Description of
The System and User Guide Manual

IoTag Module Version: 1.0 build 90
App Version: 1.4 (0.1.1)
Web Service Version: 1.1

Contents Page

About the document

(a) Purpose

This document provides description of the system and user guide manual for the IoTag technology. IoTag technology comprises of purpose-built mobile application, Tridium Niagara 4 service and cloud or dedicated server-based web portal.

IoTag mobile application is a bespoke purpose-built software to monitor and control smart BEMS system installed at the user's premise/s, providing a portable, cost-effective and easy to use secure mobile access solution.

Tridium Niagara 4 service serves as an end point connection to secure web portal gateway for the mobile application to retrieve and update data.

In addition, the web portal allows an organisation to setup and manage accounts for the mobile application.

User(s) are provided with a tabular view of the infrastructure displayed as folders and points of data from IoT devices to the mobile application.

(b) User

This document is intended for end-users of IoTag mobile application. The user may be a BEMs engineer, system administrator, security personnel, maintenance engineer, etc.

(c) Requirements for mobile application

The application is available for Android 8.1 + and iOS 12 + mobile handheld devices. Some functionality may not be readily available on older mobile devices.

Reliable connection to the internet is necessary, as poor signal may cause disconnections within the application.

To be able to utilize the application's full functionalities and features, ensure permissions are granted when requested, or manually enable it through the phone's settings.

Tasks that require permission:

- Saving password (of log-in credentials).
- Using camera for scanning QR/Bar Code.
- Bluetooth beacon.
- Notifications.
- GPS.

The entry to the application requires the user to have a valid user name and password provided during registration. As system uses several layers of authentication before any access to the data is granted.

(d) Installation of mobile application

The application is available for installation in the **Google Play Store** for **Android** devices.
Link is available here: **https://play.google.com/store/apps/details?id=app.Synmatics.IoTag**

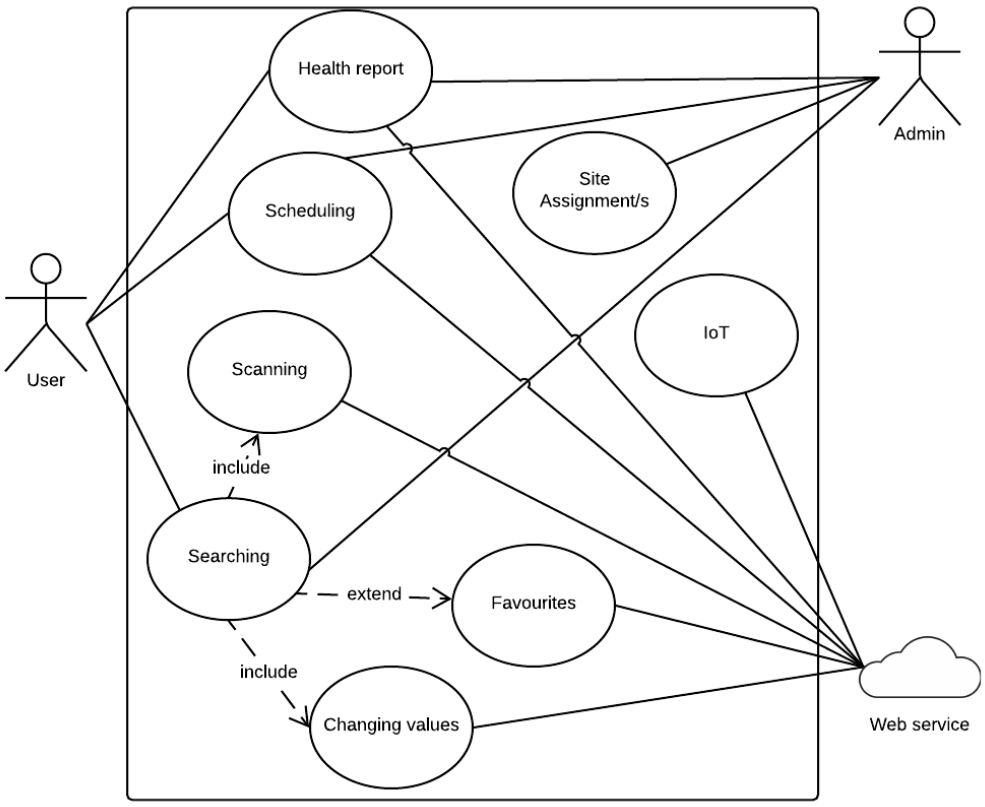
The application is available for installation in the **Apple Store** for **iOS** devices.
Link is available here: **https://itunes.apple.com/gb/app/iotag/id1436850971?mt=8**

1 System Overview

Processes required to transmit data to/from the end point (IoT device) through the web service to/from the mobile application has been explained using a series of diagrams. The diagrams explore different aspects of the system, but not necessarily in a chronological order.

1.1 Use case

At the overview level, the following use case diagram illustrates the relationship between a ***User*** (normal user), an ***Admin*** (a super user), and ***Service*** (the web service where data is requested and loaded onto the application).



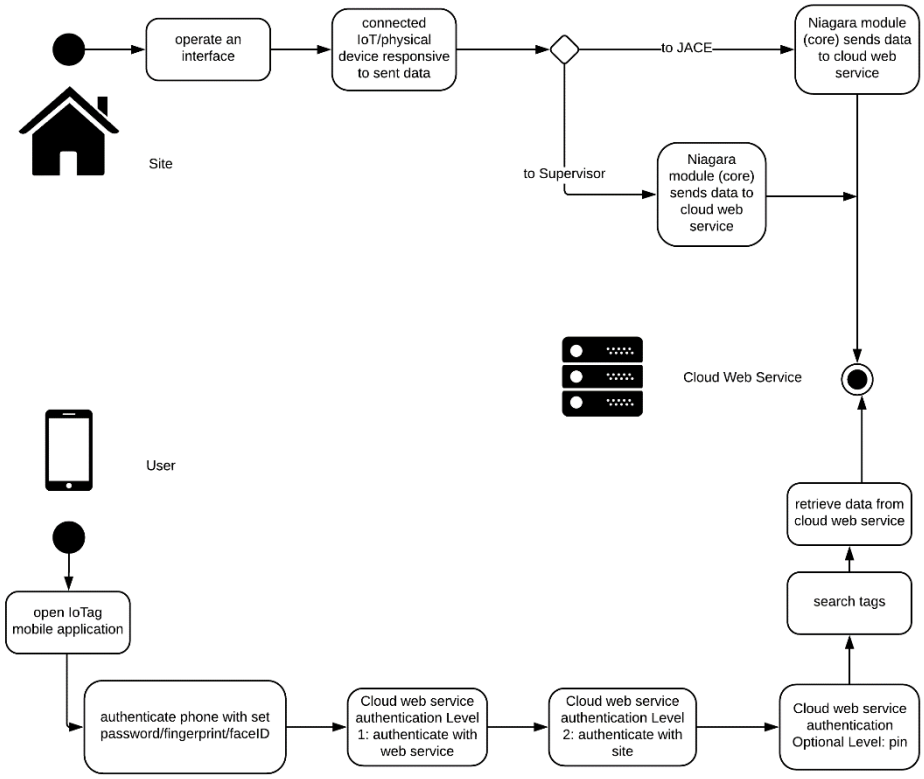
The users are able to perform several activities within the IoTag Application. Full list of functionalities will be explained in detail in the **Getting started with mobile application** section. Listed in the diagram is an exclusive list of only the critical ones.

Currently, the ***User*** is only able to use ***Health report***, ***Scheduling*** and ***Searching*** functionality within the application. The ***Admin*** has access to all functionality to assign sites and also **manage *User***.

A distinction of different users with additional restrictions can be set by administrators, if necessary.

1.2 Activity Diagram

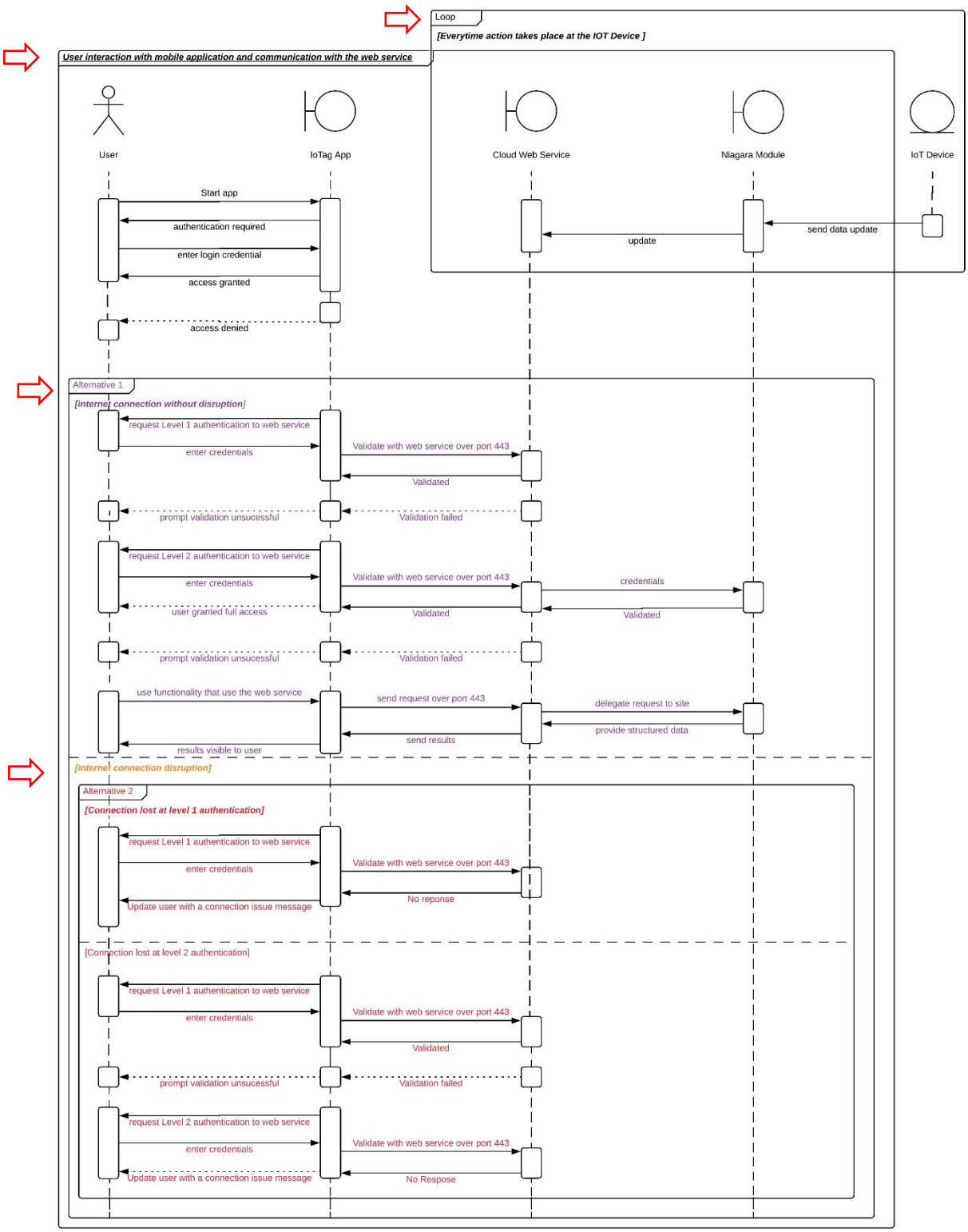
The following activity diagram illustrates the sequence of activities from a ***User*** perspective for retrieving data from the web service. On the other end point (the ***Site***) where the IoT device exists, it is also sending/refreshing data to the web service simultaneously.



Cloud web service is used as a gateway between the mobile application and the Niagara module. There exists a custom Niagara module within a JACE or a Supervisor that sends data in the correct format, which in turn sends the data to the IoTag mobile application when requested.

1.3 Sequence Diagram

Further down a level, the sequence diagram below, illustrates the relationship between, ***User***, ***IoTag*** app, ***Web Service***, ***Niagara Module*** and ***IoT Device***. The purpose of this diagram is to show several layers of authentication that takes place; security protocols that fortifies the integrity of the data.


User interaction with mobile application and communication with the web service
Loop
[Everytime action takes place at the IOT Device]
User
IoTag App
Cloud Web Service
Niagara Module
IoT Device
Start app
authentication required
enter login credential
access granted
access denied
send data update
update
Alternative 1
[internet connection without disruption]
request Level 1 authentication to web service
enter credentials
Validate with web service over port 443
Validated
prompt validation unsucessful
Validation failed
request Level 2 authentication to web service
enter credentials
Validate with web service over port 443
credentials
user granted full access
Validated
Validated
prompt validation unsucessful
Validation failed
use functionality that use the web service
send request over port 443
delegate request to site
provide structured data
send results
results visible to user
[internet connection disruption]
Alternative 2
[Connection lost at level 1 authentication]
request Level 1 authentication to web service
enter credentials
Validate with web service over port 443
No reponse
Update user with a connection issue message
[Connection lost at level 2 authentication]
request Level 1 authentication to web service
enter credentials
Validate with web service over port 443
Validated
prompt validation unsucessful
Validation failed
request Level 2 authentication to web service
enter credentials
Validate with web service over port 443
Update user with a connection issue message
No Respose

The ***Loop*** in the diagram denotes the sequence where the ***IoT Device*** in the premise is updating data to the web service. The ***User*** interactions with the ***IoTag App***, ***Web Service*** and ***Niagara Module*** shows the mobile application is not directly communicating to the ***Niagara Module***. This provides security between each layer prohibiting breach of data.

Authentication levels

- When starting the application, the user is required to authenticate on the mobile device to ensure that, the rightful owner of the phone is using the application.
- Then, the user is required to authenticate through the web service to ensure he/she has a valid licence and login credential. At which point, if the user is validated successfully, any sites linked to the user, will be populated in the application.
- If the user wants to access the site, then a further authentication to the site, would be required, with only a valid login credential granting access.

Since the application requires internet access for all the processes, if the user has a slow/bad internet connection, the ***Alternative2*** section exhibits a sequence that occurs. The user is simply notified of the issue and requested data is not displayed/populated.

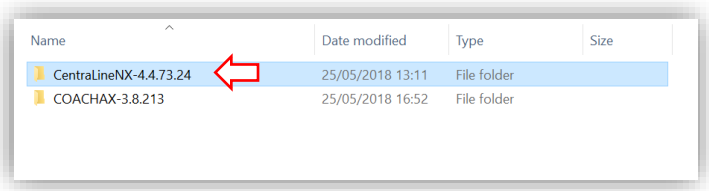
2 IoTag service in Tridium CentraLine Niagara 4+

It is essential for the IoTag service to be installed and configured within the **Supervisor** or **Jace** to communicate with the **Cloud web service**. The ***IoTag-rt.jar*** is a custom module designed and developed by Synergy Automatics Ltd which communicates to the web service. This will be provided to the client.

2.1 Adding the module

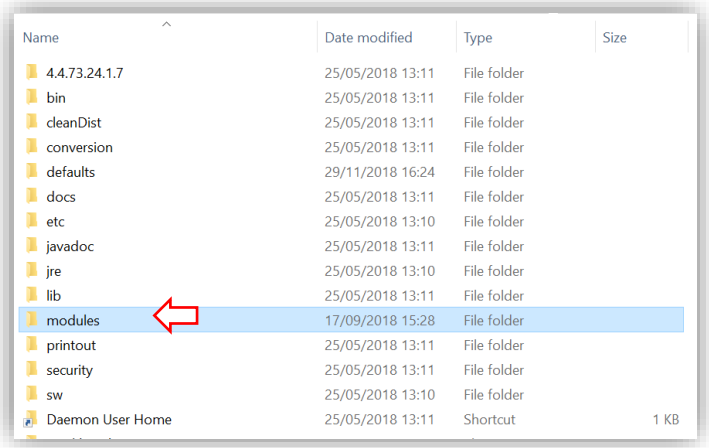
2.1.1 Into the Supervisor

Go to the root folder of CentraLine Niagara 4.



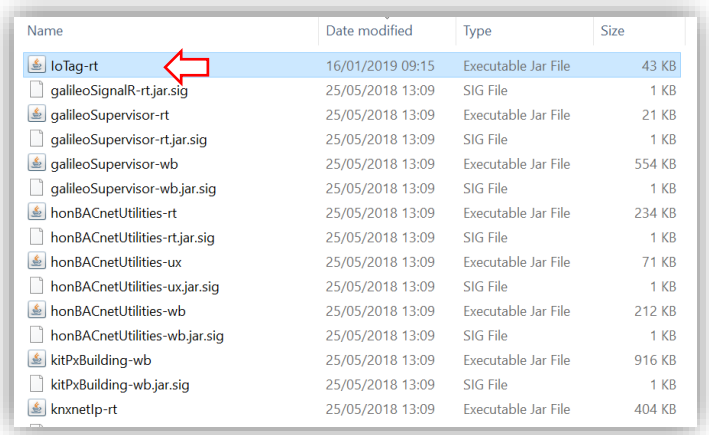
Name	Date modified	Type	Size
CentraLineNX-4.4.73.24	25/05/2018 13:11	File folder	
COACHAX-3.8.213	25/05/2018 16:52	File folder	

Find the ***modules*** folder.



Name	Date modified	Type	Size
4.4.73.24.1.7	25/05/2018 13:11	File folder	
bin	25/05/2018 13:11	File folder	
cleanDist	25/05/2018 13:11	File folder	
conversion	25/05/2018 13:11	File folder	
defaults	29/11/2018 16:24	File folder	
docs	25/05/2018 13:11	File folder	
etc	25/05/2018 13:10	File folder	
javadoc	25/05/2018 13:11	File folder	
jre	25/05/2018 13:10	File folder	
lib	25/05/2018 13:11	File folder	
modules	17/09/2018 15:28	File folder	
printout	25/05/2018 13:11	File folder	
security	25/05/2018 13:11	File folder	
sw	25/05/2018 13:10	File folder	
Daemon User Home	25/05/2018 13:11	Shortcut	1 KB

Add the ***IoTag-rt.jar*** in the folder.

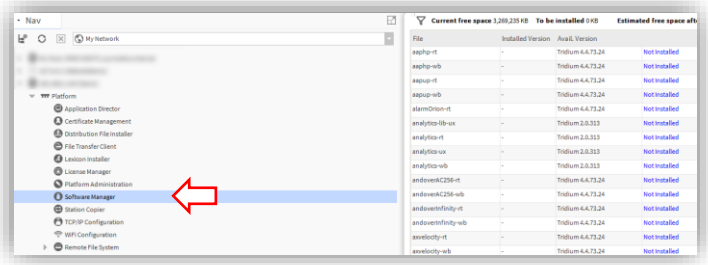


Name	Date modified	Type	Size
IoTag-rt	16/01/2019 09:15	Executable Jar File	43 KB
galileoSignalR-rt.jar.sig	25/05/2018 13:09	SIG File	1 KB
galileoSupervisor-rt	25/05/2018 13:09	Executable Jar File	21 KB
galileoSupervisor-rt.jar.sig	25/05/2018 13:09	SIG File	1 KB
galileoSupervisor-wb	25/05/2018 13:09	Executable Jar File	554 KB
galileoSupervisor-wb.jar.sig	25/05/2018 13:09	SIG File	1 KB
honBACnetUtilities-rt	25/05/2018 13:09	Executable Jar File	234 KB
honBACnetUtilities-rt.jar.sig	25/05/2018 13:09	SIG File	1 KB
honBACnetUtilities-ux	25/05/2018 13:09	Executable Jar File	71 KB
honBACnetUtilities-ux.jar.sig	25/05/2018 13:09	SIG File	1 KB
honBACnetUtilities-wb	25/05/2018 13:09	Executable Jar File	212 KB
honBACnetUtilities-wb.jar.sig	25/05/2018 13:09	SIG File	1 KB
kitPxBuilding-wb	25/05/2018 13:09	Executable Jar File	916 KB
kitPxBuilding-wb.jar.sig	25/05/2018 13:09	SIG File	1 KB
knxnetIp-rt	25/05/2018 13:09	Executable Jar File	404 KB

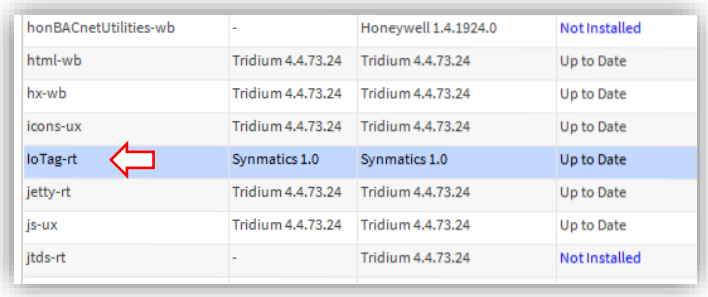
2.1.2 Into the Jace

Follow the steps above to add ***IoTag-rt.jar*** in the module folder.

Login to the Jace. Go to ***Platform***. Open ***Software Manager***.



Find ***IoTag-rt*** from the list.



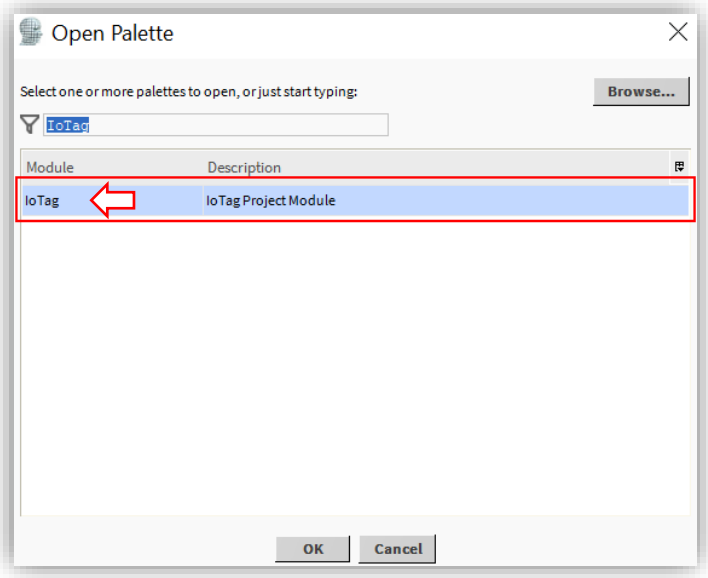
honBACnetUtilities-wb	-	Honeywell 1.4.1924.0	Not Installed
html-wb	Tridium 4.4.73.24	Tridium 4.4.73.24	Up to Date
hx-wb	Tridium 4.4.73.24	Tridium 4.4.73.24	Up to Date
icons-ux	Tridium 4.4.73.24	Tridium 4.4.73.24	Up to Date
IoTag-rt	Synmatics 1.0	Synmatics 1.0	Up to Date
jetty-rt	Tridium 4.4.73.24	Tridium 4.4.73.24	Up to Date
js-ux	Tridium 4.4.73.24	Tridium 4.4.73.24	Up to Date
jtds-rt	-	Tridium 4.4.73.24	Not Installed

Install and ***Commit*** to deploy the module into the Jace.

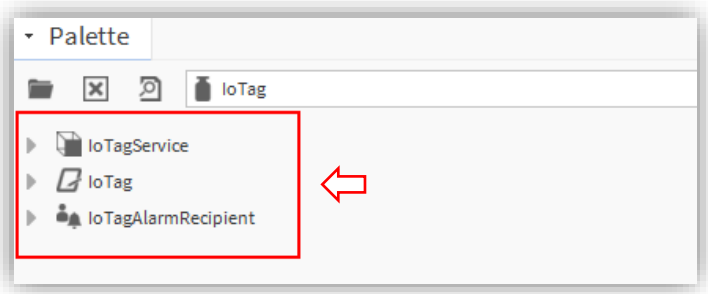
It then becomes necessary to configure correctly within Tridium Niagara 4. ***IoTagService*** needs to be activated with an activation code that will be provided by Synergy Automatics Ltd, otherwise the web service will not be functional. Once validated, the ***IoTag*** extension can be used.

2.2 Adding the IoTag Service in Tridium Niagara

Login to your station in Niagara.
Open Palette and search for ***IoTag***.

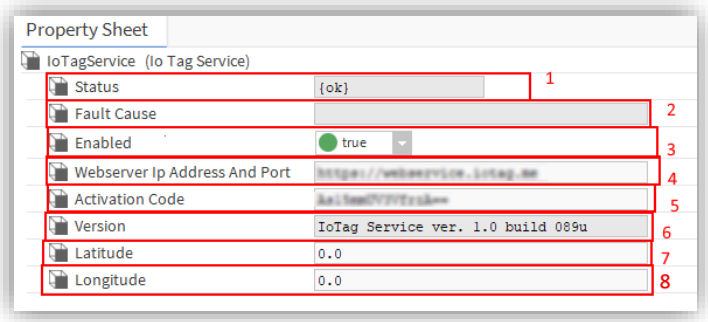


There should be a module available. Click ***OK***. If the module is not present, you may have placed the ***IoTag-rt*** file in the wrong folder, or restart to your **Niagara Framework Migration** is needed.
In the ***Palette***, the following items should be present.



IoTagService, ***IoTag***, and ***IoTagAlarmRecipient***.

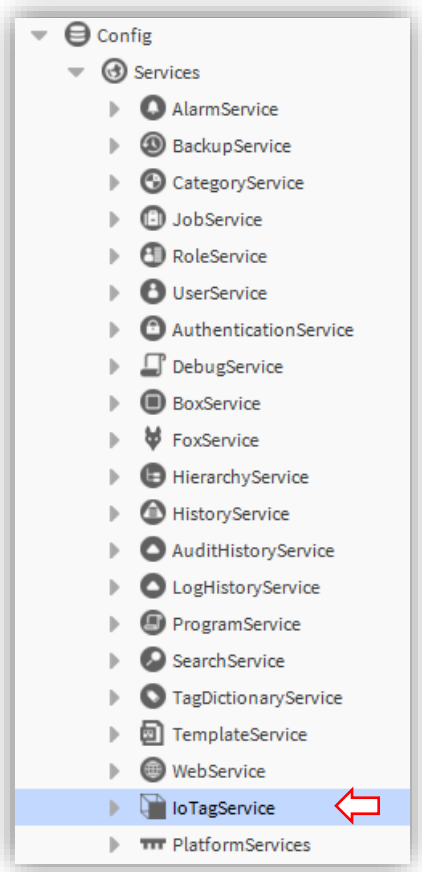
2.2.1 IoTag Service



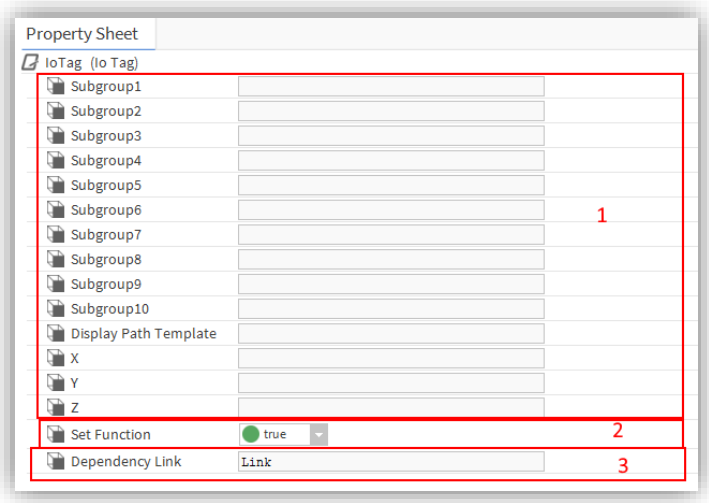
Explanation of annotations:

1. Functional or not, possible status ***{ok}*** for working, and ***{fault}*** for not working.
2. If status is in ***fault***, the cause is stated.
3. A **toggle switch** set to ***true*** by default, but can be set to ***false*** to stop the service without deleting from the station.
4. The address of the web service.
5. Activating code for the software to run.
6. Version of the module to distinguish between other builds.
7. Provided to use latitude coordinate of the site's location.
8. Provided to use longitude coordinate of the site's location.

The ***IoTag Service*** should be added to the ***Services*** in your station.



2.2.2 IoTag extension

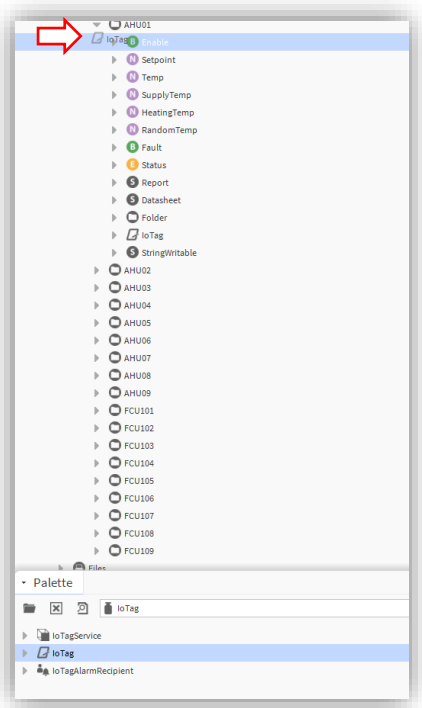


Explanation of annotations:

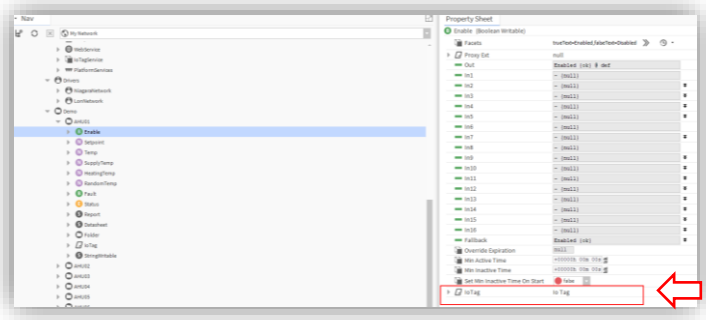
1. There are 10 ***Subgroup*** available for user to set indexing values to identify a point. The ***Display Path Template*** denotes the point's path display value. **Annotation 2** from this section shows how it is applied. When using the IoTag mobile application, users may search for this value set in ***Subgroup***, and the relevant point will be displayed as result.
2. The ***Set Function*** can be set to ***true*** or ***false***, which provisions the point **Set/Override** functionality when using the IoTag mobile application.
3. The ***Dependency Link*** allow points to be linked to each other for easy toggling during application use. **Associate point** from this section shows how it is applied.

To add ***IoTag*** extension to the station, follow the steps.

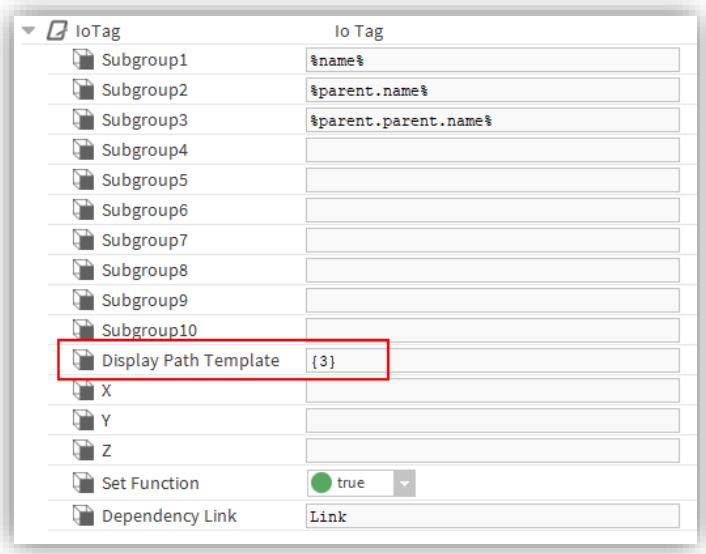
Drag and drop ***IoTag*** extension from the ***Palette*** to a point.



If successfully added, then the ***IoTag*** extension should be present in the point.

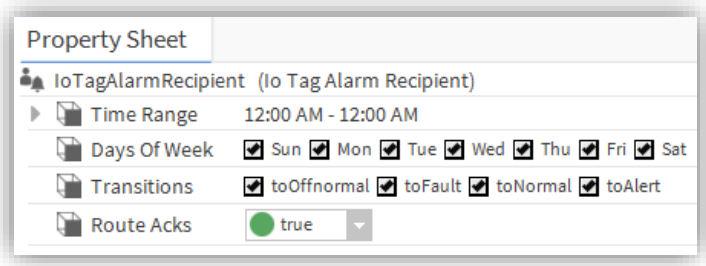


Expansion of this extension shows how a general ***IoTag*** extension exists in a point.



For this case, ***Subgroup1***, ***Subgroup2*** and ***Subgroup3*** has been filled with Niagara 4's naming convention. The ***Display Path Template*** has a value of ***{3}***, which denotes ***Subgroup3***. But the **subgroups** and ***Display Path Template*** can simply be populated with text values as well. **Subgroups X, Y, Z** are used with Bluetooth beacon functionality in premise location. The **subgroups, X, Y, Z** and ***Display Path Temple*** can also be left empty, if user doesn't need to use it.

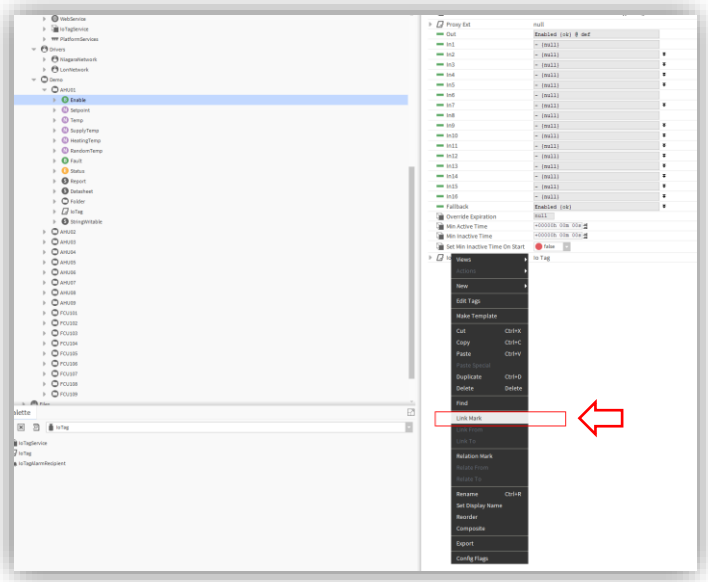
2.2.3 IoTagAlarmRecipient



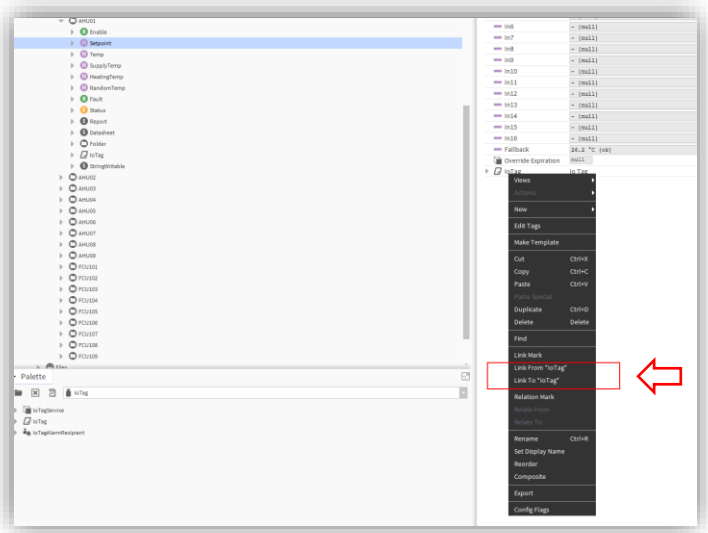
The ***IoTagAlarmRecipient*** can be used as station recipient in **Niagara Alarm Service**. This extension receives alarm for the point and can be configured to go to a recipient. The ***alarm-ConsoleRecipient*** is a built-in feature of Niagara 4, which ***IoTagAlarmRecipient*** derives from.

2.3 Linking a point

Go to a point.
Right click on the ***IoTag*** extension property.
Click ***Link From***.



Go to another point you want this point to be linked with.
Go into the ***IoTag*** property and right click on it.
Click ***Link To*** which appears below ***Link Mark*** for the point.

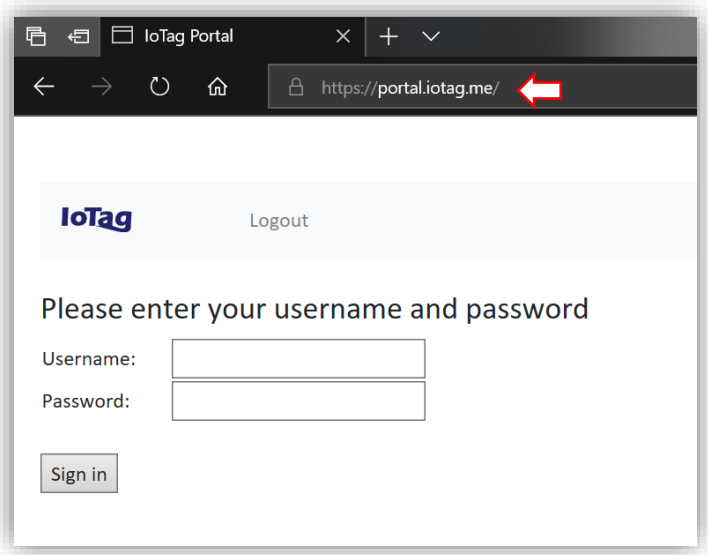


Click ***Link From "IoTag"***.
Now the two points will be linked. So, in the IoTag mobile application, the points will have associated point displayed together which will allow user in the mobile application to navigate from one to the other directly.

3 Web Portal

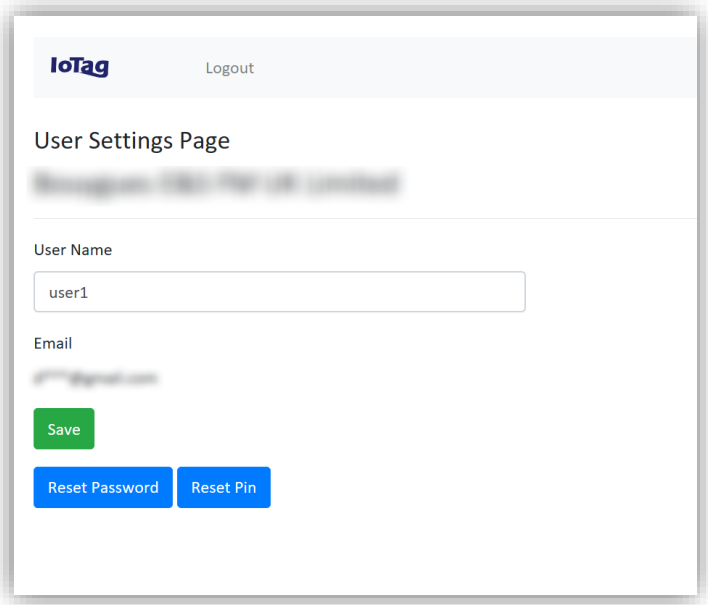
The web portal allows user to manage their IoTag mobile application accounts. User with privileges can add accounts and even modify other user accounts. A restricted user may not have all the privileges, and are only able to modify their own account.

Go to https://portal.iotag.me/ to access the web portal.

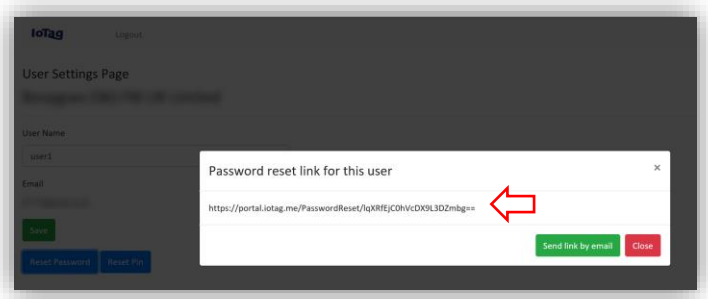


3.1 Login as Restricted user

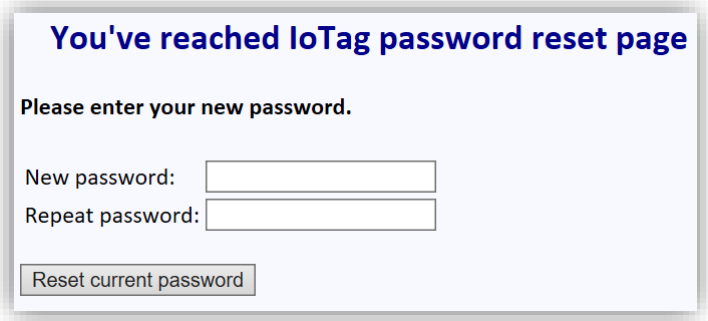
Once logged in, user is displayed with the following screen.



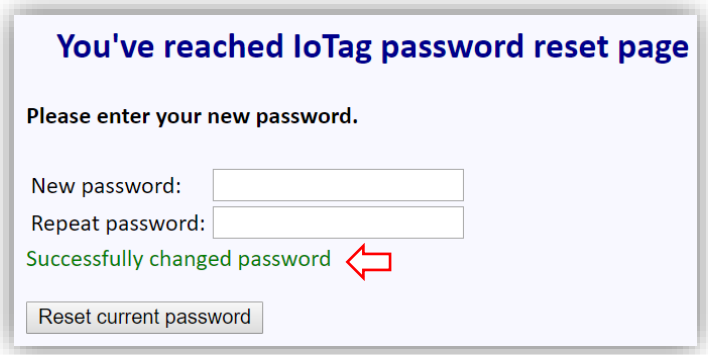
User is provided with some information on the site and their registered email.
User is given the option to change their name, reset password and pin.
If a user clicks on reset password, a link will be created which can be accessed manually. Or if the user chooses, the link can be sent to their registered email.



Opening the link displays the following web page.

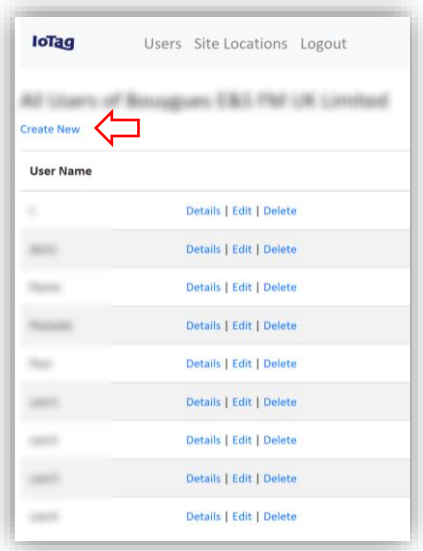


When a user has successfully entered a valid password, only then a message will be displayed above the ***Reset current password*** button.



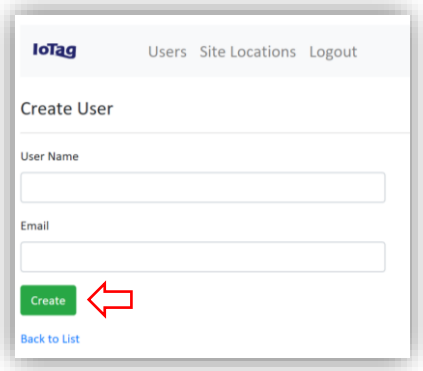
3.2 Login as Admin user

Once logged in with admin privileges, the following screen will be displayed.



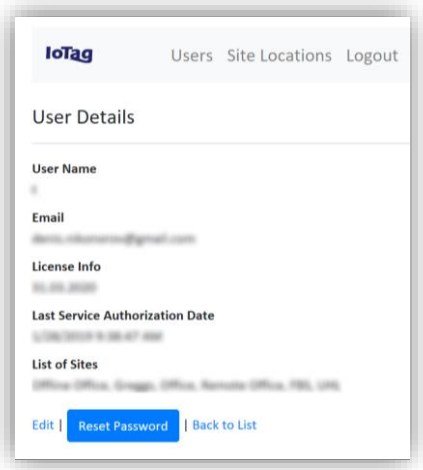
3.2.1 Create new user

Admin user are given the authority to create new user. Clicking the ***Create New*** button opens the following web page, where the admin can simply enter user name and email to create a new user.

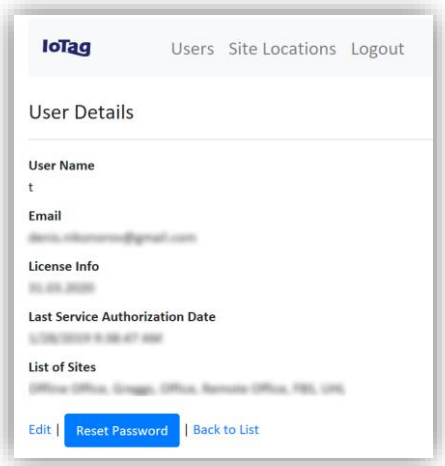


3.2.2 User details

An admin can look into details of all users by clicking on the ***Details*** button.

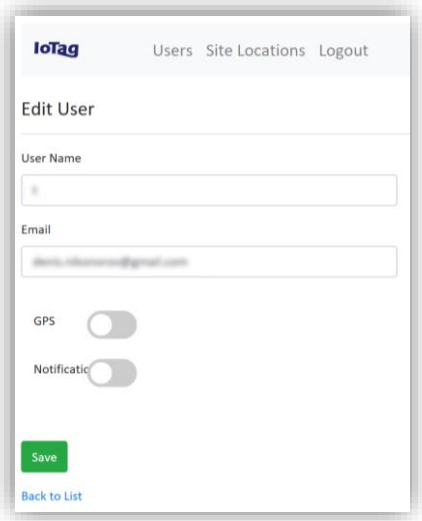


Name, email, licence info, last service authorization date, and list of all sites are displayed in this page. Additional buttons are presented below which allows the admin to edit their information and even reset password.



3.2.3 Edit

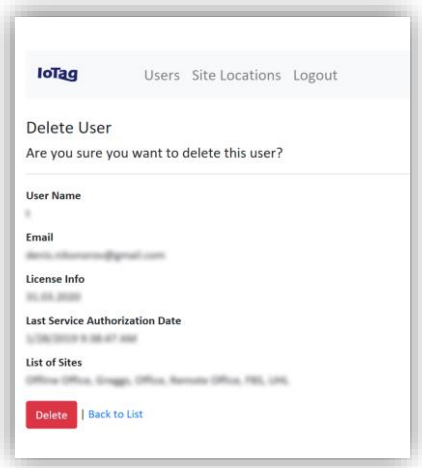
Admin have the option to change additional information on other users by clicking the ***Edit*** button. A new web page appears with the following details.



User's name and email can be changed. GPS and Notification can also be enabled for the user so it can be used in the mobile application.

3.2.4 Delete

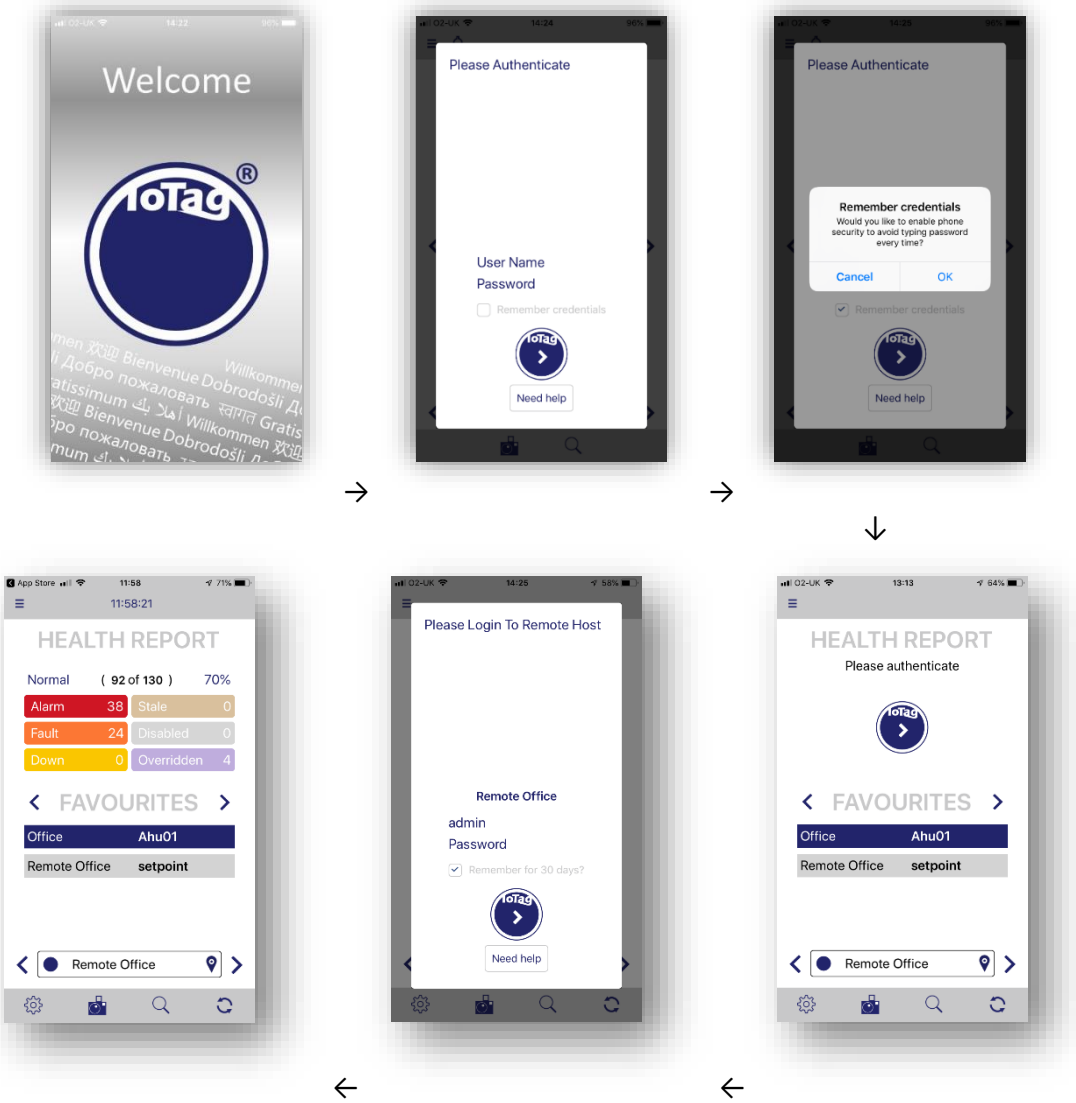
Admin can also delete users. By clicking on the ***Delete*** button, the following web page is displayed.



Here, admin is given the option to further check the detail of the user, at which point, the admin may choose to delete the user's account.

4 Getting started with mobile application

Start application.



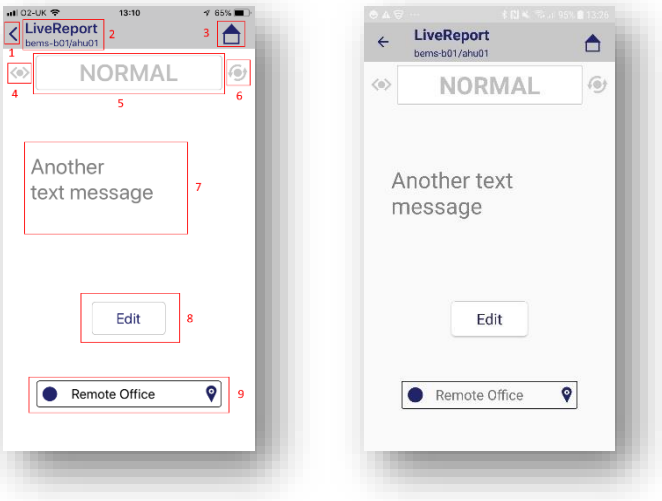
This is the point where you can use the application with full access.

4.1 Application point views

The IoTag application point views allows user to view and adjust points within the site. There are four different types of point views which provide different user-friendly interface for changing the point.

The convention to follow for the diagram below: if there are two screen prints of mobile application side by side which looks the same: consider the left-hand side to be a screen print from iOS device, and the screen print on the right-hand side to be from an Android device.

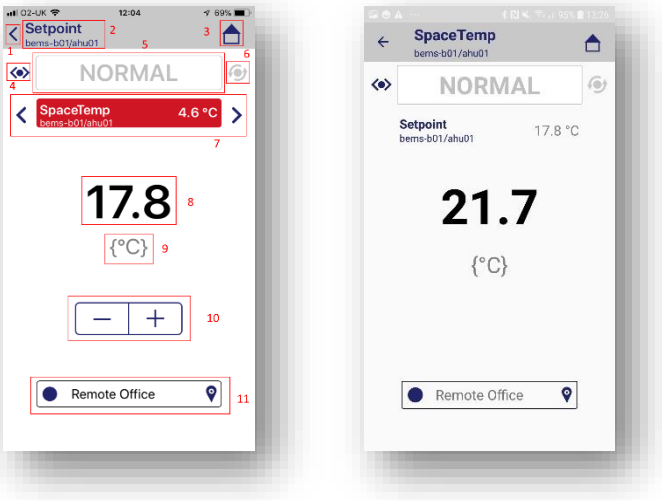
4.1.1 Point View: String (text)



String point view on the left with annotations in iOS device, and a string point view on the right in Android device.
Explanation of annotation:

1. Go back to Previous Screen.
2. The upper large text denotes the name of the point. The lower smaller text denotes the path to the point.
3. A shortcut to home (health) page.
4. Enable/disable switch to show other linked points if available.
5. Current point status.
6. Reset override status to normal.
7. The content of the point.
8. Edit button will be displayed ***if allowed***, it will become Save button when point is edited.
9. Shows the site of the current point.

4.1.2 Point View: Numeric (number)

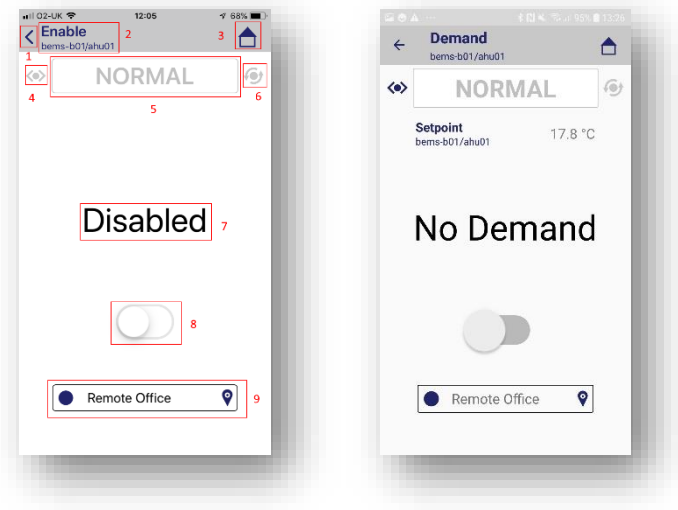


The numeric page has a separate content in the centre; numeric values. The page consists of controls below the content which allows user to change the values.
Explanation of annotation:

1. Go back to Previous Screen.

2. The upper large text denotes the name of the point. The lower smaller text denotes the path to the point.
3. A shortcut to home page.
4. Enable/disable switch to show other linked points if available.
5. Current point status.
6. Reset override status to normal.
7. Associated point.
8. The content of the point.
9. Unit (facet) associated with it which will be displayed in muted colour. Unit is optional for the value, so it may or may not appear on view pages.
10. -/+ button will be displayed ***if allowed.*** It allows for adjusting the value which may have some upper or lower boundary. (Case where -/+ button is ***not allowed*** for the android version, displayed on the right side).
11. Shows the site of the current point.

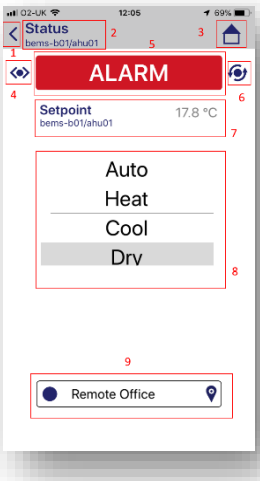
4.1.3 Point View: Boolean (on/off switch)

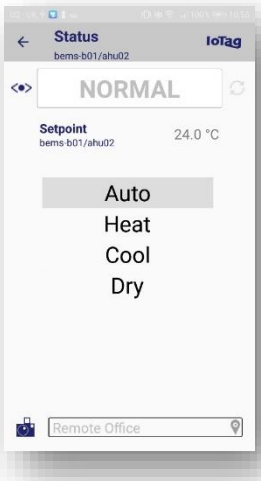


The Boolean page also has a separate content in the centre; a Boolean value. The page consists of controls below the content which allows user to toggle between the true/false state.
If in the case, the point is inaccessible, the control for toggling the value will not be visible to the user.
Explanation of annotation:

1 Go back to Previous Screen.
2 The upper large text denotes the name of the point. The lower smaller text denotes the path to the point.
3 A shortcut to home page.
4 Enable/disable switch to show other linked points if available.
5 Current point status.
6 Reset override status to normal.
7 The content of the point.
8 Toggle button will be displayed ***if allowed.*** It allows for setting the value between true or false.
9 Shows the site of the current point.

4.1.4 Point View: Enumerable (set of statuses, words, etc.)



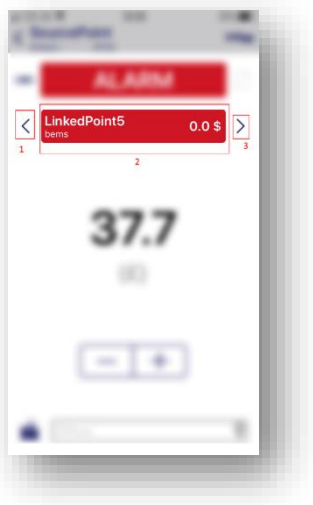


The Enumeration page also has a separate content in the centre; a list of possible values for the point. The page doesn't have any controls. Setting the value of the point can be done by tapping a single item from the list.

Explanation of annotation:

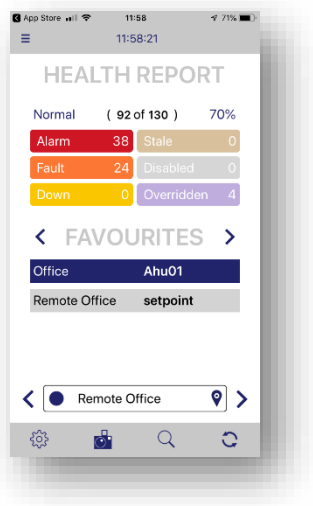
1. Go back to Previous Screen.
2. The upper large text denotes the name of the point. The lower smaller text denotes the path to the point.
3. A shortcut to home page.
4. Enable/disable switch to show other linked points if available.
5. Current point status.
6. Reset override status to normal.
7. Associated point.
8. The content of the point.
9. Shows the site of the current point. The grey colour indicating user is unable to change the site on this view.

4.1.5 Associated point



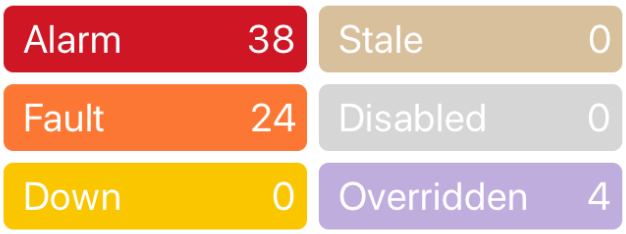
Associated points are displayed below the status UI in an application point view (if the point has not associated points, nothing will be displayed). The feature allows the user to go to the shown associated point's view upon tapping on it. These associated points are manually linked by an admin from the Niagara software.

4.2 Health Report Page



4.2.1 States

The application point views can have one of the six states for a point displayed in a page at any time based on priorities, as points can also have multiple states.

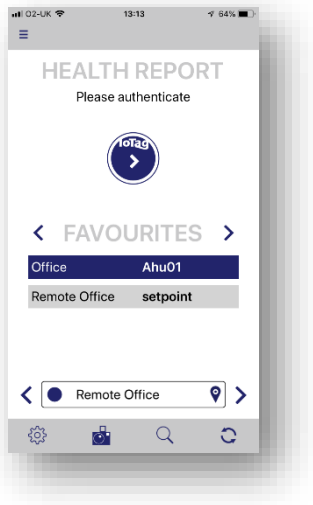


The health report page is the main page that appear after successfully logging in to the web service which is populated with data.

There is also an empty offline version of the page that appears if user is not authenticated to the web service, where the user is required to authenticated before the page is populated.

Time stamp: If time stamp is present next menu icon that indicates the last time of data update.

4.2.2 Unpopulated health report page



The middle section of the page consists of two entities: schedules and favourites. Only one entity can be present in a page at a time, and they can be changed by tapping on the greater than/ less than buttons on the left and right side of the title.

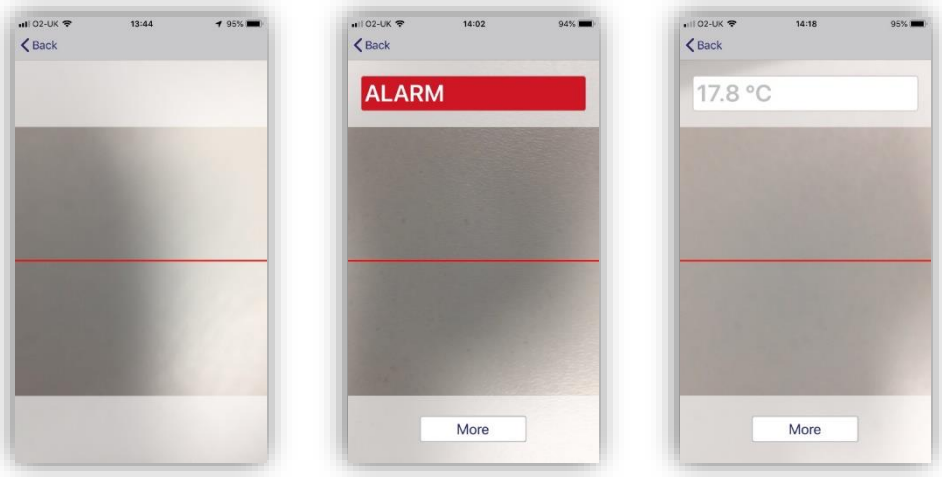
If ***Schedules*** is selected, list of all schedules is displayed. The user has the option to tap into a detailed version of the item.

If ***Favourites*** is selected, list of all favourited searches are displayed. The user has the option to directly go to the search page with the search when tapping on the item.

At the bottom section of the page, user is given the option to change site, if multiple sites are registered to the user. When changing a site, the health report page also refreshes to the new site to values in the page.

At the very bottom of the health report page, in the bottom navigation bar, there exists four entities: settings icon, camera icon, search icon and refresh icon.

4.3 Scanning Page



Tapping the camera icon prompts user to the scanning page, where users can scan a single QR/Bar code.

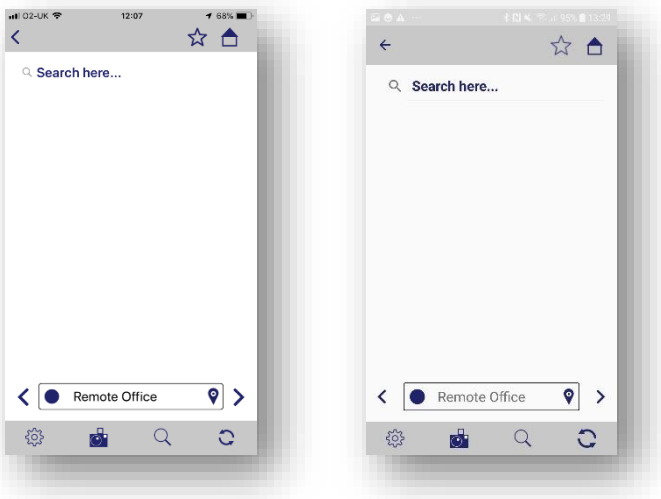
Users are required to give permission to use the camera.
User interface for this page can be divided into three section; top, bottom and middle. The top and bottom section has an empty white semi-transparent background by default. The middle section uses the camera view and scans for any form of QR/Bar code.

If a QR/Bar code is registered by the camera, a search occurs in the background of the application and displays some results.

If the search finds a single point, the value of the point and the state is displayed at the top section of the page, while a button appears on the bottom section of the page for user to go into the detail page.

If the search finds multiple points, it is assumed to be a folder, where only the state of the folder is displayed at the top section. A button appears on the bottom section of the page allowing user to go to the search page with the result.

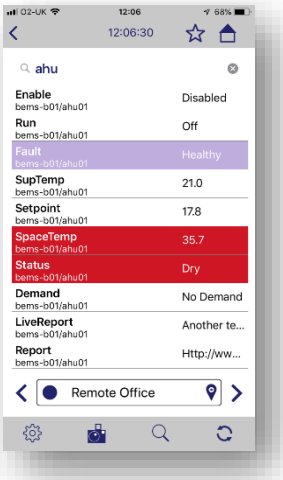
4.4 Search Page

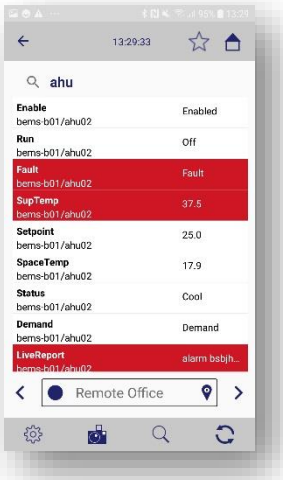


After tapping the search icon, user is prompted to the search page. At the top navigation bar, there is a back button, star icon and home icon.

The star icon allows users to favourite a search, which then appears in the favourites list in the health report page. The home button sends user to the health report page.

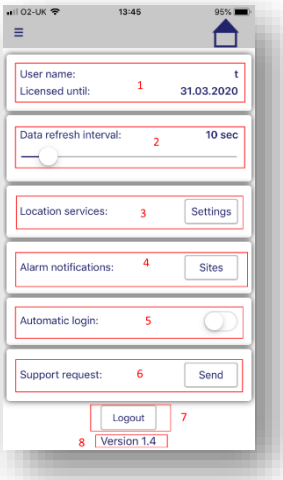
Below the navigation bar, a search option is present for users to search for tags within the site. If searching a tag doesn't find any result, nothing is displayed, or else, the section below will be populated with results.

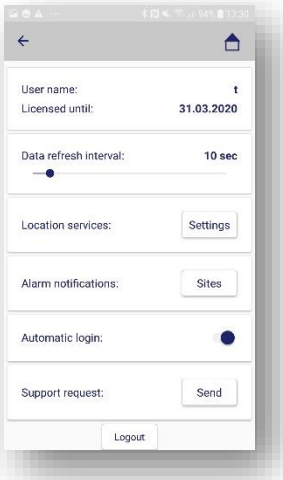




Tapping on an item in the result will send user to their respective detail page.

4.5 Settings Page





Pressing the settings icon in the health report page, provides the user a list of options. One of the options is ***Settings***. Tapping ***Settings*** sends the user to the settings page. There are seven sections in the page.

Explanation of annotation:

1. Displays user name, and license information.
2. A slider to set the data refresh interval within the application.
3. A button that opens the settings of the phone to make necessary changes.
4. Tap of the button open a pop up where user can set or disable alarm notification for available sites to be received on the phone.
5. Automatic login feature, with the toggle button user can enable/disable automatic login.
6. User can send an email for support to the development team by tapping on the ***Send*** button.
7. ***logout*** button, that logs off the user from the application.
8. Version name of the application.