Requirements for D-WIS: A Drilling and Wells Interoperability Standard

White Paper

The purpose of D-WIS is to develop a standardized software interface to permit plug-and-play functionality for external advisory applications on automated drilling control systems.

This white paper covers the reasons for D-WIS, an overview of the essential D-WIS structural elements, and their requirements.

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Executive Summary

The Drilling and Wells Interface Standards (D-WIS) group is developing standards for an open, interoperable and secure digital interface between participants in well construction. Companies such as service companies, operators and equipment suppliers shall interface their technologies to the drilling contractor's drilling rig control system using the elements of the standards. The technologies could be models, applications, or algorithms, or various auxiliary equipment with their own control systems.

Of primary importance is the concept of "separation of concerns". The operation and control of rig equipment is the responsibility of the drilling contractor.

This paper serves to document an overview of the intended scope of the standards, D-WIS structure, and D-WIS requirements.

Introduction

The promise of lower drilling costs and increased efficiencies drives the deployment of Drilling Systems Automation. Other notable drivers include removal of personnel from red zones at the wellsite, and avoiding overloading the Driller with data and systems. In the last five or so years, remote operations (the move of skilled personnel from the wellsite to remote centers) has revealed the promise of software process automation, coupled with new personnel deployment models.

This re-deployment of specialized personnel from rig to remote office has increased the pressure for drilling process automation software at the wellsite. Examples of process automation applications might be “starting the bit on-bottom”, or “bringing the pumps up-to-speed”, or “downlinking to a rotary steerable system.” These repetitive tasks lend themselves to processes automation and batch processing.

Drilling process automation systems deliver advice to the rig drilling control system. The advice might be from real-time calibrated models, lessons-learned, sequential steps required by downhole or surface equipment, or many other types of procedures. To deliver their advice they require a software interface to communicate with the rig operating and control systems. This is the D-WIS Software Interface. In D-WIS, we describe this as a software interface allowing communication between external Advisors and the Automated Drilling Control Systems (ADCS).

To be honest, this software interface exists today. However, each ADCS has its own interface “language.” The large number of players potentially interfacing to a large number of rig operating and control systems in a bespoke fashion is expensive and carries a significant HS&E risk. There is substantial cost and risk to parties for developing and maintaining reliable interfaces to each drilling installation, and for verifying compliance of each external parties’ software to each interface.

There is therefore a need to define a standard that allows for interoperable operations in a safe, secure and reasonable fashion. The technical benefits of such standards include increased efficacy, integrity and security of operations. The business benefits are lower operational and maintenance cost. Further, the lack of standards for an interoperable interface is a significant impediment to development of systems automation at the rigsite.

Of primary importance in this standard is the concept of “separation of concerns”. The operation and control of rig equipment is the responsibility of the drilling contractor: the Driller shall remain in complete control of the rig when accepting digital advice from external Advisors.

The Drilling and Wells Interoperability Standards (D-WIS) group is currently developing and demonstrating a set of interoperability standards for this multi-player environment, designed to permit reliable and secure plug and play operations. This document introduces the scope of this work, and provides a list of requirements for the standards. It is by no means a complete document (the topic is evolving), but the document hopefully supports a working discussion of D-WIS.

Standards Background

It is worthwhile to locate the scope of D-WIS within the Drilling Systems Automation Decision Making and Control Framework, proposed by John de Wardt and his co-authors in 2015. This framework is adapted from ISA-95, a well-known and much applied standard for the integration of control systems with enterprise level planning and management systems.

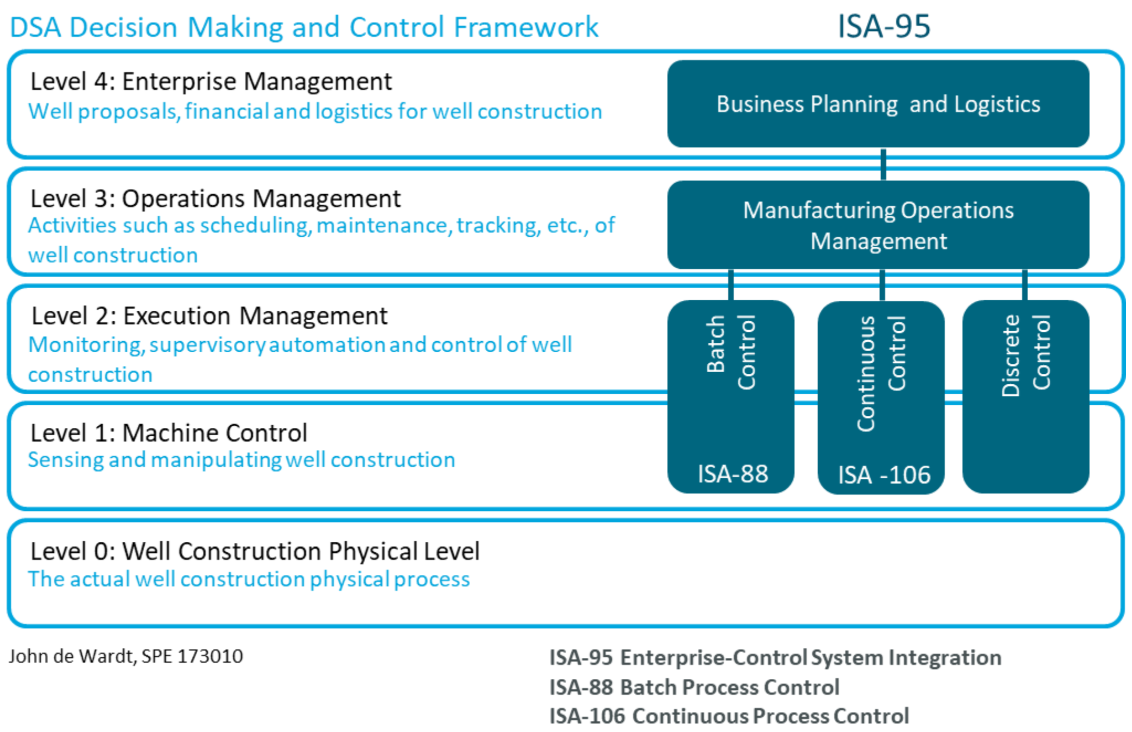

Figure 1: Systems Automation Standards, shown in relation to the Drilling Systems Automation Decision making and Control Framework, described in SPE 173010, 2015, Drilling Systems Automation Roadmap – The Means to Accelerate Adoption

In terms of standards, ISA-95, ISA-88 and ISA-106, among others, are relevant to D-WIS. Referring to the DSA Decision Making Framework, the D-WIS software interface links levels one and two, and supports batch-processing components at level three. Some of the terminology used in D-WIS has evolved from ISA-88, the batch-processing standard, although the implementation focuses on well construction and the terminology is, therefore, more narrow than in ISA-88. A separate D-WIS document (a glossary of D-WIS terms) describes the terminology.

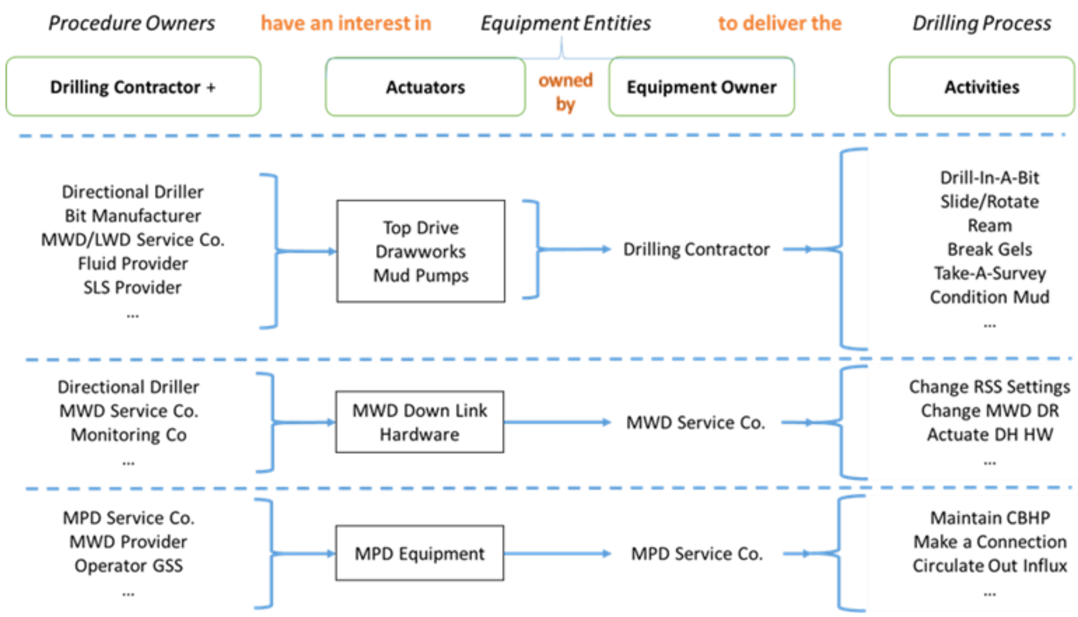

Figure 2: The DWIS Interface Construct in ISA-88 Terminology

Figure 2 shows the D-WIS rig interface construct in ISA-88 terms: "procedures use equipment to deliver a process". There are several levels depending on who owns the equipment. D-WIS will develop an interface standard that applies to all examples in this figure. It does this through a construct in which the procedures are in advisor applications that have optional third party equipment; these advisor applications communicate via a D-WIS interface with the Rig OS or ADCS.

Another set of developing standards is of interest to D-WIS. These are the open data platform initiatives of the Open Group's Open Subsurface Data Universe (OSDU) forum. The OSDU Data Platform "is an Open Source, standards-based and technology-agnostic data platform for the energy industry." It is rather wide ranging data platform encompassing exploration, construction and production in the oil and gas industry, and data platforms for other energy industries, such as wind. Within OSDU is the Well Data Foundation (WDF) group, which is interested in standards for digital data, such as digital drilling plans, moving to and from the wellsite. Figure 3 shows the relationship between WDF and D-WIS.

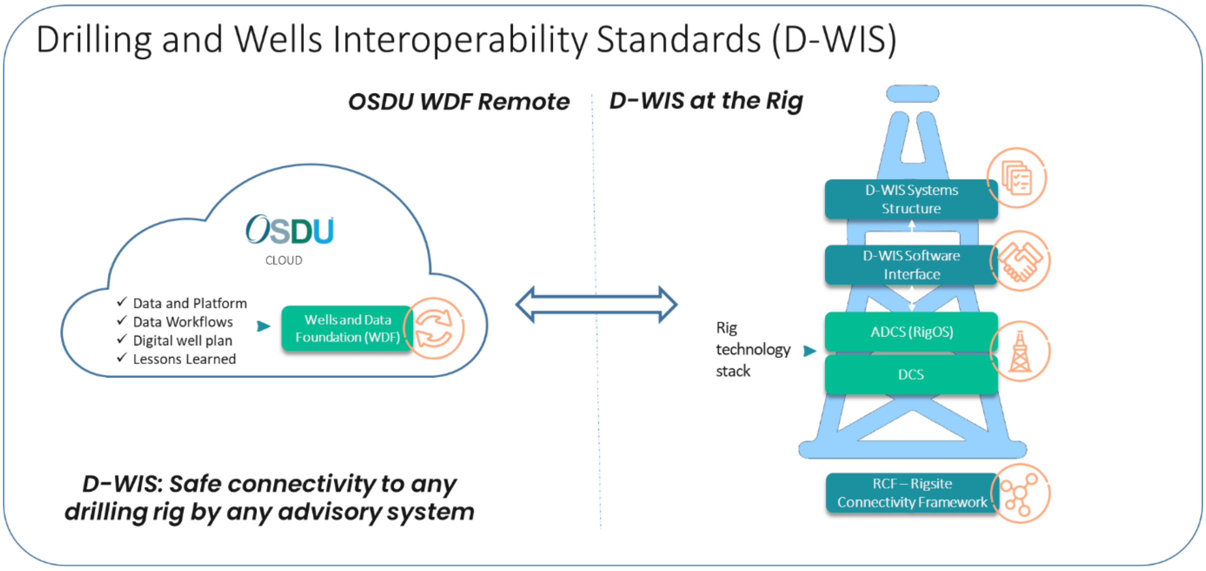

Figure 3 Relationship between OSDU WDF (Wells and Data Foundation) and D-WIS. WDF covers digital well plans, workflows, and lessons learned conveying data from offsite to and from the wellsite. D-WIS is exclusively wellsite-based (EDGE) and conveys real-time advice from Advisors operating on the digital well plan to and from the Rig Technology Stack.

D-WIS Context

The D-WIS Software Interface enables communication between external Advisors (applications, algorithms) and rig control systems (Automated Drilling Control Systems) in real-time. In terms of development, it is simply the next step in rig infrastructure development, from manual operations, to automated operations, and now to interoperable operations (figure 4).

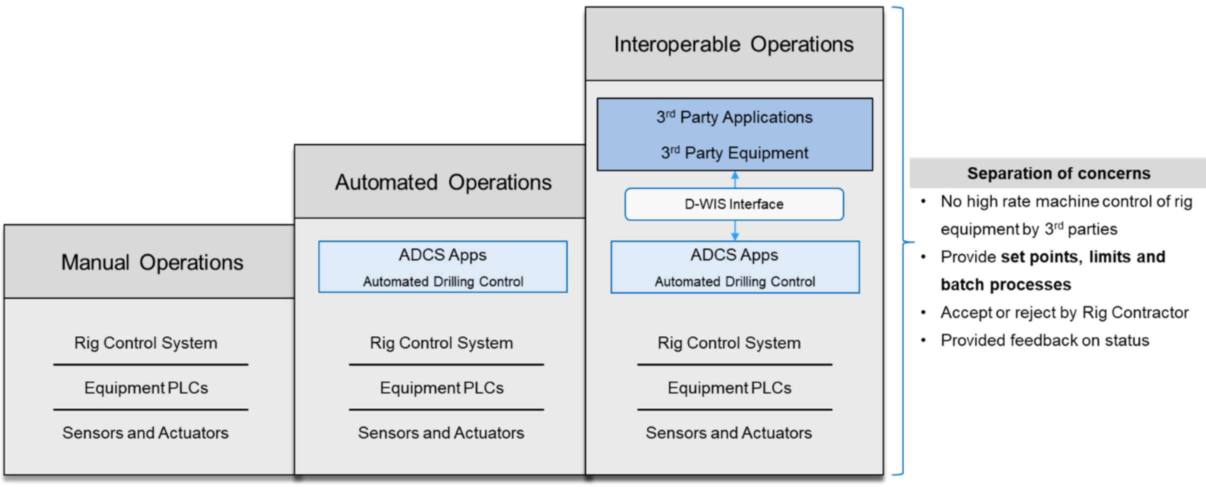

Figure 4 Technology evolution and the place of D-WIS in that evolution. From Mark Carrier et al., 2022, Advancing Wells and Drilling Interoperability Standards (D-WIS), IADC World Drilling Conference, Paris

As shown in figure 4, *Separation of Concerns* is of prime importance in this effort, and there is no control of rig equipment at the machine level by external applications. The external application simply provide set points and limits for the ADCS. Examples of these:

- External third party hydraulic software calculates safe running speeds and accelerations (limits) during tripping, to avoid formation damage by excessive swab and surge pressures.
- External third party drilling optimization software delivers WOB, RPM and FLOW set points for efficient drilling, realizing optimal ROP with minimal bit wear.
- External third party systems deliver a set point schedule for downlinking by rotary speed or pump rate to Rotary Steerable (RSS) systems for control of the wellbore trajectory.

There are many other examples, but the point is that all of these applications bring value to well construction. Embedding these applications in the ADCS is possible, but not commercially attractive, since there are several ADCS' in the industry and application-providers would have to develop and maintain many different versions of the same application, with resulting safety and validation issues.

Hence D-WIS: the Drilling and Wells Interoperability Standard provides, at its simplest, communication between external advisors and the rig ADCS. It enables competition between application-providers by providing a reliable platform on which to develop and maintain value-adding applications.

As always, the issues are in the details. This construct works well for one provider of one application, but we need to consider the general case where multiple advisors from several parties are present for each phase of a drilling operation, all of them wishing to deliver simultaneous advice to the ADCS.

D-WIS: System Structure

An overview of the D-WIS architecture is in Figure 5, and as the caption indicates, it consists of three main components:

- **D-WIS Software Interface**: low-level communications between the Advisory Structure and the rig ADCS.

- **D-WIS Advisory Structure**: contains multiple Advisors and other structural components required to make them work together.
- **RCF (Rig Connectivity Framework)**: contains system wide connectivity components, such as time synchronization, cybersecurity, etc. A recent paper outlines the recommended time synchronization and time stamping methods within the D-WIS structure (Annaiyappa et al., 2022, SPE-208732).

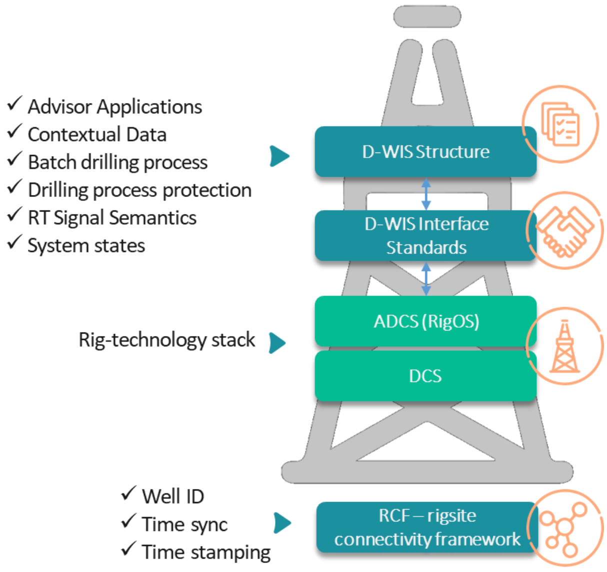

Figure 5 Overview of D-WIS showing three main components, the D-WIS Software Interface to the ADCS, the overlying D-WIS Advisory Structure that contains Advisor applications and software components to make them work, and the Rig Connectivity Framework (RCF)

Figure 6 shows a more expanded view of the D-WIS Architecture. The purpose of this architecture is to:

- Manage the multiple Advisors that wish to communicate with the ADCS, in a safe, understandable, reliable and verifiable fashion.
- Permit transformation of components of the digital drilling plan into batch processes, operations and tasks.
- Provide a framework for interoperable operation system components, such as drilling process protection, fault detection and handling, and real-time signal semantics.

It is worthwhile exploring the workflow and the primary purposes of these components before listing the requirements of the main building block of the DWIS Architecture. To do this we start with the Advisors, and work our way around the structure. It should be noted that the system is collapsible – in its simplest form it can consist of only one advisor external to the ADCS, in which case all of the required D-WISE Advisory Structure is located within that single Advisor.

1. **Advisors:** These applications, models, and routines compile advice for the drilling rig (the ADCS). The advice is generated in real-time, at the wellsite, dependent on the current or future operation, and intended to affect that operation in some fashion, for example to protect the wellbore, improve efficiencies, or deliver methods and operations to best utilize third party equipment. Each advisor generates output targeted at rig devices, such as the hoist, circulating system, top drive, auto-driller, etc.

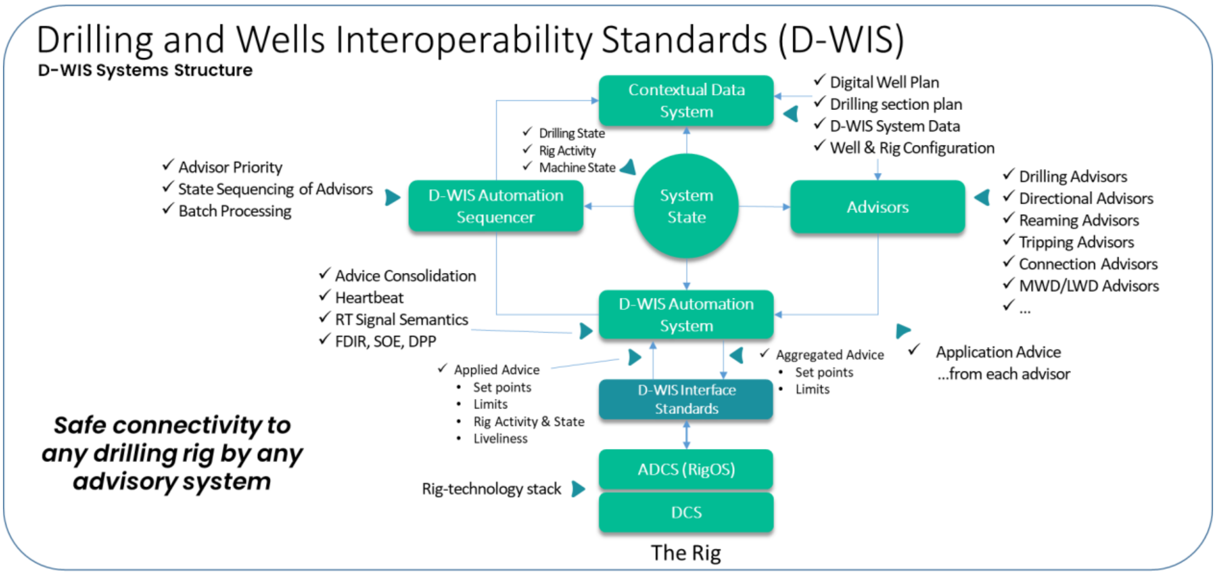

Figure 6 Overview of the D-WIS Advisory Structure, showing the primary components and portions of the data flow. See text for an explanation.

2. **System State Inference**: advice in the system (and indeed advisors) must be coordinated on the current and future state of the system. This includes the state of the borehole, rig activity, and the state of the rig equipment (ready, starting, running, etc.). Advisors, the ADCS, and its own inference rules, serve to populate the "system state" which is shared among all elements in the structure.

3. **Automation System**: consolidates advice from the different advisors depending on instructions from the Automation Sequencer and delivers aggregated advice (set points, limits and flags) to the ADCS via the D-WIS software interface. Also manages heartbeat and synchronization of the process, and most importantly, the Drilling Process Protection (DPP) method. DPP consists of Fault Detection, Isolation and Recovery (FDIR) and Safe Operating Envelope (SOE) concerns. The ADCS exposes certain variables or functions that DPP functions can address or trigger in response to detected

alerts or alarms. The D-WIS Automation system also deals with the semantics of the real-time signals, described below.

4. **Software Interface**: communication between the D-WIS Advisory Structure and the Rig ADCS, at a rate of about one Hz. Delivers set points, limits and flags for agreed upon rig equipment, and supplies rig activity, heartbeat and applied set points and limits to the advisory structure. Implementation can be as an ADCS layer or API.
5. **Automation Sequencer**: handles sequencing, including parallelization, and priority of the multiple Advisors within the system depending on the current and future inferred state of the system. This requires batch-processing capabilities to coordinate Advisors, especially with respect to the drilling plan.
6. **Contextual Data**: data required by the D-WIS Advisory Structure to operate. This includes configuration data (well, rig, equipment, etc.), digital section plan, and digital well plan.

This system is evolving and is opening new ways at looking at real-time data, one of which is **real-time signal semantics**. Fundamental to the interoperable (plug-and-play) concept is automated discovery and characterization of the available signals at the wellsite. The applied applications depend on this knowledge, and may follow different processing routes depending on the type and fidelity of a measurement (for example, if the WOB is from the deadline, block, surface sub or downhole sub). This discovery process will be part of the D-WIS automation system.

Requirements

The remainder of the document deals with the requirements for the DWIS components in figure 6. Note that the following language is used (based on RFC2119):

- Shall, Must or Required: mandatory requirements that the system must meet
- Should or Recommended: desired goals or features that are not essential
- Will, May or Optional: truly optional features or background information

There are requirements in several aspects of the system, loosely grouped as follows:

- *Requirements related to commercial aspects of the standards*

- *Requirements related to scope of the standards*
- *Requirements related to Drilling Process Protection*
- *Requirements related to the Semantic of RT Signals*
- *Requirements related to D-WIS Advisory Structure*
- *Requirements related to the D-WIS Software Interface*

Commercial Requirements

These are requirements related to deployment of D-WIS in a commercial environment. These requirements drive the selection of relevant technologies by asset owners, software and algorithm developers, and system integrators.

ID	Commercial Requirement	Considerations
COM-001	D-WIS shall provide an open development environment, supported through an open architecture	Adoption of an open standard will promote competition through new business models and offerings in the marketplace
COM-002	D-WIS shall support best-in-class solutions from multiple vendors in a single system	Few, if any, vendors provide best in class solutions for the full scope of well construction. This requirement opens up the market for vendors to provide their best-in-class solutions to any system
COM-003	Systems built using D-WIS shall support conforming components from any competitive vendor	This prevents vendor lock-in, where the end user can only use products from one vendor.
COM-004	Systems built following D-WIS shall substantially reduce the effort to integrate different vendor systems	This is a key requirement. Reducing the cost and time of integrating systems and components from different vendors into a single system is of commercial value.
COM-005	Preservation of the owner's configuration and programming intellectual property with minimal rework from one generation of D-WIS to the next.	There is significant cost and time spent by owners in defining their advising and control strategies. Requiring rewrites at generational

		changes means it is often too expensive to upgrade.
COM-006	Participation in the development and use of D-WIS shall not jeopardize the intellectual property of participants.	DWIS respects intellectual property concerns and components using DWIS shall not expose their intellectual property. This is required to have a healthy commercial environment for DWIS users.
COM-007	There shall be no cost to obtaining D-WIS	DWIS is an open standard, and a no-cost way of obtaining these standards is critical to enabling adoption in the marketplace.

Scope Requirements

The requirements governing scope constrains the relevance of the D-WIS interface. In particular, the D-WIS interface is only relevant to data exchange, and process and batch automation at the rigsite between third party equipment and rig drilling control systems. D-WIS also incorporates activities such as the ISA95/IEC 62264 Enterprise-Control System Integration standards, the ISA-88 Procedure Automation for Batch Process Operations standards, and the DSA Decision Making and Control Framework described in John de Wardt et al, 2015, SPE-173010.

ID	Scope Requirement	Considerations
SCO-001	D-WIS shall apply to automation of well construction at the wellsite	Systems conforming to D-WIS are activities related to well construction, such as drilling, running casing, cementing, etc. DWIS is concerned with interoperability in the automation of these multiplayer activities

SCO-002	The scope of D-WIS shall encompass ISA95/IEC62264 levels 1, 2 and 3.	D-WIS compliant components will include sensing, actuating, control, advising, visualization, and historical data collection. The DSA Decision making and Control Framework in paper https://doi.org/10.2118/173010-MS shows this standard applied to drilling automation.
SCO-003	D-WIS shall apply to rigsite connections between third party applications and equipment, and the Rig drilling control systems: ADCS.	Connection and control of rig equipment remains the responsibility of the ADCS or DCS. D-WIS does not apply to these interfaces.
SCO-004	D-WIS shall apply to data exchange, process automation, and batch automation of well construction activities.	Connection of third party applications for observation and control, leading to batch control of well construction
SCO-005	D-WIS will use industry standard communications protocols, and other existing standards, as needed and as specified by its members	Defining communications protocols are out of scope of D-WIS

Drilling Process Protection Scope Requirements

Drilling process protection is composed of at least three types of functionalities:

- **Safe Mode Management (SMM):** If for any reason, an automated control function fails or the connectivity between a 3rd party app and the RigOS is lost, the ADCS applies a series of actions to put the drilling machines in a state that is safe for the current operation. This state lasts for at least a few tens of second in order to leave time for the human operator to regain control of the situation even though his situational awareness may have been low. In the context of D-WIS, the only addressed SMM functions are those linked to the protection of the drilling process. Specifically, SMM functions that deal with the protection of the drilling machines are outside the scope of DWIS.

- **Fault, Detection, Isolation and Recovery (FDIR):** If a drilling process incident occurs, it is important to respond as quickly as possible. FDIR functions monitor continuously the process and are capable of detecting when an abnormal situation has started. After detection, the FDIR function proceeds with an immediate response to keep the process as safe as possible. Then after identification of the cause of the dysfunction, it applies procedures to isolate the problem. Finally, when isolation has been successful, it applies procedures to recover from the problem and get ready to resume the original normal command. FDIR functions apply when automated control functions are active, but also when human operators control the machines. A failure of the isolation or recovery procedures may trigger SMM functions. D-WIS only addresses FDIR functionalities that concern the drilling process. In other words, D-WIS does not interfere with FDIR functionalities that protect the drilling machines. FDIR is a subfield of control engineering that concerns itself with monitoring a system, identifying when a fault has occurred, and pinpointing the type of fault and its location (see https://en.wikipedia.org/wiki/Fault_detection_and_isolation)
- **Safe Operating Envelope (SOE):** Commands sent to the drilling machines shall be within acceptable limits with the regards to the tolerances of the drilling process. The ADCS combines the safe operating envelopes for the drilling process with the safe operating limits that protect the drilling machines. SOE functions apply for both human operator and automated function commands. It is not in the scope of D-WIS to address SOE functionalities concerning the protection of the drilling machines.

ID	DPP Requirement	Considerations
DPP-001	D-WIS will enable the description and transmission of DPP information from an external application to the ADCS or DCS on the rig.	The purpose of this work is not to solve how to generate the parameters of the DPP functions but assist in transmitting information across computer system boundaries.

DPP-002	The DWIS interface for DPP functionalities shall be flexible enough to account for a wide range of ADCS or DCS supported DPP functionalities.	The purpose of this work is not to impose a functionality level for DPP functions implemented in the ADCS or DCS, but to allow external application to utilize only one interface (the D-WIS software interface) to access multiple ADCS or DCS solutions instead of having to adapt for a multitude of different solutions.
DPP-003	The D-WIS interface for DPP functionalities shall be simple to use both on the ADCS or DCS side, and on the external application side.	D-WIS shall avoid imposing any restrictions to either the ADCS or DCS, or the external application. For example, there shall not be a restriction on the programming languages used on each side of the interface.
DDP-004	It is not within the scope of D-WIS to provide a solution for concurrent contributions of parameters for DPP functionalities.	The ADCS/DCS shall have a strategy to manage concurrent access for DPP functionalities.
DPP-005	The D-WIS interface shall allow the ADCS or DCS to describe its supported functionalities (expose its functionalities) such that external application can adapt the passage of parameters accordingly.	A form describing capabilities shall be available so that both sides of the interface can agree on how to pass parameters.
DPP-006	It is not in the scope of D-WIS to address DPP configurations that require sub-second updates.	Requiring sub-second updates demands tightly integrating the external application into the ADCS or DCS.
DPP-007	The D-WIS interface for DPP functionalities shall enforce a form of detection for loss of connection	It is important to detect a connection outage between the two sides of the interface, and to execute SMM procedures on the

	between the two sides of the interface.	ADCS or DCS side in such an eventuality.

Semantic of RT Signals Requirements

Drilling real-time signals are currently accessible through different real-time data sources, including WITS0, WITSML, OPC-DA, OPC-UA, API, etc. With such real-time data sources, the drilling real-time signals either are in predefined positions in records, e.g., WITS0, or are accessible through a mnemonic in a time-based log, e.g., WITSML, or some other sort of tag reference, e.g., OPC-DA. To access the correct real-time data channel, one must know beforehand where to find the information, i.e., the mnemonic, tag or position in which record. Furthermore, there is very limited metadata associated with the signal. When metadata information is available, it is in a statically defined format.

In practice, drilling operations are evolving constantly, and the availability of drilling real-time signals changes almost on a daily basis. Therefore, personnel in maintaining support applications for signals spend much of their time updating which signals are now available and where to find them. Also, as metadata is very limited, such applications cannot take full advantage of the actual qualities and uncertainties associated with the available signals. In addition, different applications exchange very few calculated signals, simply because it is already cumbersome to connect to measured signals. This in turn reduces the possibility of achieving synergies between the different systems that are monitoring and controlling the drilling process. Finally, it is difficult to create automatic quality control of available drilling real-time signals since connecting them requires a lot of work.

By defining a flexible and generic way in which to describe the semantics of real-time signals, it is possible address most of these issues – by making available facts about each available signal. These facts describe the meaning of the signal. A potential consumer of the signal can read those facts and determine whether the signal corresponds to its requirement or not. The consumer discovers real-time signals dynamically based on characteristics that are important for its application.

Various consumer applications may have different perspectives on what is a relevant signal for their own functionality, and they can choose dynamically the most relevant available drilling real-time signal. In addition, a consumer application can make available calculated signals that may be of interest for other applications. By providing the semantics of these additional signals, they provide an opportunity for other applications to discover them.

ID	Semantic RT Signal Requirement	Considerations
SRT-001	D-WIS will enable the description of the semantics of drilling real-time signals.	By exposing the semantics of each available signal, it is possible for any application to discover and choose the signal of interest for its own functionality
SRT-002	The description of the semantics of drilling real-time signals proposed by D-WIS shall be flexible and generic.	It is important that the solution chosen for describing the semantics of drilling real-time signals can support currently available signals and future signals that are not yet “invented”.
SRT-003	The description of the semantics of drilling real-time signals shall rely on a very concise method.	As there are tens of thousands of real-time signals at the rig site, and there can be even more signals that may be made available when calculated signals are also exchanged, it is important that the proposed solution to describe the semantics of real-time signals is not subject to combinatorial explosion.
SRT-004	The chosen method to provide a semantic description of drilling real-time signals shall support multiple data sources.	The drilling process involves many different service companies. The constellation of the service companies that are present during the drilling process evolves constantly. Therefore, it is important that the proposed solution is

		compatible with a very changing environment.
SRT-004	The introduction of the description of the semantics of drilling real-time signals shall not affect refresh rates, delays, uncertainty, and quality of the actual signals.	As there are already problems with latency, refresh rates, uncertainty and data quality in general, it is important that the introduction of semantical description does not exacerbate the current situation.
SRT-005	The semantic description of drilling real-time signals shall be completely agnostic to which programming languages, operating systems or any other computer specificities is used by the data provider or the data consumer.	The different service providers utilize many different software solutions, including, PLCs, IoT, Servers, handheld computers, etc., running many different types of OS like Windows, Linux, iOS, Android, Step7… and programmed in various languages, e.g., Python, Java, C, C++, C#, … Also, new computer solutions, new OS and new programming languages will arise in the future. It is important that the chosen solution does not block the access to the DWIS interoperability to any of those possibilities.
SRT-006	The semantic description of drilling real-time signals shall be compatible with the access-control rules implemented in any drilling operations.	Typically, the proposed solution shall contain an AAA (Authentication, Authorization and Accounting) strategy so that only authorized parties can access the information.

D-WIS Advisory Structure Requirements

Advisory structure requirements covers the system organization, so that it is scalable to batch processing of wellbore construction. It is concerned with the hierarchy of procedures, the multiplayer advisor environment, authorization and authentication of components, and the state of the various activities on both surface and downhole. These requirements ensure an architecture that is relevant to batch processing and, in future, well construction orchestration.

ID	Advisory Structure Requirement	Considerations
ADV-001	The advisory structure shall define an approach for batch procedure development	The standards shall be capable of scaling to batch processing of a wellbore, where a batch is a borehole section, fluid for a borehole section, drilling operations for a borehole section, etc.
ADV-002	The advisory structure shall define an approach for handling multiple advisors during a phase of drilling	There could be multiple advisors, from multiple players, running in parallel during any phase of the drilling operation
ADV-003	The advisory structure shall define an approach for handling hierarchy of drilling phases and handling of advisors.	Wellbore construction is a hierarchy of phases, as is partially defined in IADC DDR Plus. The architecture shall be capable of handling multiple advisors across and between these phases.
ADV-004	The advisory structure shall define an approach for contextualization of common data items.	D-WIS is primarily concerned with data exchange, and it is therefore important to define – and know – the context of the data.
ADV-005	The advisory architecture shall define authentication and authorization for integrating into system.	Advisors (applications) need to be fully authenticated and authorized before becoming members of the system
ADV-006	The advisory structure shall define methodology for communicating to the Driller during batch processing.	As part of the architecture, it should be specified how the driller communicates with batch processes (and sub-processes) to develop a standard, reliable, interface

ADV-007	The advisory structure shall define a method of registering batch processes relative to a phase of drilling.	A batch process may be valid and operational across multiple drilling phases, and this validity must be known to schedulers and third party advisors
ADV-008	Identify and address cross cutting concerns including but not limited AuthN/Z, Logging, Batch Processing, Advisor Registration, Advisor State Management, Drill State, Rig State	Various concerns may apply to all components in D-WIS. These need to be identified and addressed in a scalable fashion
ADV-009	The advisory structure shall define integration with Drill State and Rig State inference.	Rig State (rig activity) and Drill State (borehole activity and condition) are relevant to registered advisors. They may prepare to run, execute, or terminate, depending on these states. Therefore, definitions should be agreed upon that are scalable across control and batch processing.

D-WIS Software Interface Requirements

These requirements cover the interface software, or data model, transferring information between the D-WIS advisory structure and the rig ADCS. This is an important component of the D-WIS Architecture, and must be implemented is as simple and robust a fashion as possible.

ID	Requirement	Considerations
DSI-001	The D-WIS software interface shall support the various roles of well construction. Currently we are defining: • Operational view – Equipment agnostic interface that	Each interface specification will define the inputs, outputs and behavior. Interfaces must conform to the specification regardless of the technology used for implementation

	exposes normalized rig functions and supports safe operations. • Engineering view – interface that supports equipment configuration	
DSI-002	Interfaces must be flexible enough to evolve over time. Interfaces will implement a versioning scheme to support evolution of an interface.	We will only define parts of the interface which are required not parts which "may" be used in the future. It is possible to update an interface when data points are required.
DSI-003	A Platform Independent Model (PIM) will define the data model.	A PIM exhibits a specified degree of platform independence so as to be suitable for use with a number of different platforms of similar type
DSI-004	Platform Specific Models (PSM) shall implement the D-WIS data model.	PSM combines the specifications in the PIM with the details that specify how that system uses a particular type of platform. When defining a PSM a target Platform Model has to be available. Read more at: http://www.theenterprisearchitect.eu/blog/2008/01/16/mda-model-driven-architecture-basic-concepts/
DSI-005	Interfaces must support security	Security should be an intrinsic part of the interface. There should not be a requirement as to which method of security to use. Governance and policies should define security.

References & Links

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