



The Drive for Operational Excellence in Pipeline Operations

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GeoGathering 2007



Thesis

- There is a strong drive for operational excellence in pipeline operations
- ... motivated by mandates both external and internal to pipeline operators.
- One result is the continued growth in the use of IT resources for supporting pipeline operations.



Outline

- Motivating dimensions
- Chevron investment examples
- Strategic choices & issues



Motivating Dimensions

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Summary

Expansion in two independent dimensions motivate the continued growth of IT resources dedicated to supporting pipeline operations:

- *Types of pipeline facilities under mandate*
- *Geographic scope of mandates*

Both dimensions may have components

- **external** (*government regulations*)
- and **internal** (*e.g., corp. OE mandate*)

to a company.



Recent Domestic Regulations

May 2001, Feb. 2002:

- *Hazardous Liquid IM Rules (49 CFR Part 195)*

Dec. 2002:

- *NPMS Mapping System Reporting Requirement (49 USC 60132)*

Dec. 2003, May 2004:

- *Gas Transmission IM Rule (49 CFR Part 192)*

Sep. 2006:

- *Rural Onshore Liquid Gathering & Low Stress Pipeline Rule Proposed (49 CFR Part 195 extension)*



“Our intent in mandating the [recent pipeline] regulations was not to require the use of GIS, but I frankly don't see how any operator can meet the requirements without GIS.”

Jeff Wiese

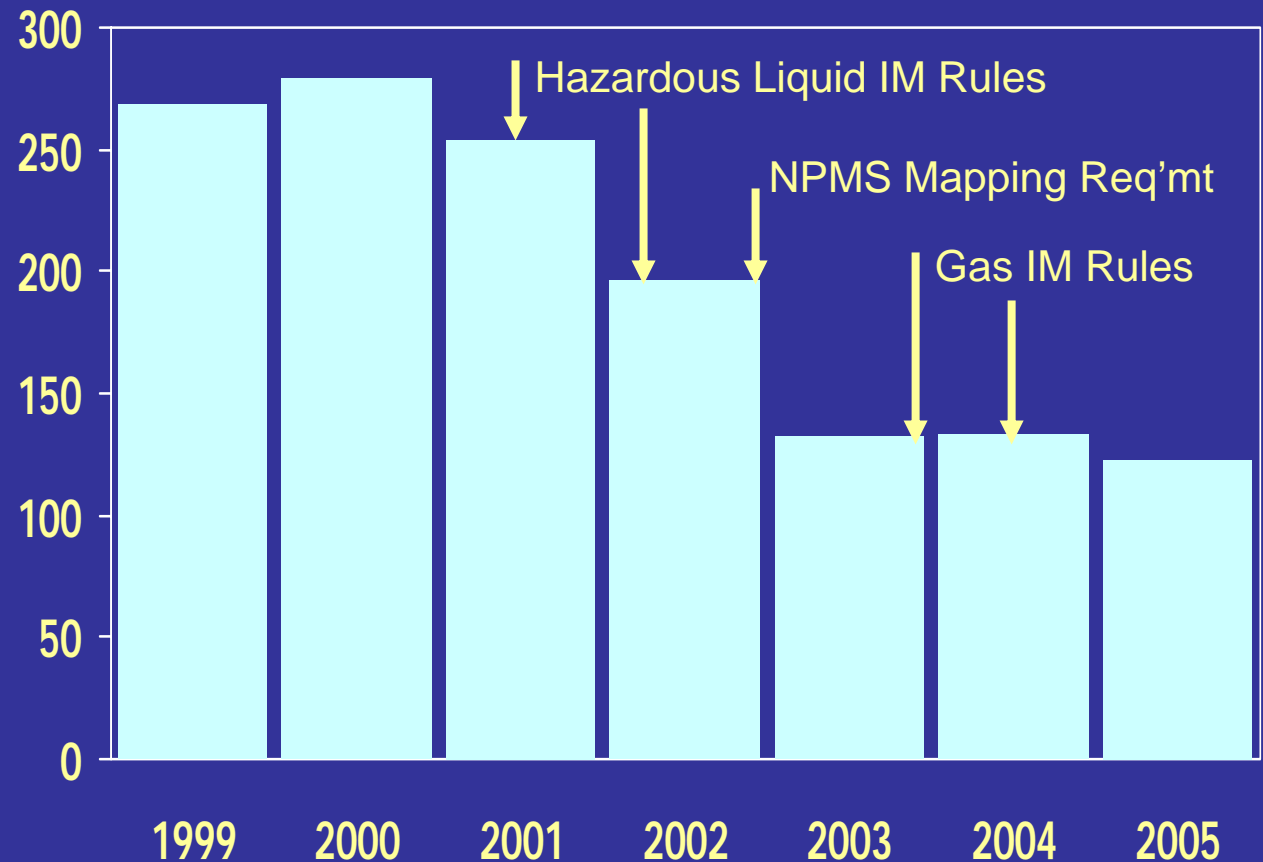
*Then-DOT/OPS R&D Program Director
NACE International PIM Seminar, 2003*



Impact of Regulations

Onshore Pipe Incidents (All Causes)

From PPTS
- courtesy API, AOPL





External International Drivers

- PIM performance expectations rising in developing nations
- Some adopting PHMSA-like regulations
 - *E.g.*, West African Gas Pipeline Authority (Nigeria, Togo, Benin, Ghana) have adopted parts of 49 CFR 192 relevant to steel pipelines.



Chevron Corp. OE Mandate

It is the policy of Chevron Corporation to protect the safety and health of people and the environment, and to conduct our operations reliably and efficiently. ...

We will assess and take steps to manage potential risks to our employees, contractors, the public and the environment within the following framework of Operational Excellence Expectations:

1. Security of Personnel and Assets - Providing a secure environment ...
2. **Facilities Design and Construction** - Designing and constructing facilities to prevent injury, illness and incidents and to operate reliably, efficiently and in an environmentally sound manner.
3. **Safe Operations** - Operating and maintaining facilities ...
4. **Management of Change** - Managing both permanent and temporary changes to prevent incidents.
5. **Reliability and Efficiency**: ...

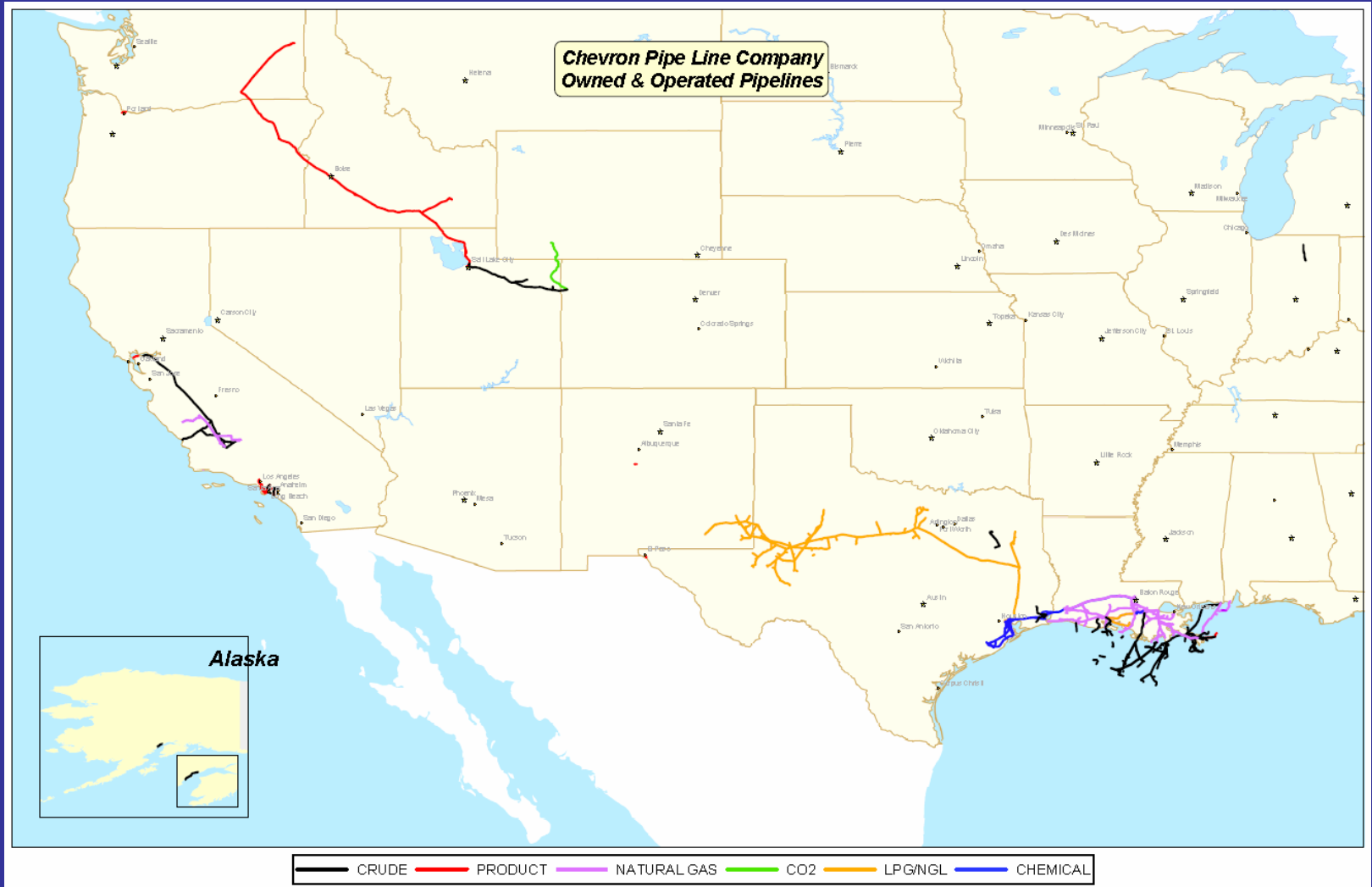
www.chevron.com/about/operational_excellence



Example 1 – Chevron Pipe Line Co.



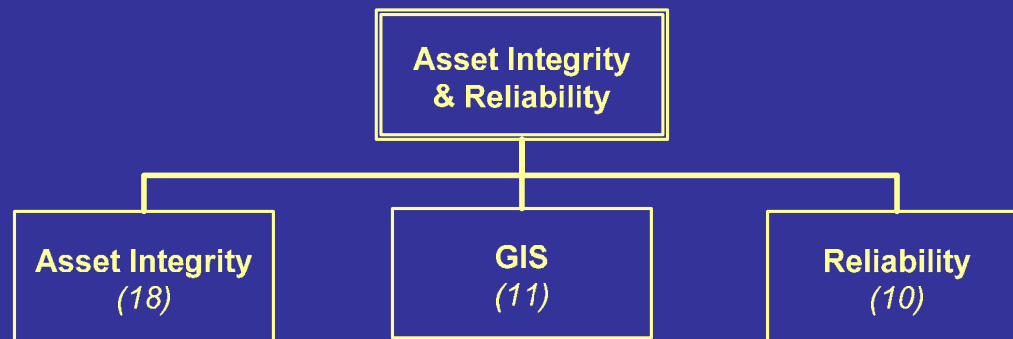
U.S. Operations





PIM Investments

- →**2003**: PIM resources: 7 FTE staff
- **2001-present**: Questionnaire-based assessment of hazardous liquid lines
- **2003-2006**: PIM staff resources triple in number
- **2004**: Acquired vendor application for risk assessment of gas lines
- **2007**: New Asset Integrity & Reliability organization:

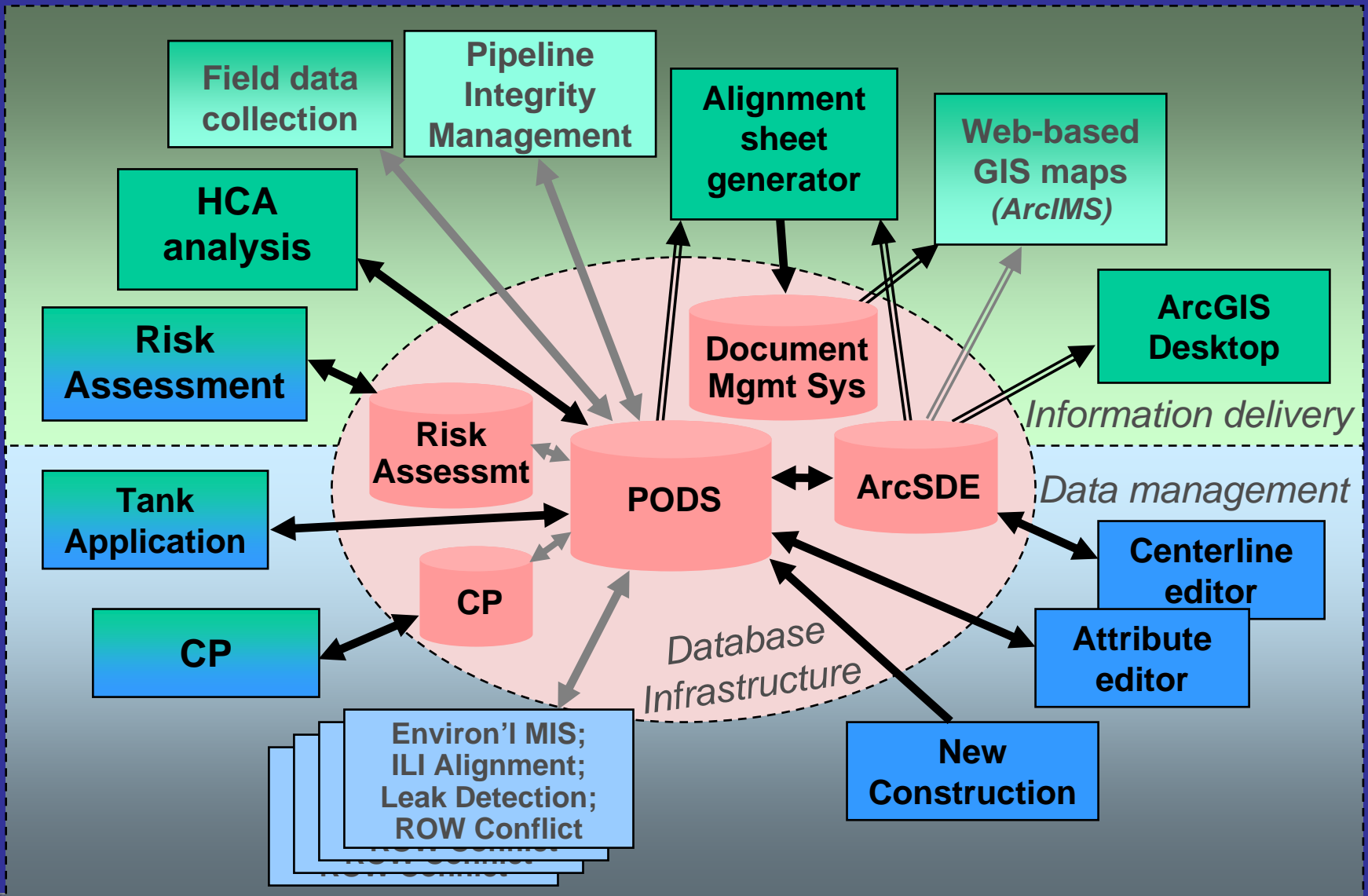




Data Management Investments

- **1999-2000**: Deployed CAD-based proprietary mapping system
- **1999-2002**: Converted ~8700 of legacy paper to proprietary mapping system
- **2002**: Replaced proprietary system with one based on PODS data model
- **2003**: Implemented PODS enhancement & application to manage data for Breakout Tanks
- **2006**: Implement & grow GIS Support organization

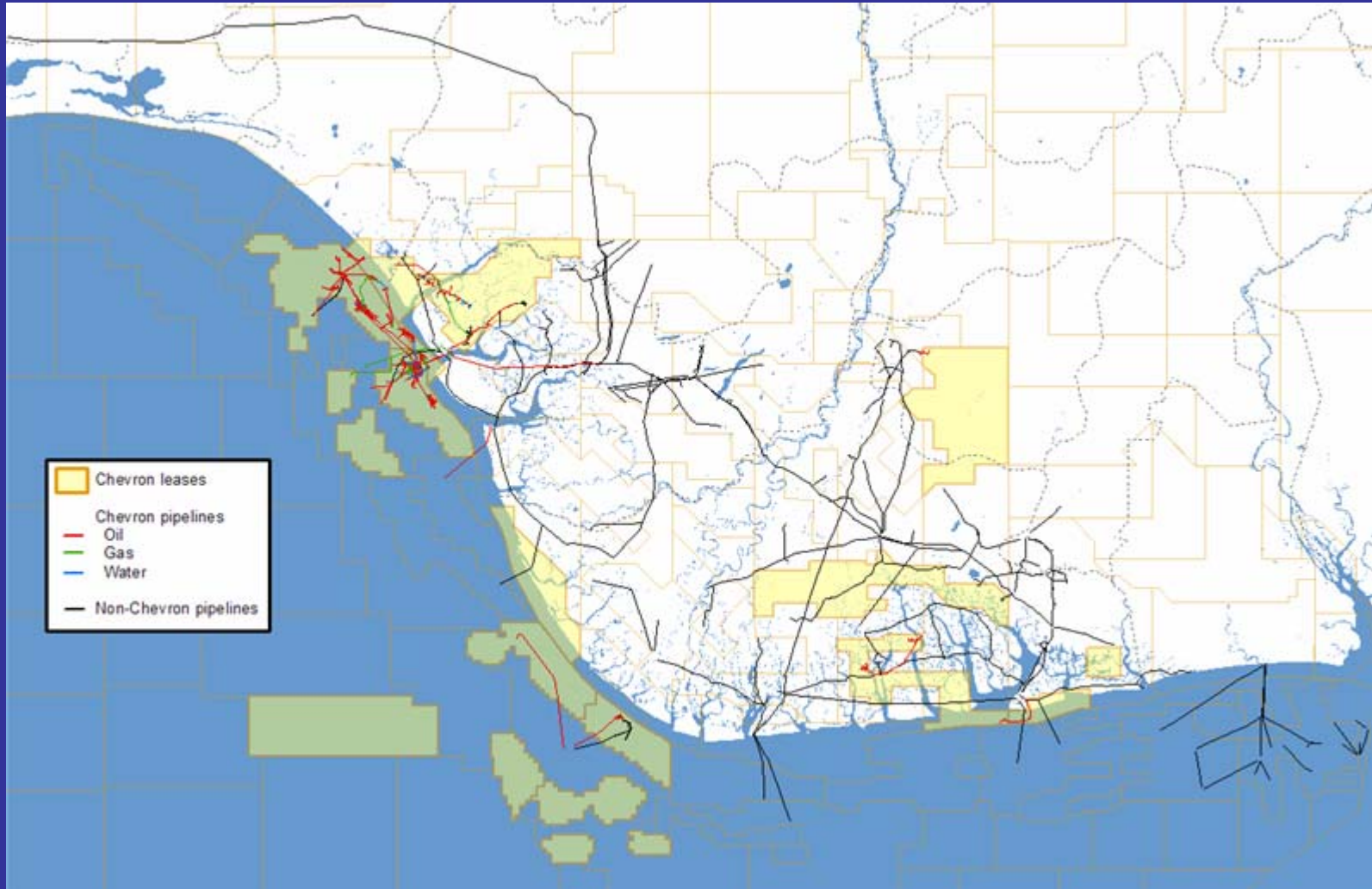
CPL Architecture





Example 2 – Chevron Nigeria Ltd.

Nigeria Operations

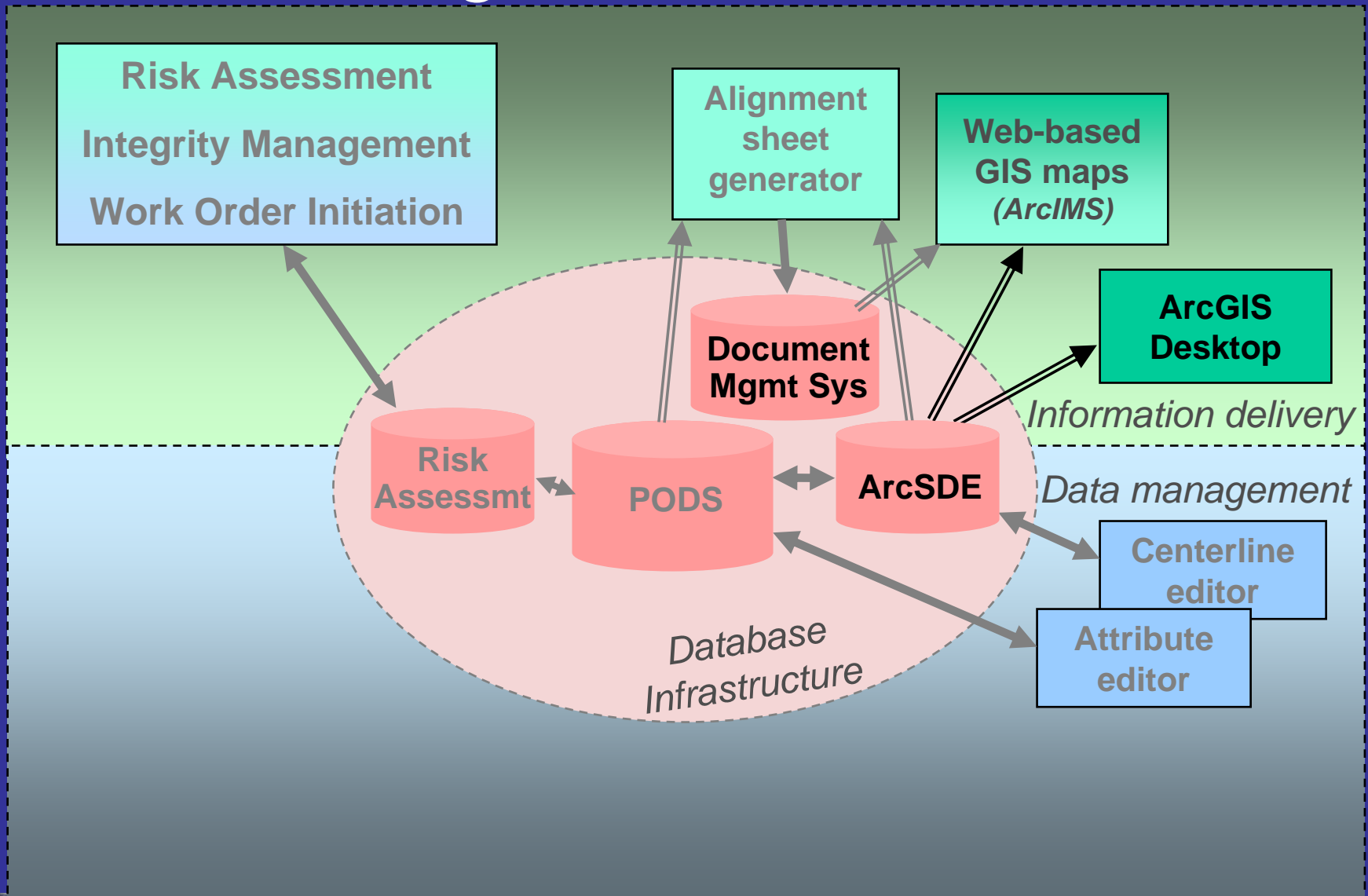




Investment History

- **2003-2004**: Evaluate alternative pipeline data management solutions; perform industry benchmark study
- **2004**: Identify & design PODS-based system as preferred solution; design supporting work processes & organization
- **2006**: Implement Mechanical Integrity organization; select Risk Assessment application
- **2007** (*in progress*): Design & test integration of PODS system and Risk Assessment application

Target Architecture



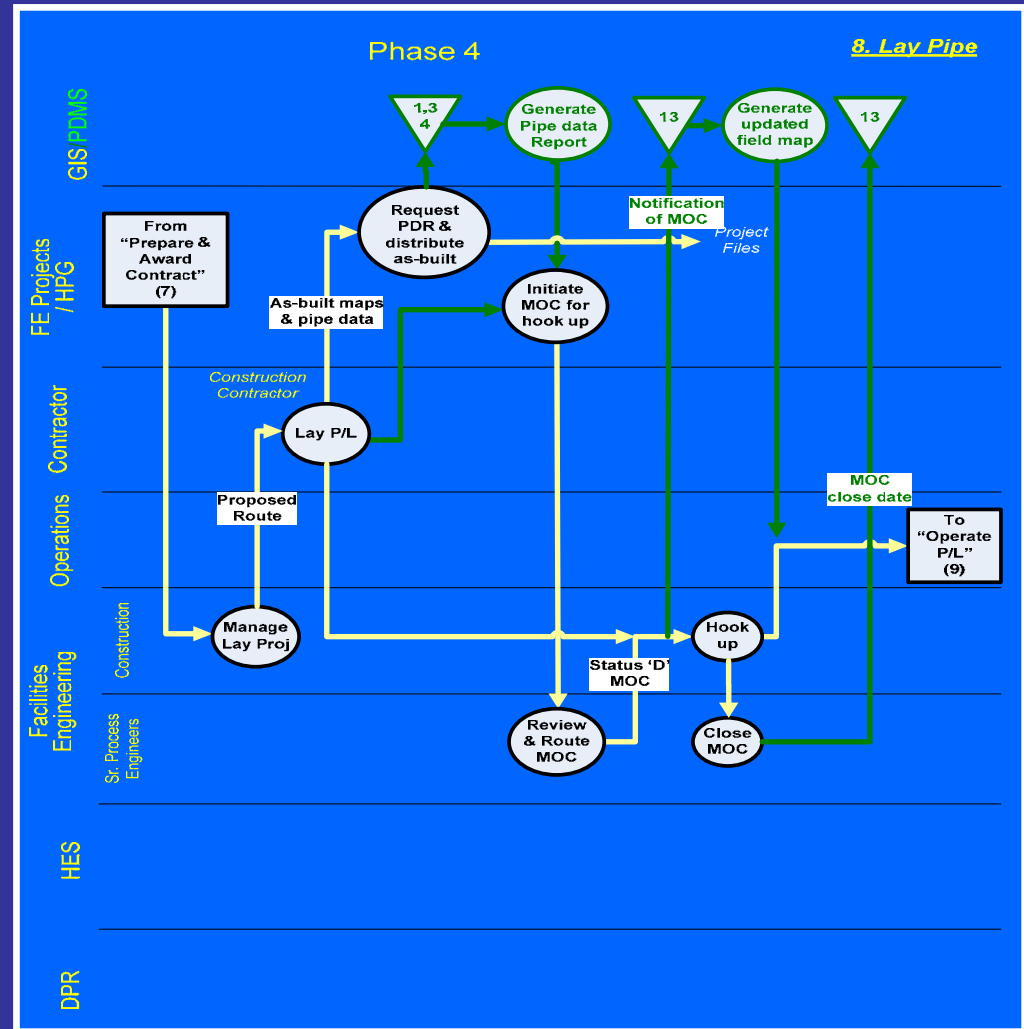
Workflow modules

Lay Pipe (Module 8)

- Pipeline Data Mgmt staff are expected to update most pipeline data. Exchange of data with this group is highlighted in green.

Process Improvement:

- New MOC Process may be needed for the laying pipeline.
- Current MOC Process only involves topside hookup.





Key Requirements

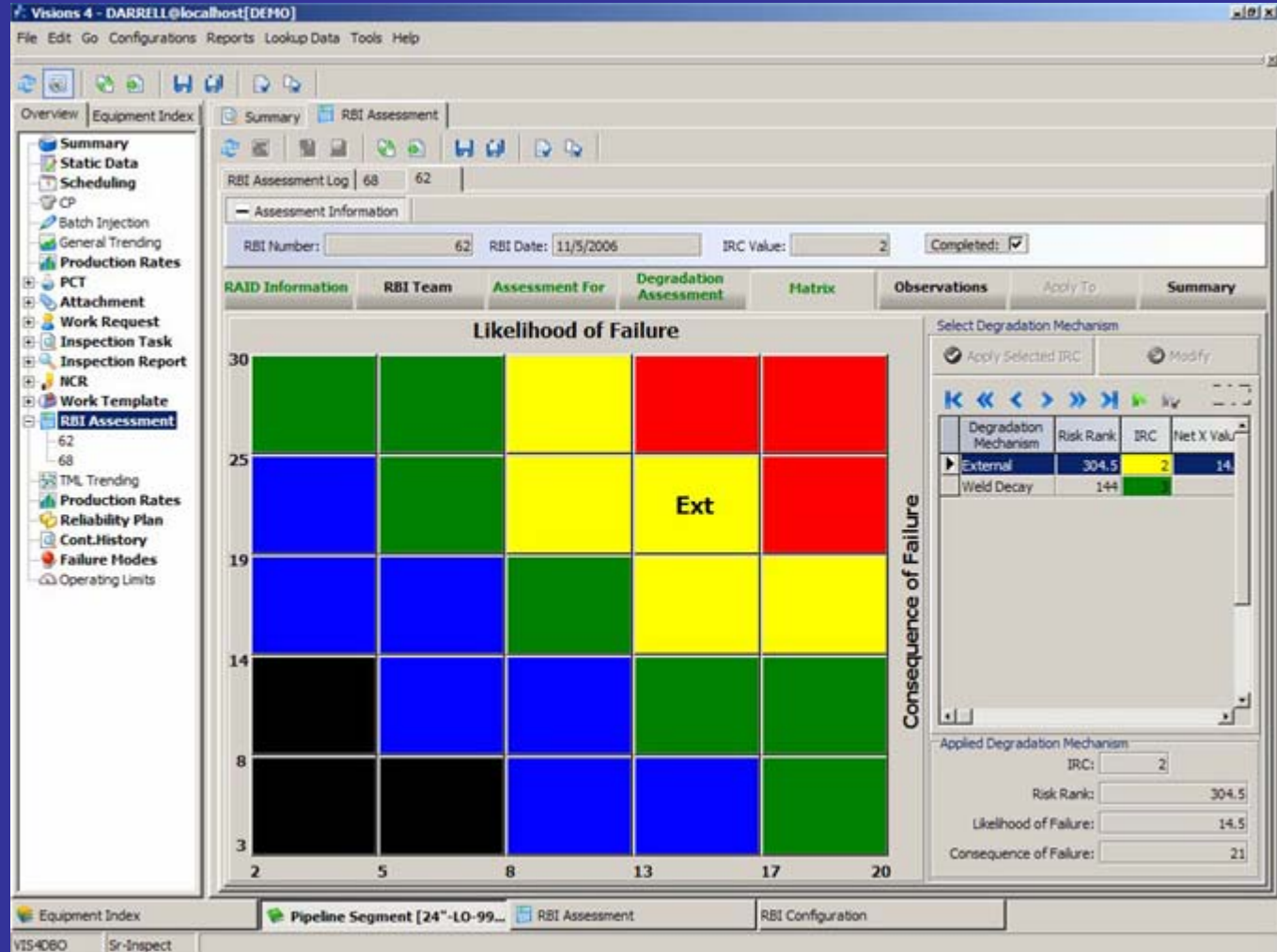
Consistent with Chevron's preference for deploying standardized IT solutions:

- Solutions must conform to Corp. Information Protection requirements
- Applications must integrate with standard, published PODS data model
- Any spatial data & services must be compatible with the ESRI GIS environment
- Risk Assessment application must be readily and highly configurable

Risk Assessment (1/2)

CNL's vision is to adopt a PIM methodology based on Risk Based Inspection

The RBI tool will provide the work management support to facilitate this methodology

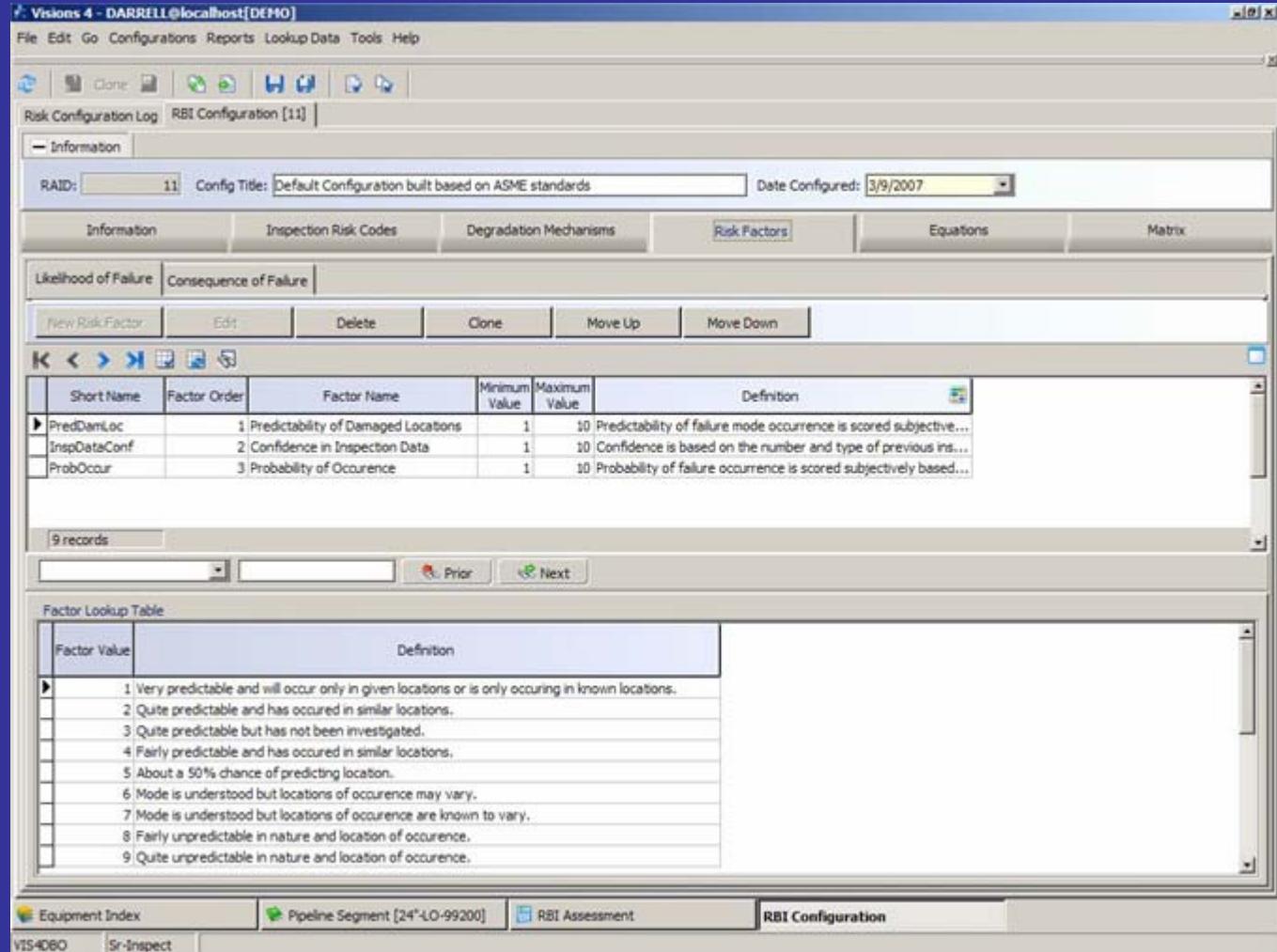


Risk Assessment (2/2)

The RBI tool is **fully configurable** in what factors are used to determine failure:

- Likelihood
- Consequence

and the formulae used to translate those factors into a risk rank



Visions 4 - DARRELL@localhost[DEMO]

File Edit Go Configurations Reports Lookup Data Tools Help

Risk Configuration Log RBI Configuration [11]

Information

RAID: 11 Config Title: Default Configuration built based on ASME standards Date Configured: 3/9/2007

Information Inspection Risk Codes Degradation Mechanisms Risk Factors Equations Matrix

Likelihood of Failure Consequence of Failure

New Risk Factor Edit Delete Clone Move Up Move Down

Short Name	Factor Order	Factor Name	Minimum Value	Maximum Value	Definition
PredDamLoc	1	Predictability of Damaged Locations	1	10	Predictability of failure mode occurrence is scored subjective...
InspDataConf	2	Confidence in Inspection Data	1	10	Confidence is based on the number and type of previous ins...
ProbOccur	3	Probability of Occurrence	1	10	Probability of failure occurrence is scored subjectively based...

9 records

Factor Lookup Table

Factor Value	Definition
1	Very predictable and will occur only in given locations or is only occurring in known locations.
2	Quite predictable and has occurred in similar locations.
3	Quite predictable but has not been investigated.
4	Fairly predictable and has occurred in similar locations.
5	About a 50% chance of predicting location.
6	Mode is understood but locations of occurrence may vary.
7	Mode is understood but locations of occurrence are known to vary.
8	Fairly unpredictable in nature and location of occurrence.
9	Quite unpredictable in nature and location of occurrence.

Equipment Index Pipeline Segment [24*LO-99200] RBI Assessment RBI Configuration

VIS4DBO | Sr-Inspect



Choices & Issues

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PODS Strategy

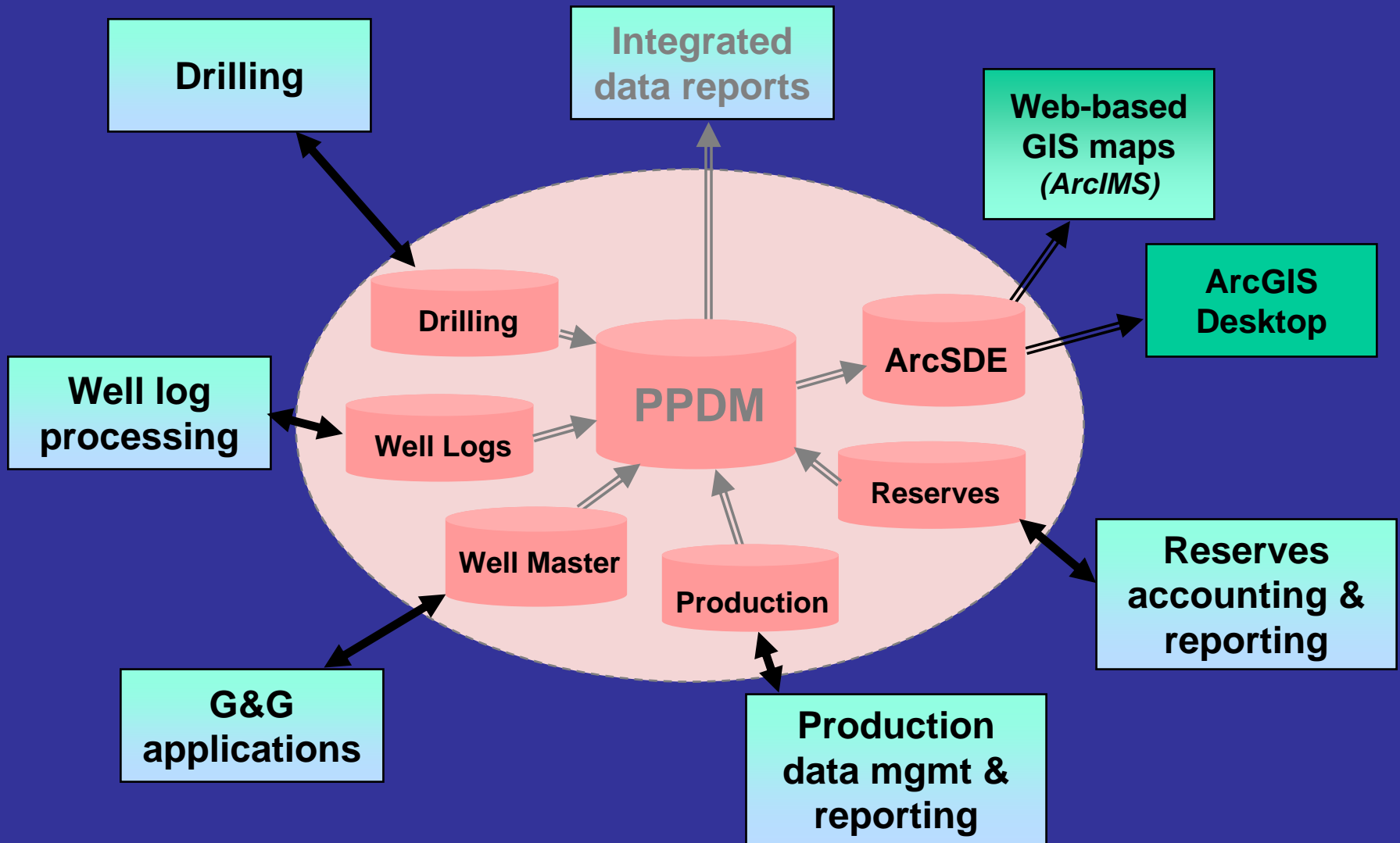
Benefits:

- Allows implementation of 'best in class' applications
- Minimizes impact of application replacement
- Maximizes availability of external resources with expertise using the model
- Minimizes likelihood and cost of migrating to an entirely new solution

Costs:

- Imposes complex integration requirements on application components
- Complex component upgrade and system maintenance

Analogous Architecture





Considerations

General Integration:

- Which database is the “System of Record?”
- “Tight” or “Loose” (e.g., SOA) database integration?

Gathering System-specific:

- Generally much more complex topology than Transmission systems
- What is the optimum organization of the centerline hierarchy?
- PODS pre-4.0 not well designed to enable dynamic definition of the hierarchy

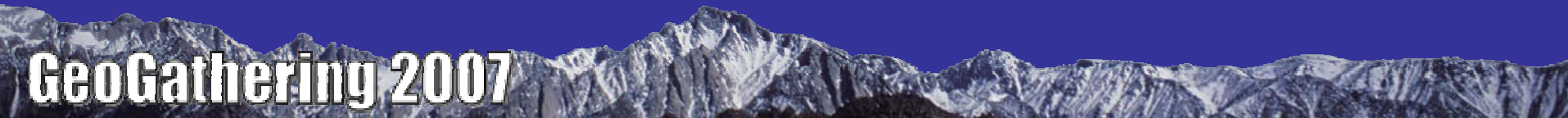


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Questions?



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