

DRIVING PERFORMANCE IN DRILLING THROUGH SUBSURFACE DATA LIBERATION THROUGH OSDU

Luzern, September 2022

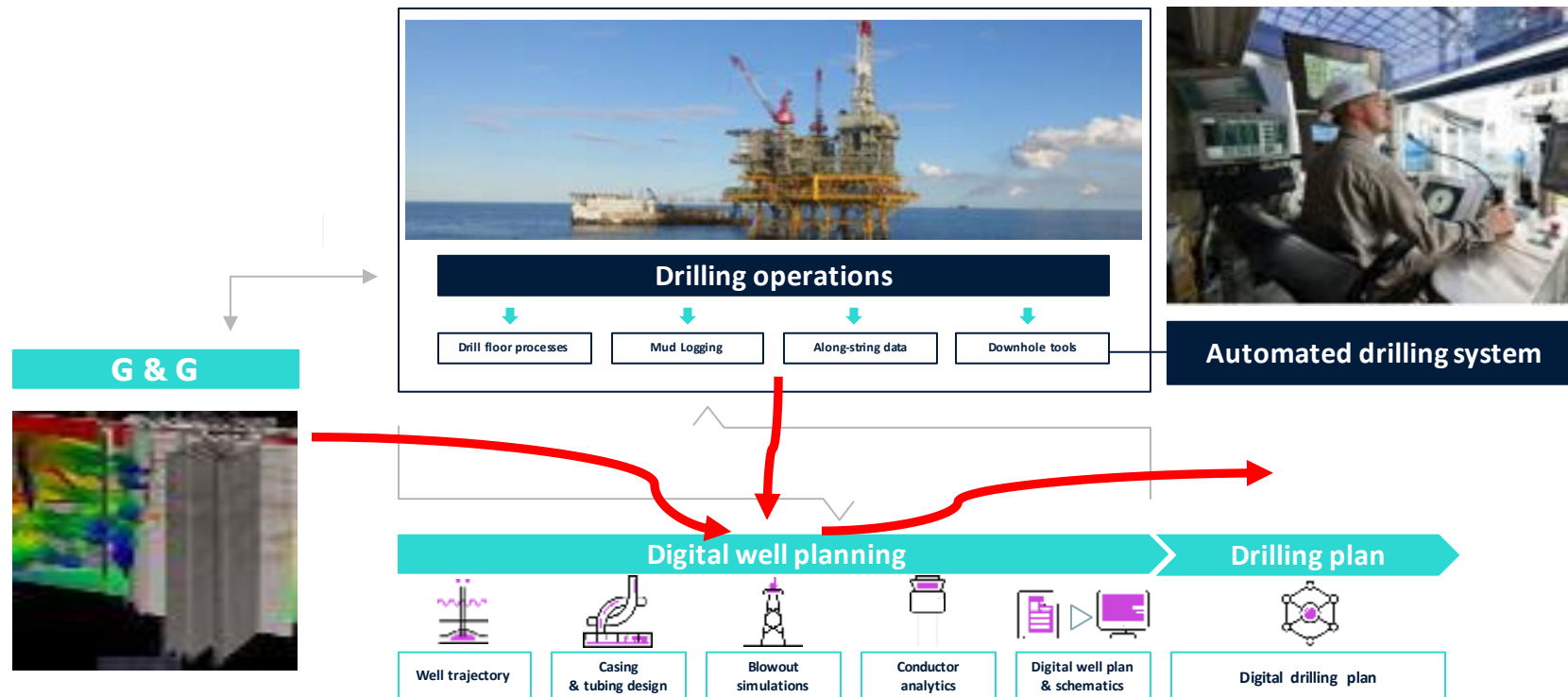




ANDERS HAAVIK

WELLS PERFORMANCE MANAGER
NEPTUNE ENERGY

who is a part of and what constitutes the well plan?



Digital drilling procedure

Safe operating windows & drilling strategy for optimal drilling without error

Procedures constantly updated based on rig & down-hole data

some challenges getting to the plan



Data is manually imported and exported between Subsurface and D&W applications. Poor filing and governance can increase time intensiveness of this manual process



Data is shared both internally and externally via Outlook and SharePoint which is challenging to ensure version control, and ensure the latest correct calculations are used



Daily Drilling Reports, Performance and Financial reports are **manually collected** and consolidated, which is **time intensive**



Multiple systems are used during well delivery and have overlap in the data that must be entered – this results in timely repeated input (compounded by dynamic design) and increased risk of error



Data is **stored in multiple places** by different functions during closeout, including zip files and unstructured formats which results in **difficulty finding and accessing data**



Ensuring D&W data is **archived** in structured systems is **limited** by its ability to be accessed by external users

...but what if something changes?



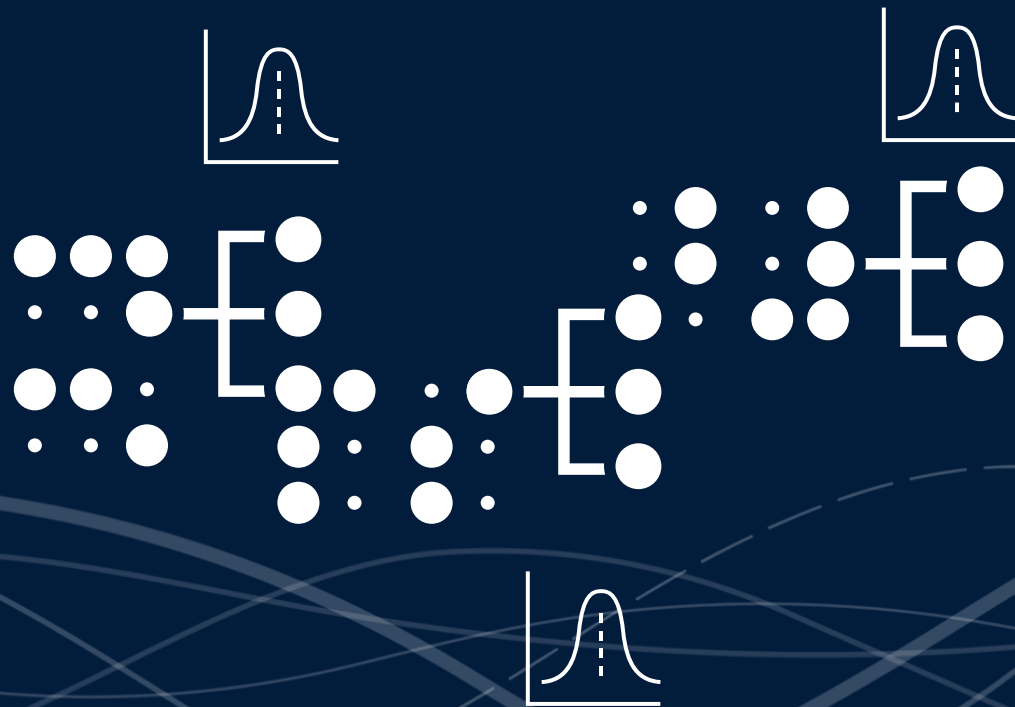
Drilling target/trajectory handover between Subsurface, OpsGeo, DrillEng and DirDriller done manually and time-consuming (e.g. Fenja: 19 revisions – 57 trajectory sign-offs)

Each time trajectory changes (e.g. 19 times for a project) the Ops Geologist has to send new data to DrillEng (PPFG, temp, formation tops). This is time-consuming and any mistake has high consequences.

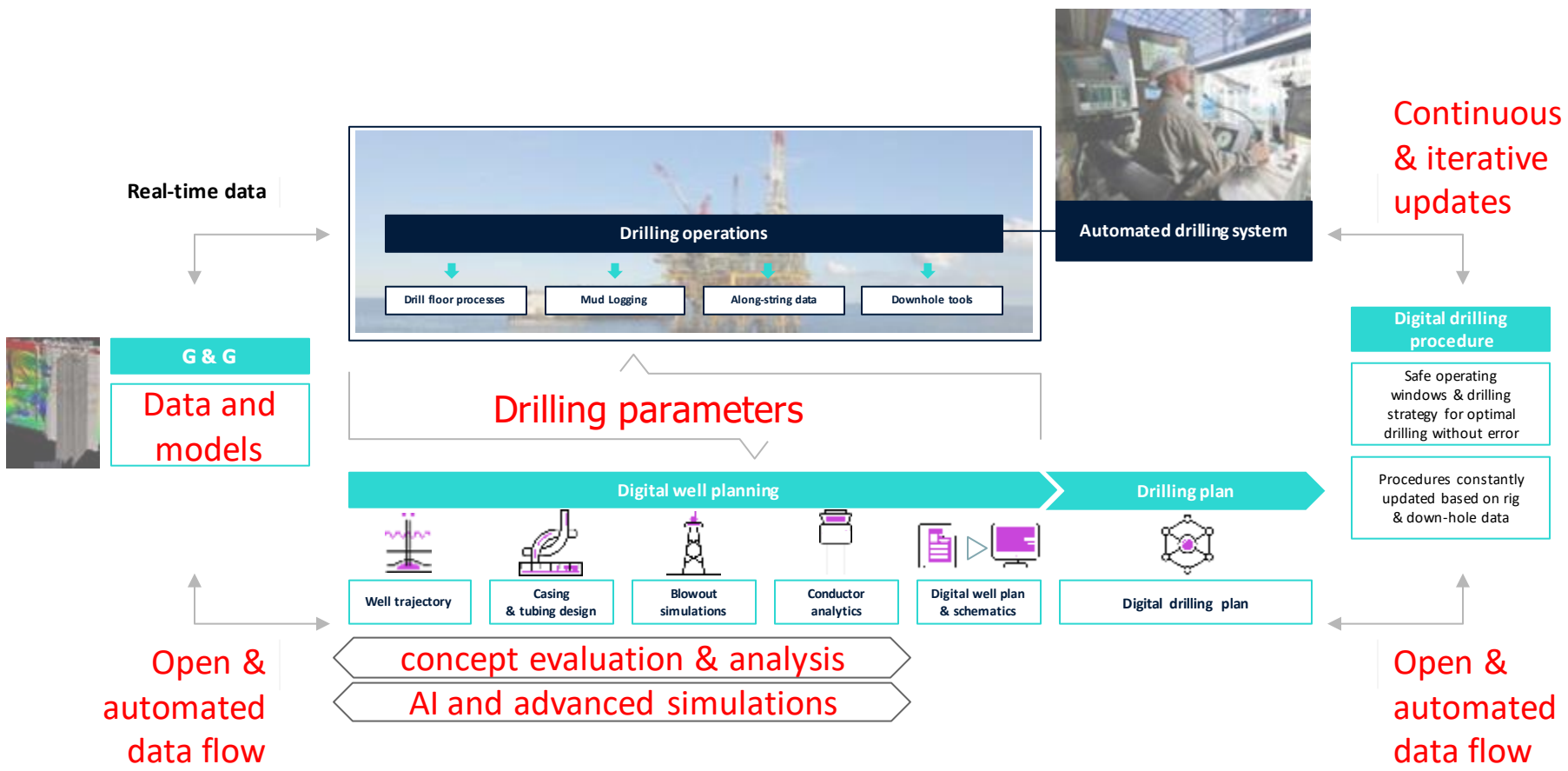
Blowout & kill analysis require ≈15 input data points (about well design and reservoir), each iteration by 3rd party very time consuming

Several data types «live» in spreadsheets/silos, but should be in a central database to be managed and used (e.g. risk)

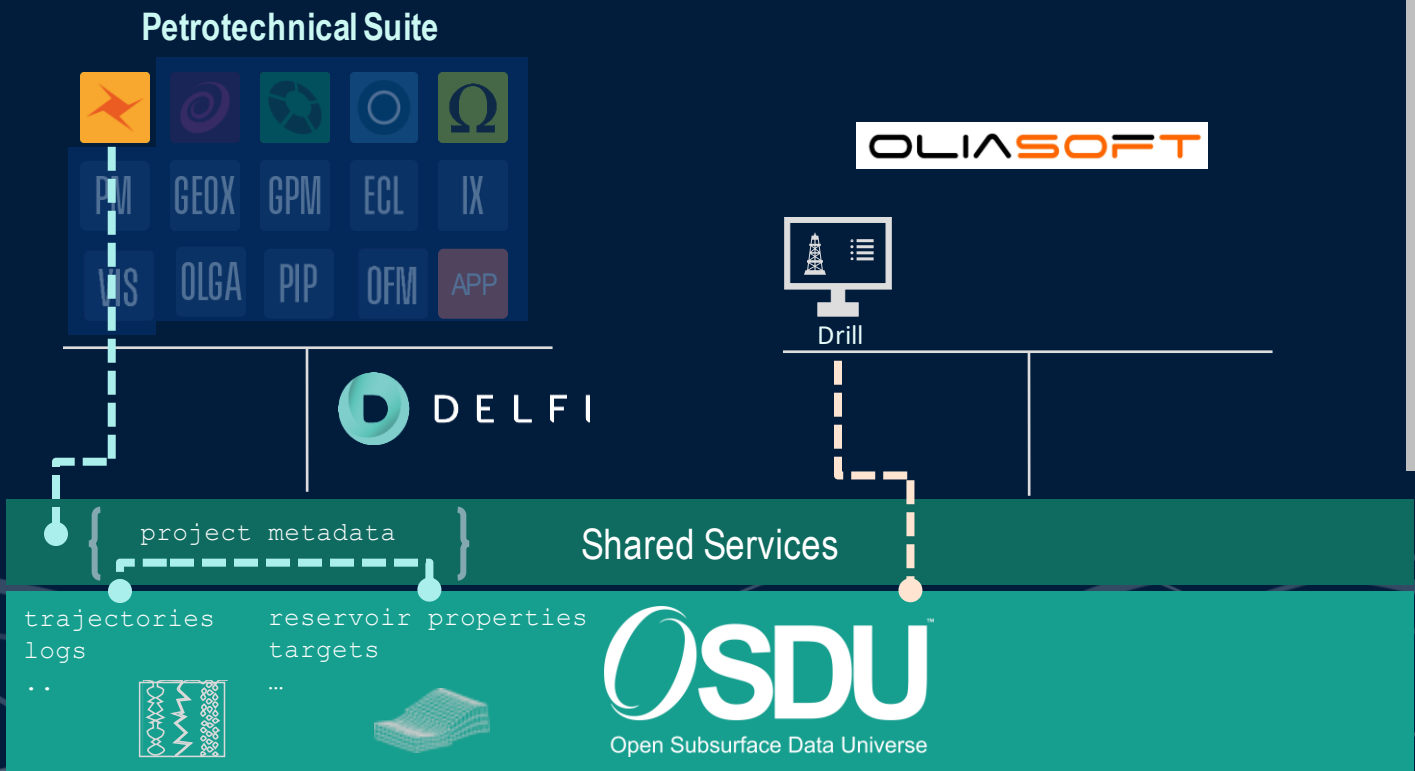
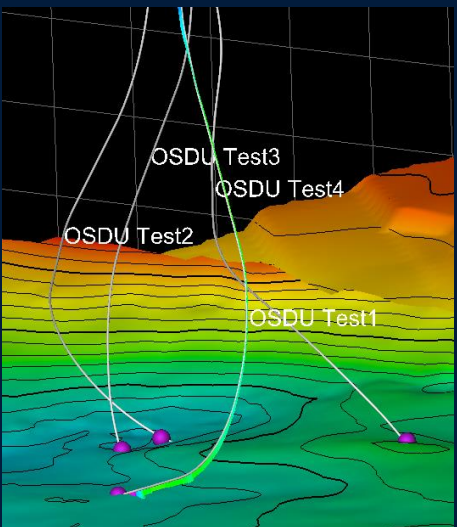
...and what is the uncertainty from the contributing sources?



need better integration to enable automation



integration through OSDU



Petrel PTS and OSDU

The screenshot displays the Petrel software interface with several key components:

- Project Explorer:** A sidebar on the left showing a list of projects. The top project is 'structured syn...' with a size of 31.8 GB and Petrel version 2020.4. Other projects include 'reservoir prop...', 'QC review final', and 'QC review 1'.
- Data Liberation Dialog:** A central dialog box titled 'Data Liberation' with the instruction 'Select the data to be liberated in the Data Platform when saving your project.' It contains a table with columns for 'Liberate', 'Name', 'Path', 'Data type', 'Modified date', and 'Modified by'.

Liberate	Name	Path	Data type	Modified date	Modified by
<input type="checkbox"/>	OSDU Test1	Wells\OSDU Wells	Well	2022-03-30 11:12	trannem
<input type="checkbox"/>	OSDU Test2	Wells\OSDU Wells	Well	2022-03-30 11:13	trannem
<input type="checkbox"/>	OSDU Test3	Wells\OSDU Wells	Well	2022-03-30 11:14	trannem
<input type="checkbox"/>	OSDU Test4	Wells\OSDU Wells	Well	2022-03-30 11:14	trannem
<input type="checkbox"/>	OSDU Test2 Target	Input\TARGETS	PolylineSet	2022-03-30 11:18	trannem
<input type="checkbox"/>	OSDU Test1 Target	Input\TARGETS	PolylineSet	2022-03-30 11:22	trannem
<input type="checkbox"/>	OSDU Test3 Target	Input\TARGETS	PolylineSet	2022-03-30 11:26	trannem
<input type="checkbox"/>	OSDU Test4 Target	Input\TARGETS	PolylineSet	2022-03-30 13:27	trannem
<input type="checkbox"/>	Seabed	Input\TARGETS\SURFACES\Overburden surface...	Surface	2022-03-30 13:29	trannem
<input type="checkbox"/>	Naust	Input\TARGETS\SURFACES\Overburden surface...	Surface	2022-03-30 13:30	trannem
<input type="checkbox"/>	Lange	Input\TARGETS\SURFACES\Overburden surface...	Surface	2022-03-30 13:32	trannem
<input type="checkbox"/>	Lyr	Input\TARGETS\SURFACES\Overburden surface...	Surface	2022-03-30 13:33	trannem
<input type="checkbox"/>	Top Reservoir	Input\TARGETS\SURFACES\Overburden surface...	Surface	2022-03-30 13:35	trannem
<input type="checkbox"/>	Internal 1	Input\TARGETS\SURFACES\Overburden surface...	Surface	2022-03-30 13:39	trannem
<input type="checkbox"/>	Internal 2	Input\TARGETS\SURFACES\Overburden surface...	Surface	2022-03-30 13:39	trannem
<input type="checkbox"/>	Internal 3	Input\TARGETS\SURFACES\Overburden surface...	Surface	2022-03-30 13:40	trannem
<input type="checkbox"/>	Internal 4	Input\TARGETS\SURFACES\Overburden surface...	Surface	2022-03-30 13:40	trannem
<input type="checkbox"/>	Internal 5	Input\TARGETS\SURFACES\Overburden surface...	Surface	2022-03-30 13:41	trannem
<input type="checkbox"/>	Internal 6	Input\TARGETS\SURFACES\Overburden surface...	Surface	2022-03-30 13:41	trannem
<input type="checkbox"/>	Base Reservoir	Input\TARGETS\SURFACES\Overburden surface...	Surface	2022-03-30 13:36	trannem
- Main View:** A 3D visualization of a reservoir model with a wellbore. A color scale on the right indicates depth from -3000.00 to -4400.00. A 2D plot on the left shows a vertical stress gradient for 'OSDU Test1 [MD]' with values ranging from 0.00 to 2.40 g/cm3.

OSDU and Oliasoft

OSDU Integration

Wellbore Trajectory
 WellLog (Pore/Frac Pressure)

Fetch from OSDU | Re-Import

Blowout simulations

OSDU Blowout
 2022-04-05 22:06

- 1.4 sg, AN: 11000 lpm - Parallellisation
- 1.5 sg, AN: 11000 lpm - Parallellisation
- 1.5 sg, AN: 12000 lpm - Parallellisation

Blowout and Kill Summary

	1.3 sg	1.4 sg	1.5 sg	1.6 sg	1.7 sg
AN: 11000 lpm	Fail	Fail	Fail	Fail	Fracture pressure exceeded
AN: 11500 lpm	Fail	Fail	Fail	Success	Fracture pressure exceeded
AN: 12000 lpm	Fail	Fail	Fail	Success	Fracture pressure exceeded
AN: 12500 lpm	Fail	Fail	Fail	Success	Fracture pressure exceeded
AN: 13000 lpm	Fail	Fail	Fail	Success	Fracture pressure exceeded

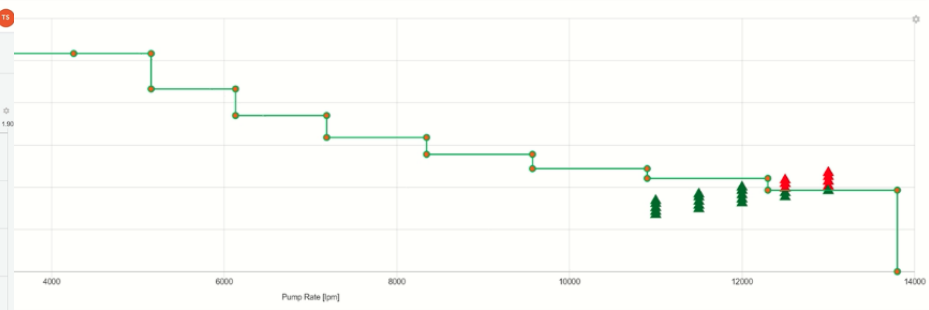
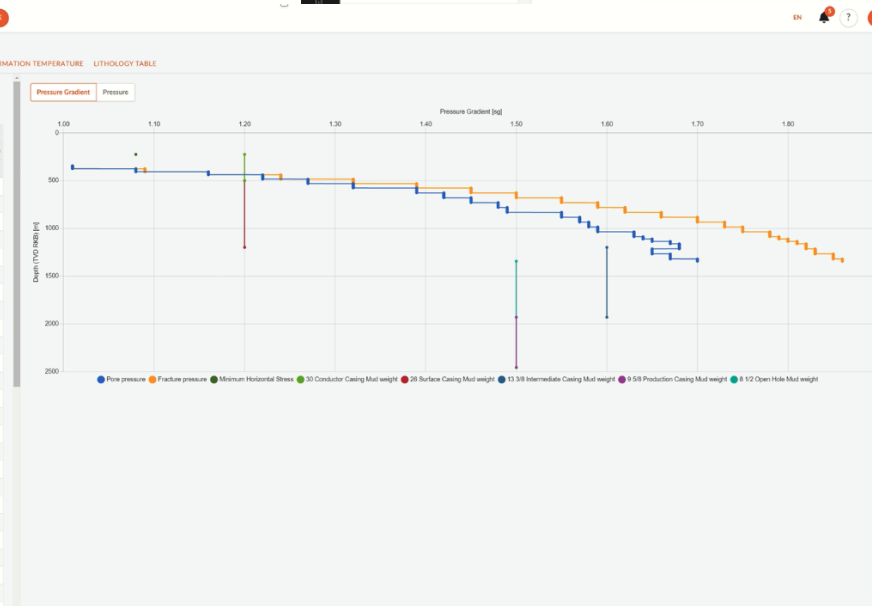
KILL PUMP CURVES
 Rig configuration annulus | 3 pumps 2200 HHP

Formation Inputs

PORE PRESSURE | FRACTURE PRESSURE | MINIMUM HORIZONTAL STRESS | FORMATION TEMPERATURE | LITHOLOGY TABLE

Enable collapse pressure | Enable uncertainty range

Depth (TVD)	Pressure Gradient	Pressure
m	kg / m ³	Bar g
344	1.03	34.07
345	1.03	34.17
346	1.03	34.27
347	1.03	34.37
348	1.03	34.47
349	1.03	34.57
350	1.03	34.67
351	1.03	34.77
352	1.03	34.86
353	1.03	34.96
354	1.03	35.06
355	1.03	35.16
356	1.03	35.26
357	1.03	35.36
358	1.03	35.46
359	1.03	35.56
360	1.03	35.66
361	1.03	35.76
362	1.03	35.86
363	1.03	35.95
364	1.03	36.05
365	1.03	36.15
366	1.03	36.25
367	1.03	36.35



more cost effective



Reduce well design
iteration time



Reduce risk of wrong
input data



Reduce non-value
adding efforts

drill the well right



Reduce well design
iteration time



Reduce risk of wrong
input data



Reduce non-value
adding efforts



Improved hand-offs



Faster iterations

drill the right well



Faster iterations



Reduce non-value
adding efforts



Improved hand-offs



Use of best available knowledge
across teams

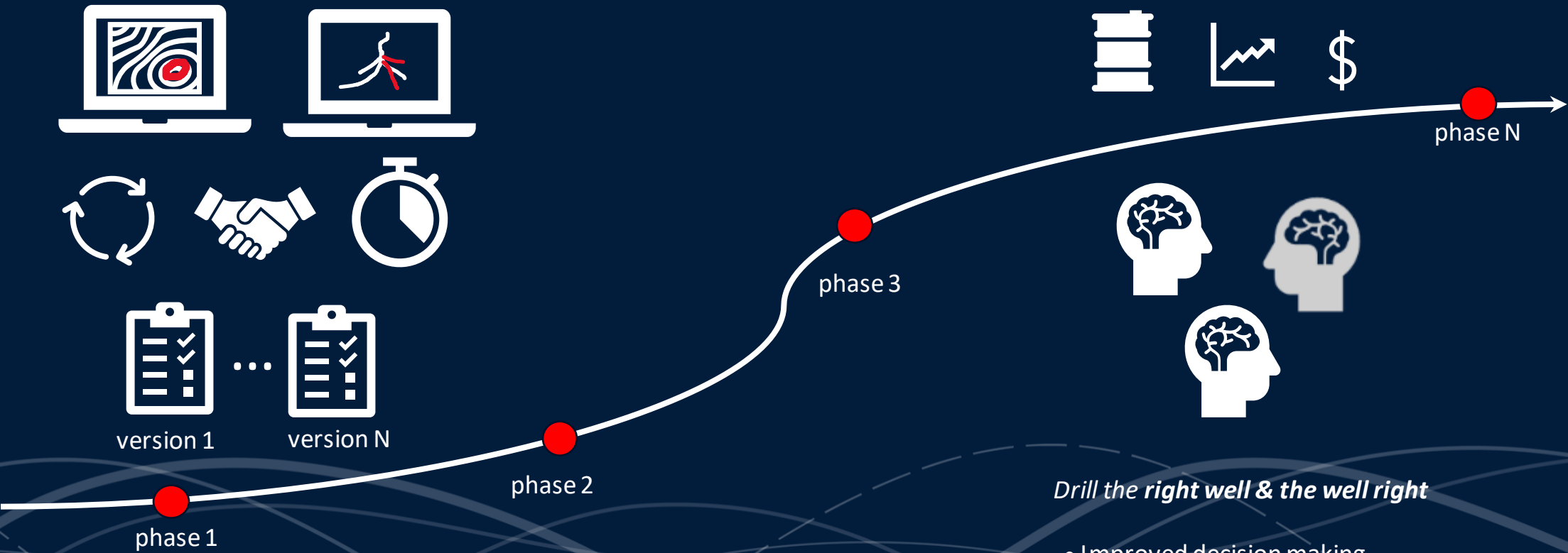


Reduce well design
iteration time



Reduce risk of wrong
input data

agile development, incremental delivery



Collaborative environment: drill the well right

- Initial reduction well planning time
- Shorten well planning time
- Reduce NPT
- More data driven decisions

Drill the right well & the well right

- Improved decision making
- Increased drill target success rate
- Reduced NPT
- Shorter well planning time
- Collaborative environment

how we have worked together





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