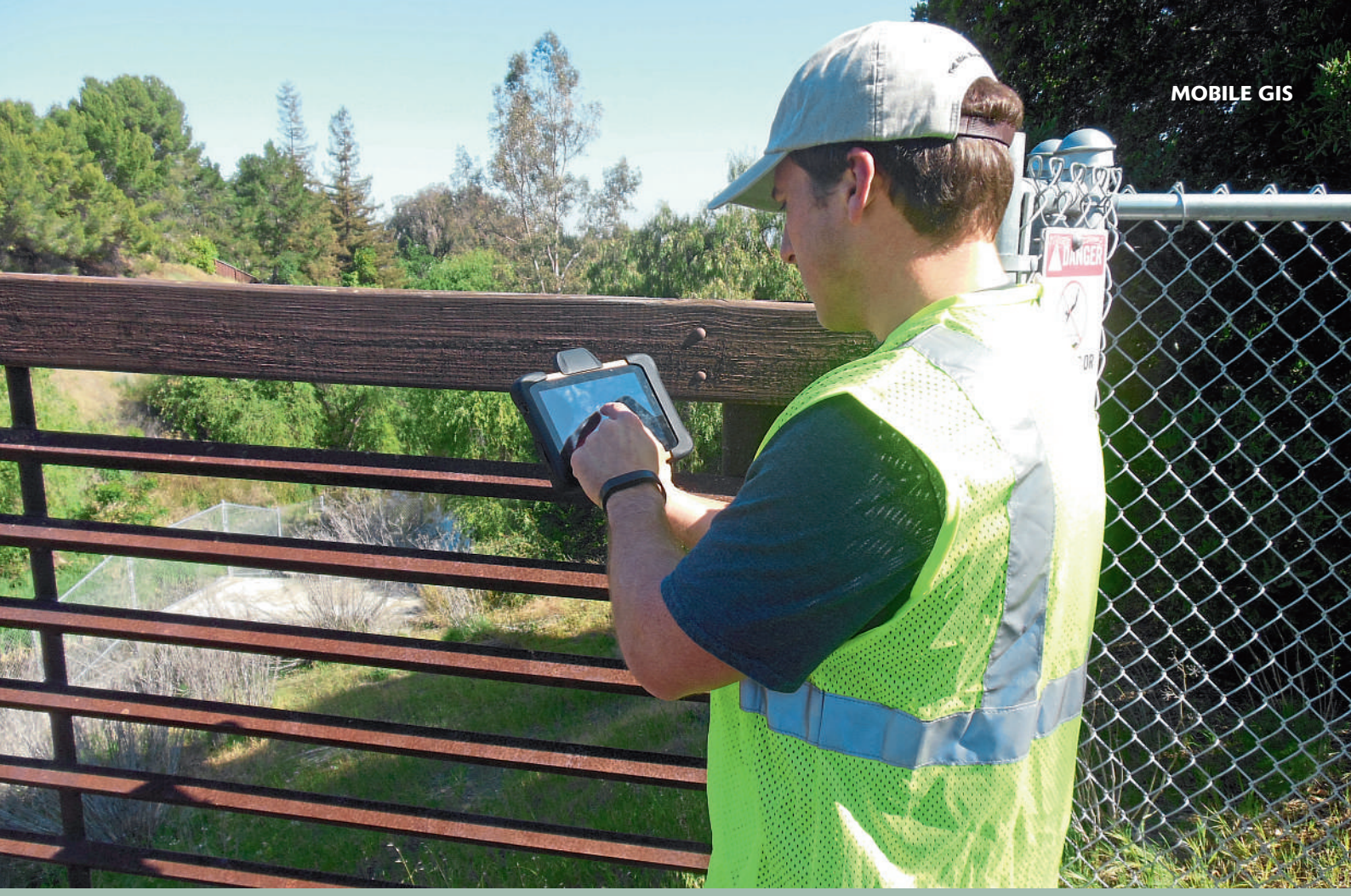


FIELD GOAL

RUGGED TABLETS WITH GNSS AND BUILT-IN COMMUNICATIONS TECHNOLOGIES MEAN SURVEYORS CAN BENEFIT FROM THE POWER OF THE INTERNET OF THINGS, SAYS DAW TSAI

These days, data is everywhere – literally. As Internet of Things (IoT) devices proliferate outdoors and underground, new opportunities to capture and use data are emerging. By using modern rugged tablets in combination with IoT devices, the ability to measure, compute, and communicate is making real-time field data management possible.

Equipped with advanced communications, ranging from 4G LTE to Class 1 Bluetooth to UHF radio, GNSS rugged tablets are now better enabled to conduct field data management in real-time. In construction, engineering, and inspection, rugged tablets can enable seamless workflow by bringing together data capture, data transmission, and accurate positioning through live communication.

Real-time field data management for IoT can be defined in three words: measurement, computation and communication. The enhanced measurement capacity of today's rugged tablets is facilitated in several ways. Traditional GPS has been replaced by GNSS, which includes constellations such as GLONASS and Beidou. Featuring integrated receivers and antennae, various devices from handhelds to 'pro'-sized tablets each have different accuracy specifications for all applications.

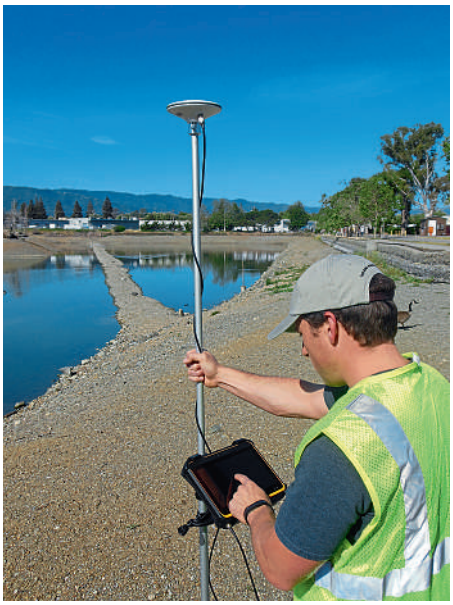
There are many improvements in the communication capabilities of rugged tablets. The expanding 4G and Wi-Fi networks allow devices to communicate instantaneously in more places than ever before, increasing efficiency and productivity. These technologies can rapidly transmit large amounts of data to the cloud for aggregation, storage and viewing as well.

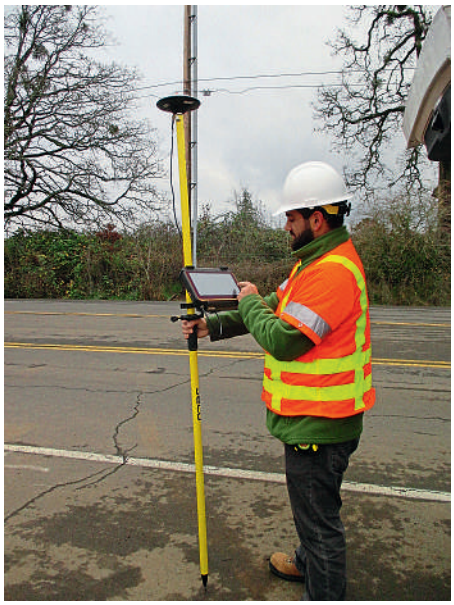
Cloud applications are particularly important when working with enormous quantities of data, such as 3D modelling, in conjunction with concurrent engineering. By eliminating redundant tasks, more focus can be spent on mission-critical work. Having 4G LTE is even more advantageous when centimetre-level accuracies are required, by using real time networks (RTN). RTN involves using a series of GNSS base stations of known location (positioned by major GNSS vendors) connected to the internet. These stations are used to generate correctional data and enable users to almost instantly get centimetre-level accuracy.

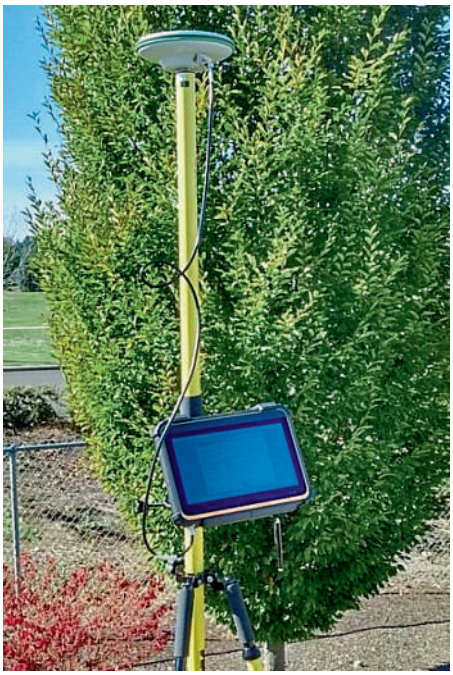
Additional communication capabilities include long-range Bluetooth, which is invaluable for communicating with equipment up to 300m away. Such situations occur in construction when lasers are used to provide horizontal and vertical measurements. By mounting a tablet on a prism pole, users can remotely control and monitor the lasers from a safe distance, while viewing on a larger screen.

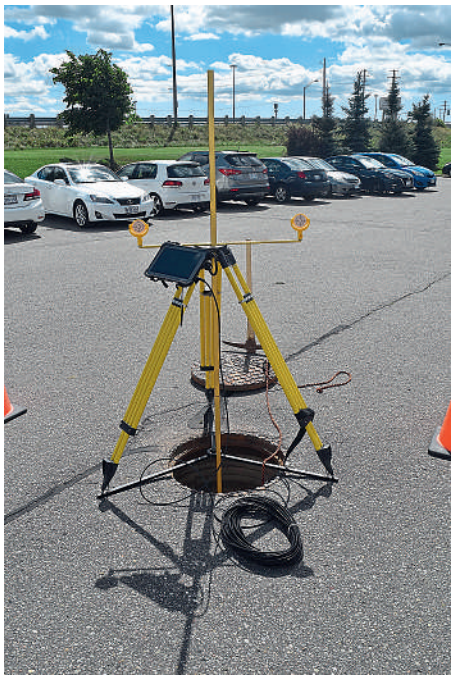
Machine control construction work

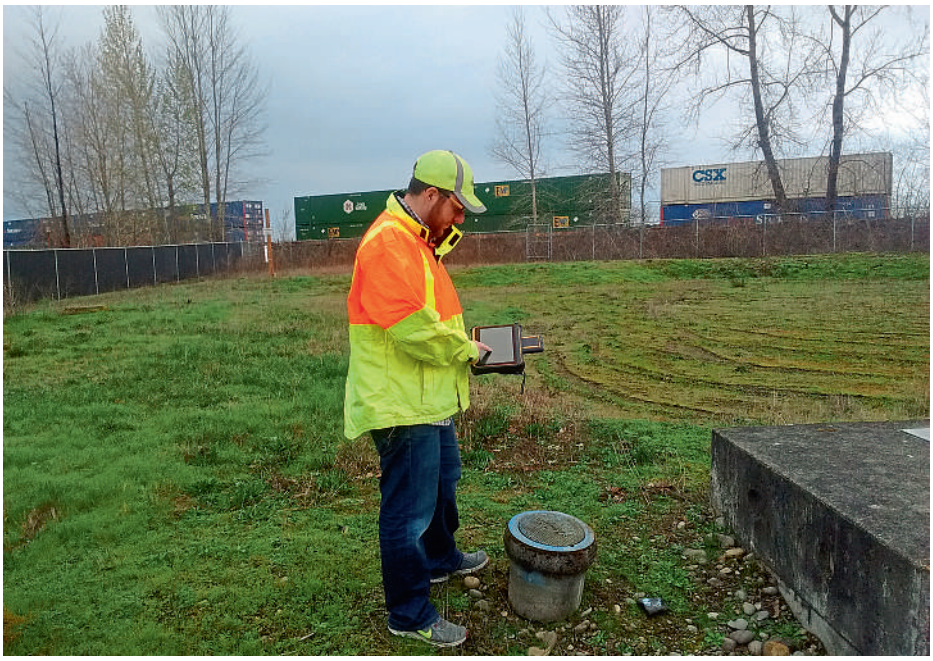
Within most industries, particularly public works, land surveying and construction, there is a growing move towards digitisation and the abandoning of conventional paper documentation. Before the advancements in field data management facilitated by GNSS rugged tablets, construction companies would map territory with land surveyors positioning stakes in the ground in accordance to a paper map. Upon completion of the work, civil engineers would repeat the process to check the level of accuracy.











GNSS rugged tablets streamline this process in several ways by using the IoT as a real-time mechanism for the transmission and monitoring of work as it is done. The tablets provide the initial basis for developers to digitise these procedures by issuing a digital map to construction companies outlining the final product, load into their own machines and implement with the positioning technologies. All the ensuing data, including the mapping and positioning work, is sent to the cloud for storage and is accessible in real-time by any host of relevant parties.

Therefore, civil engineers can confirm the construction company's work by leveraging the same technologies when they mount GNSS rugged tablets on a pole to check grade and determine relevant factors such as whether enough soil was cut out or filled in. Again, this data is instantly transmitted to the cloud so all involved parties can monitor and verify them. In this respect, the tablets function as real-time IoT endpoint devices transmitting data to a centralised cloud for the management of field work.

By transmitting and sharing this data via the cloud as part of the IoT, construction and engineering companies can monitor their progress in a sustainable, paperless format. The real-time facet of machine control land survey work involves all parties in the process for less disambiguation and more cost-effective efficiency. The added flexibility of this method is critical for change orders, which can consume a substantial amount of monetary and temporal resources when using traditional paper methods of construction.

The real-time engineering of the digital approach not only reduces the amount of change orders, but their difficulty as well. Since all diagrams for remodelling, for instance, can be contained on a rugged tablet or accessed through the cloud, there is less time and money spent on mark-ups, additional diagramming, materials and labour for designing changes and optimising them. The IoT enables this instantaneous transmission of data through the tablets in the field.

Asset mapping on Windows

The advent of Windows 10 and Windows 10 IoT operating systems has increased the capacity of mobile computing by effectively issuing desktop functionality for measurement, computation and communication in the field.

In Ohio in the US, the Rural Assistance Community Partnership (RCAP) is using GNSS rugged tablets to identify, navigate and map water utilities to the Native American population – a task which generally does not require sub-metre or centimetre levels of accuracy for the more basic form of mapping required. The tablets function as IoT endpoint devices that transmit mapping and navigational data in real-time to the cloud for centralised access to a bevy of users who

are not actually in the field, yet can monitor the data provided as they're generated.

Most rugged tablets can provide this utility without some of the more extensive software necessary for the more exact mapping demands of construction. One of the noteworthy benefits about deploying rugged tablets in this regard is that they are empowering a group of people to perform this work by themselves simply by using these devices. There are no external entities required for this vital social function of mapping water utilities; the same people providing the tablets to the locals are teaching them to accomplish this task. Such a use case not only attests to the utilitarian nature of these devices but also to the universality of Windows, the knowledge of which is necessary to use these tablets.

Agricultural scouting

In agriculture, GNSS rugged tablets are emerging as one of the most viable means of conducting 'ag scouting', the purpose of which is to determine the contents of soil and other notable factors for farming. Traditionally, this sort of work was performed by taking a GPS, probe and computer on an all-terrain vehicle (ATV) to attain soil samples.

Today, this process can be made more efficient by attaching a probe to a GNSS rugged tablet and using its measurement, computation and communication capabilities to log the soil information. This is necessary to ascertain what nutrients exist where in the soil and is a requirement for precision agriculture in which supplementary nutrients are distributed throughout the land based on this information. Rapidly communicating that data to the cloud so organisations can monitor them and adjust them to affect the process is the most vital way in which these slates use the IoT. The IoT effectively modernises ag scouting, which is needed to identify which soil amendments (such as phosphate or nitrogen) can maximise the potential yield of crops.

The same procedure can also generate information about which insects are present and where they might be located, which can impact what pesticides are used and the most advantageous way of deploying them. A similar process can increase operational efficiency when it's time to harvest. Field operatives merely have to transfer their rugged tablets and probes from their ATVs to their harvesters to generate sub-metre accuracy for traversing pastures for harvesting, and sending this data to the appropriate parties for monitoring and approval.

Although the differences in levels of accuracy may seem negligible in this regard, their relevance for providing the optimal soil content, pesticide control and harvesting yield is essential to monetising the agricultural process and attaining the best results possible.

A critical combination

These examples offer a window into the wide scope of possibilities for using GNSS rugged tablets to deliver real-time field data, based on the ability to integrate measurement, computation and communication with IoT devices, using some of the most advanced techniques found today.

REAL-TIME FIELD DATA MANAGEMENT FOR IOT CAN BE DEFINED IN THREE WORDS: MEASUREMENT, COMPUTATION AND COMMUNICATION

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