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The difference between can and will! ™

williamsrdm

WilliamsRDM, Inc. START™ Sensor Network

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ISO9001:2008 / AS9100:2009 Certified
SBA Tibbetts Award Winner
Subcontractor of the Year / Lockheed Martin
Certified Supplier / The Boeing Company
Best Value Gold Medal / DSCR
Texas Family Business of the Year / Baylor University
SBA Administrator's Award for Excellence

Contents

1 General Company Information

WilliamsRDM is a woman-owned small business located in Fort Worth, Texas, which designs and manufactures military grade automated test equipment, cable assemblies, connectors/adapters, electronic hardware, and sensor systems. We have decades of experience in all phases of electrical, mechanical, and software design—performing innovative engineering research, design, and new product development and manufacturing in Fort Worth, Texas, since our founding in 1963.

WilliamsRDM is a complete turn-key operation; all manner of business—from fabrication and assembly to design and engineering—are conducted in-house. WilliamsRDM is registered to the ISO 9001 and AS9100 quality management standards.

WilliamsRDM has held a 100% rating in quality and on-time delivery to the government for multiple consecutive years. We have also received numerous other recognitions from government and industry over the years for our exceptional quality and delivery, including being certified as a Boeing Preferred Supplier, being named a Gold Medalist in the DSCR Automated Best Value System, winning the SBA Administrator's Award for Excellence, and being recognized by Lockheed Martin Rotary and Mission Systems (RMS) as a Small Business Subcontractor of the Year in 2008 and again in 2011. Our company was awarded the U.S. Small Business Administration's coveted Tibbetts Award. The award honors small businesses for excellence in technological innovation and economic stimulus. These awards and recognition attest to our company's experience and expertise in developing and delivering quality products. Most recently, WilliamsRDM was awarded the Boeing Performance Excellence Award (BPEA) for 2014. Our company was among only 119 suppliers that were awarded the Gold level of recognition.

WilliamsRDM is a financially secure, profitable, and diversified small business that has been in business for over 50 years.

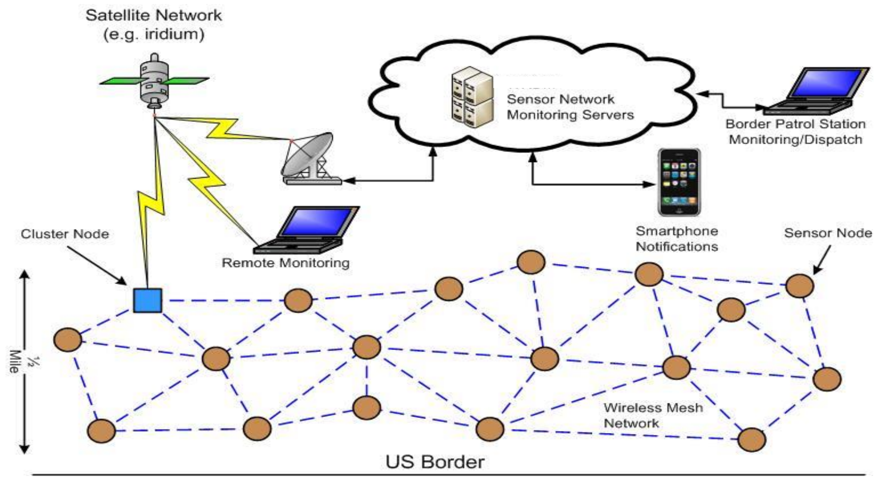
2 START™ Sensor Network

System Overview

The WilliamsRDM START™ Sensor Network (**Figure 1**) for border security is a low power wireless mesh network intrusion detection system consisting of sensor nodes, cluster nodes, and a server application. The system is deployed in a rough grid pattern 1/4 to 1/2 mile deep along the border, with nodes spaced approximately 100 meters apart. One mile of border would require 150 to 200 sensor nodes and 2 cluster nodes.

The sensor and cluster nodes incorporate a suite of sensors to detect border intrusions by people or vehicles as well as integrated GPS to precisely locate intrusions. The sensor nodes form a wireless mesh network to communicate to one another and to the cluster node. The cluster node sends data to the server application through satellite or other long range RF links. The server application is responsible for further analyzing and then presenting node and intrusion location information via a web based map enabled Graphical User Interface (GUI) to border patrol personnel.

The difference between sensor and cluster nodes is that cluster nodes have additional processing capability to communicate and analyze data from up to 200 sensor nodes; as well they have higher power radio transmitters for longer range satellite/RF communications to the server application and/or directly to border patrol personnel. Sensor nodes detect intrusions by changes in Radio Frequency signal strength between nodes, augmented by other sensors on each node, and a multi-tiered filtering algorithm to eliminate false detections. As the server application GUI is web based, any device that has a browser and has access to the internet can securely view information.



*** The START™ Sensor Network System is designed to comply with FCC Part 15 section 15.247 as an unlicensed system**

Figure 1 – START™ Sensor Network Architecture

The unique advantage of the START™ Sensor Network system is its ease of deployment, low cost (90% less than a physical wall), and its inherent reliability due to its use of a wireless mesh network. Nodes do not have to be manually placed when deployed. Each node is rugged enough to be deployed by ground or air. The system is designed to use very little power, requiring only batteries and small solar panels. All electronics and batteries are potted within a sealed enclosure with no openings and there are no moving parts, thus no maintenance of the deployed nodes is required. With no maintenance and using solar power, each node has a multi-year deployment life. The system uses a very simple Radio Frequency "trip-wire" capability, augmented with other sensors, to detected intrusions and uses a multi-tiered configurable filtering system to eliminate false detections. Each node self-activates upon deployment; each node turns themself on upon impact and begins communicating automatically with the rest of the network, to the backhaul communications link, and to the application server. As the system is deployed in a rough grid pattern 1/4 to 1/2 mile deep along the border and consists of a wireless mesh network, there is sufficient sensor density to provide multiple communication paths for RF "trip wire" detection, thus if one or more sensor nodes is damaged or destroyed, there will be no gap in the networks ability to detect intruders. The system may be deployed along the entire length of the border, or it can be deployed to augment physical walls and/or be deployed in areas where it would be difficult or cost prohibitive to build a physical wall. As it is made up of a wireless mesh network which transfers sensor data to monitoring servers, it can serve a dual use function of monitoring weather, the environment, air quality, or anything that one could monitor with sensors deployed to communicate through the network.

Server Application

The START™ Server Application is a web server based software program that communicates with the START Sensor Network through satellite or other long range RF links and displays node and intrusion detection location information on a map enabled web page. Sensor and cluster node GPS information is used to graphically display each node on the map in its deployed location (**Figure 2**). Lines between sensor nodes depict the RF "trip wire" between each node. If an intrusion is detected by sufficiently changing the RF signal strength between nodes, the lines between the nodes will change color to visually see where the intrusion has been detected on the map. If an intrusion is detected by other sensors on a sensor node, the sensor node graphic will change color and bounce in place to identify the location of where the intrusion has occurred on the map. In addition to visual indicators, a log with GPS location, node information and date and time stamp of detections are displayed.

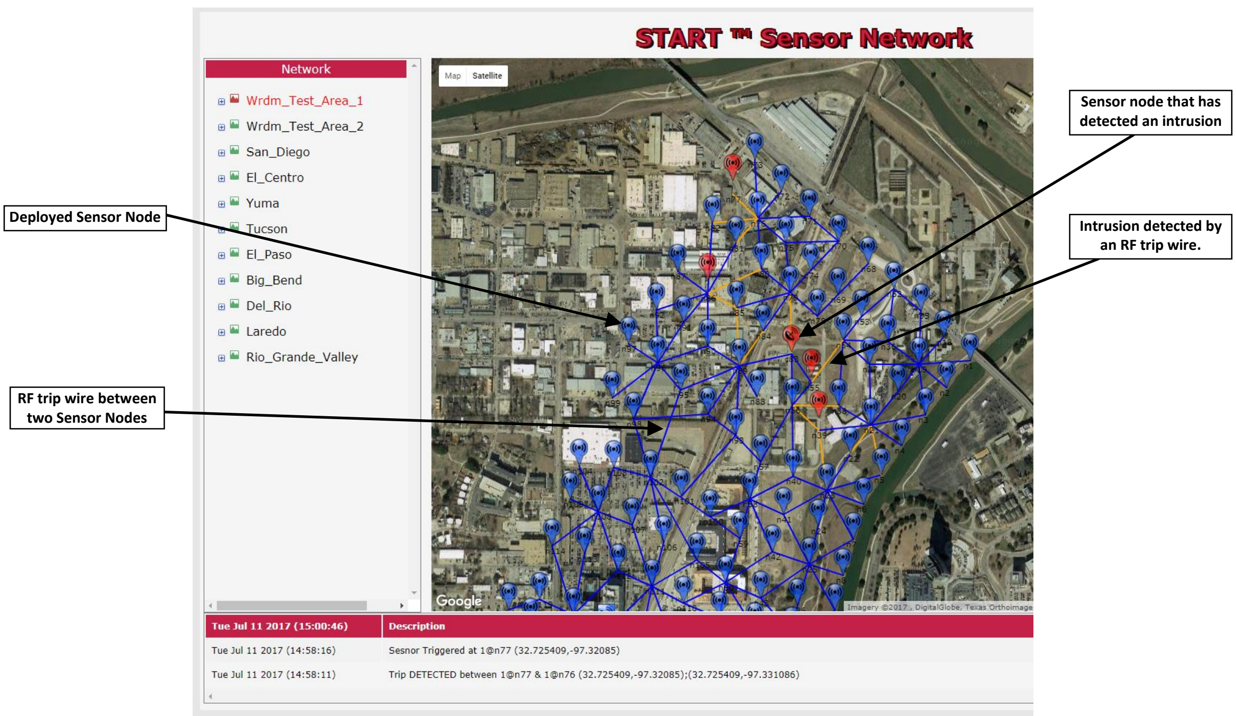


Figure 2 – START™ Server Application Graphical User Interface

The START™ Server Application has the ability to geo-fence areas on a map to reduce the sensitivity of alarms in that area due to known friendly activity (farming, cattle, etc.), but increase the sensitivity of detections going into and out of the area. Or, the geo-fenced area could be identified as a "hot spot" of increased surveillance, and the sensitive inside the geo-fenced area could be increased to ensure all activity is alarmed quickly. In addition, geo-location based alerts can be configured such that if intrusions are detected within a certain radius around a border patrol agent, SMS text messages can be sent directly to the agent with the location of the incident for a quicker response. Historical intrusion information may be archived and available for viewing graphically on a map in time-lapse mode to identify intrusion patterns to ensure resources are focused in critical areas. An Over The Air (OTA) software download capability is available to update deployed sensor and cluster nodes to minimize maintenance costs and provide the ability to deploy software enhancements after nodes have been deployed.

Packaging

Sensor and cluster nodes are designed to withstand the harsh environments of the border between the U. S. and Mexico (temperature cycles of extreme heat and cold, rain, sleet, snow, etc.). All electronics are completely potted to withstand air and vehicle deployment. The sensor node (**Figure 3**) is designed to be self-righting. It weighs 1 lb. and is 4.5 in. wide by 3.9 in. tall. The top half is made of a transparent polycarbonate with a UV inhibitor to allow sun through to the enclosed solar panel.

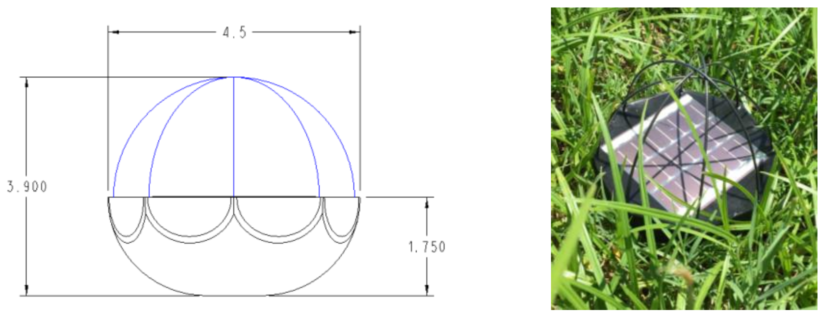


Figure 3 – START Sensor Node

The START cluster node (**Figure 4**) is larger due to needing larger solar panels as it requires more power for longer range RF communications. It weighs 3.5 lb. and is 12.8 in. long by 9.5 in wide by 2.3 in. thick. It is designed with solar panels on each side so it does not matter which side is facing up. It is also designed to fall on one side or the other so one solar panel is facing up.

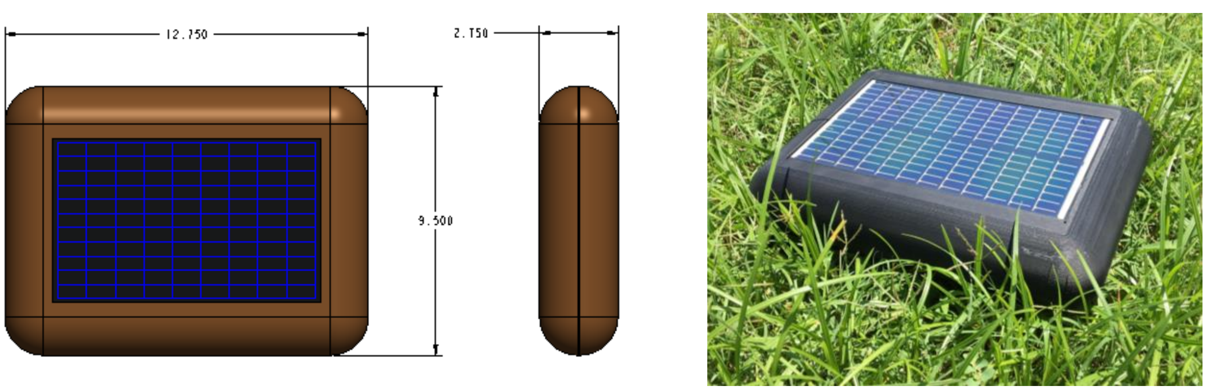


Figure 4 – START Cluster Node