NEWSLINE

Unidata

Environmental Monitoring & Industrial Measurement No. 19, 2022

geo scientific ltd.
watershed monitoring instrumentation

MAA-NULTH FIRST NATIONS

Geo Scientific assists Maa-nulth First Nations with groundwater and water quality monitoring

Our partner, Geo Scientific, has recently provided a large number of groundwater and water quality monitoring systems for the Maa-nulth First Nation people in British Columbia, Canada.

(Left) Wawadit'la, also known as Mungo Martin House. (Above) West coast of Vancouver Island.

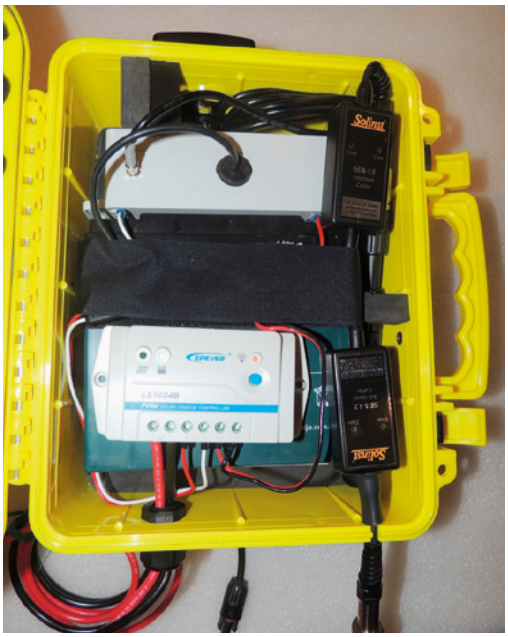
The people of the Maa-nulth First Nations live in one of the most beautiful places on Earth — the west coast of Vancouver Island, surrounding Barkley Sound and Kyuquot Sound. In the Nuu-chah-nulth language, Maa-nulth means "villages along the coast."

The photo above of Wawadit'la, also known as Mungo Martin House, is a Kwakwaka'wakw "big house" with a heraldic pole. Built by Chief Mungo Martin in 1953. Located at Thunderbird Park in Victoria, British Columbia.

The groundwater and water quality systems will allow the Maa-nulth First Nations people to manage the important water resources in their lands. The systems are deployed in remote areas away from cell phone coverage; hence, they are based on the Unidata's 3004M Neon remote logger with the Iridium satellite communications option.

The system was set up on an AWS (Amazon Web Services) cloud server to allow for the transfer of services to the Maa-nulth First Nations people if needed in the future.

The systems also include high-quality monitoring instruments, such as Insitu probes, all of which are housed inside waterproof Pelican cases to ensure there is no water ingress in heavy rain conditions. Geo Scientific have often used the Pelican cases for harsh environments; they are high quality and very well sealed, and as they are polycarbonate, radio signals are transmitted easily through this material.



Telstra's new IoT services - wider coverage / lower power

Telstra continues the rollout of the newer services, which they call Cellular Low Power Wide Area Networks (Cellular LPWANs). These new services are a great improvement for Telemetry/IoT services throughout Australia. A summary of these services is below.

The names are sometimes confusing, but the data rates are simple to understand, so we consider the data rates as a comparison.

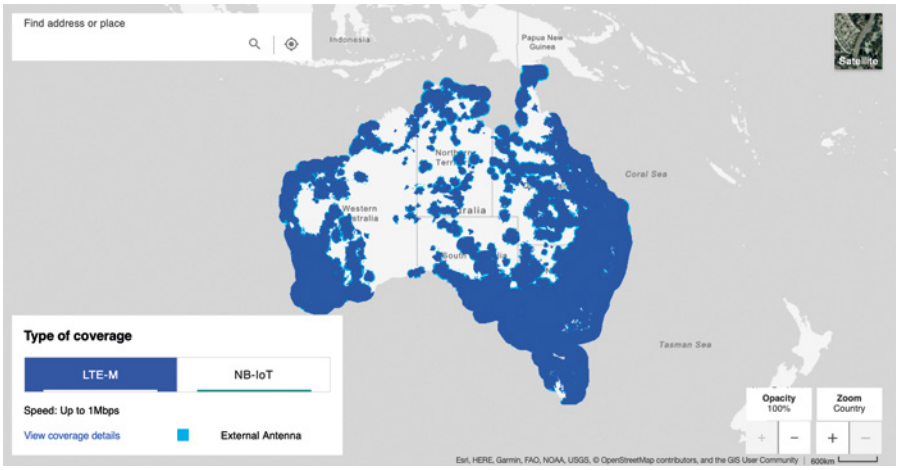
- CAT 4 is a 150Mb data rate (our mobile phones use this).
- CAT 1 M is a 10Mb data rate
- Cat M 1 is a 1Mb to 500Kb data rate

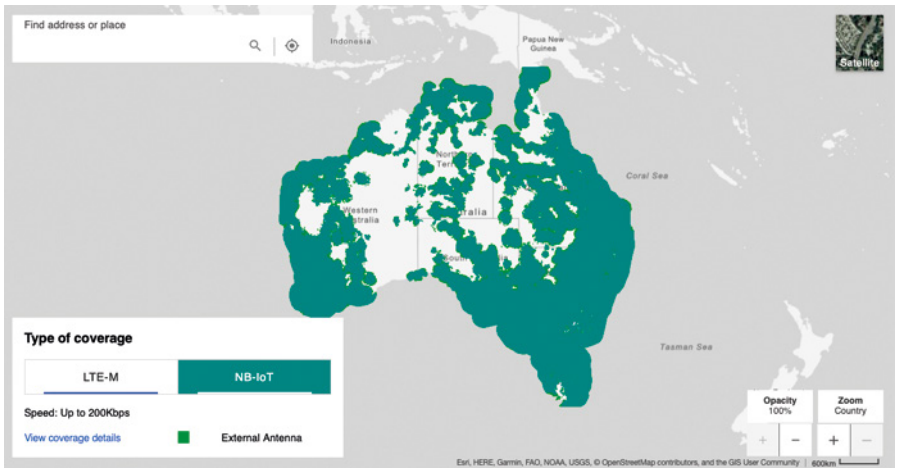
NB: IoT is 200Kb to 32Kb data rate

The lower data rate needs less power which extends battery life for data loggers and sensors. The lower data rate also allows the signal to be transmitted further from the cell tower than high-speed services. These features are very important in our business because we normally do not need higher speed services, and we are always attempting to save power.

These new Services are SIM configuration settings, so all Telstra SIM cards can be set up to use these new services. Telstra also has various online tools to make the configuration and management of a large number of SIM cards easier. Other providers, such as M2M One, also offer these online management platform services.

The current coverage maps for Cat M 1 services - blue colour and the NB-IoT services - green colour (courtesy of Telstra) are shown in the images here.





Note the wider coverage for the NB IoT service.

In many of these areas, only (higher cost) satellite services were available, but now the lower cost and the robust service offered by Cell technology make it easier for us to provide telemetry/ IoT from remote sites for environmental monitoring and industrial measurement applications.

The lower data rate services are also much lower cost.

Essential services continue at Meridian Energy Power Station through lockdown

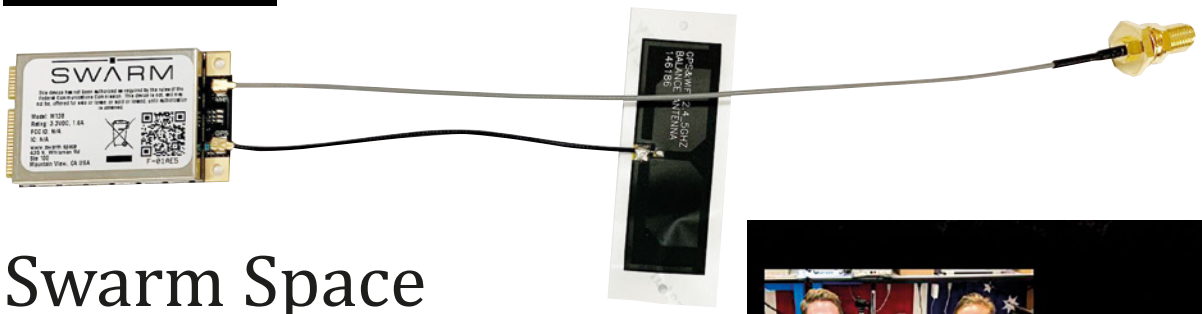
The supply of near real-time rainfall data for the headwaters of Lake Te Anau is essential for inflow forecasting and reservoir management of New Zealand's largest hydroelectric power station.

Unfortunately, a critical rain gauge station was affected by a lightning strike in August last year. The monitoring Station issue was identified via telemetry voltage data, and Meridian Energy asked our NIWA colleagues to fix the problem because of the critical inflow forecasting this station supports.

Andrew Willsman, NIWA Principal Technician based at the NIWA Dunedin office, travelled to the damaged gauge station by helicopter, replaced the damaged Neon Satellite System components and restored the system to the full monitoring operation connected via Satellite to the Main NIWA Neon Server. This required substantial wiring work, re-configuration, and start-up to ensure their connection to the Neon server.

Aside from the lightning, which the Fiordland region has seen a lot of lately, a local Kea Bird family had taken to eating the power wires from the solar panels. Andrew repaired that wiring too.

Meridian Energy were grateful for this quick response by our NIWA colleagues, with the lake Te Anau nearing maximum level, and the possibility of large inflows at the next melt event given the large snowpack in Fiordland. Andrew can attest to the snowfall – he spent 3 hours on site at zero degrees with a gusting northerly in one of the highest and most remote Neon Satellite Monitoring Stations in the world. It is also one of the most picturesque sites in the world.



Swarm Space (Satellite IoT)

Unidata has been working closely with Swarm Space over the last year, and we now have the latest Swarm Space Modules integrated into the NRL series. They work well.

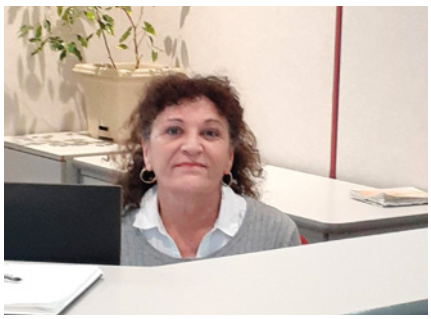
Swarm Space is a significant player in the satellite IoT industry and is part of the SpaceX group, renowned for pushing the envelope on technology advancements.

The system is message-based, but Unidata has added support to build the functionality up so it can now achieve most functions available over full IP networks. We aim to have full support for a higher level of OTA (Over the Air Management) features, such as uploading NRL programs/schemes over the Swarm Space network.

With better OTA features, it is easier to manage many units in the field. Expecting technical staff to visit units in the field for configuration and program updates is no longer acceptable.

The satellite density of the Swarm Space System continues to grow. More satellites are being launched via SpaceX every few months. The service level is reasonable now, and it will quickly grow in 2022/2023.

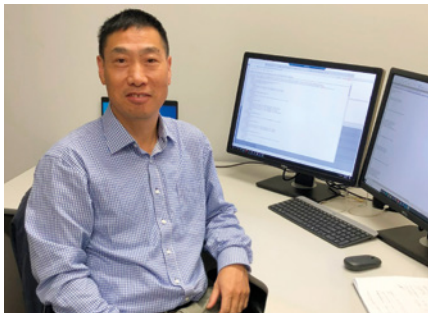
UNIDATA **STAFF PROFILES**



Rita Castorina

Rita joined us last year to assist with Finance and Accounting as Elena O'Neil transitions to retirement. Rita moved from sunny Queensland to Western Australia in March 2021. She has three grown-up children and two grandchildren.

Rita is environmentally conscious and has worked in a diverse range of industries. Medical, fishing charters and hydroponics. Rita comes from a Sicilian background and loves to travel back to her father's hometown. Her interests are travel, animal protection, live performances, gardening, high-performance vehicles and, like most Italian girls, cooking.



Dr Julian Shao

Julian joined us earlier this year to assist with the Neon Applications Software. Julian holds a PhD in Remote Sensing and Information Engineering from Wuhan University. He says his strength is in specialised algorithmic, real-time, and low-level optimised implementation. That's very complicated.

Julian is also a competitive table tennis player and a very accomplished gardener; he grows vegetables and fruit at his home in Rossmoyne, where he lives with his wife, teenage son and two daughters. From time to time he brings some of his home-grown fruit and vegetables to share with his work colleagues.

Neon Satellite Systems on the Coquihalla Atmospheric River

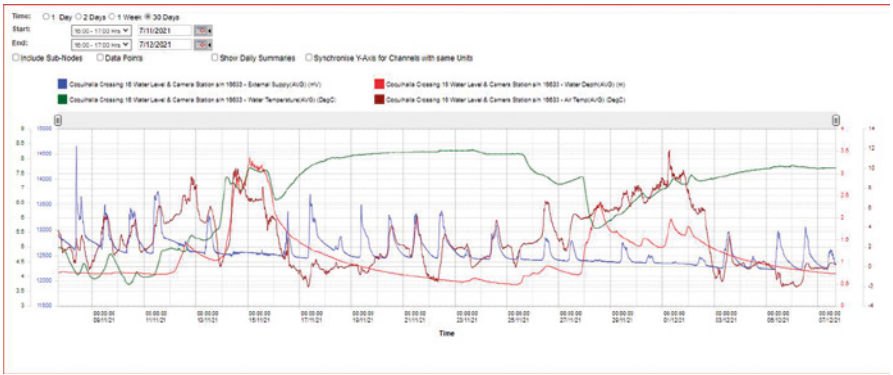
One of our customers has experienced a significant flood event on what they call an Atmospheric River.

One of the Neon Monitoring stations on the Coquihalla River in Canada stopped working during a very sizeable flood in November last year. A helicopter inspection revealed the cause. The attached photo shows the pipe bridge to which the Neon unit was attached. A sizeable debris flood occurred on a tributary stream which buried the instrument housing in sediment, rock, and debris.

However, a second Neon Monitoring system was located on an upstream site. Despite substantial channel shifting, it operated flawlessly for a short period, providing hydrometric data available for the lower Coquihalla River and has been indispensable in determining what is occurring in this remote watershed. Sadly, this second Neon Monitoring system was also washed away a few days later.

There were some helicopter passes over the river as well, to take photos of the sites. One photo shows the pipe bridge across the river where the second Neon Monitoring system was located. The second photo shows a few days later when the entire pipe bridge had been washed away.

The flood events have been recorded on the Neon Server. The graphs show the detail of these flood events and the effect of the erosion of the mid-channel island. The mid-channel island has been eroded, and some erosion has occurred on the left bank of the former side channel at the active pipeline crossing.

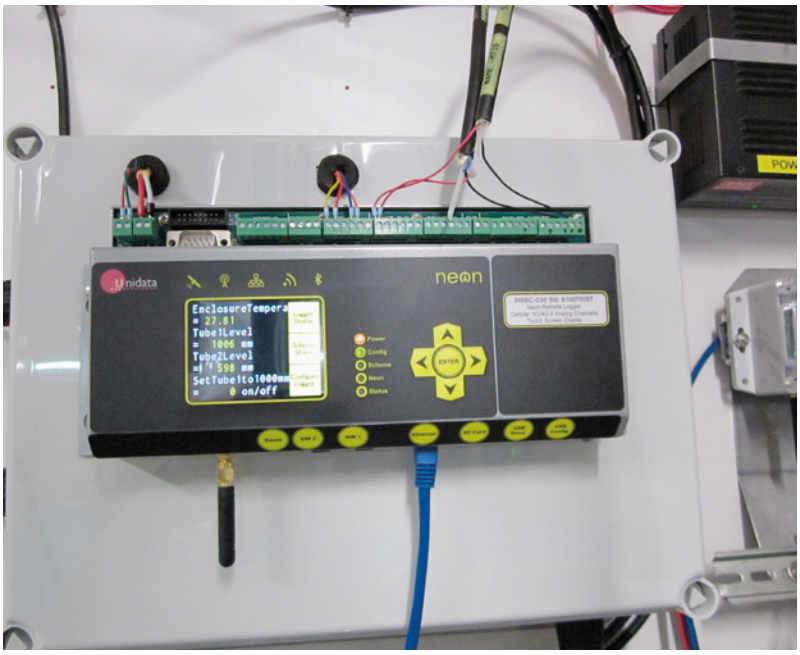


Level and Temperature data

River before neon and pipe wash away

River after neon and pipe wash away

Groundwater sensors



Groundwater sensors

Unidata automated production testing

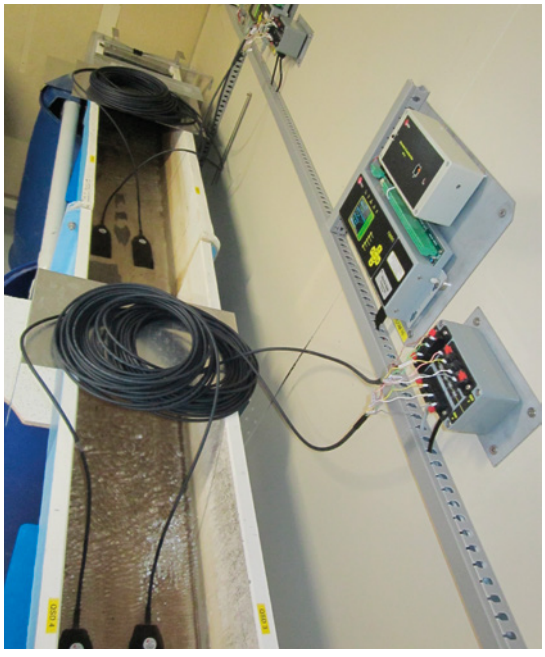
Unidata is using its own products to maintain automated production testing. We show two examples of this.

Starflow QSD Ultrasonic Flow Meters are tested in a long flow tank with an automated test function, which records the instrument performance, and reports the performance across a set of flow rates.

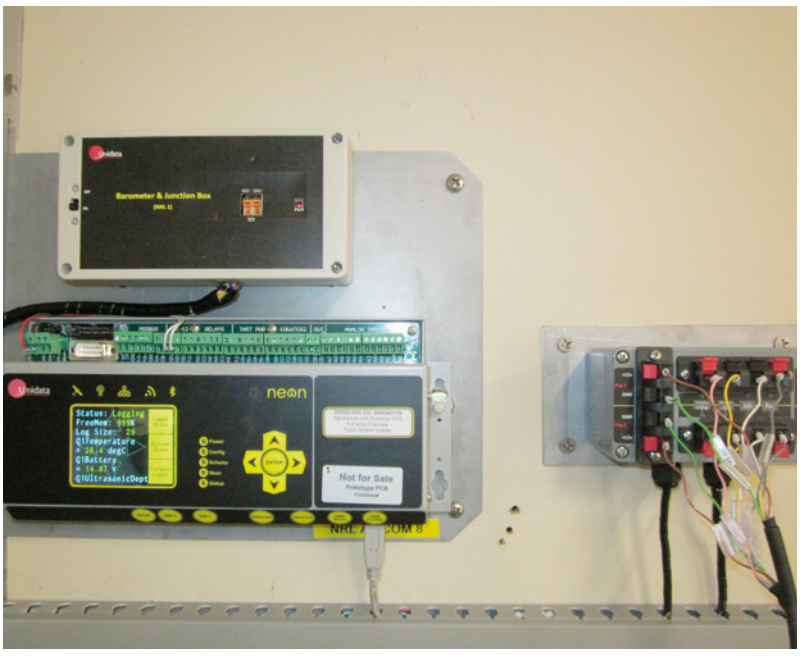
Unidata has also automated production and calibration testing for our 6549 Modbus Water Level Sensors. These sensors are loaded into water columns, approximately twenty sensors at the same time. The water column is then cycled from top to bottom over a period of days, over a set of levels with control units remaining for months so we can be assured that these units are meeting their calibration.

These systems are automated using a 3008 Neon Remote Logger, which automates the test using relay and digital outputs and inputs and Modbus interfaces. The automated production testing systems are also connected to the Unidata network to record the test results.

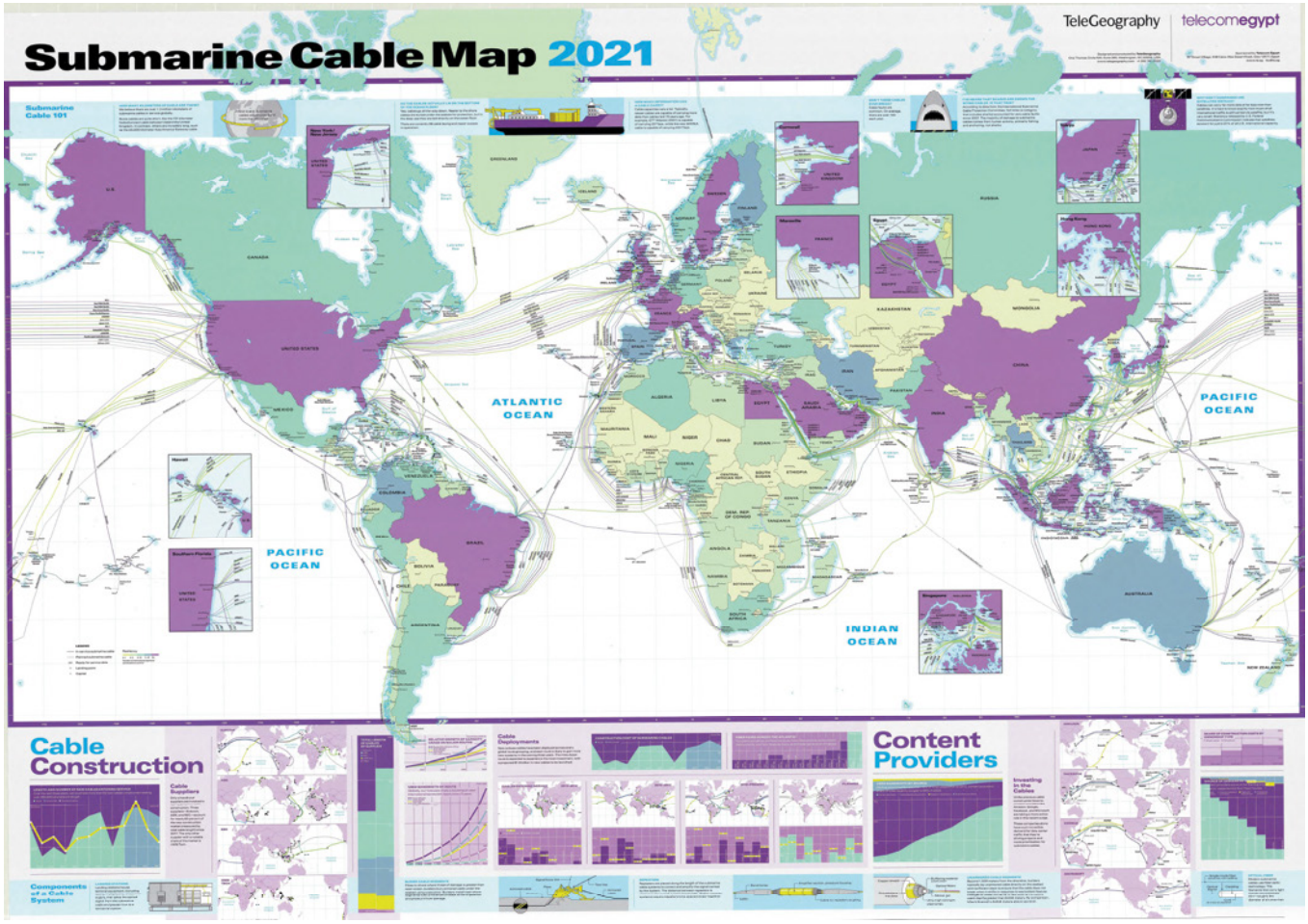
These systems were introduced in 2021, and they have improved productivity and allowed for consistent, automated test results for this Starflow QSD instrument. The systems were conceived by our engineers and production technicians, and they were built by our production technicians.



Starflow QSD



Starflow QSD



Hydro Terra Webinar Series / IoT and telecommunications

HydroTerra
Environmental Monitoring Specialists

Unidata presented at the recent Hydro Terra IoT Webinar with the Managing Director of Hydro Terra, Richard Campbell, earlier this year. Hydro Terra runs these webinars frequently, providing valuable information on many technical subjects. The Webinars are well attended; for example, around 100 participants attended the Update on the emerging IoT technologies webinar.

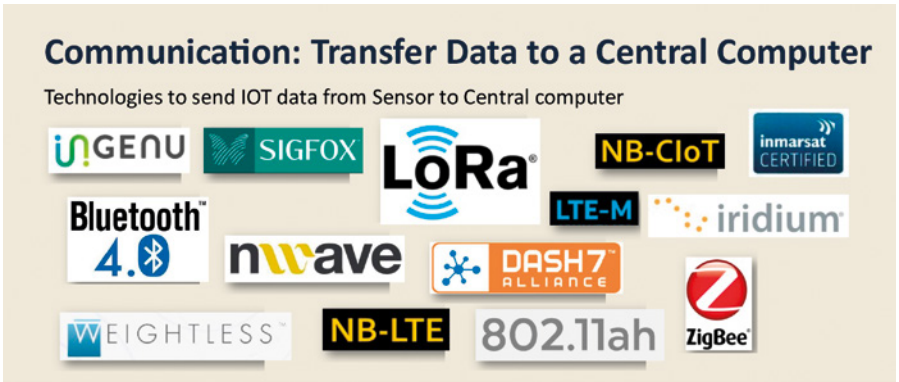

Richard Campbell


Matt Saunders

The IoT communications options continue to grow, and we see trends emerging, especially the new cell phone NB IoT services, as discussed earlier in this Newsline.

To add interest, Unidata presented the general history of the world's telecommunications chronology and the growth paths emerging in this industry. The transmission speed and the bandwidth becoming available are immense. That huge capacity will be the enabler of new ways of working, especially home working after Covid, cloud computing and remote diagnosis of equipment in the field. The new Indigo WEST cable system is designed with two fibre pairs, with a design capacity of around 36 Tbps and the option to expand in the future.

Please see the Webinar details and a map of the world's optical fibre submarine cables. (Courtesy of telegraphy). There are more than 400 submarine cables in the world, and these submarine cables carry more than 95% of the world's communications traffic.



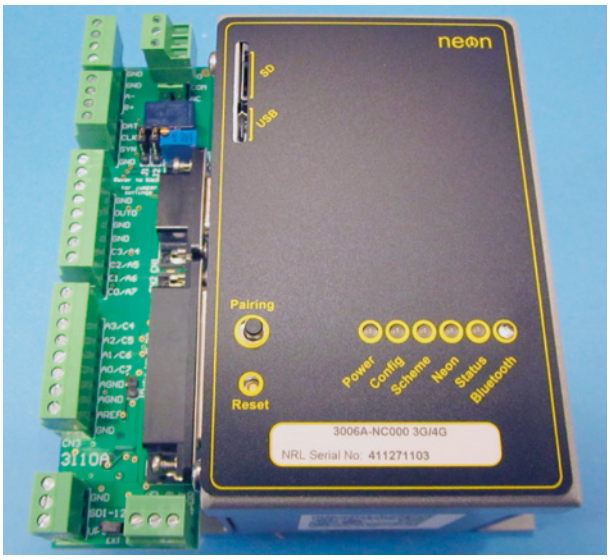
New Neon Remote Logger 3004N - NRT Mechanical Form Factor

Unidata has been listening to our customers. We should do that all the time. Several customers have preferred a new Neon Remote Logger (NRL) but in the same form factor as their older Neon Remote Terminals (NRT).

The usual reason for this is they wish to upgrade from an NRT to a new NRL, but they don't want to change the mounting enclosure they have already installed. They also want to have the same or similar Field Termination Strip (FTS) that they have been using, allowing for a straightforward wire up for the newer NRL models. They also like the flexibility of analog and counter channels from time to time. Some customers, especially customers in Asia, like to have dual sim cards to have a backup cell phone provider to connect to in the event of a cell phone system failure. Some customers also require an Iridium short burst data modem in place of the cell phone modem, so the new NRL 3004N model also supports the Iridium modem.

Hence Unidata introduced the new 3004N Model of NRL. This model achieves those objectives. We have also added the optional Bluetooth module and an optional LCD display.

We expect many of our customers will choose this model of Neon Remote Logger (NRL) in the future because of the form factor and the additional features.



Unidata 3004N FTS

We have had this model of NRL on our long-term test panel for about one year already, and it has proven reliable. Please see the photo of the three Iridium Satellites and three cell phone models on the Unidata long-term testbed.

LCD display 3004N

Testbed panel

Cloud computing - Neon Systems on AWS Amazon Server

Amazon Web Services (AWS) is one of the world's largest cloud platforms with millions of customers, and it has been operating for more than 15 years.

Unidata Neon Systems are now being set up on Amazon Servers, and they work very well. They are low cost for relatively small neon systems of up to one hundred connected Neon field units.

All setup and configuration are done online, and a credit card is needed to establish these services. They are quick to set up; a couple of hours is all that is needed. Once established, they are very reliable and secure. They are being used by large enterprises and government agencies. Our experience is they are low cost, fast to set up and they work very well.

Cloud computing with AWS

Amazon Web Services (AWS) is the world's most comprehensive and broadly adopted cloud platform, offering over 200 fully featured services from data centers globally. Millions of customers including the fastest-growing startups, largest enterprises, and leading government agencies are using AWS to lower costs, become more agile, and innovate faster.

Most functionality

AWS has significantly more services, and more features within those services, than any other cloud provider–from infrastructure technologies like computer storage and databases–to emerging technologies, such as machine learning and artificial intelligence, data lakes and analytics, and Internet of Things. This makes it faster, easier, and more cost effective to move your existing applications to the cloud and build nearly anything you can imagine.

AWS also has the deepest functionality within those services. For example, AWS offers the widest variety of databases that are purpose-built for different types of applications so you can choose the right tool for the job to get the best cost and performance.

Largest community of customers and partners

AWS has the largest and most dynamic community, with millions of active customers and tens of thousands of partners globally. Customers across virtually every industry and of every size, including startups, enterprises, and public sector organizations, are running every imaginable use case on AWS. The AWS Partner Network (APN) includes thousands of systems integrators who specialize in AWS services and tens of thousands of independent software vendors (ISVs) who adapt their technology to work on AWS.

Most secure

AWS is architected to be the most flexible and secure cloud computing environment available today. Our core infrastructure is built to satisfy the security requirements for the military, global banks, and other high-sensitivity organizations. This is backed by a deep set of cloud security tools, with 230 security, compliance, and governance services and features. AWS supports 90 security standards and compliance certifications, and all 117 AWS services that store customer data offer the ability to encrypt that data.

Fastest pace of innovation

With AWS, you can leverage the latest technologies to experiment and innovate more quickly. We are continually accelerating our pace of innovation to invent entirely new technologies you can use to transform your business. For example, in 2014, AWS pioneered the serverless computing space with the launch of AWS Lambda, which lets developers run their code without provisioning or managing servers. And AWS built Amazon SageMaker, a fully managed machine learning service that empowers everyday developers and scientists to use machine learning–without any previous experience.

Most proven operational expertise

AWS has unmatched experience, maturity, reliability, security, and performance that you can depend upon for your most important applications. For over 15 years, AWS has been delivering cloud services to millions of customers around the world running a wide variety of use cases. AWS has the most operational experience, at greater scale, of any cloud provider.

Unidata joins Inmarsat Applications & Solution Provider (ASP) Programme

In December last year, Unidata joined the Inmarsat Application and Solution Provider (ASP) Programme, an ecosystem for software, hardware and solutions providers, and original equipment manufacturers (OEMs) in commercial land markets. As an ASP member, Unidata will gain access to Inmarsat's global L-band satellite connectivity network, ELERA, and worldwide reach to scale its solutions into new sectors and geographies.

Commenting on Unidata's membership in the ASP, Mike Carter, President, Enterprise at Inmarsat, said: "Inmarsat is pleased to welcome Unidata to our ASP programme and to be working with them to support sustainable solutions to critical social, health, and environmental issues around the world. Innovative solution providers like Unidata are using leading-edge technology to help industries respond to some of the biggest global challenges. Inmarsat stands ready to support their journey through the provision of reliable connectivity through our industry-leading ELERA narrowband network, as well as go-to-market alignment and support."

Matt Saunders, General Manager, Unidata Pty Ltd, comments: "Here at Unidata, our ambition is to successfully create and implement impactful and unique IoT solutions, no matter how remote our clients' assets or infrastructure might be. As our products can be configured to provide solutions for most environmental monitoring and industrial measurement requirements, the potential for innovative use of IoT-based monitoring is almost limitless now that we live in a connected society.

The Inmarsat ASP Programme is open to new entrants, disruptors, and established brands of any size who have developed an innovative digital product or service but may

need additional support to exploit the benefits of satellite enabled IoT solutions. Inmarsat provides dedicated technical guidance on how to integrate and support its highly reliable satellite services, go-to-market strategy planning and exposure to the Inmarsat distribution channel to enable access to new markets.

UNIDATA

The potential for and the innovative use of IoT environmental monitoring and industrial measurement tools takes on new meaning in today's connected society. Australian technological solutions provider, Unidata, has vast experience in this field – having delivered reliable and cost-effective technologies for the global monitoring and measurement markets for nearly 50 years.

Since its inception in the early 1970s, Unidata has delivered close to 50,000 data loggers and measuring instruments to almost 5,000 customers worldwide. It prides itself on finding unique solutions to its customers' requirements. This flexibility enables Unidata to explore precise, detailed needs and find a way to ensure its products can meet such challenges.

Because of the increasing value in measuring and monitoring, Unidata's products are helping to transform several industries. These include such pivotal sectors as: environmental, industrial, agricultural, mining, oil and gas and utilities.

Unidata's status as an Inmarsat Certified Partner allows the organisation to effectively engage with partners worldwide on satellite telemetry/M2M projects through its Unidata Neon/Neon IP Data Logger system – just one of many products it offers.

neon Unidata

ADVANTAGES

- Dedicated IoT software system, NEON, that supports world leading sensor and camera technology
- Bespoke end-to-end IoT solutions built to customer specifications, not just a provision of components
- Over-the-air management with a feature-rich IoT platform to re-set, initialise and reboot to limit remote site visits
- Factory acceptance tests to guarantee performance before deployment in the field
- Global online support to assist with project training, operation and maintenance

FEATURES

- Receive, process, display, store and report on collected data in a variety of ways
- Issue control commands based on pre-set algorithms and issue alarms/notifications
- Initiate physical actions in the field through alarm triggers e.g. turning pumps on/off
- Fully bi-directional communications between data logger, RTU units and central servers
- Flexibility to operate on hosted servers or purchase service software to be run on a client's own server
- Range of readily compatible interfaces such as ModBus and SDI-12 and 4-20 ma

USER SCENARIOS

- Careful measurement and monitoring of streams and rivers to manage water resources and mitigate damage
- Oil and gas pressure and flow pipeline monitoring and metering
- Remote pipeline cathodic protection against corrosion of infrastructure
- Remote image and video capture to enhance safety and operational efficiencies

KEY BENEFITS:

1. Reduce operating costs through remote diagnosis, programming and firmware updates
2. Minimise site visits by using sophisticated over the air management of the Neon IP Data Logger technology This is very important in pandemic times
3. Forecast future scenarios based on water or oil flow attributes gathered from sensor data
4. Protect the value of vital infrastructure assets such as pipelines through proactive corrosion detection
5. Realise operating efficiency gains in coal seam gas by implementing remote industrial measurement controls
6. Reduce the cost of site visits through early issue detection via remote image and video capture

Unidata and NIWA assist Tonga after volcanic eruption

According to NASA, a volcanic eruption on January 15th, 2022, of the Hunga Tonga-Hunga Ha'apai volcano in Tonga was hundreds of times more powerful than the atomic bomb the US dropped on Hiroshima during World War II.

In the immediate aftermath of the eruption and tsunami, there were fears that water sources had been polluted by the thick blanket of ash, increasing the risk of diseases like cholera and diarrhoea.

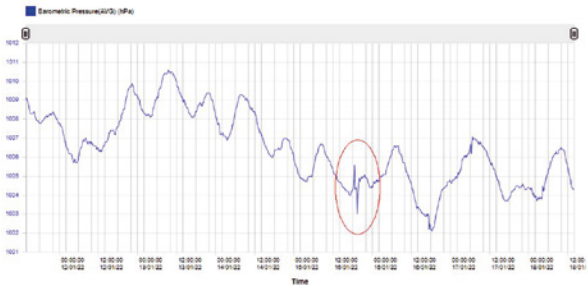
Unidata and our shareholder, NIWA, assisted in many ways. There are several Unidata Neon / Inmarsat BGAN Weather Stations in Tonga. The Weather Station at Hunga Tonga was completely submerged by the tsunami. The remote archipelago was cut off for five days because the explosions severed the sole fibre-optic sea cable bringing the internet to the island. Unidata and NIWA worked together to reconfigure one of the Inmarsat BGAN systems to restore limited internet connectivity and allow the essential weather stations to be restored so the weather effects could be understood after the event.

One interesting observation was that the volcanic eruption caused a large pressure wave across the world. Many Unidata Neon users worldwide observed that atmospheric shock pressure wave because the Neon Remote Loggers have an inbuilt barometer instrument on a chip. We received reports of the pressure event from one of our customers in the UK, and we observed the event on two test systems at the Unidata Factory. The first (high) peak was at 18:30 AWST. The second (low) peak was at 19:30 AWST. The event occurred at 12:10 Tonga local time and was about 6868km away, meaning it took about 6h20m (22,800sec) to get to Perth, WA and travelled at about 300m/s. That approximately matched the numbers reported by a person in the UK.

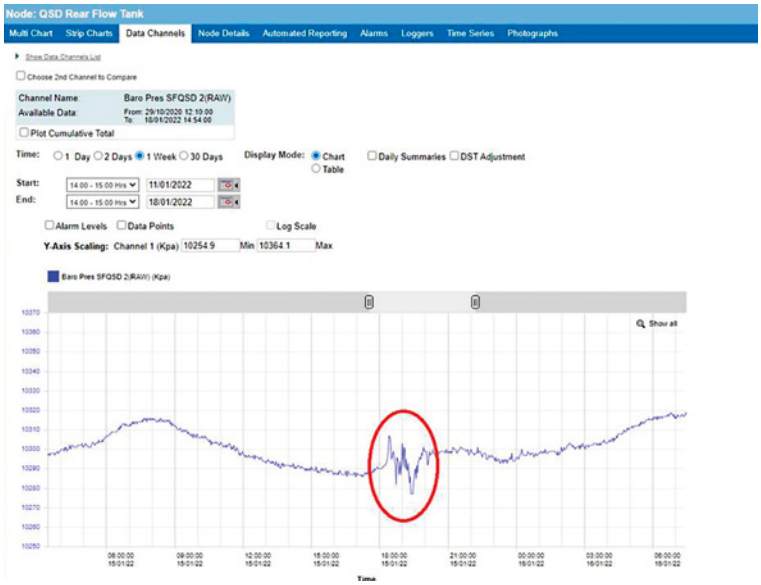
New Zealand and Australia led the international response, using their air force and naval carriers to make contact-less drops of supplies, including water, food, hygiene kits and tents, as well as water-treating and telecommunications repair equipment.

Before the eruption

Shoreline damage at Tonga following the eruption and tsunami



Pressure wave observed on our weather station at the Unidata Factory



Pressure wave observed on Starflow QSD at the Unidata Factory

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