A new paradigm for rapid technology onboarding

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How do you get results from technology?

R&D prototype (technology) ?? fast onboarding production (results, that is $$)
Outline

• Strategy
• Tactical plan
• Implementation
  – BHPviewer
  – Configurable XMLeditor
  – Wavelet based reservoir ID
Environmental changes

• Java
  – 25% to 30% development time and cost
  – Easy to port to new hardware platforms
  – Extendable (10-20x more than C or Fortran)
  – Performance rivals that of C and Fortran
    – 400 Mflop/s performance per Linux processor (Colt dense matrix benchmark), 60 Mflop/s (Linpack benchmark)
    – CERN Colt library
    – Insignificant object oriented overhead, performance determined by FFT speed (same as optimized C and Fortran program)

• OpenSource maintenance

• Linux clusters with LSF
  – Low cost
  – Robust distribution
Strategy

• Exploit superior knowhow
  – Increase the value of our assets
• Rapid technology development and onboarding
  – Maximize the rate of technology change
Tactical plan

• 100% Java based development
• OpenSource maintenance whenever possible
• Seismic Unix backplane
• BHPviewer
  – servlet-applet, multi-tier structure
  – Java, XML saveset of view
  – Multidimensional 2D viewer, 3D in future
• Linux cluster with LSF
• General XML editor for parameters and distribution
  – Behavior determined by xsd
  – Servlet-applet infrastructure
Software architecture supporting fast implementation

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Web page access to results – a picture that can be browsed

BHPviewer (South Africa, Orange Basin)

Press the above button to get a new session.

Wavelet Reservoir ID

Line K2002-10 with wavelet transform and stratigraphically flattened

If you cannot see the above button, your browser fails running the applet.
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Synchronized viewer

Wavelet transform or model behind seismic wiggles

cursor tracking

do double click synch
XML distribution via the web interface with application specific Java help
XML explorer of parameter file

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Distributed on Linux cluster using LSF

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There is multiscale structure in seismic reflectors, can we detect it?

![Graphs showing multiscale structure in seismic reflectors]

- Lithofacies A
- Lithofacies B

- Smoothed (30 m) absolute value of continuous wavelet transformation of:
  \( \frac{d(\text{well log impedance})}{d(\text{depth})} \)

- Frequency bands: 100 Hz, 30 Hz, 10 Hz
Linear inversion of real seismic data also recovers well log spectrum

Stratigraphic slice with wavelet transform and movie

Wiggle trace = rfc seismic

= density of 50 m beds

stratigraphically flattened
Full wavelet spectrums for two traces
Wavelet spectrums for two times show spectral shadow.
Conclusion

• New paradigm has enabled rapid reduction of the cycle time from concept to business value
  – Wavelet based reservoir ID (12 months)
  – Advanced horizon amplitude extraction (2 months)
  – Stratigraphic flattening (2 months)
  – Bayesian imaging velocity tomography (9 months)
  – Stochastic model based inversion (24 months)
  – Bayesian wavelet extraction (8 months, in progress)
  – Stochastic inversion to COUGAR reservoir simulation (18 months, in progress)