PETRONAS

Going  with Data

Strengthening of Role: Data Regulator to Data Shaper

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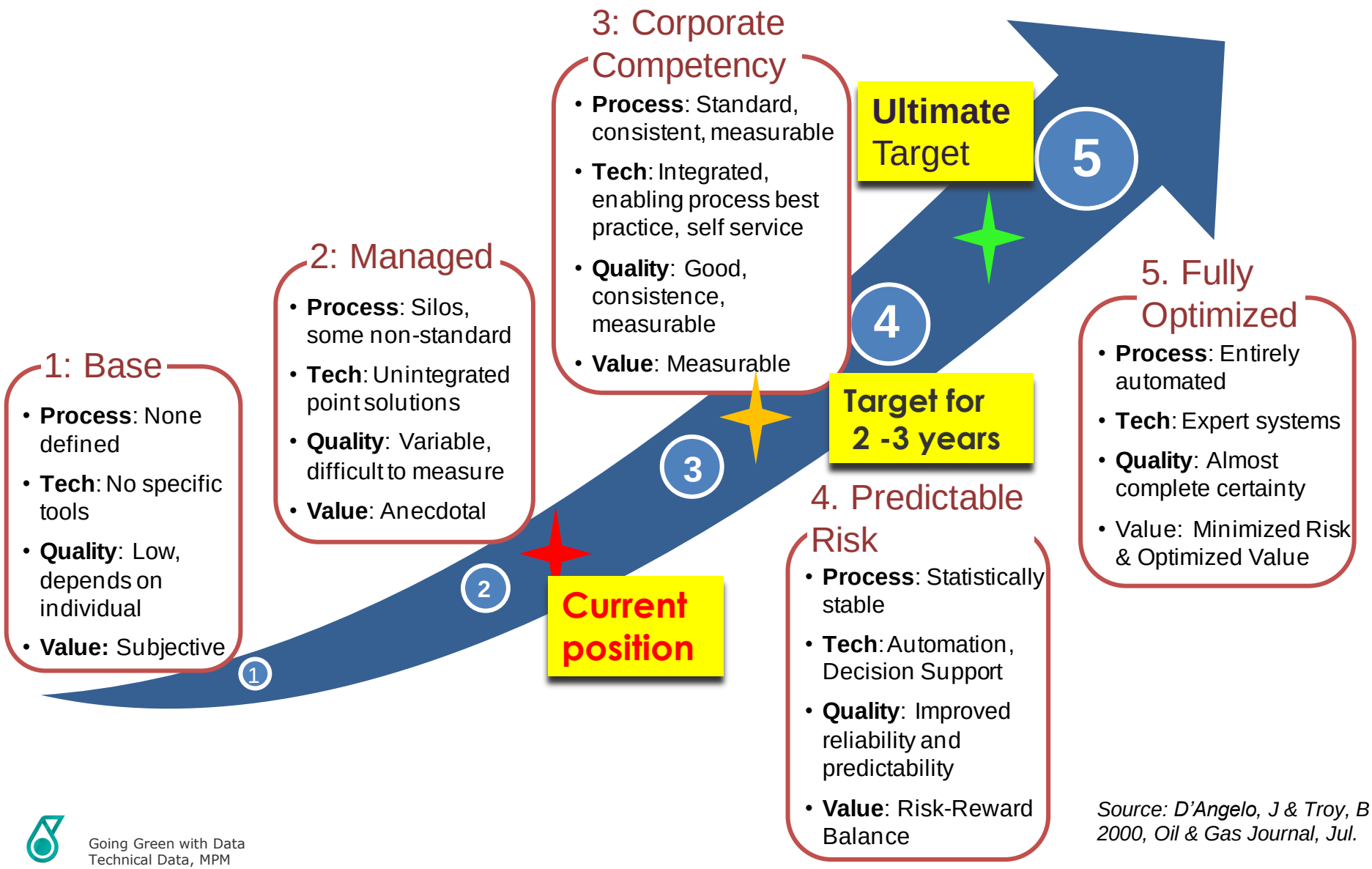
Key Questions

1. Is my required data **available**?
2. If available, is it of the **right quality**?
3. If it is of the right quality, is it coming from the **right source**?

Technical Data Management – Reality Check



Source: D'Angelo, J & Troy, B 2000, Oil & Gas Journal, Jul.

TD Management Framework

Covers the management of information lifecycle activities; acquire, create, QC, store, publish, manipulate, archive, discard, secure.

Covers data management workflows throughout the data management lifecycle

Covers all technical applications for each domain areas. Includes suites of applications and databases

Related to work instructions, best practices, general documentation on Seismic, Well, Reservoir, Interpretation, GIS data covering all technical data types

Focuses on the different data depositories used to store both corporate and project data

Going Green with Data (GGD):

The Role of Technical Data Management in Value Creation

Previous industry studies : Geologists spend up to 60% of their time looking for & quality checking data for their projects

Recent PETRONAS study : Geologists spend 39 days looking for & quality checking basic data (well header, checkshots, deviation and well logs) for their projects. This is an estimated 20% of their time.

To realise the opportunities
What components need to be in place?

Step 1

Cost management

Reduce the 39 days to 5 mins for the 4 data types.

1

Step 2

Process improvement

Standards & workflows
Bring to acceptable quality
Capture work done for re-use

2

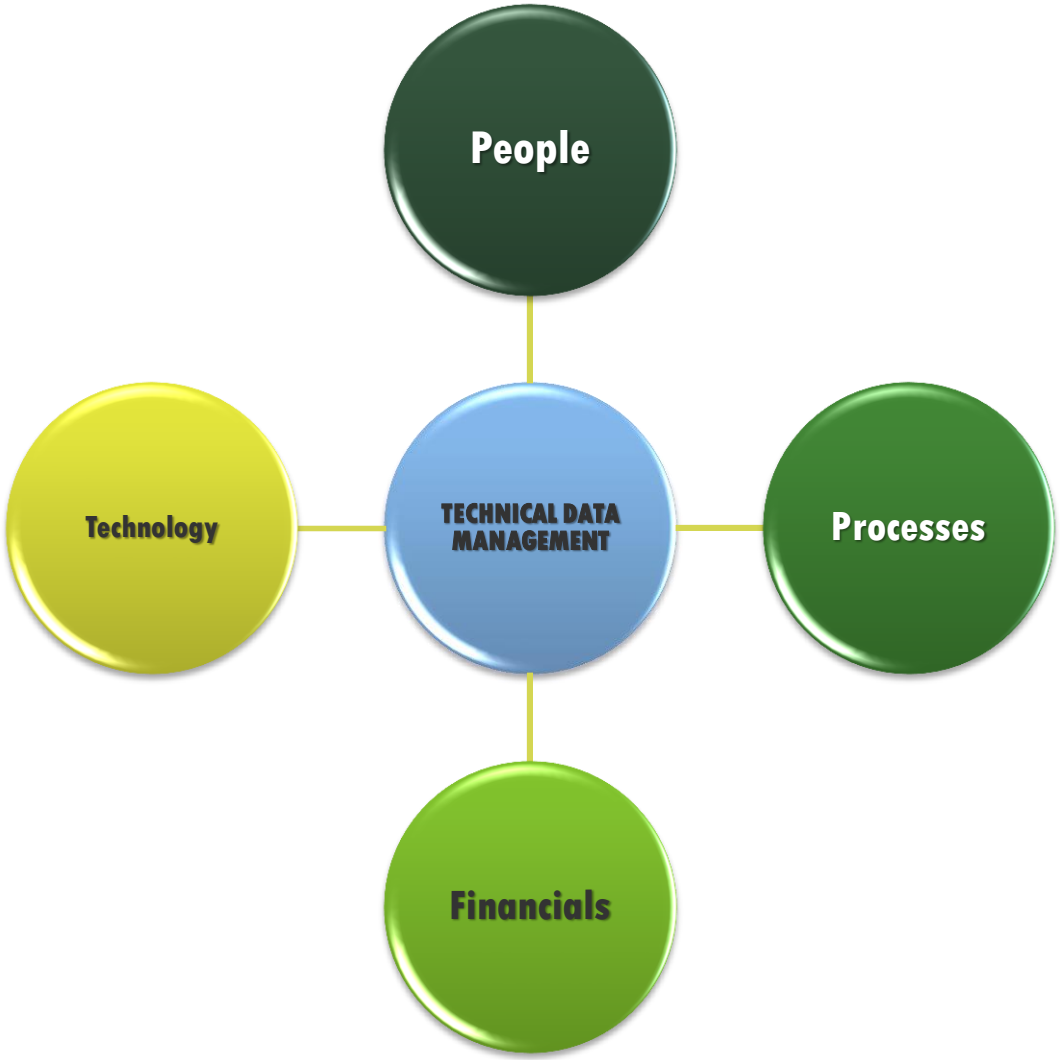
Step 3

Optimization

'One version of truth' datasets
Re-use many times

3

Crafting the Elements – The Journey



People & Skills

- Finding the right talent
  - *Hybrid skillsets of Technical EP and IT*
  - *Right mindset and interest*
- Defining a home for Technical Data
  - *Setting up of a Skillgroup*
- Developing the people
  - *Training program, competency framework and career options*

Processes

- Right Structure
  - *Functional Excellence*
  - *Delivery Discipline*

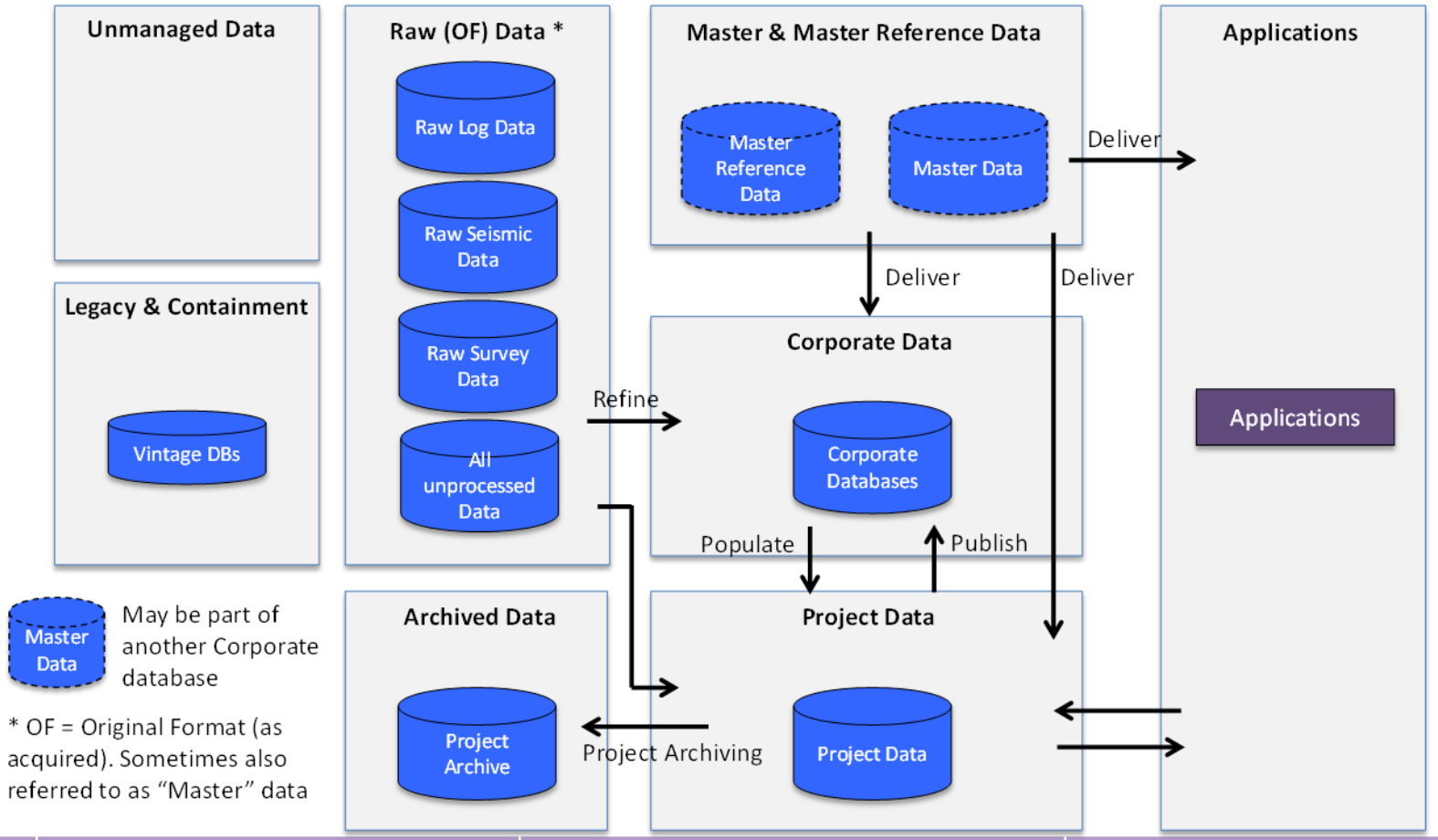
- Governance
  - *Project Management Office (PMO)*
  - *Technical Data Review Committee (TDRC)*
  - *Data Quality Metrics Dashboards*
  - *Standards and compliance*

Technology

- Data Architecture
  - *Technical data architecture*
  - *Integration architecture*

- Application Portfolio Management
  - *Application Maps*

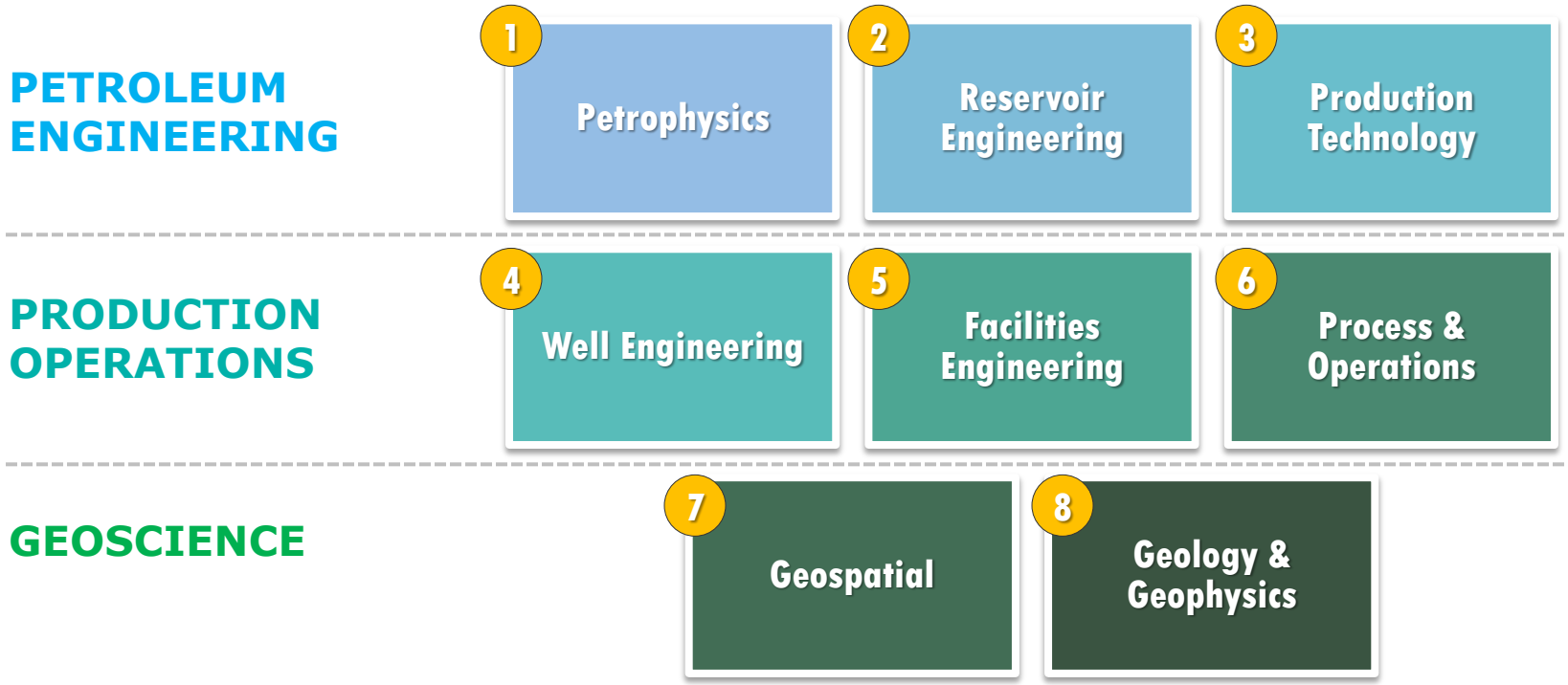
Technical Data Architecture



ASPECT	KEY MESSAGES	IMPLICATIONS	IMPACT
Data	- Distinguish the main roles of data stores and ensure all roles are sufficiently in place - Aim for moving more data scope into managed data stores	- Gradually expand data footprints for better coverage of the EP value chain - Ensure full adoption of the 10 data management principles which focus for data ownership in the business	- Technical data managed as an asset - Asset Integrity - Facilitates cross discipline teamwork and audit trail for decisions

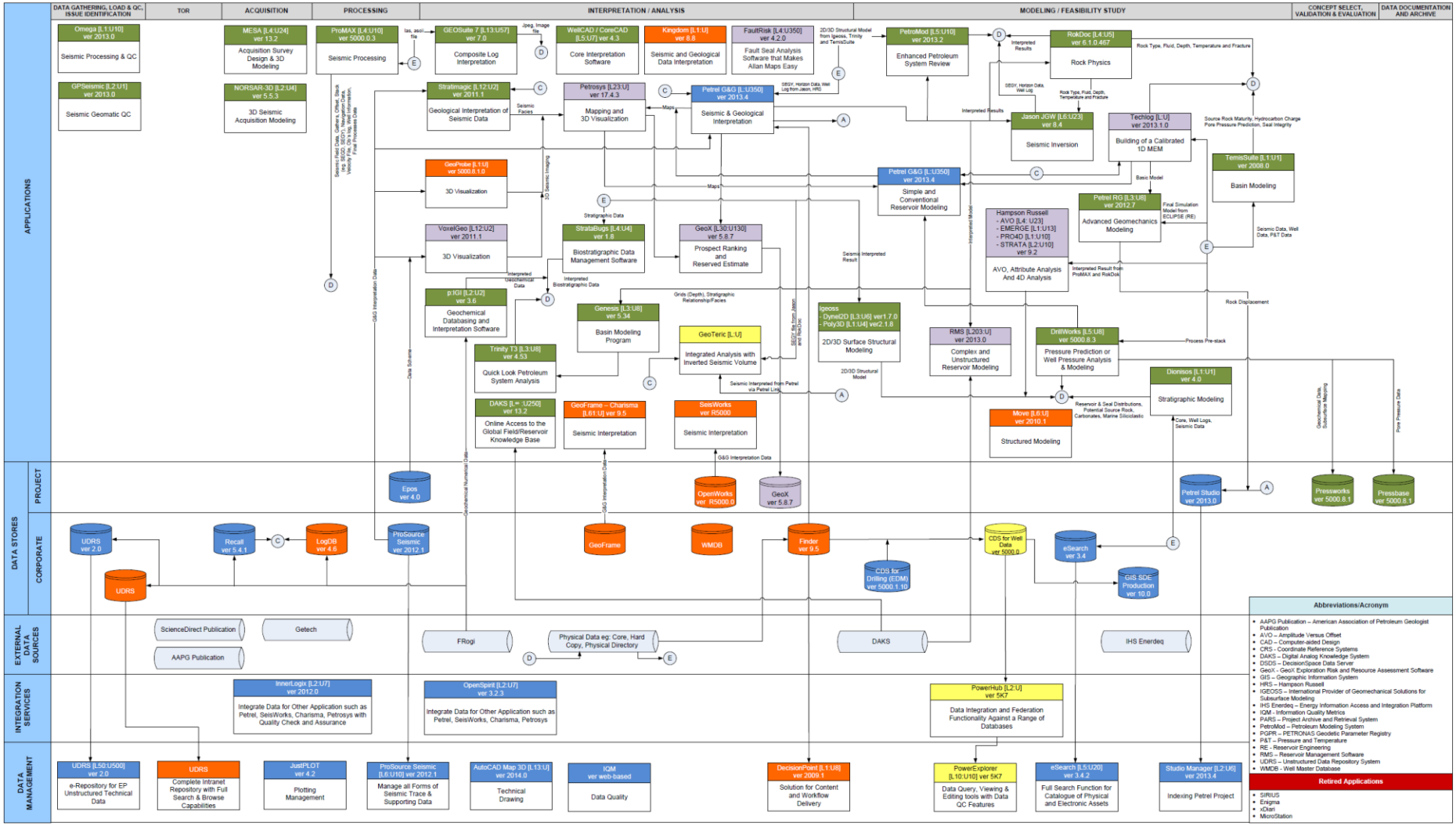
Application Maps

- Application Maps provide an overview of standard technical applications used in PETRONAS EP
- The maps are colour-coded, using the agreed Software Application & Database Portfolio Management Taxonomy
- TD is currently the custodian of the following 8 application maps:



Application Maps

Example: Geoscience – Geology and Geophysics



Financials

- Investing to create value
  - *Technical Data Excellence – Value Register*
- Optimisation
  - *Technical Applications & Data Repository Optimisation (TADRO)*

Going Green with Data (GGD):

The Role of Technical Data Management in Value Creation

Previous industry studies : Geologists spend up to 60% of their time looking for & quality checking data for their projects

Recent PETRONAS (PEX) study : Geologists spend 39 days looking for & quality checking basic data (well header, checkshots, deviation and well logs) for their projects. This is an estimated 32 man years / year.

To realise the opportunities
What components need to be in place?

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Select/Key GGD Initiatives

Common GGD Initiatives:

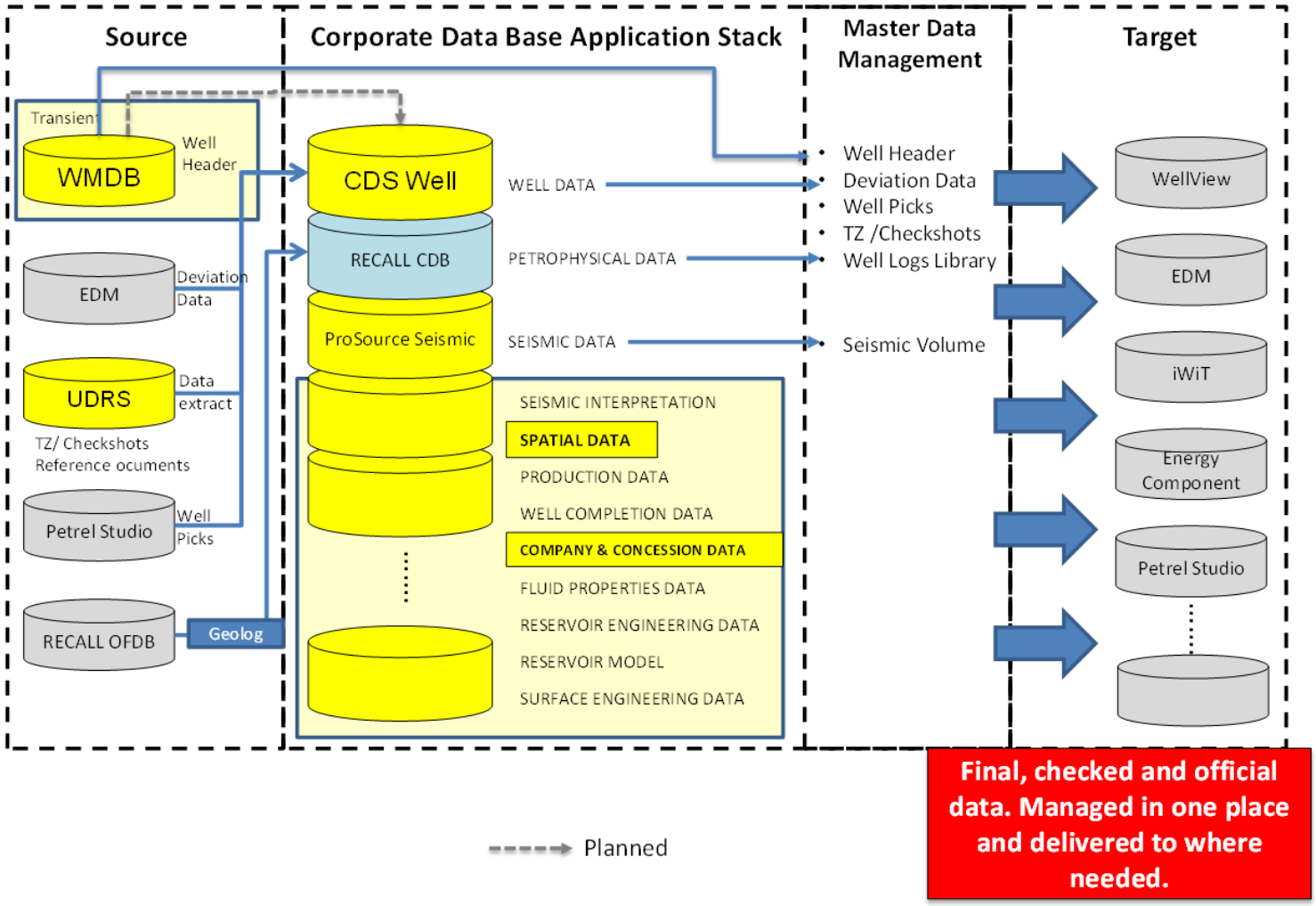
- **Corporate Data Stores**
  Database to store "official" and "quality-approved" data within a governance boundary
- **Technical Data Standards**
  Converging the differences in data standards
- **Data Quality Metrics and Governance Dashboards**
  Improving All-Round Data Quality to reduce Decision-Making Cycle Time
- **Technical Applications and Data Repository Optimisation**
  Optimising Usage of EP Technical Applications

Business-specific GGD Initiatives:

- **GIS Beyond Exploration**
  Improving Asset Integrity through Visualization
- **Malaysian Bathymetry and Site Survey Data Repository**
  Mitigating Geohazard Risks for safer Offshore Operations

Corporate Data Store (CDS)

Database to store "official" and "quality-approved" data within a governance boundary



Technical Data Standards

Converging the differences

High Level Roadmap

2013

- What we have
- What we need
- What are the gaps?
- Develop approach & process

Deliverables:
1) Inventory
2) Standards workshop
3) Priority list
4) Agreed process

2014

- Working groups set up
- Top 4 data standards
- Develop industry collaboration proposal
- Identify next priority items
- Implementation plan for 1 standard
- Identify value

Deliverables:
1) 4 standards agreed
2) Standards workshop
3) Priority list
4) Implementation plan
5) JIP proposal
6) 1st quantified value

2015

- Implement & test identified standard
- Track value
- Industry collaboration kick off meeting
- Next 4 standards
- Develop longer term standards plan

Deliverables:
1) 1 standard implemented
2) Learnings report
3) Value tracking ongoing
4) JIP kick off meeting
5) Priority list
6) Longer term plan

Data Quality Metrics (DQM)

Improving All-Round Data Quality to reduce Decision-Making Cycle Time

The Enterprise Data Quality Dashboard

The to-be situation

ACCOUNTABILITY
Custodians / Principals
DDOs – Data Definition Owners

ACCOUNTABILITY
Business Asset Owners or
DSOs – Data Set Owners

Good quality
Medium quality
Poor quality

Query Set Name	Type	Lower Norm	Upper Norm	A	B	C	D	E	F	G	H
Checkshots / TZ/Checkshots	datatype	90.0	95.0	38923.0 1342.0 96.6	141485.0 1059.0 99.3	219232.0 14651.0 93.3	179813.0 1649.0 99.1	547160.0 54092.0 90.1	8083.0 726.0 91.0	139417.0 8854.0 93.6	447303.0 11968.0 97.3
Formation Tops	datatype	90.0	95.0	608295.0 23955.0 96.1	936564.0 10181.0 98.9	4069835.0 91639.0 97.7	2521585.0 46544.0 98.2	4470170.0 22126.0 99.5	71720.0 2915.0 95.9	1198380.0 13638.0 98.9	5571120.0 92125.0 98.3
Position Logs / Deviation Data	datatype	90.0	95.0	43608.0 85.0 99.8	47378.0 2418.0 94.9	164842.0 3648.0 97.8	79362.0 992.0 98.8	382995.0 62800.0 83.6	3978.0 104.0 97.4	545683.0 1712.0 99.7	249982.0 5747.0 97.7
Seismic Horizons	datatype	90.0	95.0	297620.0 19072.0 93.6	538844.0 18895.0 96.5	1010155.0 160733.0 84.1	1119180.0 292678.0 73.8	806556.0 52738.0 93.5	7212.0 489.0 93.2	117806.0 2800.0 97.6	1221882.0 68455.0 94.4
Well headers	e	90.0	95.0	43452.0 1525.0 96.5	81288.0 3638.0 95.5	238046.0 9922.0 95.8	138744.0 13816.0 90.0	716652.0 47282.0 93.4	7452.0 350.0 95.3	789508.0 17838.0 97.7	873184.0 83964.0 90.4

The Enterprise Data Quality Trend

Problem areas identified, allowing teams or governance body to mobilize corrective actions as appropriate

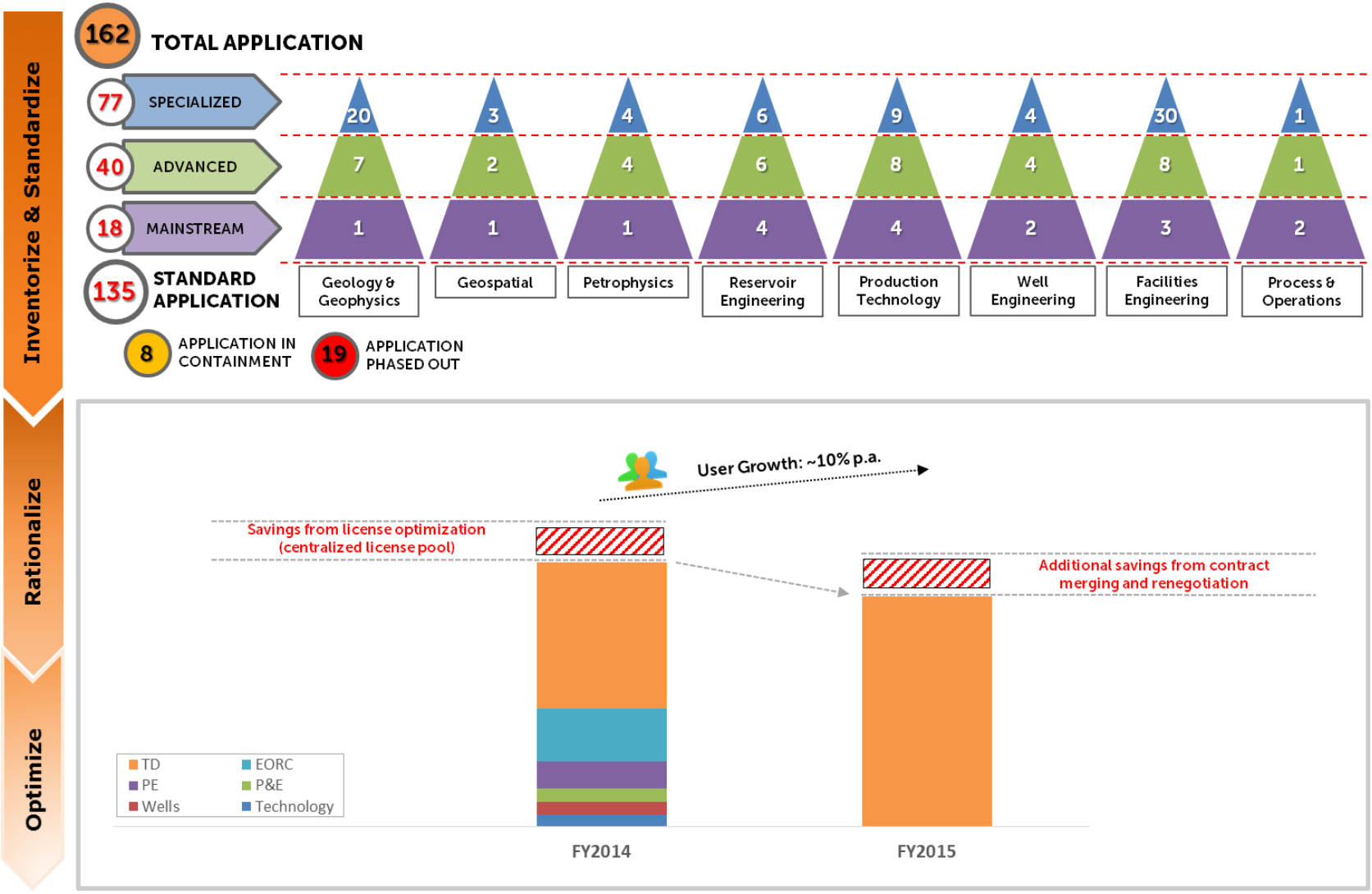
Our EP databases (Oracle & SQL Server)

Wells Projects Logs

141485.0	Total records polled
1059.0	Total errors found
99.3	Quality percent
▲▲▲	Trends : Monthly, Weekly, Daily

TADRO

Upstream Technical Application Portfolio and Cost Landscape

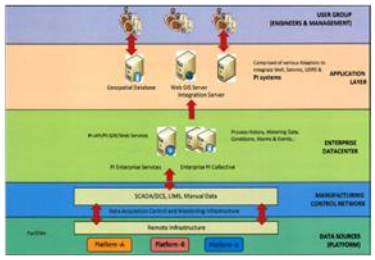


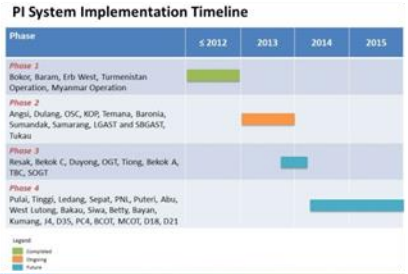
GIS Beyond Exploration – Asset Integrity

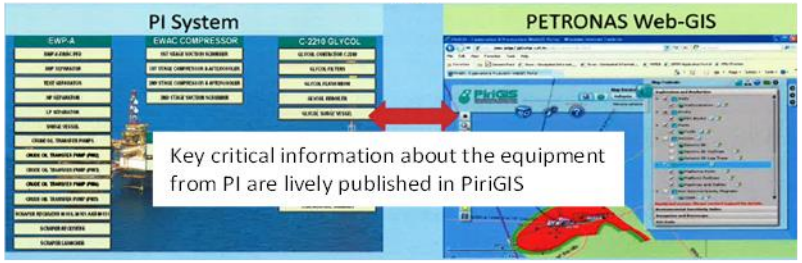
Improving Asset Integrity through Visualisation

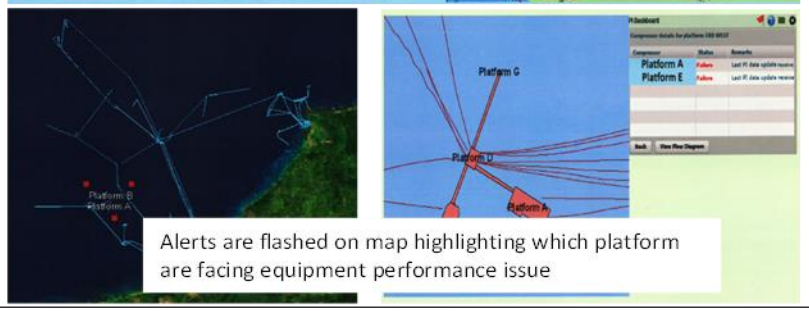
Asset Integrity Monitoring

- Monitoring of equipment status on offshore platform (from PI System) on map view via PiriGIS
- **Pilot Completed** for Erb West (Mar '13)
- Roll out - pending PI readiness field & priority : Next target are Dulang & Angsi





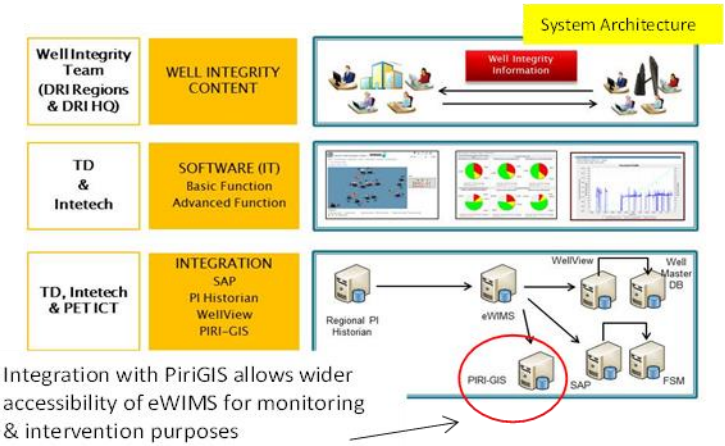




Well Integrity Monitoring

- Monitoring of well integrity (from eWIMS) on map view via PiriGIS
- Integration work is in progress
- Full eWIMS Roll out with PiriGIS integration - Q1/2014

Well integrity information resides in & accessible via eWIMS



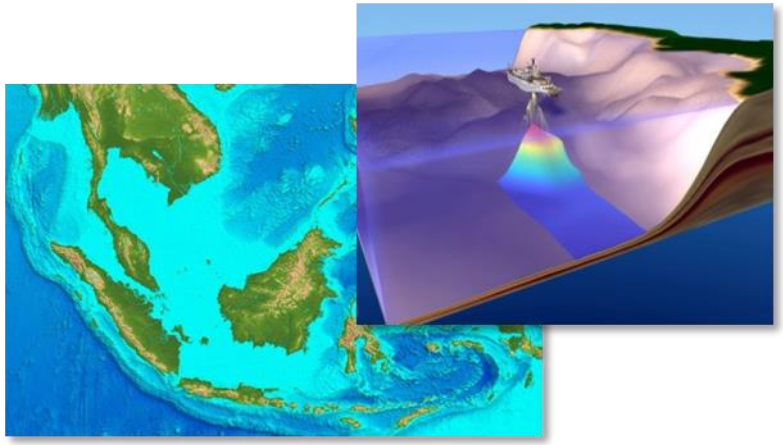
Integration with PiriGIS allows wider accessibility of eWIMS for monitoring & intervention purposes

Malaysian Bathymetry and Site Survey Data Repository

Mitigating Geohazard Risks for Safer Offshore Operation

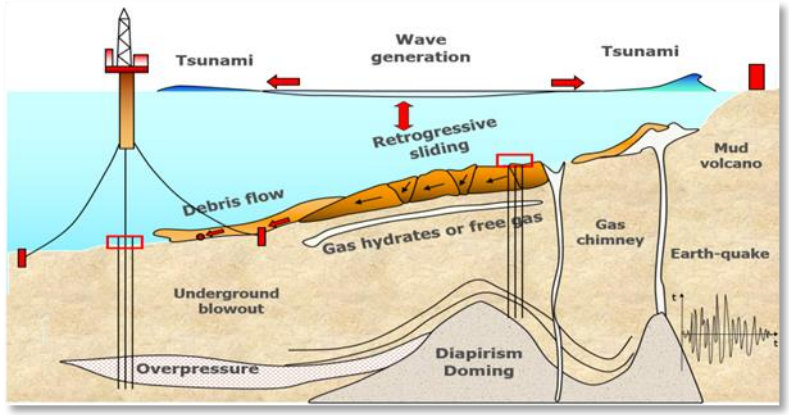
Background

- Drilling through geo-hazards like over-pressured zones - could result in significant risk
- The mitigation and prevention are paramount, through improved understanding of geo-hazards, their preconditions, causes and implications.
- Bathymetry and site survey are among basic data which are important for the geo-hazard assessment.



Business Driver

1. Better planning and mitigation of geo-hazards risk reducing potential HSE risks.
2. Limited data coverage – available only within current areas of operation, i.e. within the vicinity of pipeline routes and offshore structures
3. Available datasets are incomplete (site survey)
4. Current business practice is ignoring the past data since new data will always be acquired, past data not well managed



Concluding Remarks

- Driving the **quality of data** to acceptable levels is a key strategic initiative.
- Pushing towards a **streamlined technical applications portfolio** for greater efficiency and clarity of purpose.
- Increasing our capabilities to be able to achieve **delivery excellence**.
- **HSE** aspects remain one of our top concerns in all activities.