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CANADA'S OIL & GAS AUTHORITY :: NOVEMBER 2010 :: \$10



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THE LAST MILE

Drilling software requirements and rig crews push bandwidth requirements at even the remotest wellsites

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The last mile

Drilling software requirements and rig crews push bandwidth requirements at even the remotest wellsites

by R.P. Stastny

New instrumentation, elaborate drilling software, remote monitoring and rig crews in the middle of nowhere craving distraction are all pushing communication solutions providers to deliver broadband Internet to even the remotest oil and gas locations.

Parallel to the evolution of resource play drilling and completions, where production-style horizontal wells ferret out the best pay, and massive fracs detonate with increasing precision across gruelling around-the-clock schedules, runs the evolution of instrumentation and elaborate software programs. More data

is being collected and analyzed against seismic data in real time. Brute force is making room for a better understanding of subsurface developments.

At the same time, head office wants to see what the site drillers see to ensure better results in drilling, production and safety. Remote access also drives down costs, as the same team can monitor multiple drill sites. When problems arise, technical experts can be brought in without having to send them to the site.

"The Internet is used in all aspects of drilling and fracing operations these days," says Dean Cubley, chairman and chief ▶

executive officer of ERF Wireless Solutions, a leading U.S. wireless broadband provider that boasts a vast terrestrial network in support of oil and gas, covering some 165,000 square miles in Texas, New Mexico, Oklahoma, Louisiana and British Columbia. ERF Wireless just announced a contract with a multi-billion-dollar global oil and gas exploration company that pushes its coverage into Kansas.

"The big trend is that software in the oil and gas industry is becoming more and more bandwidth hungry," he says.

Wireless broadband (typically defined as throughputs of 1.5 megabits per second and greater), cellular networks, and satellite compete along the edges of their respective market niches. Pointing out the relative strengths of cellular versus broadband, Torban Peterson, a communication analyst with energy industry IT solutions provider Noralta Technologies, says cellular networks are geared to voice transmission but also have data capability, while wireless broadband data networks are geared for data transmission but also have voice capability.

"Cellular networks are after very low latency," Peterson says. "Broadband doesn't care that much about how fast it gets to the other end, it just wants lots of data throughput. It chops the data up into packets, sends them at different times and then reassembles them at the other end, but the exact timing doesn't really matter. You can't do that to a voice conversation and have the words arrive seamlessly at the other end. You end up with a Skype effect, a stutter."

To this, ERF Wireless's Cubley adds, "Cellular is an entirely different format. With cellular service, you don't get high-capacity circuits that can handle 20 or 30 or 40 megs. Cellular and wireless broadband are two different technologies. Both are running parallel as far as the consumer is concerned."

Another difference is that cellular networks are built by major telecommunications companies and now push out to remote areas of North America, while small-niche providers typically build broadband networks in response to industry needs.

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— Dean Cubley, Chairman and Chief Executive Officer, ERF Wireless Solutions

When bandwidth isn't an issue and coverage is available, cellular is the obvious choice for oil and gas applications. All of Savannah Well Servicing's rigs, for example, are Internet-enabled using aircards (a type of wireless modem).

"We do daily invoicing," says Brad Kingston, Savannah's vice-president and general manager. "We run a program that the guys enter all their daily reports into. Each night it's automatically synchronized with our database. This eliminates that long gap where people wait a week or two to submit their stuff and it helps smooth out our workload in the Calgary office."

Internet access over cellular networks also allows Savannah's people on rigs to access information from the Canadian Association of Oilwell Drilling Contractors, Occupational Health & Safety pages and other key websites like ENFORM or the Energy Resources Conservation Board. As for bandwidth, Kingston says data transmission over the cellular networks hasn't been an issue. More problematic is the lack of coverage in southeastern Saskatchewan.

In the remotest areas beyond cellular coverage, the obvious choice is satellite. The cost of bandwidth is high, but, in many areas, building out an infrastructure of repeater towers is higher. But apart from the costs, satellite introduces problematic latency issues.

"By the time the signal goes up 22,000 miles to a satellite orbiting the Earth and then back down, the signal incurs a time delay that doesn't allow some of the oil and gas drilling software programs to run properly," Cubley says.

Pason Systems, an Alberta-based provider of specialized rental oilfield instrumentation systems for land-based drilling and service rigs that utilize satellite extensively, puts a finer point on latency.

"There's Internet tricks you can run on the modem at the rig site so that, in general, you don't notice much of a latency problem over a satellite link even if it's in the 500- to 600-millisecond time range," says Jonathan Kinghorn, satellite systems administrator with Pason.

As for tripping up software, he defers to software manufacturers' specifications, adding, "I know Baker Hughes has pretty elaborate bandwidth requirements for their real-time directional drilling just to get the gamma and stuff, but Pason's instrumentation data represents only about one to two per cent of our overall network usage."

Kinghorn says the largest consumer of bandwidth over its networks is actually the Internet. "IP protocols makes up about 70 per cent of our overall traffic," he says. "The other almost 30 per cent is email, Windows updates, anti-virus updates and a variety of traffic classifications."

So while he agrees that drilling software is growing more bandwidth-hungry, the real drivers to broadband at rig sites, based on the traffic over Pason's communications equipment on over 1,700 rigs in North America, are remote desktop applications that allow head office to monitor drilling progress, and rig crews hungry for distraction.

"The rig crews will take as much bandwidth as you can give to them," Kinghorn says. "If you were to give them three megabits per second, I'm sure they would use it up. Not all the time, but they would use it."

Peer-to-peer traffic is a big problem across these networks, so Pason blocks that content. "Guys will watch flash video until the cows come home because there's not a lot to do out there except watch TV and surf the Internet," he says.

Plugging in

Niche Internet providers offer creative custom solutions

Photo: Aaron Parker



Graham Fletcher, president, The Internet Centre

Systems integrators typically cite their order of preference in delivering connectivity as cable, wireless and satellite. Stationary oil and gas locations such as plants with high levels of command and control automation needing software updates, or work camps that offer city-like amenities including online video conferencing and online education upgrading opportunities, will try to connect to the Internet by cable if possible.

Telephone and cable companies have been providing Internet cable for years in major cities. Outside those centres, they often can offer Internet connectivity as well, but at a steep price even in Canada's only province with a fibre optic broadband Internet network.

Small Internet providers fill that niche, competing on price, service and flexibility.

Graham Fletcher, president of The Internet Centre and one of the original architects of Alberta's Supernet, recently plugged a relatively remote oil and gas facility into the fibre optic network that connects 429 communities in Alberta.

"A lot of these fibres are dark, so an oil and gas facility can tie into that if it's available nearby," Fletcher says. "Telus quoted a fiber connection for \$182,000 into this plant and \$2,500 a month for 10-megabit-per-second bidirectional service. We were able to plug them into the spare fibre on the Supernet infrastructure for a total cost of \$70,000, and I'm charging \$1,500 a month.... The customer now owns the asset, which goes onto the books, and he controls the fibre. If anybody else shows up along the road and wants to plug in, the deal I made with the company is a condo-type arrangement, where every new customer will reduce my customer's original cost."

All of Pason's instrumentation, pressure rotation, torque depth, etc., actually only amounts to about 20 kilobits per second. "So our bandwidth usage for all the drilling instrumentation," Kinghorn says, "is much, much less than what the directional guys normally need for their stuff, and that's only because they're choosing to use things like remote desktop."

As a specialized communications solutions provider, Pason builds systems that move data efficiently. But a lot of directional companies don't have the technical resources to develop that type of software to just send the instrumentation data back, so they use something simple like remote desktop.

"So you've got this huge bus travelling down the highway with one guy in it, effectively," as Kinghorn puts it.

In some remote but busy oil and gas areas, activity levels can warrant building out broadband networks. These towers tend to be smaller and less expensive than million-dollar cell towers. They can be spaced as much as 72 kilometres apart and where possible, broadband circuits are collated on outlying cell towers within cell networks. (The Canadian Radio-television and Telecommunications Commission

mandates the sharing of towers to minimize the footprint of sprawling wireless networks.)

"There's several kinds of wireless but two important kinds," says Graham Fletcher, president of The Internet Centre, and one of the original architects of Alberta's Supernet. "The spoke and hub set-up is where you have an antenna in the middle of a small town, for example, and the radio signal goes out from the central place in a 360-degree manner. Many small radios spoke back into the central radio."

Higher throughputs and higher security needs over longer distances, however, require point-to-point radios. ERF Wireless uses point-to-point wireless at its drilling locations. Its typical installation is a 1.5-megabit-per-second connection. A mobile tower is set up at the rig, pointing back to the ERF Wireless's broadband network. Different microwave frequencies can be used in the field depending on the terrain and tree coverage as well as the client's data requirements.

Free-of-charge frequencies are set aside by the CRTC and are sufficient in many cases, but virtual private voice over Internet Protocol (voice over IP) networks

using paid for frequencies can be more suitable for companies with intense data and privacy requirements.

Since there's no utility power at these sites, thermal-electric generators, solar power or wind power drives this communication equipment. When the rig moves, ERF Wireless crews move the equipment to the next location and re-point the dishes back at its network, which ties into a bigger network such as the Supernet and ultimately connects to head offices anywhere.

Despite its current data limitations, cellular seems to be winning the war for wireless supremacy with its determined network expansions and cellular technology advances. Cellular technology has been replacing SCADA in some applications for about a decade now. SCADA, the horse and buggy of production data acquisition and transmission, is a cereal-based network that doesn't need much wireless bandwidth, even in a field of 200 or 300 wells, but the control units in these applications are becoming smarter.

"Years ago, when we first started, the industry wasn't that interested in tremendous speeds," says Kelly Candy, co-founder of 3C Information Solutions. Predominantly ▶

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an Edmonton-based telecommunications solutions company, 3C has been serving the oilpatch since 1996 and is currently one of the few companies providing terrestrial broadband wireless data services in northeastern British Columbia and northwestern Alberta.

"But now we've gone the whole circle to where we are replacing the equipment we originally put in," Candy says. "We're actually doing gigabit speeds for some locations.... So the cereal-based, or even two-way radio networks, are now becoming complex ether-based systems with routing and switching networks."

Does that mean SCADA will eventually give way to the Internet altogether?

"The convergence we see happening is between data and traditional SCADA," he says. "Most of the oil companies we deal with are also separated from a departmental perspective. So you have your IT department, which deals with Corporate traffic, and then you have a SCADA, automation and instrumentation group, but those two departments also seem to be coming together into a converged technology."

More significant is the convergence between cellular and broadband. Cellular voice-based providers are intent on expanding their data-handling capability as the industry moves toward 4G technology.

"4G is completely a data standard," Noralta's Peterson says. "Everything will work off of data networks in the future. Instead of your phone being natively designed for speed, it will be natively designed for data, but the speed will also be there too."

Pason Systems is relying on cellular to win the day and is rolling out a wireless cellular-based system to augment its satellite network. Rig crews will be able to surf the Internet on the cellular network and Pason's instrumentation data will be transmitted over satellite.

"We've taken cellular technology, added some intelligence to the box and made our own product," Kinghorn explains. "It's not just an aircard anymore. It's a wireless Ethernet solution similar to broadband providers, but we're using the cellular infrastructure networks."


Another benefit of cellular-based technology is it doesn't have to be managed. "They'll just show up and it will work if there's a cellular signal. You don't have

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The next generation

Over the years, wireless communication has evolved through four generations:

1G: analog

2G: digital transmission, in 1992

3G: multimedia support, spread spectrum transmission and at least 200 kilobits per second, in 2002

4G: refers to the fourth generation of cellular wireless standards. The nomenclature of the generations generally refers to a change in the fundamental nature of the service, non-backwards compatible transmission technology and new frequency bands. 4G includes all-IP packet-switched networks, mobile ultra-broadband (gigabit speed) access and multi-carrier transmission. (Pre-4G technologies such as mobile WiMAX and first-release 3G long-term evolution, or LTE, have been available on the market since 2006 and 2009, respectively. LTE will likely become a global standard.)

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to have a guy re-aiming antennas." This product will be rolled out in time for the upcoming winter drilling season.

Noralta's Peterson predicts that as Bell gets its 3G+ technology fired up across the province, the next step to 4G will be a small one technologically, but a massive one operationally because "eventually, 4G should run wireless broadband providers out of business."

Does 4G technology worry the likes of ERF Wireless or 3C Information Solutions?

"I think it's inevitable that at some point [cellular providers] will be able to deliver speeds over networks that are cost effective enough and fast enough that clients will probably look at that as a solution, so it does worry me," Candy says. "But once we have a physical infrastructure in place, we do voice over IP, video and all the other layers, so if the competition changes the underlying layer in the future, we still expect to be entrenched on the other side and can simply move over to that technology."

To this ERF Wireless adds, "The two [wireless broadband and cellular] will merge, but there will unique features that each will be able to provide." ■



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