E&P Data management in the cloud using ArcGIS and PPDM

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IT management consultant for Addax Petroleum Group

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Agenda

- Addax context
- GIS at Addax
- Cloud at Addax
- GIS in the cloud
Addax Petroleum Limited

Assets in West Africa, North Sea and Kurdistan

Offices in 5 countries

HQ transferred to Beijing

Aberdeen, UK
JV with Repsol

Lagos, Nigeria
Operating company

Douala, Cameroon
Operating company

Port-Gentil, Gabon
Operating company

Production (bopd average) and key events

Collapsing Oil Price
Less Capex
Low Productivity

Addax Acquired by Sinopec

PanOcean

OML 125 drilling

Entry in Nigeria

OML 126 Okweti First Oil

46% Talisman UK

HQ transferred to Beijing

Confidential
Subsurface: G&G data discovery
Development: cost/prod analysis
Compliance: document retention
Drilling: spatial integrity

M&A: opportunity qualification
HSSE: environmental impact assessment
Operations: asset integrity/inventory
E/P data architecture

Portal Level
- Spatial Data Access
  - PetroWeb
- Tabular Data Access
  - Dodeca

Corporate Level
- Corporate Databases
  - PPDM: Industry standard database model
  - EDB: Corporate well database
  - PSApphire: Technical document archive
  - ESRI: Spatial database
  - SeisQuest: Seismic Database
- Corporate Reserves Database

Project Level
- Production Analysis
  - OFM
- Subsurface Mapping
  - Petrophysic
  - Geolog
- Interpretation
  - Kingdom
- Interpretation and Modeling
  - Petrel
- Reservoir Simulation
  - Eclipse

User Level
- Search Engine
  - Voyager

Cloud-based Corporate Production Database

PPDM: Industry standard database model
EDB: Corporate well database
PSApphire: Technical document archive
ESRI: Spatial database
SeisQuest: Seismic Database

Corporate Databases

Corporate Reserves Database

Search Engine Voyager

Cloud-based Corporate Production Database
Value chain & Disciplines

Explore
- Geology
- Geophysics

Develop
- Drilling
- Engineering

Produce
- Operations
- HSSE

Abandon
- Decommission

GIS for data discovery

Model

- COUNTRY
- BLOCK
- FACILITY
- FIELD
- WELL
- STRING
- POOL
- STRAT UNIT
Cloud is a multi-year IT strategy

2012 First “Software as a Service” applications
2014 Identity management and SSO
2015 Local Internet break-out
2016 Office 365
2017 POC on Azure: Corporate Web Site

and

2018 Full Azure migration triggered by GVA HQ shutdown !!!
### Why Azure?

#### OF365 already in-place
- Azure AD connected
- SSO in place

#### Microsoft contracts already in-place
- Sinopec EA
- Addax EA

#### Data Centre location
- Amsterdam for African users
- Hong Kong for Beijing users

#### PaaS offerings available
- Azure SQL for databases
- Azure AD services

#### The E/P data platform

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<table>
<thead>
<tr>
<th>Cloud Feature</th>
<th>Alibaba Cloud</th>
<th>Huawei</th>
<th>Microsoft Azure</th>
<th>Amazon Web Svc</th>
<th>URL</th>
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<td>1,364</td>
<td>&gt; 100,000</td>
<td>606,471</td>
<td>39,157,956</td>
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A cloud platform combining modern (real-time, big data, machine learning) and traditional technology (BI, SQL DWH)

Opening possibilities around:

- Predictive maintenance feeding off facilities/well sensor data
- Understanding of legacy facilities using cognitive search on millions of unstructured documents, emails and schematics
- Predicting reservoir performance using machine learning on high volumes of well logs
GIS and PPDM cloud migration was just one part of a much wider program

- **Technical systems**
  - Q4 17: Phase 1 G&G apps, Production DB, Tech. records
  - Q1 18: Phase 2 SEGY records
  - Q2 18: Phase 3 GIS & PPDM migration
  - Q3 18: Phase 4 Economics and Reserves
  - Q4 18: Phase 3 & 4 Hand-over to SIPC Teams

- **ERP systems**
  - Q4 17: Phase 1 200 new SIPC users
  - Q1 18: Phase 2 HR Systems
  - Q2 18: Phase 3 Finance and Supply Chain systems
  - Q3 18: Phase 4 Intranet and reporting
  - Q4 18: Phase 3 & 4 Hand-over to SIPC Teams

- **IT Systems**
  - Q4 17: Phase 1 SIPC access
  - Q1 18: Phase 2.1 Network ready for Azure
  - Q2 18: Phase 2.2 Addax sites on SIPC WAN
  - Q3 18: Phase 3 Azure Tenant
  - Q4 18: Phase 4 Hand-over to SIPC and GVA decommissioning
The network needs to be adapted to public cloud hosting.

Azure is seen as another SIPC data centre
- Internal IP addresses
- Connected to corporate WAN

Dual connection & automated fail-over
- BT Express Route (primary)
- VPN (fail-over)

Local internet break-out
- Local Internet providers
- Local Palo-alto firewalls and Riverbed Steelheads

Central management
- Central management console in Azure for the Palo’s and the Steelheads
The Azure “virtual data centre” needs to be designed, implemented and operated.
Application migration strategy

- Balancing complexity of migration with operational cost reduction

**Lift & Shift (IaaS only)**
- Fast, easy and relatively cheap
- Limited operating cost reduction
- Less scalable and less resilient
- Supported by application vendors

**Re-Platform (SaaS, PaaS or IaaS)**
- Slow, complex and more expensive
- Reduces operating costs
- Scalable and more resilient
- Not always supported by application vendors
Applications re-installed (IaaS)

- ArcGIS server using ESRI Cloud Builder (IaaS)
- ArcGIS desktop on Azure VMs (5 users each)
The full framework is in Azure

- ArcGIS Enterprise
- SQL Azure
  - Geodatabases
  - PPDM Well Database
  - Dodeca Technical Databases
- File Storage
  - Azure Storage Account
  - SSD File Share
- ArcGIS Desktop
- PetroWEB
- Dodeca framework
Cloud migration: lessons learnt

Define your cloud strategy
- Objectives
- Roadmap

Technical enablers are key
- Network: Dual Connectivity
- Topology: Break-out
- Central optimization/security
- Identity mngmt: SAML & SSO

Business case and follow-up
- Baseline & track
- Cloud provider and price plans
- Adapted sizing (IO, CPU, GPU)
- Environments (Test, Prod)

Balance benefits, cost and risk
- SaaS & PaaS vs IaaS
- Lift and Shift vs re-platforming
- Editor support & 3rd party compatibility

Cloud is not out of the box
- Design: security and scalability
- Implementation: standardize
- Operations: automation/dashboards

Track application performance
- Using automation/tools
- Baseline & track
- Integrate in user support/service desk
Thank you, any questions?

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