



A Case Study on Cranberry Bog Automation, Control, and Monitoring



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About

ioBridge, Inc. (www.iobridge.com) offers technology and services that enable almost anything to be monitored and controlled over the Internet. ioBridge's technology includes a Web services commercial integration services and licenses its core, patent-pending technologies.

Business Situation

Dan Luechauer and Linda Letourneau own a cranberry bog on Cape Cod. In order to protect their cranberries from frost damage in the spring, they use a sprinkler system to spray water on their plants to prevent cold air from damaging or ruining the crop for the entire year.

Dan and Linda had to monitor the frost forecast and, if frost was predicted, had to travel to their bog to switch on the sprinkler system to run overnight. Since weather forecasting is an inexact science, their sprinkler system often ran unnecessarily, wasting water and cutting into their time and profit.

The Massachusetts Department of Agricultural Resources offers an Agricultural Environmental Enhancement Program (AEEP) that provides grants of up to \$30,000 to support the mitigation and/or prevention of negative impacts to natural resources that may result from agricultural practices such as wasting water. Dan and Linda were aware of the AEEP and sought a way to participate.

In addition to being a cranberry farmer, Dan has control systems experience and wanted a way to control and monitor their sprinkler system remotely. They also wanted to turn it on automatically when the temperature approached the frost point. In 2010, Dan and Linda started looking for a cost-effective and easy-to-implement system that would meet their needs and potentially qualify for an AEEP grant. After looking at a number of rather expensive solutions, Dan and Linda decided to tailor ioBridge's general purpose solution to meet their needs due to its flexibility and cost-effective price point.

Technical Situation

Dan and Linda had an irrigation system already in place, which included an irrigation and priming pump and a standard pump control system. Dan and Linda were also able to maintain an Internet connection at the pump house adjacent to the cranberry bog.

Dan had a clear idea of their requirements and sent ioBridge the high-level logic diagram shown in Figure 1.

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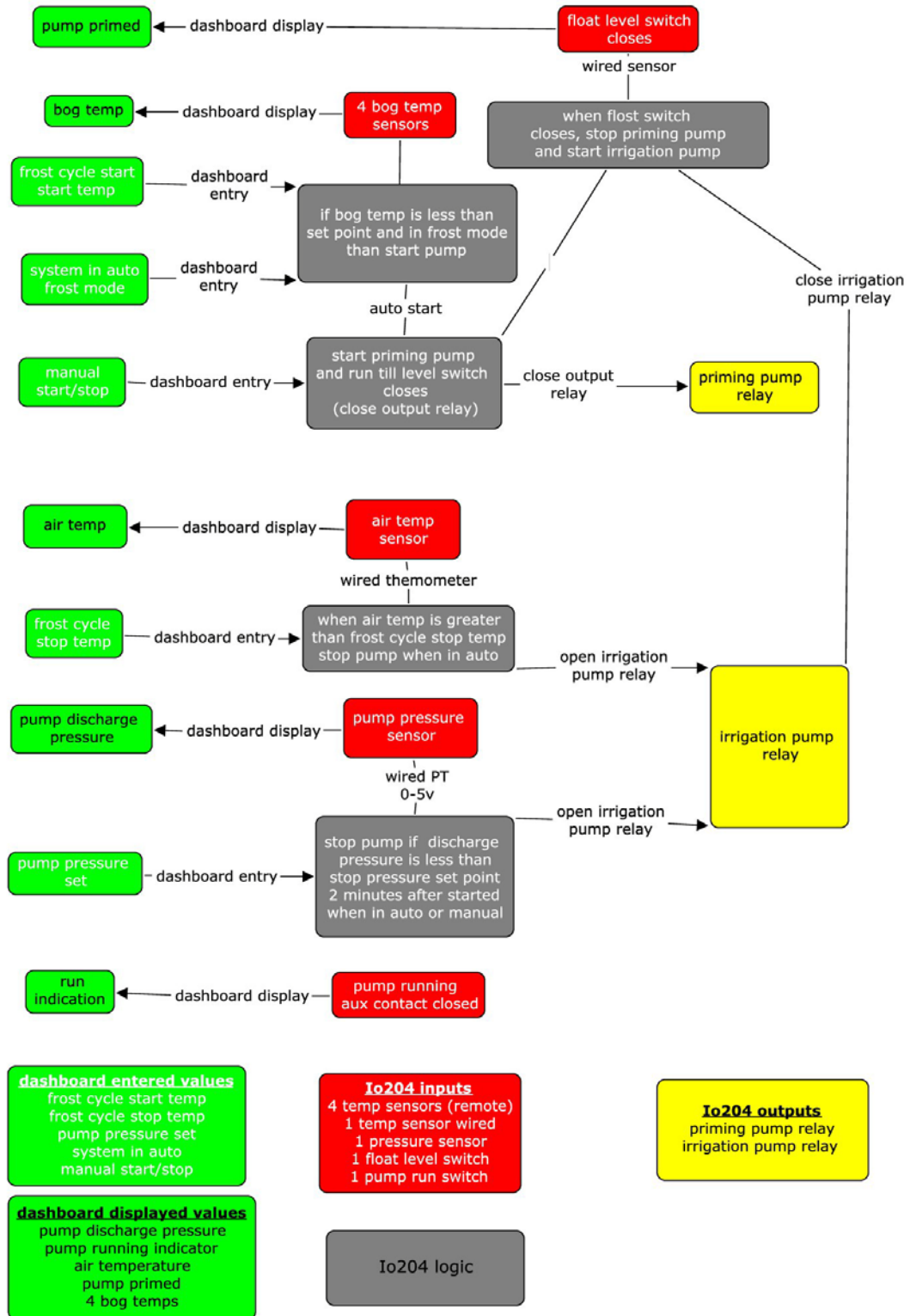


Figure 1: Cranberry Bog Control and Monitoring Logic

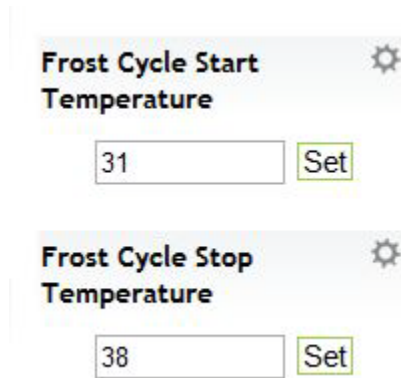
In essence, what Dan and Linda wanted was a system that wirelessly measured temperature at four locations throughout the bog and turned on and off the sprinkler pump to keep the cranberry plants from freezing. Dan and Linda also wanted to control and monitor the bog remotely over the Internet, receive email alerts, and remotely configure temperature set points.

Solution

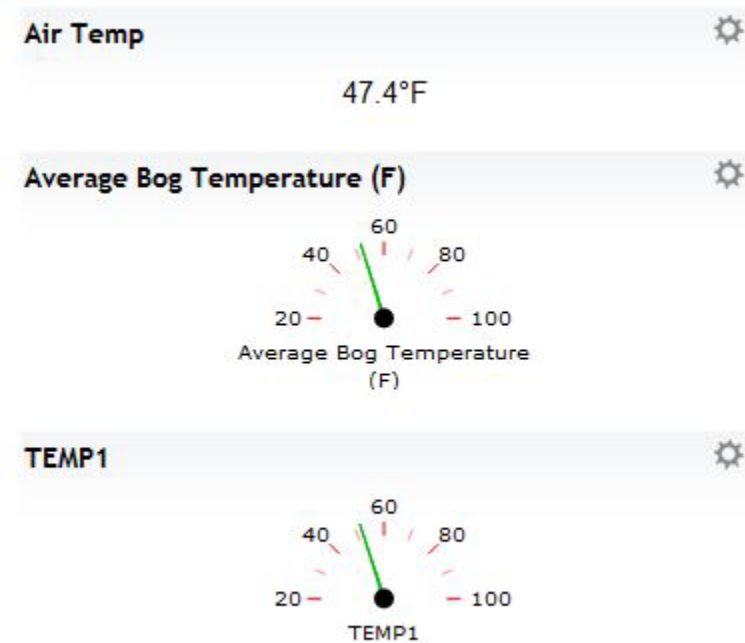
ioBridge reviewed Dan and Linda's requirements and determined that they could be met by ioBridge's standard technology and its Web-based wizards. The solution would not require any custom coding.

For the initial implementation, two IO-204-PRO modules were used: one to monitor the temperature in the bog, and one to control the priming and irrigation pumps. In addition to the two modules, ioBridge provided Dan and Linda with four ioBridge XBee wireless sensors to be placed at four different locations in the cranberry bog. ioBridge's Onboard Rules and Actions, Expression Builder, and dashboard widgets were used to implement the functionality outlined by Dan and to create a dashboard tailored to their needs.

One of the ioBridge modules was used along with the four wireless temperature sensors and set an output high when the temperature of any wireless sensor dropped below a *Frost Cycle Start Temperature* specified using a widget on the dashboard. The output was reset when the *Frost Cycle Stop Temperature* was met.



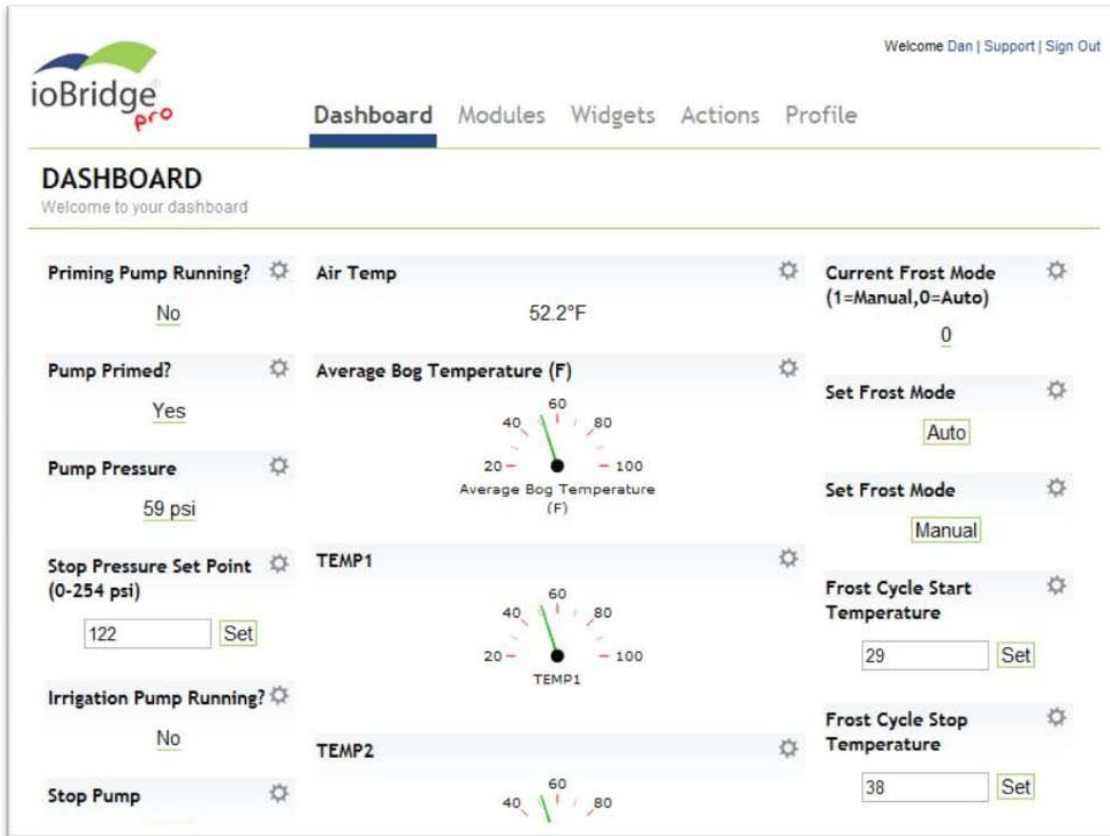
In addition to the ability to create set points, gauge widgets were placed on the dashboard to monitor bog temperature. The four bog temperature sensors were labeled TEMP 1 through 4.



The second ioBridge module was used to control various irrigation pump functions. This included the ability to set the system in automatic or manual mode, to monitor pump settings, and to control the pump remotely. Some of the dashboard widgets for these functions are shown below.

The figure shows a collection of dashboard widgets for pump control. On the left side, there are four widgets: "Priming Pump Running?" with a "No" button, "Pump Primed?" with a "Yes" button, "Pump Pressure" showing "62 psi", and "Stop Pressure Set Point (0-254 psi)" with a text input field containing "122" and a "Set" button. On the right side, there are three widgets: "Irrigation Pump Running?" with a "No" button, "Stop Pump" with a "Stop" button, and "Start Pump" with a "Start" button. Below these is a "Pressure RAW set point" widget with a text input field containing "122".

A snapshot of a portion of the dashboard, images of the IO modules in a plastic enclosure, and images of the four wireless temperature sensors are shown below. Note that the plastic enclosure includes room for expansion.



Benefits

ioBridge provided an integrated end-to-end solution that was easily interfaced with existing equipment. The ability to use Web-based wizards rather than having to write custom software also provided Dan and Linda with the flexibility to modify and improve their system without having to ask for professional help. For example, Dan and Linda purchased a third ioBridge module and was able to add their own time-delay features.

For less than a third of the cost of competitive offerings, Dan and Linda obtained an adaptable and effective monitoring, control, and automation system that saves water and makes it much easier to manage their bog. The solution also enabled them to qualify for an AEEP grant.

Products and services used in this project

Quantity	Item
2	IO-204-PRO modules
4	ioBridge XBee wireless sensor
1	IO-204-PRO XBee daughterboard
1	Polycarbonate enclosure
1	ioBridge consulting services