SPE Drilling Systems Automation Technical Section and the DSA Roadmap Initiative

John Macpherson
Drilling Systems Automation

• Involves the control of the drilling process by automatic means, ultimately reducing human intervention to a minimum.

• Employs control systems and information technologies

• Includes all components downhole, on surface and remote to the drilling rig that are used in real-time to drill and complete the wellbore.
Drilling Systems Automation

includes all components downhole, on surface and remote to the drilling rig that are used in real-time to drill and complete the wellbore

→ Wellbore Construction Activities

→ Drill Bit to Shore, and all systems in between

→ All RT activities: Monitor, Advise, Control

→ All contextual activities that feed the RT world
Levels of Drilling Systems Automation

The current level of automation

**Monitor**
- Wellsite Monitoring Systems
- Remote Data Centers
- Smart Alarms

**Advise**
- Drilling Dynamics Diagnostic Systems
- Directional Drilling Advisors

**Control**
- Auto-Driller
- Stick-Slip Surface Control
- MPD Control Systems

**Autonomous**
- MWD Rotary Steerable Systems
- LWD Formation Samplers

Source: SPE 166263
SPE Drilling Systems Automation Technical Section (DSATS)

- Founded 2008, now approximately 1000 members
- Major Oil, National Oil, Independent Oil, Service Companies, Equipment Suppliers, Drilling Contractors, Consultants, Academia, ...
- **Committees**: Communications and language group focused on interoperability (recommendations and standards); student contest; IEEE & University ...
- **Affiliation**: Drilling Systems Automation Roadmap Industry Initiative & IADC Advanced Rig Technology Initiative
Strategy and Plan DSATS

• Facilitate the development and implementation of drilling systems automation
  – Technical Sessions at Conferences
  – Advanced Technology Workshops
  – Forum Series meetings
  – Distinguished Lecturer programs
  – Webinars
  – Effective liaison with other industry experts in automation
  – Appropriate publicity in journals such as JPT

• Communicate the technology of Drilling Systems Automation
  – communicate lessons learned and best practices
  – development of standards.
DSATS Rig Control System

Communications

- OPC UA for automation
- Interface to proprietary or other standards
- Machine independent clients:
  - data-to-information
  - control algorithms
- Standardized method for obtaining real-time drilling data
- Simplified device control architecture for drilling rigs
OPEN Standards Example

Communication Protocols

Enterprise Level
- Enterprise level software, simulations and database systems

Application Level
- Remote Operations
- Modeling, Analytics
- Simulation

Control Level
- Control Systems
- HMI Systems

Acquisition Level
- Measurement Systems

Process Level
- Surface Sensors
- Downhole Instruments

SPE Drilling Systems Automation Technical Section

Source: SPE 166263
DSATS Communications Group

• Current Status/Work
  – Units
    • Every sensor value will consist of the value, the value units, and the value source
    • Working with Energistics (WITSML) to define a complete definition of a unit
    • Push back to OPC Foundation, adopt as a property of any measurement
  
  – Rig Information Model
    • Data structure {Rig Object, Well Object} that is required to use OPC UA
    • Expose WITS0 and WITSML specified information through a consistent method
    • Take rig objects that are controlled {top drive, drawworks and pumps}
    • Define minimum set of information that is required to automate a DAS task
    • Baseline to be addressed in Halifax, September 2014
    • Turn into standard to yield common way of accessing data and devices on the rig
  
  – Security and Threat Model
    • We have a certificate procedure for system access
    • Cooperation between IADC and DSATS needed to develop security and threat model
Drilling Systems Automation Roadmap Industry Initiative (DSA-R)

- Development of a holistic roadmap for the development of Drilling Systems Automation
- Affiliated to SPE, IADC and AUVSI; formed mid-2013, 50 participants
- Adopted Sandia National Labs Roadmapping process
- Target year - 2025
Addressing 8 challenges identified as critical elements to a DSA roadmap:

– Systems Architecture
– Communications
– Sensors, Instrumentation and Measurement (highlighted in next slides)
– Drilling Machines
– Control Systems
– Simulation and Modeling Systems
– Human factors
– Certification and Industry Standards
IMS-centric view of the drilling systems automation space, showing relationship with other challenges.
DSA Roadmap: IMS Challenge

- Technology trends, needs, and gaps
- Recommendations for DSA sensor and IMS development
- Business Opportunity
Measurement Metadata

- Provide ability to discover information about measurements
- A/D, bandwidth, sampling (snapshot, continuous), correction ...
- Form group -> recommendation -> standard
DSA- R Reporting Findings Phase I at SPE / IADC Drilling Conference March 2015 London

Paper SPE/IADC-173010-MS
Drilling Systems Automation Roadmap - The Means to Accelerate Adoption

Multiple authors who are working on this initiative
IADC ART Affiliation

• Advancing drilling technology by exploring future technology, drilling control systems and automation
• Focus on operational guidelines, assessing new technology, and identifying key deliverables

• Future Technology Subcommittee
• Drilling Control Systems Subcommittee
Summary: Drilling Systems Automation

• **SPE Drilling Systems Automation Technical Section (DSATS)** is the body developing the recommendations for Drilling Systems Automation. It is aligned with:
  – the **IADC Advanced Rig Technology** group (IADC ART), and
  – the **Drilling Systems Automation Roadmap Initiative (DSA-R)**

• DSATS is concerned with increasing awareness of automation in the drilling community, and recommending standards to create an open environment.

• IADC ART is concerned with automation of the drilling rig equipment

• DSA-R is focused on developing a technology roadmap for drilling systems automation
Thank you
John Macpherson: Chairman DSATS

Links to stay in touch with Drilling Systems Automation:

connect.spe.org/dsats/home/
connect.spe.org/DSARoadmap/Home/
www.iadc.org/dsaroadmap
www.iadc.org/advanced-rig-technology-committee/#access

Coming soon: www.drillingsystemsautomation.org