

**Society of Exploration Geophysicists
Annual Conference and Technical Exhibition
Denver, October 2004**



Fugro's 'GeoRanger' airmag drone

Introduction

The 2004 Denver Annual Conference and Exposition was buzzing. Hard to say exactly why – just that there were a lot of folks milling around the exhibition floor – and with oil above \$50/bbl – the mood was of ‘optimistic uncertainty’ as GX Technology president Mick Lambert described. The uncertainty was because, although oils are raking in the cash, little of it is trickling down to the service companies. This, along with a perceived **lack of R&D** spend and ‘**slow take-up**’ of new technologies, brought renewed calls for a ‘new business model.’ The massive amount of new technologies on display suggested that this was the usual geophysical tilting at windmills. There may be overcapacity in seismic acquisition, but there sure is a lot of new computer **hardware** available to process, interpret and visualize just about any geophysical measurement you can imagine.

Speaking of new geophysical techniques, the purchase of **Controlled Source Electro Magnetic (CSEM)** specialists AGO Geomarine by Schlumberger was announced at the show. And ExxonMobil made somewhat veiled references to breakthroughs with its patented ‘R3M’ technique – inviting attendees to ‘read the Wall Street Journal’ for more. Some have suggested that CSEM might even replace seismic exploration. We visited with the EM vendors who generally seemed surprised at all the fuss. To the established players, the technique is not exactly new and none would endorse the ‘could replace seismic’ position.

IBM announced its return to the oil and gas business at the Schlumberger Forum earlier this year – and indeed made quite an impression at the SEG. Along with several other hardware vendors, IBM is pushing ‘compute on demand’ from off-site data centers, but what literally caught our eye was the 9 megapixel screen which, although we’ve reported on this before, now has a graphics card capable of driving it at full resolution – a gem! IBM’s offering in bespoke, web and roaming computing was also impressive – with a substantial development for ChevronTexaco leveraging WebSphere.

In the keynote speeches, SEG president **Peter Duncan** contrasted the ‘shell shocked’ situation in US geophysics with ‘energized’ countries like China – where 180 land crews operate, and where there are 1,000 geophysics graduates per year. **Matthew Simmons** (Simmons and Company) gave an excellent talk on the impending peak of global oil production. Peak oil is at hand – but the world is in denial and there is ‘no plan B’. **Bob Peebler** (I/O) thinks 4D seismics is a kind of Plan B. **Peter Carragher** (BP) described how BP is addressing demographics issues. **Ibraheem Assa’adan** (Saudi Aramco) opined that recovery factors are the key to world oil reserves – and that

they are to rise from 40% to a ‘target of 70-80%.’ Landmark’s **Peter Bernard** lamented the ‘slow take-up’ of new technology – especially in the digital oilfield. This because oilfield operations are a ‘factory-like process, focused on optimization and cost reduction’. What is required is a risk-taking mentality and a portfolio management approach to production. PGS’ **Diz MacKewan** ventured that procurement philosophies that mandate multiple suppliers for the same service have to change; companies should be prepared to pay more for new technology and take risks to accelerate adoption.

A big trend is the ability to manage and visualize multiple representations of the same data. Different attributes show different aspects of a dataset – and it is even better to visualize them at the same time. This is achieved by **co-rendering** or **bump mapping**, now offered by most vendors in one form or another. The concomitant data management issues are causing the hardware vendors to rub their hands as the data storage volumes and complexity explode.

Landmark showed a massive 400GB dataset using Geoprobe in the Denver planetarium – using an **SGI Onyx** with 11 graphics pipes and a Terabyte of so of RAM. Following the trend of recent years, the SEG has turned into a hardware vendors’ paradise – with a bewildering range of NAS, SAN, switches and clusters on offer. As hardware vendors configure larger and larger cluster farms, they are naturally looking for things to do with them – hence Computing on Demand offerings from **IBM** (as above), **Sun** and **Appro**.

On the curiosity front a weird 3D graphic workstation from **Xerox/Panoram** and the even weirder ‘Perspecta’ 3D crystal ball display from **Actuality Systems**.

Highlights

[Peak oil is ‘at hand’](#)

[Schlumberger acquires AGO Geomarine](#)

[Sarbanes-Oxley compliance](#)

[Interviews – Sun, AMD, SGI, Paradigm, dGB](#)

Compute on demand - [IBM](#), [Sun Appro](#)

[IBM’s return to oil and gas](#)

and ‘hardware, hardware, hardware’

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SEG President's address



Duncan

Peter Duncan, SEG President, noted that despite \$50 plus oil prices and gold and copper at all time highs, those on the 'supply side' are still waiting for their piece of the cake. The SEG has had a good year though with \$9 million revenues and \$650k of 'excess revenue'¹. The SEG owns its own building and has no debt. The Distinguished instructor course (DISC) costs \$100k per year and the SEG has spent \$35k buying PC's for the third world. Each year the SEG turns down 85% of the projects that apply for financial support. Halliburton pays for student dues (90k) and Apache Corp pays fees for 'global' third world members². The SEG is to celebrate its 75th anniversary next year and is buying a 10% stake in the [North American Prospect Expo](#) (NAPE³). The SEG is teaming with the SPE and EAGE to initiate a Middle East equivalent of the Offshore Technology Conference (OTC) – the [International Petroleum Technology Conference](#) IPTC – to be held next November in Doha, Qatar. A novelty for 2005 will be the DISC on DVD. This will cost \$29 and will be free to students. The SEG is increasingly international: in 1985, 75% of membership was in the US, today only 45%. Another demographic change is the fact that 65% of earth science graduates today go into environment and near surface geophysics. Also more and more are self-employed.

Duncan described the life of the SEG president as consisting of a) the 'minutiae', dealing with 'trivial questions' from individuals, b) legislative – executive committees, conference calls, staff salary and strategy, c) the fun part – as an ambassador around the world – traveling 100k miles. In Mexico, the government has 'energized' geophysics as part of a \$16 billion program to increase production and reserves, in India – the 1,200 strong local society has likewise been energized by the government privatization program⁴. Bahrain is similarly avoiding penny pinching in geophysics – doing 'risky science' and China is producing 1,000 geophysics graduates per year! The three Chinese oil companies have a total of 180 onshore seismic crews operating.

¹ As a 'not for profit', the SEG doesn't make a 'profit'.

² Wouldn't it be better if the SEG gave access to deserving parties for free and Halliburton and Apache gave their money (its equivalent in IT resources) to the third world members?

³ Despite property deals in the \$50k to \$10 million range, NAPE is also a 'not for profit'.

⁴ Hard to square this positive note with the bleak picture of Mexico's outlook painted in the December 13th issue of Business Week – [Pemex may be turning from gusher into black hole.](#)

Duncan contrasted these ‘energized’ countries with the ‘shell shocked’ US where there is a dwindling number of older guys who have made it, but who are now ‘on cruise’. The middle aged guys are ‘holding on’ while there just aren’t very many youngsters. Recently though, the Colorado School of Mines has been ‘blitzed’ by companies looking to hire geophysicists – but they are just not there!

TLE Forum Monday am

Mike Lambert president and CEO GX Technology said that China and India are the growth engines of the world economy. The mood of SEG is optimistic uncertainty – as opposed to the pessimistic uncertainty of 1980s.

Bob Gistri – ExxonMobil



Gistri

In 60s and 70s G&G were very closely integrated. Use of direct hydrocarbon detection – bright spots – meant that full hydrocarbon system analysis didn’t get done – we were all guilty of this. Now we need to go back to full hydrocarbon systems analysis. Exxon pioneered seismic stratigraphy, next generation reservoir simulator and the inventor of 3D (in 1963). R3M is coming along today from Exxon R&D labs. ‘Geophysics needs to look at closer integration opportunities at all scales.’

Seismic DHCI⁵ is a maturing technology which, along with 3D is moving toward ‘asset scale’ interpretation. The changing nature of the opportunity space is leading to tougher rock physics and smaller targets. Gistri illustrated his point with a PSDM interpretation of a flower structure. Today the shift is toward non DHCI, deeper plays (with HPHT⁶ challenges) with a return to frontier areas with new data and concepts. Geophysics continues to play a key role in hydrocarbon systems understanding. The Gulf of Mexico (GOM) shows how such issues can be tackled worldwide. The future will bring ‘plates to pores’ integration – from basin fill and evolution through plate dynamics, rock fluid modeling, palaeoenvironment calibration and inverse modeling loops. This will start with mantle and crustal-scale geodynamic models for tomography and heat flow leveraging deep seismics – increasingly used in petroleum systems modeling. Other ExxonMobil innovations include the use of horizontal gradient of satellite Bouger anomaly to study GOM fracture zones and (of course) direct detection with R3M. But on the new technology Gistri was less than forthcoming – ‘you can read about this in the Wall Street Journal!’

Gistri ended up with a sketch graph of the ‘impact and effort’ against time (from 1920 to 2020) of earth sciences. From 1920 to the present, geophysics has ‘lead’ geology –

⁵ Direct Hydrocarbon [seismic] Indicator.

⁶ High pressure high temperature [wells].

but geology will catch up in the next couple of decades as new techniques such as ‘rapid forward modeling’ of geology are developed and applied.

Robert Brunck – CGG



Brunck

The worldwide market for seismics amounts to some \$4.5 billion per year. Of which \$3.3 billion is shared between the four top western seismic companies – CGG, PGS, Veritas and WesternGeco. It is interesting to compare these numbers against the \$720 billion revenues of the top four oil and gas companies. Brunck calls on the seismic industry for more bargaining power – get a better share of revenues in order to be able to fund more technologies. Beyond its traditional uses of exploration and reservoir imaging, seismics is poised to increase recovery factors and monitor production. Brunck plugged CGG’s seabed acquisition toolkit ARMSS and the Millenium ROV saying he was ‘not sure when this would take off’ – but that it could prove to be like 3D 15 years ago. Brunck pointed out that most reserves are onshore – and so CGG has been working on increasing Vibroseis productivity – which has ‘doubled in 5 years’ thanks to CGG’s HPVA⁷. In the field of ‘sustainable development’, Brunck applauded the IAGC⁸’s study of the impact of seismics on sperm whales – saying that ‘perceptions are everything’. Local communities are involved in CGG’s activity – hardware is manufactured in China, software developed in India. As for a ‘new business model’ – CGG ‘has changed many times over the past 70 years and will continue to change’.

Joao Figuera – Petrobras



Figuera

Figuera offered a high level view of world energy futures to ask, ‘Can the oil industry meet future demand?’ He cited the Financial Times saying, ‘If proved reserves indicate the health of a company, most oils are rather sickly!’ Fields are declining and new discoveries ‘rather small’. Profits – while perceived as huge – are ‘modest in relationship to capex’. Petrobras’ discovery costs are now \$0.36 per barrel. Figuera concluded with another quote – from OPEC, ‘The downstream may be the prime source of oil price volatility in the future’.

⁷ Presumably high performance vibroseis acquisition?

⁸ [International Association of Geophysical Contractors](#).

Matthew Simmons – [Simmons & Company.](#)



Simmons

While the timing of peak oil is a ‘guessing game’ – it is going to happen. Our only diagnostic tool is the rear view mirror. Note though that ‘peak’ does not mean we’ll run out. With proven reserves at 1.2 trillion barrels (40 years of supply) and high prices bringing in new supplies (from oil sands) Simmons asks, ‘Why is ‘peak’ so unpopular?’ Simmons believes that peak oil is ‘at hand’. Demand has become a runaway train. Supply is ‘old’ – 70% comes from fields which are over 30 years old. 20% comes from 14 giant fields over 50 years old. Modern technology drains oil faster – global decline rates are ‘soaring’. Demand is set to grow by 2.4 million bbl/day in the next quarter – and by 4.3 mm. bbl/day in the next 15 months. By Q4 2005 demand could be 86 million bbl/day (as compared to 1990’s forecasts of 65million bbl/day). Proven reserves do not correlate with peak oil – much would not pass SEC⁹ scrutiny anyhow. The concept of ‘reserves appreciation’ is obsolete. Overproduction is bypassing oil – causing poor ‘quality of life’ in older fields.

The worst is, ‘there is no plan ‘B’.’ In fact the world is expecting demand to soar. The problem of a replacement for oil is ‘daunting’ – even over the next 15 months. Coal has its own issues. China has used up all its high quality coal seams and its future is emission prone. ‘Clean coal’ is energy inefficient. Gas reserves have been exaggerated and are no substitute in most cases. Nuclear, hydro and renewables are ‘non starters’. Other new sources on the drawing board include hydrates, tidal, space/solar in space, volcanism, bacteria ‘energy’ etc.. All might help – anything to bide time – including access to all banned areas. We should also ‘avoid energy intensive solutions’ that use more energy than they create. Gas to liquids technology is 250% energy inefficient. The reality is that \$50 oil is a blessing because ‘the wall’ may be just ahead of us.

Bob Peebler – [Input-Output.](#)



Peebler

Peebler pontificated on the ‘yin and yang’ of the energy industry. The industry’s good times ran through to the 1980s – but even during the 80s, there was progress in 3D etc. Success ratios were up, finding costs down. Now we are harvesting the results – and have become ‘risk averse’. Industry could (but isn’t) doing a lot to bridge the gap. Capex is not keeping up with surging cash flow – a huge disconnect. Exploring on Wall

⁹ US Securities and Exchange Commission – Wall Street’s watchdog.

Street does not create reserves. Companies are spending as much on unproductive stock repurchase as on exploration.

Why? The domino effect – capital destruction in last boom has led to focus on risk reduction. There is also little confidence in the current high prices. But the shift could be for real. When Shell announced that it was going to up exploration spend, its stock went down! Part of Simmons' Plan B is right under our noses – 4D – whose potential is generally underestimated. 4D could provide¹⁰ one quarter of the forecast shortfall by 2015.

The demographic 'peak' - Peter Carragher, BP



Carragher

There have been many presentations on the demographics of the oil industry since the 1990s. BP's median age is 41. The SEG's median age is 46-50. Geophysical opportunities are on the increase, but the population is dwindling. There are only a third of the students in geophysics as compared to 20 years ago. A potential shortage looms – a.k.a. the 'boiling frog syndrome'¹¹. Industry needs people with good science and understanding of the earth to address the challenges of the field of the future – competition, harsh conditions, subsalt, deepwater, poor quality reserves, poor seismic attributes etc. BP has done breakthrough seismic imaging in-house thanks to a close end-to-end integration with the whole interpretation and reservoir management team. Seismics has now moved into reservoir and production engineering for instance with the use of spectral decomposition in 'time of flight' simulation of flood fronts.

To renew its workforce, BP is offering more opportunities for undergraduates including on-the-job training on company values and technology. BP is also acting to retain its workforce to stay on and mentor – 'providing that they can maintain their technical edge'. There ensued a promotional video encouraging BP youngsters to 'think regionally to understand the basin and the business'. Arm waving appears to be an important part of the curriculum and these youngsters already well-versed in BP-speak as in 'composite common risk segment mapping'. Someone with less than two years in the company can 'deliver a prospect'¹².

On team work, Carragher cited collaboration with [Ann McFadyen of NCSU](#) on 'interpersonal exchange networking' (IEN) and knowledge creation. BP is applying IEN structures to study how an individual is 'connected', what they know, how they communicate. Seemingly, things are better if you know everybody. A drilling engineer in the same room as a VSP specialist is good IEN. Redundant overlap is also good – leading to better communication and fewer misunderstandings. The time for knowledge

¹⁰ How is one to assign the contributions of 4D and Digital Field of the Future to enhanced reserves?

¹¹ Put frog in cold water and apply heat slowly – frog can't be bothered to get out and gets boiled alive. Please note – our understanding is that this is a metaphor, not a recipe. **Do not try this yourselves.**

¹² Carragher didn't say if the juniors' prospects were actually drilled – let alone if they were successful!

transfer to the young is NOW! Peter Drucker's techniques made manual workers 50 times more productive – now we need to do the same for knowledge workers¹³.

Q&A

Last year Steve Farris (Apache) stated that the contractor/company business model was broken. Is this still the case? What needs doing to fix it?

Gistri – R&D investment from both sides needs to continue – a dialog is necessary to understand future challenges and how these can lead to profitable growth.

Garragher – Things are different this year. BP is more aggressive with field trials of technology (speaking to Peebler) – engaging business and R&D in low risk trials. These are funded by group technology until the economics are proved. Not sure that the contracting industry is really as interested in the economics as they should be.

How come we are good at new technology and bad at getting paid?

Peebler – That's the biggest disconnect! I have no real answer.

Brunck – Seismics has proved a destroyer of shareholder value and I'm pessimistic on the impact of 4D. We need more bargaining power.

What is ExxonMobil's position re training?

Gistri – We have many programs for knowledge capture and best practices. We have the biggest training facility in the world – we could have presented a whole paper on the subject.

Do governments recognize the need for Plan 'B'?

Simmons – No, not yet. Next year will see a totally different mindset.

Is 4D best for green field or brown field?

Peebler – 4D is best for greenfields – but it is good also for CO2 flood.

Carragher – We did a large successful 4D on Valhall. It all depends on the nature of production and on economics of extra wells. Ideally there should be pools of unswept oil of economically viable size.

What will the impact of the new CSEM technology be on the seismic business?

Gistri – R3M is complementary to seismics. You need calibration. It is not an immediate threat to the seismic industry. We need vessels of opportunity – roll out to the contractor model. Currently R2M is performed on our own vessels.

Global Forum – Tuesday am

Ibraheem Assa'adan – Saudi Aramco

A major problem is the disparate scale of geology and geophysics. We need to bridge gap between seismics and cores. But an even bigger gap exists between million cell geological model and a 100k cell reservoir model. The big picture – of reserve estimation and use – requires improvement of recovery factors from the current 40% to

¹³ *In itself it is hard to disagree with this as an aim. But if 50-fold productivity gains are about to be realized amongst knowledge workers too, it is easy to see why knowledgeable youngsters steer clear of industry!*

a target of ‘70-80%’. This mandates accurate reservoir characterization and realistic simulation. Assa’adan enumerated some of Saudi Aramco’s own developments – advanced imaging with Detect, modeling and reservoir simulation with Powers. These will soon be capable of modeling 10 million cell models – simulating geological models ‘as they are’. By 2020 new logging tools will be able to see thousands of feet into the reservoir. Geosteering will be used to revitalize dead oil fields and to find new oil in old fields – extending asset life. We have to challenge the conventional wisdom of ‘least cost’. Saudi Aramco employs a different corporate paradigm to ‘quickest return on investment’.

Peter Bernard – Landmark president and CEO



Bernard

Without the impact of E&P innovations, finding and development costs would by now be around \$20/bbl. Interviews conducted with 300 E&P research organizations showed that oil and gas companies spend a meager 0.5% of revenues on R&D while service companies spend a (slightly) more healthy 2 to 2.5% of revenues. The oil industry is ‘very, very slow’ to take up new technology and loses money through slow take up of new technologies. R&D investment ‘must be rewarded’ – new business models are needed – with more collaboration and outsourcing.

Why are we moving at a snail’s pace? Because production operations are a factory-like process – focused on optimization and cost reduction. 4D is more of a risk-capital process. Also the decentralization of operations to asset teams brings shorter planning horizons. Production engineers are optimizers, not risk takers.

What can we do? Get closer to reservoir engineers. Help them understand the portfolio management approach to field management. Create hybrid funding between assets and global portfolio. Identify uncertainties. Geophysics and the exploration mindset have as much to add as the technology.

Dalton Boutte – Western Geco



Boutte

Finding and development costs fell 50% from 1989 to 1997. But today they are creeping back up as exploration and development moves into more challenging areas

like West Africa and deepwater GOM – ‘we need to get them back down’. A marked decline in R&D spend by oil companies has only very partially been matched by a small increase in spend from service companies. The capital needed to develop new technology ‘simply isn’t there’. We need a change in mindset. For example – twin streamer 3D seismics in the GOM recorded in 1983. But it took 10 years to take off – largely waiting on compute power to catch up. Contrast this with the cell phone which ‘took off’ in 3 years¹⁴.

Pete Morowski – Dell



Morowski

Clustered PCs now make up 50% of the [TOP 500](#). These leverage Infiniband, Myriant or Gigabit Ethernet interconnectw with seismic clusters typically using 256 to 4,000 nodes. The market is moving from proprietary systems to COTS¹⁵. All this is driving down the cost of a GigaFlop: in 2003, \$1 million bought 1100 GFlops, today you can buy a 256 node cluster on the web. This also lets you use the same building blocks for an E&P Oracle data repository, a Visualization applications server or HPC¹⁶. Morowski advocates promoting ‘standards’ to provide choice and lower TCO¹⁷.

Marcus Mozetic – Repsol

Repsol is well aware of the importance of high tech in E&P. Particularly with ‘prestige’ seismic operations (including PSDM¹⁸) in the Andes at an altitude of 4,000m. Contrary to other speakers, Mozetic noted ‘very, very rapid development and deployment of new technologies’. With persistent high prices, Mozetic sees a return to large R&D facilities in oil industry¹⁹. This would allow R&D to be ‘tuned to individual company needs’.

Bob Peebler – Input-Output

We need ‘more collaboration’ to shrink cycle times and move technology from early adopters to industry-wide acceptance. The new ‘full wave era’ promises higher resolution and more content in signal. Peebler compares today’s situation with 3D in the 1980s – except that there are fewer early adopters these days. So I/O is creating new

¹⁴ Actually the cell phone ‘took off’ over a comparable time span to 3D seismics. The [first call](#) was made in 1973, and public cell phone testing began in 1977 in Chicago. More from [inventors.com](#) and [CellPhoneCarriers.com](#).

¹⁵ Common off-the-shelf technology.

¹⁶ High Performance Computing.

¹⁷ Total cost of ownership – i.e. capex plus opex.

¹⁸ Pre stack depth migration.

¹⁹ *The good old days!*

win-win relationships in the form of contractor-Oil Company ‘symbiosis’ as joint early adopters.

Diz MacKewan - PGS



MacKewan

R&D spend is down and companies are slow to adopt new technologies. Cash flow in the industry reached a low in 2000 with \$685 million outflow. This has been negative for 5 years from 1998-2002. A McKinsey study showed slow take-up of technology. The problem is that it is ‘hard to make a case for long, slow development cycles’. Other issues include resistance to change and the need to demonstrate and prove technology in many different circumstances. A procurement philosophy that mandates many suppliers of the same technology is another obstacle – forcing technology leaders to ‘wait for the competition to catch up’. Also, new technology has to be no more expensive than old. We need to provide a clear expression of new technology needs and timing, to match ‘push and pull’, to collaborate and share results. This should reduce the need for field trials. On procurement, ‘do you really need more than one supplier?’ The need for new technology – and new talent is greater than ever. R&D spend is down. We must accelerate adoption.

Exhibitor set pieces and press events



‘The Press’ en route to planetarium²⁰

Planetarium event - Landmark – SEOS – SGI

Peter Bernard, Landmark President and COE presented a joint program with SGI on Geoprobe to tie software to hardware. The whole facility was built by SEOS and

²⁰ Stretch limo courtesy Halliburton.

showed a 400GB dataset from Marathon – a ‘new benchmark’ – no more data ‘chunks’ for regional interpretation. Landmark is in good company, Steven Hawkins uses an SGI Onyx and NASA’s new visualization platform runs Linux on Intel Itanium2 – a 10,240 processor machine. The first demo was of the Denver Planetarium’s own Cosmic Atlas with a flight around Jupiter leveraging a Performa port to the multi-pipe environment. Landmark’s demo showed 64 bit Geoprobe running on Linux, an 11 pipe Onyx with 30 processors driving 11 Barco DLP projectors. Overall 14 million pixels were pushed to the planetarium ceiling – with net 11 million net pixels visible (because of edge blending). The effect was underwhelming – even 11 million pixels are lost on the massive planetarium roof. The nighttime paradigm of bright points in darkness is great for stars, but doesn’t work so well for seismics – even looking up is somehow wrong!

Schlumberger - Petrel

Petrel workflow/manager lets you combine (or co-render in the jargon) attributes including variance, coherency etc. Schlumberger’s ‘Ant’ horizon tracking lets users define a ‘species’ of ant – e.g. Texas fire ants which are ‘very aggressive’. Beneath the colorful metaphor are a multitude of numerical ‘fiddle factors’ – but the technique seems to do a good job and the stereo net dip filtering is neat.

Schlumberger AGO acquisition

Dalton Boutte presented the press event on the acquisition of EM prospecting company AGO Geomarine by Schlumberger. This is ‘full circle’ for Schlumberger, with its history of 75 years of electrical prospecting. Schlumberger EM receiver manufacturer acquired EMI in 2001 and has now acquired AGO for its sources.

AGO’s Lionel Fray described the company as a key player in continuous source electro magnetic profiling (CSEM). AGO is ‘making a significant change to appraisal of oil and gas’ – but the technology is in the early stages of commercial development. CSEM identifies rocks of different resistivities as hydrocarbons are much more resistive than their surroundings. The CSEM source signature changes as the dipole field is distorted by a conductive reservoir. An article in the Wall Street Journal earlier this year ‘recognized CSEM.’ The technique will be applied to appraisal and development and will be used for production monitoring. This is ‘more than seismic and AVO – a complement to 4D seismics’. A survey costs around \$1 million. But the technique is ‘not good for all prospects’. AGO performs initial modeling to test feasibility.

In 2000 AGO worked with a large oil company²¹ – and ‘proved the potential’. There is now an ongoing campaign started in July 2003 using Polar Bjorn and working for ExxonMobil. 12 surveys with hundreds of receiver drops and hundreds of line kilometers have been shot to date. Today CSEM has more potential – but needs better sources, receivers, navigation and software. AGO needs Schlumberger’s know-how, capital and R&D.

Q&A

? With or without seismic

Boutte – today the techniques are complimentary. But the technique could possibly replace 3D seismics in the future. Also could provide a better link between seismics and wire line, cross well tomography etc.

²¹ ExxonMobil.

? Role of WesternGeco?

Boutte – the company will report to Schlumberger HQ.

Statoil, Southampton and others are in the consortium and, along with ExxonMobil – all have various claims to the CSEM IPR²². How can you do this without patents ‘bumping into’ each other?

Boutte – Exxon has worked with some of these partners. (*no real answer to this good question*).

Schlumberger has been working on electrical prospecting for the best part of a century – is there no ‘prior art’ in Schlumberger’s own IPR portfolio?

Boutte – Schlumberger was involved in early 1960s first use of MT at Scripps. Techniques are very compute-intensive and have evolved over the years. A big step was made in the last decade as the technique went marine.

What are the limitations of the technique?

Fray – The technique is ‘not a direct oil finder’ but identifies rock properties and resistive anomalies. It is a deepwater technique – good for the open ocean. It works well in 1000 meters of water and has been tried in 400m. The ‘non trivial’ problem exists of discriminating the air wave and the signal from the rocks (orders of magnitude difference). When applied to wells²³, these techniques may suffer from steel casing.

Landmark Demo – PowerExplorer, Janet Hicks

The PowerExplorer demo connected to PetroBank in Houston. Corporate Data Archiver was used for project management – providing a synopsis of data before download. Issues of different API numbers etc. were fixed with Landmark’s Reference Data Manager (RDM). RDM manages data transfers and nomenclature/taxonomy differences by pre-populating new projects with corporate standards. RDM allows for bulk edit and project update. A second connection was initiated via ‘SilverWire’ to A2D’s log database in Denver.

Sarbanes-Oxley compliance – Rick Johnson, Schlumberger

Schlumberger is offering support for ‘traceability of financials and general business practices’ to support companies involved in Sarbanes-Oxley compliance. Reserve categorization from technical data is problematic, because in the SEC criteria of ‘reasonable certainty’ seismics is deemed subjective. Schlumberger is offering a ‘united reserve management workflow’ from G&G through engineering, reserves, economics, finance and into corporate planning. Results capture and management is currently ‘challenged’ by multiple data sources and stores and ‘standards’. These practices have poor transparency and repeatability. The new solution streamlines business processes, rendering them traceable and transparent. Standards can be applied, information attached and annotated. Processes can be made repeatable.

²² Intellectual property rights.

²³ *The suggestion is that Schlumberger will research ways of using the techniques downhole – that there will be a technology transfer to wireline. In our opinion, it beggars belief that, with Schlumberger’s history and constant development of electro magnetic and resistivity tools for downhole use, there is a fundamental technique that has somehow been overlooked!*

All this is achievable using Schlumberger's ProSource Results Manager (RM) with secure entitled access, data tagged with context and quality. An RM workflow starts with browse project data stores, identifying key results and capturing a 'project outline' of context and interpretation grids etc. These are transferred to the Results DB – ready for use and re-use. The software is said to be 'financial and regulatory compliance-driven' and to provide feedback to improve business processes.

A great idea but a bit thin on examples of RM use in the financial area.

Input-Output – Digital Full Wave seismics

According to Chris Friedmann, I-O has 'sweet talked' Wall Street into giving it \$250 million to buy Concept and GX Technology – part of its strategy of a 'Digital Full Wave' seismic offering. IO has the 'best sensor for single point measurement'. Endorsement from Jim White CEO Trace Energy – 'all the problems are fixed'. IO claims over 50% of the world market for geophones and 95% of the geophone test equipment market. IO also has a 'secret' full wave streamer project – field trials next year. Iain Williams said that Concept System's Gator was used on the first commercial nodal acquisition. The (new) Orca project (replacement for Spectra) is tuned for 4D marine.

Interviews

Doug O'Flaherty – AMD

Geophysics is one of the earliest adopters of new processors. It's 18 months from the first commercial Opteron and today there are 12 demos at least of Opteron-enabled software and hardware in clusters and visualization. The traditional AMD positioning is in the seismic data processing center because of \$/trace advantage. Veritas was an early adopter of the Athlon MP. 64 bits offers a larger memory space. There is a move underway from the legacy Northbridge architecture to direct connect architecture. This allows users to tune math algorithms to oil and gas.

Q. Really? Aren't math algorithms independent of the industry?

A. Well, because geophysics is an early adopter, it is pushing the envelope.

Q. Others speak of the industry as being slow to adopt new technology!

A. Not when the new technology is non-disruptive. AMD's core philosophy is customer centric, non disruptive change. The end user shouldn't even know about changes like low latency and NUMA-aware operating systems from Microsoft and Linux.

Q. What sort of memory is addressable from a 'PC'?

A. HP's DL 585 has 64GB system memory and 4 processors. The competition currently is limited to 16GB.

Q. The inevitable question – compatibility with Intel?

A. For the x86 platform AMD and Intel have been sharing information and competing on performance. For 64 bit, Microsoft has made a significant and strong statement that 'there will be only one Microsoft 64 bit Operating System.' The [Intel C++ 8.1 compiler for Linux](#) runs on an Opteron.

Eldad Weiss – Paradigm

SEG is an important show for Paradigm both for services and products. On the product front the second release of Paradigm's Epos integration platform is announced. We now have several hundred installations of the Epos infrastructure. Productivity enhancement is a reality – many tasks reduced from months to days. Our solutions bring pervasive and easy to use visualization to every geoscientist's desktop.

New applications are tuned to the new hardware – 64 bit Linux and high end graphics on \$15k desktop. These provide essentially the same performance as a high end machine. Our 3D Canvas integrates all data – seismics, interpretation, mapping and reservoir.

Another key offering is our production tools for automated fault picking including Coherence Cube and the BP Center of Visualization fault propagation technology. We also automate the process of interconnecting horizons and faults streamlining the interpretation process.

How do you integrate an OpenWorks or GeoFrame shop? Can you plug-in your fault technology into these environments?

Interoperability is important but it doesn't make sense to integrate features. Actually customers are quite ready to buy into a new interpretation platform. Interpretation platforms are a bit like word processors.

Is VoxelGeo your main revenue stream?

We are getting more and more out of VoxelGeo – a great segment for us.

What is the typical client workflow?

It differs and clients are looking at their strategies. Some start in OpenWorks then move data into VoxelGeo. This of course creates opportunities for us and exposes clients to other Paradigm tools.

Does Paradigm really offer a truly integrated environment – a complete solution?

Yes, last year we completed our integration – it's no longer wishful thinking.

So you are targeting users of mainstream systems now?

Absolutely! Customers are dissatisfied with current solutions which have their roots in 1980s technology. They are looking for second generation solutions.

That's not true for Petrel or Geoprobe!

OK! Petrel, Geoprobe and Epos are the new game for companies looking for a best in class solution. Landmark is switching to Geoprobe, SIS to Petrel. On the hardware front, the move to Linux is behind us – now looking to 64 bit. All this is great news for Paradigm – we 'designed for' the switch a couple of years ago – we anticipated these major changes.

Windows or Linux – and 64 bit?

50% of our applications run on Windows. Geolog for instance – which is less compute intensive. Next year all apps will run equally on Linux and Windows. Epos is compatible across Windows and Linux. Everything will be on 64 bit Linux.

WAM?

The Web-based Asset Management solution, WAM, is an important part of Epos – part of our integration solution. The spidering technology creates data catalogues and makes finding, managing and transferring data easy.

OpenSpirit?

Epos and Schlumberger's OS are similar products. OS can coexist with Epos. But the Epos footprint is larger than the current OS offering. There will always be a problem with a 'standard.' The reality is that you cannot limit a data model.

Services?

Paradigm is now a tier 1 service provider of seismic processing. 10,000 cpus worldwide. The CoreLab services division acquisition has strengthened our market position of strong, product-driven service provision.

Paul deGroot – de Groot Bril (dGB)

Open dTect now supports 2D and 3D seismic attributes – released as beta version this month. New software developed by dGB tracks fault and horizons simultaneously – 'the user is in control'. This will be included in the Open dTect base system as open source. The base system has had 4000 downloads since going open source. dGB is working on a business model of commercial plug-ins such as dip steering, filters, attributes, seismic neural networks and the chimney cube. Seismics can be imported from OpenWorks and GeoFrame. dGB used to be in OpenSpirit – but considered this too costly and complex. It was 'easier faster' to do direct access through the vendor's APIs.

Bill Bartling – SGI

The 'virtual enterprise' can be measured by the 'gating factor - the rate at which information is consumed and transformed into action - a.k.a. the 'expert bandwidth'. SGI is creating the 'broadband experts'. This is actually a metric – the throughput of single person at interpretation workstation in 1993 was 800kb/month. In 2004, this rose to 400GB/month. In this context, PC's and desktops have their limitations.

In a benchmark test, Marathon is running Geoprobe with 500GB in memory over multiple graphics processing units – without decimation. Such systems can scale to 4TB memory. SGI scales in any direction – memory as above – but also graphics pipes and in the data lifecycle. From primary storage – through nearline disk to tape and archive²⁴. A flagship client is ConocoPhillips with its remote operations center for Ekofisk.

SGI's new graphics supercomputer '[Prism](#)' is combines Linux on Intel, ATI graphics accelerators with SGI's 'sauce' as the differentiator. The aim is to make this technology accessible and reduce cost of SGI technology, lowering the price/performance threshold. 'Many new and returning software houses are coming from desktop Linux to SGI'. This is because of SGI's libraries for seamless scaling to huge addressable memory, large numbers of CPUs and multi-pipe graphics - all in a single operating system instance. Clustered solutions require an operating system and total commuting architecture for every 2 processors. Each of these instances can only address the memory on the node (typically 2 gigabytes). In contrast, Landmark used a 64-processor system, with 512 gigabytes of globally shared memory and 4 graphics cards, with only a single copy of Linux, to visualize 400 gigabytes of seismic data. SGI's Numaflex interconnectivity requires less copies of Linux and less graphics cards. Makes the whole thing look like a single PC.

For a graphics cluster to have done this, it would have required 256 Linux nodes (512 processors), each with its own 2 gigabytes of memory and graphics card. SGI's

²⁴ [RLX Control Tower](#) also ran...

solution for this problem therefore requires 448 fewer processors, 255 fewer nodes, 252 fewer graphics cards, and with NUMA, there is also no need for an expensive 256 port Gig-E or Infiniband router switch.

The principal limitation on solving this problem is addressable memory. With a cluster solution, in order to add memory you have to add processors, nodes, graphics cards and router switch ports. Because SGI scales each of the processor, memory and graphics components independently of each other, you can add memory without adding any of the other components thus saving you a significant amount of money to get to the best solution.

VoxelVision's GigaViz, originally designed for COTS Linux clusters, has now been ported to the Altix (in four days!). Previous GigaViz used Ethernet interconnect and PC graphics cards – not really a high-end solution from the graphics standpoint. The Prism solution is to map PC graphics cluster-NUMA architecture.

Does industry really need 400GB of data?

If you start with a 100GB dataset then create continuity data for co-rendered probes – then do the same for AVO, RSI attributes etc. You are easily looking at 400GB of corendered data – you can also use shadows to accentuate relationships.

Nick Weston – Sun Microsystems

Sun's AMD Opteron-based machine has been validated by all major upstream ISVs. Sun is also running Windows on Sun! Petrel runs on Windows on Sun. You can boot to Windows, Linux (Suse and RedHat) or Solaris. RedHat is the winner in the US. In the EU it is Suse – especially on licensing costs. Total is on Mandrake. These machines support a maximum of 16GB addressable memory, even from 64 bit Windows.

As companies move towards multi-processors and clusters, Sun sees a return to the complexity of the old 'big iron' solutions. There are non trivial management issues associated with clusters. It therefore makes sense to outsource operations to a computer company. Sun offers CPU 'power on demand' from the Sun-owned and operated centers in Dallas and New Jersey. Cost as low as \$1/cpu/hour.

Atos Origin is an early adopter in the Dallas data center offering seismic processing of 2TB datasets. Data and application are encrypted – the client keeps the keys. Processing is carried out remotely and data is de-encrypted at the client end.

Another project with the [University of Austin TACC](#) involves a 100 CPU machine, with ½ TB RAM running big models for interpretation. This serves pixels over the internet – an example of utility computing for large scale visualization. This is especially interesting as the ROI of an in-house visualization center has never been great because of under-use – a good candidate for outsourcing.

This strange device offers a flashing 3D holographic display for exhibiting a prospect in the boardroom. In its current manifestation, it is hard to see any real-world use.

Contact Gregg Favalora

info@actuality-systems.com

www.actuality-systems.com

Advanced Logic Technology - WellCad V4.0

Well CAD adds core description (CoreCAD) and new templates for storage of complete composite or other log templates. New header/trailers can be configured and standardized. Well CAD integrates with Cambrian's InToto database.

Contact Timo Korth

Timo.korth@alt.lu

www.alt.lu

AOA Geomarine Operations - CSEM and MMT

Controlled Source Electro Magnetics (CSEM) Transmitters and receivers – rated to 6000m water depth. Combined CSEM and Marine Magneto Tellurics (MMT) acquisition. Company acquired by Schlumberger at show.

Contact Arnold Orange

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Appro International - Compute on Demand service.



Appro's Houston BladeCluster center

Compute On Demand Service offers supercomputing power to the oil and gas industry. Appro offers Server Cluster Solutions with AMD Opteron processor 32-/64-bit technology or Intel Nacona processor 32-/64-bit technology, management and storage nodes, high-speed interconnect options, virtual private network gateway devices, firewalls, Linux or Windows. The service will be located at Houston, TX or at the customer's site, if needed.

Contact Maria McLaughlin

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www.appro.com

SEG-Y Viewers

BHP Billiton (Americas) - BHP Viewer

Free seismic data viewer. Currently uses INT but this is to be replaced by own development.

Contact Michale Glinsky

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www.downundergeo.com.au

GeoPlus - SEG-Y Viewer

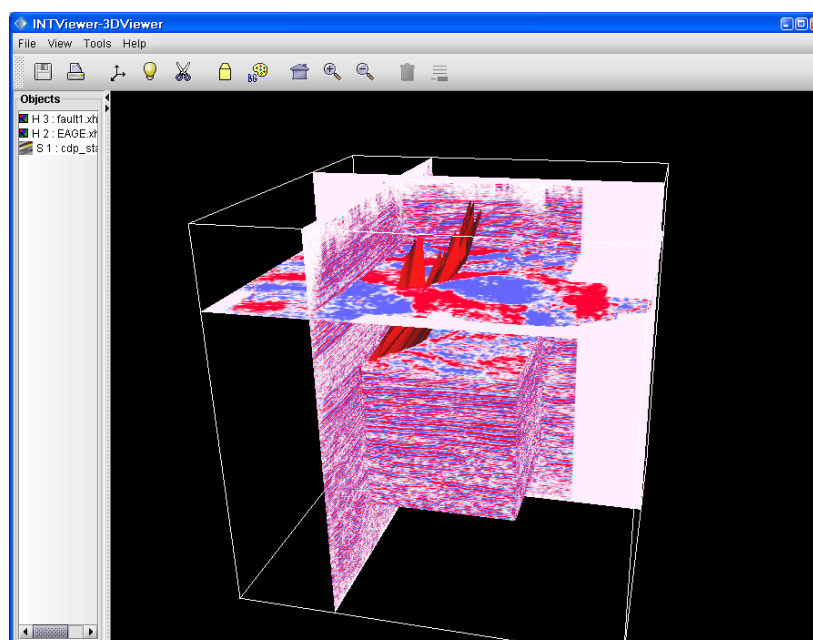
Another free SEG-Y viewer.

Contact James Redman

jredman@geoplus.com

www.geoplus.com

INT - INTViewer



INT's SEG-Y Viewer

The INT Viewer - general purpose viewer of 2D and 3D seismic data. Can be run as stand-alone application or as Java applet in browser. Multiple SEG-Y lines of different provenance can be combined thanks to XML header descriptor. The viewer also supports random access to multidimensional data. Seismic volumes stored in a project datastore along with reservoir simulation output can be overlaid and linked back to the original pre-stack data. The INTViewer provides horizon picking, including snap to minimum or maximum amplitudes, and zero-crossings. Horizons can also be loaded from SU, OpenSpirit or the internal XML based horizon format.

Contact Doyle Fouquet

Doyle.fouquet@int.com

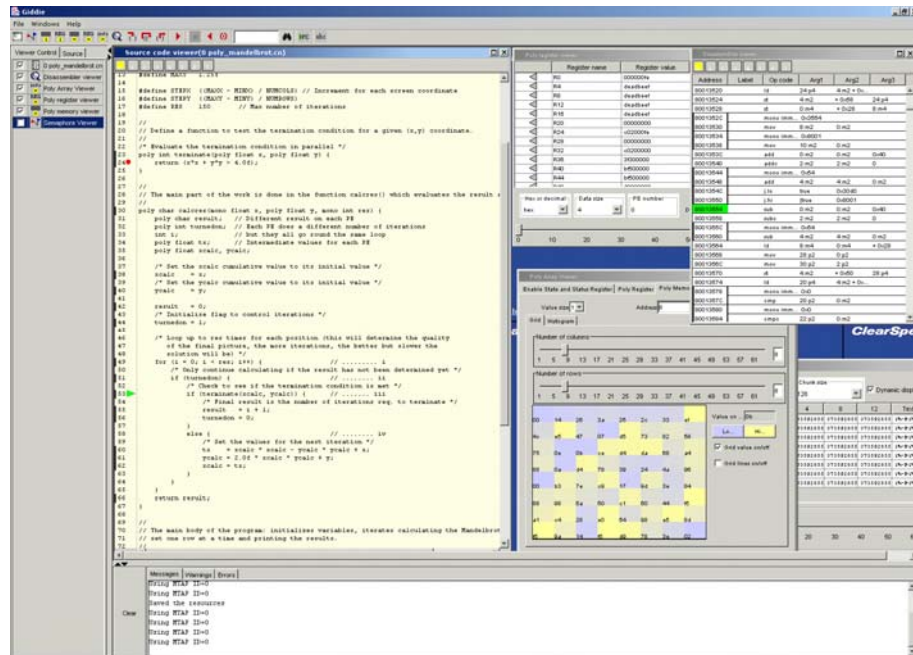
www.int.com

ClearSpeed Technology - CSX 600 Array Processor



Clearspeed's array processor card

ClearSpeed makes an accelerator chip used as a co-processor to standard X86 processors. At the SEG ClearSpeed cards populated a Linux Networx dual-Xeon node cluster. The board (above) houses two ClearSpeed CS301 processors and offer Fast Fourier Transform (FFT) routines for seismic applications. The 5 CS301 cards being demonstrated at SEG are performing a combined total of a million FFTs per second (1,024 point complex FFTs).

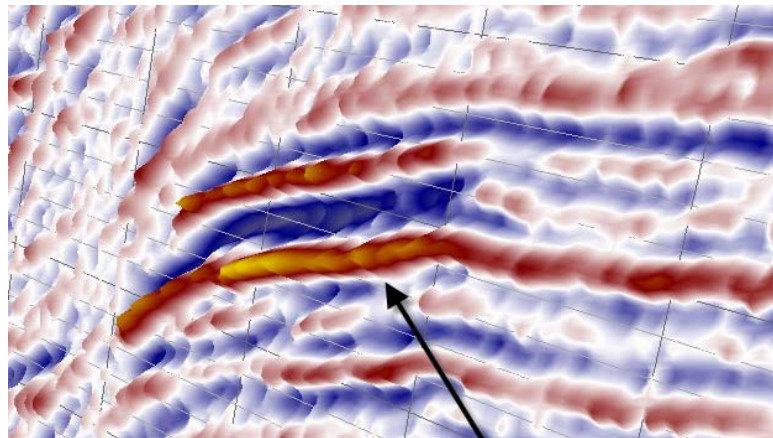


Clearspeed debugger

ClearSpeed's chips are programmable in C and have been shipping to software developers for about 9 months. The next-generation device, the CSX600, will offer a peak of 50 GFLOPS early next year.

David.hoff@clearspeed.com
www.clearspeed.com

Divestco.com - WinPics and SeiScape 5



WinPics SeiScape

Divestco has released two new modules for its WinPICS seismic workstation. Envision VSX offers 3D views of WinPICS project data. Light density and composite density seismic displays provide terrain-like views of seismic data and provide tools for changing incident light highlight seismic properties. SeiScape 5.0 displays seismic data as a 3D terrain with ‘complex lighting and shading effects’.

Contact Butch Butler

Butch.butler@divestco.com

www.divestco.com

ElectroMagnetic GeoServices AS - Seabed Logging

Same technology as used by ExxonMobil’s R3M. But it will ‘never replace seismics’.

Contact Erik Skogen

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www.emgs.no

Eastman Kodak/Paradigm - Stereo 3D Display



Kodak’s monstrous 3D display

Bad – but not as bad as the Perspecta!

Contact Robert Kerbs

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Fugro Airborne - GeoRanger I airmag drone



Fugro's GeoRanger airmag drone

Airborne drone flies for up to 10 hours at 75 kmph to acquire airmag data.

Communication by Iridium satellite.

Contact Terry McConnell

tmccconnell@fugroairborne.com

www.fugroairborne.com

Force 10 Networks - TeraScale E-Series Router

10 Gigabit Ethernet and Gigabit Ethernet switch. Veritas, PGS, Halliburton, Landmark users – Chevron testing.

Contact Martin Ward

mward@force10networks.com

www.force10networks.com

G&W Systems - GW-2464 Workstation

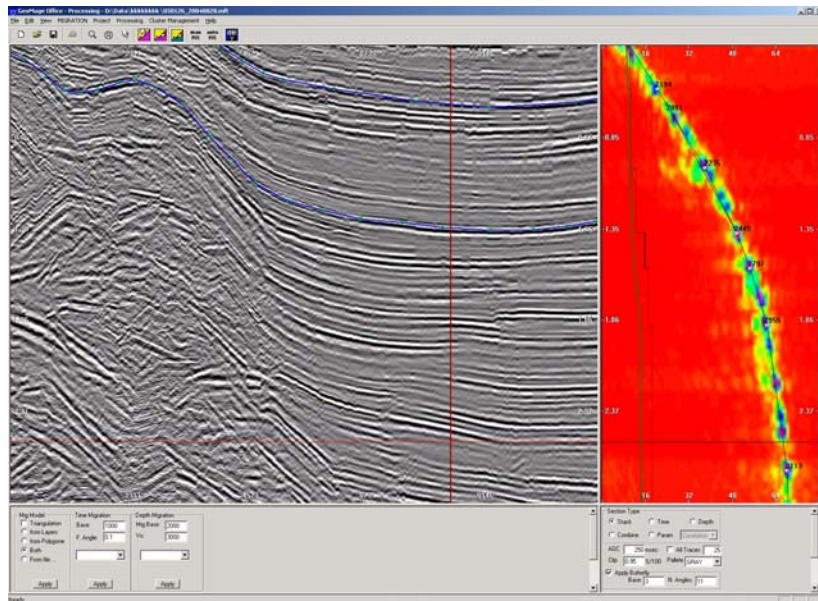
Hi-end, 4 screen PC workstation with 2TB disk. Demo with 600GB dataset.

Contact Tony Realzola

tony@g-w-systems.com

www.g-w-systems.com

Geomage Office – Windows-based seismic processing



Geomage Office

Windows-based seismic processing software. Commercial release Q3 2005. 2D/3D multi-focusing technology.

Not sure if you're selling a Windows front end to seismics or niche processing software?

We're not sure either!

Contact Emil Guberman

emil@geomage.com

www.geomage.com

Graphstream - Linux Clusters

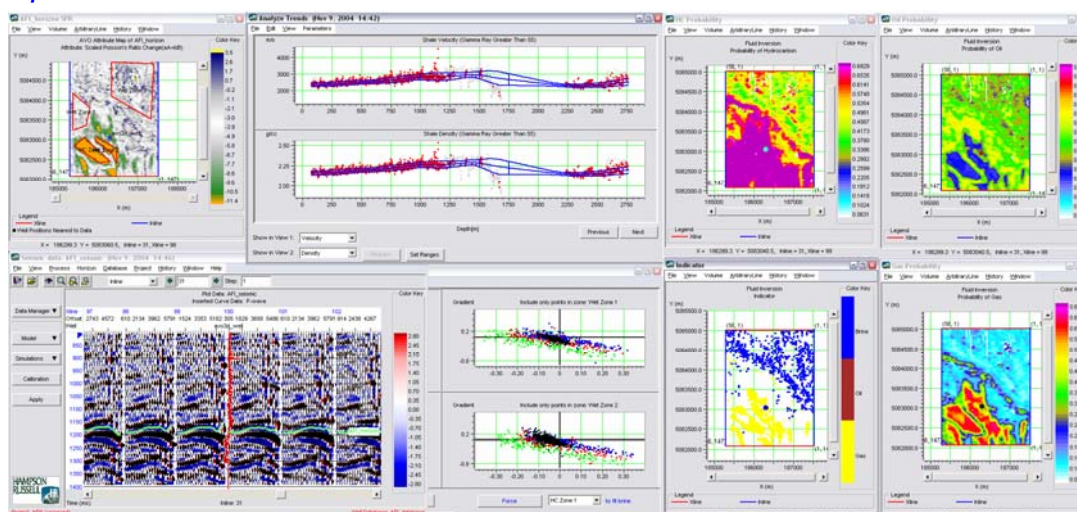
Hardware – Linux Clusters 'COTS' up to 44 RU cabinets.

Contact Craig Dunwoody

cdunwoody@graphstream.com

www.graphstream.com

Hampson Russel - AVO fluid inversion.



Hampson-Russel's AVO inversion workflow

Veritas unit Hampson-Russel's AVO-based fluid inversion (AVI) embeds technology developed by ENI/AGIP.

Contact Rebecca Goffey

Rebecca_goffey@veritasdgc.com

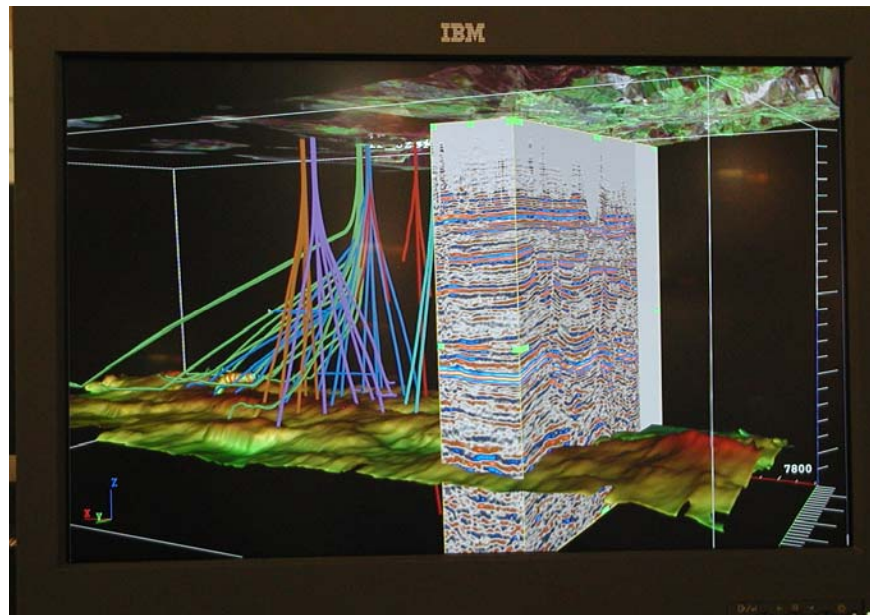
www.hampson-russel.com

IBM returns to Oil & Gas IT

DeepView Topspin/NVidia visualization research

IBM is working with Landmark on visualization R&D which sets out to break the 'pathological' memory greed of GeoProbe. Currently all data must be resident on memory. DeepView is a cluster of workstations with Infiniband links. Leverages programmable NVIDIA graphics adaptors and TopSpin interconnect. Intercepts OpenGL calls in GeoProbe to 'virtualize' graphics. A Digital packet video link (DPVL) daisy chains monitors with GB Ethernet clients only receive changed pixels.

T221 9.2 megapixel display and NVIDIA FX 3400



IBM's T221 9.2 megapixel display (actual screen photo)

IBM was also showing the T221 display with its 9.2 megapixels. This now actually has a graphics card to drive it – the NVIDIA Quattro FX 3400. A very fine display indeed – comes in at about \$2500 for the card plus \$7000 list for the screen. But deals are available...

Contact Earl Dodd

earldodd@us.ibm.com

Integrated Collaborative Environment for Asset Monitoring

Integrated Collaborative Environment 2.0 - Asset monitoring uses IBM Websphere for remote alerts from production facility etc. Highly configurable – a Java programmer's dream. Uses [Telispark Mobile Enterprise](#) and [Websphere Everyplace Connection](#) to bring data from SCADA systems to smartphones etc. A rather telling demo showed use in monitoring a failing pump. The software anticipates failure and generates a work order and documentation required for repair. Includes parts and barcode/RFID tag management and has stubs for Maximo, SAP and Dassault's Smart team. Used by (developed for?) ChevronTexaco's pipeline unit.

Contact Russ McKay

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www.ibm.com

IBM - Deep computing capacity on demand (DCCoD)



IBM's Houston DCCoD

DCCoD is now available in Houston with 512 Intel nodes. Landmark is the 'anchor' tenant – also GX Technology and PGS. Houston Metro Area served over Gigabit Ethernet.

Contact Alan McCarter

armccar@us.ibm.com

Ibrix Inc. - Ibrix Fusion scalable file system

Software-based file storage solution – scalable volume manager. 10s of GB/s bandwidth use as cluster, NFS or CIFS as scalable NAS.

Contact

sales@ibrix.com

www.ibrix.com

Isilon Systems - Isilon IQ Clustered Storage

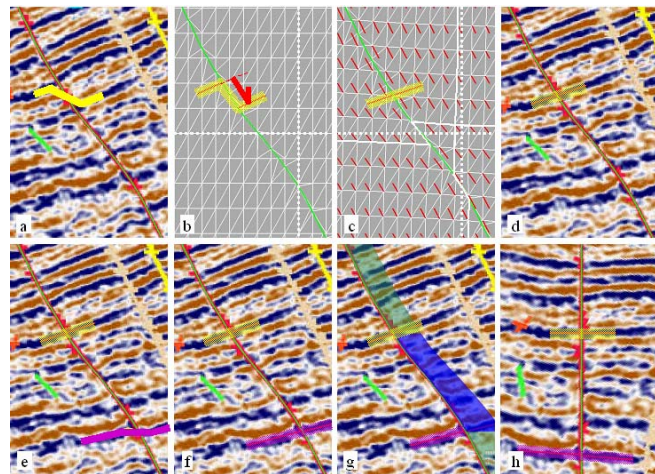
Clustered storage system – OneFS distributed file system offers single global namespace across modular, standard hardware. Throughput scales to 2GBytes/s. No single point of failure.

Contact

sales@isilon.com

www.isilon.com

Landmark/Geographix - Fault healing technology.



Geographix fault-healing workflow

Geographix new fault restoration workflow integrates GeoGraphix' SeisVision interpretation suite.

Contact Dutch Thompson

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www.lgc.com

Mercury Computer Systems – VolumeViz 4.0

VolumeViz pre-processes data into sub-sampled data sets – 1/8th 1/64th etc. These bricks (3D tiles) are loaded at lowest resolution and then refined on use. The responsiveness optimizes bandwidth and ‘improves users experience.’ Graphics libraries for sale to ISVs. Used by WesternGeco to QC seismic. A component of the [Stony Brook Visual Computing Cluster](#) at New York State University.

Contact Michael Heck

mheck@mc.com

www.mc.com/TGS

Mercury Computer Systems - XRi series clusters



Mercury's XRi cluster

Mercury's XRi cluster systems are based on Intel 32/64 Xeon processors and incorporate PCI Express and options such as FPGAs and GPUs. With a high-speed interconnect fabric and multiple high-performance processors and GPUs, the XR series eliminates potential bottlenecks common in image processing. The latest release of Open Inventor application programming interface (API) for C++ and Java developers; and AmiraVR are integrated into the XRi cluster systems.

Contact James Wheeler

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www.mc.com

Multiwave Geophysical Company - Permanent Seismic Monitoring.

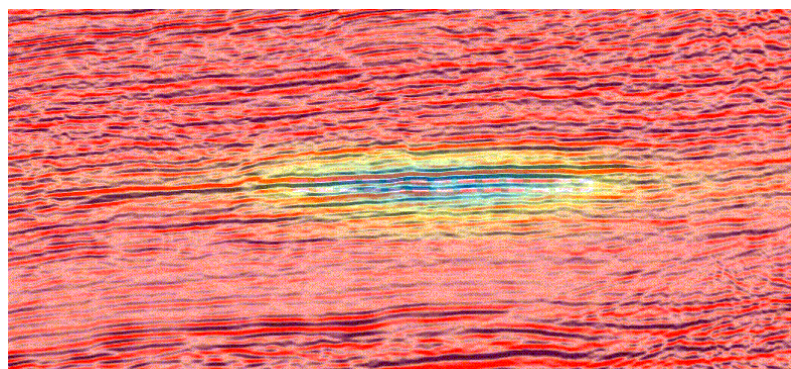
4C time lapse pilot on Shell's Mars GOM field. Already have 140km of cable buried on Valhall (BP) for continuous recording ([see paper below](#)).

Contact Steve Primeau

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www.mgc.com

OHM – CSEM C4 Receiver



OHM CSEM results²⁵

OHM makes the C4 receiver – towed 30m above sea floor. The basic technique is to generate a synthetic model and compare with recorded data. Tests from offshore Namibia (above) compares real seismics and synthetic EM data. EM collects around 1 GB per day – compare with 1 TB for seismics. Use is as a control for seismic inversion and edge location of hydrocarbon extent. OHM is said to have a \$100 million MCAP for around \$1million in sales.

Contact Anthony Greer

Anthony.greer@OHMsurveys.com

www.OHMsurveys.com

Panasas - ActiveScale Storage Cluster

Hardware – storage cluster. Used by TGS Imaging (3x25TB clusters). 10x performance improvement over NFS. See also Force 10

Contact Tony Delfavero

tdelfavero@panasas.com

²⁵ Original data courtesy [TGS-NOPEC](#).

www.Panasas.com

Petrosys - Petrosys 14.5 – Well data drill down.

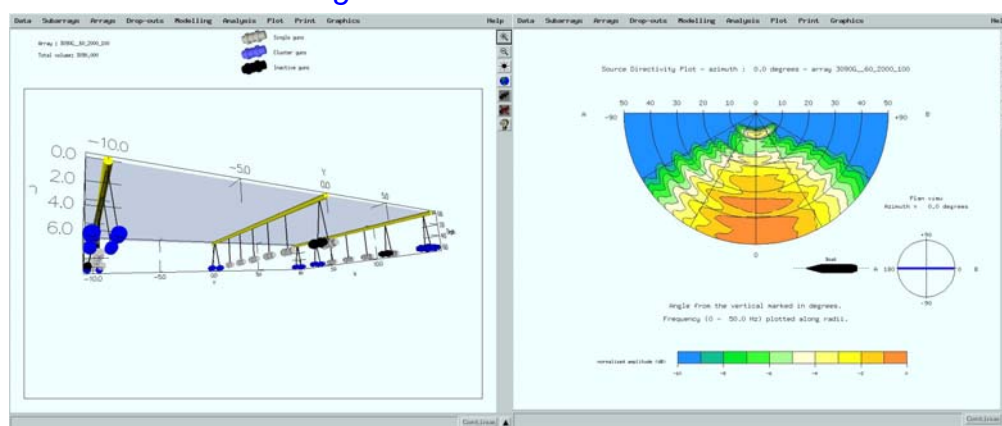
New V14.5 version (and neat new booklet). Uses cascading style sheets css and @media.print for neat printing from html. Petrosys is leveraging the new Mozilla Firefox tabbed browser – which is ‘taking over from Microsoft Internet Explorer’. Anadarko and Robertson are also keen. In general, many companies are in the final phase of Linux testing – Landmark and GeoFrame IV are running well on Linux.

Contact Volker Hirsinger

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www.petrosys.com

PGS – Nucleus source modeling software



PGS Nucleus

PGS performs seismic modeling and feasibility studies including full wave field reflectivity, 2D & 3D dynamic ray-tracing, and 2D & 3D visco-elastic finite difference modeling.

Contact Anders Jakobsen

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www.pgs.com

Rock Solid Images - Combo Mambo attribute rendering

Bump mapping – embossing one attribute over another representation – to co-render two attributes. The latest Geoprobe gizmo.

Contact Uwe Strecker

u.strecker@rocksolidimages.com

www.rocksolidimages.com

Seismic Micro Technology - AVO Pack

Big demo of AVO Pack – around 100 in attendance. Software due out in November. KerrMcGee, Unocal and Devon use alongside Landmark – but Pioneer switched to SMT.

www.seismicmicro.com

SimSci/Invensys - PipePhase 8.2 and link to Eclipse.

SimSci's Upstream Optimization Suite – PipePhase, NetOpt and Tacite. All for optimizing surface and subsurface design. Were they at the wrong show?

Contact Kathy Beckman

kathy.beckman@invensys.com

www.simsci.com

Sonardyne Intl. - RFID system

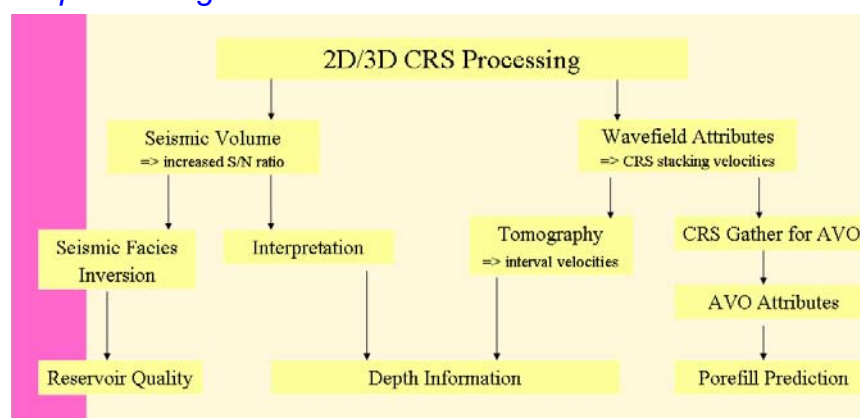
Radio Frequency Identification tracking system for use with Sonardyne's OBC asset tracking system. Manages hundred of acoustic positioning transponders used in ocean bottom surveying. The system is compatible with Sonardyne's Asset Tracking System (SATS) and interfaces with Concept Systems (I/O) Gator.

Contact Marketing Dept

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TEEC – CRS seismic processing



TEEC's CRS workflow

TEEC is working with a cluster hardware company to offer its CRS technology 'in a box'. The CRS process begins with PSDM and leverages TEEC's wavefield tomography and AVO attributes to determine pore fill. TEEC also offers 'data driven' model-less velocity analysis.

Contact

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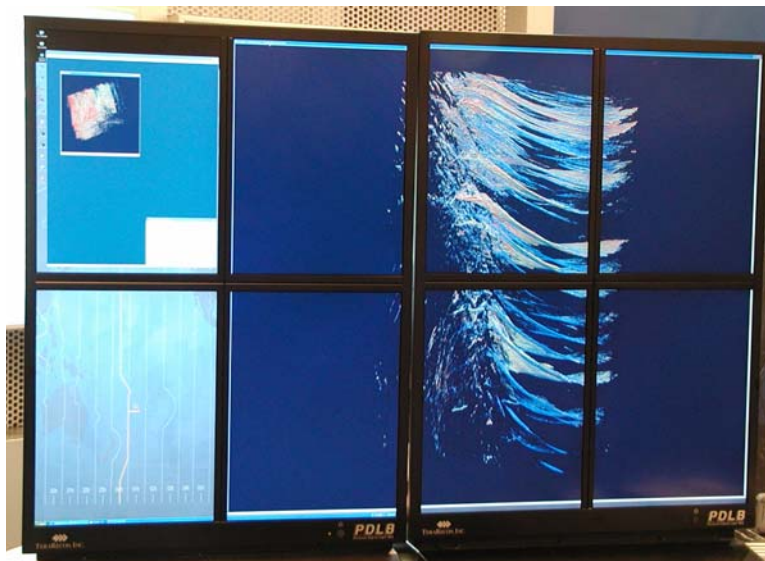
Teksouth Corp - IQ Swift communications protocol

Communication protocol – replaces FTP with secure, encrypted https server. Uses lossless compression. Sun 'to be early adopter'. Partner with NalTech. Have been doing data warehousing for the US Department of Defence for past 20 years.

Contact Larry Northington

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TeraRecon - Personal Digital Light Box



TeraRecon's Digital Light Box - up to 48 MegaPixels

TeraRecon's F1 graphics card drives ultra high resolution display arrays like the Personal Digital Lightbox (above). The PDLB was designed to replace light boxes used to view medical films. Up to 9 F1 cards can be used in a single system to drive as many as 36 panels. Each card has dual 6 mega-pixel DVI outputs with up to four 2048 x 1536 panels per card.

Contact Frank Baker

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Verari Systems - ipSAN, 64bit blades and graphics workstation

PureCluster is scalable iSCSI SAN. The XEON EM64T Blade supports 12GB/Blade, Gigabit Ethernet and U320 SCSI. Verari bought MPI Software and also teams with Engenio on Blade Server Storage. Clients include Shell, WesternGeco, TGS-NOPEC etc.

Contact George LaBarbera

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Western Scientific - TeraFS

Parallel, iSCSI File System deployed as scalable NAS, database or IP SAN. Target market is seismic processing and interpretation. Supply with Geotrace Shell.

Contact Peter Pelekis

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Zeh Software - Plot Express V4.6

Plot Express V 4.6 now supports Red Hat Enterprise Linux, iSys iTerra Pro printers, HP 100, 120, 130 printers and has color management improvements. More information

from http://www.zehsoftware.com/theplot/Whats_New_0704.pdf Active Directory is also supported as are PCL/PC3GUI , ArcGIS 9 and Arc IMS.

Contact Pete Bawa

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www.zeh.com

Zokero Incorporated - SeisWare 6.0

Market-leading interpretation system in Calgary – with around 300 seats. Just joined OpenSpirit for Landmark link. Straightforward tool – nice integration with GeoTIFF imagery.

Contact Kerry Befus

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Force 10 Networks - TeraScale E-Series Router

10 Gigabit Ethernet and Gigabit Ethernet switch. Veritas, PGS, Halliburton, Landmark users – Chevron testing.

Contact Martin Ward

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Papers²⁶

4C seabed seismic monitoring – Jan Kommedal, BP

Does Life of field seismics work? Very clearly yes! Kommedal showed a 4D map where the effect of depletion over a four month period could be seen. A ‘puzzling’ pattern was attributed to a plugged injector. One use of the survey is to plot 4D effects along well bore and monitor effect of perforations. BP deployed 120 km of cables – 2,304 groups of 4 C sensors. The array is continuously live (but not recording). Also deployed are three hydrostatic sensors and three low frequency geophones for earthquake monitoring. BP is pleased with the data quality from trenched cables. Acquisition QC is piped to the office over the internet in real time. Problems encountered - seismic vessel noise, tidal variations and varying water velocities – all taken into account. The data volumes (around 4 TB per survey) create their own data management issues. BP advocates frequent surveying.

Peremanent seismic monitoring of Gahwar Field – Shiv Dasgupta, Saudi Aramco

The original title was to be ‘When 4D seismics doesn’t work!’ A change because usually all papers are ‘success stories’. But in the mature part of the Gahwar field, hard limestone matrix, low (<2%) depletion, low fluid compressibility and other problems conspire to render time-lapse seismics problematical. This is a ‘challenge’ to industry as many giant fields share the same problems. Petro-acoustic modeling showed that the change in acoustic impedance over 80 years is only 4%. A 5-6 year lapse is a

²⁶ The complete extended abstracts of the 2004 SEG are available on CD from the [SEG](#).

minimum for a detectable difference. But the array has proved good at monitoring microseismic events. The 4D time lapse measurement will be replaced with permanent microseismic monitoring.

Combo Mambo – Uwe Strecker, Rock Solid Images

Looking for oil porosity is like looking for cancer in medical imagery. Strecker described bump mapping of a class III AVO anomaly. Bump mapping ‘embosses’ one attribute over another e.g. ‘co-shading’ of amplitude and another attribute. Strecker showed a compelling co-rendering of amplitude and semblance. RSI’s ‘GeoAnomaly’ lets users ‘mine’ through a spreadsheet of seismic anomalies extracted from 3D data attributes.

Support Vector Machines – Kuzma et al. U. of CaL. at Berkley, (Paper 294)

Support Vector Machines (learning algorithms akin to Neural Networks) are used to solve large classification problems such as handwriting recognition and document sorting. This paper describes their use to speed up seismic inversion by ‘orders of magnitude’.

Combined Attribute Displays – Steven Lynch et al., Divestco (Paper 347)

Describes use of Divestco’s SeisScape embossed seismic display for co-rendering two seismic attributes.

4D case study of Norne field – Richard Goto et al., WesternGeco (Paper 404)

Presented the results of a ‘Q on Q’ survey with steered streamer over Statoil’s Norne field. Clearly shows produced gas cap movement over 2 year period.

Prestack hyperspace event picking – Troy Thompson, Curtin U. of Technology (Paper 455)

Treats seismic data as a 4D hypercube which is used for automated event propagation using a ‘probabilistic neural net’ (PNN). Seismic interpretation as data mining in hyperspace.

4D in BP’s North West Europe operations – 5 years on – D.N. Whitcombe et al., BP (Paper 410)

Report on BP’s ‘systematic’ application of 4D time lapse seismic to its North Sea fields. 5 years on, the technique is now routinely applied, not just to ‘easy’ tertiary targets, but also to older reservoirs. Also describes BP’s ‘Sim2Seis’ method of synthetic modeling of 4D seismic response from rock properties. The paper concludes that ‘significant value has been added [...] and we are still probably underestimating this’.

Bit bounce detection using neural networks, Vassallo et al., POLIMI, Italy

Uses data mining of measurement while drilling to detect ‘bit bounce’ a resonance phenomenon associated with tricone drilling bits.

Continuous Seismic Monitoring – Olav Barkved, BP Norge (Paper 815)

Permanent seismic receiver array on the Valhall field is used for frequent time-lapse surveys and passive monitoring. A ‘step change’ in the use of seismics for active reservoir management. Production effects observed over ‘months rather than years.’

3D-Gradient Magnetics for Pipeline Detection – Ricardo Fernandez, Fugro Airborne Surveys

Describes use of airborne geophysical techniques to ‘plan, locate and assess’ underground or underwater pipelines.

Gravity monitoring of gas production – Ola Eiken, Scripps Institute

Time-lapse gravimetric monitoring of the Troll field, Norway. From the 8 micro gal anomaly it was possible to estimate total water influx. This is used in mass balance calculations.

SEG Standards Committee

Chairman Alan Faichney was thanked for services and new chairman Ted Mariner (Veritas) welcomed by committee.

European Petroleum Survey Group database

The EPSG database of geodetic coordinate reference system parameters and transforms is now in a state where it can be adopted as a standard by the SEG. The subcommittee proposed to the SEG executive that the EPSG should be adopted for current and future standards.

Could the EPSG be housed on the SEG website?

Anyone can the EPSG’s Microsoft Access database. A SQL version is also available now and next year there will be online web server version. The EPSG database is now versioned and does not changed. There is also a deprecation mechanism.

SPS and SEG-D reviews

Review committee set up two years ago. There has been no significant effort and the chair proposed to disband. The ensuing discussion revealed a need for revisions to handle 4C, source type and non sequential media. Some concerned that these should be standardized. Or that we no longer need an acquisition standards since data is delivered in SEG-Y (In fact Rev 2 does disk/byte stream media). Norris pointed out that few use SEG-D rev 2 – even SEG-Y rev 1 has had very limited take-up. Input-Output believes that the SEG-E VSP standard has been a ‘total shambles’. There is a need but no volunteers. SEG-Y loses all instrument information. There was as little enthusiasm for an SPS revision as for SEG-D. An observer suggested that if and when any of these standards be re-visited, then more IT friendly technologies should be investigated – notably XML for sharing of metadata and units of measure.

Marine EM profiling data exchange

ExxonMobil is using mobile EM profiling – three companies are producing EM data. ExxonMobil would like a new standard or best practices for the use of existing formats. The technology ‘looks like it will have a central impact on our business’. It

was suggested that airborne EM standards developed by the Australian SEG be checked-out.

[Electronic Geophysical Year \(EGY\) – Brian Spies](#)

An ad hoc committee has been set up to promote an Electronic Geophysical Year in 2007-2008. This will be the 50th anniversary of the 1957 IGY. Email ideas to Brian Spies.

[Gravity and Magnetism](#)

Alan Mee said the Australian SEG's gravity and magnetism initiative was on hold, waiting on an international XML initiative.

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