Drilling operations benefit from new generation of real-time technologies that reduce personnel exposure, optimize processes, reduce drilling risk, and increase well productivity.

Companies across the industry are adapting real-time technologies to their business, organization, and culture. These companies share a number of common requirements, including the need for remote and extended teams to provide collaborative support, data that has been translated into decision-ready information, a new generation of techniques and processes, and effective access to and application of organizational knowledge.

Underpinning these developments are three key industry trends:

- Increased availability of high-quality connectivity at wellsites, rigs, and offices, and to individual experts, regardless of location
- Advancement and acceptance of the WITS and WITSML standardized data protocol
- The steady growth and importance of remotely located operation support centers/facilities for operators, service companies, and major equipment providers.

The end-to-end technologies and support services that enable the benefits of a new generation of real-time drilling processes—a Wellsite Data Hub, the InterACT* system, and the PERFORMView* application service.
To deliver real-time drilling operations capabilities, Schlumberger has developed a portfolio of flexible technologies and services:

- **Wellsite Data Hub (WSDH) Services**—hardware, software, and support services that enable vendor-neutral data collection, aggregation, and streaming from the wellsite, provide collaboration tools, and are backed by a 24/7 end-to-end support organization

- Options for remote connectivity from Schlumberger Information Solutions (SIS)

- The industry-proven InterACT connectivity, collaboration, and information system to connect wellsites, reservoirs, and people anywhere, anytime

- The PERFORMView application service for drilling surveillance and analysis, with collaboration tools for better and faster decisions.

These real-time drilling operations services enable a new generation of petrotechnical workflows, including sophisticated models that are able to receive and integrate real-time data streams (e.g., Petrel* seismic-to-simulation software or the Osprey* drilling software suite). A drilling optimization workflow can then serve as the foundation for a sophisticated geomechanics model that is able to receive data in real time. Using this model, downhole risks identified in the planning stage can be managed. Since the model is continuously updated in real time, risks can be mitigated as operations progress. Lessons learned during the drilling process are captured for application on future wells.

**PERFORMView APPLICATION SERVICE**

The PERFORMView software application is designed to receive real-time data streams generated during drilling operations or stored in a database. The PERFORMView application enables

- user-configurable viewing screens, alerts, and alarms
- user-configurable key performance indicators and cross-plotting tools
- rig-state detection for performance analysis, including well-to-well
- collaboration across the organization using the results, during or after the job.

Remote surveillance of drilling activities

Remote surveillance of drilling activities utilizes all real-time measurements on the rig from the drilling contractor and service companies. These include rig instrumentation, mud logging, MWD, and LWD.
Data can be displayed in a variety of formats—as graphical or numerical gauges with associated statistics or as conventional logs. The PERFORMView application enables a user to oversee multiple operations simultaneously.

The at-a-glance job status schematic displays rig status and well curtain section with information such as casing, bit depth, and actual versus planned well trajectory. The schematic is continuously updated based on a proprietary rig-state detection algorithm, which automatically derives which drilling process is occurring—such as on-bottom drilling or in-slips—using data from rig sensors.

Subsurface data indexed in both time and depth can be plotted to scale with the BHA while remaining synchronized as users change the time display range. The PERFORMView application also includes alarms that can be set to user-defined drilling parameters, making use of historical knowledge.

**Drilling data analysis**

Drilling data analysis in real time is key to anticipating, identifying, and resolving underperformance problems during operations. The PERFORMView application includes a sophisticated crossplot package that operates in both time and depth and allows filtering of data by rig state. Crossplots are powerful tools for the detection of trends and correlations. Real-time data can be plotted, along with data imported from models and offset wells to ensure that drilling parameters remain within safe limits.

Rig-state detection is also used to generate color-coded rig activity breakdown charts over a user-defined period of time. Further analysis is then possible when data from time/depth crossplots is viewed in relation to these rig activities. This is a powerful tool for comparing performance across wells and rigs over time, for developing action plans, and for driving continuous improvement in operations.

**Collaboration**

The work of any user of the PERFORMView application can be shared across the organization using built-in collaboration tools. The application runs on an individual’s computer, maintains a list of all drilling team members involved in each job, and provides chat, whiteboard, and shared annotation features. Users can assemble plots and charts into a custom view that can be shared across the team. These custom views provide the basis for collaboration, enabling the sharing of information and ideas.
of any analysis that results in a recommendation. Once the team makes a decision, the actions taken can be followed in real time and compared to the predicted plan.

**INFRASTRUCTURE TO ENABLE DRILLING OPERATIONS IN REAL TIME**

The benefits of real-time technologies are only possible with a highly reliable, secure, supported infrastructure, in particular connectivity. The Wellsite Data Hub and InterACT technologies can make use of existing connectivity, or connectivity can be provided by Schlumberger Information Solutions.

Whichever connectivity solution is used, proprietary tools within WSDH and InterACT systems ensure data integrity, even in the event of temporary communication breaks. A 24/7 Schlumberger support desk proactively monitors the end-to-end system, responding to any issues. The primary role of the infrastructure is to collect all real-time information captured on the rig or in the office and provide this information where it is needed in standard formats such as WITSML. This allows the use of geological and geophysical modeling tools, drilling software, and expert software supporting well placement, formation evaluation, or geomechanics workflows.

**Vendor-neutral data aggregation using the WSDH service**

One of the challenges to drilling operations in real time is data aggregation for the range of different companies and systems. The industry is at very different stages of adopting data standards, and there are often measurements of the same parameter with different sensors, channel names, and protocols. The WSDH is designed to handle any measurement configuration and works with both WITS and WITSML protocols. Custom adapters can be developed to support proprietary formats. The result is a single interface to all the data, regardless of the service provider.

On site, the connections from sensors to WSDH can either be cabled or via wireless. Both are available with the network management service. Field technicians are able to assess and recommend suitable configurations.

All collected information is stored at the wellsite so it can be accessed by the rig team using PERFORMView and InterACT real-time monitoring and data delivery viewers, just as the remote team can.

**Dual-hub architecture**

The WSDH on each rig is synchronized with a central data hub that is part of the InterACT connectivity, information, and collaboration system. This is known as a dual-hub architecture. This architecture allows rig-site teams to access the data from the WSDH while remote users access the same information from a hosted InterACT site.

Dual-hub access results in optimized bandwidth consumption since the data is only transmitted once over the remote connectivity link when synchronized. In the event of a remote connectivity outage, the information is still collected and is accessible to the rig team until connectivity is restored and synchronization can resume.

InterACT technology delivers the reliability, accessibility, and security required by drilling operations.

**End-to-end managed service**

Schlumberger real-time technologies and services support is designed for the demands of today’s drilling operations. An end-to-end managed service is provided that covers all IT elements of the real-time chain. This service encompasses installation, monitoring, maintenance, and support of the infrastructure. The service also includes the option of direct Voice-over-Internet-Protocol (VoIP) capabilities between the rig and the remotely located teams.

Proactive 24/7 monitoring and support are performed remotely from Schlumberger Customer Support Centers (CSCs) to ensure continuous performance of all IT infrastructure components. These include data feed from wellsite data providers, the WSDH, connectivity services, InterACT hubs, and data feed into PERFORMView or specialized drilling software.

Having a single provider with an integrated end-to-end system offers significantly improved reliability, quality, and security of the real-time infrastructure.

E-mail sisinfo@slb.com or contact your local Schlumberger representative to learn more.

[Link: www.slb.com/realtimedrilling]