Making waves in marine telemetry

With climate change leading to unforeseen weather patterns, the need for reliable 'just in time' environmental data becomes ever more pressing. John Pepper outlines a development in marine telemetry that ticks all the right boxes

Traditionally, environmental data such as tides, currents and met-ocean conditions have been easily telemetered.* However, the challenge of using this technology has grown along with the vast array of other environmental data being transmitted and received.

The requirement for 'just in time' environmental data is increasing globally, so the speed of transmitting data (latency) has to reflect the expectations of the customer. For example, tide and wind data required by a Vessel Traffic Service (VTS) control system will call for accurate, near real-time data in order to bring very large ships safely into port. This is especially so where environmental conditions leave little margin for error (see Fig.2 facing page).

Reliability in transmitting and receiving data is also important. We need to be sure that data is going to be received successfully. Mechanisms are needed to ensure the data can be re-sent if failure occurs, and can continue to do so until successful. The cost of transmission should be proportionate to the requirement, so if the need is 'safety critical', then more redundancy in the technology will be needed.

Power supply at sites, many of which are remote and subject to extreme conditions, is a major consideration. Batteries or solar panels or wind generators can make equipment selection challenging.

Fig.1: The ip.buffer

The ip-buffer 'Smart' Telemetry Unit

In order to meet the expectations of its extensive Ports and Harbours and Energy and Telecoms customers, OceanWise has developed a unique solution to all of the above considerations. The ip.buffer (Fig 1) has been adapted with our UK partner from use in the worldwide telecommunications sector to meet the needs of both marine and terrestrial environmental monitoring requirements.

The ip-buffer is a combined data logger and Remote Telemetry Unit (RTU) that stores and transmits data. It is scriptable (programmable) meaning that latency of the information can be controlled (e.g. sending wind gust data every five seconds, or tide data measurement every 30 seconds)

The modem has been tested in marine and other harsh environments and has proved to be a most reliable communication and buffering device with zero or minimal data loss. It allows for acquisition of data from multiple IP and serial-based sources and is available in one or four-port versions.

A wide range of storage options allows the direct acquisition of data from a range of sensors. Having numerous protocols built into it as standard, the ip-buffer can transmit data as FTP, e-mail, HTTP, or TCP depending on the supplied end receiver.

Data is compressed prior to transmission, thereby reducing costs. Its bi-directional mode of operation means it can also be used as a receiver, thereby saving field time and cost in having to physically access the unit in-situ. It embodies the latest internet network security features and is continuously maintained to keep abreast with changes as they are released.

Depending on the protocol used, the ip.buffer has a near-100% guarantee of transmission. In the rare event that a transmission fails (e.g. the signal cuts out, or a cable is removed in a server room), the ip.buffer will re-transmit at the next opportunity (i.e. when the signal returns or the cable is reinstated). It can also provide complete remote access, both to itself and the attached instruments so they can be changed and/or updated as required.

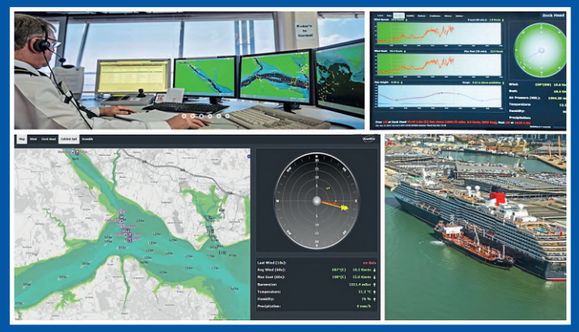

Fig.2: Environmental monitoring dashboards at the Port of Southampton

Fig.3: Port-Log in Port of London VTS

The importance of reliable data

There is an overarching requirement for clarity so that port and harbour authorities, coastal/ offshore engineers and scientists can keep abreast of ever-changing environmental conditions and can respond accordingly in real or near-real time.

Marine vessels are becoming larger carrying more passengers or cargo and operating within ever tighter margins (e.g. under keel clearances) with the need for accurate tide and real time wind measurements to avoid collisions and incidents.

Understanding weather patterns (e.g. wind, storms, tide surges) means reliable data gives clarity on what is happening now, but also can provide the whole picture over time, looking backwards (for hind cast) and forwards (to forecast).

Transmission costs are similar to broad band. If there is GPRS /4G connectivity there is a practical limit to the amount of data that you can send but for most oceanographic monitoring purposes you are looking at as little as $12-20. This excludes cameras/ videos and high output instruments such as wave sensors which require a higher band width. Satellite transmissions are possible starting at $100 up to $1000 per month.

The ip-buffer is configured to work seamlessly with Port-Log, OceanWise' Environmental Data Sharing and Publishing solution (Fig.3). OceanWise has installed ip.buffers at locations in the UK, Europe, Middle East, Africa, Central and South America and SE Asia (Figs.4 & 5). In some regions, the units operate in very harsh conditions and, to date, have successfully withstood hurricanes, extreme heat, desert sand storms and extreme cold.

The ip-buffer is 'smart' because it improves reliability, reduces transmission costs and eliminates many service visits when compared to cheaper and more basic alternative modems. We all want reliable and timely data transmission.

New applications

Smart Telemetry can be used in any scenario where reliable data transmission is required. It was first used in the telecommunications sector but can be used reliably for any kind of information or data. As a result, the requirement for new applications for the i.p. buffer is growing.

One such example is in the measurement of Air Quality (AQ). In many cities, towns and/or ports around the world, AQ is becoming an emotive subject. Ports in the UK, moving more than a million Twenty-foot Equivalent Unit (TEU) freight containers annually are required to develop AQ strategies by the end of 2020.

Towns and cities are being mandated to measure the combined impact of emissions from cars, buses, lorries, rail and air traffic, as well as the movement of passenger ferries, cruise liners and cargo ships. Smart telemetry is being used to do this too.

The coastal and offshore engineering sector can now use smart telemetry to monitor plant and machinery activity and performance in, for example, dredging, jetty construction and coastal defences.

As climate change leads to unforeseen weather patterns becoming more commonplace across the world, the need for reliable and durable environmental data management has never been more important. The 'invest now to save later' approach has assumed greater urgency for port authorities as they aim to operate in a 'smarter' manner; for coastal authorities as they develop strategies to deal with storms and coastal inundation, and for those in the oil, gas and renewable energy sectors that need accurate data to monitor waves and currents.

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Fig.4: ip.buffer deployed in Abu Dhabi

Fig 5: Sensors deployed in Southampton

* TELEMETRY BASICS

Telemetry is the automated communication process whereby remote data is transmitted from instruments and sensors back to a receiver. A 'marine' sensor is a device used to measure environmental data. An instrument will read a stream of numbers from a sensor (which has no specific intelligence) and turns them into something useful such as engineering or scientific units.

A 'logger' or storage unit is used to hold data locally. Not all instruments have loggers, in which case they relay the data to loggers elsewhere. A logger doesn't have to have a database; it could be as simple as a USB memory stick.

A standard telemetry unit transmits data from single or multiple sensors whereas a Remote Telemetry Unit (RTU) is one not physically connected to the place where the instrument and sensor is located.