



human energy™

# SIS Global Forum 2019

the future is open

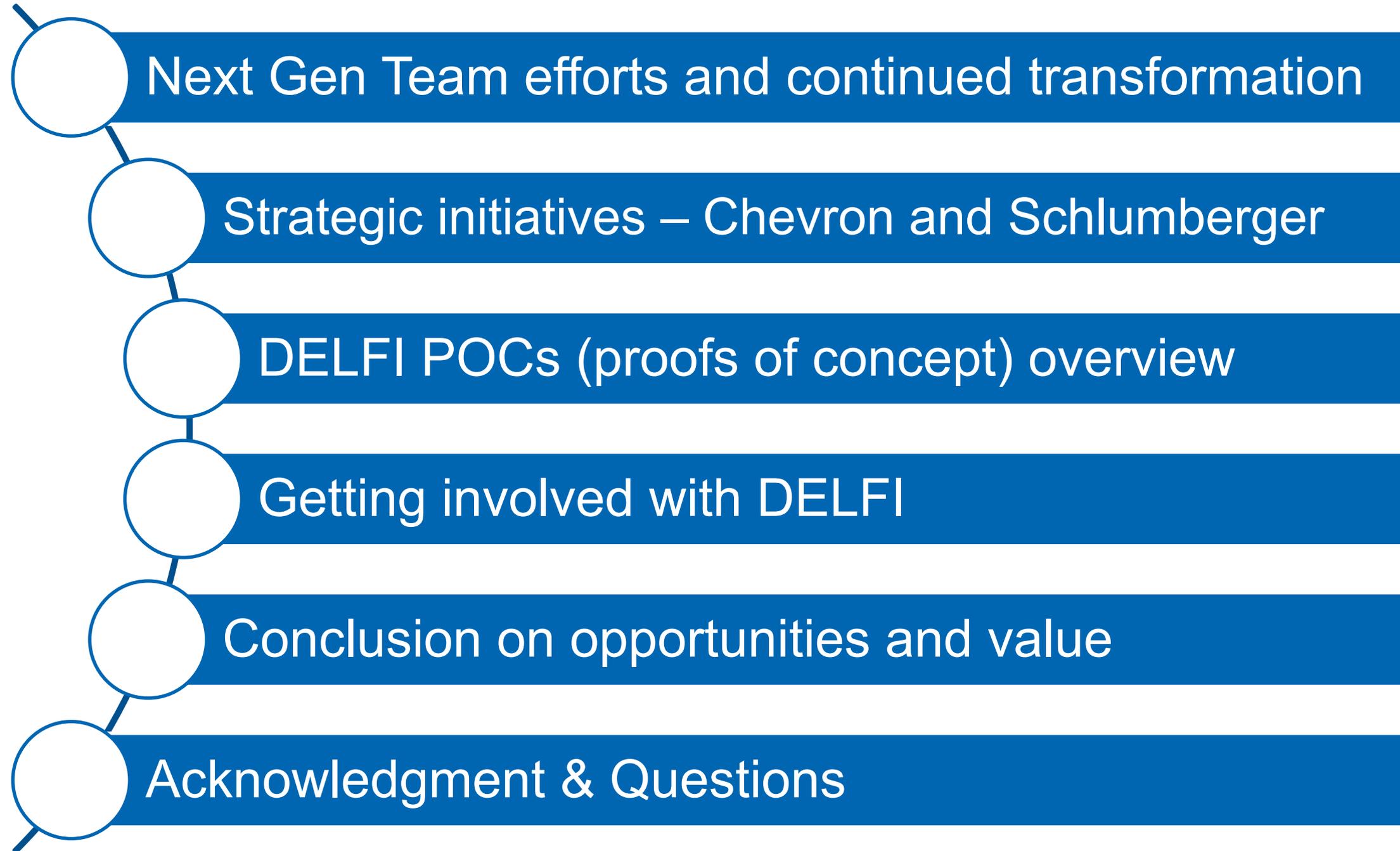
# DELFI Evaluation at Chevron: Learnings and Next Steps

Stan Jayr, Sara Ante

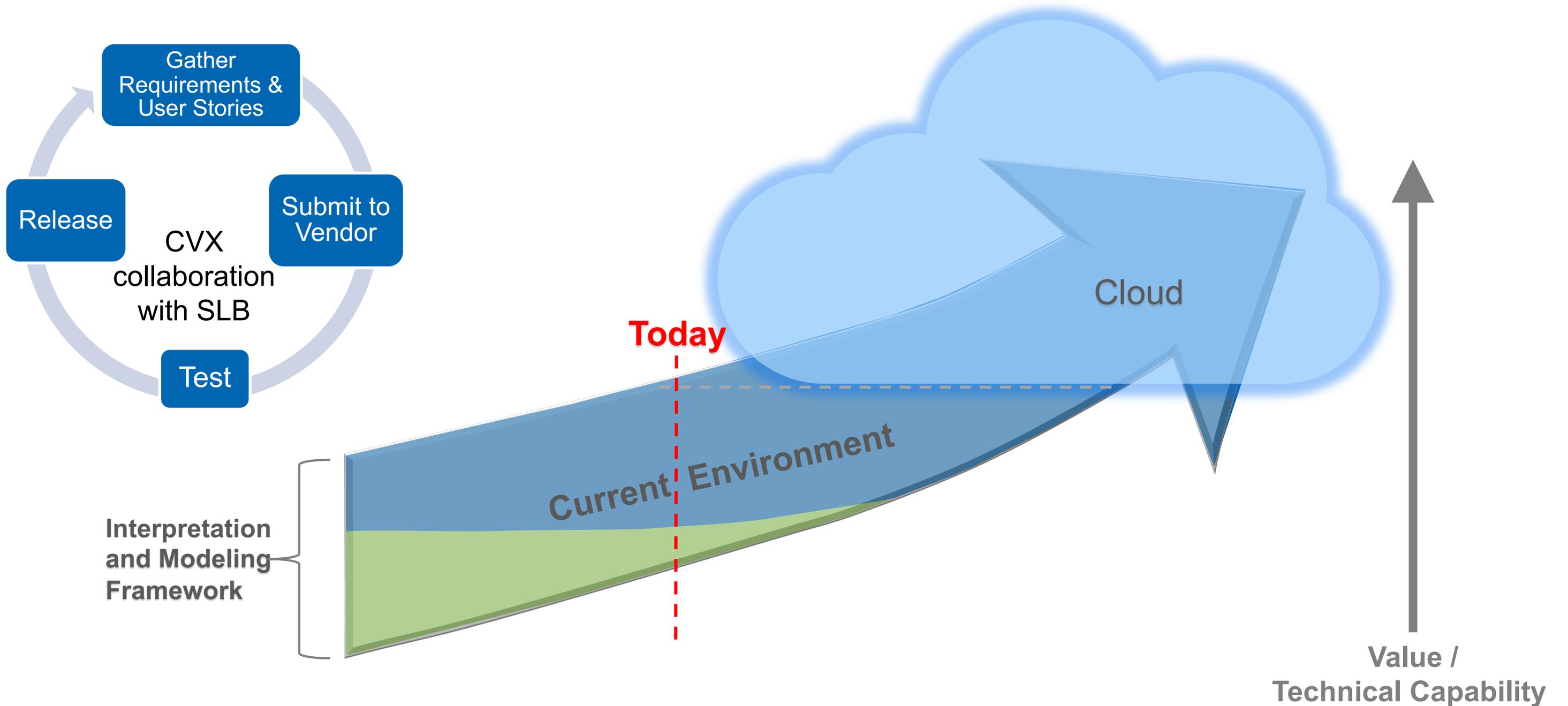
Earth Science Strategists, Energy Technology Company

September 17<sup>th</sup> 2019

# Agenda



# Next Gen Team efforts and the continued transformation



# DELFI core values are aligned with Chevron's strategic initiatives

Chevron Subsurface Priorities		DELFI Core Values							
		Data Centric	Extensible	Secure	Scalable	Cognitive	Collaborative	Automated	Personalized
Revolutionize Subsurface End-to-End Workflow From 24 to 3 Months	Specific Data-Enabled Foundation								
	Self Service Access to Insights								
	Semi-Automated Subsurface Assessments								
Predictability of Forecasts to Drive Value Across the Chain	Global Analogs to Improve Forecasts								
	Decision Driven Development Modeling								
	Optimize Development Planning and Execution								
Integrate Subsurface, BB&O and D&C to Drive Performance Optimization	Full Life of Field Optimization								
	Dynamic Portfolio Optimization								



# DELFI POCs (proofs of concept) overview

- POCs developed with a mindset of “**explore and discover**” considering Chevron user stories. Not a deployment readiness checklist.
- POCs are here to help understand and formulate the **scope of the opportunity**.
- Multiple functions involved in POCs (Drilling & Completions, Earth Science, Reservoir & Production Engineering, technical Computing)
- Staged progress of POCs mainly depend on readiness of technology
  - POCs grouped into 4 Swim Lanes

**A**  
Cloud Native  
Tech

**B**  
Ecosystem

**C**  
Lift and Shift

**D**  
Product  
Design

# DELFI Cognitive E&P Environment



secured



supported



automated

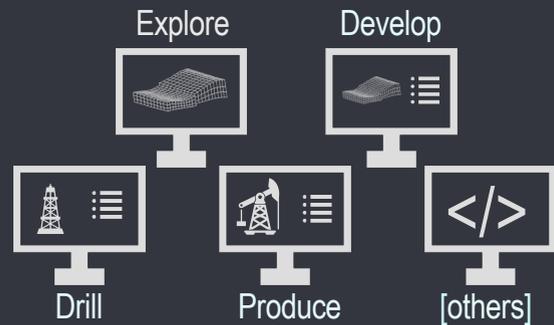
## Petrotechnical Suite



APP

3<sup>rd</sup> party apps & plug-ins

## Native Domain Experiences & App's



APP

3<sup>rd</sup> party domain apps

## Data Stewardship & Analytics



APP

3<sup>rd</sup> party analytics apps



cognitive

## API Gateway

apigee



openness

## Domain Science & Compute Engines

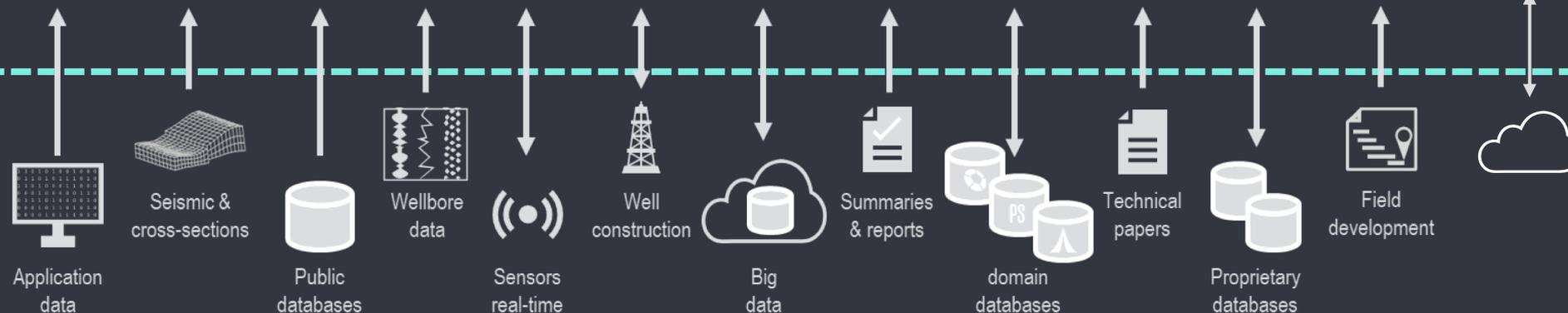
## Data Ecosystem

Domain Consumption (APIs)

Domain Storage & Data Lifecycle

Ingestion Framework (APIs)

{ MICROSERVICES }



Schlumberger

# DELFI Cognitive E&P Environment

**A**  
Cloud Native  
Tech

**B**  
Ecosystem

**C**  
Lift and Shift



secured



supported



automated

**C** **Petrotechnical Suite**



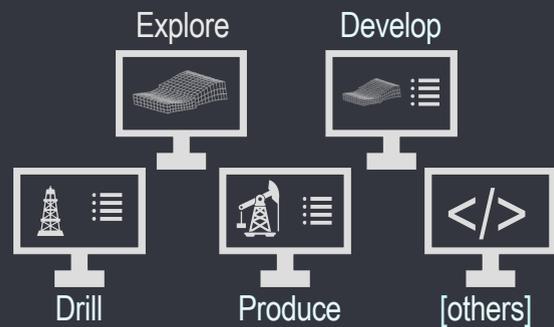
PM GEOX GPM VIS OFM

OLGA ECL IX PIP

APP

+  
3<sup>rd</sup> party apps  
& plug-ins

**A** **Native Domain Experiences & App's**



Drill Produce [others]

APP

+  
3<sup>rd</sup> party  
domain apps

**Data Stewardship & Analytics**



APP

+  
3<sup>rd</sup> party  
analytics apps



cognitive

**API Gateway**

apigee

**Domain Science & Compute Engines**

**Data Ecosystem**

Domain Consumption (APIs)

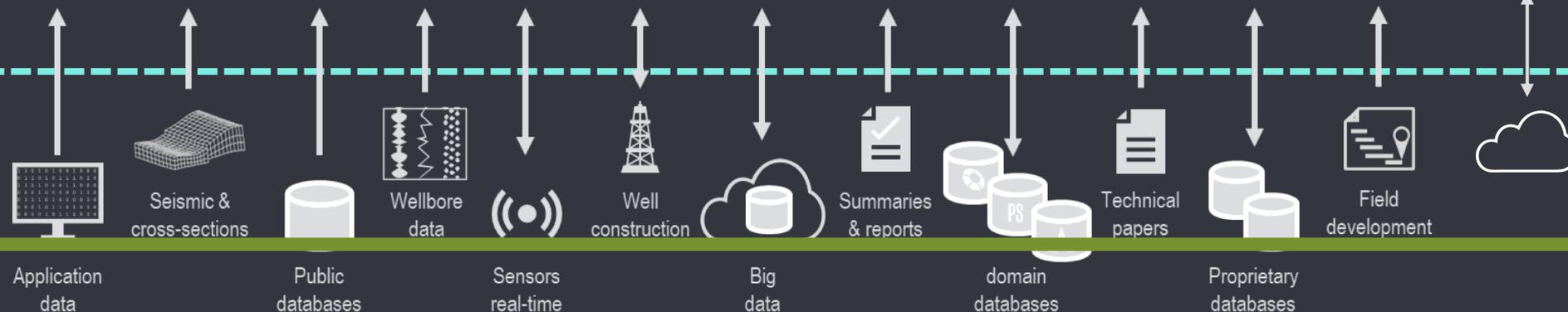
Domain Storage & Data Lifecycle

Ingestion Framework (APIs)

{ MICROSERVICES }



openness

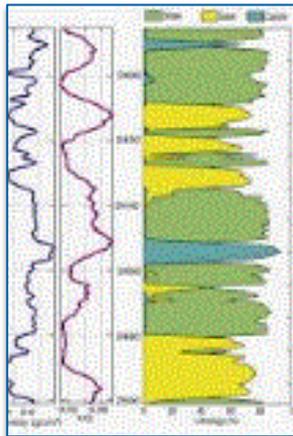


**Schlumberger**

# What we are doing with DELFI by domain

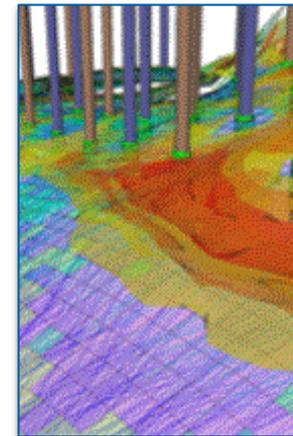
*Testing SS workflows in the cloud through POCs and assessment*

**DELFI: Transformational, cloud based, cognitive E&P environment to dynamically connect workflows and data across the upstream value chain**



## Earth Science POCs

- Replicate a BU petrophysical workflow in DELFI. Identify bottlenecks and focus on data I/O efficiency.
- Test lift-and-shift Petrel functionality to ensure results are consistent with current ES interpretation and modeling requirements



## Petroleum Engineering POCs

- Replicate reservoir simulation and uncertainty analysis workflow in DELFI with:
  - Phase 1: All Schlumberger tools
  - Phase 2: Chevron proprietary tools
  - Phase 3: External vendor tools (e.g., Petroleum Experts).



## Drilling and Completion POCs

- Test well planning, positioning, project management, and drilling engineering functionality of DrillPlan to ensure results are consistent with current G&G and drilling requirements.



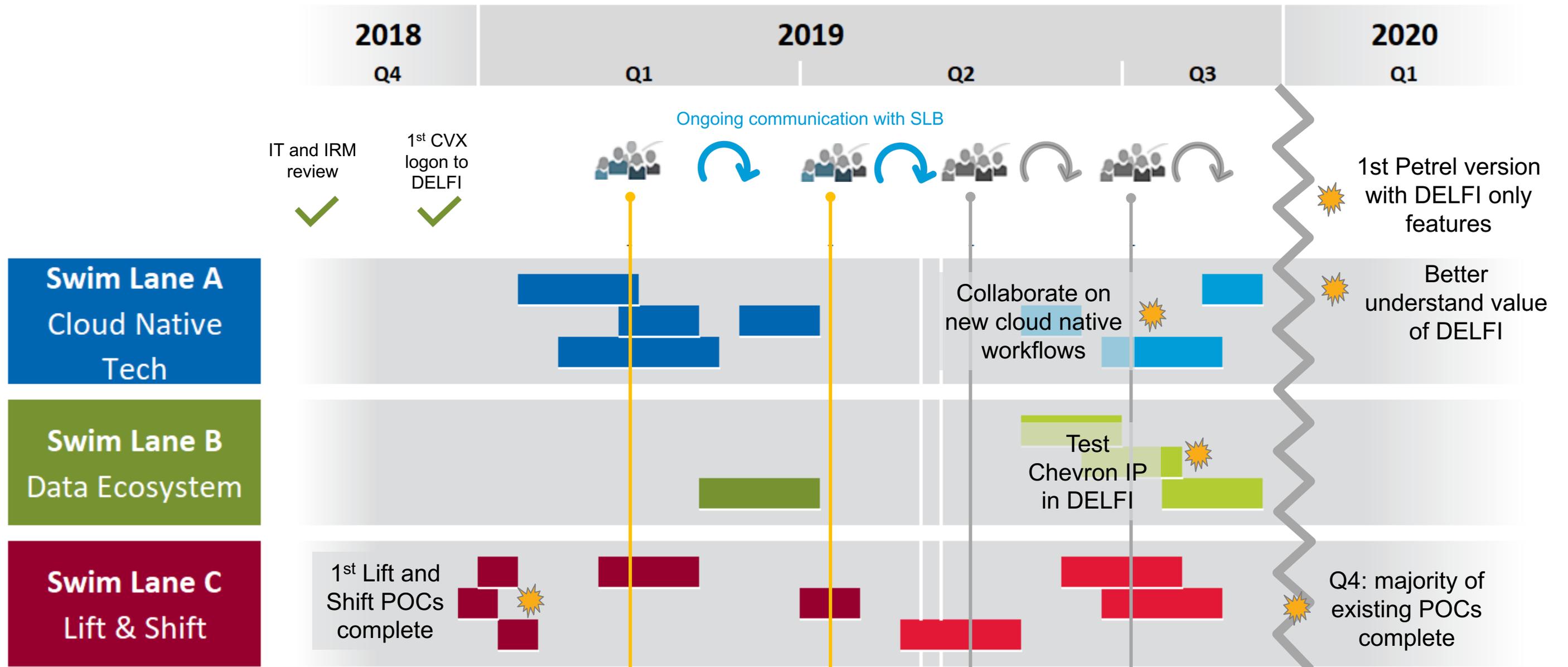
## Ecosystem assessment

- Review DELFI data architecture, APIs and integration, software development platform, security and reliability.
- Understand DELFI integration with Chevron digital architecture.

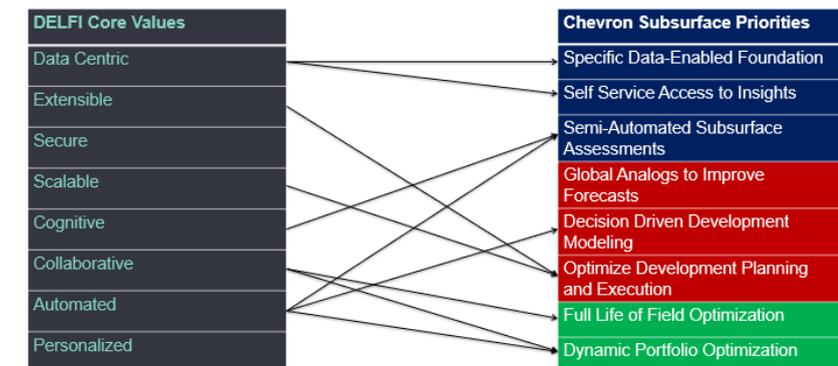
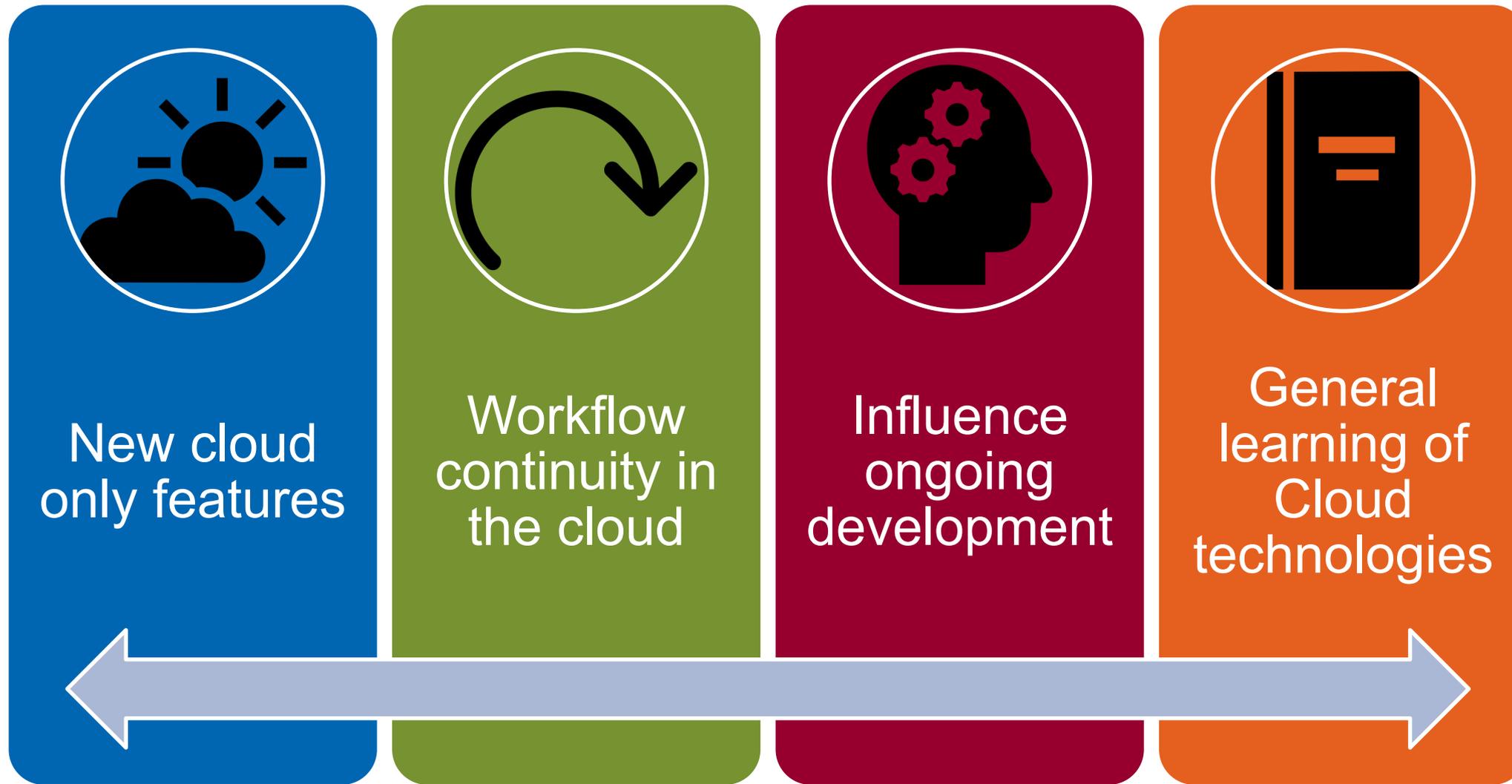
# POC Example: Reservoir Engineering and Simulation

- **Profile:** Reservoir Engineer Plus
- **Objectives:** To determine whether DELFI constitutes a technically viable element of Chevron's reservoir simulation workflows.
- **Effort:** few months - sprint based
- **Tester:** John Doe (team 1) & Jane Doe (team 2)
- **Phase 1:** Run DELFI reservoir simulation workflows using Chevron models. Replicate a typical ETC and Business Unit history match reservoir simulation workflow in a native DELFI environment on 2-3 assets. Ability to perform real-time data transfer and analysis between Chevron and its vendor partners using DELFI as the ecosystem.
  - Get historical data out of Source 1
  - Get historical data out of OFM with OFM Chevron Plug-ins
  - Get well events data from Source 2
  - Transfer historical data to Petrel using Chevron Enterprise Data Links
  - Get flow table data from Source 3 (test data transfer, not required for history matching)
  - Construct full field simulation models in Petrel/PetrelRE
  - QA and QC simulation model using line charts, 2D maps and 3D model visualization
  - Submit simulation runs to Cloud
  - Submit simulation runs using the Petrel Uncertainty and Optimization process together with the Multiple-Realization options.
  - Submit Source 4 runs for history match workflows
  - Analyze simulation results using line charts, 2D maps and 3D model using Petrel
- **Phase 2:** Run Chevron-proprietary workflows with the DELFI environment, primarily our PetrelRE plug-ins, Chevron in-house tools, and the Chevron version of INTERSECT
- **Phase 3:** Run Chevron workflows coupled with 3rd-party software

# DELFI POC: Iterative planning, execution, review / adjustment



# DELFI could provide opportunities and value



# Conclusion

## Leverage DELFI POCs to understand opportunities and business value:

Assess workflow continuity in the cloud

Understand new cloud-only features

Increase competency with cloud technologies

Influence ongoing development

## Disrupt the technology, not the business:

Employ lessons learned from Next Gen's long history around deployment and value driven decisions

## Use best practices:

Stay aligned with Chevron strategy and with BU needs

Scaled Agile Framework (SAFe) is improving how we partner with Schlumberger.

Be flexible: learn, investigate, validate, adjust – (More POCs coming!)

## Acknowledge challenges:

Digital transformation is challenging for us and for vendors

- Constant change as technologies develop (ML, Data Lake...)
- Balancing resources between current and future state
- Very early days of DELFI, with an aggressive release plan by Schlumberger

# Acknowledgment & Questions

Thank you to the many individuals and teams involved...

Earth Science
Reservoir & Production Engineering
Technical Computing
Drilling & Completions
Schlumberger