Data and Analytics

Unconventional Session in Progress

Knowledge Discovery in DELFI

Our mission is to create value from unstructured data with Artificial Intelligence

Background

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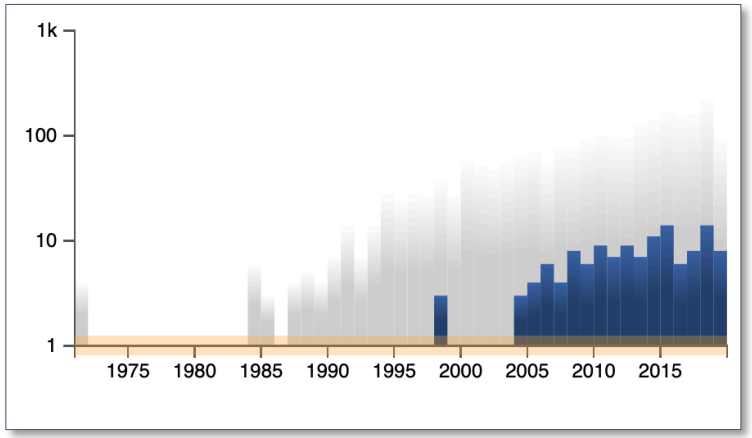
- Data processing and analytics have matured in the last 40 years
- Concern about *data reuse* is more recent:
  - "½ of respondents spend > ¼ time identifying data"
- *Information reuse in text* remains a challenge



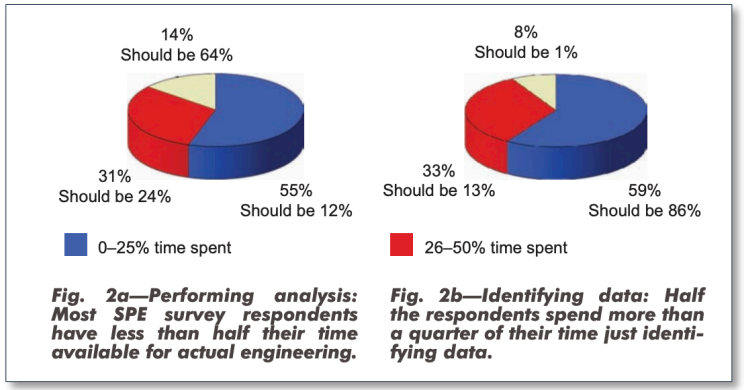


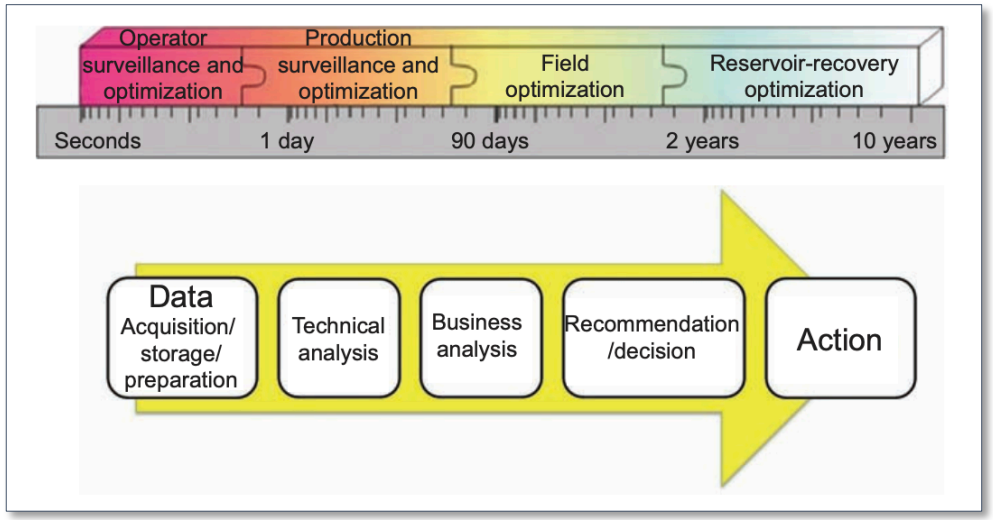
Fig. 2a—Performing analysis: Most SPE survey respondents have less than half their time available for actual engineering.

Fig. 2b—Identifying data: Half the respondents spend more than a quarter of their time just identifying data.

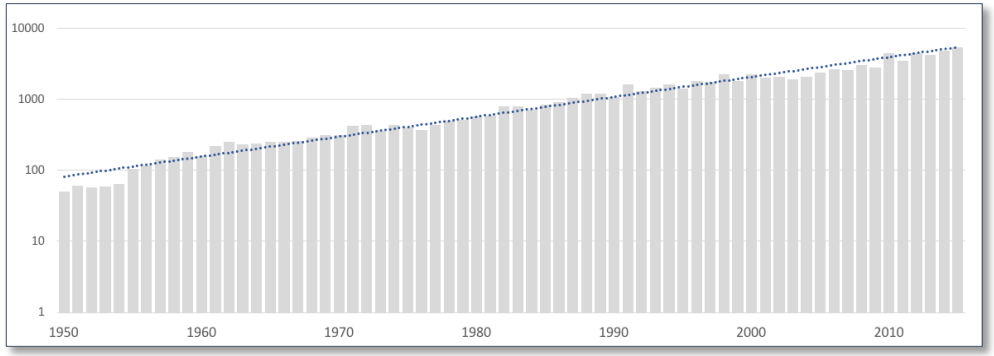
SPE-0909-0048-JPT, Sept. 2009

Why is Text Important?

- Data drives real-time control…
- … but written reports drive tactics and strategy.
- Reports are valuable, but rapidly get lost in content clutter.
- Content doubles about every 10 years.



SPE-0909-0048-JPT, Sept. 2009



SPE-191758, Sept. 2018

What Kind of Text?

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- Interpretations
- Text included with structured data
  - Remarks in daily activity logs (daily drilling reports, production reports, etc.)
- Policies, procedures, and manuals
  - Written to be directly actionable by people, not computers
- Written material that may have a long “shelf life”
  - Insights that are valuable long after being written
- Written material may only be useful for a short period
  - Email, internal and external web pages (e.g., news)

Text Analysis Goals: Find Structure in Documents

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Title	What is the best name for this text? Especially important when analyzing file shares!
Summary	What is a short, useful synopsis?
Key phrases	What concepts stand out?
Classification	What is it about, relative to one or more taxonomies?
Named entities	What does it mention: Places, oil fields, basins, formations?
Data points	What labelled values (or tables of values) can be extracted?

Why is Text Analysis Hard?

- Large vocabularies: high dimensionality problem space
  - Techniques that reduce dimensionality can lose accuracy
- Multiple languages
- Lack of good, complete labelled training examples
- Words have multiple meanings: homonymy and polysemy (e.g., metaphor)
  - Phrases are more precise than words but have variable length
  - Idioms: “hot potato” is not a reference to food…
- Visual layout—alignment, font size—implies a “hidden” meaning
- Noise (e.g., misspellings), formats, size, OCR, …
- All the usual system issues: performance, scalability, reliability, security, …, memory pressure

What's the Payoff?

- Good text analysis is like a good assistant
  - Reduce the manual effort to use information in documents
- Improved search efficiency: recall and precision
  - Find by classification
  - Drill down to a desired result… much like how you buy things on the web
- Improved usability
  - Titles and summaries help users to decide which documents to explore
  - Key phrases can lead to discovery
  - Leverage structure from text analysis to find other information:
    - *e.g.,* place names => places on a map
    - In general, use all the power of mature structured data analysis tools!

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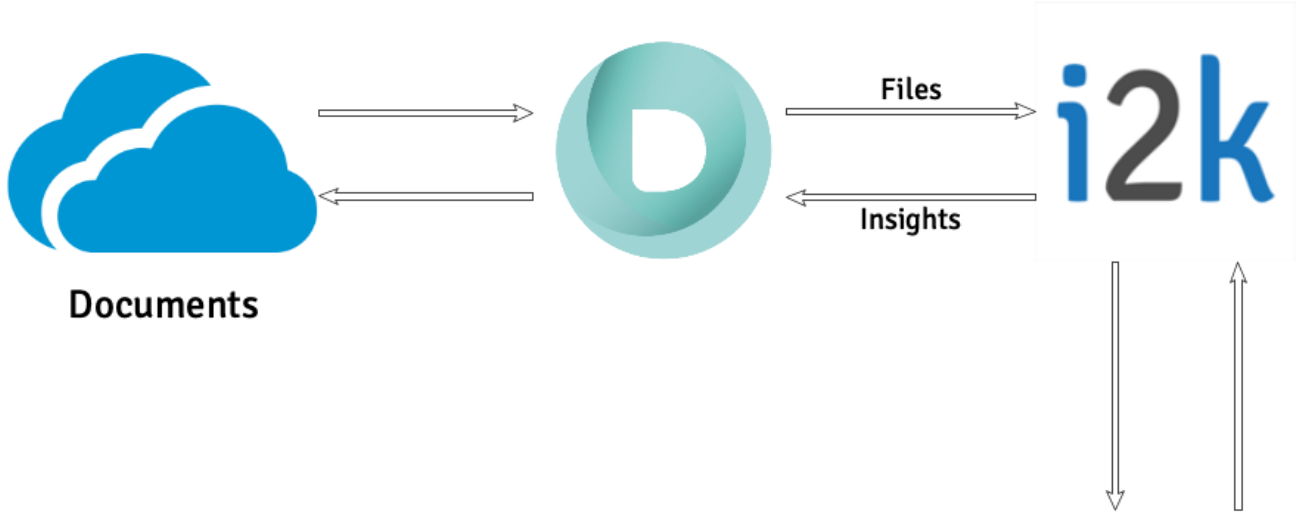

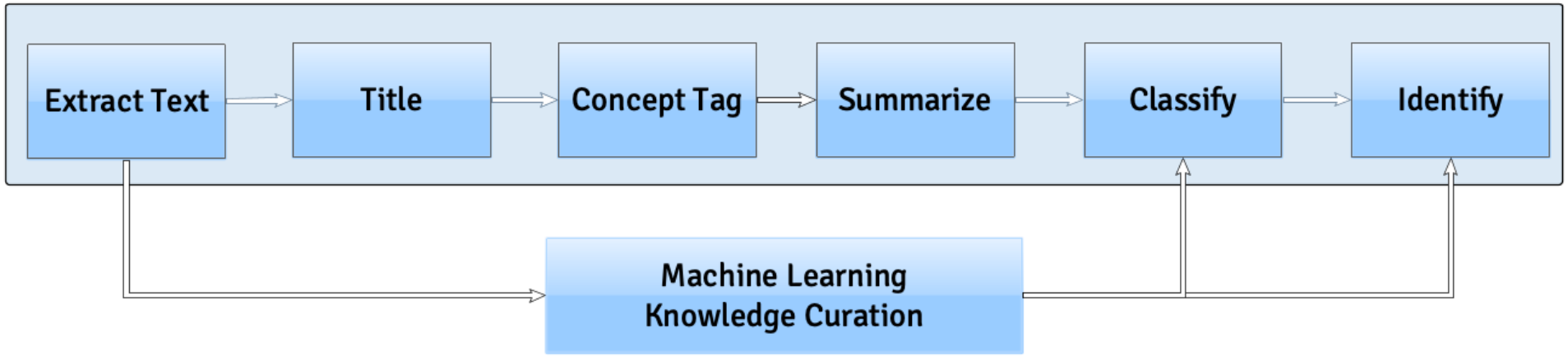

SIS Global Forum Presentations

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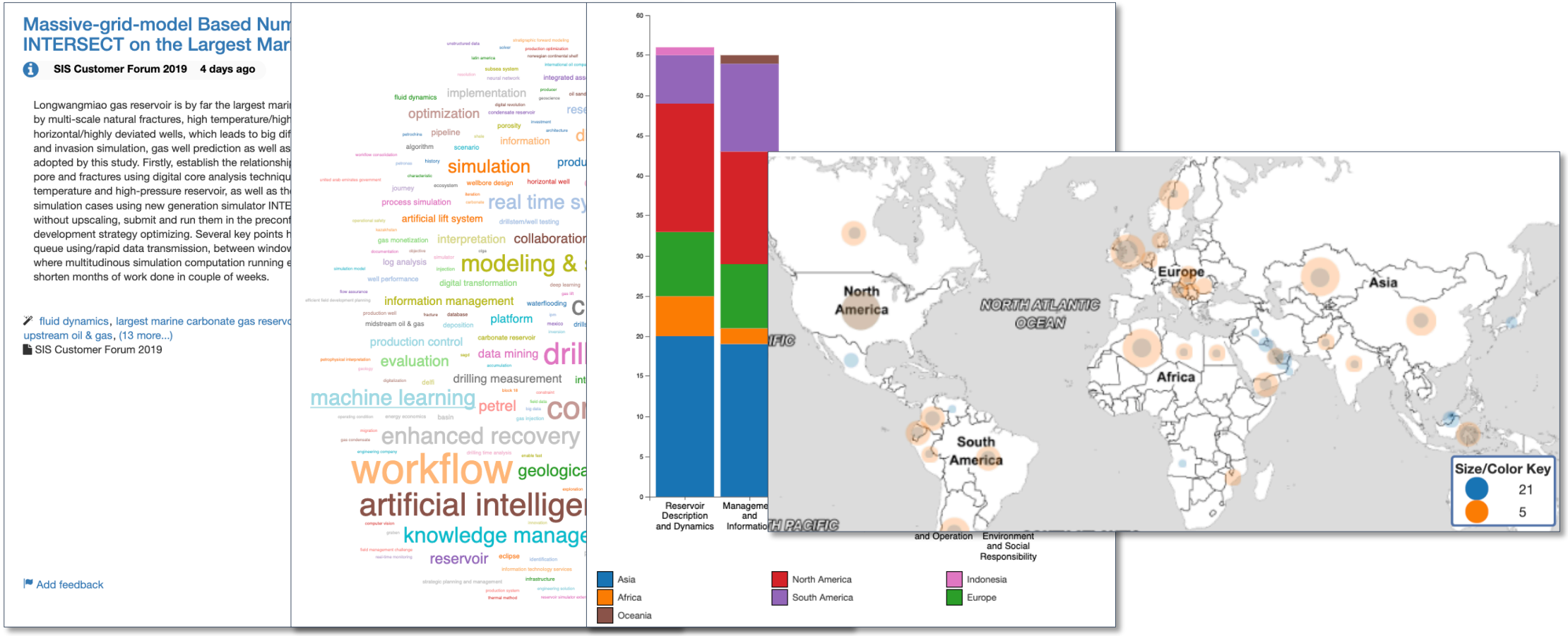

Analyzing Large Documents

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- Example:
  - Carnarvon Basin End-of-Well report
  - 2175 pages
  - Tables, daily drilling, daily geology, logs, etc.
  - https://nopims.dmp.wa.gov.au/Nopims/Search/Wells

- What can we discover?
  - Identify what it is
  - Identify what is in it—section by section
  - Extract data from sections
  - Look at inter-section trends
  - Look for interesting content in individual sections

Large Documents: Classification

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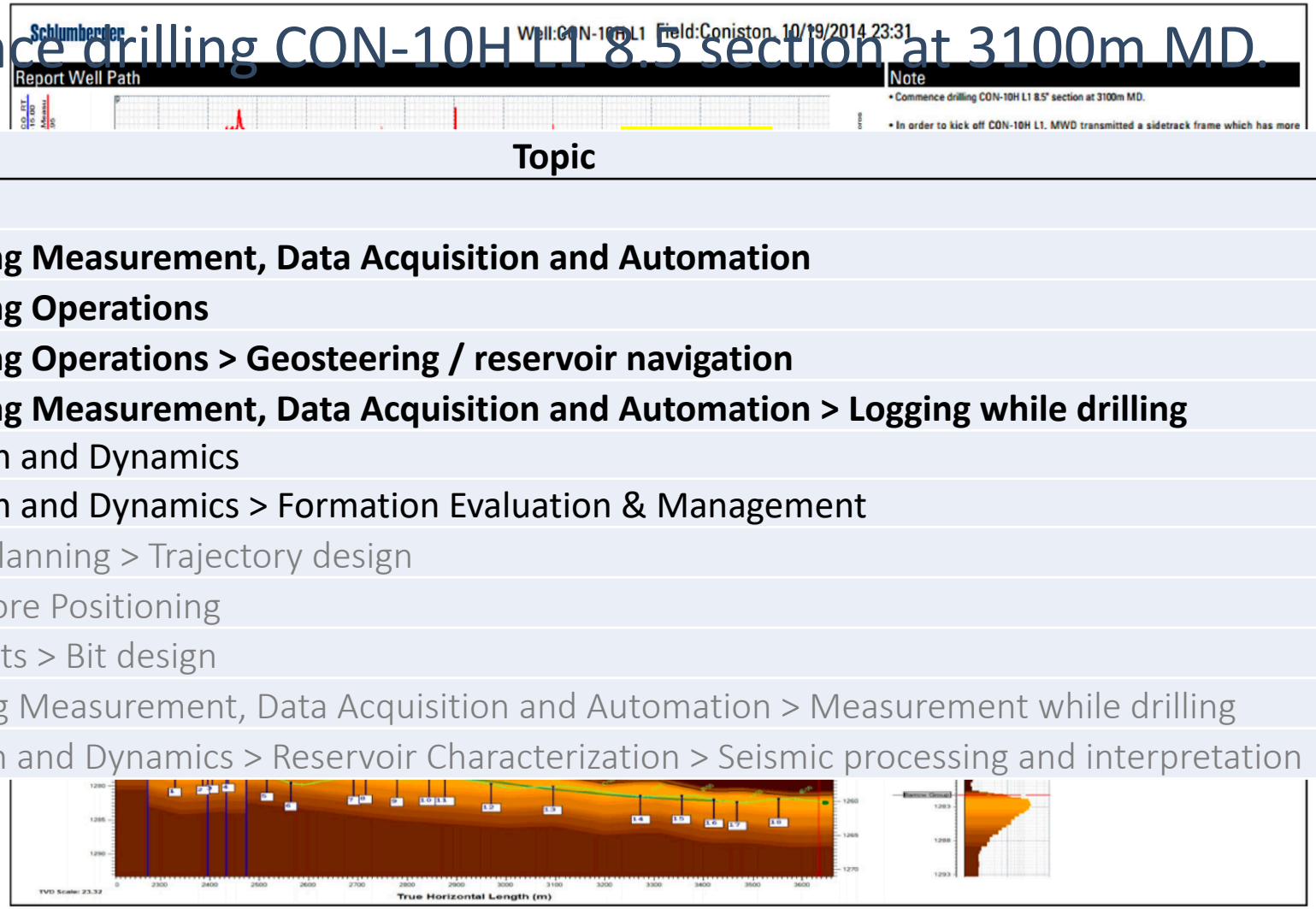
- Commence drilling CON-10H L1 8.5 section at 3100m MD.



Topic	Score
Well Drilling	**1**
Well Drilling > Drilling Measurement, Data Acquisition and Automation	**0.96**
Well Drilling > Drilling Operations	**0.75**
Well Drilling > Drilling Operations > Geosteering / reservoir navigation	**0.53**
Well Drilling > Drilling Measurement, Data Acquisition and Automation > Logging while drilling	**0.52**
Reservoir Description and Dynamics	0.3
Reservoir Description and Dynamics > Formation Evaluation & Management	0.16
Well Drilling > Well Planning > Trajectory design	0
Well Drilling > Wellbore Positioning	0
Well Drilling > Drill Bits > Bit design	0
Well Drilling > Drilling Measurement, Data Acquisition and Automation > Measurement while drilling	0
Reservoir Description and Dynamics > Reservoir Characterization > Seismic processing and interpretation	0

Large Documents: i2k Oilfield Places™

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Company:
Field: Coni
Well: CON-
Rig Name:
Country: A

- Oceani
  North W
  Block W

Schlumberger

Company:	Apache Energy Ltd
Field:	Coniston
Well:	CON-10H L1
Rig Name:	Atwood Falcon
Country:	Australia
Report Date:	Sunday, 19 October 2014 (UTC+08:00) Perth
Prepared by:	Laura Pontarelli/Matthew Rigden

Well Placement End of Well Report

Product Code:

Disclaimer

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Aside: Learning from Reading

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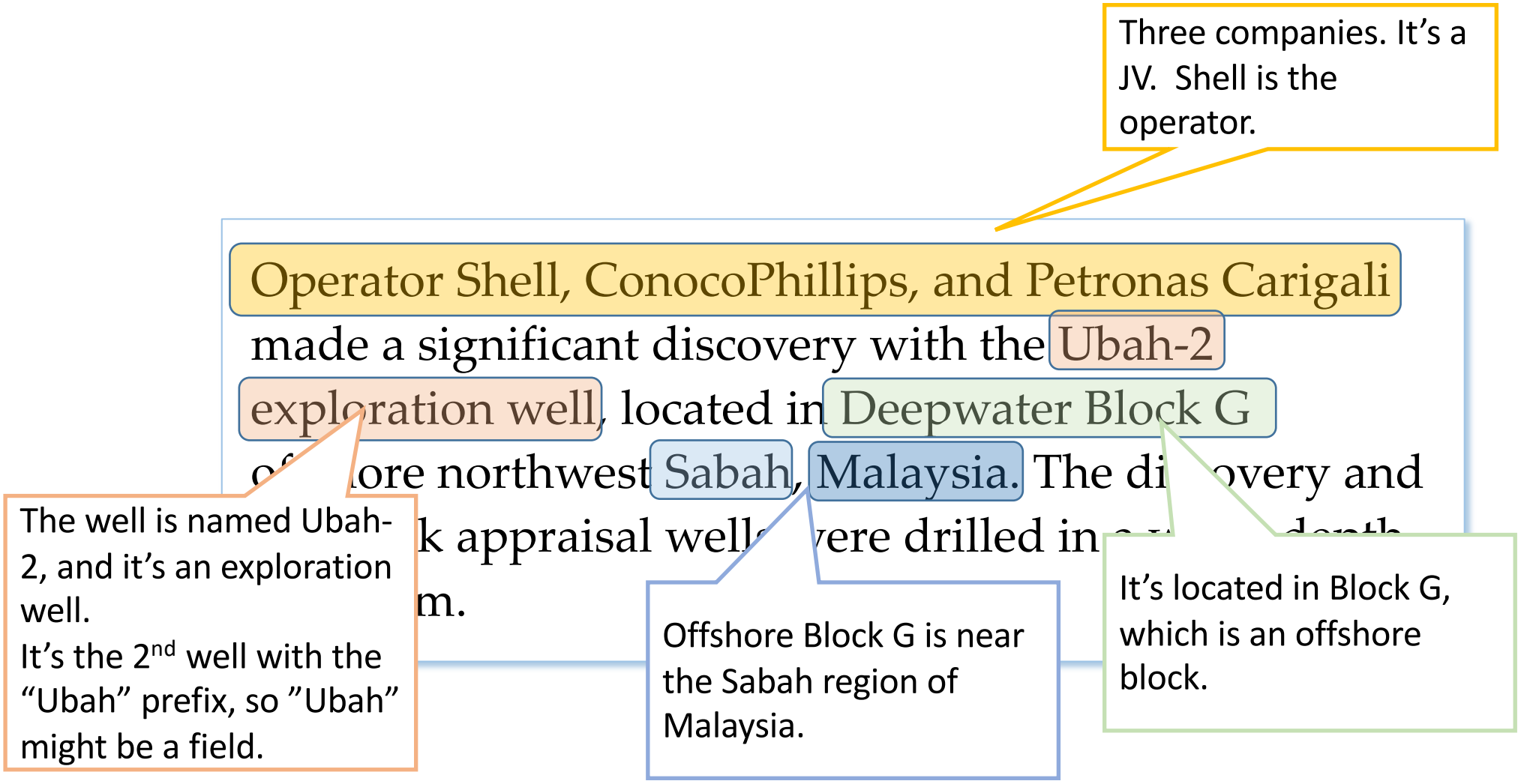

Large Documents: Cutting Edge Data Extraction

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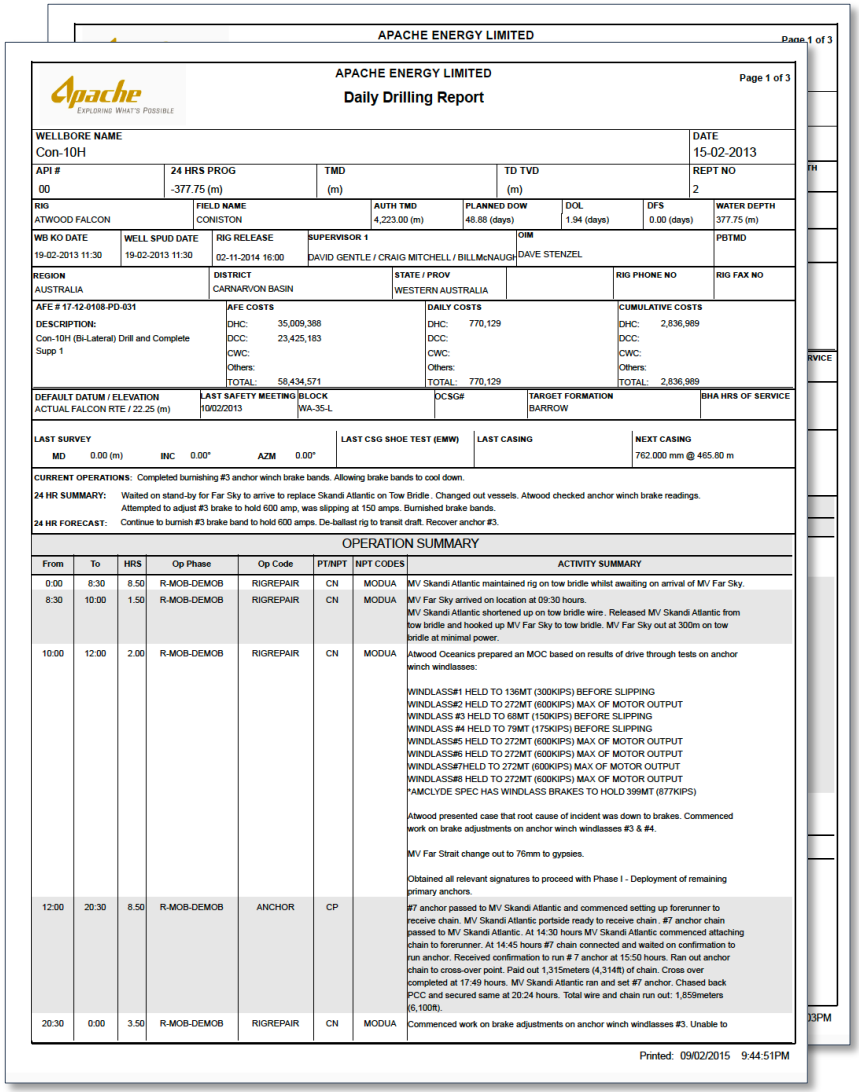


APACHE ENERGY LIMITED

Page 1 of 3

Daily Drilling Report

WELLBORE NAME					DATE
Con-10H					15-02-2013
API #	24 HRS PROG	TMD	TD TVD		REPT NO
00	-377.75 (m)	(m)	(m)		2

RIG	FIELD NAME	AUTH TMD	PLANNED DOW	DOL	DFS	WATER DEPTH
ATWOOD FALCON	CONISTON	4,223.00 (m)	48.88 (days)	1.94 (days)	0.00 (days)	377.75 (m)

WB KO DATE	WELL SPUD DATE	RIG RELEASE	SUPERVISOR 1	OIM	PBTMD
19-02-2013 11:30	19-02-2013 11:30	02-11-2014 16:00	DAVID GENTLE / CRAIG MITCHELL / BILLMcNAUGH	DAVE STENZEL	

REGION	DISTRICT	STATE / PROV	RIG PHONE NO	RIG FAX NO
AUSTRALIA	CARNARVON BASIN	WESTERN AUSTRALIA		

AFE # 17-12-0108-PD-031

DESCRIPTION: Con-10H (Bi-Lateral) Drill and Complete Supp 1

AFE COSTS		DAILY COSTS		CUMULATIVE COSTS	
DHC:	35,009,388	DHC:	770,129	DHC:	2,836,989
DCC:	23,425,183	DCC:		DCC:	
CWC:		CWC:		CWC:	
Others:		Others:		Others:	
TOTAL:	58,434,571	TOTAL:	770,129	TOTAL:	2,836,989

DEFAULT DATUM / ELEVATION	LAST SAFETY MEETING	BLOCK	OCSG#	TARGET FORMATION	BHA HRS OF SERVICE
ACTUAL FALCON RTE / 22.25 (m)	10/02/2013	WA-35-L		BARROW	

LAST SURVEY				LAST CSG SHOE TEST (EMW)	LAST CASING	NEXT CASING
MD	0.00 (m)	INC	0.00°	AZM	0.00°	762.000 mm @ 465.80 m

CURRENT OPERATIONS: Completed burnishing #3 anchor winch brake bands. Allowing brake bands to cool down.

24 HR SUMMARY: Waited on stand-by for Far Sky to arrive to replace Skandi Atlantic on Tow Bridle. Changed out vessels. Atwood checked anchor winch brake readings. Attempted to adjust #3 brake to hold 600 amp, was slipping at 150 amps. Burnished brake bands.

24 HR FORECAST: Continue to burnish #3 brake band to hold 600 amps. De-ballast rig to transit draft. Recover anchor #3.

OPERATION SUMMARY

From	To	HRS	Op Phase	Op Code	PT/NPT	NPT CODES	ACTIVITY SUMMARY
0:00	8:30	8.50	R-MOB-DEMOB	RIGREPAIR	CN	MODUA	MV Skandi Atlantic maintained rig on tow bridle whilst awaiting on arrival of MV Far Sky.
8:30	10:00	1.50	R-MOB-DEMOB	RIGREPAIR	CN	MODUA	MV Far Sky arrived on location at 09:30 hours. MV Skandi Atlantic shortened up on tow bridle wire. Released MV Skandi Atlantic from tow bridle and hooked up MV Far Sky to tow bridle. MV Far Sky out at 300m on tow bridle at minimal power.
10:00	12:00	2.00	R-MOB-DEMOB	RIGREPAIR	CN	MODUA	Atwood Oceanics prepared an MOC based on results of drive through tests on anchor winch windlasses: WINDLASS#1 HELD TO 136MT (300KIPS) BEFORE SLIPPING WINDLASS#2 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS #3 HELD TO 68MT (150KIPS) BEFORE SLIPPING WINDLASS #4 HELD TO 79MT (175KIPS) BEFORE SLIPPING WINDLASS#5 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS#6 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS#7HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS#8 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT *AMCLYDE SPEC HAS WINDLASS BRAKES TO HOLD 399MT (877KIPS) Atwood presented case that root cause of incident was down to brakes. Commenced work on brake adjustments on anchor winch windlasses #3 & #4. MV Far Strait change out to 76mm to gypsies. Obtained all relevant signatures to proceed with Phase I - Deployment of remaining primary anchors.
12:00	20:30	8.50	R-MOB-DEMOB	ANCHOR	CP		#7 anchor passed to MV Skandi Atlantic and commenced setting up forerunner to receive chain. MV Skandi Atlantic portside ready to receive chain . #7 anchor chain passed to MV Skandi Atlantic. At 14:30 hours MV Skandi Atlantic commenced attaching chain to forerunner. At 14:45 hours #7 chain connected and waited on confirmation to run anchor. Received confirmation to run # 7 anchor at 15:50 hours. Ran out anchor chain to cross-over point. Paid out 1,315meters (4,314ft) of chain. Cross over completed at 17:49 hours. MV Skandi Atlantic ran and set #7 anchor. Chased back PCC and secured same at 20:24 hours. Total wire and chain run out: 1,859meters (6,100ft).
20:30	0:00	3.50	R-MOB-DEMOB	RIGREPAIR	CN	MODUA	Commenced work on brake adjustments on anchor winch windlasses #3. Unable to

Printed: 09/02/2015 9:44:51PM

Divide into sections

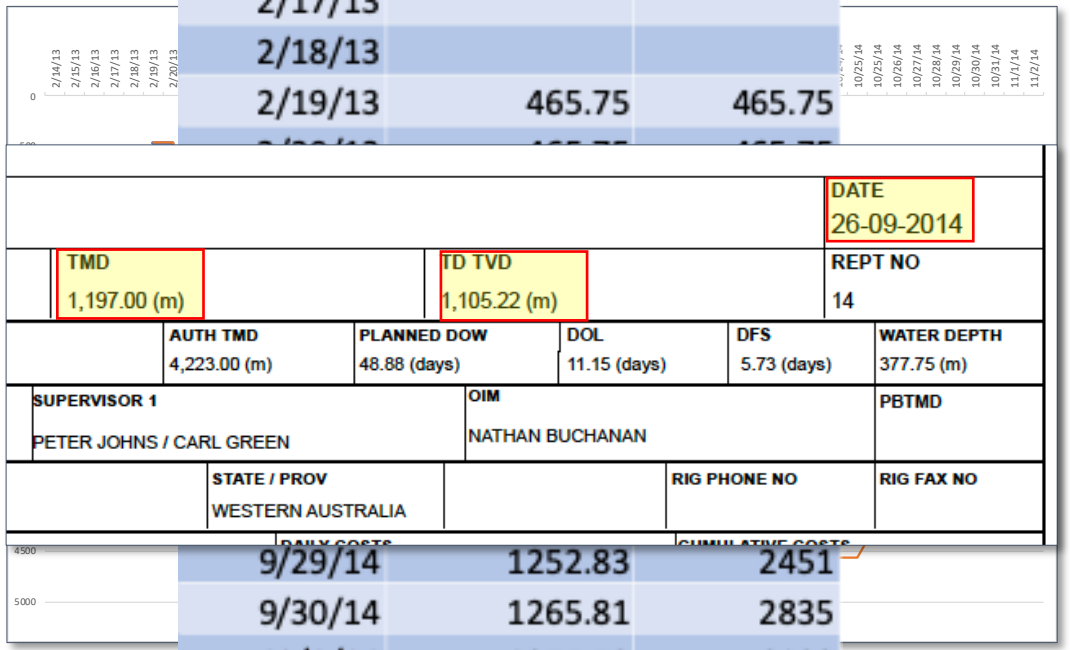
Enrich each section

Group sections

Extract data from sections

Analyze data

DATE	TD TVD (m)	TMD (m)
2/14/13		
2/15/13		
2/16/13		
2/17/13		
2/18/13		
2/19/13	465.75	465.75
9/29/14	1252.83	2451
9/30/14	1265.81	2835
10/1/14	1275.53	3188
10/2/14	1275.53	3188
10/3/14	1275.53	3188
10/4/14	1275.53	3188



https://search.spe.org (For AI: https://aitopics.org)

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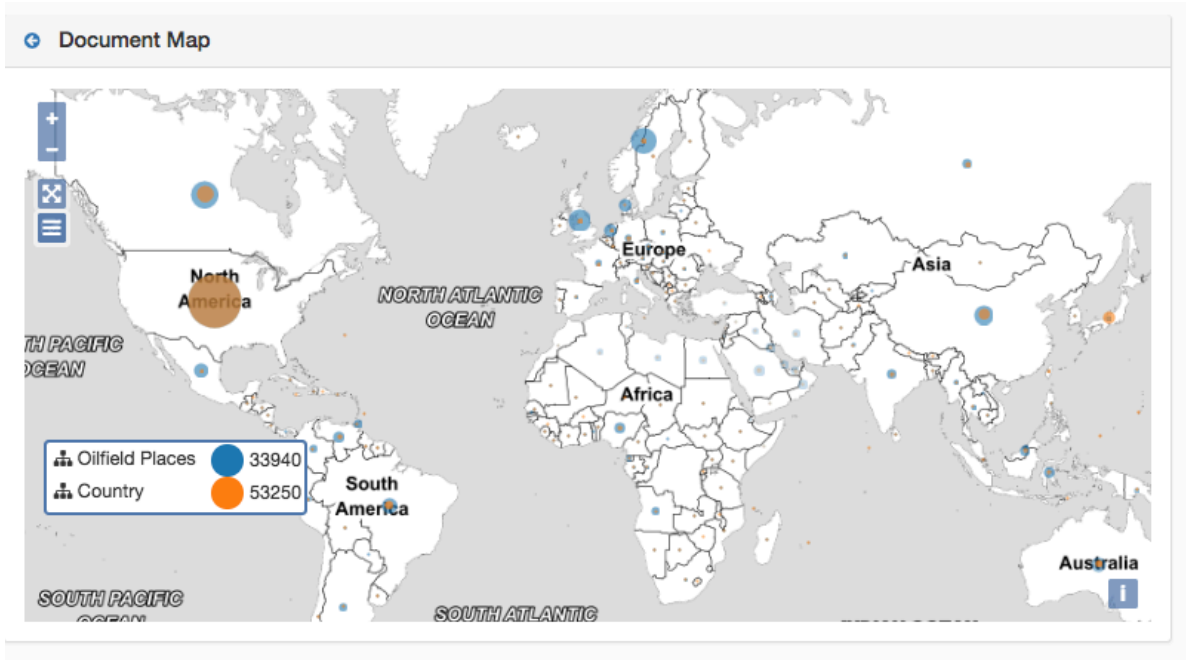
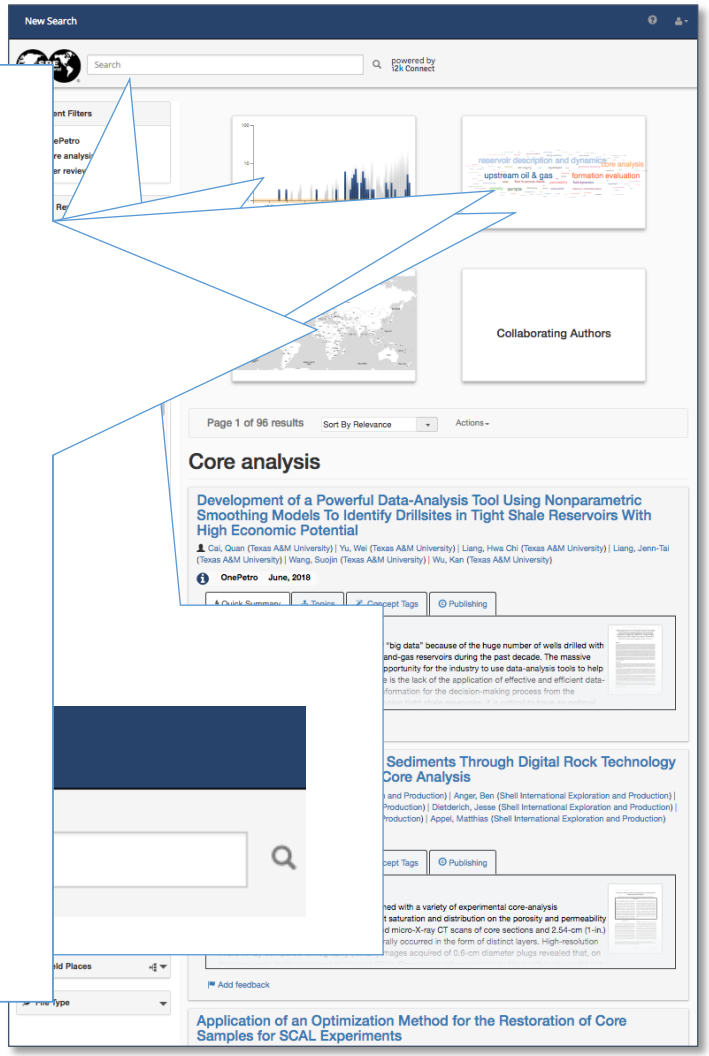
- Collects content from OnePetro, PetroWiki, SP
- En
- Inc
  cla
- Tre

Dashboard



Map



Analytics

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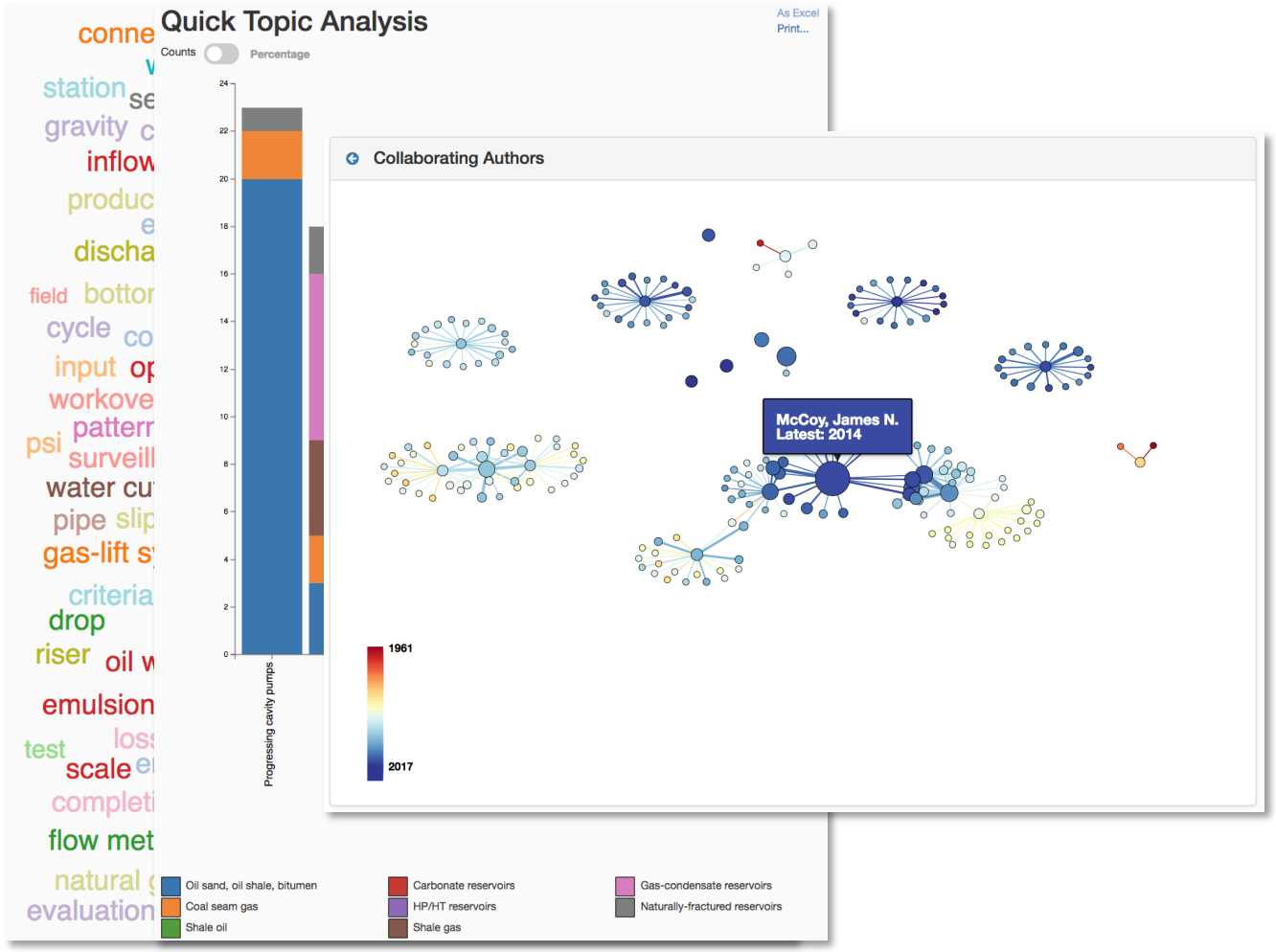
- Co-occurring concepts
- Co-occurring classifications
- Collaborating authors
- Trends



AI-powered Text Analysis

i2k Connect

- i2k Connect and Schlumberger are delivering structured insights from unstructured data in DELFI.
- The payoff is improved search efficiency and usability, and the ability to leverage quantitative data discovered in documents.

- Our vision:

  Eliminate 90% of the manual effort that is today done by knowledge workers to extract and interpret data in documents.