

The SensiNet Handbook



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1. SensiNet[®] Product Line

1.1 Overview

SensiNet[®] is a complete wireless sensor network built for industrial and commercial environments where high reliability is required. SensiNet includes everything you need to monitor important process and environmental data across a wide range of industries and applications.

1.2 Services Gateway

The SensiNet Services Gateway provides data access and external communication for SensiNet. SensiNet Services Gateway is a self-contained network management and access appliance that lets you securely access and analyze the data collected by Smart Sensors using a convenient browser interface. For larger installations with existing monitoring and legacy control software already in place, the SensiNet Services Gateway communicates sensor data directly to dozens of industrial automation software applications including Wonderware, LabView, RS View, OSI PI, Genesis32, CitectSCADA, Intellution, Excel and any other software compatible with ModBus, OCBC or OPC.

1.3 Mesh Routers

The SensiNet Mesh Router is an intelligent repeater that optimizes and extends the operating range of a SensiNet wireless sensor network. Every mesh router establishes direct communication links with at least two other Mesh Routers or Gateways in the network. This redundancy ensures that a wireless message coming from or going to a wireless sensor or another Mesh Router will be received.

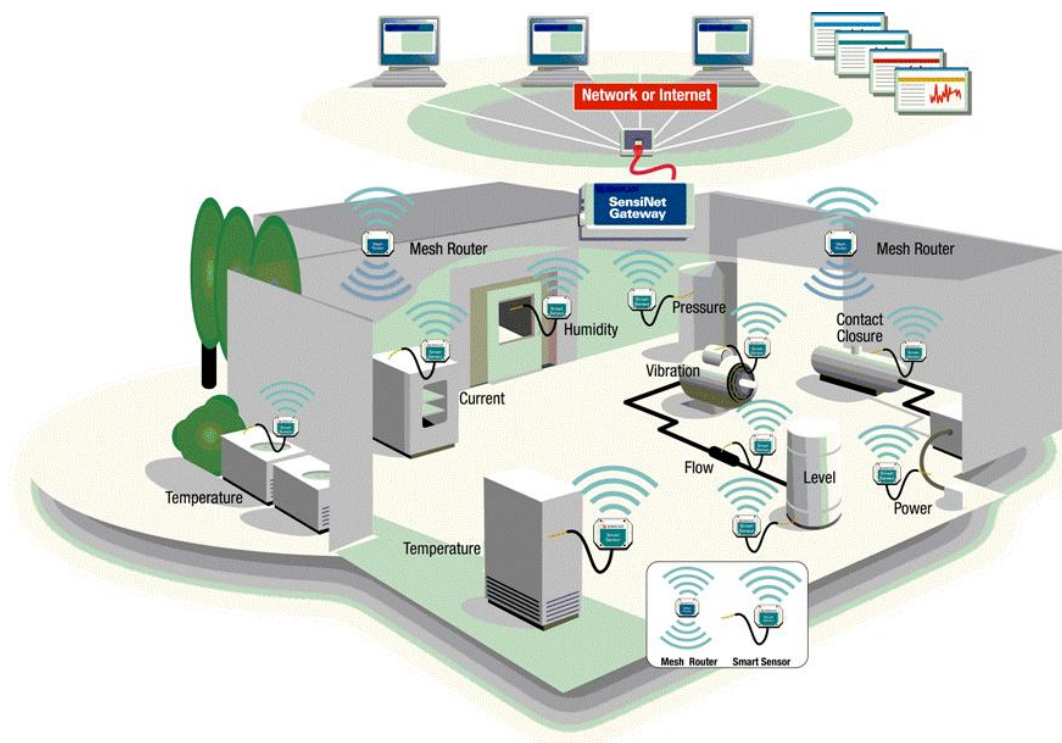


Figure 1: SensiNet graphical deployment.

1.4 Smart Sensors

Smart Sensors provide customers with the real-time process, equipment status and environmental information required for analysis and key decision making. Every Wireless Sensors Smart Sensor connects industry standard sensors to SensiNet, the most reliable wireless sensor networking technology available. Furthermore, every SensiNet Smart Sensor includes RF power amplification to deliver the maximum connection range possible—even in the harshest RF environments. Wireless Smart Sensors are available for use in the 2.4 GHz unlicensed band.

1.4.1 Ambient Temperature and Humidity Smart Sensor

The SensiNet TEHU Smart Sensors are real-time temperature and humidity monitoring devices. The Smart Sensors utilize a radio amplifier and frequency diversity to ensure ultra-reliability in applications and environments that are typically unfriendly to wireless products, such as factories, refineries and power plants.



1.4.2 RTD Smart Sensor

The SensiNet TEMP Smart Sensors are wireless temperature measuring devices. All of the devices operate at 2.4GHz and are FCC and CE approved. They report highly accurate and repeatable real-time temperature measurements to a central management application.



1.4.3 4-20mA Current Smart Sensor

The SensiNet CURR Smart Sensors are input current monitoring devices. The CURR-1022 operates on 2.4 GHz and is an FCC and CE approved device that wirelessly transmits 4-20mA sensor data.



1.4.4 0-10V Voltage Smart Sensor

The SensiNet VOLT Smart Sensors are analog input voltage monitoring devices. The devices are real-time wireless transmitters of 0-10v sensor data. The VOLT-1022 operates at 2.4 GHz and is FCC and CE approved.

1.4.5 Contact Closure Smart Sensor

The CONT-1022 transmits all state changes of an attached circuit, as well as continuously transmits the current state of the circuit at a user-defined interval. When used with the SensiNet Gateway, the status is accessible via a variety of formats, including OPC, ModBus and SOAP/XML. The CONT-1022 can be used with a variety of switches including mechanical, IR and magnetic. Two contacts are supported for each CONT-1022.



2. SensiNet Deployment Overview

This section provides a brief overview of the steps required to successfully install a SensiNet system and the details of this process are more fully described later in this document.

2.1 Step 1: Gather Installation Information

Certain customer information is useful to specify and deploy a SensiNet wireless sensor network. This includes area floor plans or schematics with locations of sensors, power and Ethernet drops.

2.2 Step 2: Determine Environment Type

Use the descriptions to determine if the environment is Commercial, Light Industrial or Heavy Industrial.

2.3 Step 3: Select SensiNet Components

Specifying a SensiNet system involves determining how many SensiNet Services Gateways, Mesh Routers and Smart Sensors you will need. Smart Sensor number and location are determined by the requirements of the application, while determining the necessary Services Gateway and Smart Sensor numbers is a two-step process. If the overall installation is very large, break the installation down into multiple, smaller networks. Then determine Mesh Router requirements for each network.

2.4 Step 4: Deploy and Commission SensiNet

SensiNet deployment involves installing the Smart Sensors, Mesh Routers and Services Gateways according to the demands of the installation and each environment type has its own unique characteristics and is described in its own section. Network commissioning is generally most effective when the Gateway is commissioned first, then the Mesh Routers and finally the Smart Sensors. This procedure allows for the network to form rapidly and in optimal fashion.

3. Valuable Site Information

This section describes valuable information which allows for a smooth and effective installation.

3.1 Area Floor Plans

Areas within customer sites where SensiNet is deployed can be broken down into three categories based on the area construction and equipment. Each area has its own characteristics that affect SensiNet radio performance. The three areas are Commercial, Light Industrial, and Heavy Industrial and are described in Section 4. Understanding this information during the selection procedure allows proper selection of components for a trouble free deployment and extremely robust network performance.

3.2 Network Information

SensiNet has a very low IT footprint requiring only an Ethernet connection and a web browser to access all functions. The system is shipped configured to receive its IP address from a DHCP server upon connection and power up. A small “discovery” application is supplied which locates the IP address it has been assigned so a browser can be “pointed” to it. It is useful to know the network it is connected to so you can assure the discovery application and Gateway are located on the same network, otherwise the application cannot “see” the Services Gateway. Once you have connected to the Gateway you can assign a fixed IP address if you intend to connect directly to a workstation instead of through a network. You may need a “crossover” cable (depending on your computer’s Ethernet port) and will need to make sure you know the IP address, network ID and subnet mask for the workstation. If not familiar with these network concepts your IT department should be able to help. No other network services are required.

4. Determining Environment Type

Wireless Sensors defines three environments: Commercial, Light Industrial and Heavy Industrial, where SensiNet systems are typically deployed. Each environment has unique properties that affect how SensiNet is specified and deployed.

4.1 Commercial

Commercial environments are typically constructed of drywall and studs and are found in most office buildings. Small-item manufacturing can be conducted in commercial areas but does not utilize large equipment that might interfere with transmission paths. Examples of commercial environments are office buildings, hospitals, pharmaceutical labs and data centers.



Figure 2: Commercial environment picture and layout

4.2 Light Industrial

Light industrial environments typically have manufacturing facilities utilizing metal equipment. The building construction might be drywall and stud or it could be metal and concrete. The metal equipment used is typically smaller than that found in heavy industrial environments and might consist of large machines in several rooms or a machine line that is 5 to 20 feet tall and housed in one large room. Transmission paths are often blocked by this equipment. Examples of light industrial environments are biotech manufacturing and injection molding operations.



Figure 3: Light Industrial interior pictures

4.3 Heavy Industrial

Heavy industrial environments are categorized by very large, metal equipment in an open-air environment or in buildings that are several stories tall. The metal equipment used will be much larger and taller than that used in light industrial environments. Examples of heavy industrial environments are refineries, power plants and steel mills.



Figure 4: Heavy Industrial exterior and interior pictures

5. Specifying a SensiNet Wireless Sensor Network Solution

While the application dictates the number and type of Smart Sensors to be installed, the environment determines the number of SensiNet Services Gateways, and Mesh Routers required in the particular environment whether Commercial, Light Industrial, or Heavy Industrial. Each environment has unique properties that result in various specification procedures.

5.1 Commercial

Construction is typically drywall and studs with limited concrete (refer to special section) and rooms are generally offices or lab space. These areas are typically found in office buildings, hospitals, libraries, museums, food storage and blood banks. Common transmission challenges in these areas include transmitting through multiple walls, stairwells, elevator shafts, floors, walk-in freezers and large equipment.

Below is a description of some common layouts.

1. Offices on perimeter with cubicles possibly in the center, stairwells and elevators in middle
2. Random office space
3. Lab space mixed with office space

Refer to the example layout and pictures below.

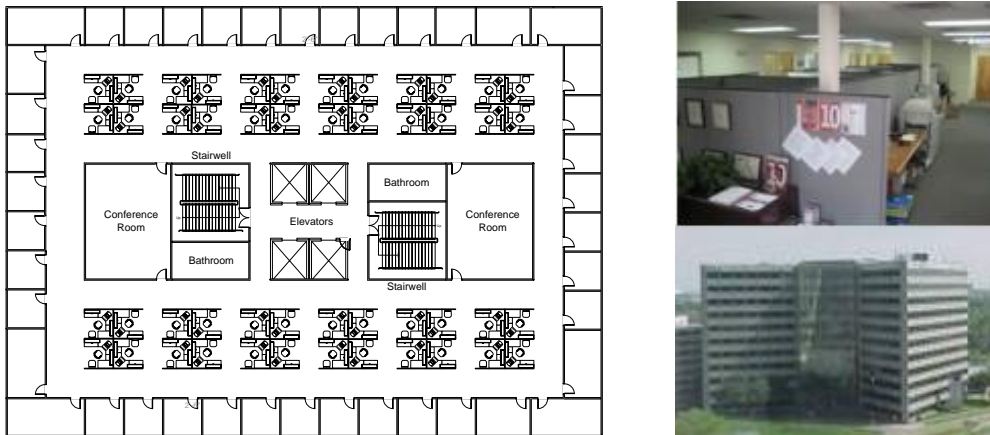


Figure 5: Commercial environment layout and pictures.

Specifying a SensiNet wireless sensor network is a two-step process. First, break down the installation into multiple, smaller networks. Second, for each network, determine the number and placement of Mesh Routers required on site.

5.1.1 Breaking Installations into Multiple, Smaller Networks

Large installations are typically broken down into multiple, smaller networks. Often this is unavoidable because there may be a remote building or multiple floors, however, there are a variety of situations where this is a good practice and will result in more stable networks. Each new network will have its own Gateway. By determining the optimal number of networks for stable operation; you will determine the number of Gateways required for the installation. The Gateway requires Ethernet and line-power, so location of these should be a consideration for optimal Gateway placement.

This section gives examples to each of the rules for breaking down networks that are listed below.

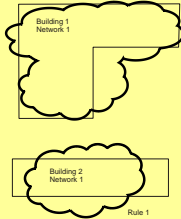
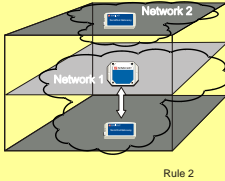
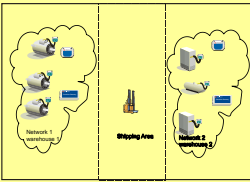
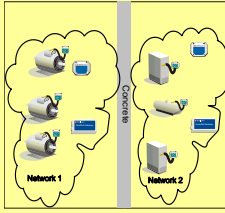
<p>Rule 1: Each separate building will require a separate network.</p> 	<p>Rule 2: No more than two floors should be combined in a network and only one if floors contain metal pans.</p> 
<p>Rule 3: Create two or more networks when transmitting across dynamic, high-movement environments such as roads, warehouses or shipping yards.</p> 	<p>Rule 4: Enclosed concrete areas will require their own network.</p> 
<p>Rule 5: Remote clusters of nodes require their own network.</p>	

Figure 6: Rules for breaking installations into multiple, smaller networks.

Once the installation is broken down into smaller, manageable networks, you must now determine the required number of Mesh Routers and location.

5.1.2 Determine Mesh Router Requirements

Mesh Router specification guidelines and the Mesh RangeFinder table are described below. Use these two tools to determine the optimal number and placement of Mesh Routers.

Mesh Router Placement Guidelines

Follow these guidelines when deciding Mesh Router placement.

1. Place Mesh Router roughly halfway between a Smart Sensor or a cluster of Smart Sensors.
2. Maximize use of open space such as hallways.
3. Minimize number of walls and other obstacles transmitting through.
4. When using multiple Mesh Routers to connect to a Smart Sensor, place Mesh Routers equal distance apart from the Smart Sensors.

Mesh RangeFinder

The Mesh RangeFinder allows you to calculate the maximum range to expect in each point to point connection. While it is optimal to place a Mesh Router halfway between a Smart Sensor or a cluster of Smart Sensors, if the halfway distance is greater than what is calculated by the RangeFinder, then extra Mesh Routers may be required. The Mesh RangeFinder table is shown below.

Commercial Areas = 200' Base			
Wall Type	0-10'	50'	100'
Drywall	25'	50'	50'
Concrete	50'	100'	n/a

Figure 7: Mesh RangeFinder

For every wall the signal passes through, subtract the corresponding distance from the baseline distance to determine the maximum recommended range for the Mesh Router.

Example #1: Open air (no obstacles)

When there are no obstacles to be transmitted through, there is no need to reduce the base range, thus the maximum recommended range between routers is 200'. Figure 8 below shows this graphically.

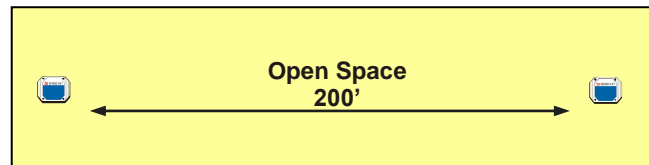


Figure 8: Maximum recommended range for open air transmission.

Example #2: One wall 10' away

Subtract 25' from the base range to get a maximum recommended range of 175' ($200' - 25' = 175'$). See Figure 9 below.

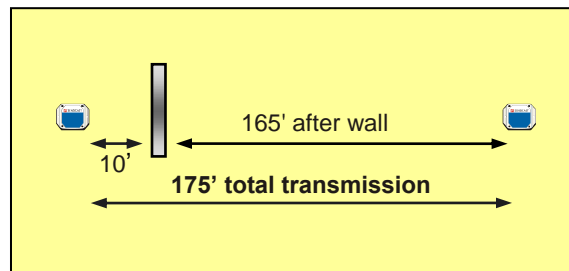


Figure 9: Recommended transmission range for obstacle 10' from transmitter.

Example #3: One wall 50' away

Subtract 50' from the base range for a maximum recommended range of 150' ($200' - 50' = 150'$). See Figure 10 below.

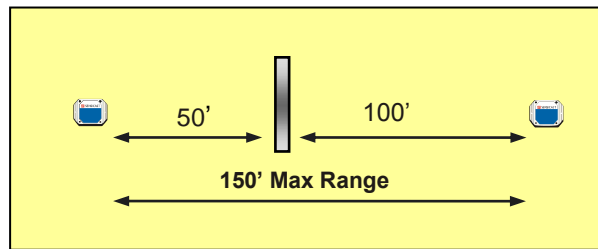


Figure 10: Recommended transmission range for obstacle 50' from transmitter.

Example #4: Two walls: one wall 10' away and a second wall 50' away.

Subtract 25' because of the wall 10' away then subtract an additional 50' because of the wall 50' away ($200' - 25' - 50' = 125'$). See Figure 11 below.

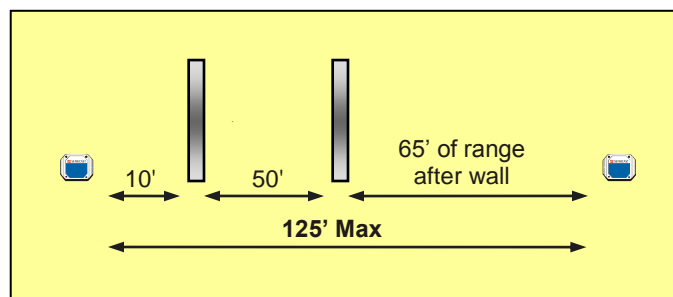


Figure 11: Transmitting through two walls.

5.2 Light Industrial Areas

Light industrial construction is defined the same as Commercial construction (i.e. drywall and stud) but also has a large amount of equipment in the rooms. Food manufacturing, pharmaceutical manufacturing, biotech, semiconductor and blood banks are common industries housed in light industrial environments. Common transmission challenges in this environment are large equipment, transmitting through several drywall walls, transmitting through concrete and through floors.

Refer to the pictures below.



Figure 12: Light Industrial environments

Specifying a SensiNet wireless sensor network is a two-step process. First, break down the installation into multiple, smaller networks. Second, for each network, determine the number and placement of Mesh Routers required onsite.

5.2.1 Breaking Installations into Multiple, Smaller Networks

Large installations are typically broken down into multiple, smaller networks. Often this is unavoidable because there may be a remote building or multiple floors, however, there are a variety of situations where this is a good practice and will result in more stable networks. Each new network will have its own Gateway. By determining the optimal number of networks for stable operation; you will determine the number of Gateways required for the installation. The Gateway requires Ethernet and line-power, so location of these should be a consideration for optimal Gateway placement.

This section gives examples to each of the rules for breaking down networks that are listed below.

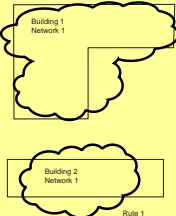
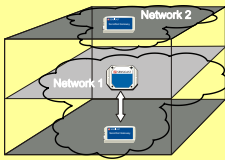
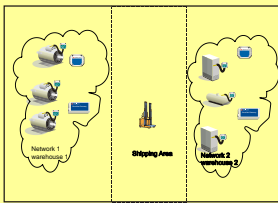
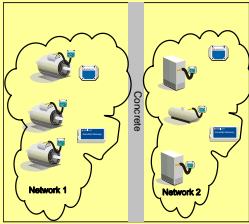
<p>Rule 1: Each separate building will require a separate network.</p>  <p style="text-align: right;">Rule 1</p>	<p>Rule 2: No more than two floors should be combined in a network and only one if floors contain metal pans.</p>  <p style="text-align: right;">Rule 2</p>
<p>Rule 3: Create two or more networks when transmitting across dynamic, high-movement environments such as roads, warehouses or shipping yards.</p> 	<p>Rule 4: Enclosed concrete areas will require their own network.</p> 
<p>Rule 5: Remote clusters of nodes require their own network.</p>	

Figure 13: Rules for breaking installations into multiple, smaller networks.

Once the installation is broken down into smaller, manageable networks, you must now determine Mesh Router number and location.

5.2.2 Determine Mesh Router Requirements

Mesh Router specification guidelines and the Mesh RangeFinder table are described below. Use these two tools to determine the optimal number and placement of Mesh Routers.

Mesh Router Placement Guidelines

Follow these guidelines when deciding Mesh Router placement.

1. Place Mesh Router roughly halfway between Smart Sensor or a cluster of Smart Sensors.
2. Maximize use of open space such as hallways.
3. Minimize number of walls and other obstacles transmitting through.
4. When using multiple Mesh Routers to connect to a Smart Sensor, place Mesh Routers equal distance apart.

Mesh Range Finder

The Mesh RangeFinder allows you to calculate the maximum range to expect in each point-to-point connection. It is optimal to place Mesh Routers halfway between a Smart Sensor or cluster of Smart Sensors. However, if the halfway distance is greater than the distance calculated by the RangeFinder, then extra Mesh Routers will be required.

Light Industrial Areas = 250' Base				
Material Type	0-10'	50'	100'	150'
Drywall	75'	100'	100'	90
Concrete	150'	175'	n/a	n/a
Metal	150'	175'	n/a	n/a

Figure 14: RangeFinder for Light Industrial Areas

For every wall the signal passes through, subtract the corresponding distance from the baseline distance to determine the maximum recommended range for the Mesh Router.

Example #1: Open air (no obstacles)

When there are no obstacles that are transmitted through, there is no need to reduce the base range, thus the maximum recommended range between routers is 250'. Figure 15 below shows this graphically.

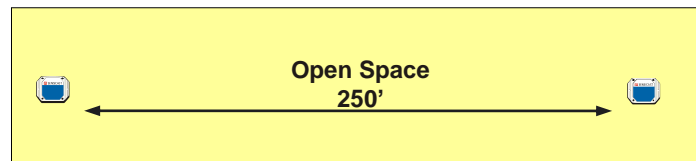


Figure 15: Maximum recommended range for open air transmission.

Example #2: One concrete wall 10' away

Subtract 150' from the base range to get a maximum recommended range of 100' ($250' - 150' = 100'$). See Figure 16 below.

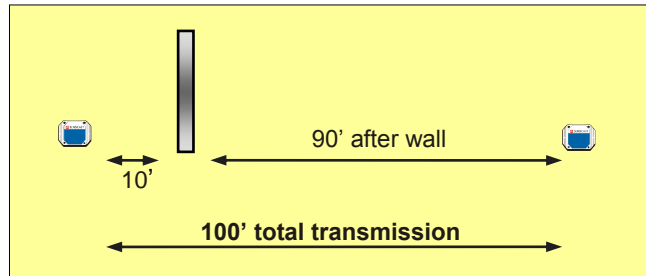


Figure 16: Recommended transmission range for obstacle 10' from transmitter.

Example #3: One concrete wall 50' away

Subtract 175' from the base range for a maximum recommended range of 75' ($250' - 175' = 75'$). See Figure 17 below.

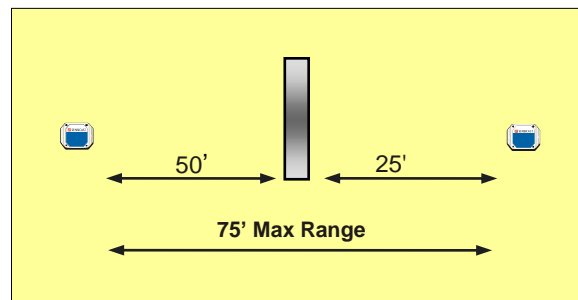


Figure 17: Recommended transmission range for obstacle 50' from transmitter.

Example #4: Two drywall walls: one wall 10' away and a second wall 50' away.

Subtract 25' because of the wall 10' away then subtract an additional 50' because of the wall 50' away ($200' - 25' - 50' = 125'$). See Figure 18 below.

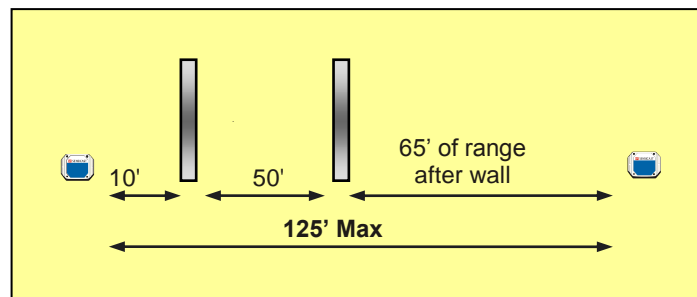


Figure 18: Transmitting through two walls.

5.3 Heavy Industrial Areas

The construction in Heavy Industrial environments consists of very large metal equipment typically found in open-air plants or housed in very large buildings. Concrete is usually very abundant in the walls, floors and equipment. Oil and gas refineries, steel mills, power plants, aluminum plants and nuclear plants are typically classified as heavy industrial. Common transmission challenges in these areas include transmission through concrete and around very large metal equipment. Refer to the layouts below.



Figure 19: Pictures of Heavy Industrial environments.

Specifying a SensiNet wireless sensor network is a two-step process. First, break down the installation into multiple, smaller networks. Second, for each network, determine the number and placement of Mesh Routers required on site.

5.3.1 Breaking Installation into Multiple, Smaller Networks

Large installations are typically broken down into multiple, smaller networks. Often this is unavoidable because there may be remote buildings or multiple floors, however, there are a variety of situations where this is a good practice and will result in more stable networks. Each new network will have its own Gateway. By determining the optimal number of networks for stable operation; you will determine the number of Gateways required for the installation. The Gateway requires Ethernet and line-power, so location of these should be a consideration for optimal Gateway placement.

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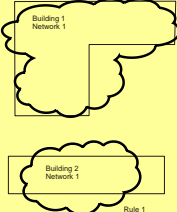
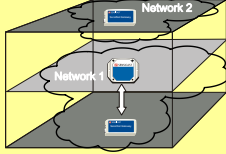
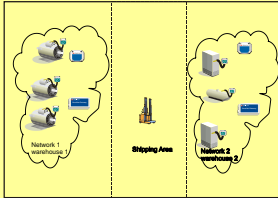
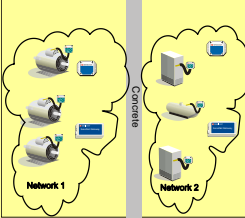
<p>Rule 1: Each separate building will require a separate network.</p> 	<p>Rule 2: No more than two floors should be combined in a network and only one if floors contain metal pans.</p> 
<p>Rule 3: Create two or more networks when transmitting across dynamic, high-movement environments such as roads, warehouses or shipping yards.</p> 	<p>Rule 4: Enclosed concrete areas will require their own network.</p> 
<p>Rule 5: Remote clusters of nodes require their own network.</p>	

Figure 20: Rules for breaking installations into multiple, smaller networks.

Once the installation is broken down into smaller, manageable networks, you must now determine Mesh Router number and location.

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Heavy Industrial Areas = 300' Base			
Obstacle Type	0-10'	50'	100'
Concrete	200'	225'	n/a
Metal	200'	225'	n/a

Figure 21: RangeFinder for Heavy Industrial environments

A general idea to keep in mind when working in a Heavy Industrial area is that the SensiNet transmitters will transmit either near their base range (300') or a much shorter range (i.e. 100' or less). This is because the obstacles in Heavy Industrial areas.

Example #1: Open air (no obstacles)

When there are no obstacles that to be transmitted through, there is no need to reduce the base range, thus the maximum recommended range between routers is 300'. Figure 22 below shows this graphically.

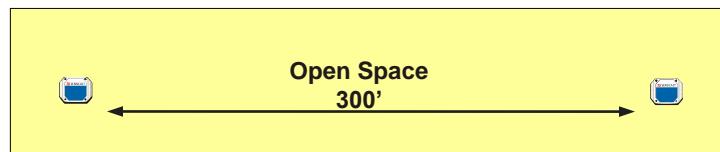


Figure 22: Maximum recommended range for open air transmission.

Example #2: One concrete wall 10' away

Subtract 200' from the base range to get a maximum recommended range of 100' ($300' - 200' = 100'$).
See Figure 23 below.

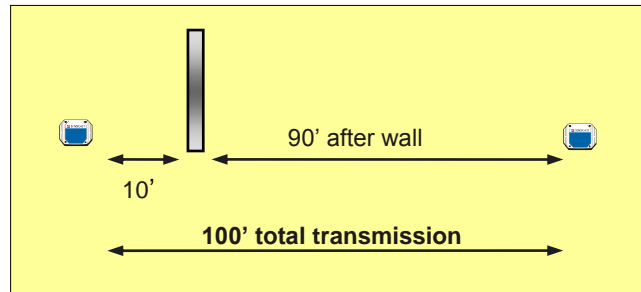


Figure 23: Recommended transmission range for obstacle 10' from transmitter.

Example #3: One concrete wall 50' away

Subtract 250' from the base range for a maximum recommended range of 100' ($300' - 200' = 100'$).
See Figure 24 below.

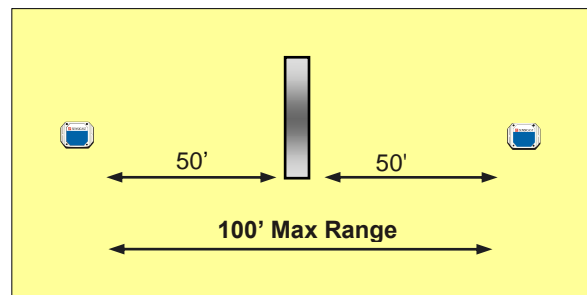


Figure 24: Recommended transmission range for obstacle 50' from transmitter.

6. Deploying a SensiNet Wireless Sensor Network Solution

This section describes the various deployment best practices for Commercial, Light Industrial and Heavy Industrial environments.

6.1 Commercial Environments

SensiNet wireless sensor networks are best deployed in the following order: Services Gateway, Mesh Routers, then Smart Sensors.

6.1.1 Services Gateway Placement

Use the following guidelines to determine Services Gateway placement.

1. Place in or near a cluster of data points.
2. Place near Ethernet drop and line power or run these to the Gateway.
3. Place high, near the ceiling similar to the sensor placement described above.
4. For areas with several large obstacles in the center such as high-rise office buildings, place at far end then use Mesh Routers to communicate to either side of obstacles.

6.1.2 Mesh Router Placement

Use the following guidelines to determine Mesh Router placement.

1. Lengthen transmission distances from transmitters in open space and shorten when transmitting through thick walls or concrete.
2. Make use of open space by placing high above equipment and transmitting down hallways, corridors and above machine lines.
3. Place in line of sight to Gateway, other Mesh Routers and Smart Sensors whenever possible.
4. Minimize the number of walls the signal transmits through.
5. Place near line power or run it to the Mesh Router.

6.1.3 Sensor Placement

Below are best practices guidelines for deploying a stable SensiNet Wireless Sensor Network. SensiNet is typically deployed in the following order: Gateway, Mesh Routers then Smart Sensors.

Customers determine general area for sensor placement. Use the following guidelines for final placement.

1. Place toward inside of building near center of network rather than near outer walls.
2. Place high near the ceiling. Install on walls, set on top equipment or even above ceiling tiles. The majority of equipment and material is on the floor and roughly 6-8' tall leaving the top few feet clear for transmission.



Figure 26: Example of Smart Sensor deployed in Commercial environment.

6.2 Light Industrial Areas

SensiNet wireless sensor networks are best deployed in the following order: Services Gateway, Mesh Routers then Smart Sensors.

6.2.1 Services Gateway Placement

Use the following guidelines to determine Services Gateway placement.

1. Place in or near a cluster of data points
2. Place near Ethernet drop and line power or run these to the Gateway.
3. Place high near the ceiling similar to the sensor placement described above.
4. For areas with several large obstacles in the center such as high-rise office buildings, place at far end then use Mesh Routers to communicate to either side of obstacles.

6.2.2 Mesh Router Placement

Use the following guidelines to determine Mesh Router placement.

1. Lengthen transmission distances from transmitters in open space and shorten when transmitting through thick walls or concrete.
2. Make use of open space by placing high above equipment and transmitting down hallways, corridors and above machine lines.
3. Place in line of sight to Gateway, other Mesh Routers and Smart Sensors whenever possible.
4. Minimize the number of walls the signal transmits through.
5. Place near line power or run it to the Mesh Router.
6. Avoid mounting on steel columns or beams.



Figure 27: Example of Mesh Router placement in Light Industrial environment.

6.2.3 Smart Sensor Placement

1. Make use of open space by placing Smart Sensors high above equipment and transmitting down hallways, corridors and above machine lines.
2. Place in line of sight of the Gateway and Mesh Routers whenever possible
3. Minimize number of walls the signal transmits through
4. Lengthen distance from Mesh or Gateway in open space and shorten when transmitting through concrete.

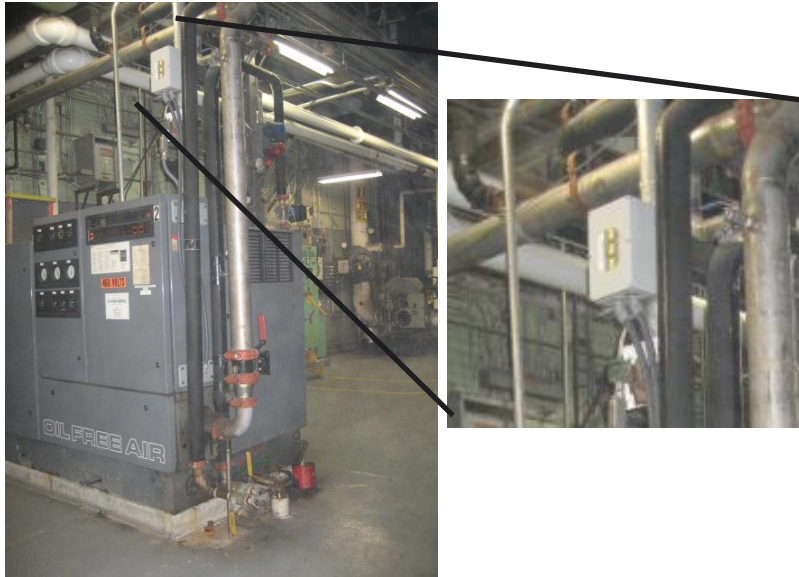


Figure 28: Example of Smart Sensor deployed in a Heavy Industrial environment.

6.3 Heavy Industrial Areas

Below are best practices guidelines for deploying a stable SensiNet wireless sensor network. SensiNet is typically deployed in the following order: Smart Sensors, Gateway then Mesh. Customers determine general area for Smart Sensor placement. Use the following guidelines for final placement.

6.3.1 Services Gateway Placement

Use the following guidelines to determine Services Gateway placement.

1. Place in or near a cluster of data points
2. Place near Ethernet drop and line power or run these to the Gateway.
3. Place high near the ceiling similar to the Smart Sensor placement described in Figure 29.
4. For areas with several large obstacles in the center such as high-rise office buildings, place at far end then use Mesh Routers to communicate to either side of obstacles.

6.3.2 Mesh Router Placement

Use the following guidelines to determine Mesh Router placement.

1. Lengthen transmission distances from transmitters in open space and shorten when transmitting through thick walls or concrete.
2. Make use of open space by placing high above equipment and transmitting down hallways, corridors and above machine lines.
3. Place in line of sight to Gateway, other Mesh Routers and Smart Sensors when possible.
4. Minimize the number of walls the signal transmits through.
5. Place near line power or run it to the Mesh Router.
6. Avoid mounting on steel columns or beams.



Figure 29: Example of Mesh Router deployed in a Heavy Industrial environment.

6.3.3 Smart Sensor Placement

Below are best practices guidelines for deploying a stable SensiNet wireless sensor network in Heavy Industrial environments. SensiNet is typically deployed in the following order: Smart Sensors, Gateway, then Mesh Router. Customers determine general area for Smart Sensor placement. Use the following guidelines for final placement.

1. Place toward inside of building near Mesh rather than near outer walls.
2. Place high near the ceiling. Install on walls, set on top equipment or even above ceiling tiles. The majority of equipment and material is on the floor and roughly 6-8' tall leaving the top few feet clear for transmission.

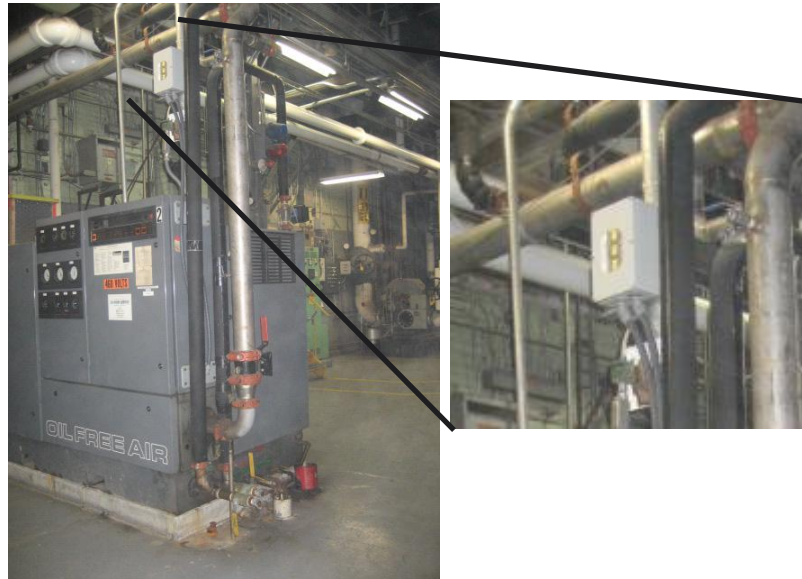


Figure 30: Example of Smart Sensor deployed in a Heavy Industrial environment.

7. SensiNet Services Gateway

This section contains information about the SensiNet Services Gateway.

7.1 Overview

The SensiNet Services Gateway provides data access and external communications for the SensiNet wireless sensor network. A self-contained network management and access appliance, SensiNet's Services Gateway lets you securely access and analyze the data collected by Smart Sensors using a convenient browser interface. The Gateway provides SensiNet Network configuration tools and allows three methods for viewing data:

1. Third Party Software Integration
2. Standalone HMI
3. SensiNet Services Site

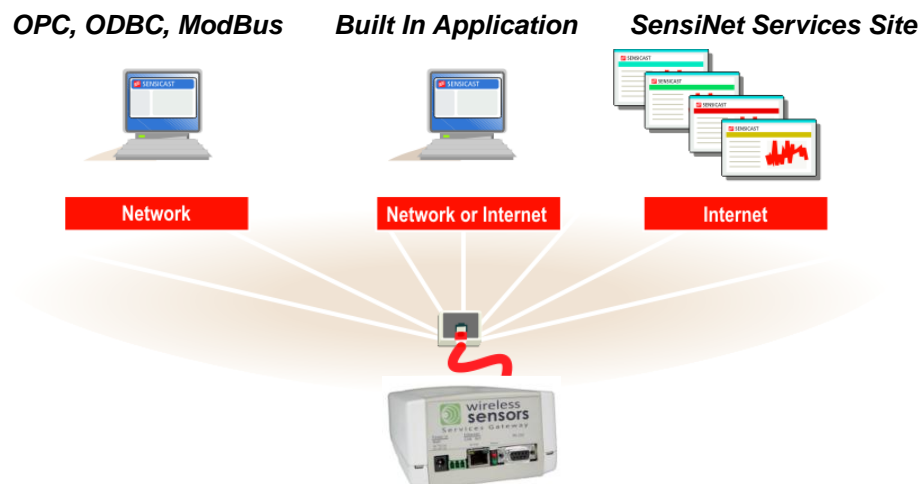


Figure 31: Wireless Sensors Services Gateway capabilities and protocols

Third Party Software Integration

For larger installations with existing monitoring and legacy control software already in place, the SensiNet Gateway communicates sensor data directly to dozens of industrial automation software applications including:

- Wonderware
- ICONICS
- Intellution
- Citect
- LabView
- Other ModBus, ODBC, and OPC-compatible software

Standalone HMI

The SensiNet Gateway provides standalone HMI capability including the following functions:

- Graphical and tabular real-time and historical data
- Alarms

SensiNet Services Site

The Services Gateway can integrate with the SensiNet Services Site.

1. View sensor data from any web browser in any location
2. Graphical and tabular real-time and historical data
3. Alarms

7.2 SensiNet Services Gateway Guidelines for Installation on IT Networks

The SensiNet Services Gateway provides data access and external communications for the SensiNet wireless sensor network. Gateway usage guidelines are provided below.

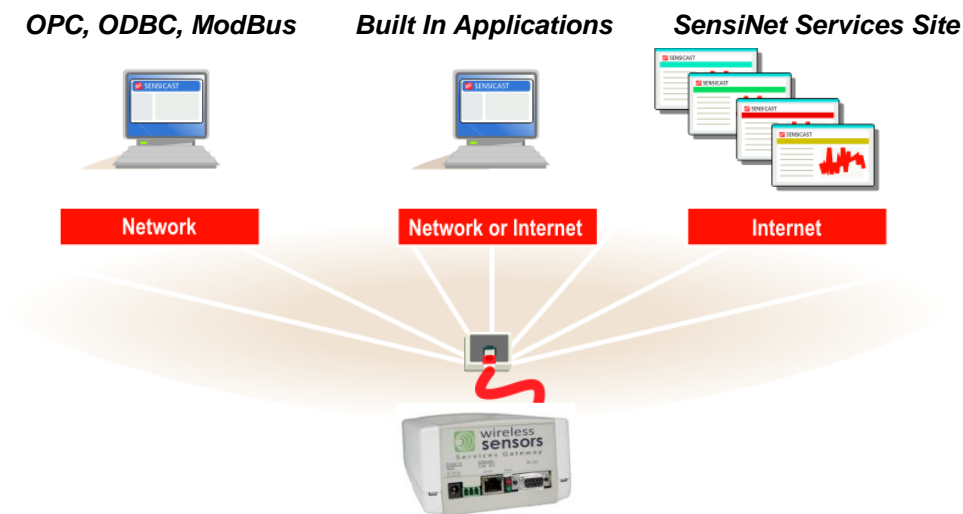


Figure 32: Wireless Sensors Services Gateway capabilities and protocols

Best Practices

Wireless Sensors recommends the steps outlined below in order to make the best use of your Gateway:

1. Configure access control to the Gateway by navigating to Configuration->User Access. It is recommended that administrative privileges are only given to the appropriate users.
2. Power your Gateway through an uninterruptible power supply.

7.3 SensiNet Services Gateway Integration – Web Services

The SensiNet Services Gateway is easily configurable to use web services to transmit data. This allows for designing web applications to make use of the sensor data aggregated by the Gateway.

To manage the OPC data access on the Gateway, navigate to **Configuration -> Data Connections -> Web Services**. This will produce the screen in Figure 33.

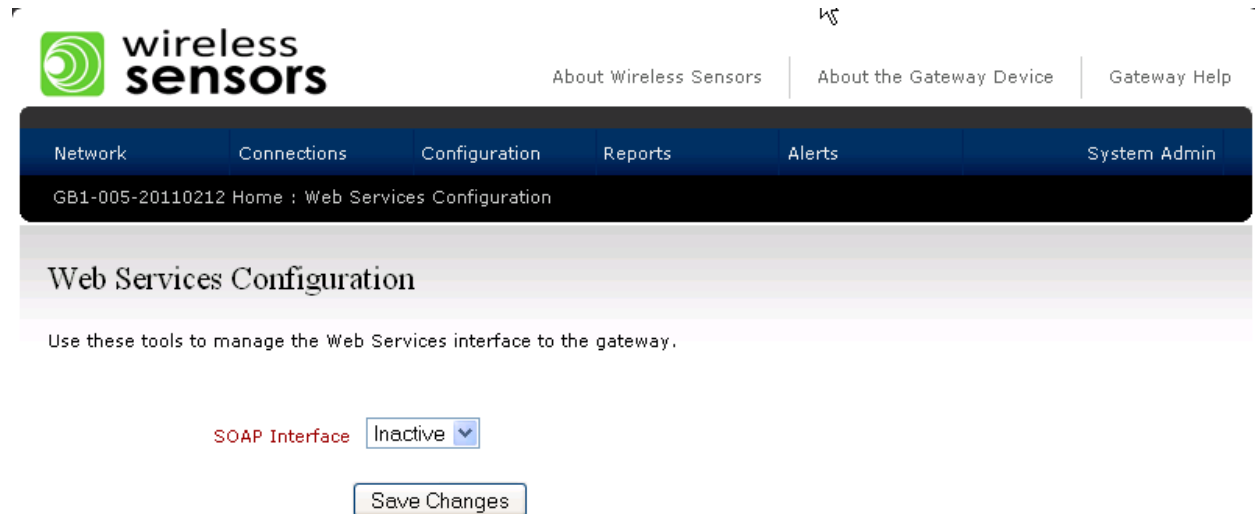


Figure 33: Gateway web services configuration screen

The basic steps for configuring Web Services are:

1. Activate the service by selecting “Active” in the pull-down menu

7.4 Wireless Sensors Services Gateway Integration – OPC

The SensiNet Services Gateway is easily configurable to communicate via OPC. The SensiNet OPC server software can aggregate data from any or all Gateways on the subnet and provides OPC data services to third-party software.

The basic steps for configuring OPC are

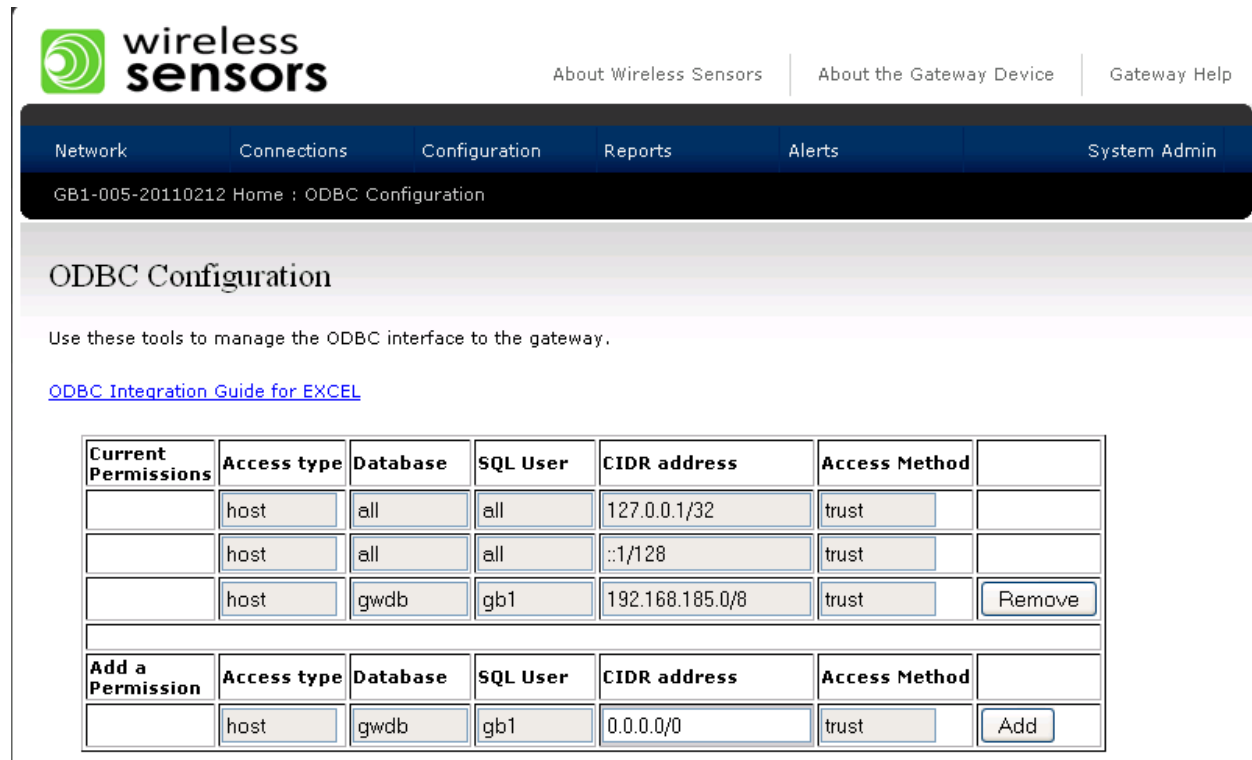
1. Install and configure SensiNet OPC server SW on host PC
2. Configure Gateway to add an ODBC host connection for server PC
3. Configure SensiNet OPC server SW
4. Map OPC tags to variables in third-party software

When finished changing information, click Save Changes to save the information.

7.5 Wireless Sensors Services Gateway Integration – ODBC

The Wireless Sensors Gateway is easily configurable to communicate via ODBC. This allows multiple third-party applications access to the data on the Gateway.

To manage the OPC data access on the Gateway, navigate to Configuration -> Data Connections -> ODBC. This will produce the screen in Figure 34.



GB1-005-20110212 Home : ODBC Configuration

ODBC Configuration

Use these tools to manage the ODBC interface to the gateway.

[ODBC Integration Guide for EXCEL](#)

Current Permissions	Access type	Database	SQL User	CIDR address	Access Method	
	host	all	all	127.0.0.1/32	trust	
	host	all	all	::1/128	trust	
	host	gwddb	gb1	192.168.185.0/8	trust	Remove
Add a Permission	Access type	Database	SQL User	CIDR address	Access Method	
	host	gwddb	gb1	0.0.0.0/0	trust	Add

Figure 34: Gateway ODBC configuration screen

The basic steps for configuring ODBC are:

1. Enter the Classless Inter-Domain Routing (CIDR) Address of the client machine or network. For example, the CIDR address for a single host might be 192.168.185.76/32 and for a network 192.168.185.0/24.
2. Leave the other fields with the default values and click "Add"

7.6 SensiNet Services Gateway Integration – ModBus

The SensiNet Services Gateway is easily configurable to communicate via ModBus TCP/IP to external devices. The Gateway acts as a ModBus slave to make data available to ModBus master devices. In the Gateway Interface, SensiNet Smart Sensor devices ports can be mapped to ModBus registers.

To manage the ModBus slave feature on the Gateway, navigate to **Configuration -> Data Connections -> ModBus**. This will produce the screen in Figure 35.

wireless sensors

About Wireless Sensors | About the Gateway Device | Gateway Help

Network | Connections | Configuration | Reports | Alerts | System Admin

GB1-005-20110212 Home : Modbus Configuration

Modbus TCP Slave Interface

Use this page to map SensiNet data to Modbus TCP Slave registers. The Modbus TCP slave will be restarted automatically after you add or remove registers.

[Modbus Integration Guide](#)

Slave Configuration

Slave ID:

Slave Status: Active Inactive

Sensor Mapping

Add New Register:

Delete	Register	Mapping
<input type="button" value="X"/>	1	Create

Figure 35: Gateway ModBus configuration screen

Within the ModBus Configuration page you can set several options:

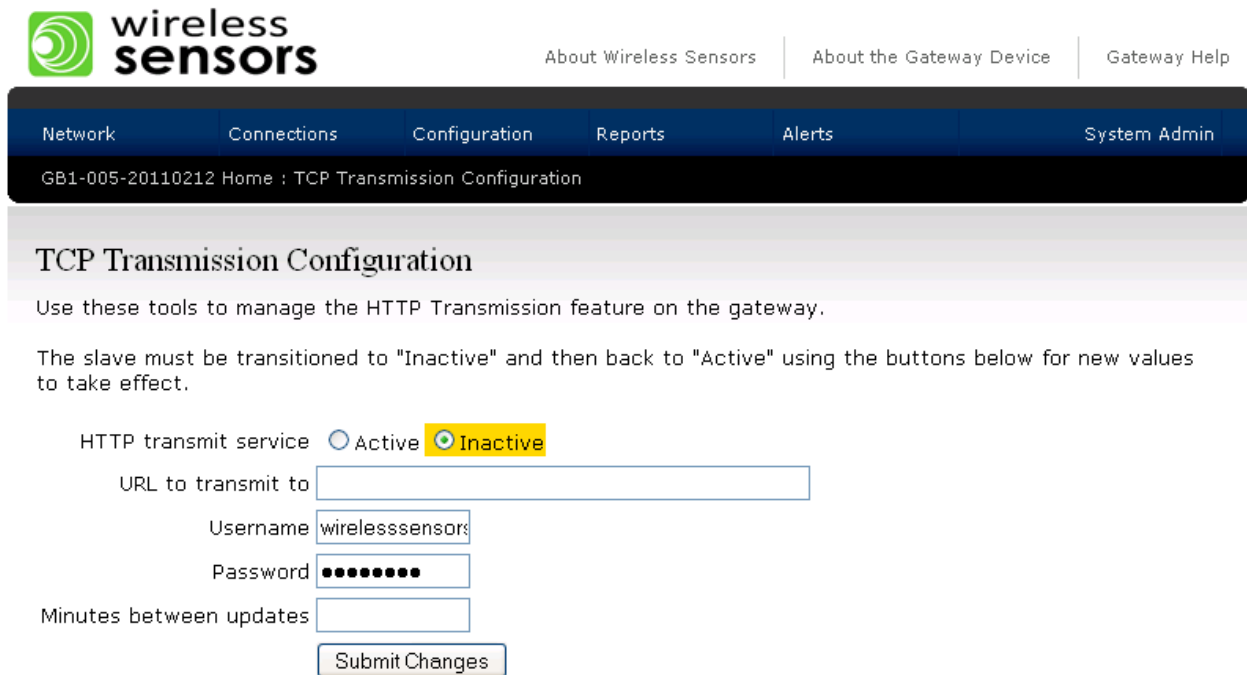
1. Set ModBus slave option as Active or Inactive by clicking the appropriate radio button.
2. Set Gateway ModBus slave ID by typing the ID into the appropriate field.
3. Change ModBus register mapping by entering new information into the appropriate fields.

When finished changing information, click Save Changes to save the information.

7.7 SensiNet Services Gateway Integration – HTTP

The SensiNet Services Gateway is easily configurable to transmit via HTTP. This allows you to transmit sensor data to an Application Service Provider site.

To manage the OPC data access on the Gateway, navigate to **Configuration -> Data Connections -> HTTP**. This will produce the screen in Figure 36.



wireless sensors

About Wireless Sensors | About the Gateway Device | Gateway Help

Network | Connections | Configuration | Reports | Alerts | System Admin

GB1-005-20110212 Home : TCP Transmission Configuration

TCP Transmission Configuration

Use these tools to manage the HTTP Transmission feature on the gateway.

The slave must be transitioned to "Inactive" and then back to "Active" using the buttons below for new values to take effect.

HTTP transmit service Active Inactive

URL to transmit to

Username

Password

Minutes between updates

Figure 36: Gateway HTTP Transmission configuration screen

The basic steps for configuring HTTP are:

1. Activate the service by selecting the "Active" Radio Button.
2. Enter the destination URL to transmit data to.
3. Enter the password required for the site data is being transmitted to.
4. Specify the time between updates in minutes.