Hand Hygiene Electronic Monitoring System

Gateway/Repeater Installation and Service Guide

Version 1.1

1/29/2013

GOJO Industries, Inc.

Warning (In according to FCC part 15.19):

This device complies with Part 15 of the FCC Rules.
Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Caution (Pertaining to FCC part 15.21):

Modifications to this equipment not expressly approved by GOJO Industries, Inc. could void the user's authority to operate the equipment.

This unit is certified to FCC Part 15 Part C for intentional unlicensed radiators. FCC ID O76-X1DL0915A

Glossary of Terms

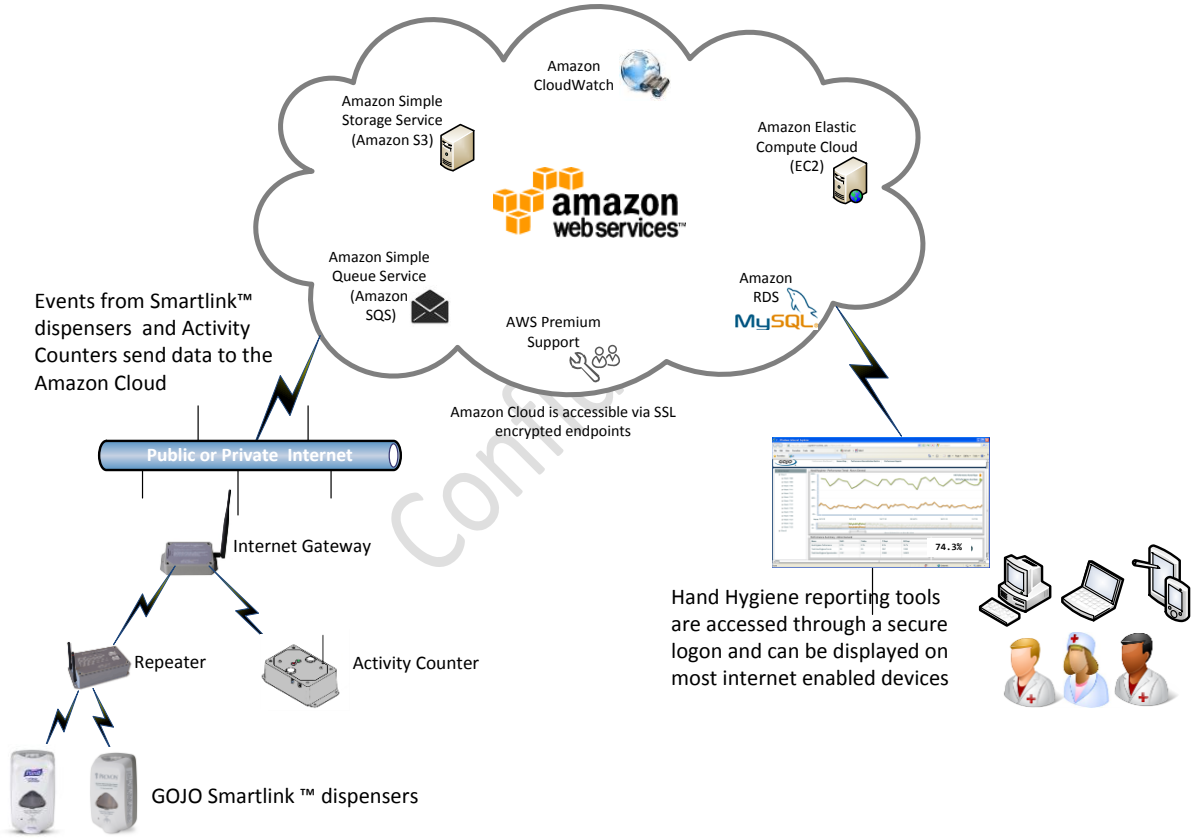
System	The GOJO compliance monitoring hardware and web-based software used to record hand hygiene events and opportunities by using dispensers, activity counters, repeaters and gateways.
Sensor	The module in a dispenser or activity counter, which records and transmits usage data.
Repeater	Used to extend the distance of the Radio Frequency signal between sensors and gateway devices.
Gateway	Used to transmit hand compliance events and opportunities to the web-based software.
Activity Counter	Infra-Red sensing device that records room entrances and exits of hospital staff, patients, and/or visitors. Mounted above a doorway in a patient room or monitored area.
Dashboard	The web-software that is used to display data collected by the system in meaningful graphs, tables and charts.
Average Compliance	A calculation that includes the average number of observed opportunities (room entrances and exits) for a unit. Generally provided by the hospital Infection Control or Nurse Manager as a result of direct observation. The average opportunities are used as the denominator in the compliance calculation.
Actual Compliance	Calculated by dividing actual dispenser events and actual activity counter opportunities.
SmartLink™ Module	The module that resides in a GOJO dispenser that transmits data to the system.
Improvement Index	A visual representation of progress made toward hand hygiene improvement. This view does not display the actual compliance rates, but instead uses a predetermined baseline and goal to show compliance. The baseline is generated by collecting 2 weeks of usage data before an intervention is executed.

Device Overview

The GOJO **Gateway and Repeater** are two components of the Activity Monitoring System. The network of Gateways and Repeaters collect data wirelessly from sensors, and pass this information to the cloud server through the internet. The sensors can be SmartLink™ enabled dispensers or Activity Counters.

Gateways and Repeaters both receive data directly from sensors. The Gateway requires a wired connection to a network with internet access. The Repeaters do not connect directly to a network, and are instead used to extend the wireless range of the system. Repeaters receive data from the sensors, and in turn pass along the data to other Repeaters or to a Gateway.

System Architecture



Technical Specifications

Hardware

Network Repeater

- Auto configuring star-mesh network topology
- Line powered wireless devices (120VAC)
- 915 MHz 2-way proprietary communications*
- 910 MHz receiver for sensor data*
- Continuously receiving incoming communications
- Supports up to 40 Dispenser and/or People Counter devices
- Transmission Range: 300 ft. open air / 150 ft. indoor

Network Gateway

- Auto configuring star-mesh network topology
- 10/100 Mbps Ethernet interface
- RJ45 (standard) Ethernet cable connection
- Connected via port 50101 (outbound traffic only)
- Uses DHCP for IP address assignment
- Line powered wireless devices (120VAC)
- 915 MHz 2-way proprietary communications*
- 910 MHz receiver for sensor data*
- Continuously receiving incoming communications
- Supports up to 6 Repeater plus 40 Dispenser and/or People Counter devices
- Transmission Range: 300 ft. open air / 150 ft. indoor
- 256 bit data packet size (small)

*This unit is certified to FCC Part 15 Part C for intentional unlicensed radiators. FCC ID O76-X1DL0915A

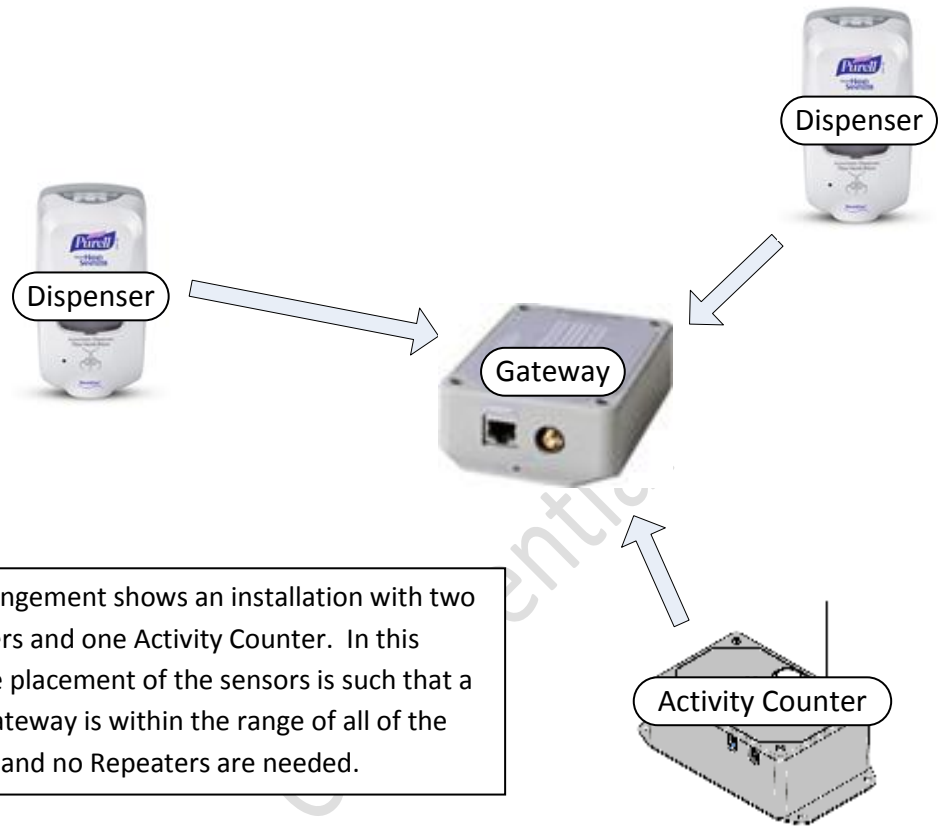
Installation

Selecting a Location

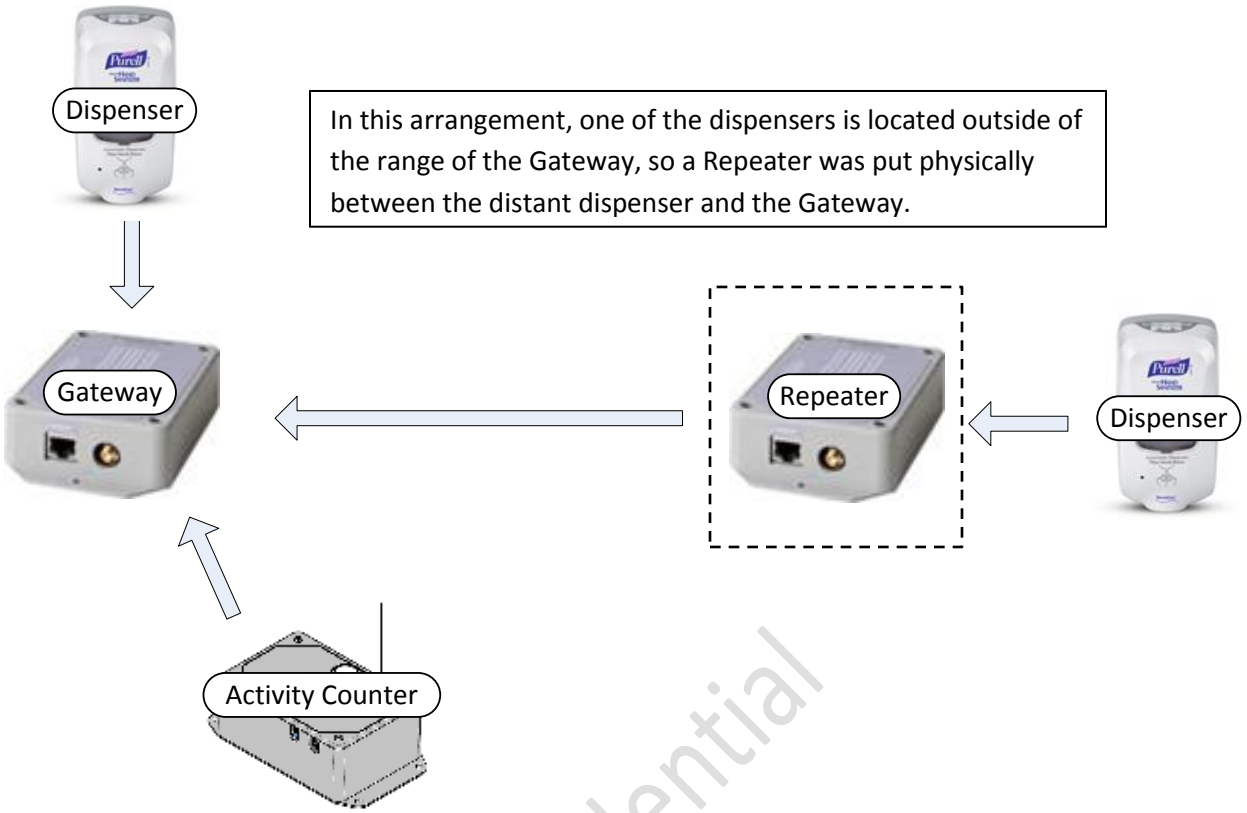
The placement of the Gateways and Repeaters is critical to ensure a reliable system. After the locations of all of the sensors (dispensers and Activity Counters) in a facility have been determined, the process of selecting where to position the Gateways and any needed Repeaters can begin. The intent of the location selection process is to create a zone of coverage that will fully encompass all of the sensors. There is a lot of flexibility in where the Gateways and Repeaters can be placed, within the following guidelines:

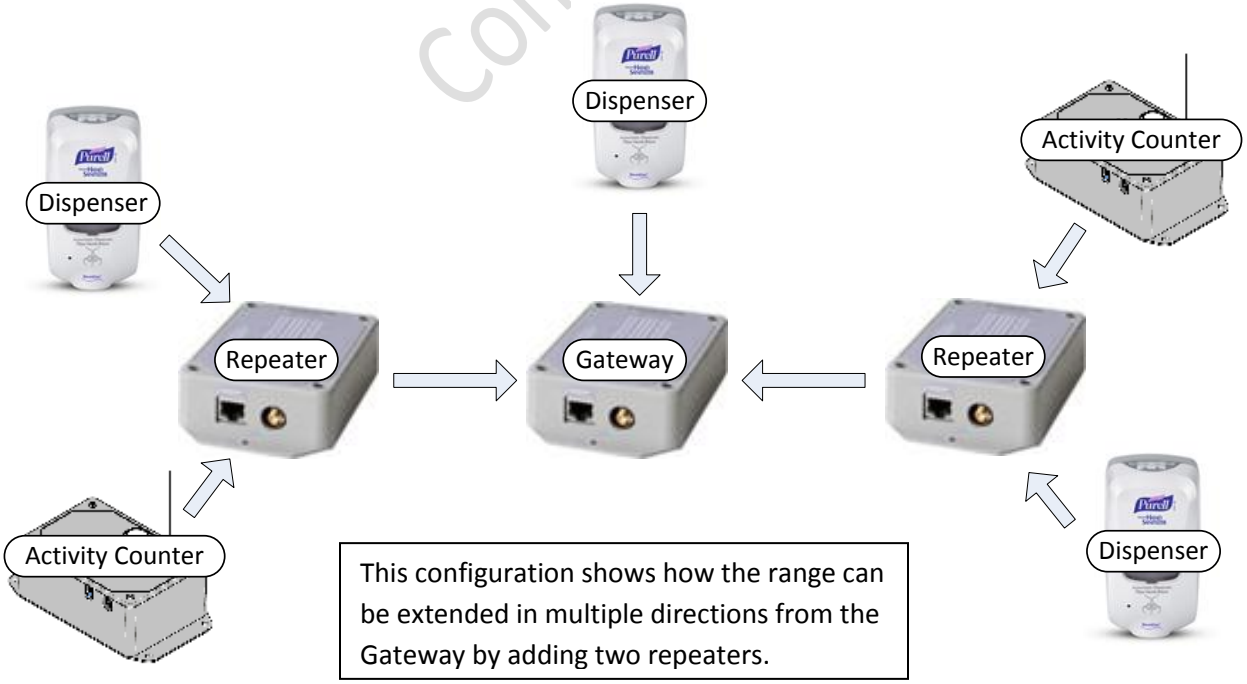
- Every sensor must be within range of either a Gateway or Repeater. Sensors have a typical operating range of about 80', so the initial layout should locate a Gateway or Repeater no further than 80' from every sensor.
- The system requires at a minimum one Gateway. The Gateway is hard-wired to a facility's network, and so access to an available network port and maximum cable run lengths need to be considered when locating a Gateway.
- Repeaters are added as needed to "extend the reach" of a Gateway's ability to receive wireless sensor data. Repeaters are optional and only needed when a Gateway is located outside the range of one or more sensors.
- Repeaters propagate sensor data to a Gateway. Multiple Repeaters can be used depending on the distances involved. Repeaters have a typical operating range of about 150', so the initial layout should locate Repeaters no further than 150' from the Gateway or from another Repeater that is associated with that Gateway.
- A maximum of six Repeaters may be used to extend the range of a particular Gateway. If the physical spacing of sensors is such that the entire area cannot be covered by a Gateway and six Repeaters, then additional Gateways are required, each of which may have up to six Repeaters.
- Repeaters and Gateways are not intended to communicate across multiple floors in a facility. Each floor should have its own Gateway.
- Gateways and Repeaters are AC powered devices, and so must be located close to a non-switched AC receptacle.
- Certain building features such as elevator shafts, stairwells, fire doors, HVAC ductwork, etc., can affect the operating range. Additional devices may be required in facilities around these areas.

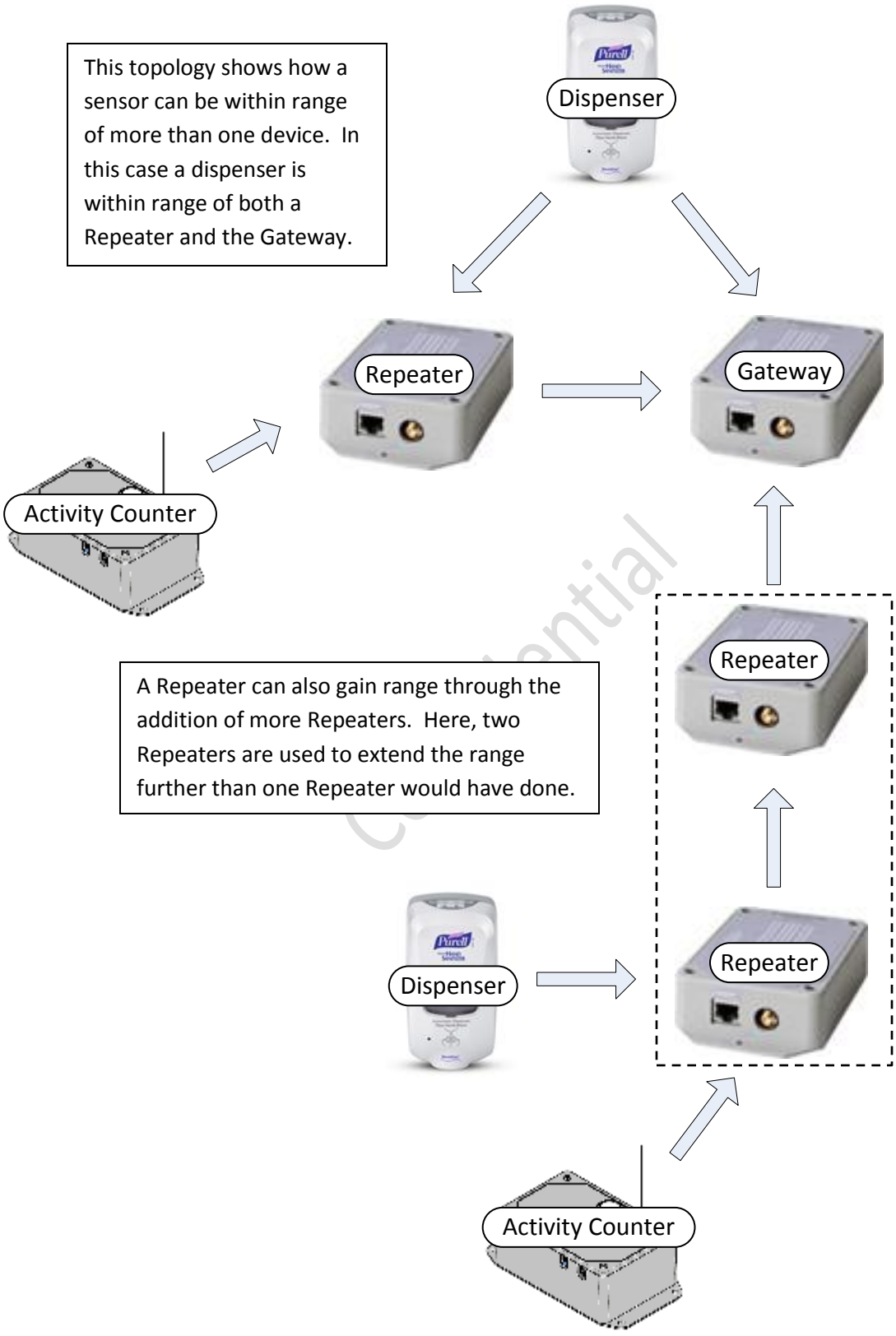
The network of Gateway and Repeater(s) is self-configuring, and will maximize the placement of the devices. The layout of the devices can be implemented in a variety of ways to provide the desired coverage. Here are some examples of how the system will configure itself to capture the sensor data:

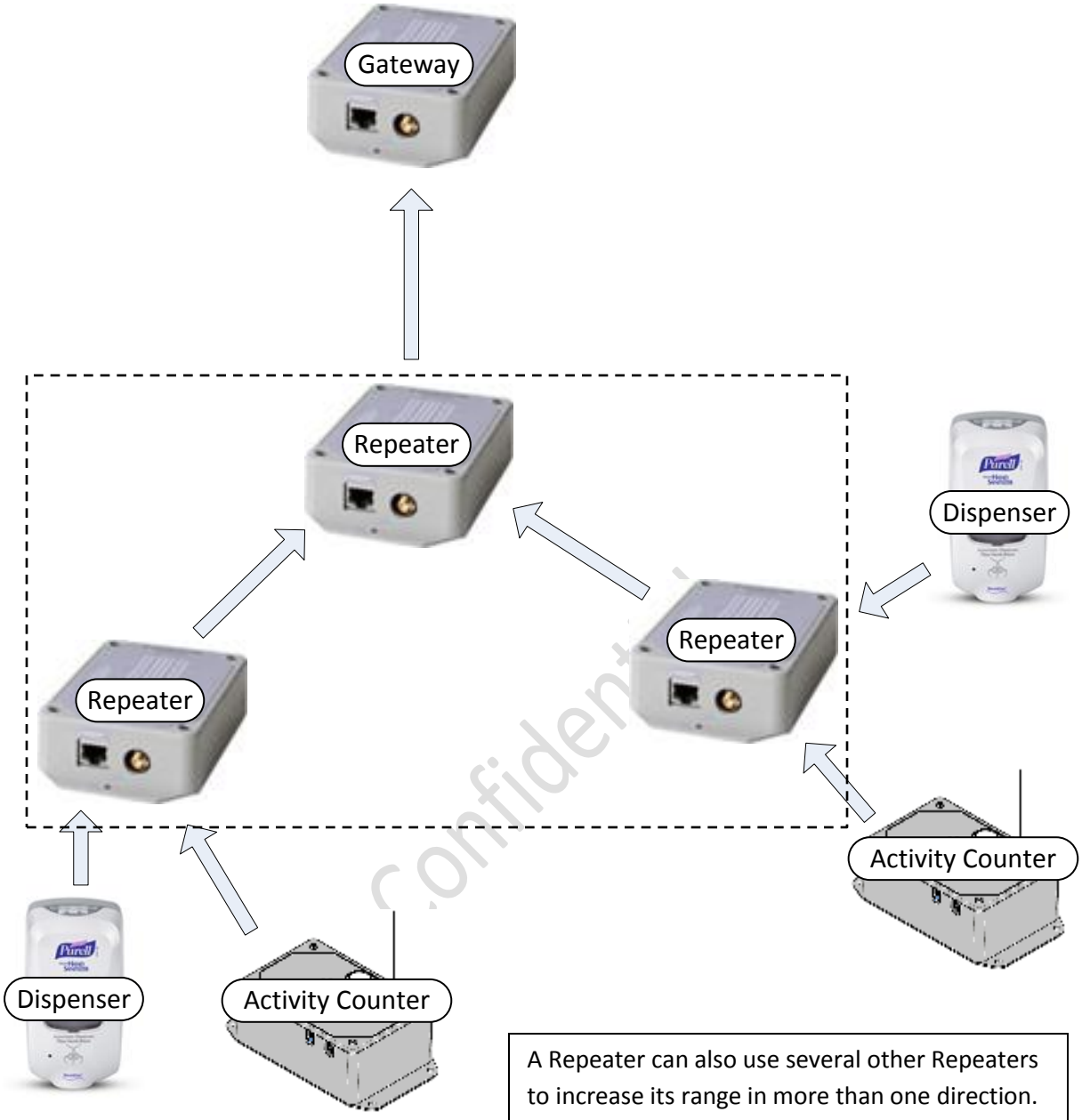


This arrangement shows an installation with two dispensers and one Activity Counter. In this case, the placement of the sensors is such that a single Gateway is within the range of all of the sensors, and no Repeaters are needed.







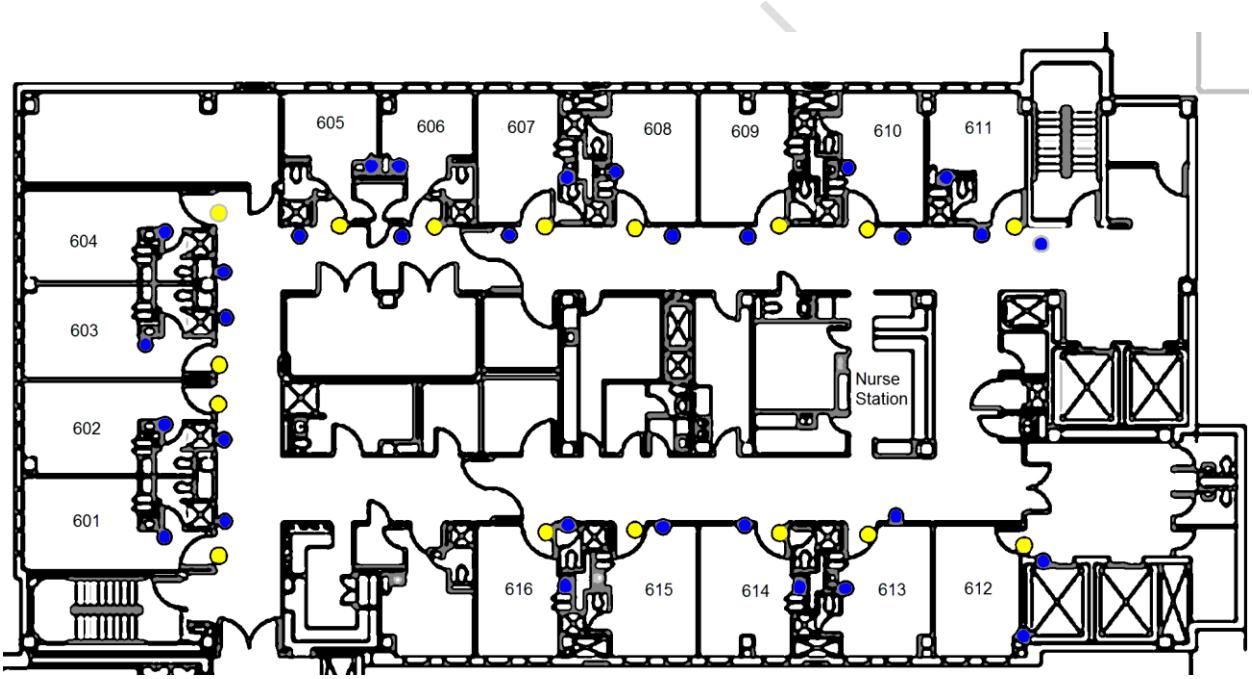


A Repeater can also use several other Repeaters to increase its range in more than one direction. Here, a Repeater close to the Gateway is using two additional repeaters to read sensors spread out in multiple directions.

Selecting the Locations

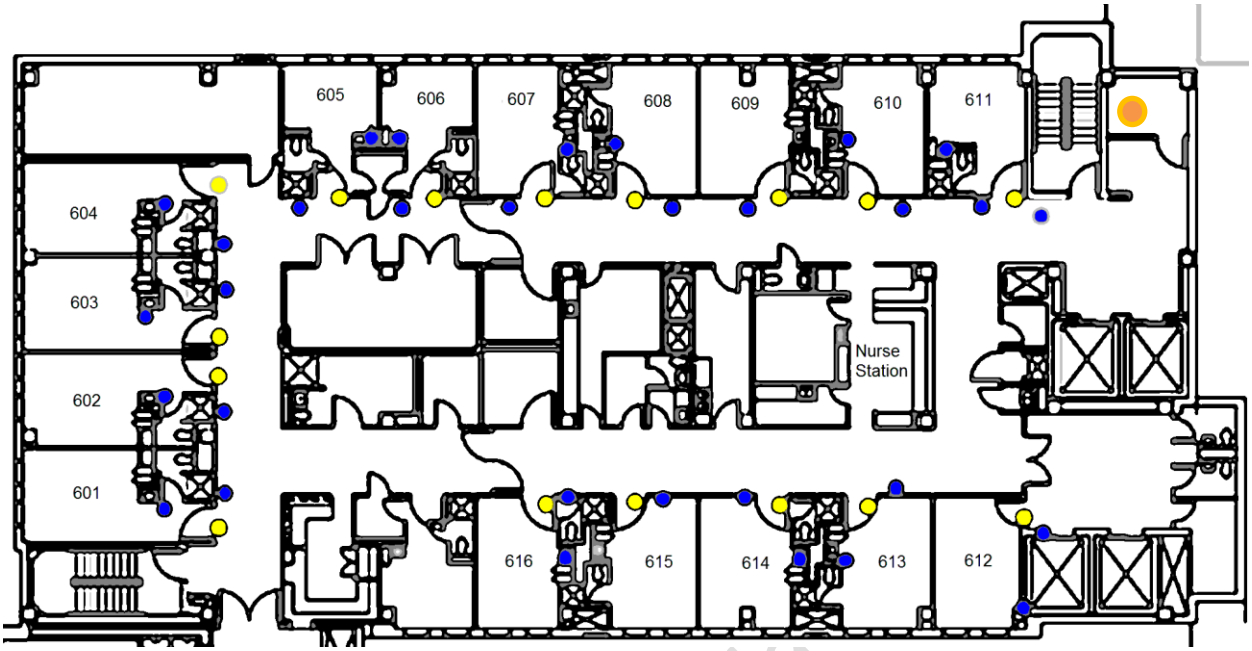
Several factors in determining the location and number of devices will be constrained. The system needs at a minimum one Gateway, which will need to be located somewhere that can provide a network connection, and the location of the sensors will determine where the Gateways and Repeaters will be installed. Every level in a building will be treated as a complete installation separate from other levels.

With all of the sensors installed, or placements defined, the floor plan should be analyzed to determine the optimal location of the Gateway and any Repeater(s) that minimizes the number of devices used, and/or significantly reduces the complexity of the installation. Looking at the floor plan with the location of the sensors indicated, first determine if all of the sensors are located within a radius that can be covered within the range of a single Gateway, and further that a network connection can be made near the center of this radius. If all of these conditions are satisfied, then one Gateway can be installed around the central point of the sensors and connected to the network, and no additional hardware will be needed for the floor plan. In most cases, however, the sensors won't be grouped closely enough, or located close enough to an available network connection and additional hardware will be needed. As an example, consider the partial floor plan below:

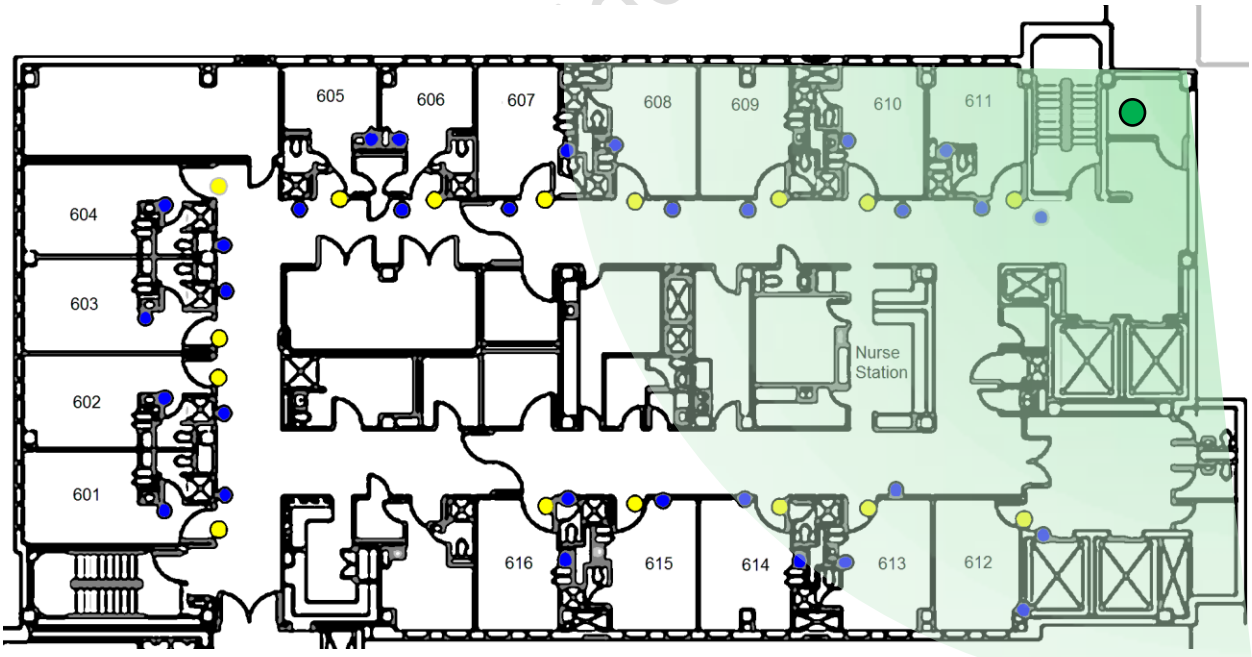


The yellow circles indicate Activity Counters, and the blue circles represent dispensers.

Suppose now that the only convenient network connection is located at the area indicated in orange:

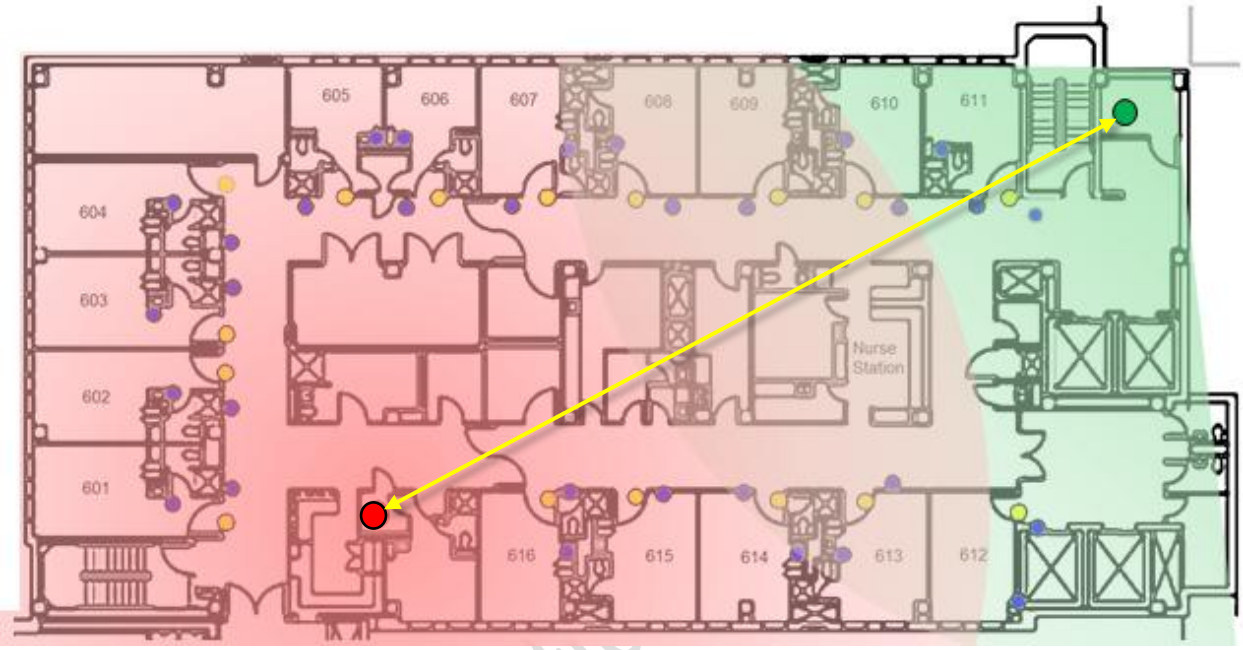


This immediately defines the starting point for device placement. The Gateway should be placed there and the rest of the devices will be added accordingly.



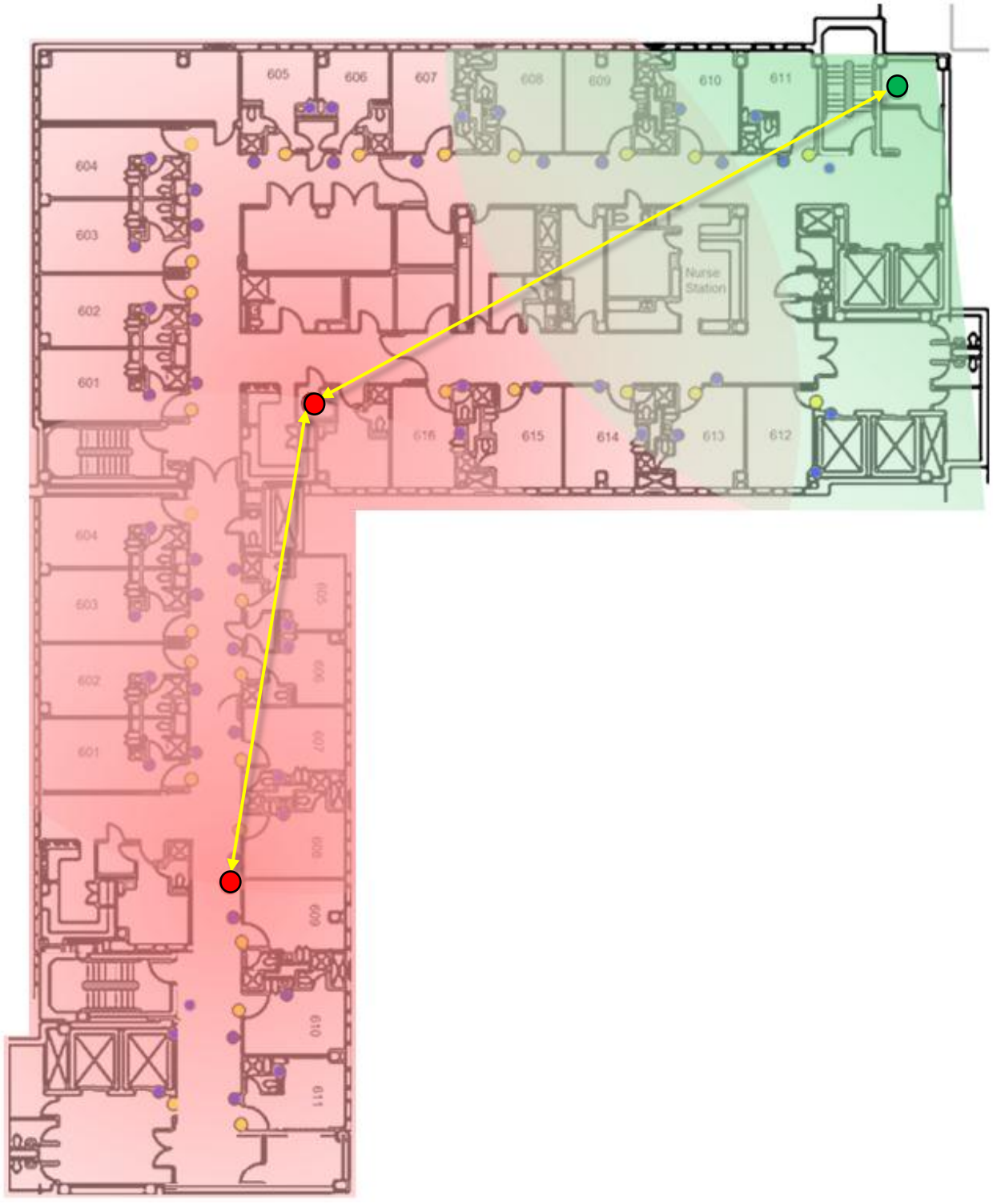
The green circle indicates the location of the Gateway, and the shaded area represents roughly the expected range based on 80' per sensor. The sensors which are located clearly within the shading can

be read directly by the Gateway. Next, a Repeater will be added to extend the coverage range. The Repeater will have to be both within range of the target sensors, as well as within range of the Gateway, or another Repeater. Since this diagram only shows a portion of the floor, and there are more rooms located below the area shown, the Repeater will be placed so that it can read the sensors and also so that it can link to additional Repeaters that will be added in the remainder of the floor.



The red circle indicates the location of the Repeater, and the red shaded area indicates the anticipated sensor range coverage that will be gained, again approximately 80' indoor. Repeaters and Gateways have an expected range of about 150' to another Repeater or Gateway, so in the above scenario, the Repeater and Gateway are close enough to communicate (see the yellow line). Some of the sensors fall within the range of both the Gateway and the Repeater. This is acceptable, and the sensor data will either route directly to the Gateway, or it will route through the Repeater to the Gateway, whichever path is better.

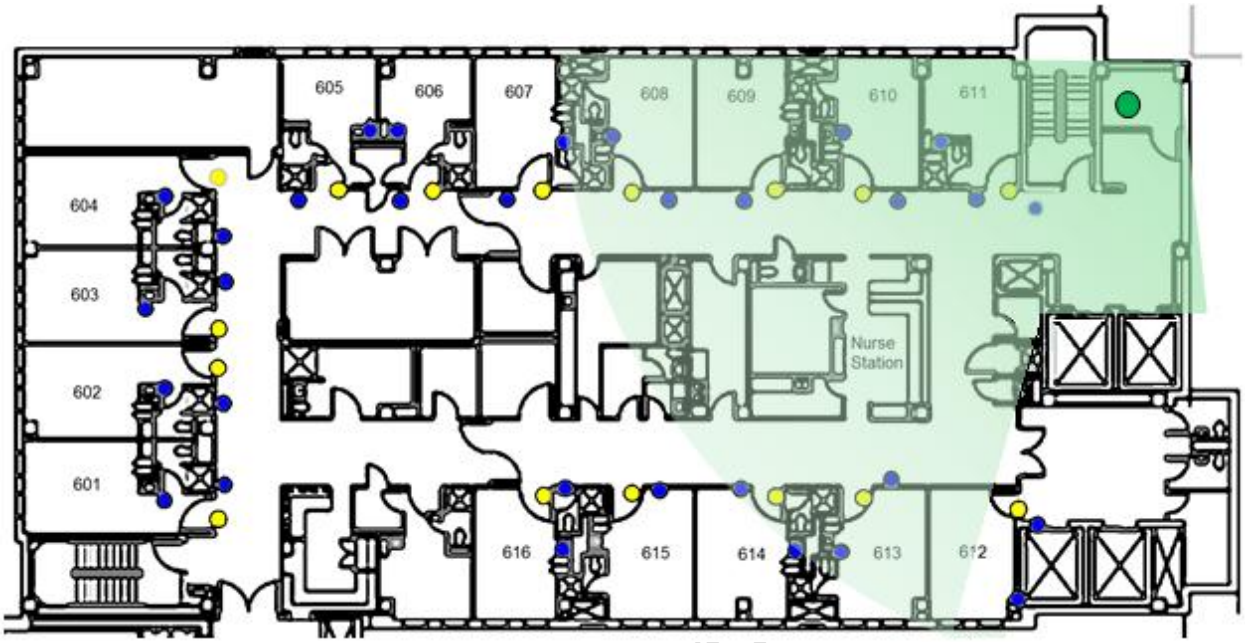
The remaining areas of this floor will be completed next, by adding more Repeaters until all of the sensors are covered, or until the maximum of six Repeaters has been reached. Shown below is what the final arrangement for the entire floor looks like.



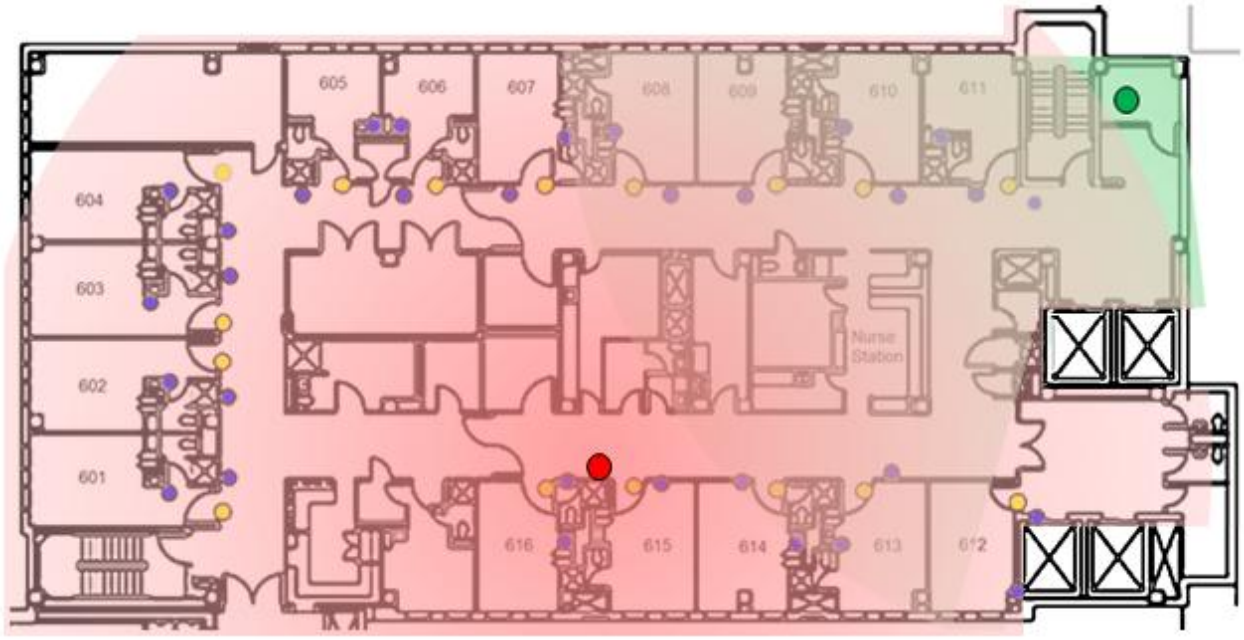
In this case, the last Repeater was mounted in the hallway.

Occasionally, certain building features might inhibit the signal, and create “blind spots” within a building. When this occurs, Repeaters must be added to help route the data around such areas. Looking at the

previous floor plan, if the elevator shafts were to interfere with the signal, then with only the Gateway installed, the coverage might look something like:



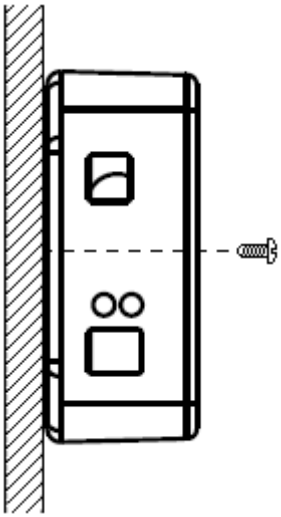
In this situation, the first Repeater added would need to be a little closer to the elevator shafts to provide a pathway for the sensors located by the elevators:



Now the affected sensors have a clear path to the repeater, which in turn has a clear path to the Gateway.

Mounting

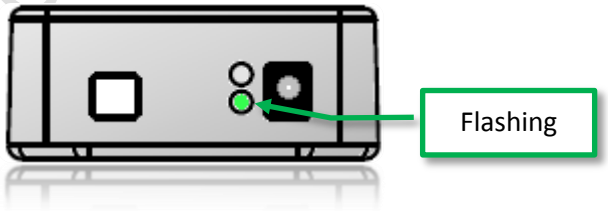
The Gateways and Repeaters can be directly mounted to solid surfaces using screws or adhesive.



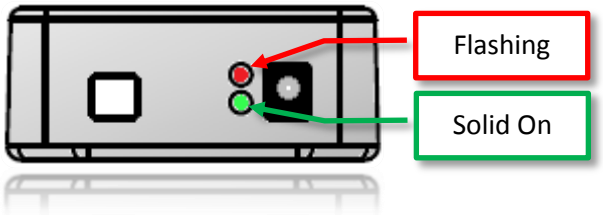
Set-up

Once mounted, the Gateway or Repeater can be powered-up and tested for functionality. First connect the AC adapter to each Repeater and plug the AC adapter into a powered receptacle. After each Repeater has been powered, connect the network cable from the Gateway to an available port on a network switch, and apply power to the Gateway. Note that the Gateway uses port 50101 to connect to the internet, so ensure that this port is not blocked.

After applying power to the Gateway, the system will enter self-configuration mode. During the self-configuration mode, the red LED will be off, and the green LED will be flashing slowly.



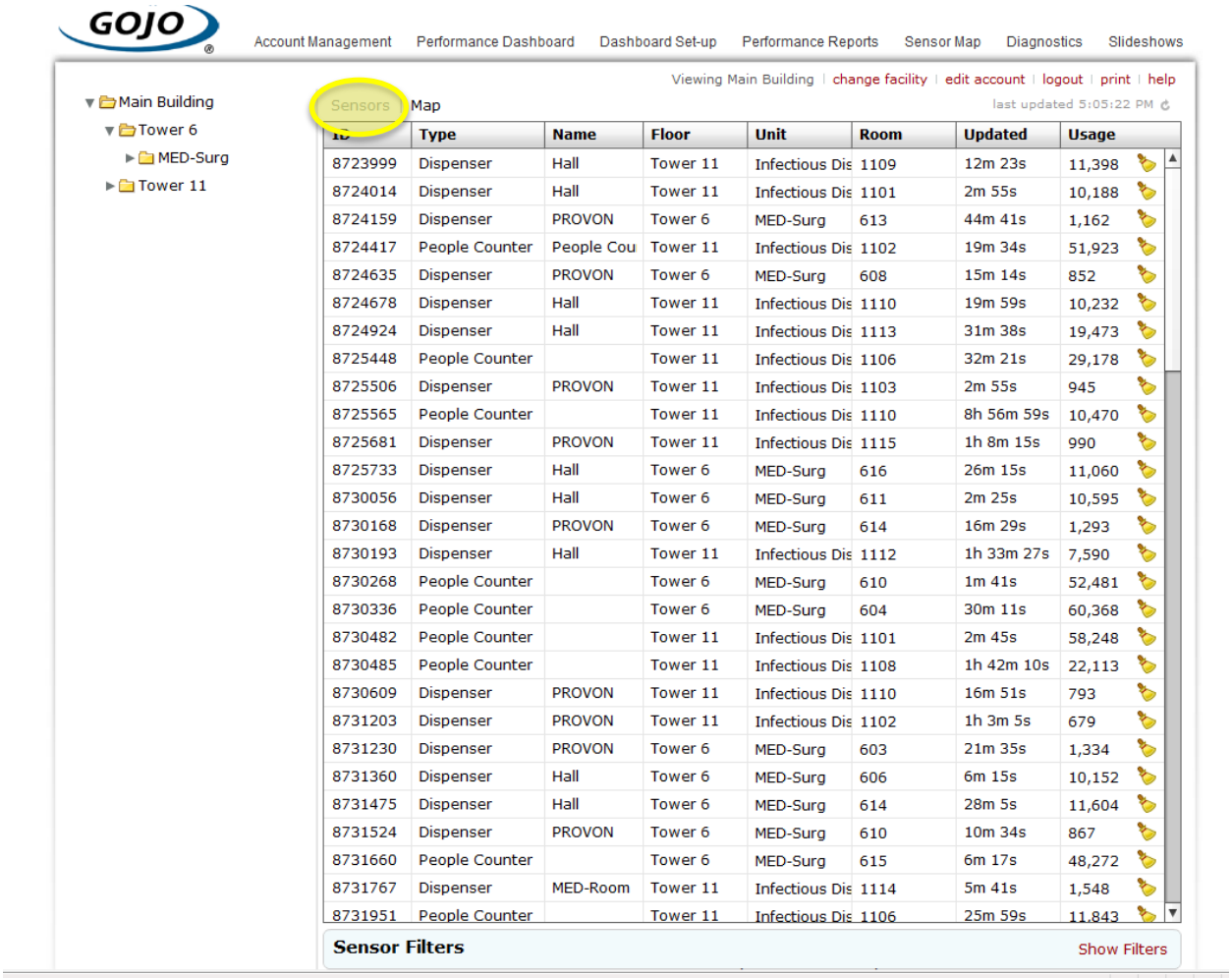
During the self-configuration, the Gateway and Repeaters are establishing their connections. After the self-configuration is complete, the units will enter data acquisition mode. This is the normal mode of operation. While in this mode, the green LED is on solid, and the red LED will flash slowly.



Integration with the Hand Hygiene Electronic Monitoring System

Testing the installation of the Gateway and Repeaters involves checking each sensor for updates using the Dashboard. After all of the components have been installed and powered, login to the Hand Hygiene Electronic Monitoring System Dashboard using your account.

The Hand Hygiene Electronic Monitoring System allows you to view, sort, name, and map sensors to specific locations of the hospital hierarchy. This is done by accessing the **Sensor Map** screen by using the main menu (refer to the Hand Hygiene Electronic Monitoring System documentation for details on the software). This section contains two views of the sensors associated to the system. The first is the tabular view which is displayed when you click the Sensors link above the table (see below).



ID	Type	Name	Floor	Unit	Room	Updated	Usage
8723999	Dispenser	Hall	Tower 11	Infectious Dis	1109	12m 23s	11,398
8724014	Dispenser	Hall	Tower 11	Infectious Dis	1101	2m 55s	10,188
8724159	Dispenser	PROVON	Tower 6	MED-Surg	613	44m 41s	1,162
8724417	People Counter	People Cou	Tower 11	Infectious Dis	1102	19m 34s	51,923
8724635	Dispenser	PROVON	Tower 6	MED-Surg	608	15m 14s	852
8724678	Dispenser	Hall	Tower 11	Infectious Dis	1110	19m 59s	10,232
8724924	Dispenser	Hall	Tower 11	Infectious Dis	1113	31m 38s	19,473
8725448	People Counter		Tower 11	Infectious Dis	1106	32m 21s	29,178
8725506	Dispenser	PROVON	Tower 11	Infectious Dis	1103	2m 55s	945
8725565	People Counter		Tower 11	Infectious Dis	1110	8h 56m 59s	10,470
8725681	Dispenser	PROVON	Tower 11	Infectious Dis	1115	1h 8m 15s	990
8725733	Dispenser	Hall	Tower 6	MED-Surg	616	26m 15s	11,060
8730056	Dispenser	Hall	Tower 6	MED-Surg	611	2m 25s	10,595
8730168	Dispenser	PROVON	Tower 6	MED-Surg	614	16m 29s	1,293
8730193	Dispenser	Hall	Tower 11	Infectious Dis	1112	1h 33m 27s	7,590
8730268	People Counter		Tower 6	MED-Surg	610	1m 41s	52,481
8730336	People Counter		Tower 6	MED-Surg	604	30m 11s	60,368
8730482	People Counter		Tower 11	Infectious Dis	1101	2m 45s	58,248
8730485	People Counter		Tower 11	Infectious Dis	1108	1h 42m 10s	22,113
8730609	Dispenser	PROVON	Tower 11	Infectious Dis	1110	16m 51s	793
8731203	Dispenser	PROVON	Tower 11	Infectious Dis	1102	1h 3m 5s	679
8731230	Dispenser	PROVON	Tower 6	MED-Surg	603	21m 35s	1,334
8731360	Dispenser	Hall	Tower 6	MED-Surg	606	6m 15s	10,152
8731475	Dispenser	Hall	Tower 6	MED-Surg	614	28m 5s	11,604
8731524	Dispenser	PROVON	Tower 6	MED-Surg	610	10m 34s	867
8731660	People Counter		Tower 6	MED-Surg	615	6m 17s	48,272
8731767	Dispenser	MED-Room	Tower 11	Infectious Dis	1114	5m 41s	1,548
8731951	People Counter		Tower 11	Infectious Dis	1106	25m 59s	11,843

This tabular view can be sorted by any column by simply clicking on the column name. Each click toggles the sort method between ascending and descending. The default sorting method is by ID ascending.

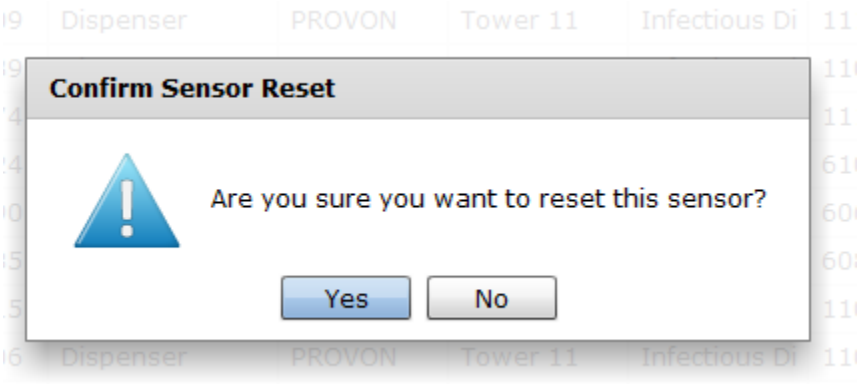
Descriptions of the columns on the Sensor Map table:

ID	The unique identifier given to a sensor during initial programming. This can only be changed by a GOJO system administrator.
Type	Displays the type of sensor, either “Dispenser” or “People Counter”.
Name	The name given to the sensor for tracking and identification by the site administrator. This field allows end-user text entry and is optional.
Floor	Identifies which floor the sensor is associated to during the mapping process.
Unit	Identifies which unit the sensor is associated to during the mapping process.
Room	Identifies which room the sensor is associated to during the mapping process.
Updated	Shows the Time of last data transmission from the sensor to the network.
Usage	Shows the total count of usage for each sensor. The small broom icon  allows the end-user to clear the count data for a specific sensor. This will reset the compliance data accumulated to date and should only be done during initial installation and testing.

While displaying the Sensor Map, activate each installed Activity Counter by walking through the sensor zone, and activate each dispenser. Observe the “Usage” value of each sensor prior to activation. After activation, ensure that the value increments by the number of times the sensor was activated.

Clearing Sensor Data

During installation and testing each sensor will be activated several times to determine accuracy and validated data transfer. After the system is formally tested and validated, the GOJO system administrator may clear the counts to allow for a fresh start of data collection. The small broom icon in the Usage column removes data associated to a sensor. This is done by clicking on the icon. *Once cleared, the data is removed from the database completely.* You will receive a warning message warning you of the clear and will prompt you to confirm the clear.



Once you click yes the sensor count will be zeroed out for the selected sensor.

Troubleshooting

In the event that the device is not functioning properly, use the troubleshooting guide below to find common issues and how to resolve them.

Issues	Possible Resolution
A sensor I.D. is not detected by the system	A sensor is not working or is beyond the range of the closest Repeater or Gateway. • Verify that the sensor is powered. Check the batteries in suspect sensor. Replace if low or missing. • Verify that the sensor is functional. If necessary, dismount the sensor and physically move the sensor close to a Repeater or the Gateway and activate the sensor. If the event is then recognized, the sensor is located too far away from the nearest Repeater, or the sensor is located in a "blind spot". Move the nearest Repeater or Gateway closer to the sensor if doing so does not affect the operator of other sensors. If moving a Repeater of Gateway is not practical, add another Repeater (but do not exceed six Repeaters per Gateway).
A group of sensors are not detected by the system	A Repeater is not working properly or is too far from the next-closest Repeater or the Gateway. • Check the Repeater for power. • Move the Repeater closer to the next closest-Repeater or Gateway. If moving the Repeater would put it outside the range of some sensors, then add another Repeater to span the distance (but do not exceed six Repeaters per Gateway).
The red and green LED's are flashing rapidly	Consult factory
The cloud server is not reporting any data collection	The Gateway is not communicating with internet. • Check Gateway for power. • Ensure port 50150 is not blocked. • Ensure Gateway is connected to network switch via cable. • Check network switch for link light.

Note: At any time after adding or moving Repeaters or Gateways, the Gateway power must be cycled so that the system can reconfigure itself.

Contacting Technical Support

Contact system support at 330-255-6282 or via email at gojosupport@gojo.com.