Wireless Data Acquisition & Monitoring System for Green Power Generating Sources

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Students assisted with the project

Program: **Wireless Telecommunications Graduate Certificate Program**

Background and Problem:

Kortright Centre, a part of Toronto Region Conservation Authority, showcases sources of renewable green electrical power generated, using panels of photovoltaic cells and wind turbines. Nine sites at the centre produce AC power using inverters, and status-related data such as voltage, power, temperature, humidity, etc using equipments like sensors and data-loggers. These data from all the sites need to be collected to a central location, called Archetype House. However, so far, none of the nine sites, which are geographically dispersed in an area of about 325 hectares of pristine woodlands, were networked. Kortright Centre joined hands with Humber Institute of Technology to design and develop network architecture for remote data acquisition. The Humber group working on the project selected three nodes at different locations and designed a wireless networking solution that would transmit the status data generated at these sites and retrieved at Archetype House. Collected data would then be stored in a server at the Archetype House or be displayed on a web page, shown in Figure 1. The group working on the project had to consider numerous options for data acquisition and transmitting network. The group then selected the most economical solution approved by the client - Kortright Centre.

Solutions:

One of the challenges was the terrain at the Kortright Centre. Wireless networks require either very high power wireless bridge routers for this type of terrain using omni directional antennas to transmit and retrieve data or low power wireless bridge routers

with directional antennas. Of the number of options with respect to the hardware interface, Kortright Centre approved the data logger manufactured by the manufacturer of the inverter. Data logger had number of interfaces with different sensors that would acquire data from inverter, solar panel or wind turbine and convert them in TCP Ethernet format. The group working on the project calculated the link power budget to match the radiation pattern lobes of the selected directional line-of-site patched antenna and the omni directional patched antenna. This optimized the data transfer rate between the two wireless bridge routers. One of the wireless bridge routers was connected to the output of the data logger and it transmitted the data through a directional patched antenna at the top of the building. The second wireless bridge router and the omni directional patched antenna were installed at the Archetype House where the transmitted data was retrieved from all three locations, as shown in Figure 2. This data was displayed on the web browser using customized web application that supports the data logger.

Conclusions:

The group successfully completed the wireless network to retrieve the real time data from the renewable electrical power generators located at three locations. This data was displayed on the web browser and would be used for the optimal green electrical power generating environmental conditions in the future.

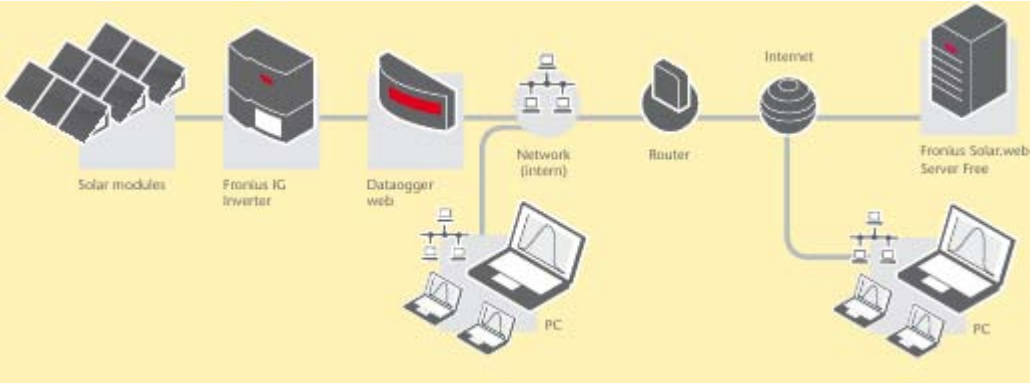

Figure 1 Architecture of data acquisition and display network

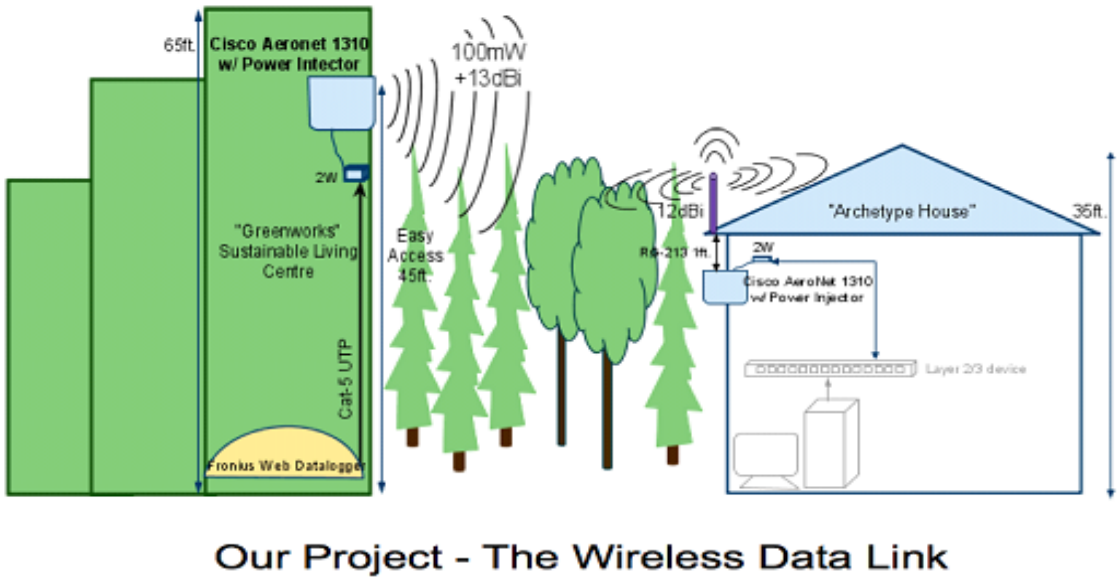

Figure 2 Wireless data network from Sustainable Living Centre to Archetype House