58th General Meeting
Main meeting 19th of October 2023
San Antonio

SPE International

Wellbore Positioning Technical Section

ISCWSA

The Industry Steering Committee on
Wellbore Survey Accuracy (ISCWSA)

Challenges and Innovations Needed in Definitive Survey Database Management

Rustam Rakhmangulov

K&M Technology Group

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SPE International

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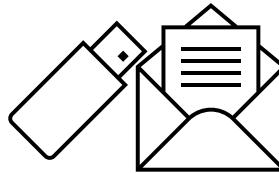Wellbore Survey Accuracy (ISCWSA)

"Post-drilling" surveying

- **Definitive survey QC**

Final wellbore survey and supporting data checks before input to databases
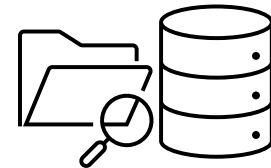

- **Legacy survey QC**

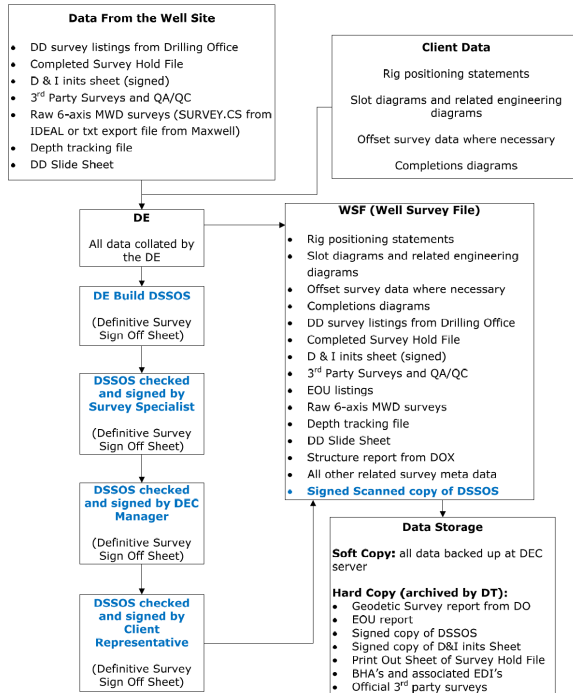Offset well survey verification/validation upon importing to the database

- **Master Survey Database audits**

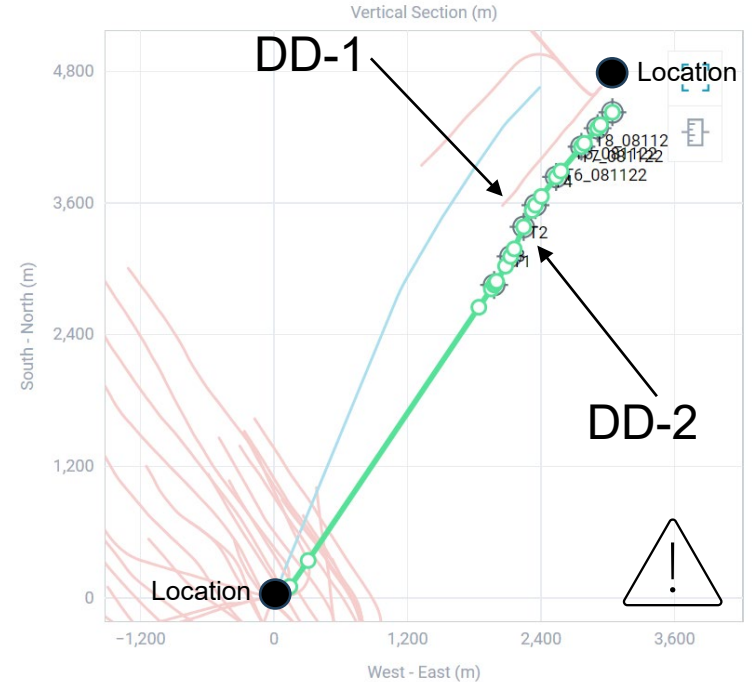Periodical internal/external database checks for standard compliance

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Definitive Survey QC

Data From the Well Site
- DD survey listings from Drilling Office
- Completed Survey Hold File
- D & I inits sheet (signed)
- 3rd Party Surveys and QA/QC
- Raw 6-axis MWD surveys (SURVEY.CS from IDEAL or txt export file from Maxwell)
- Depth tracking file
- DD Slide Sheet

Client Data

Rig positioning statements

Slot diagrams and related engineering diagrams

Offset survey data where necessary

Completions diagrams

DE

All data collated by the DE

DE Build DSSOS

(Definitive Survey Sign Off Sheet)

DSSOS checked and signed by Survey Specialist

(Definitive Survey Sign Off Sheet)

DSSOS checked and signed by DEC Manager

(Definitive Survey Sign Off Sheet)

DSSOS checked and signed by Client Representative

(Definitive Survey Sign Off Sheet)

WSF (Well Survey File)
- Rig positioning statements
- Slot diagrams and related engineering diagrams
- Offset survey data where necessary
- Completions diagrams
- DD survey listings from Drilling Office
- Completed Survey Hold File
- D & I inits sheet (signed)
- 3rd Party Surveys and QA/QC
- EOU listings
- Raw 6-axis MWD surveys
- Depth tracking file
- DD Slide Sheet
- Structure report from DOX
- All other related survey meta data
- Signed Scanned copy of DSSOS

Data Storage

Soft Copy: all data backed up at DEC server

Hard Copy (archived by DT):
- Geodetic Survey report from DO
- EOU report
- Signed copy of DSSOS
- Signed copy of D&I inits Sheet
- Print Out Sheet of Survey Hold File
- BHA's and associated EDI's
- Official 3rd party surveys

- Turn-around time ranges from 5-10 days

- Additional resources (Drilling Engineers / Survey Specialists)

- Extensive data verifications involving numerous documents in different formats
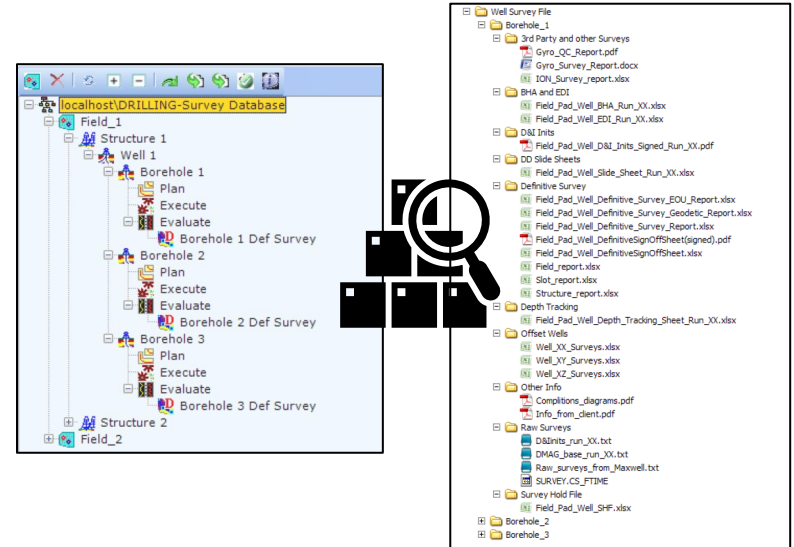
- Presence of redundant data

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Legacy survey QC

- Missing supporting data → downgrade tool codes

- Not able to reprocess → cannot upgrade survey program

- Limited data exchange between multiple companies
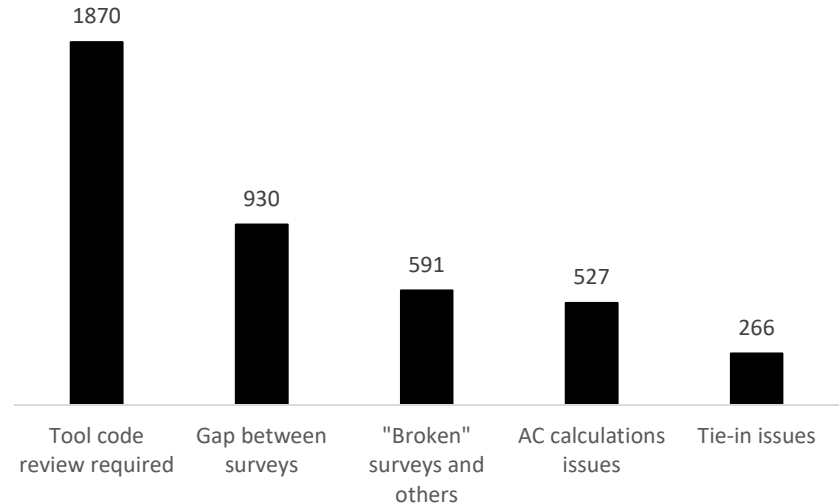
- Increased risks and cost

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Definitive Survey Audits

- Shift in working preferences from servers to local machines

- Rapidly growing database sizes

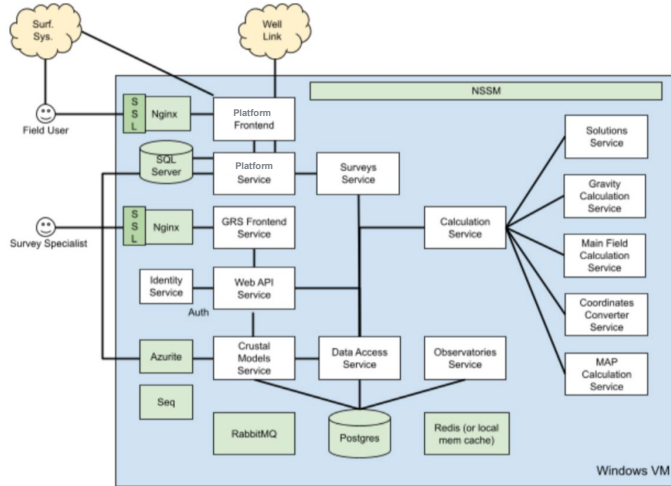- New practices, tool code revisions require software flexibility

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Recent audit findings

- Total number of surveys **5063**

- Lack of automation tools to conduct audits

- Supporting data missing for validation when required

- Uncontrolled survey import/export affects data integrity

- Multiple databases usage

Bar chart:
- Tool code review required: 1870
- Gap between surveys: 930
- "Broken" surveys and others: 591
- AC calculations issues: 527
- Tie-in issues: 266

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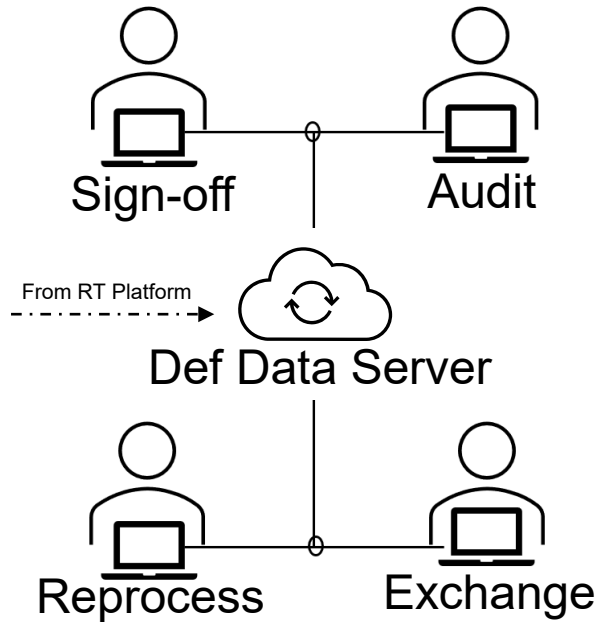
RT Correction Platforms

Basic Architecture

Existing Features

- Raw data transfer directly from the rigs

- Auto QC and MS corrections

- Error models auto-assign

- Utilizes SQL for data storage

- Speed, safety, reliability

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Transformation to Definitive Survey Database

Proposed New Features

- Dedicated storage for every operator and user access management

- Approval of the surveys in the system

- Export definitive surveys in formats compatible with well planning software

- Sending back surveys to correction engine

- Conducting automated data integrity checks

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Switching to the new platforms

Pros

- Higher data integrity, consolidated storage

- Using the platform requires minimum expertise and personnel requirements

- Faster features implementation and flexibility

Cons

- Existing databases transfer

- Missing raw data from some tools (gyros for example)

- Data residency laws

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