iBuoy

Datawell - Oceanographic Instruments

iBuoy for Iridium and GSM Internet
Connect your buoy to the Internet through Iridium or GSM and update to full data mode using iBuoy software.

Introduction to Iridium

Iridium is a satellite based cellular phone network. It is built upon a constellation of 66 low earth orbit (LEO) satellites. The constellation is organized in such a way that every part of the globe is covered 24 hrs a day. This makes Iridium the only truly global network that is able to deliver voice, sms and 2400bps data services anywhere in the world. Iridium gets its name from the element Iridium (Ir), which has an atomic number of 77. This name was chosen because the constellation was initially supposed to be built using 77 satellites.
Iridium is designed for use with handheld, hence low power, telephone sets. These properties (global coverage, data service, low power) make Iridium very suitable for buoy data communication applications.

Introduction to GSM

"Today's second-generation GSM networks deliver high quality and secure mobile voice and data services with full roaming capabilities across the world. In less than ten years since the first GSM network was commercially launched, it became the world's leading and fastest growing mobile standard, spanning over 210 countries." (source: GSM world).

GSM is mostly used for wireless communication on land. However the coverage maps show that GSM coverage extends many kilometers out to sea. Experiments on the North Sea demonstrated reliable communication over distances more than 10 Km. This makes GSM a good data link alternative for buoys that are close to the shoreline.

Application

A Datawell Waverider equipped with Iridium or GSM can send data directly to a computer using the Iridium or GSM network and the internet. As long as the internet connection is up, any (practical) amount of data can be transmitted. This gives access to the following data:

- Spectral data of half-hour blocks of wave data (compressed or full spectrum).
- Spectral parameters.
- System parameters.
- Logged data files, including raw displacement files.

The ability to download logged data is ideal to "zoom-in" on certain time frames. If the periodically transmitted spectral data shows that something interesting happened during a certain period, the raw displacement data of that period can be requested from the logger for further analysis. Because the internet is a two-way communication medium, it is also possible to remotely control the buoy.

How it works: iBuoy

Inside each GSM or Iridium equipped Waverider, there is essentially a normal modem. This modem functions much like a normal PC modem. With a PC modem, a computer can "dial in" to the internet. With a GSM or Iridium modem, a buoy can dial in to the internet! To be able to do this, the buoy's firmware talks all the necessary internet protocols like PPP and TCP/IP.

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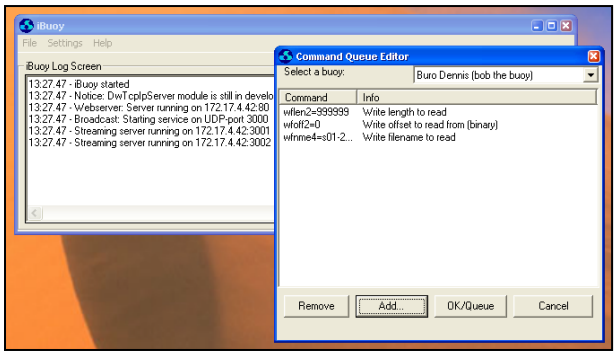
Once connected to the internet, the buoy will connect directly to the destination computer. The destination computer (which is permanently connected to the internet) runs a W@ves21 module called iBuoy. iBuoy is like a small “server” that accepts connections from the buoy. iBuoy handles all further communication completely automatically; it will download the requested data (spectral data, parameters, logged files) from the buoy and upload new commands to the buoy.



To save power and costs, a connection session is only set up by the buoy at programmable transmission intervals. Each session is kept as short as possible (typically around 60 seconds for Iridium and 30 seconds for GSM to set up a connection and download spectral data). The modem is switched off during the rest of the time to keep the power consumption as low as possible. The transmission interval is programmable from 0.5 to 24 Hrs in steps of half an hour. This gives a range of 1 to 48 sessions per day.

Requirements and costs

Because of the way iBuoy works, it is necessary that the computer running iBuoy has a direct connection to the internet. Additionally, the computer must have a listening port available on the internet. The listening port is necessary because iBuoy acts as a server to which an Iridium equipped buoy connects. Typically, this setup is realized by using a broadband internet connection and a router/gateway. The router handles the forwarding of the listening port to the computer running iBuoy.

The operating costs depend mainly on the chosen transmission interval and the amount of data that must be downloaded. As iBuoy is very flexible in this department, a cost overview of 2 possible examples for Iridium is given here:

- **Full spectrum download every half hour.** In this example, a full spectrum is downloaded every half hour. A session of this type takes about 60 seconds. At a typical Iridium rate of $1.30*, this amounts to about $62.40 per day. This mode is useful when the data must be available in realtime.
- **Compressed spectrum download every 3 hours.** In this mode, connection is made every three hours. The 6 compressed spectra of the previous 3 hours are then downloaded in one single session. Downloading of 6 compressed spectra takes about the same transmit time as downloading a single full spectrum, but it only needs to be done 8 times per day. At a typical Iridium rate of $1.30*, this amounts to about $10.40 per day. This mode is useful when a delay of several hours is acceptable.

The operating costs for GSM can be calculated using the same method, but for GSM a typical session duration of 30 seconds can be used.

As can be seen from these two examples, operating costs are variable and can be tailored to the specific requirements of the application. The transmission interval and download tactic can be changed on the fly through the iBuoy software so that the operating costs can be adapted to the current requirements

(*) Actual Iridium rates may vary

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