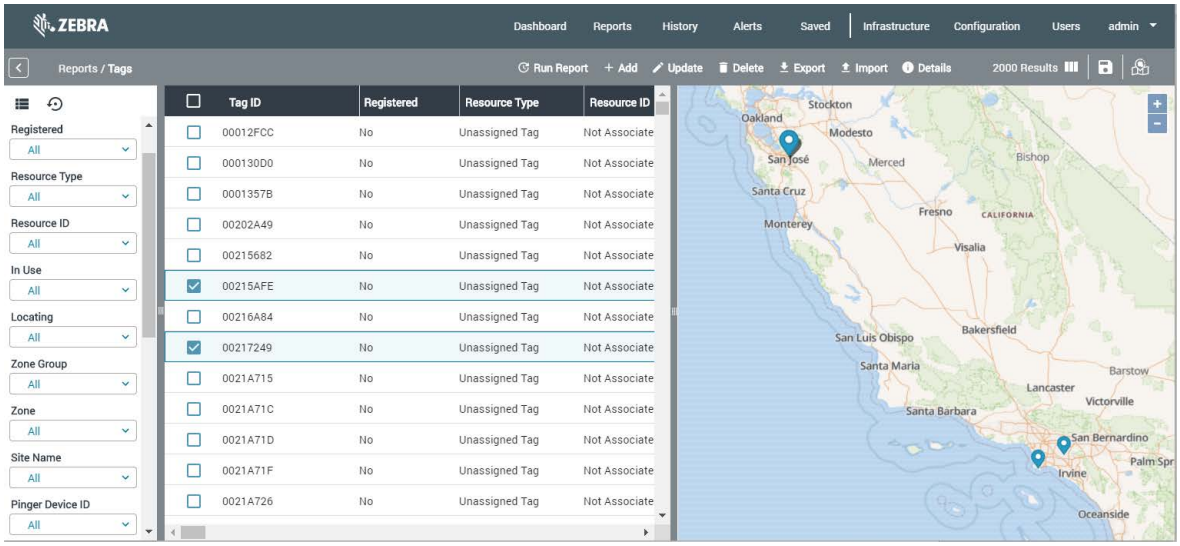
If map autozoom is enabled and two tags are selected in the report window, the map automatically zooms into an area including the two selected tags, as shown in the following figure.



If map autozoom is disabled, then the full map for the site containing the selected tags is displayed in the map window. The map window does not automatically zoom in:



In either case, if the **`Site Name`** filter is set to **`All`**, the map window displays a wide area map with all of the sites:

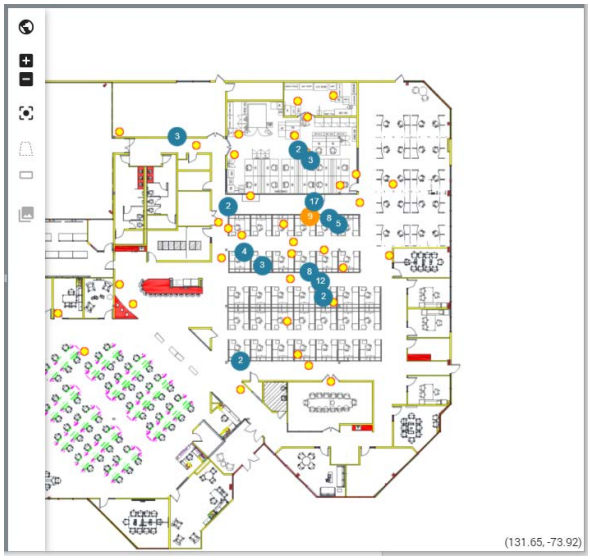


Each site on this map is represented by a blue pin. The site containing the selected tags is highlighted with a larger sized blue pin. Clicking on a blue pin on the map sets the **`Site Name`** filter and the map window only displays the maps for that specific site.

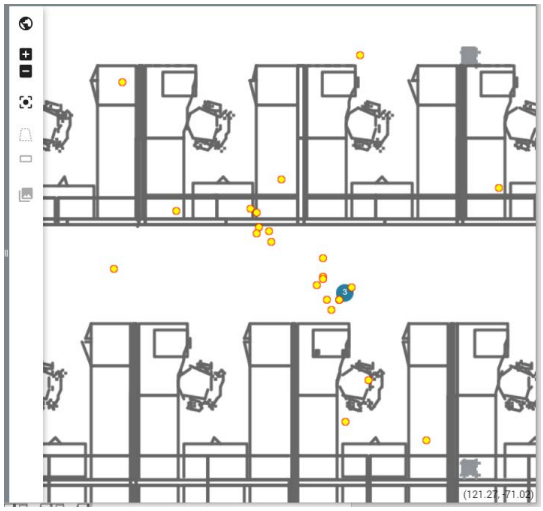
Map Data Clustering

A tag or resource is represented on the map window by a yellow dot with a red border. This dot turns red when the tag or resource is selected on the map or in the report.

When two or more tags are physically in close proximity, they are clustered and represented by a larger blue circle as shown in the following figure. The number on the circle corresponds to the number of tags in that cluster.



Zooming in shows the individual tags in a cluster.



Defining a Resource Type

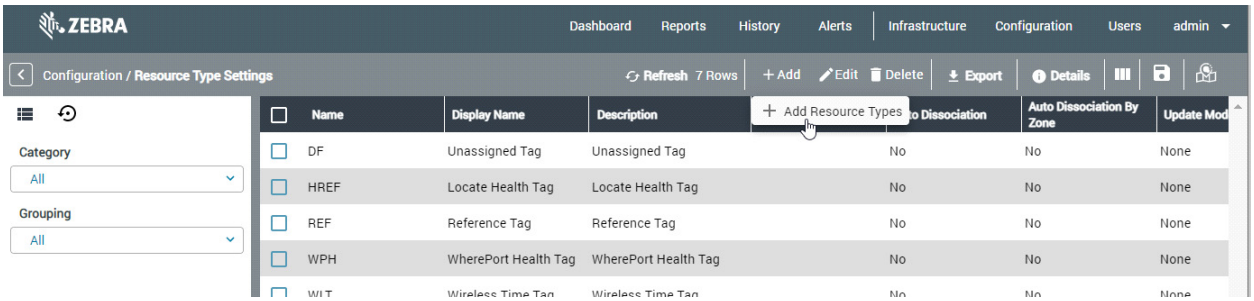
The main purpose of the MWE software and the underlying RTLS system is to track the location and status of assets/resources. Tags (active/passive RFID transmitters) tracked by the RTLS system are physically attached to resources. Therefore, each tag ID must be associated with a unique resource ID within the MWE software.

MWE offers multiple ways of associating/dissociating tags with/from resources, including data entry, API calls, scanners, applications installed on top of MWE, and mobile applications. In the following sections outline the data entry operations available in the MWE web client to associate/dissociate tags with resources.

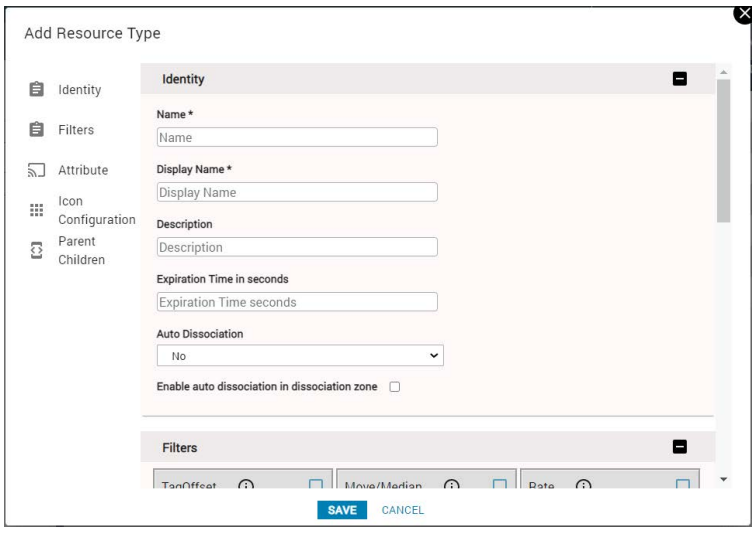
Create a Resource Type, which represents a category or type of resources. For example, a Resource Type could be printer, trailer, or container.

To create a Resource Type:

1. Go to the **`Configuration`** > **`Resource Type Settings`** report, click the **`+Add`** tool button and select **`+Add Resource Type.`**



2. Enter the necessary information in the **`Add Resource Type`** data entry window:



The meaning of the various fields in the Add Resource Type data entry form is given in the table below. Fields with an asterisk (*) next to its name are mandatory.

Table 3 Add Resource Type Field Definitions

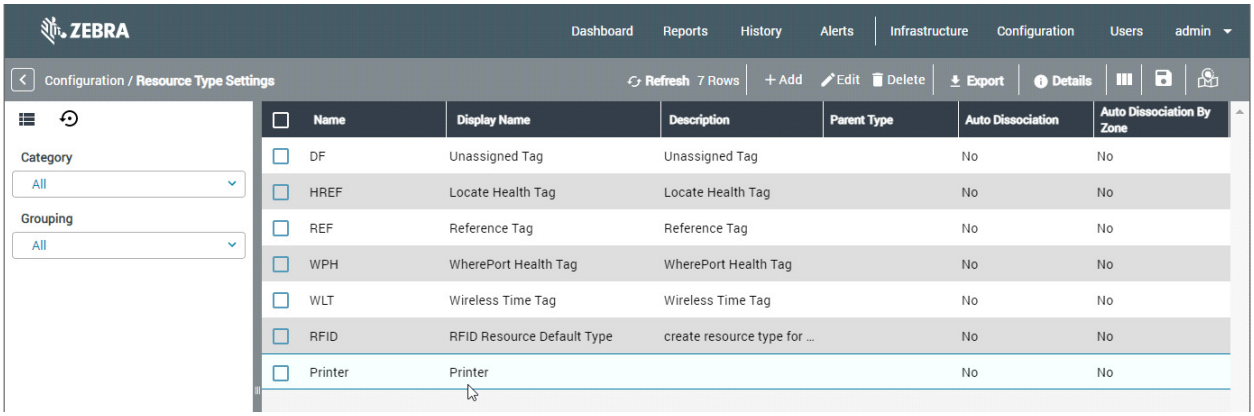
Section	Field Name	Description
Identity	Name	The name of the field using internally by the application. Also used in Data Import operations.
	Display Name	Field name shown in report columns, filters, and data entry operations. By default, Display Name is set equal to Name, and it is recommended to leave it this way.
	Description	Optional description field.
	Expiration Time	If a tag of this resource type does not blink in the specified period, MWE will trigger a Tag No Blink alert.
	Auto Dissociation	If set to No, you will not allow to associate a resource ID with a tag ID that is already associated with another resource ID. If set to Yes, the tag will be automatically dissociated from its current resource ID when you attempt to associate it with a new resource ID.
	Enable Auto Dissociation in Dissociation Zone	If this checkbox is checked, it is possible to automatically dissociate the tag when it blinks in a zone defined as a dissociation zone in the Site Manager à Configure Zones page.
Filters	TagOffset	Click on the information icon next to the filter name to see a brief description. See more details in the Resource Type Filters section later in this document.
	Move/Median	Click on the information icon next to the filter name to see a brief description. See more details in the Resource Type Filters section later in this document.
	Rate	Click on the information icon next to the filter name to see a brief description. See more details in the Resource Type Filters section later in this document.
	ZoneLockDown	Click on the information icon next to the filter name to see a brief description. See more details in the Resource Type Filters section later in this document.
	ZoneChange	Click on the information icon next to the filter name to see a brief description. See more details in the Resource Type Filters section later in this document.

Table 3 Add Resource Type Field Definitions

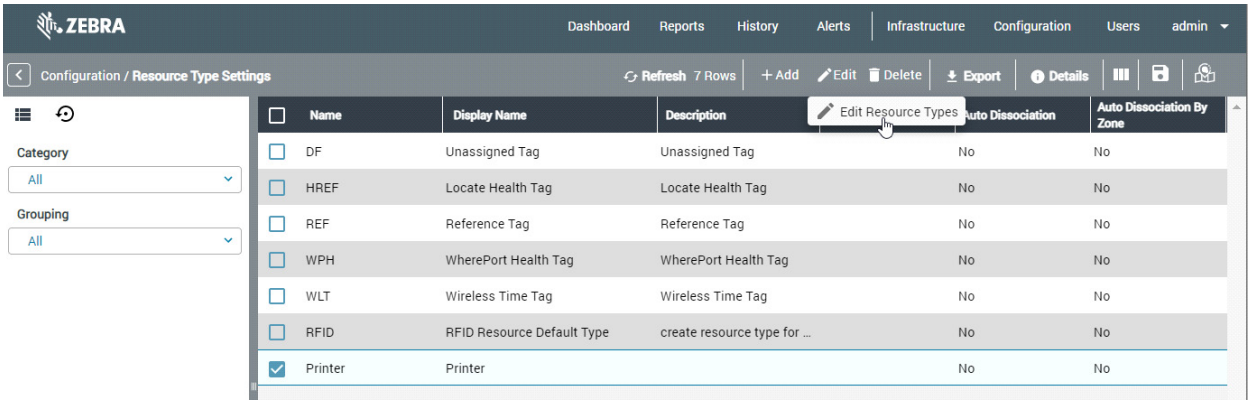
Section	Field Name	Description
Attributes	Attribute names defined by user	Attributes can be of two types: Free Text and Lookup. Free Text fields allow a user to type any string. For Lookup fields the user must select from a dropdown list of pre-defined values. When selecting a resource type in the Resource Type filter in the Resources report, you will see that a set of additional attribute columns and filters is displayed in the report.
Icon Configuration		Load and select an icon or figure to represent this resource type on maps displayed by MWE.
Parent Children		Here one can associate the resource type with a parent resource type such that the children resource types will inherit the same x,y reported by MWE for the parent resource type. See more details in the section Resource Parent-Child Grouping later in this document.

1. Once the **`Add User Resource`** data is added to the entry form, click the **`Save`** button to save the information and create the resource type.

   The following figure shows a newly added resource type named **`Printer`**.



2. If you would like to make changes to the resource type definition, select the resource type in the report, click the **Edit** tool button, and select **Edit Resource Type** to open the Edit Resource Type data entry form:

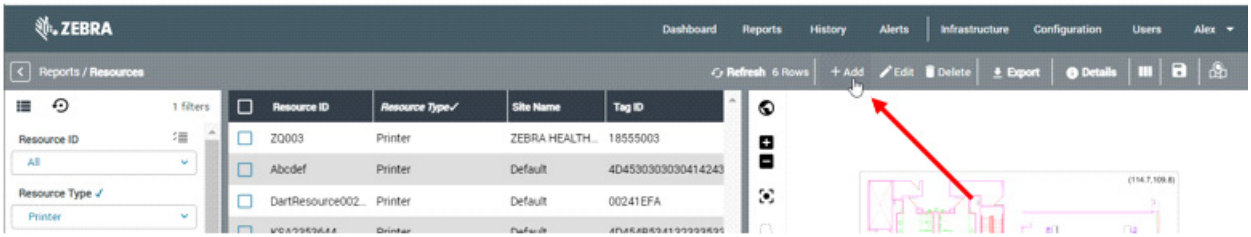


3. After making the desired changes, click **Save** to save your changes.

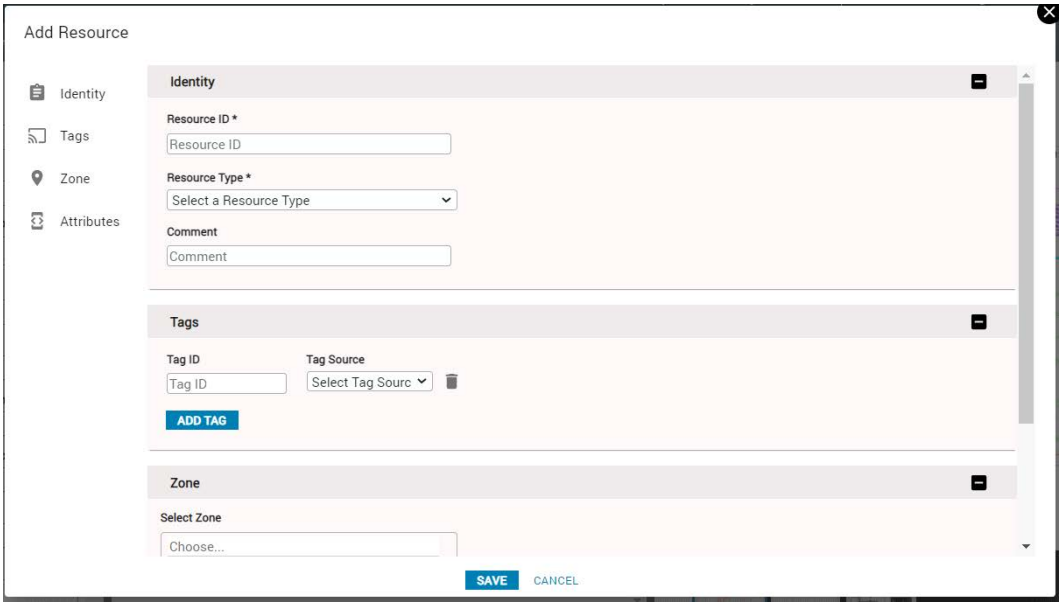
The next step after defining a resource type is to associate a resource having a unique resource ID with a tag ID being tracked by the system.

Associating a Tag ID with a Resource ID

To associate a tag ID with a particular resource/asset, open the **Reports > Resources** report, click **+ Add** on the report menu bar as shown in the figure below:



The Add Resource data entry form opens:



The meaning of the various fields in the `Add Resource` data entry form is given in the table below. Fields with an asterisk (*) next to its name are mandatory.

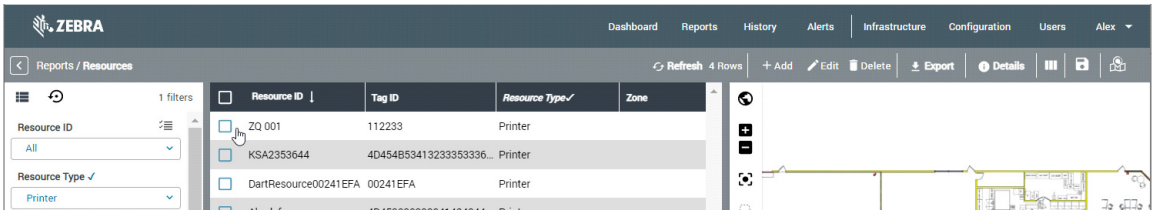
Table 4

Section	Field Name	Description
Identity		
	Resource ID	A unique alphanumeric resource ID
	Resource Type	Select from the list of previously defined resource types
	Comment	Optional comment field
Tags		

Table 4

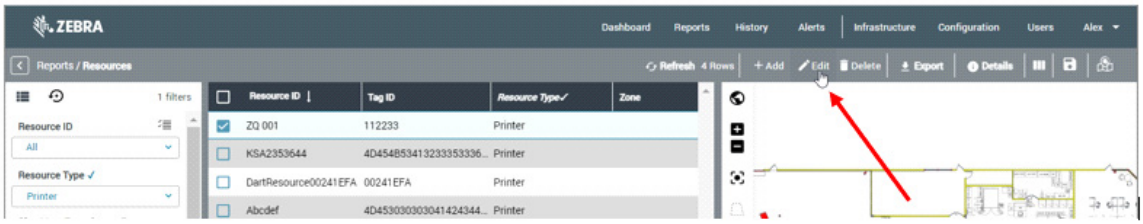
Section	Field Name	Description
	Tag ID	A unique tag ID value. It can be an integer or an alphanumeric string depending on the type of tag technology selected in the Tag Source dropdown list.
	Tag Source	The type of tag technology. Options include WhereNet, Dart (UWB), EPC, MPACT (BLE), MSE, and Unknown
Zone		When a tag blinks, its location (x,y coordinates and zone) will be automatically updated by the system. But here you can specify an initial zone before the tag is heard by the system.
Attributes		If attributes have been defined for the resource type selected in the Resource Type list, then a set of corresponding fields will be displayed here. For free text attributes, you can type any string. For lookup attributes, you can select a value from a list of predefined values.

Click **Save** to save the information. The newly created record will be shown in the report:



Several fields in this report, such as Zone, x, y, latitude, longitude, etc, will be automatically updated whenever the tag blinks.

To change/update the tag ID, resource ID, or resource type, select the item in the report and click the **Edit** tool button.

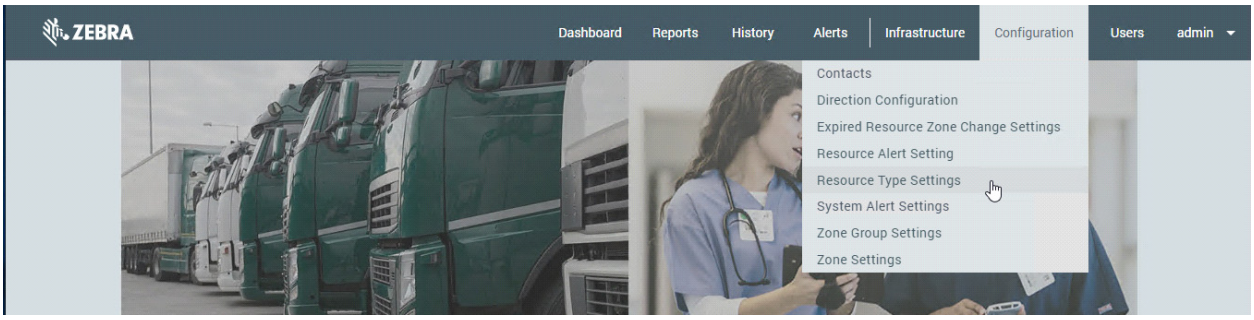


Resource Type Filters

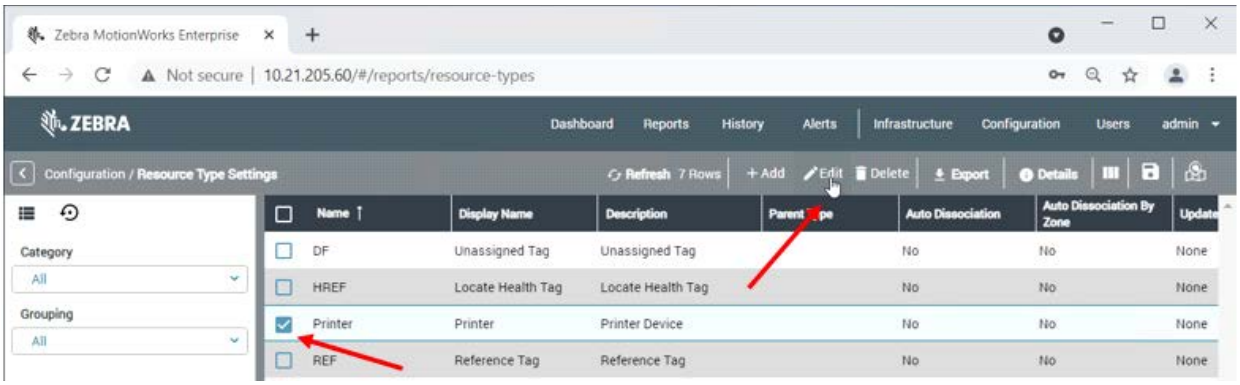
Different tag blink data filters are available within MWE. Specifically, it is possible to define filters per resource type, by defining a set of filters that apply only to tags associated with a particular resource type, and defining another set of filters that is only applicable to tags associated with another resource type. These filters include median filters, zone lockdown filters, time based rate filters, and distance based time filters. Configuration of these filters is done via the MWE web client.

Within MWE, these filters are applied to incoming tag blinks in the following order: **`Median filter > Zone Lockdown filter > Rate filters.`** All filters are disabled by default.

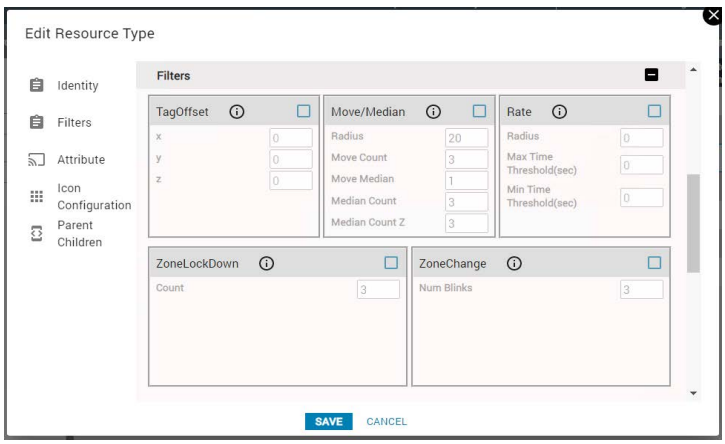
To configure filters for a resource type, open the Resource Type Settings report:



Select the resource type and click **`Edit`** on the menu bar:



In the Edit Resource Type data entry form, scroll down to the **`Filters`** section:



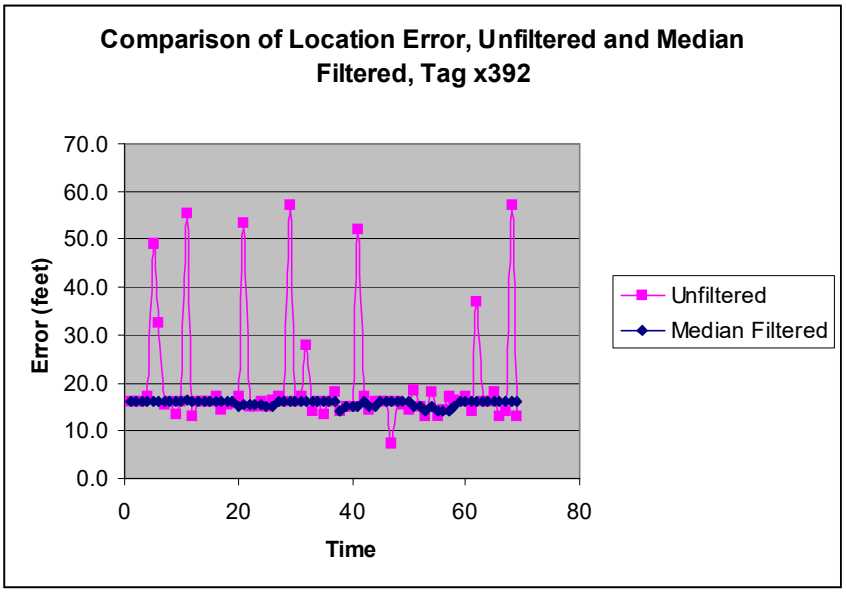
Tag Offset Filter

The tag location reported by sensors/readers is shifted by this filter by the specified x,y,z offset values. This is useful when tags sit close to the boundary of two zones and it is desirable to report tags in the center of a zone.

Median Filter

The location of tags (assets) in a facility measured or calculated by an RFID RTLS system is subject to occasional movement caused, for example, by the reflection of the radio signal transmitted by the tag. Depending on the density of the RF obstructions in the environment, this movement, called jitter, may become objectionable. A median filter is available in MWE to reduce or eliminate this jitter.

When enabled, the median filter reports the median X, Y, and Z values of the last Median Count tag locations. Thus, if a location is received that is significantly different from previous locations, the median filter will ignore that value and report the median value from history. The table below provides an example of a median filter applied to the Y dimension; note how the occasional jitter is eliminated from the reported value.



The following table shows filter examples with three different values of a median filter parameter named Median Count.

Table 5 Median Count Variables

Tag Blink	Asset Location (X,Y)	Reported Location "Median Count"=3	Reported Location "Median Count"=5	Reported Location "Median Count"=7
1	(25, 93)	?[1]	?[1]	?[1]
2	(25,93)	(25, 93)	?[1]	?[1]
3	(25,93)	(25, 93)	(25, 93)	?[1]
4	(25,93)	(25, 93)	(25, 93)	?[1]
5	(20, 85)[2]	(25, 93)	(25, 93)	(25, 93)

[1]Dependent on previous location.
[2]Position change caused by location jitter.

Table 5 Median Count Variables

Tag Blink	Asset Location (X,Y)	Reported Location "Median Count"=3	Reported Location "Median Count"=5	Reported Location "Median Count"=7
6	(20, 85)[2]	(20, 85)[2]	(25, 93)	(25, 93)
7	(25, 93)	(20, 85)[2]	(25, 93)	(25, 93)
8	(25, 93)	(25, 93)	(25, 93)	(25, 93)

[1]Dependent on previous location.
[2]Position change caused by location jitter.

NOTE: Observe that wo successive occurrences of location jitter were successfully filtered by the Median Count=5 and Median Count=7 filter settings, but not the Median Count=3 setting.

A potential drawback of filtering is that the reported tag location lags the actual tag location when the tag (asset) is moving. The amount of latency is the number of extra tag blinks required at the new location before the median filter outputs the updated position; it is dependent on the filtering parameter Median Count chosen. For this median filter more than ½ of the Median Count samples must represent the actual location. Therefore, the actual location of a moving tag will be reported integer (Median Count/2)+1 samples after movement has stopped. This latency is of no consequence when the assets are stationary; however it is of concern when assets are repositioned. The median count for the (X, Y) values can be specified independently from the Z value.

The level of filtering for different values of Median Count is shown in the following table.

Table 6 Filtering Levels for Median Count Values

Filter Value Median Count	Latency (Number of extra blinks before accurate report)	Number of Jitter Blinks Ignored
3	1	1
5	2	2
7	3	3
9	4	4

To reduce the latency in tracking moving assets, a second filter is invoked when the asset is measured to be moving. The moving filter value Move Count is specified to be less than the value of the stationary parameter Median Count in order to provide faster response time.

The tag (asset) is declared to be moving if the average of the most recent Move Count consecutive blinks is located at least Move Radius (ft) distance away from the current median. The moving filter is invoked for a tag that moved to a new position, but not if only the jitter has increased. The tag location will be filtered using value Move Median until Median Count values are found within Move Radius of the median. When the moving filter is initially invoked, it is loaded with the most recent Move Count values from the history table see below.

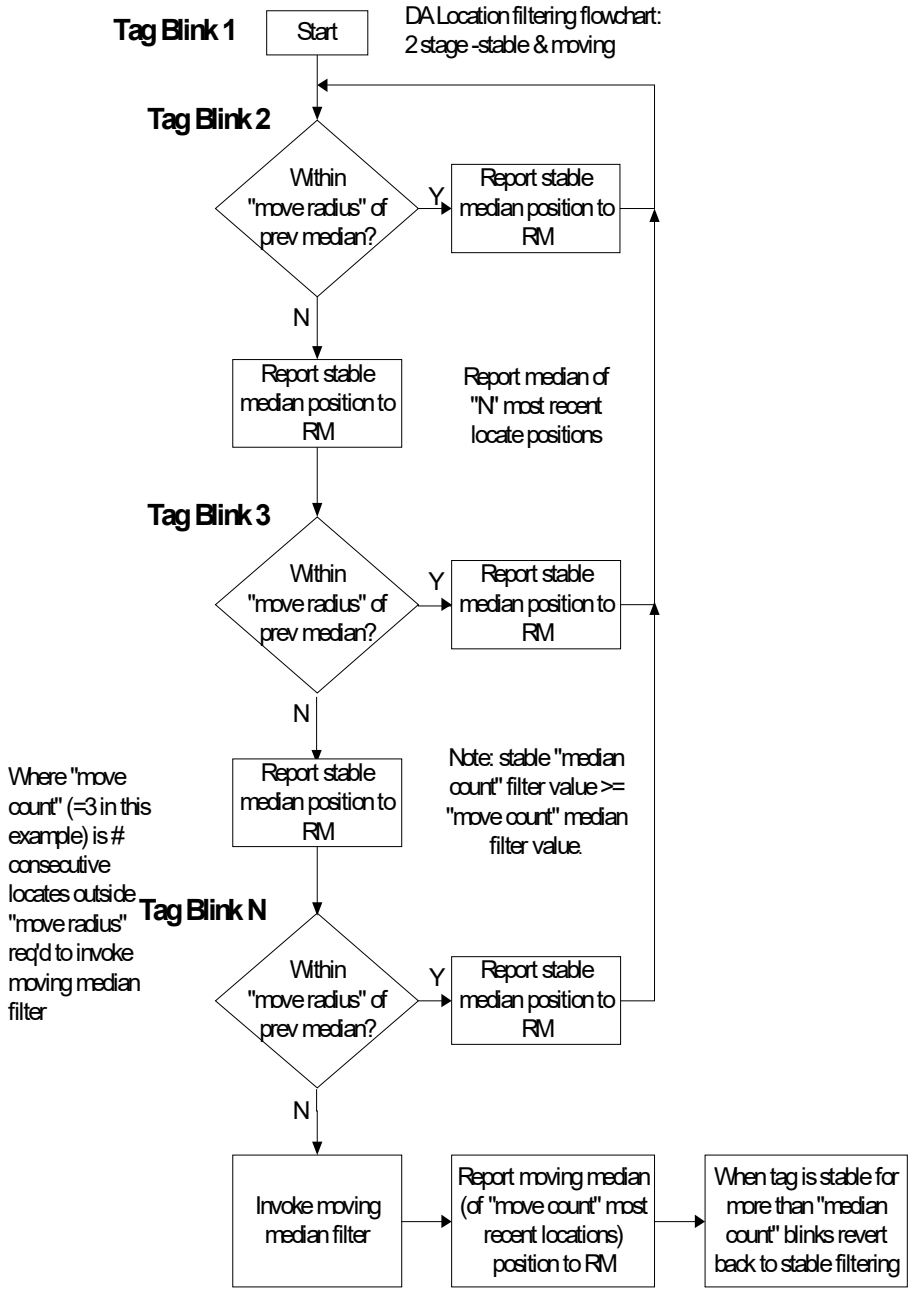


Table 7 Median and Move Type Definitions

Variable	Description
Median Count	The number of recent blinks used to compute the median for the X and Y coordinates. This value must be an odd integer between 1 and 21.
Median Count Z	The number of recent blinks used to compute the median for the Z coordinate. This value must be an odd integer between 1 and 21.
Move Radius (ft)	The minimum distance from the latest blink to the current median. This can be from 0 to 50,000 ft.
Move Count	The number of consecutive blinks that must be outside the Move Radius. This can be between 1 and 5.
Move Median	The new median count to use once a move is detected. All but the last Move Median history samples are thrown out when a move is detected. The samples then accumulate until there are Median Count samples. The Move Median value should be less than the Median Count and must be an odd integer between 1 and 21.
Enable Filters	When set to Y, the median and move filters will be applied to the (X,Y,Z) from the locate packet. When set to N, the raw (X,Y,Z) are used.

The recommended configuration of the median filter is dependent on the RF obstructions at site. Higher levels of obstructions will produce more jitter and require heavier filtering. The recommended filtering levels are provided below:

Table 8 Obstruction Classifications

Obstruction Classification	Stable filter N	Moving filter M	Moving radius R	Consecutive blinks C
Unobstructed	3[1]	N/A	N/A	N/A
Minimally Obstructed	3, 5[1]	3[1]	20 ft (6.1 m)	2
Significantly Obstructed	5, 7[1], 9[1]	3, 5[1]	45 ft (13.7 m)	2, 3[1]
[1]Optional value indicated for additional filtering if desired.				

Every time the locate system computes the location of a tag it will arrive at a slightly different result. The median filters described above do a good job at removed infrequent pops in the location. The tag location will still vary slightly even if the actual asset is not moving at all.

Zone Lockdown Filter

In some applications it is known that once an asset enters a zone it does not move at all. For these special cases, the reported (X,Y) location can be locked-down after an asset enters a zone. The zone lockdown filter has the following configuration parameters:

Table 9 Zone Lockdown Types

Zone Lockdown	Description
Zone Lockdown	When set to Y the zone lockdown filter is enabled.
Zone Lockdown Delay Count	The number of blinks to wait upon entering a zone before locking down the (X,Y) location. All further blinks in this zone will have this same (X,Y) until the asset exists the zone.

A special case occurs for the On-Site zone. Zone Lockdown occurs for this zone.

Rate Filter

The purpose of the Rate Filter is to decrease the blink rate processed by the MWE database, and decrease the processing of redundant blinks.

The Rate Filter configuration parameters are explained in the following table. There are two types of rate filters supported:

- Time based rate filter, configured with the parameter **Min Time Threshold.**
- Distance based rate filter, configured with the parameter **Report when move X feet and Max Time Threshold (sec)**.

Table 10 TIme-based Rate Filter

Time based rate filter		
Parameter	**Possible Values**	**Comments**
Minimum Time Threshold (sec)	Null, 0, or integer larger than 0	This filter calculates the time elapsed between the incoming blink and the most recent blink reported to the database for each tag ID. If this time period is larger than the minimum value specified in this parameter, the filter reports the blink to the database. Otherwise the filter does not report the blink to the database. This filter is applied to both locate and no-locate (null x,y) blinks. If this parameter is set to Null or 0, no minimum time filtering is applied.

Table 11 Distance-based Rate Filter

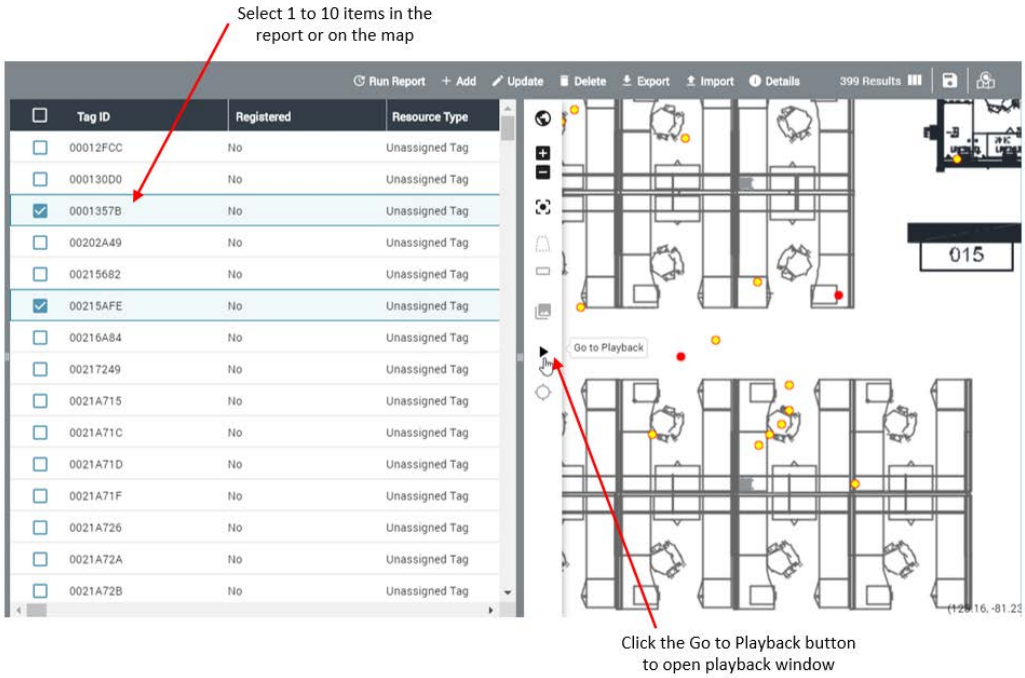
Distance-based rate filter		
Parameter	**Possible Values**	**Comments**
Report when move X feet	Null, 0, or integer larger than 0	This filter calculates the distance between the incoming blink and the previous blink received by the filter for each tag ID. If this distance is larger than the minimum distance specified in this parameter, the filter reports the blink to the database. Otherwise the filter does not report the blink to the database. If the incoming blink is a no-locate blink (null x,y), no distance calculation is performed and the blink is not reported to the database. If the incoming blink is a locate blink (non-null x,y), the distance is calculated using this blink and the previous locate blink received by the filter. If this parameter is set to Null or 0, no minimum distance filtering is applied.
Maximum Time Threshold (sec)	Null, 0, or integer larger than 0	This parameter can be used to work in conjunction with the Report when move X feet parameter. If the filter has not reported any blinks for a given tag ID in a period of time equal to the value specified in this parameter, the filter reports the next blink from this tag ID even if the tag has not moved a distance larger than the distance specified in Report when move X feet. This allows the filter to periodically report blinks to the database for tags that are blinking but are not moving. This filter reports the first blink received after Max Time Threshold has been exceeded to the database regardless of whether the blink is a locate or no-locate (null x,y) blink. If this parameter is set to Null or 0, it will be disabled. That is, a tag that is blinking but not moving is never reported to the database.

NOTE: Rate filters are not applied to low battery blinks, that is, blinks where the low battery bit in the tag transmission is set to 1.

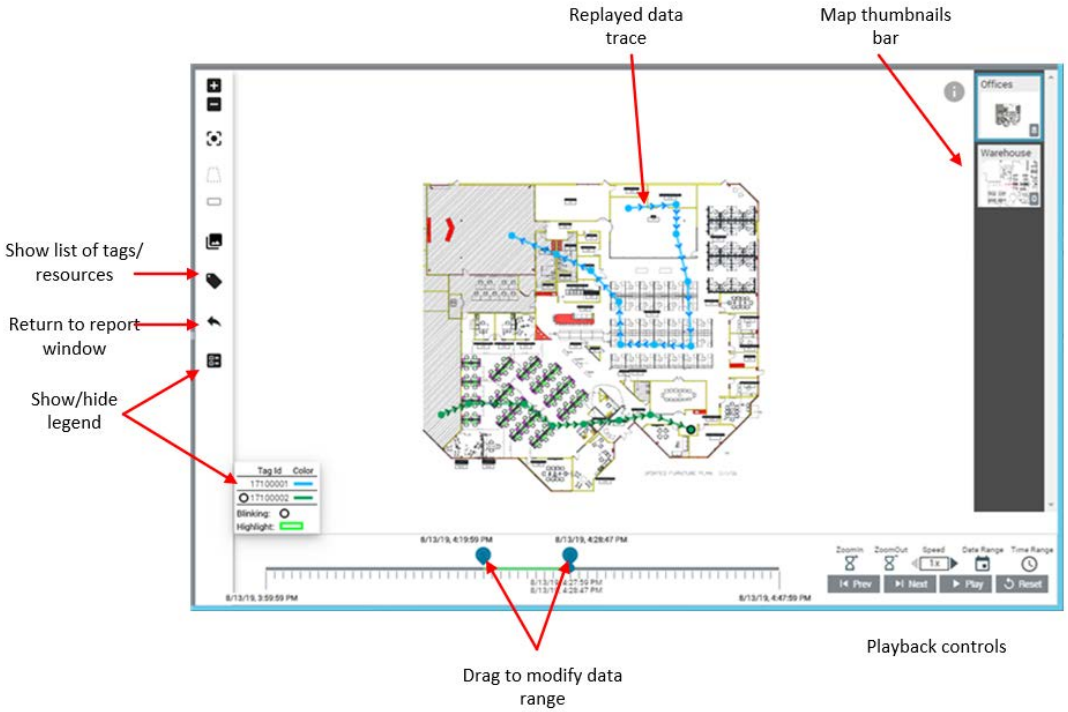
Viewing and Replaying Location History

The blink history (every blink) of a tag can be viewed in the Tag Blink History report, and the zone history (zone changes) of a tag can be viewed in the Resource Event History report, setting the Event filter to Zone Change.

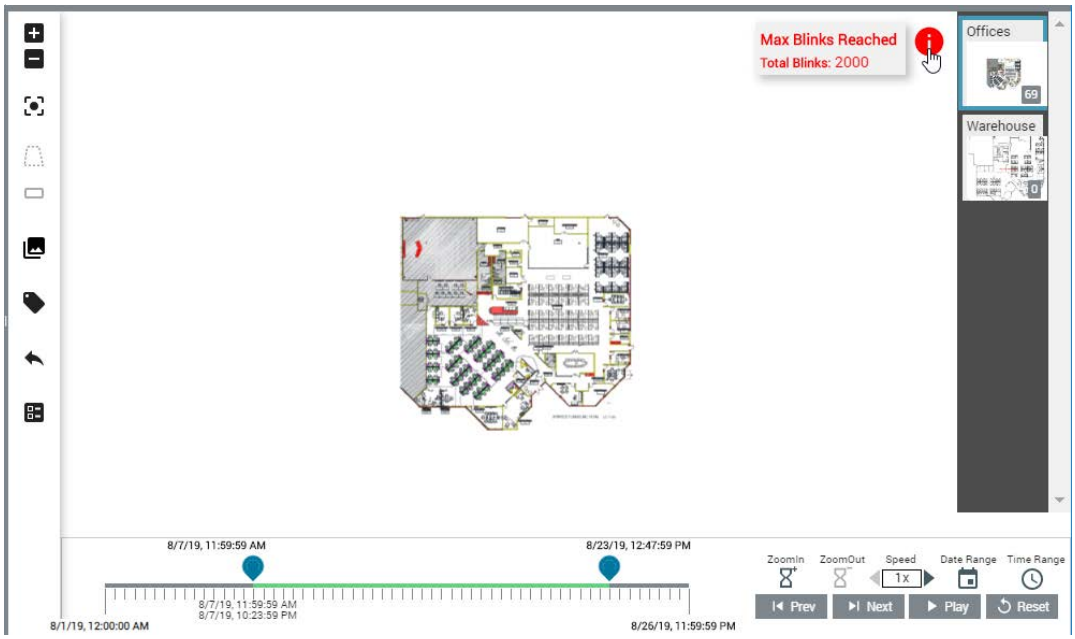
Additionally, the Resource Event History, Tag Blink History, Tags and Resources reports in the MWE web client allow replay of historical data on a map window, showing a trace of the historical path. Select from one to ten tags in the report and click the ▶ button on the map tool bar to switch to the replay window. Click the ↩ button on the playback window to go back to the regular map window. Users are then prompted to select a date range when the replay window opens. The date and time range, and replay speed controls are found on the lower right corner of the playback window.



The figure below displays the playback window with data replayed for two selected tags:



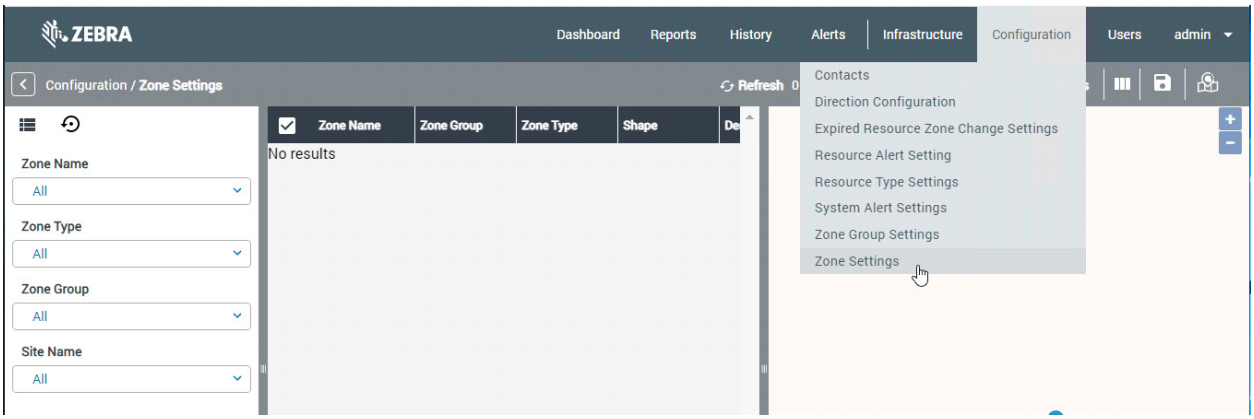
Between one and 10 tags or resources can be selected at a time to playback their data. Additionally, a maximum of 2000 data points can be replayed at a time. Placing the mouse over the **i** icon on the top right corner of the playback window displays the number of data points being replayed

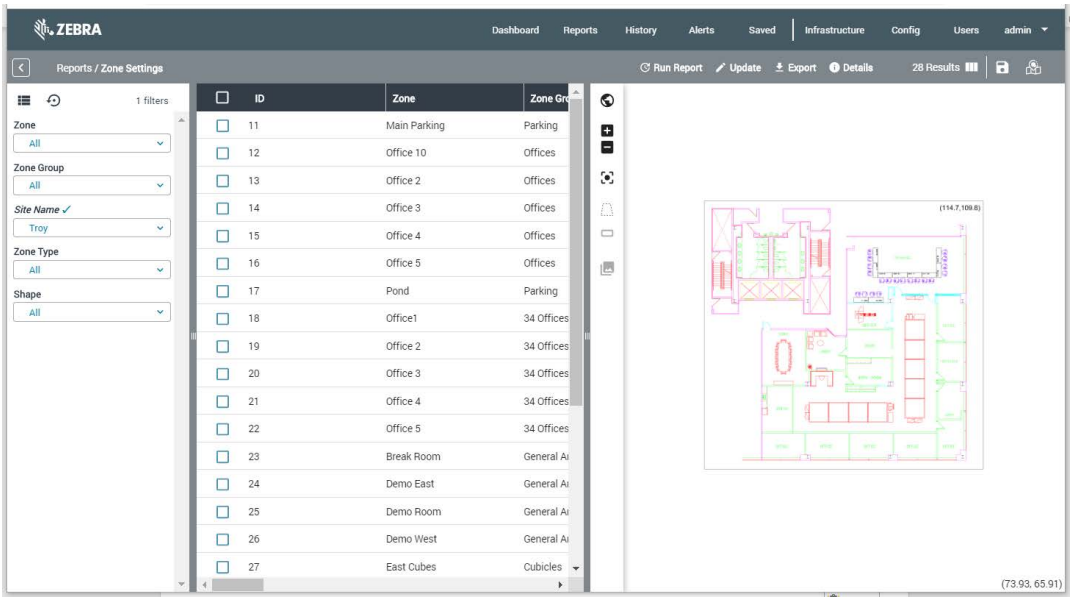


Viewing Zones

Zones and Zones Groups are defined in the **`Infrastructure menu > Site Manager report > Configure Zones`** tab in the MWE web client. Refer to the MWE Configuration Guide for details.

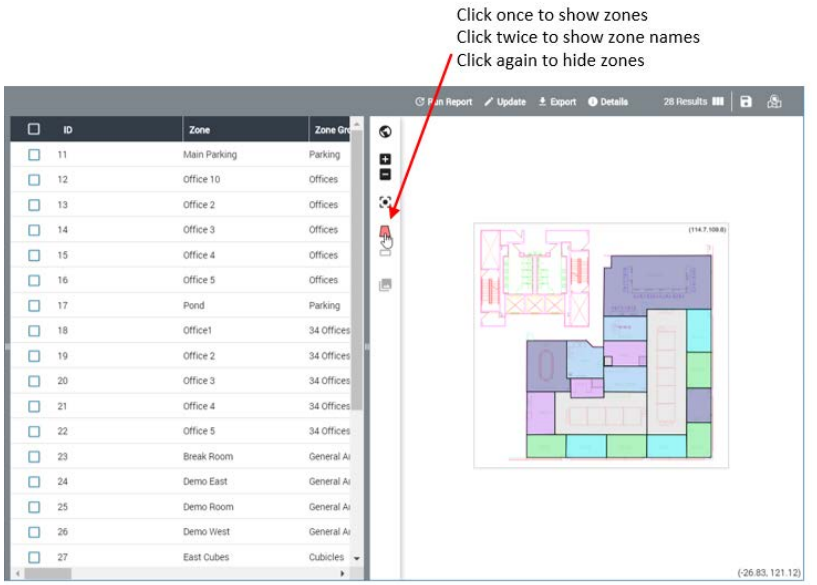
Zones defined for all sites and maps can be viewed in the **Configuration → Zone Settings** report using the MWE web client.

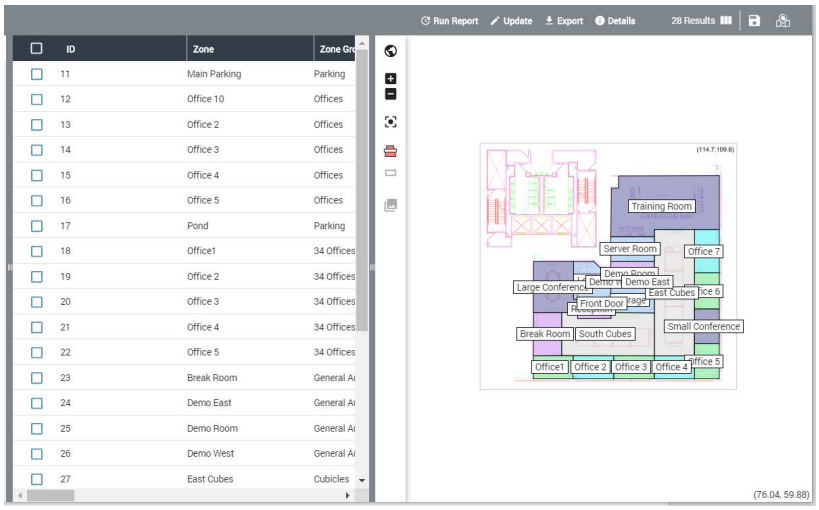




The report allows filtering on Site Name and Zone Group.

Zones and their names can be viewed on the map by clicking the **Show/Hide Zones** button on the map toolbar.

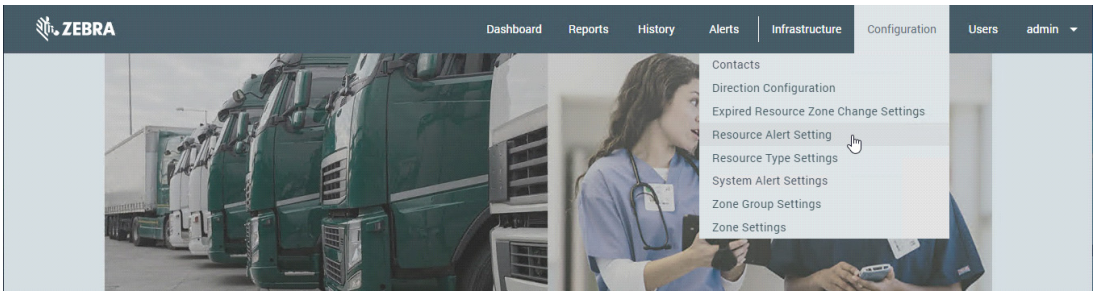




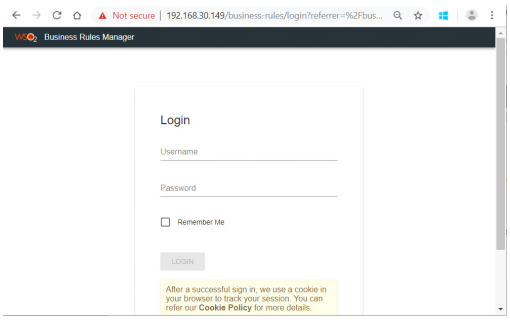
The **Show/Hide Zones** button on the map toolbar is available in all reports that include the map window, such as the **Tags** report and the **Resources** report.

Business Rules Alerts

A business rules engine is provided in MWE 2.0, based on the wso2 Siddhi engine. The engine allows defining conditions based on the location and status of tags and resources such that the system can trigger alerts and take various actions when the conditions are met. These alerts are referred to as Business Rules Alerts or Resource Alerts. To create and manage such alerts, go to the **`Configuration`** > **`Resource Alert Settings`** link:

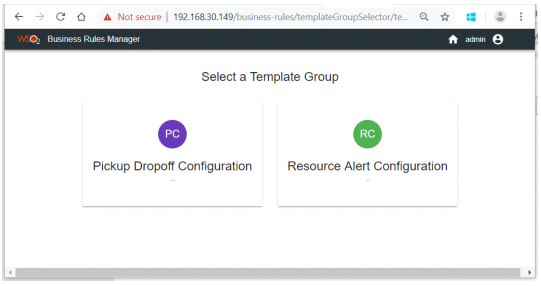


The login page is displayed:

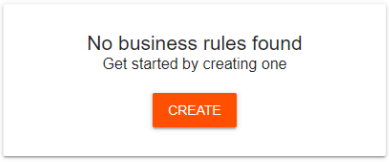


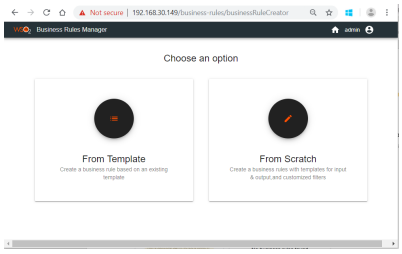
The default login is **`admin / admin`**.

Two templates are provided: **`Resource Alerts`** and **`Pickup/Dropoff`**:



NOTE: The business rules template in MWE 2.0 are customized versions of the generic templates provided by the underlying Siddhi rules engine. Before users reach the page shown in the following figure, the two extra dialog windows are shown. Click **`Create`** and **`From Template`**.





Resource Alerts

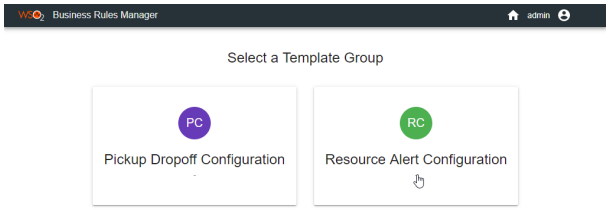
Condition definition:

A resource or resource type enters/leaves a zone or set of zones, and/or resource parameters are equal to or different from specified values, and the condition is met for a specified length of time.

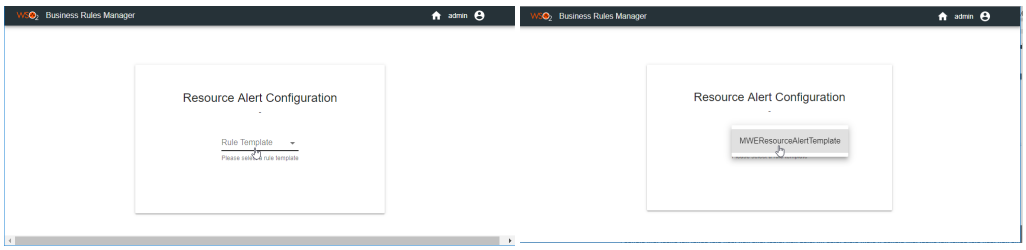
System response when condition is met:

- Triggers an alert, which can be seen in Event History report in the MWE web client
- Triggers a Resource Alert event that can be used by MWE or other applications
- Automatically changes any resource custom parameters to specified values
- Sends email notification to a specified list of email addresses
- Generated events can be seen in the **`Event History`** report in the MWE web client.

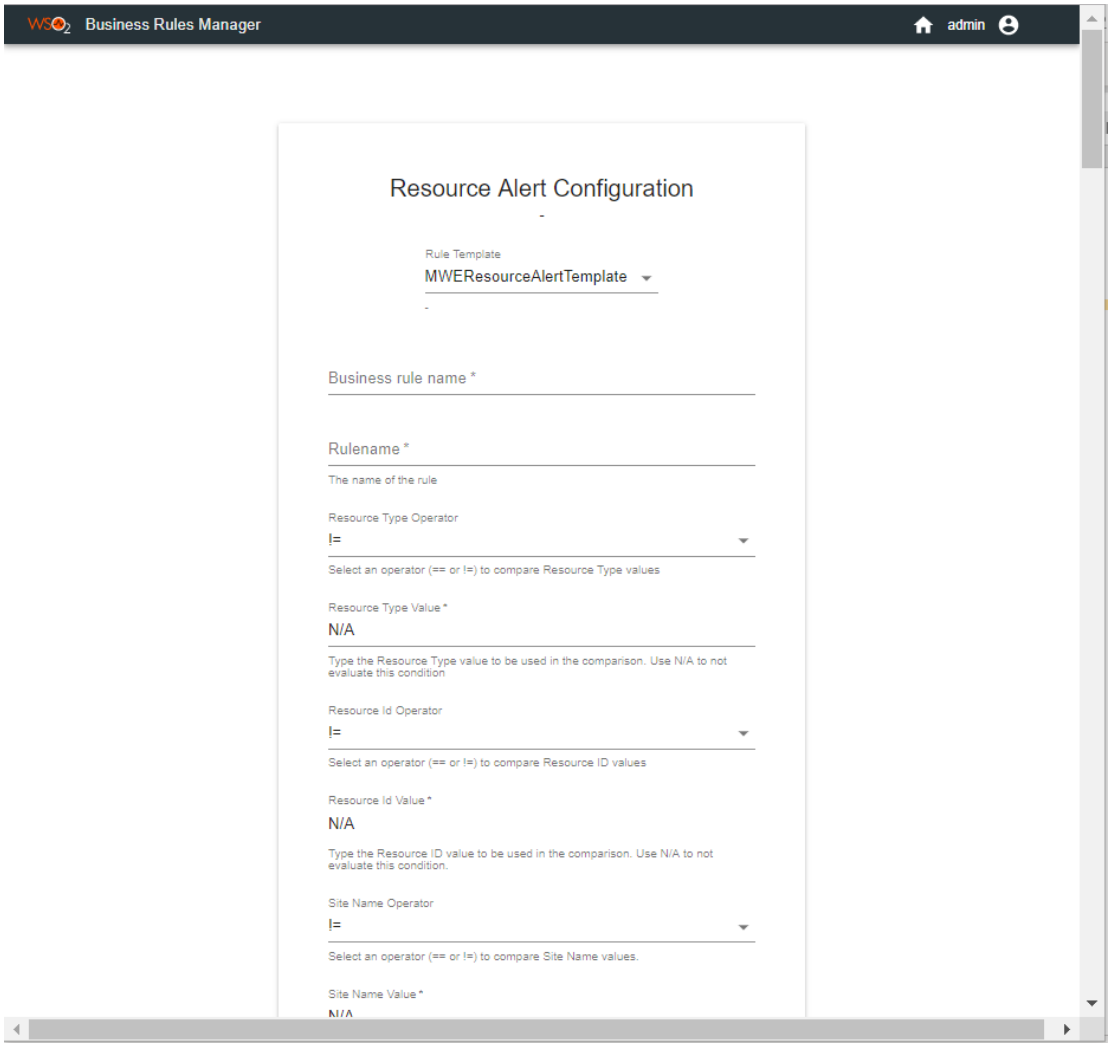
To open the Resource Alert template, click **`Resource Alert Configuration.`**



Then click on **`Rule Template`** and **`MWEResourceAlertTemplate.`**



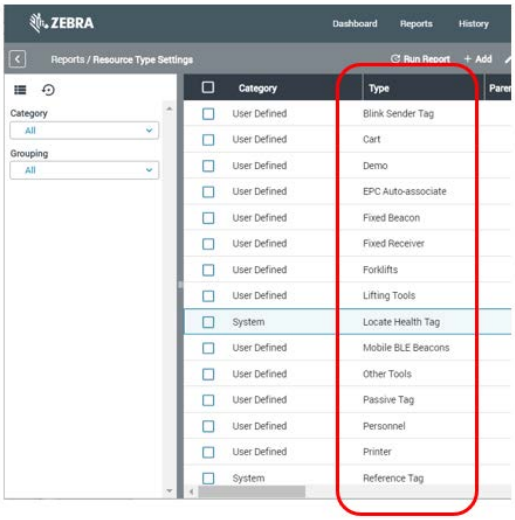
The **`Resource Alert`** template opens.



When using the above template to define a Resource Alert:

- Enter a name for the resource alert in the ‘Business rule name’ field.
- Due to technical reasons underlying the generic template used in MWE 2.0, enter the same rule name in the Rulename field. This extra field is eliminated in the next MWE release.
- In this template, for each field to be evaluated, you first need to choose an operator: equal to (==) or different from (!=)

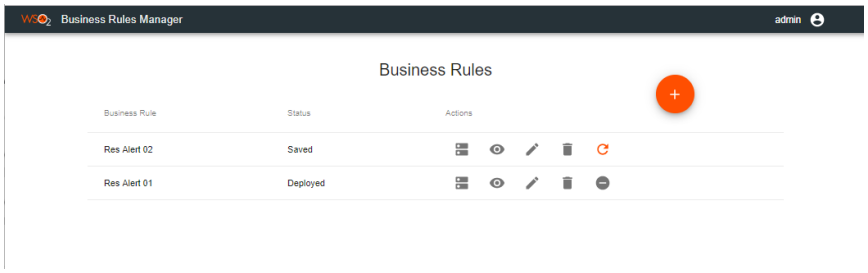
- After the operator is chose, type in the value of the field to be used in the evaluation. There is no dropdown list of possible values in this version of the template. Users must type in the desired value. For example, to know the possible values for the Resource Type Value field, users must look at the **`Type`** column in the **`Resource Type Settings`** report in the web client and choose one value to be used.



- The value N/A in a field means do not evaluate/compare this field. This is equivalent to say accept all values.
- A single value can be typed in every field. Lists of values are not allowed.
- For each of the custom property value fields, you can specify a value to be used in the evaluation, and also a value to be applied when the alert is triggered
- Leave the default N/A value for Third-Party Kafka Broker and Third-Party Kafka Topic fields.
- The Emails field is the only field that accepts a list of items. Enter a comma separated list of email addresses to notify when the alert is triggered.

NOTE: For the rules engine to send email notifications, the configuration file **`etc/zebra/mwe/conf/camel/general.properties`** on the MWE Linux server needs to be updated with appropriate information about the email server. Refer to details in the Configuring Email Notifications section in the MWE 2.0 Configuration Guide.

- Click **`Save`** to save the resource alert definition without deploying it. Click **`Save and Deploy`** to save it and enable it at the same time. Users are taken to a page displaying a list of defined resource alerts, where users can edit, delete, deploy/cancel, and view deployment status for each alert.



- Click the orange + icon to add a new alert. Logout using the icon on the top right of the window.
- Resource Alerts that have been triggered can be viewed in the **`History > Event History`** report in the MWE web client.

Pickup/Dropoff

Pickup Condition definition:

Two resources from specified resource types blink within a specified time and a within a specified distance from each other and keep doing so for a specified length of time.

System response:

- The system considers the two resources to be paired and traveling together, and generates a Pickup event that can be used by MWE or other applications. If the pairing happens in a specified Dock Zone, a Received event is generated.
- Generated events can be seen in the **`Event History`** report in the MWE web client.

Dropoff Condition definition:

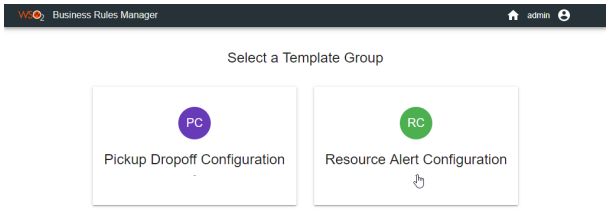
Two resources previously paired stop blinking together (that is, within the specified time and distance defined in the Pickup condition) for a specified length of time.

System response:

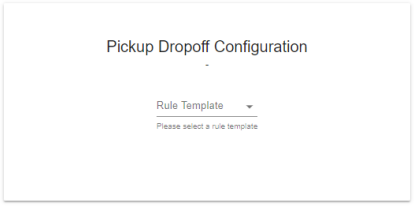
- The two resources previously paired are now considered unpaired and moving independently. The system generates a Dropoff event that can be used by MWE or other applications. If the unpairing happens in a specified Dock Zone, a Shipped event is generated.
- Generated events can be seen in the **`Event History`** report in the MWE web client.

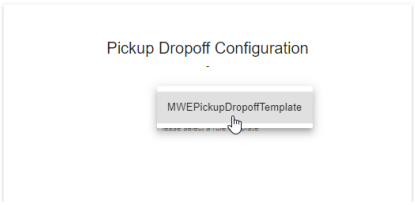
To open the Pickup/Dropoff template:

1. Click **`Pickup Dropoff Configuration.`**

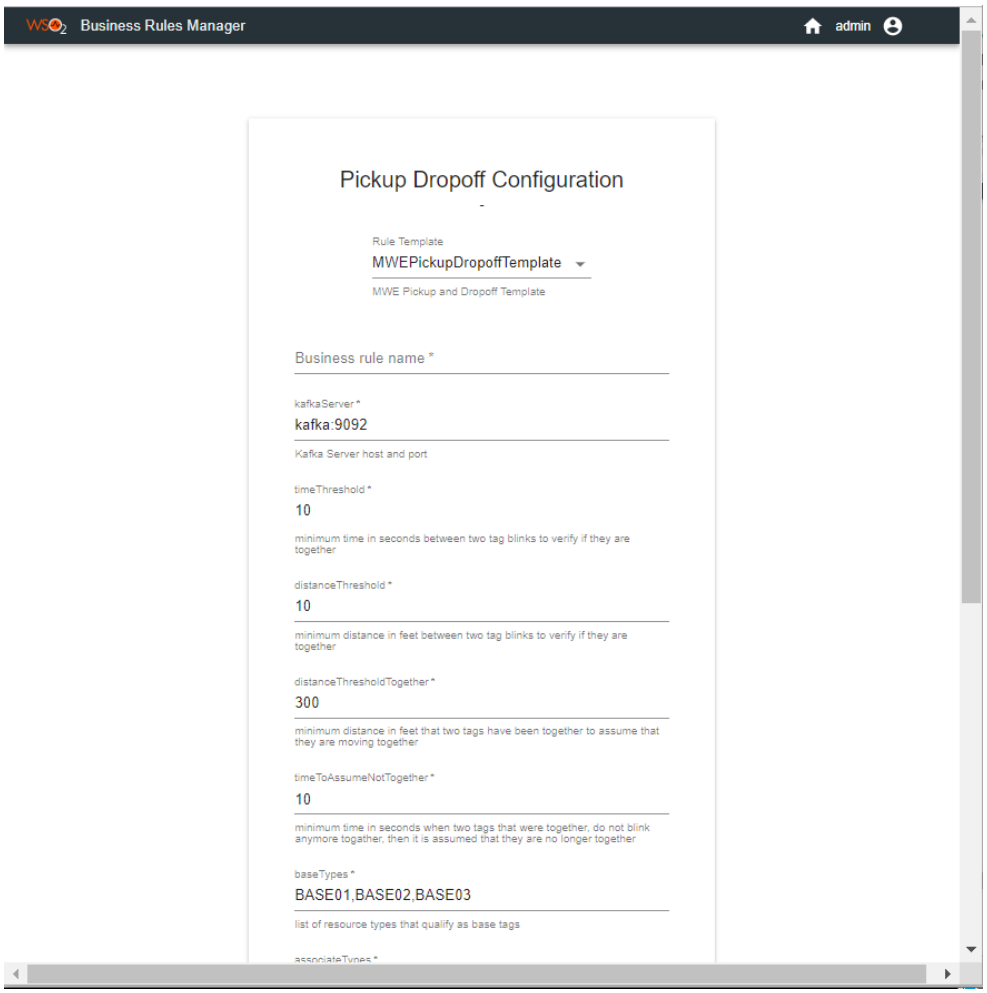


2. Click on **`Rule Template`** and **`MWEPickupDropoffTemplate`**:





The **`Pickup Dropoff`** template opens:



Resource Parent-Child Grouping

In use cases where pallets are being located and tracked within a warehouse or manufacturing plant by the MWE system, each pallet has a tag physically attached to it so that MWE can locate it. The tag can be active or passive RFID tag. A user would then place several boxes on the pallet. The boxes may have tags attached to them so that MWE can detect their presence independently, or they may just have optical bar code labels and therefore MWE cannot detect them directly. However, while the boxes are on the pallet, users might want the boxes to inherit the location of the pallet so MWE can report the location of the boxes as the same as the location of the pallet.

For similar use cases, MWE offers the **`Resource Parent-Child Grouping`** functionality, where one parent resource ID (the pallet ID) can be associated with multiple child resource ID's (boxes ID's) so that each child resource will inherit the location of the parent resource.

To enable and configure this functionality, follow the steps below. For example, there are two different cases, when the child resources do not have tags physically attached to them (only optical bar code or similar labels) and when they do.

NOTE: If the child resources have tags, the tag type and location technology used for locating child resources can be the same or different from the ones used for locating parent resources. It is not relevant to the Resource Parent-Child functionality.

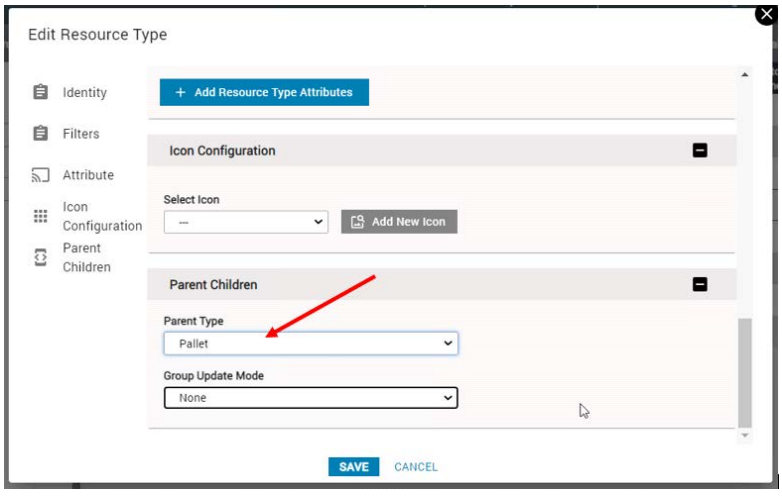
Child Resources with No Tags

In the **`Resource Type Settings`** report in the MWE web client, use data entry to create a resource type that will be a parent resource type.

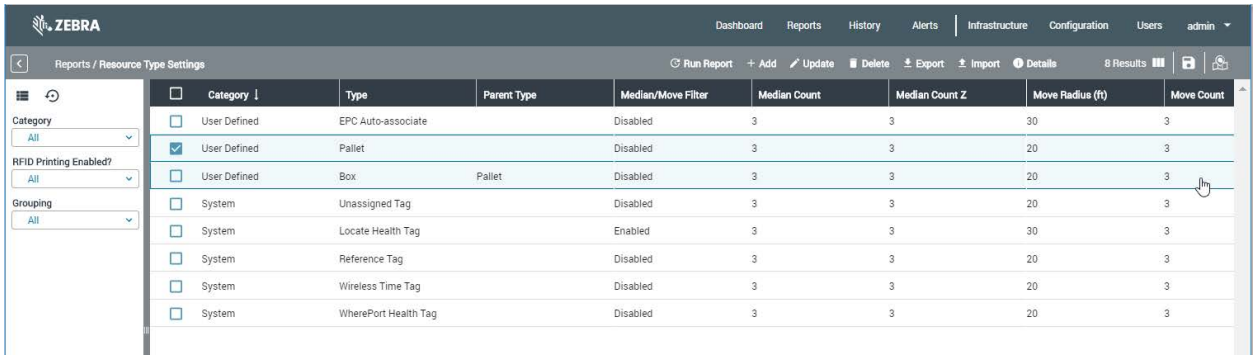
Create it as you would create a regular resource type; see Defining a Resource Type on page 40 for more information. In the example here, this would be a resource type named **`Pallet`**.

In the same report, use data entry to create a resource type that will be a child resource type.

In the example, this would be a resource type named Box. In the data entry form you must select the parent resource type in the **`Parent Type`** field. In the example, select **`Pallet.`**

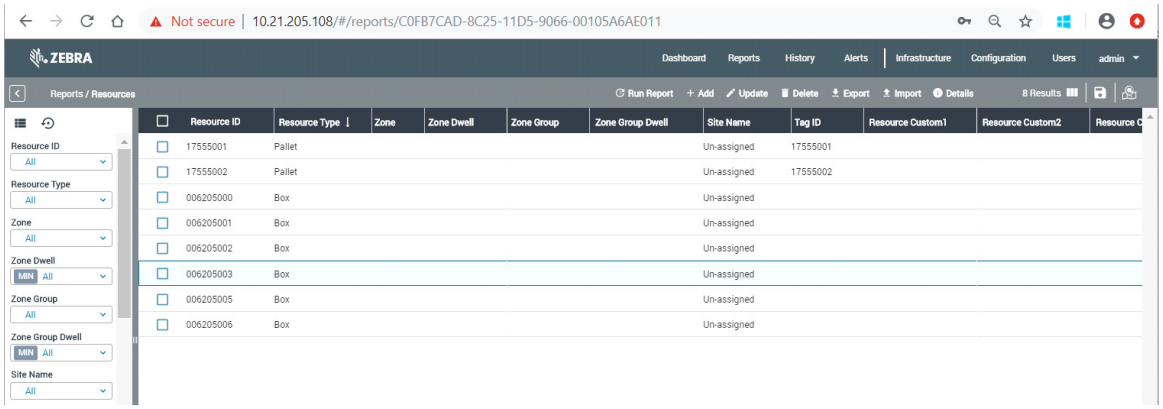


In this example, you should already have in the `Resource Type Settings` report a resource type named `Pallet` and a resource type named `Box` with Parent Type = Pallet, as shown in the following figure.

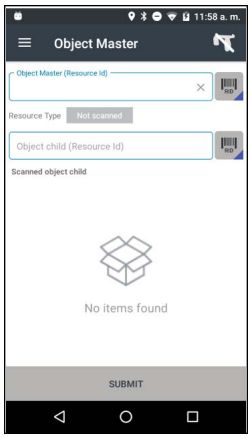


In the **`Resources`** report, add Pallet resource ID's and Box resource ID's as you would normally do. See Associating a Tag ID with a Resource ID.

- Each pallet has a tag physically attached to it, enter the tag ID for each pallet ID. Each pallet may have some label that identifies it, and you could use the content of such label as the pallet or resource ID. Otherwise, use the tag ID also as the pallet ID, as in the following figure.
- Boxes in this example do not have RFID tags attached to them, but only an optical bar code label. You can enter the optical bar code as the box's resource ID and, optionally, also as its virtual tag ID.



Associate a Pallet ID with one or more Box ID's. This is done using a Zebra mobile application that runs on TC5x mobile device. The application allows you to scan the resource ID of the parent asset (identifying label attached to a pallet) and then scan the resource ID's of one or more child assets (the optical barcode on the boxes). The mobile application also allows scanning tag ID's instead of resource ID's. The following figure shows a screenshot of the mobile application.



MWE then reports the location of each child resource ID to be the same as the location of the parent resource ID associated in the mobile app.

Child Resources with Tags

When the child resources (boxes in the example provided) have tags physically attached to them so that MWE can detect their presence, there are two options for associating a parent resource ID with one or more child resource ID's:

- Option One: Follow exactly the steps listed above for child resources without tags. The parent ID – child ID's association is done using a mobile app as explained above. After the association is done, MWE will ignore the tag blinks from the children tags and have the child assets inherit the location of the parent asset.
- Option Two: Follow the steps listed above for child resources without tags, but the parent ID – child ID's association is done automatically when a parent resource and one or more child resources stay in the same zone (pre-configured as 'resource association zone') for a configurable length of time (resource association time). After the association is done, MWE ignores the tag blinks from the children tags and have the child assets inherit the location of the parent asset.

The following steps explain how to make a zone into a resource association zone and how to specify the resource association time referred to above.

1. Use the Zone Builder tool to define one or more zones in MWE that are intended to be resource association zones. Define them similarly to any normal zone. Refer to the MWE Configuration Guide for additional details on Zone Builder.
2. Publish the zones when complete.

NOTE: A physical zone being used as a resource association zone should have location sensors with sensitivity adjusted to hear only tags within the zone. Alternatively, a Faraday cage can be used to block RFID transmissions going in or out of the room. The location sensors inside the association zone can be configured to locate tags inside the association zone using a presence algorithm or any other location algorithm.

3. Connect a Putty or Terminal window to the MWE Linux server and use the **vi** or similar command to edit the **`autofamily.properties`** configuration file located in the **`/etc/zebra/mwe/conf/autofamily-svc/`** directory.

   The contents of this file are shown below.

```
# REPORTSVC SETTINGS
report-service-url=http://reportsvc:8081
resources-url=/report-service/v1/resources/
tags-url=/report-service/tags?objectId=
X-Consumer-Username=admin
X-Consumer-Groups=administrator

# KAFKA SETTINGS
app-id-faraday=faradayCage
app-id-parent-child=parentChildBlink
bootstrap-server=kafka
bootstrap-server-port=9092
window-time=5000
window-type=fixed
cache-max-bytes-buffering=1000000
max-poll-records=10000
commit-interval-ms=100
auto-offset-reset=latest
faraday-zone=NEW ZONE 11,NEW ZONE 12,NEW ZONE 13,NEW ZONE 4
input-topic-faraday=mwe.resource.locate
input-topic-parent-child=mwe.resource.locate
output-topic-parent-child=tagBlink
path-logs-faraday=/log/kafka-faraday-cage.log
filename-logs-parent-child=/log/kafka-parent-child.log
```

Ensure that only the following lines are modified:

- **`faraday-zone`**: enter a comma separated list of the names of the zones that you would like to be resource association zones, as in the default list shown above (NEW ZONE 11, …).
- **`window-time`**: the default is 5000 ms = 5 seconds. When a location sensor inside the association zones hears the first tag blink, MWE will open a 5 second time window and group all tag blinks detected in the association zone during that time. There should be only one parent ID tag heard in that time window, and there can be one or multiple child ID tags. MWE will automatically associate the parent ID and all child ID's detected during the time window. Note that if more than one parent ID is detected during the 5 second window, MWE will not perform any parent – child association. Once a 5 second window is closed, another 5 second window will open when the next tag blink is detected inside the association zone. Feel free to change the default value of 5000 ms as needed.

For the changes above to take effect, run the following commands in the Putty window:

```
# cd /root/mwe
# docker-compose up -d mwe-rescorrelationsvc
# docker-compose up -d mwe-autofamily-svc
```

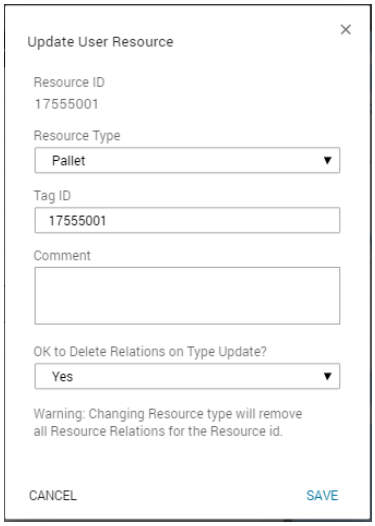
At this point, MWE reports the location of each child resource ID to be the same as the location of the parent resource ID associated in the association zone.

The **`Resource Grouping`** report in the MWE web client displays all of the parent-child associations (or groupings) that are currently active.

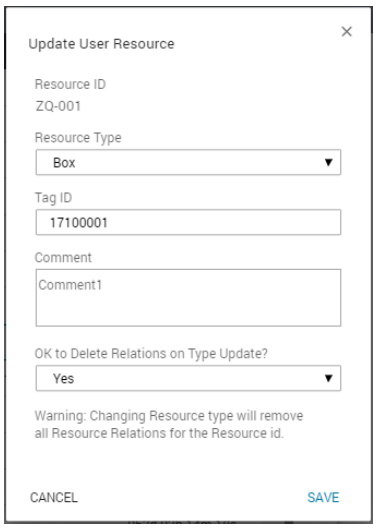
Releasing Child Resources

To release the child resources from inheriting the parent resource location, complete one of the following:

- Associate the child resources with a different parent resource, using either the mobile application or a resource association zone. In this case, the child resources stop inheriting the location of the previous parent resource and will start inheriting the location of the new parent resource
- In the **Resources** report in the web client, select a parent resource, open the **Update User Resource** data entry, and set **OK to Delete Relations on Type Update?** to **Yes** as shown in the following figure. Then click **Save**. This releases all child resources that are associated with this parent resource.



- In the **Resources** report in the web client, select a child resource, open the **Update User Resource** data entry, and set **OK to Delete Relations on Type Update?** to **Yes** as shown in the following figure. Then click **Save**. This releases the specified child resource from the parent resource that it had previously been associated with.



Dynamic Locate Fusion

Resource Parent-Child Grouping allows assets (child assets) that only have an optical barcode label attached to inherit the location of another asset (the parent asset) having an active RFID tag attached to it and being located and tracked by the MWE system. The association between parent and child assets is done manually using a mobile application or automatically in a specially configured **resource association zone**. Dissociating child and parent assets requires the usage of a mobile application or data entry form in the web client.

Similar to Resource Parent-Child functionality, Dynamic Locate Fusion functionality allows a set of items to inherit the location of another item that is being located and tracked by the MWE system, however, the association and dissociation happens anywhere automatically when specified conditions are met. In this case, the set of items inheriting the location must have some type of low-cost RFID tag attached to them, such as a passive RFID tags or BLE beacons.

For example, a forklift at a manufacturing plant is constantly moving pallets loaded with boxes around the site. The forklift is fitted with an active RFID tag, such as a WhereNet tag or a Dart tag, that allows MWE to locate the forklift anywhere within the site using WhereLAN or Dart sensors installed across the site. The manager at the plant would also like to be able to locate the boxes being moved around, but it is either too expensive or impractical to attach a WhereNet tag or Dart tag to each box.

The Dynamic Fusion functionality offers a solution for this use case. Attach a low-cost tag such as a passive RFID tag to each box and install a tag scanner such as a passive RFID reader on the forklift. When the forklift gets close enough to a box or to a pallet loaded with boxes, the passive RFID reader will scan all the tags on the boxes and wirelessly send this information to the MWE system. The MWE system knows what RFID reader is sending the information and what forklift it is attached to, and therefore can assign to the boxes the location of the forklift. If the RFID reader keeps detecting a tag (indicating proximity to that tag), the MWE system will assign to that tag the same location as the forklift.

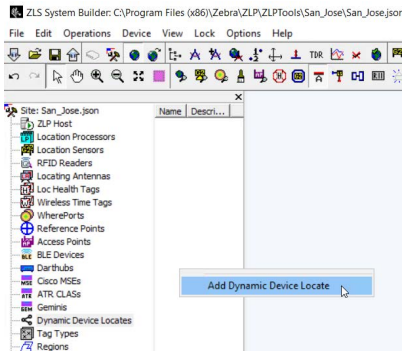
MWE must be configured properly so that Dynamic Fusion happens only with the intended forklifts and RFID readers, and not randomly with any forklifts and readers. This configuration is done in the System Builder configuration tool and is explained later in this section.

Dynamic Fusion involves the following pieces:

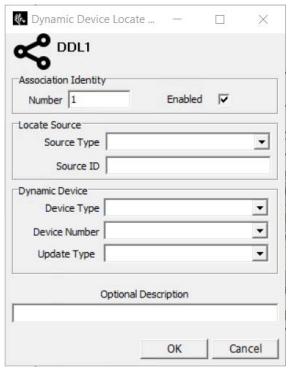
- A moving vehicle.
- A tag being tracked and located by MWE attached to the moving vehicle. This tag is called a locate source in the System Builder tool.
- A tag scanner or device mounted on the moving vehicle. This is called a dynamic device in the System Builder tool.
- Low-cost tags attached to the boxes (a tag type that can be scanned/detected by the scanner/device mounted on the vehicle).

To configure Dynamic Fusion, add dynamic devices in System Builder. To add a dynamic device in System Builder, follow the steps below:

1. Click on **Dynamic Device Locates** in the tree-view, then right-click in the middle pane and select **Add Dynamic Device Locate** from the popup menu, as shown in the following figure.

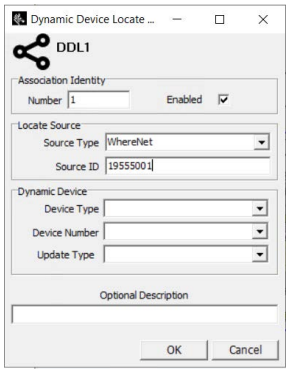


The Dynamic Device Locate properties window displays:



2. In the **Locate Source** pane, select a **Source Type.**

   This is the type of tag being attached to the moving vehicle and located by the MWE system. The options are: Dart, (passive) RFID, WhereNet, BLE. In **Source ID**, enter the ID of the tag being attached to the vehicle.

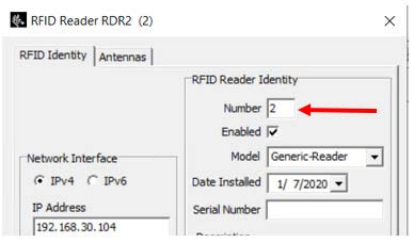


3. In the **Dynamic Device** pane, select a **Device Type**.

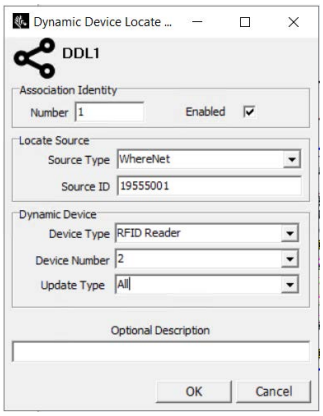
   This is the type of scanner or device mounted on the vehicle. Options are: BLE Beacon, BLE Receiver, RFID Reader. What you must select depends on the type of tags being affixed to the boxes. If the boxes are being tagged with passive RFID tags, you must select Device Type=RFID Reader. If the boxes are being tagged with BLE beacons, select Device Type = BLE Receiver. If the boxes are being tagged with BLE Receivers, select Device Type=BLE Beacon.

4. Select the Device Number.

   This is an integer number assigned by System Builder to each device added in System Builder. For example, if you have added 3 RFID readers in System Builder, they will have Device Numbers 1, 2, and 3 respectively. For any device added in System Builder, the device number is displayed near the top of its properties window, as in the example below:



   The Dynamic Device Locate properties window displays:



   The options in the **`Update Type`** field depend on the Device Type selected. If you have selected Device Type=RFID Reader, then Update Type allows you to select which particular antenna (1,2,3,4, or All) port will be used.

5. Once you have made your selections, click **`OK.`**

6. Once you have configured your Dynamic Devices, perform a **`Publish`** operation in System Builder to apply the configuration.

System Device Alerts

System alerts triggered by MWE fall into two categories:

- Device related alerts. These are alerts about the health and status of locating devices, including sensors, readers, tags, and more. The available alerts are listed in the **Configuration > System Alert Set tings** report lists all the system alerts that the MWE software can generate.
- MWE Server and Services. The status of the MWE server and MWE services can be viewed in the **Dashboard > Grafana – System Health** page. One can also define thresholds to trigger alerts.

The table below gives meaning of various fields/columns in the System Alert Settings report.

Table 12 System Alert Types

Field/ Column	Description
Alert	The name of the alert condition.
Time Updated	This is time the alert condition occurred or was resolved.
Type	This column will show System for alert conditions defined by the MWE module, and 'Application' for alert conditions defined by applications installed on top of MWE.
Category	Provides a way to filter the alert conditions based on more specific criteria. For example, the value will be Infrastructure for alerts related to Location Sensors and other infrastructure devices, Tag for alerts related to tags, Software for alerts affecting the MWE software, and so on.
Severity	High indicates a condition that will severely affect system operation and performance and needs immediate attention. Medium refers to a condition that will affect system performance and should be addressed soon. Low indicates a condition that should be corrected, but it will not affect overall system operation and performance, and does not require immediate attention.
Enabled	Yes indicates the alert is enabled, so that it will be set to Open when the system detects this condition, and an alert notification will be displayed or sent. No indicates the alert is disabled; even if the system internally detects this condition, the Status field will not be set to Open and no alert notification will be displayed or sent. Note that several alerts are installed disabled (Enabled=No). This is by design. A regular user will not be able to enable or disable a system alert. This currently can be done only by Zebra Product Support engineers.
Auto Close	Y indicates that the Status of an alert will be automatically changed by the system from Open to Close when the alert condition does not exist anymore. N indicates that the alert condition can be closed manually only.
Subject	This is the content of the subject line of email notification messages sent out when an alert condition is raised.
Message	This is a brief description of the error condition.
Action	Explains the necessary steps to correct the error condition. To see the full text of the Corrective Action, select (left-click on) a line, right-click and select View Detailed Information from the popup menu.
Recipients	List of email addresses to be notified when the alert is triggered.

To view the system alerts that are currently open, you can do one of the following:

- Open the **Dashboard** page in the web client
- Open the **Alerts > Open System Alerts** report

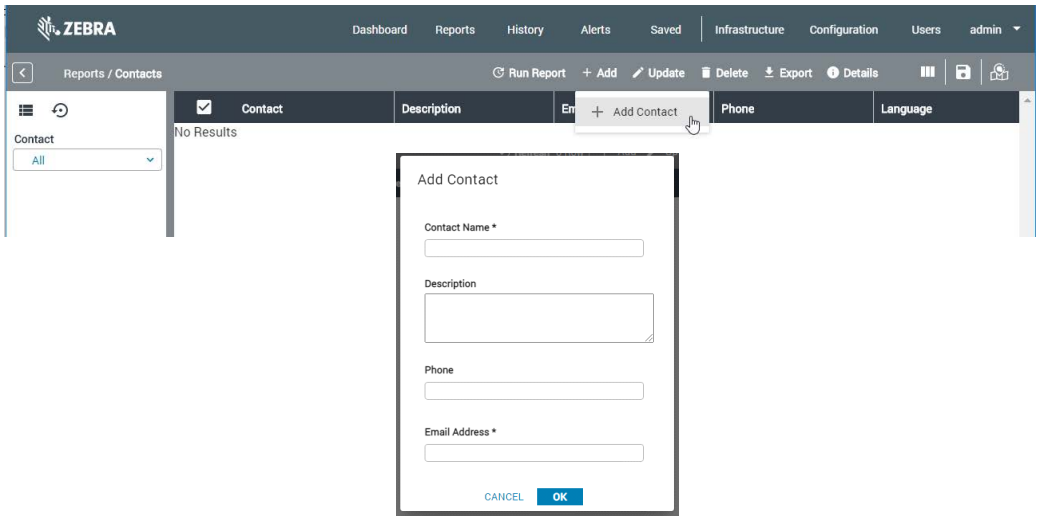
To view a history of system alerts, including when and what system alerts were open and closed, see the **History > System Alert History** report.

Contacts

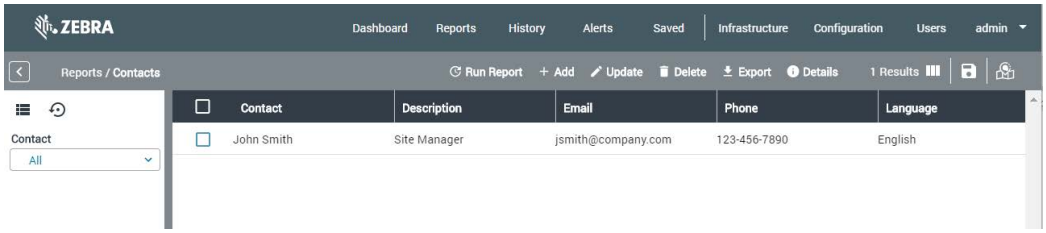
You can configure each system alert to be automatically emailed to a specified list of contacts whenever the alert is open or closed. First, enter contact information.

To add a contact:

1. Open the **Configuration > Contacts** report.
2. Click the **+ Add** tool button.
3. Select **+ Add Contact.**



4. Enter the contact information and click **OK** to save the information. Mandatory fields are indicated by an asterisk.



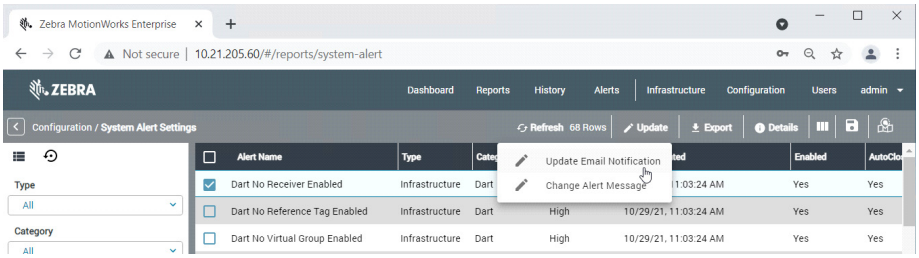
5. To modify or delete a contact, select the contact in the report and then click the **Edit** or **Delete** buttons on the report's toolbar.

Alert Notification

Each system alert can be configured to be automatically emailed to a specified list of contacts whenever the alert is open or closed.

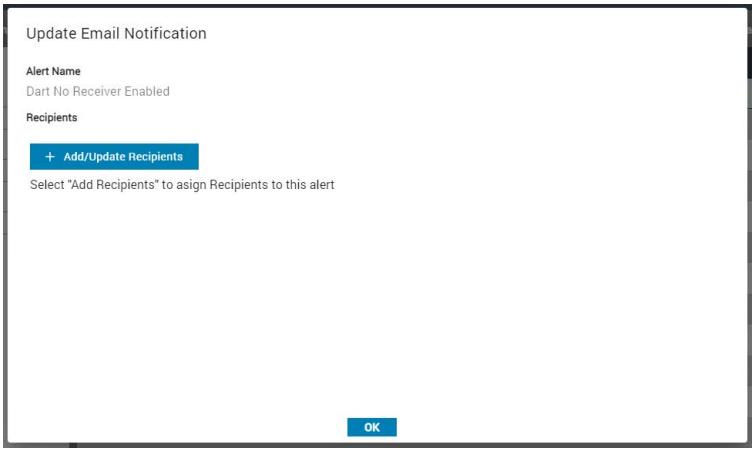
To configure alert notifications:

1. Open the **Configuration** > **System Alert Settings** report
2. Select an alert in the report (click square checkbox in first column), and then select **Update** > **Update Email Notification**

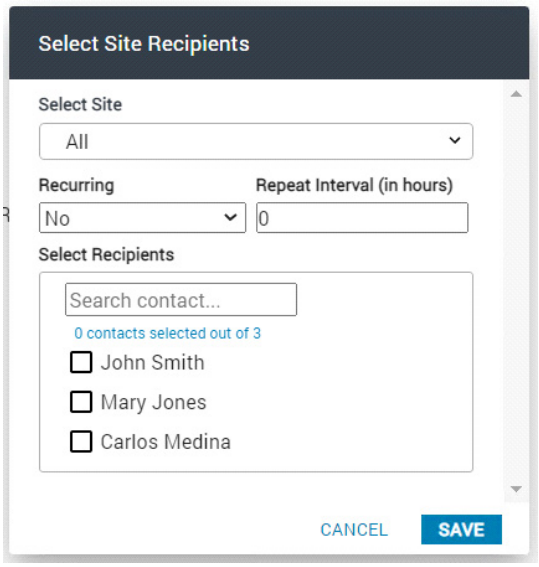


NOTE: Currently only one alert can be selected and configured at a time.

3. The Update Email Notification data entry form opens:



4. Clicking on **Add/Update Recipients** opens the Select Site Recipients window:

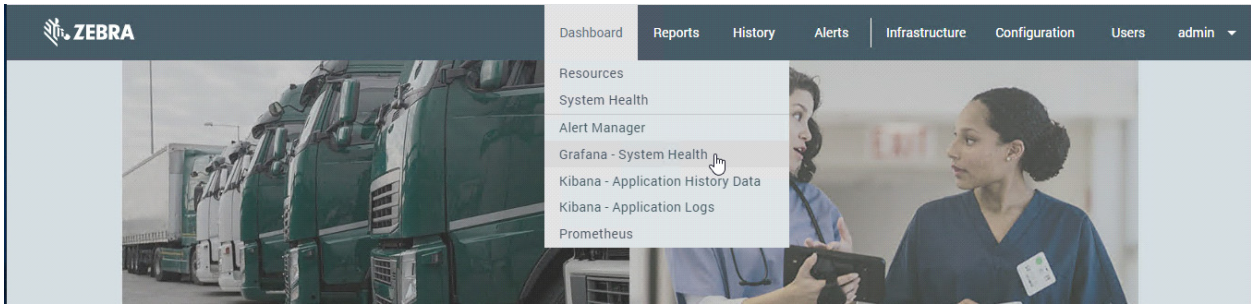


If the MWE deployment includes more than one site, select the site that the alert is being configured for. If you would like the alert to be sent periodically while the alert is open, set **`Recurring`** = Yes and specify a notification or **`Repeat Interval`** (in hours). Select the contacts that will receive email notification and click **`Save.`**

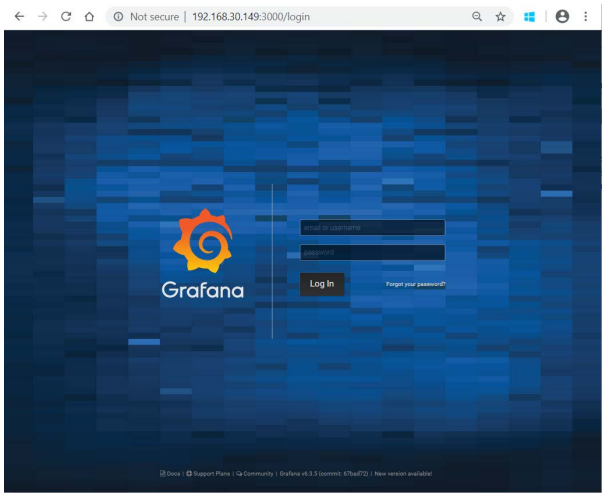
For emails to go out you need to provide information on the email server. For additional information, refer to the MWE Configuration Guide.

MWE Health

The health and status of the MWE server and services can be monitored in the **`Dashboard > Grafana - System Health`** page.

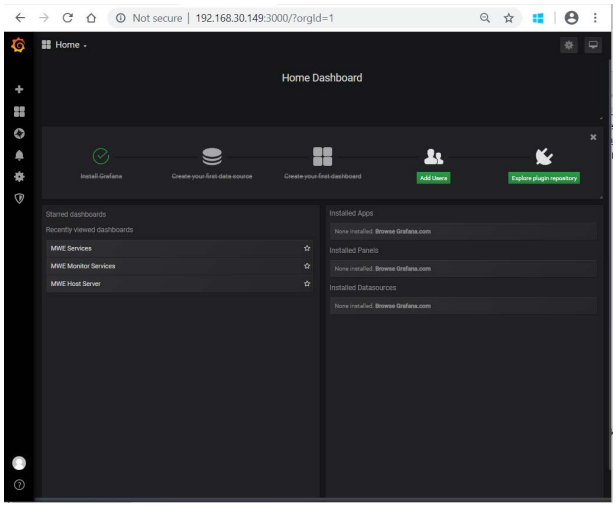


The login page is shown below.

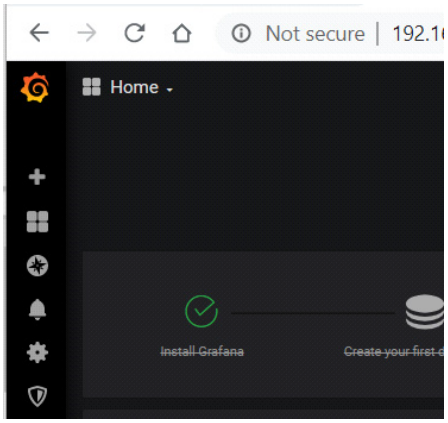


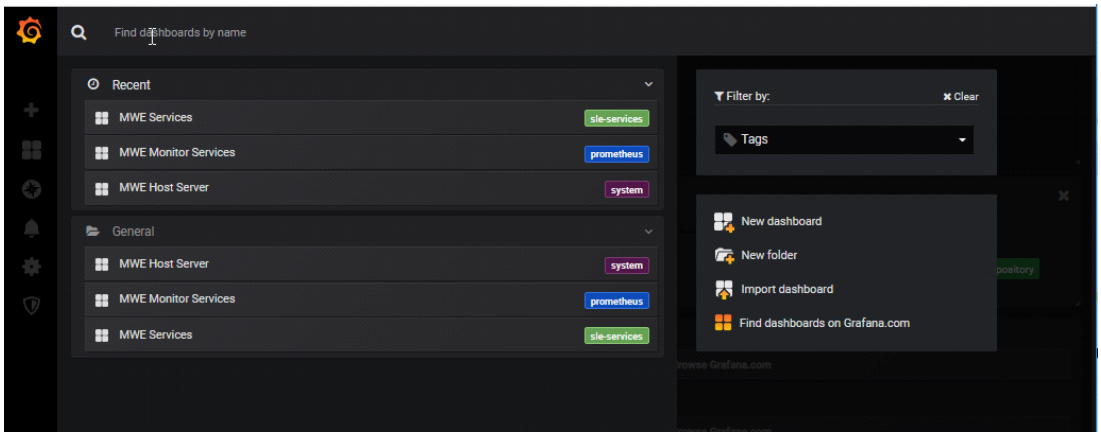
The default login is mwe-monitor / monitor!

The home dashboard page opens:



In Grafana, users can configure the dashboard. MWE includes some pre-built dashboards. To access them click on the **Home** dropdown list on the top left of the screen:



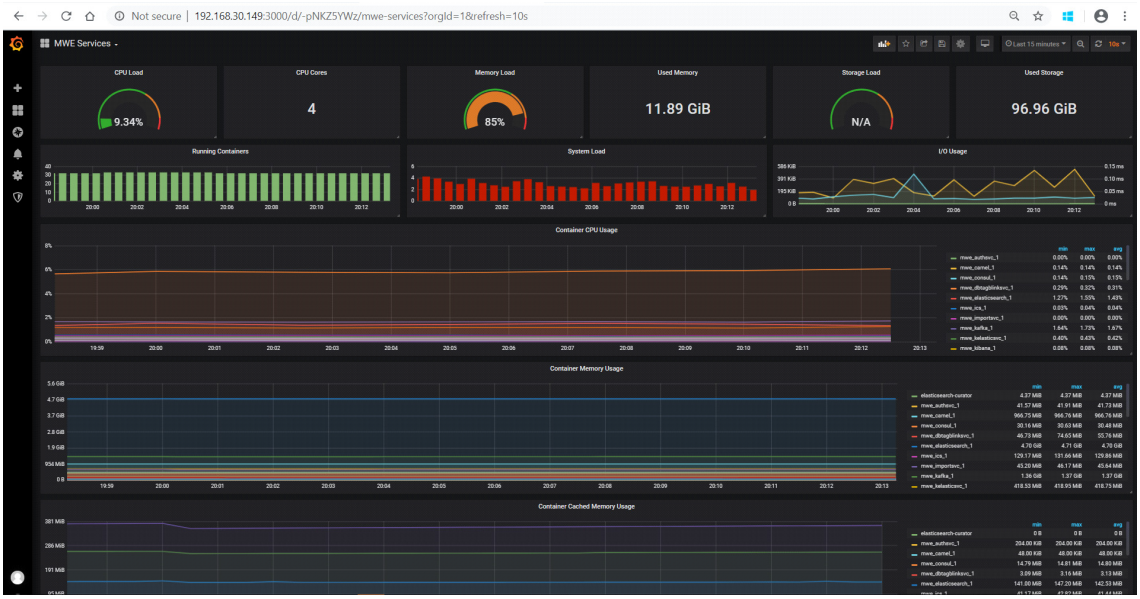


In the example above, the pre-built dashboards are:

- MWE Services
- MWE Monitor Services
- MWE Host Server

Depending on the MWE version, a different set of pre-built dashboards could display.

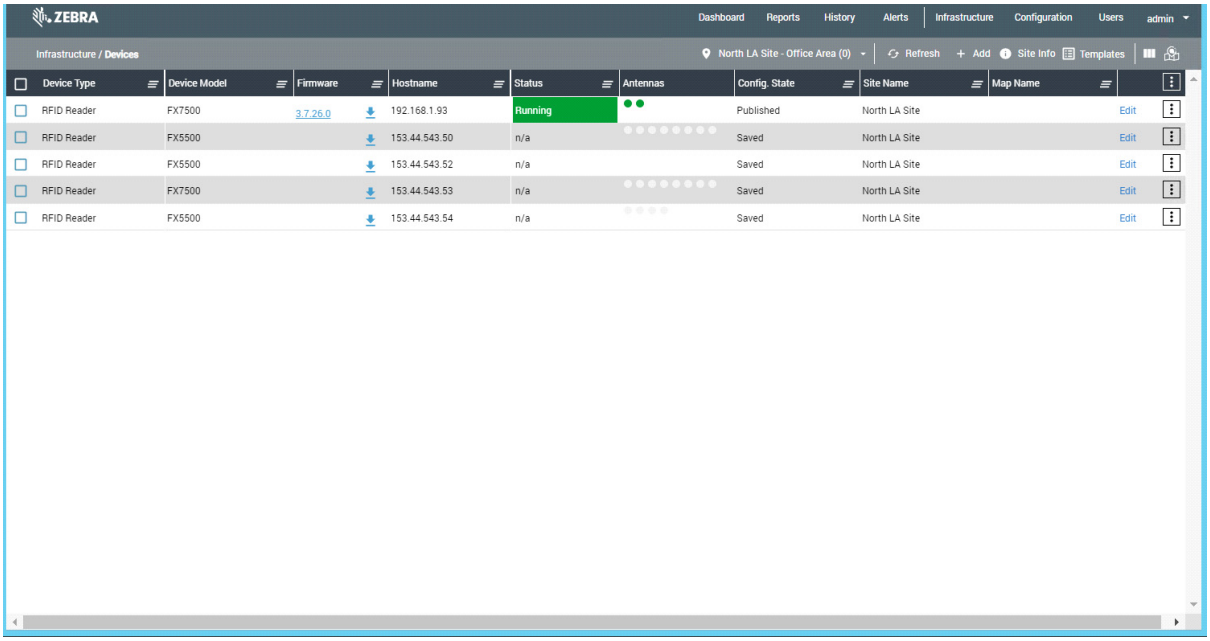
The following figure shows the MWE Services dashboard:



Device Manager

Locating devices such and sensors and readers can be added to MWE using the System Builder tool or using the Device Manager report in the MWE web client. Refer to the MWE Configuration Guide for details on adding devices via System Builder.

In Device Manager, directly add configure, and manage devices in a MWE deployment. Only passive RFID readers (FX7500, FX9600, ATR) can be added via this report in MWE 2.0. The RFID readers must have firmware version 3.9.16 or higher. Support for other device types will be added in future MWE releases.



RFID readers deployed via the **`Devices`** page send data directly to the MWE server. They do not send data to a ZLA appliance and therefore a ZLA is not required, and their operation can be configured by selecting one of 4 pre-defined operation modes. Nevertheless, you can still deploy RFID readers via the System Builder tool to send data to a ZLA using the more configurable LLRP protocol, as explained in the MWE Configuration Guide.

For more details on Device Manager, please see the MWE Device Manager User Guide.

Additional MWE documentation includes:

- MWE Installation Guide
- MWE Configuration Guide
- MWE REST API
- MWE Camel Interface
- MWE Device Manager