Cloud Experience at Eni Upstream

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Remote Technical Software and Data provisioning

Tech App Provisioning Services:

- +30 technical packages
- +1100 managed licenses
- 26 Affiliates/Countries
- + 1.600 Users
Technical Computing Visual Application Farm

Green Data Center

Linux / Windows Cluster
3D advanced graphic card

• Dynamic resources assignment
• Display remotization
• Graphic data compression
• Session sharing

Middleware: DCV

HQ Lan Users

PC w/ std graphic card
Dual screen supported

Affiliates Lan Users

EnginFrame Portal
Cloud Experience – Objectives and Technology Definition

- **Objectives**
  To verify and demonstrate that a cloud environment can deliver the service as done today or even better.

- **How**
  Make a class of 18 young geoscientists to do G&G interpretation on a real project for 6 months

- **Application technology**
  **DecisionSpace Geoscience**: it represents the standard tool for G&G interpretation
  Petrel, Hampson Russell, Jason: additionally used
  > 80% of Exploration Workflows covered
Cloud Experience: Time elapsed

**Assessment**
- Training
- Customer Survey
- As done before

**Technology**
- Linux and Windows Virtual Machine creation
- Software installation
- Sw licence management

**Data**
- Large data set to be mobilized > 50TB.

**G&G project execution**
(DecisionSpace)

**2° phase**
Additional G&G applications

**Environment Setup**
- Cloud Experience: Time elapsed
- Environment Setup
- G&G project execution (DecisionSpace)
- 2° phase Additional G&G applications
Cloud Experience – People

Project Manager, Data Manager, Service Manager
G&G Geoscientists
Exploration Manager
ICT Engineer

Project Manager
G&G Project Mentor and Specialist
Cloud Specialists

Cloud Architect Specialist
Cloud Experience – Architecture

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Classroom G&G Project

Eni HQ

Amsterdam Azure

Ferrera Erbognone-Eni GDC

- Licences On Premise
- GIS services and Map
- Data transfer to On Premise application
- Data Exchange area

RemoteGraphic rendering

- 2 Domain Controller
- 20 Nodes GPU (DSG)
- 3 Nodes GPU (Petrel)
- 3 Nodes GPU (Jason HR)
- 30 TB Storage Netapp (Windows)
- Storage BeeGFS (12 nodi)
- 4 Nodes Applicativi DSG Linux
- 1 Node Trasferimento dati sFTP
- 1 Node Amministrazione
- 1 Oracle Server
- 1 License Server

Eni HQ

Eni Azure

- 224 Gb RAM
- 24 Vcpus
- Nvidia M60 dedicata

San Donato Milanese
Classroom G&G Project

Eni HQ
Landmark delivery steps

Setup & Execution

- Blueprint definition based on Landmark know-how. Additional customizations applied based on:
  - selected Cloud Provider
  - customer needs and data size
- Daily monitoring and end user interaction to prevent and address issue
- Discuss best practices with end users
Solution overview

- DecisionSpace
  Geosciences
- Eni internal apps
  (Play Fairway Analysis, Volumetrics, GIS)
- Petrel
- Hampson Russell

Site-to-Site VPN

Shared eni FS

Technologies

- RGS
- Horizon Cloud
- VNC
- Azure NetApp Files
- BeeGFS
- NetApp File Sync
- Broker
- NetApp Files
- DSG
- Petrel
- Hampson R

Server subnet
- AD
- License

Storage subnet
- BeeGFS
- IT Management
  rdp, sftp, ...

Broker

Oracle

Apps subnet
- DSG
- Petrel

Oracle

NetApp File Sync

Horizon Cloud

VNC

VPN Gateway

Milan to Amsterdam

peering

vnet1

vnet2
~1100 wells, ~2900 2d lines, 8 3d surveys (DSG)

~ 50 TB of seismic data (HR + DSG)

18 full time users accessing a single large DSG project using advanced workflows such as Dynamic Frameworks to Fill
Issues encountered by end users over the project

Initial connectivity issues due to VPN

A new VPN has been defined and solved the issue

Generated amount of data in the first weeks larger than expected caused performance issues

Different storage and oracle server sizing solved the issue

~1100 wells, ~2900 2d lines, 8 3d surveys (DSG)
Cloud Experience – Customer Survey after 30 days

Overall rating very positive. Few concerns about performances and reliability

Reliability
- Reliable
- Poorly reliable
A new VPN has been installed to eliminate the disconnection issues

Usability
- Seamlessly usable
- Poorly usable
Daily support to address usage problems

Performance
- Performance much better than on Premise
- Less performing than on Premise
New storage quickly made available

Overall Evaluation
- Very good
- Not so good
Cloud Experience – Customer Survey at the conclusion of the Project

Reliability
- 93.3%

Performance
- 86.7%
- 13.3%

Availability
- 100%

Overall evaluation
- 93.3%
Nevertheless for a 6 months duration of the G&G project.....

100% UPTIME
Cloud Experience – Conclusion 1

IMMEDIATE BENEFITS

✓ Rapidity

✓ Scalability

✓ Cyber Security
## Azure: Trusted (covers 91 compliance offerings)

### Global
- ISO 27001
- ISO 27018
- ISO 27017
- ISO 22301
- SOC 1 Type 2
- SOC 2 Type 2
- SOC 3
- CSA STAR Self-Assessment
- CSA STAR Certification
- CSA STAR Attestation

### Regional
- Argentina POPA
- EU Model Clauses
- UK G-Cloud
- China DJCP
- China GB 18030
- China TRUCS
- Singapore MTCS
- Australia IRAP/CCSL
- New Zealand GCIO
- Japan My Number Act
- ENISA IAF
- Japan CS Mark Gold
- Spain ENS
- Spain DPA
- India MeitY
- Canada Privacy Laws
- Privacy Shield
- Germany IT Grundschutz workbook

### Industry
- PCI DSS Level 1
- CDSA
- MPAA
- FACT UK
- Shared Assessments
- FISC Japan
- HIPAA/HITECH Act
- HITRUST
- GP 21 CFR Part 11
- MARS-E
- IG Toolkit UK
- FERPA
- GLBA
- FFIEC

### US Gov
- Moderate JAB P-ATO
- High JAB P-ATO
- DoD DISA SRG Level 2
- DoD DISA SRG Level 4
- DoD DISA SRG Level 5
- NIST SP 800-171
- FIPS 140-2
- Section 508 VPAT
- ITAR
- CJIS
- IRS 1075
Cloud Experience – Conclusion 2

- Connectivity
- GPU
- Linux
Cloud providers

Top 5 IaaS Public cloud services providers per Market Share*

- AWS
- Microsoft Azure
- Alibaba Cloud
- Google Cloud
- IBM Cloud

Most active cloud services providers in E&P industry

- AWS
- Microsoft Azure
- Google Cloud
- Oracle Cloud

* Source: Gartner, July 2019
Cloud Experience – LESSONS LEARNT

✓ To establish a partnership with a specialized technology provider in the Oil&Gas Upstream domain

✓ To make a scrupulous selection of the Cloud Provider with the consideration of all technical key aspects

✓ To know your audience: users have to be led and trained. A Change Management program has to be in place

✓ To be patient, time has to be on your side, plan accordingly
Cloud Experience – Next steps

- To terminate the 2° phase of the G&G project
- To run a formal investigation to confirm/identify Cloud Providers
- To make a TCO (Total Cost of Ownership) analysis
- In 2020 to apply outcome with a more extensive and permanent Cloud Project (ex. Disaster/Recovery)
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