Reaching for the Cloud: De-risking our Subsurface Digital Transformation

Presenter: Neil Hookway

Strategic Technology Manager – Subsurface Digital

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References to “Woodside” may be references to Woodside Petroleum Ltd. or its applicable subsidiaries.

Agenda

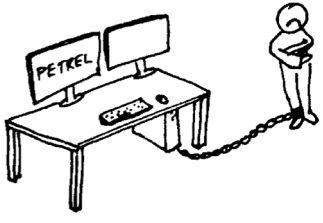
+ Compute is “Unlimited” and Storage is “Free”
  - Virtualisation
  - Cloud Infrastructure (as a Service)
  - Scalable Compute
+ Digital Transformation
  - What does it really mean?
  - Digitise / Digitialise / Digital Transformation
  - Examples: Seismic Data Management / Accelerated workflows
+ Culture not just technology
  - Partnership philosophy
+ Our journey to DELFI
  - Accelerated learning
  - Sharing and collaborating
  - Openness

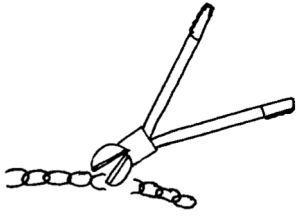
Vision: To be the Global Leader in Digital Subsurface

2016 Subsurface Technical Computing Strategy

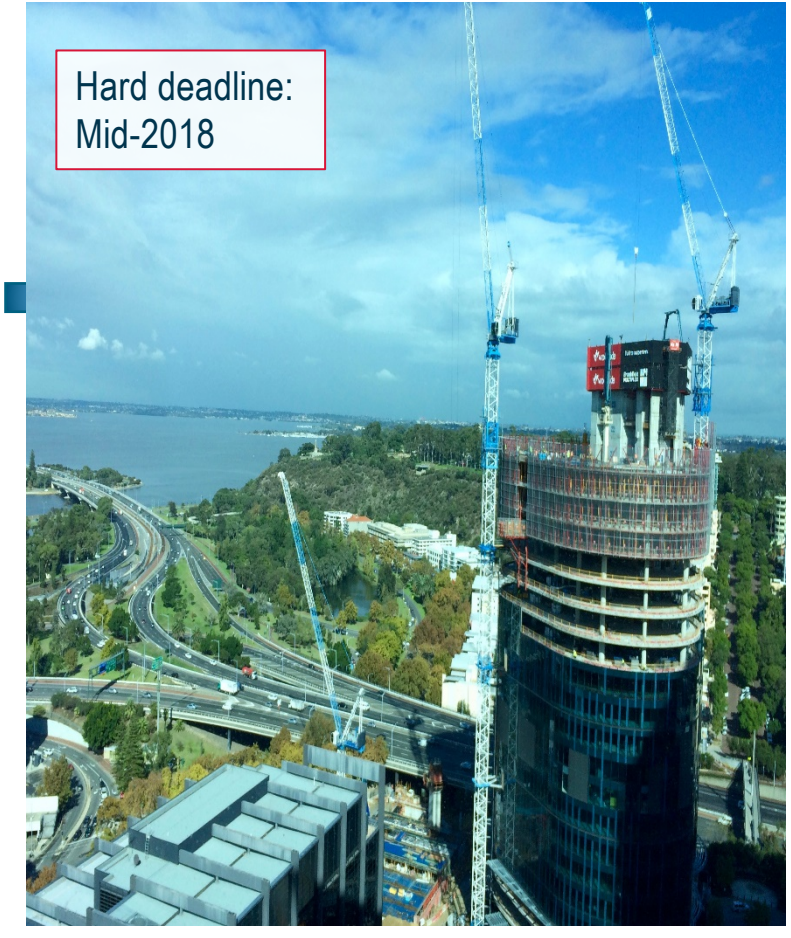
Workstation Virtualisation
Subsurface Desktop
for move to
Mia Yellagonga

'Chained' to the
Workstation at
Woodside Plaza





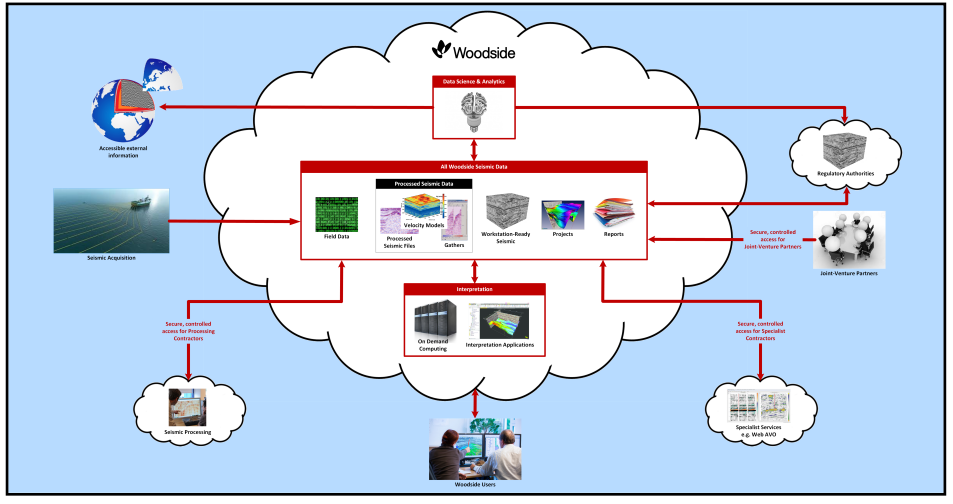
High Quality Remote
Visualisation 'cut' the chain,
Subsurface Desktop
deployed at Woodside Plaza



“Compute is Unlimited and Storage is Free”

+ Geoscience Conference 2016
  - Cloud seismic already conceived
  - Subsurface Desktop PoC
  - Public cloud IaaS

+ Woodside CTO Shaun Gregory
  - Conference opening talk
  - Exponential thinking
  - Simulation over a cup of coffee



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So what is Digital Transformation?

Digitisation

The process of converting information into a digital format, in which the information is organised into bits, e.g.

- Paper to digitised image
- Extraction of Digital Data from hardcopy media

Digitalisation

Enabling, improving or transforming business process by leveraging digital technologies (e.g., APIs) and digitised data

- Workstation based interpretation
- Autopicking
- Machine Learning

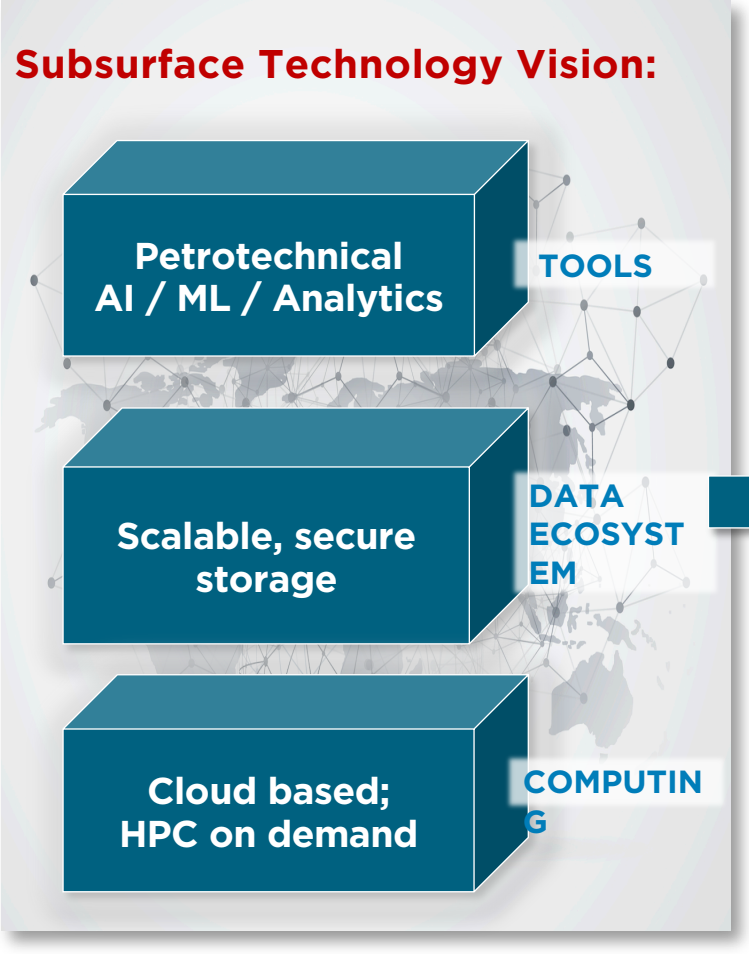
Digital Transformation

The transformation of activities, competencies, and business models to fully leverage the opportunities of digital technologies

- New business models made possible by new digital technology
- Uber, Netflix, Airbnb etc.

Woodside's Subsurface Digital Strategy

Subsurface Technology Vision:



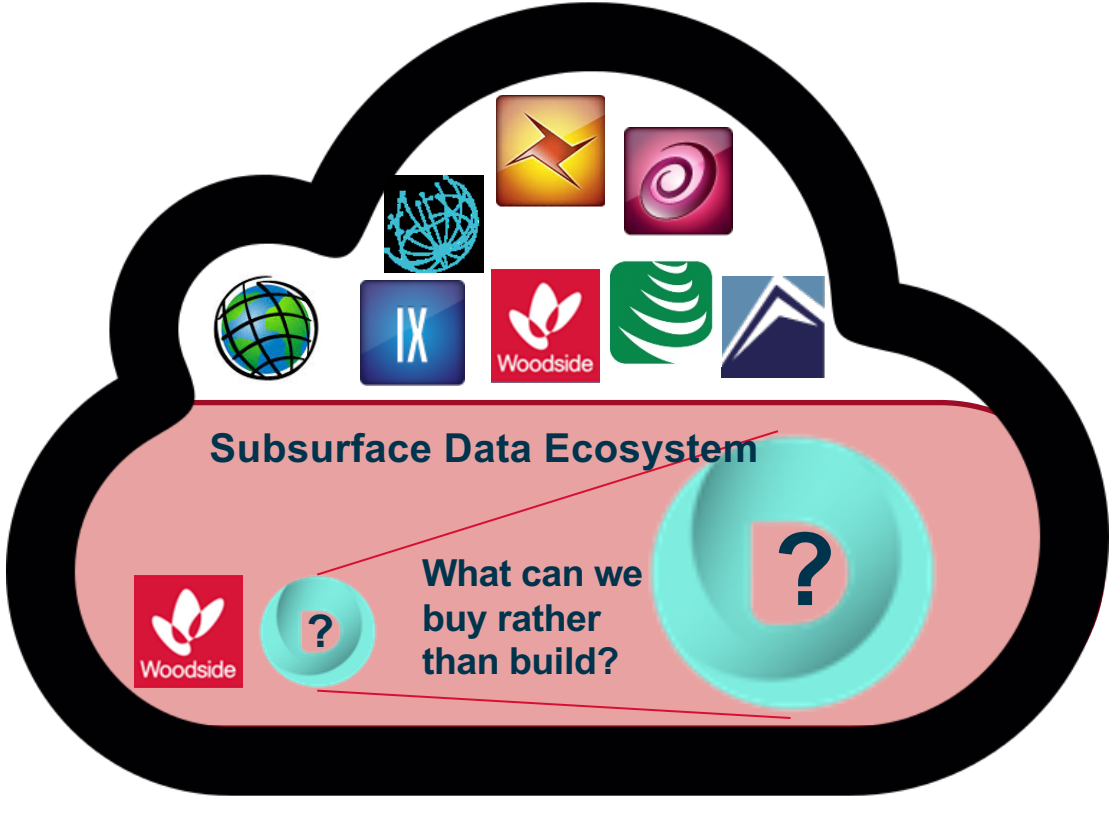
Vendor agnostic apps and microservices
From start-ups to core vendors
Frictionless access to Woodside data and IP

Rich APIs to bring technology to the data
Woodside owned; leveraging core vendors
Drives automation and interoperability

Public Cloud
Vendor neutral, scalable compute on demand

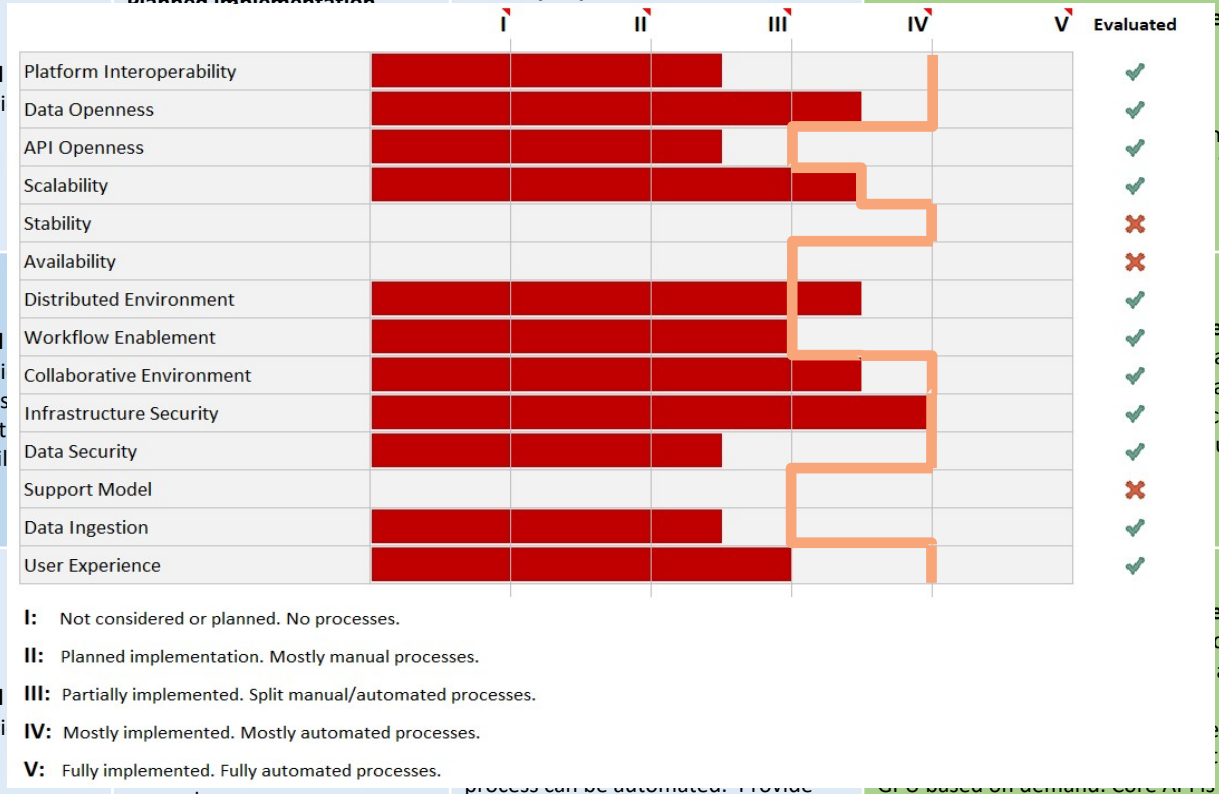
Turning the Vision into Reality

+ Define scope and dimensions of Woodside solution
+ De-risk vendor maturity with POC's
+ Align with Woodside Internal Platforms
+ High grade and select preferred partners
+ Data driven architecture driven by openness
+ Data residency driven by cost (storage, ingress and egress)
+ Integrate vendor cloud solutions through automation where direct app integration isn't possible



Assessment

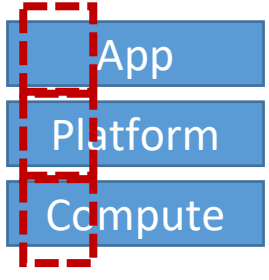
	I	II	III	IV	V
Collaborative Environment	**Not considered planned**. No Evi capability	Planned implementation	**Partially implemented. Combined**	es. n place for	**Fully implemented. Fully automated processes**. Full collaborative workflow and process are implemented. All target systems/applications are supported. Users can work in a streamline and seamless collaboration environment, with complete set of automated operational requirements met through API's
Data Security	**Not considered planned**. No Evi and support of s required for dat Petrel project fil			es. ation ady to critical urrent	**Fully implemented. Fully automated processes**. Full data security model, process and functionalities are all implemented and in place. All target systems/applications are supported, with comprehensive set of automated operational functionalities and features met through API's
Scalability	**Not considered planned**. No Evi scalability	present.	certain API for selected requirements and use cases.	es. d and ability e VM ion of in place to meet key requirements for current use cases.	**Fully implemented. Fully automated processes**. Full scan of scalability are implemented and in place. All target systems/applications are supported via automated process/functionalities. Complete set of API is provided for implementation such automated scalability operational requirements



Culture and Partnership

Model: **Legacy**

Pre-Cloud or public Cloud



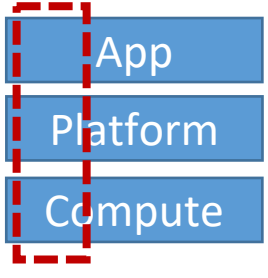
- Transactional
- Product Based
- Account Management
- Price book
- Perpetual

- We buy/lease applications
- Long product development cycle
- Commodity solution
- Low influence
- Compromised outcome
  Protected IP
- Cost comes before value
- Sunk cost (credits)
- Generational Change

Model: **Proposed**

Single vendor

Cloud 1.0 – lift and shift



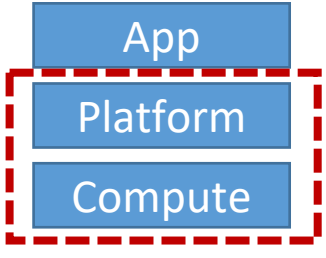
- Transactional
- Subscription Based
- Account Management + Projects
- Enterprise Commercial Agreement
- Leased

- We subscribe to functionality
- Drive accelerated development cycle
- Early access to solutions
- Tactical influence
- Woodside enhanced outcomes
  Applications + Shared IP
- Cost comes before value
- Sunk cost (credits)
- Generational Change

Model: **Desired**

Agnostic

Fast-track to Cloud 2.0



- Co-development
- Service Based
- Mutually beneficial relationship
- Holistic service
- Plug and play

- We invest in services
- DevOps
- Leading edge
- High influence
- Woodside optimised
- Shared IP
- Cost tied to value
- Consumption based
- Agile, continuous improvement

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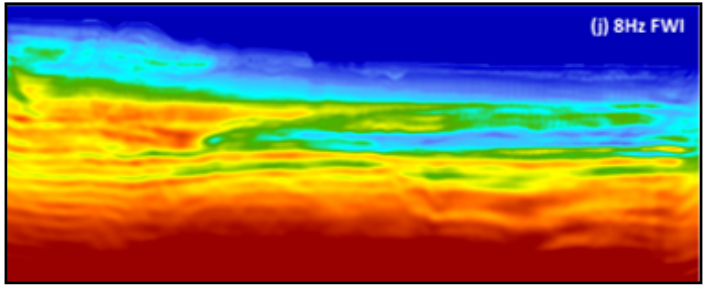
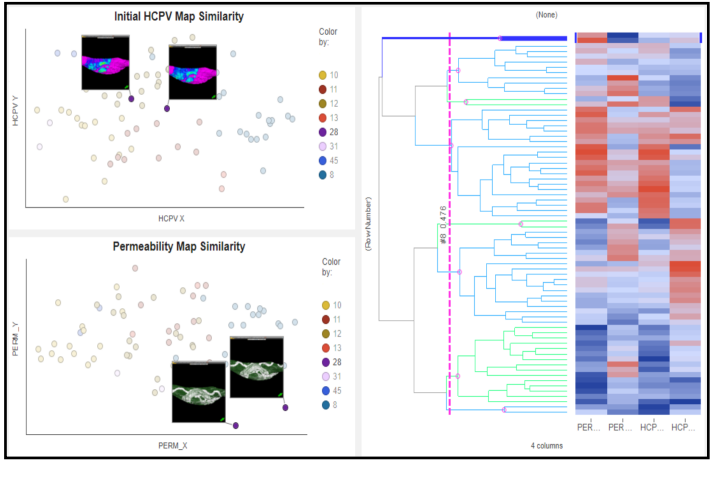
Examples of Woodside Subsurface Digital Transformation

+ Real-Time Seismic Acquisition QC
  - Acquired data direct to cloud in real time
  - Office based QC and Processing during acquisition
  - Selected volumes transferred via satellite
  - Ability to modify acquisition program on the fly
  - Immediate availability/accelerate insights

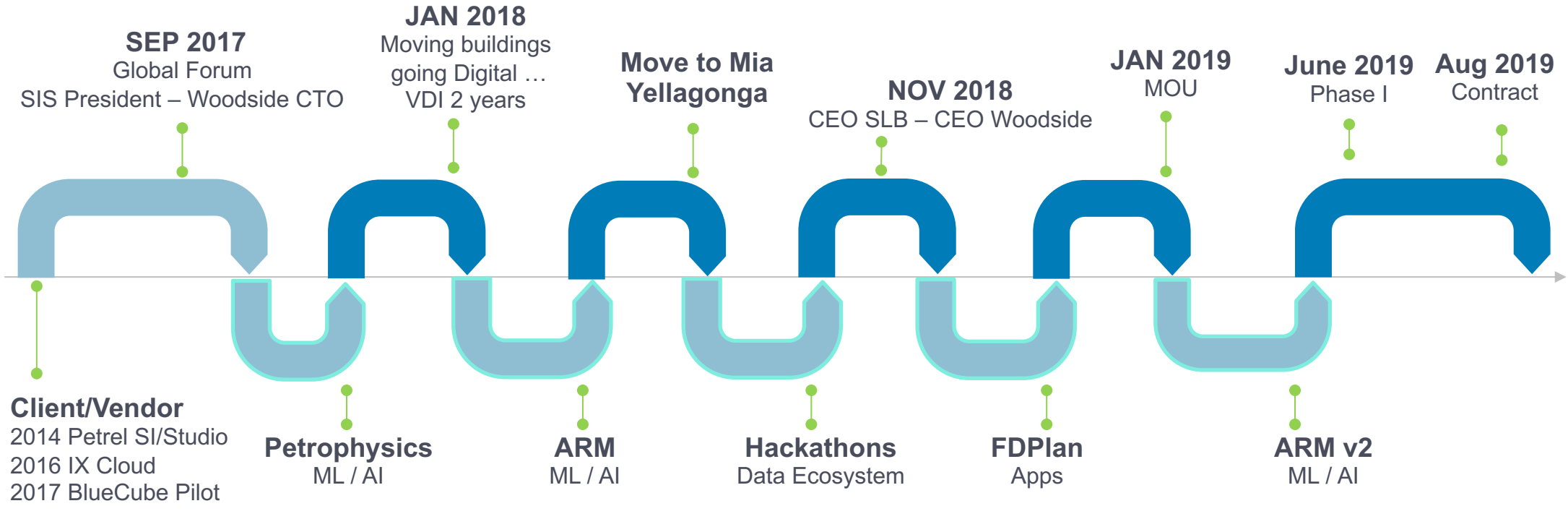


+ ARM (Agile Iterative Reservoir Modelling)
  - Probabilistic simulation
  - Thousands of geological realisations created and simulated automatically in parallel
  - Analytics to identify controlling parameters
  - Assisted quality assurance and control, and validation with production data
  - Focus activity and iterate
  - Reduction of workflow from months to days



DELFI Launched – September 2017

Woodside's journey to DELFI



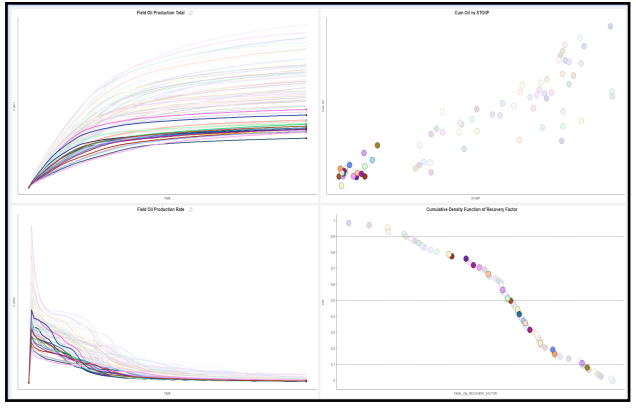
Transactional Relationship → Tactical Innovation → Innovate Together → Test Digital Openness → Innovate Together → Philosophical Alignment → Trusted Partnership

Agile Iterative Reservoir Modelling (ARM)

+ Woodside proto-typed workflow as FastFDP
  + Automated Petrel workflows
  + Fed simulation cases directly into vendor agnostic simulator
  + Excel based analytics (evolving into Spotfire) on results

+ ARM (phase 1)
  + SIS support for scaled workflow
  + Scaled to thousand of geological realisations
  + Run inside DELFI environment

+ ARM (phase 2)
  + Integrated R&D
  + Support for ARM via DELFI microservices and data stores
  + Productisation



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Digital Openness

+ Woodside request for a team to work directly with SIS R&D on business problems, within DELFI
  + Synchronisation of interpretation within working projects between London and Perth
  + Consumption of Seismic archive from 3rd cloud within DELFI
+ Both user stories were proven with outcomes exceeding expectation
+ Total immersion in platform took months off our learning journey
+ Established Woodside view that DELFI technology could be an “Open” environment
+ Created relationships that continue to be leveraged
+ Educated SIS on the practical application of DELFI technology

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Philosophical Alignment

+ CEOs of both our organisations led this engagement
+ Alignment on the value we want to generate was defined within an MoU
+ Drive to ensure contracting process didn't erode value proposition:
  + Both parties risks recognised by the other
  + Commitment to sharing risk equitably
+ Openness a guiding principle from Day 1
  + Open data ecosystem
  + Micro-service architecture
  + 3rd party applications
+ Continuous focus on win-win outcomes

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Wrap Up

+ Innovation is core to Woodside's DNA
+ In Digital Subsurface that means a vision to be a Global Leader
+ Cloud / IaaS created opportunities to re-imagine how we interpret and model our subsurface data sets
+ To scale from tactical use to enterprise use Woodside needs to partner
+ IP needs to migrate into modern microservice based software architectures
+ Since the launch of DELFI Woodside has maintained an ongoing engagement with SIS to understand how we can leverage it
+ We believe that through our partnership with Schlumberger, underpinned by our enterprise adoption of DELFI, Woodside is well place to deliver our vision for Digital Subsurface

Mia Yellagonga
11 Mount Street
Perth, 6000

GPO Box D188
Perth, WA 6840 Australia

T: +61 8 9348 4000
F: +61 8 9214 2777
E: companyinfo@woodside.com.au

woodside.com.au