PERSPECTIVES ON HPDA@TOTAL E&P

Yves Le Stunff - Digital Officer Total E&P

MODEL-DRIVEN DECISION MAKING

HISTORICAL TOTAL APPROACH MAINLY BASED ON SIMULATION

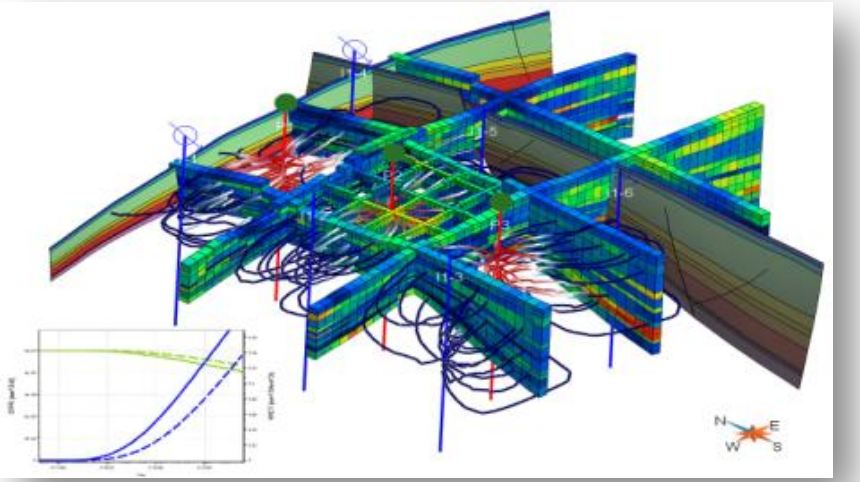
Theory

Hypotheses

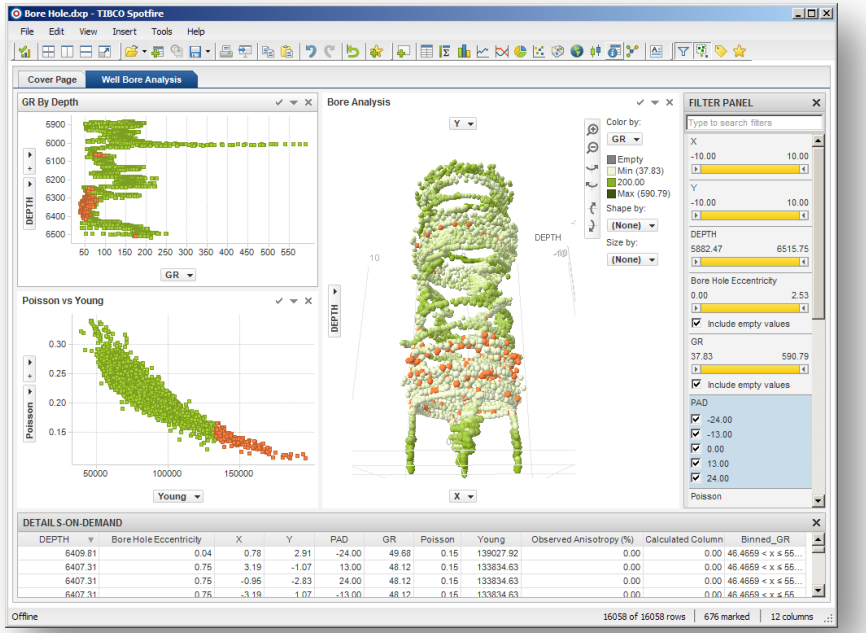
Model

Decision

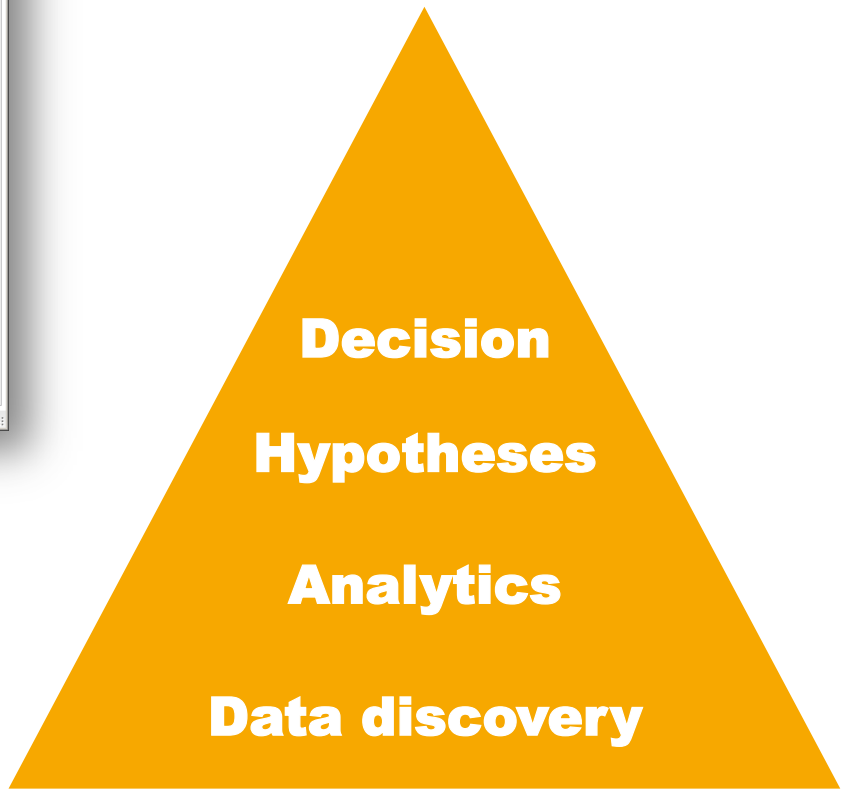
Seismic Imaging/Modeling (HPC)
GeoModeling
Reservoir Modeling (HPC)
Well modeling
Network Flow Assurance Simulation
…..



EMERGING DATA-DRIVEN APPROACHES



Monitoring Data
Simulation Data
Transactional Data
Descriptive Data
Technical documents
…..



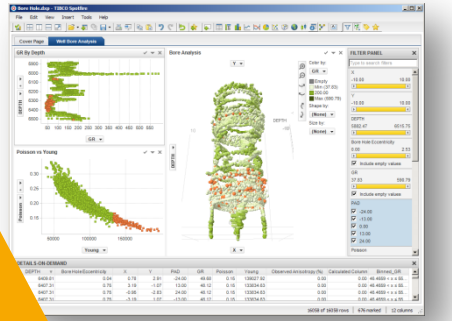
HOW APPROACHES WILL BE COMBINED IS A CHALLENGE

Theory

Hypotheses

Model

Decision

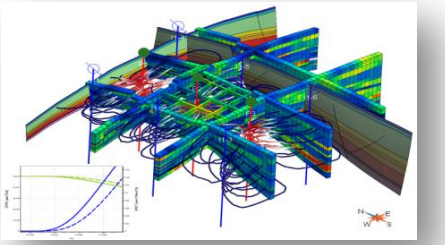


Decision

Hypotheses

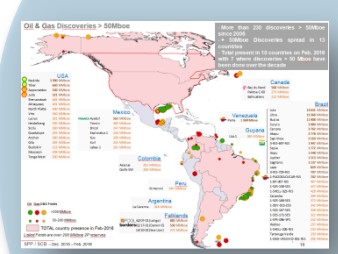
Analytics

Data discovery



A VARIETY OF DATA ANALYTICS INITIATIVES AT E&P PERIMETER

SUBSURFACE



Automated Competition scouting

Image Pattern recognition

Production Prediction

Technical Doc Semantic analysis

INDUSTRIAL

Predictive maintenance (rotating machines,...)

Maintenance plan optimization

Process optimization (foaming, etc.)

HSE incident analysis

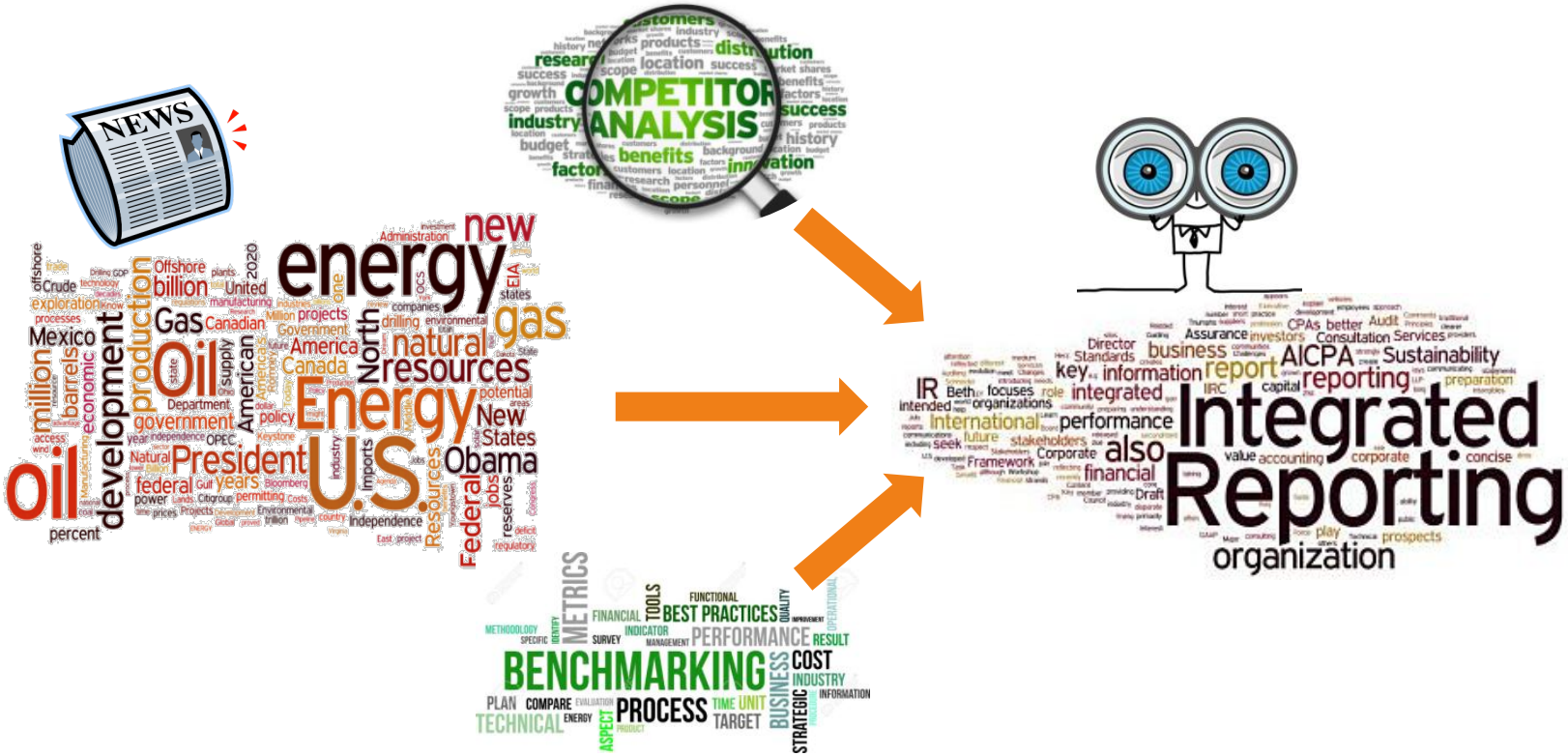
Production shortfalls

Well performance

Drilling monitoring

Blowout prevention

TEXT - AUTOMATED COMPETITION SCOUTING



Gathering data through **data crawling**

Filtering Data, enriching through **text mining and machine learning**

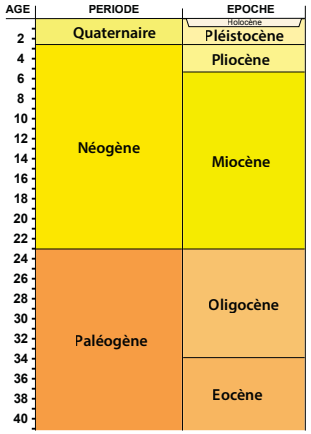
Reporting through **dashboarding**

Automating tedious tasks

IMAGES - AUTOMATED MICROFOSSILS IDENTIFICATION

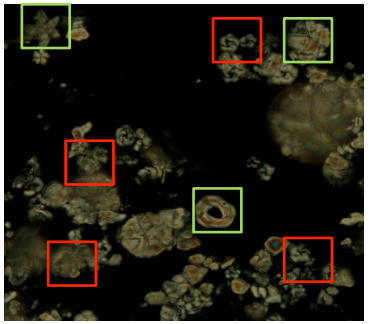
- Identify microfossils to infer period of deposition

- From a global image
  - Segment
  - Identify
  - Measure
  - Classify

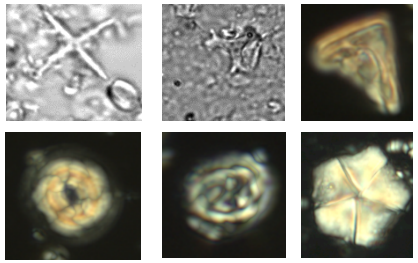


Core Sample

Microscope Image



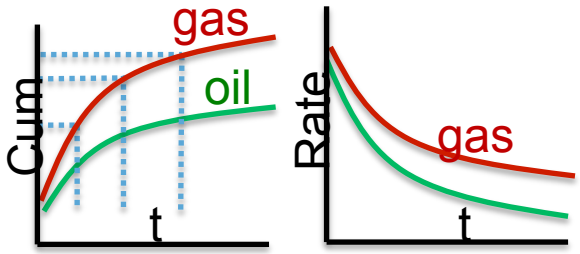
Microfossil Identification



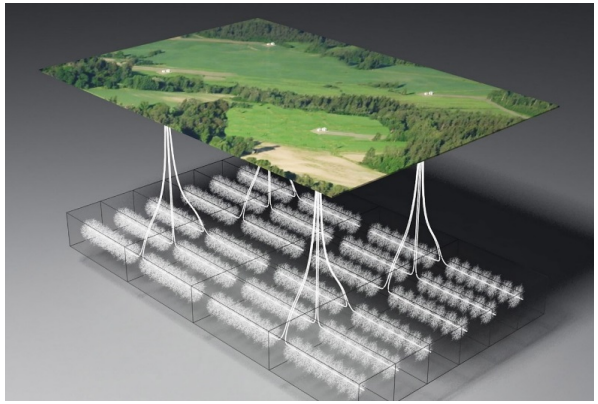
"Enhanced engineer" by automating tedious tasks

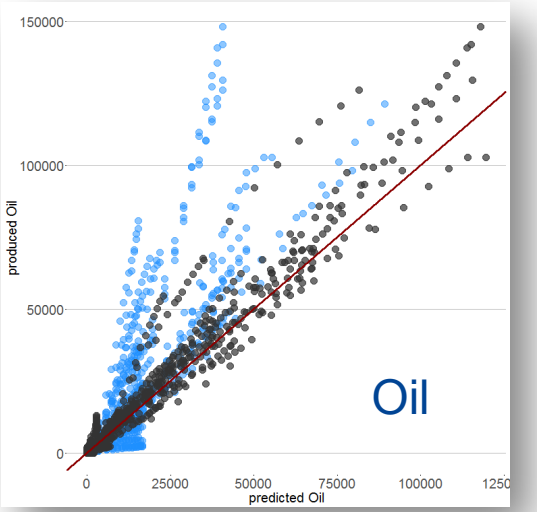
COLD MONITORING DATA - PRODUCTION PREDICTION

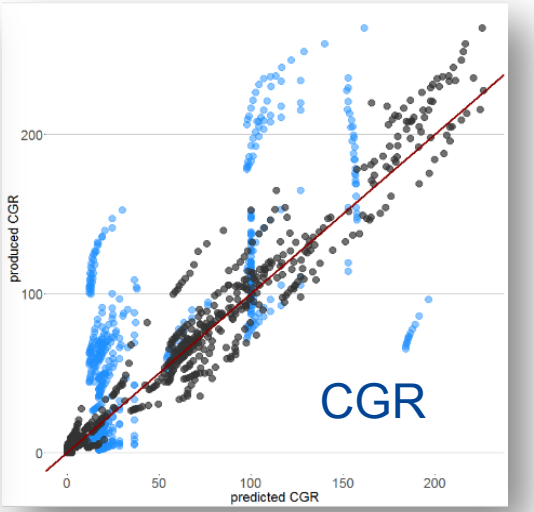
- Predict the production & depletion of a well in an unconventional play



- Identify performance drivers and optimize well management



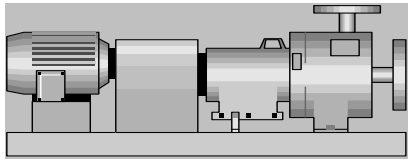


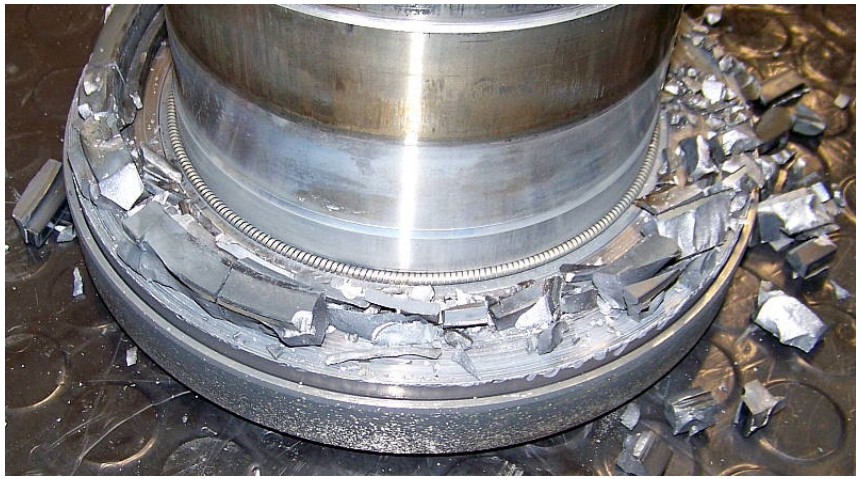


Extract more value from current assets

HOT MONITORING DATA - PREDICTIVE FAILURE DETECTION

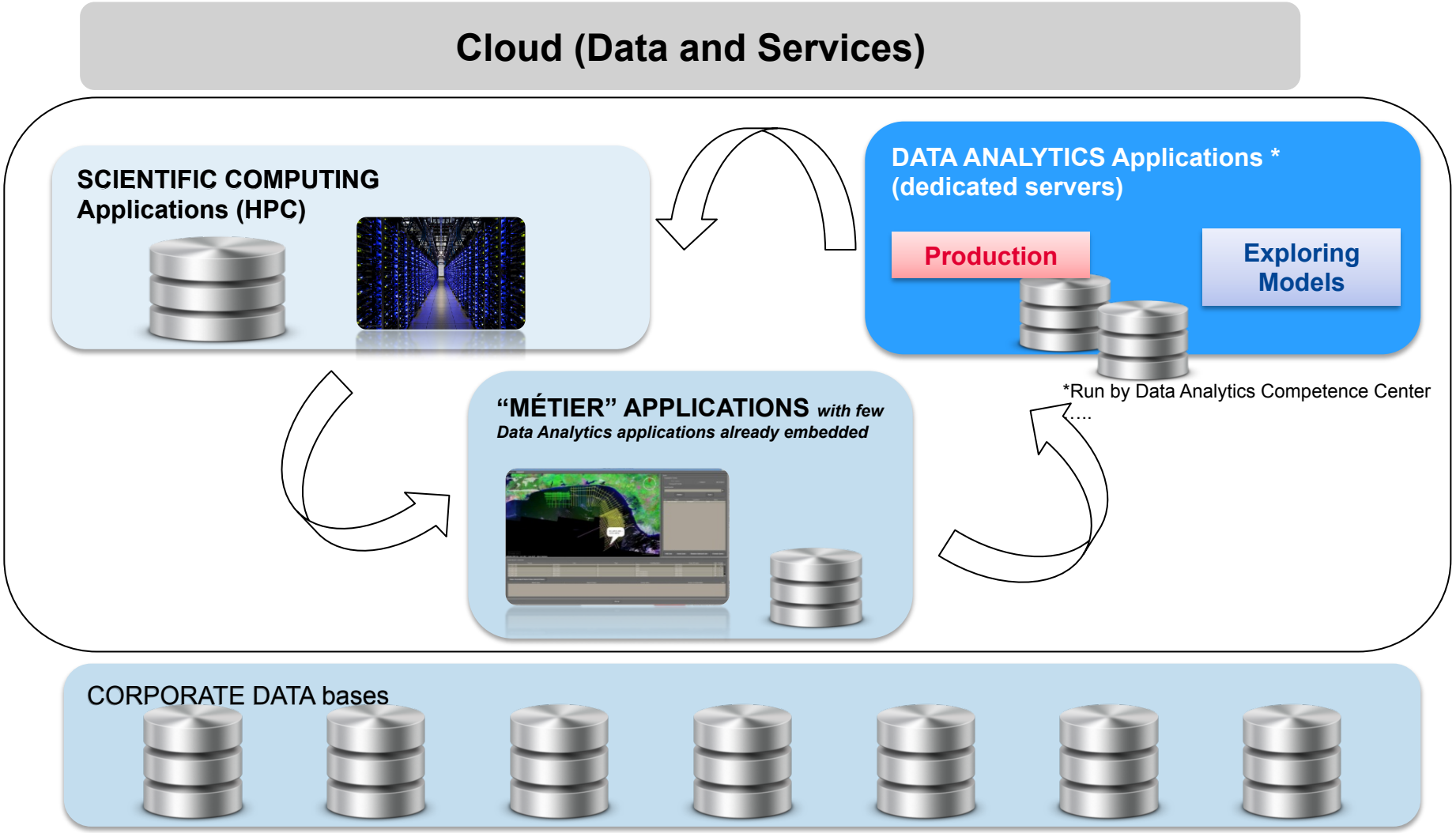
- Predict failures on rotating machines
  - Avoid turbine, centrifugal compressor and pump breakdowns
- Monitoring ~ 35,000 sensors in real time, 24/7





Enhance asset performance and safety

DATA ANALYTICS – WHERE DOES IT STAND TODAY?



CONCLUSIONS

- Data Analysis will be key for the **E&P Enhanced Engineer**
  - **Accessing fast relevant information in very large corpus**
    - Cognitive solutions helping access instantaneously relevant information
    - 2D/3D/4D Image Pattern recognition (from pores to basin scale)
  - **Assets & operations optimization**
    - Predictive maintenance, drilling, production…
    - Combination of simulation and data analytics approaches

- **HPC & HPDA convergence**
  - Perspectives of **growing need of computing resources** and a very fast convergence is expected on
    - **Infrastructure**
      - HPC platforms will integrate more & more data analytic features
      - On premise vs. Cloud ?
    - **Software platform** :
      - Merge between the two developers communities (Fortran,C++,MPI,Python) vs (Python,R, Spark,Scala) which skillsets (e.g. paralllelism) are similar