

Accessing DTS data from remote wells

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Recovering downhole distributed temperature sensing (DTS) data, accurately processing it and making it available for use anywhere within a global enterprise infrastructure, can be challenging for wells located in remote locations. Andy Nelson, senior software engineer at independent global completions service company Tendeka, has worked with medium and large-sized operators to develop and achieve an integrated solution to access data on-demand...

Understanding the relative contribution to production by different zones at different times in the wells' life, and whether production is dominated by a single zone, adds value to planning future wells. The initial implementation in 2016 was for a multiphase development across 12 coal seam gas wells for a major producer in the Surat Basin, Australia.¹

Trusted power and connectivity

As the wells were in a remote and extreme environment, the first obstacle to overcome was to secure and maintain power and connectivity. Minimal communication infrastructure and at least six-hours driving time from the nearest manned location capable of providing support, proved problematic as fluctuations or power outages can have a direct impact on the effectiveness of the data and subsequent analysis, and ultimately the value of the DTS installation.

The first DTS units deployed in the field provided limited connectivity options. The only method provided by the DTS vendor to retrieve the collected data was via a proprietary Windows desktop application. Typical collection required someone physically visiting the site and downloading the data via the application to a laptop computer and then returning that data to the office domain at some later time.

To provide a working solution, each well was equipped with either local gas-powered electrical generators or solar-powered units capable of running the DTS units and modem for extended periods without human intervention and, in the case of solar-generation, throughout the hours of darkness and times of inclement weather.

Tendeka personnel connected each Sensornet DTS unit to a GPRS modem. The company's own FloQuest modelling and analysis software was used to accurately define, model and match data from sensors across the sandface to the wellhead. This uses proprietary algorithms and intuitive interfaces to seamlessly integrate multiple data sources into clear visual outputs.

Using the telecom carrier's infrastructure, a hardware-based virtual private network (VPN) was established between the modem and centralised servers, thus securing the remote connectivity solution from outside intrusion. The modem was then connected directly to the DTS unit via a serial communication port. A tunnel capable of linking a COM port on the DTS unit over potentially any distance to the server in the data-centre was also established.

Fast and efficient data recovery

Having set up the physical connection, the next task was to recover the data. DataServer software was set up to continuously poll for new DTS measurements as they became available. Once recorded, the measurements would be retrieved from the DTS instrument and copied to the server.

A second server operating in the data-centre was installed with software responsible for managing the DTS data. This software is alerted to new DTS measurements being saved and then proceeds to import those measurements. A workflow process of validating the data was the first step in the import process.

Each file is opened and checked against pre-configured rules to determine if the data is coming from the expected well site. For example, the DTS measurement data contains details about the well, such as a name or unique identifier, which must be validated before data can be imported.

During import, any errors or data discrepancies are flagged in an alerting system to a human operator so that the data can be manually checked. The alerting system also notifies operators if the DTS unit appears to be offline, if the data coming back from the instrument is corrupt, or if the modem communications are down.

Safe and secure communications

Having imported the data, the application manages data security and access to both human operators, using Tendeka's FloQuest analysis and modelling software, and automated systems. Furthermore, the system has an application programming interface (API) that offers a representational state transfer (REST) interface to allow third-party systems, with the appropriate authorisation, access to the data, analysed results and alert status. Figure 1 shows the architectural data flow.

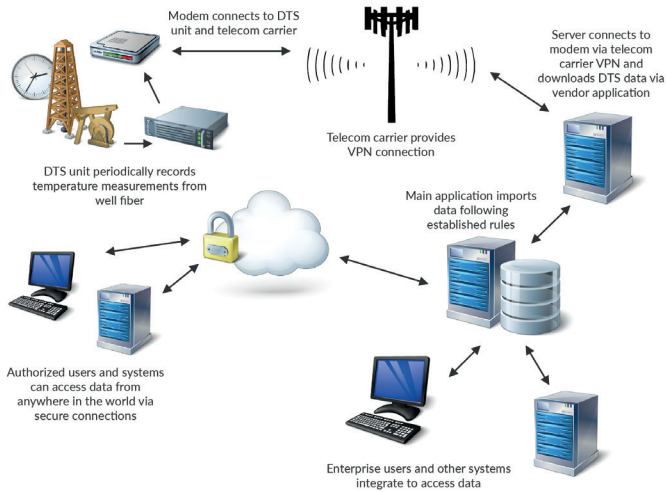


Figure 1: A representation of the architectural data flow

The results from this solution have been impressive and, to date, multiple solutions with a similar or identical architecture have been deployed. The initial solution monitored 12 wells in Australia but has subsequently been scaled to monitor more than 100 wells with another customer in South Asia utilizing the same solution and similar infrastructure. Obviously, each deployment changes depending upon the infrastructure needs of the well. Subsequent projects have been deployed using existing DTS vendors for the instrument boxes.

Wider application

Conservative estimates show that the process equipment on a typical offshore platform generates one to two terabytes per day² while some estimates put the potential amount of data being generated associated with each well at closer to ten terabytes per day.³ Only around 1% of that data is used for decision-making.

The ability to manage data automatically and process it by handling it at source and then bringing it into a cloud-based solution, means that more data can be processed to its potential value. The same methodologies can be used beyond just DTS data.

Over five billion measurement trace sets have so far been saved and analysed.

Reference

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2. Cisco. *New Realities in Oil and Gas: Data Management and Analytics*. September 2017
3. Nathan Amery, IHS Markit. *Data: Is the oil and gas industry's most valuable resource being overlooked?* February 21, 2018

Andy Nelson is a senior software engineer with Tendeka and for the past 25 years has been working in software engineering and integration.

Born and raised in England, he studied Electronics and Electrical Engineering before emigrating to California's Silicon Valley where he started his career as a published technology writer for InfoWorld magazine.

Prior to Tendeka, he held posts at TellX, a company that specialized in managing digital film assets to create interactive special affects for the movie industry; MITEM Corporation, who provide legacy integration to government and healthcare; and iManage, an industry leader in content management solutions for the fortune 500.

