HOBOnode Deployment Guide

Site Survey

One of the first objectives in setting up a wireless network is to analyze your site to determine your equipment requirements and physical setup. This involves answering specific questions related to your particular application. Doing this prior to physical setup will save time and ensure the most efficient, productive, and cost-effective system possible.

What do you want to measure?

Make a list of specific parameters to be measured (for example, temperature, humidity, voltage, current, pulses). If possible, determine the desired measurement frequencies for each.

Where will you make your measurements?

Determine the physical location for each of the measurements by making a facility map. Include the physical distances between measurement locations. Include obstructions between measurement locations that may interfere with radio communication, such as metal walls, water pipes/tanks, or appliances.

Does the location provide accurate representation?

Ensure that the locations chosen provide the most accurate representation for measurements. If, for example, you want to measure temperature for an air flow study, the most appropriate location for the measurement would be in close proximity to the airflow. You wouldn't want to make the measurement in a location where airflow doesn't exist or where dead spots occur, such as in the corners of a building.

Do you need a concealed, inconspicuous location?

Onset® has made every effort to design the network devices to be small, inconspicuous and tamperproof. If further security or concealment is required, the devices can be located in inconspicuous or hard-to-reach locations.

How often will measurements be made?

Determine the frequency requirements for each measurement. Some may need to be made more often than others.

Is power available at measurement location?

Determine power availability (120VAC) for each of the measurements. Only a node plugged into a wall outlet can route data from other nodes, which optimizes your network reliability.

Determining Equipment Requirements

With your site survey complete, you can make a list of equipment you need. As a general rule, it is best to start at the measurement sites (nodes) and work back to the receiver. Most nodes offer multiple channels, giving flexible measuring capabilities while using minimal equipment. Using the facility map, place nodes in each of the measurement locations and note if each node will be plugged into a wall outlet (which gives it routing capabilities) or if it will have to run on battery power alone (not recommended).

Device Types

The following table shows the different device types.

Device Type	**Icon** (in HOBOnode Manager)	**Functionality**
Receiver		The receiver is connected to a computer and receives data from nodes which it sends to HOBOnode Manager software.
ZW-Router		Routes data from router/nodes or nodes. Although the ZW-ROUTER has an internal temperature sensor, you should not rely on this for accurate temperature readings. Use this device for routing only.
Router/Node		A node which records sensor readings, and because it was initially powered by a wall outlet, can route data from other nodes. **IMPORTANT**: If a node appears as a router/node but is not plugged into a wall outlet when deployed, the batteries will be drained very quickly. See *Switching from AC Power to Battery Power* in the HOBOware Help for information.
Node		A node which records sensor readings and, because it was initially powered by batteries, cannot route data from other nodes. **IMPORTANT**: If this node is actually plugged into wall outlet and intended to be a router/node, you may have installed batteries before plugging it into the wall. See *Switching from Battery Power to AC Power* in the HOBOware Help for information.

Deployment Guidelines

Follow these guidelines when deploying nodes.

- **Maximum Distance / Line of Sight Restrictions**

  This system has been designed to communicate over distances up to approximately 150 - 300 feet. This is assuming there are no obstructions or interference and a direct line-of-sight between the communicating devices. Obstructions to radio communications can be overcome by strategically placing a router to relay traffic around the obstruction.

  The following table gives some general guidelines on the degree to which certain materials will obstruct your signal.

Materials	Degree of Attenuation *	Examples
Air	None	Open space, inner courtyard
Wood	Low	Door, floor, partition
Plastic	Low	Partition
Glass	Low	Un-tinted windows
Tinted glass	Medium	Tinted windows
Water	Medium	Aquarium, fountain
Living creatures	Medium	Crowds, animals, people, plants
Bricks	Medium	Walls
Plaster	Medium	Partitions
Ceramic	High	Tiles
Paper	High	Rolls of paper
Concrete	High	Load-bearing walls, floors, pillars
Bulletproof glass	High	Bulletproof windows
Metal	Very high	Reinforced concrete, mirrors, metal cabinet, elevator cage

* Attenuation is the gradual loss of signal intensity when passing through a medium.

- **Network Self-Healing and Restoration**

  The self-healing, restorative nature of a mesh network allows it to recover if a node becomes inoperable. If nodes were routing data through a lost node, they will automatically search for a new node to act as a router to the receiver.

  Ensure that if any one of the nodes in your network becomes inoperable, there is another node within range to take over routing for that node. Rearrange the nodes or add new ones if required.

Wall Placement

If you cannot get a connection to the receiver when deploying a node in your desired location, try repositioning the node, as shown in Figure 1.

A. Move the node side to side and up and down until you make a connection to the receiver.

B. Try turning the node on its side, pointing towards receiver or router/node.

C. Try placing the node on a different wall in the room.

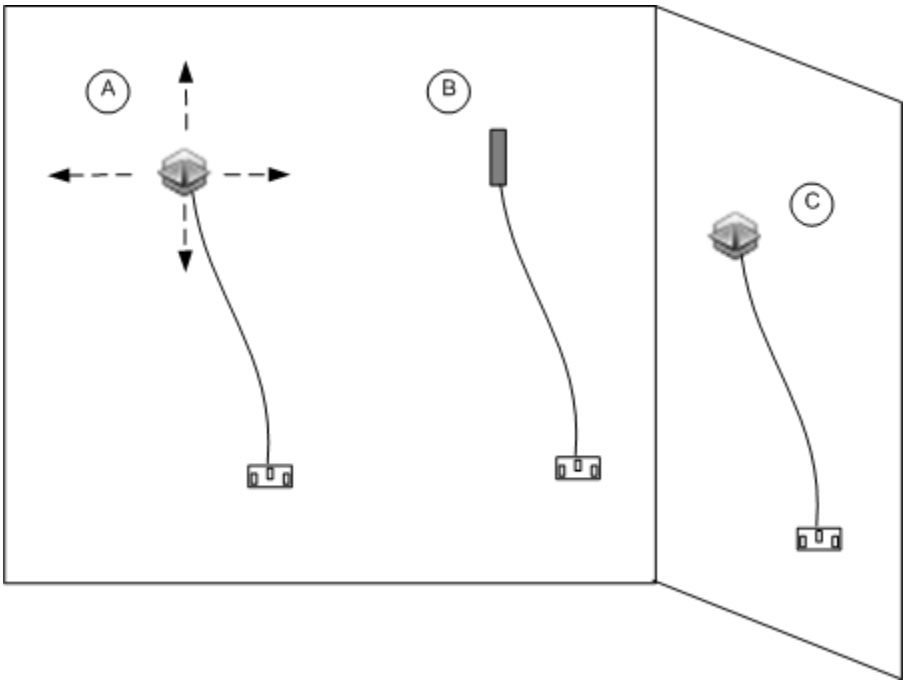

Figure 1: Placing a Node on a Wall

Basic Setup

Figure 2 shows an example of a basic setup where all nodes are plugged into an AC power outlet (recommended) and there are no obstructions. Data from some nodes may pass through other nodes to reach the receiver.

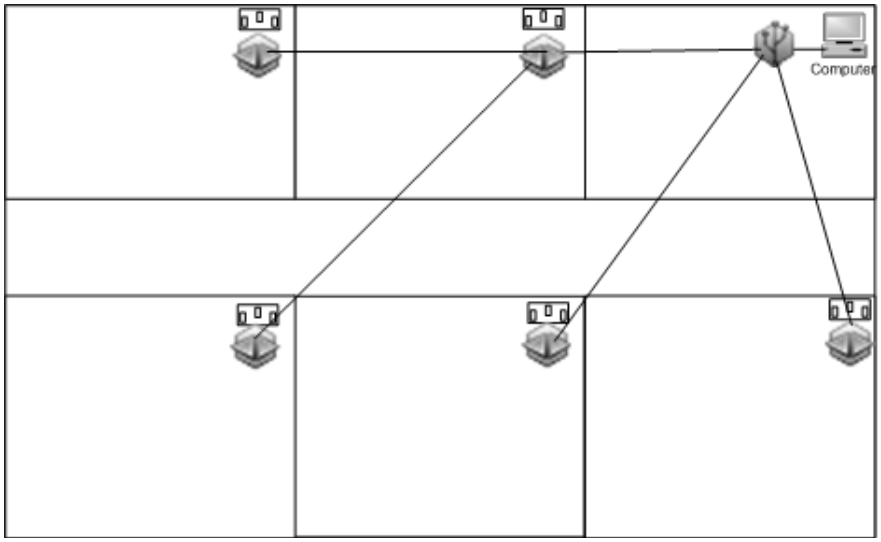

Figure 2: Basic Setup

Overcoming Obstructions

Figure 3 shows a scenario where there are some obstructions between some nodes and the receiver. Node A is placed in a position so that it can connect to the receiver (through node D), and also route data from nodes B (behind a metal door) and node C (behind an elevator shaft), which are obstructed from connecting directly to the receiver.

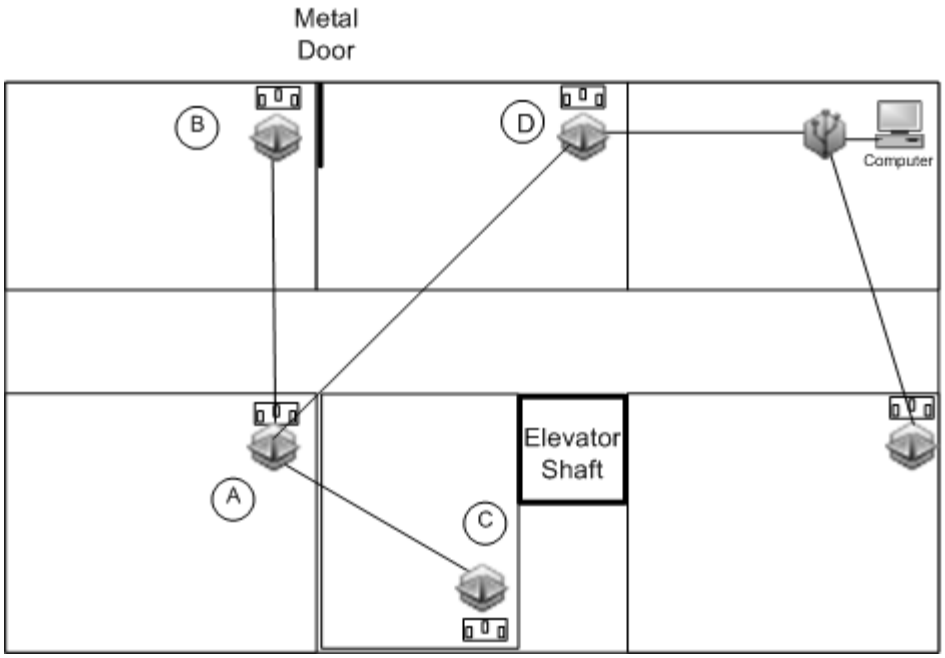

Figure 3: Overcoming Obstructions

Overcoming Distance Limitations

Figure 4 shows a scenario where nodes A and B cannot connect to the receiver due to distance.

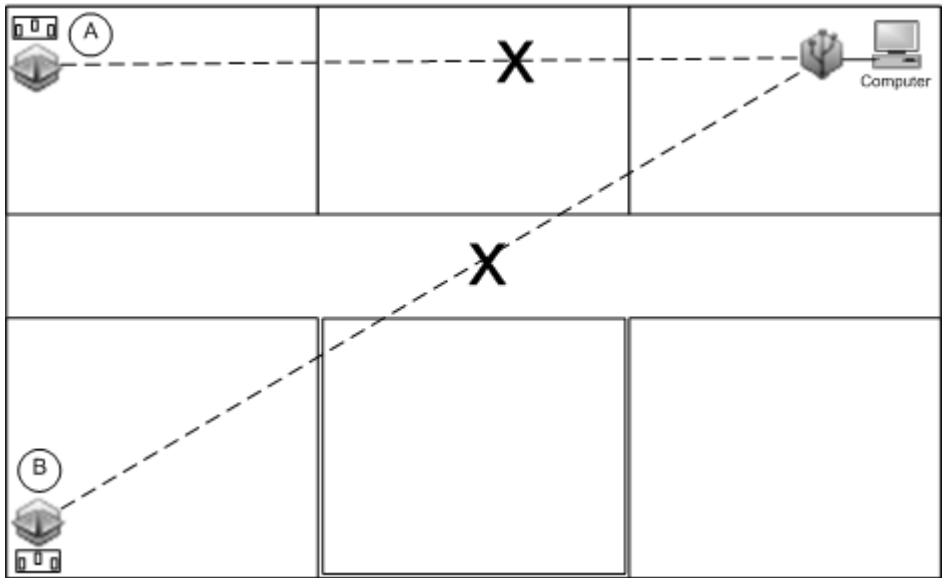

Figure 4: Nodes Cannot Connect to Receiver

Figure 5 shows a ZW-ROUTER added specifically to route data from nodes A and B to the receiver. When you add a ROUTER, position it to maximize the number of nodes it can connect to. Add additional ZW-ROUTER(s) if needed.

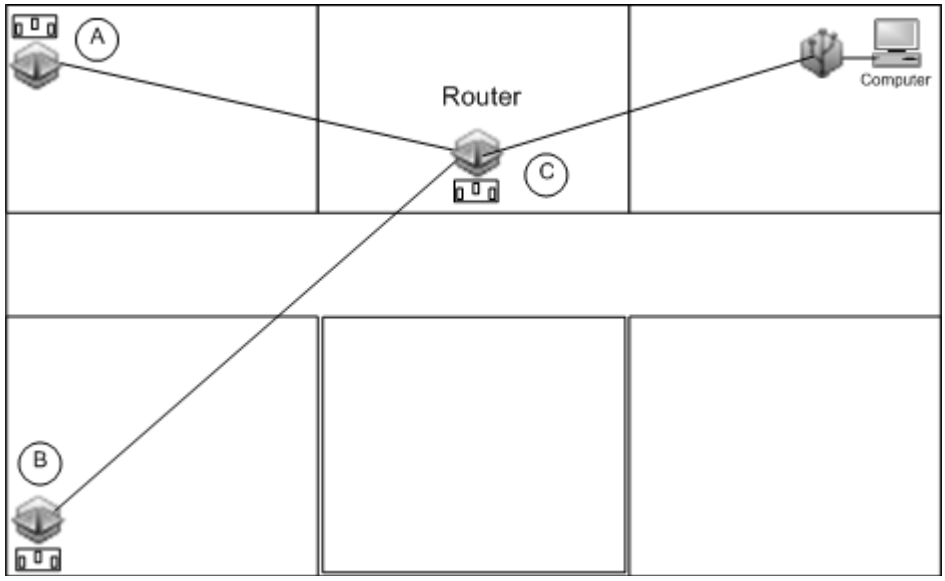

Figure 5: Adding a Router

Backing up a Critical Node

In Figure 6, node D is in a critical path between 3 other nodes and the receiver. If node D goes down, nodes A, B, and C will have no connection to the receiver.

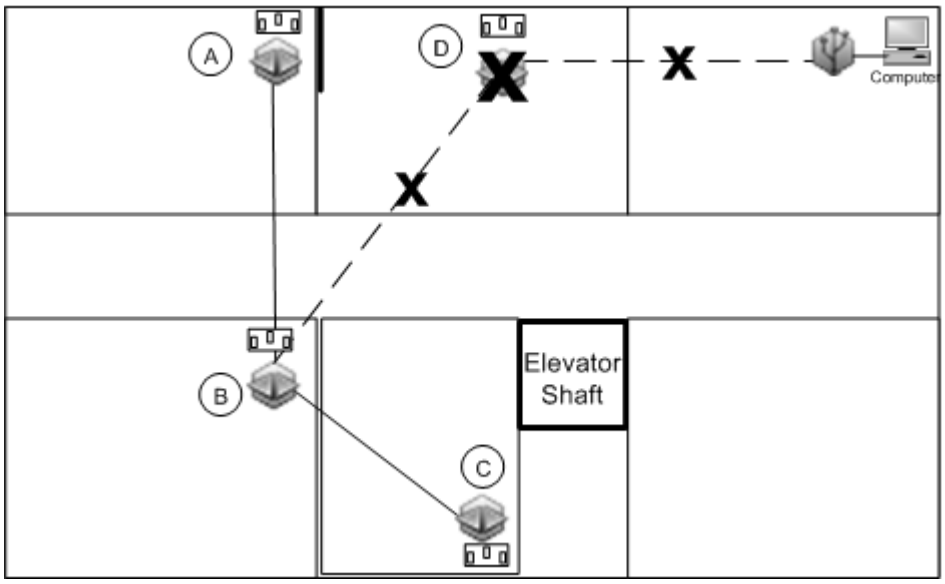

Figure 6: No Redundancy

Figure 7 shows how you can add a router/node (Node E) to a critical spot in the network to overcome the loss of a node. If node D goes down, node E will continue to route data from nodes A, B, and C.

Although you want to mount the backup router in the same general area as the primary node so that you can connect to all of the remote nodes, you don't want to put it in the exact same spot as the primary node in case the cause of the lost connection is a signal obstruction that would affect both nodes.

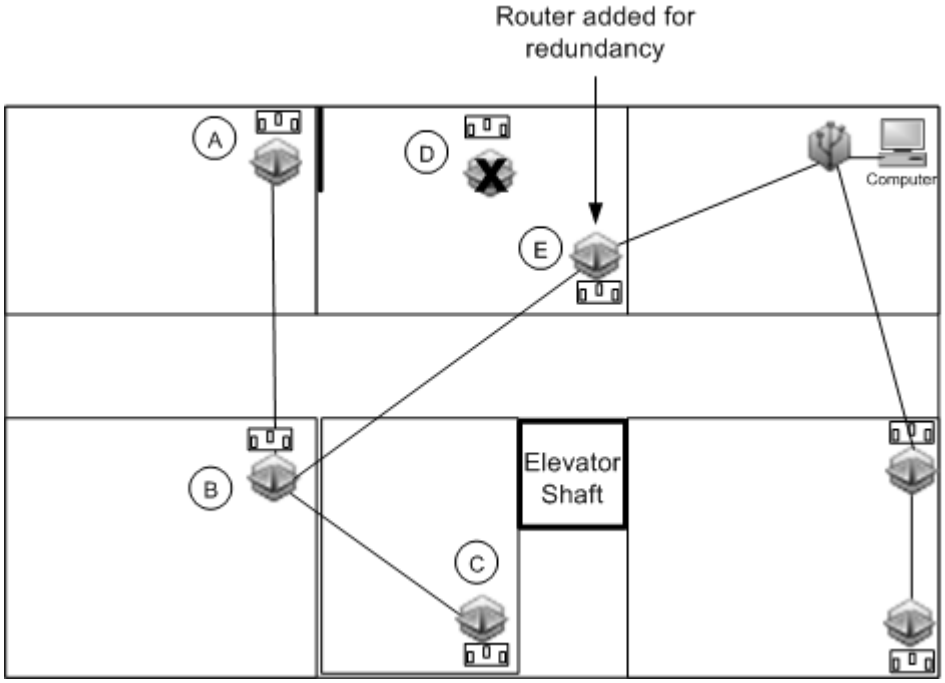

Figure 7: Redundancy

Automatic Rerouting

If a node loses its signal, a node routing though it will automatically search for a new route to receiver. In Figure 3, Node A was routing data through Node B. When Node B loses communication with the receiver, Node A automatically searches for a new path and routes data through Node C.

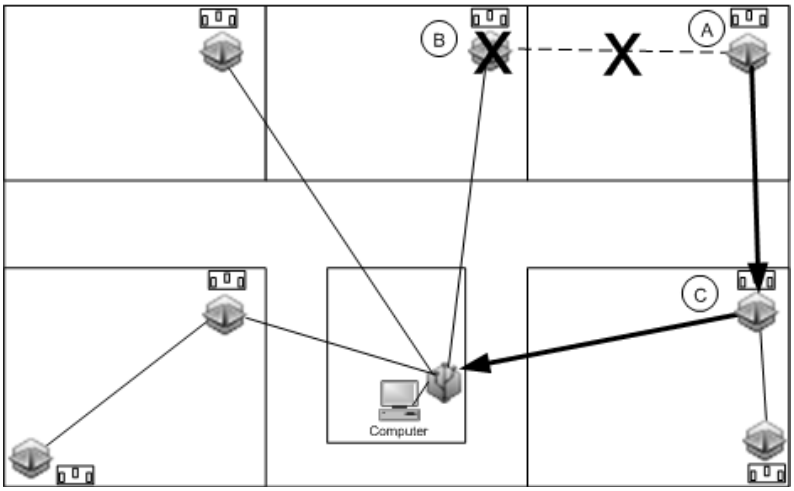

Figure 8: Automatic Rerouting

Non-Routing Nodes

Figure 8 shows a scenario where you have a node running on battery power only, and therefore cannot route data from other nodes.

If node D was plugged into an AC power outlet, it would be able to route data from nodes A, B, and C, which otherwise cannot connect to the receiver due to distance or obstructions. As node D cannot route data, nodes A, B, and C have no path to the receiver and you will need to install an additional router/node.

Onset strongly recommends that you power all nodes using AC power to maximize the routing capabilities of your network.

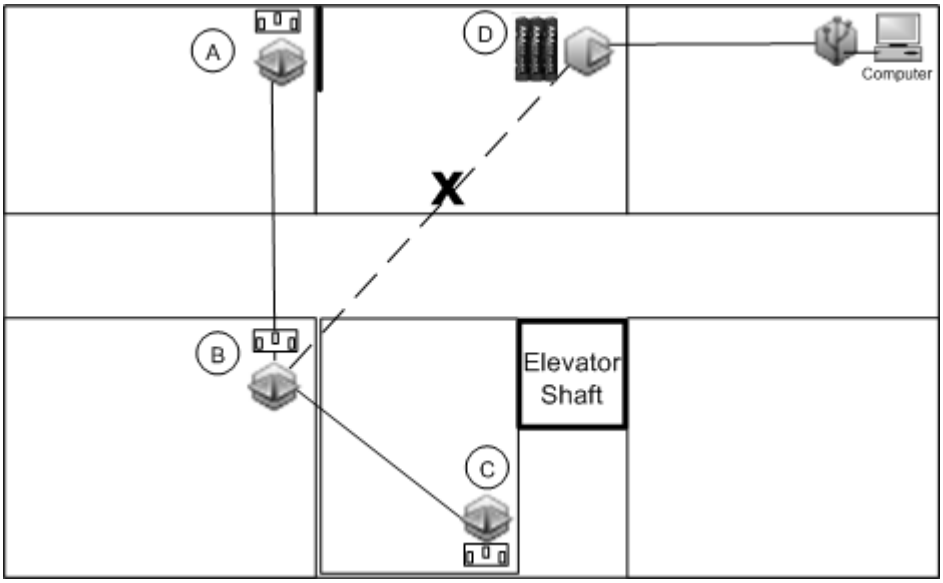

Figure 9: No Routing on a Node

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