

The Energy Industry and IPv6 Awash in Data - But Still, Nowhere Near Enough



Bill Bartling
Sr. Director Market Strategy
Silicon Graphics

Many Thanks To

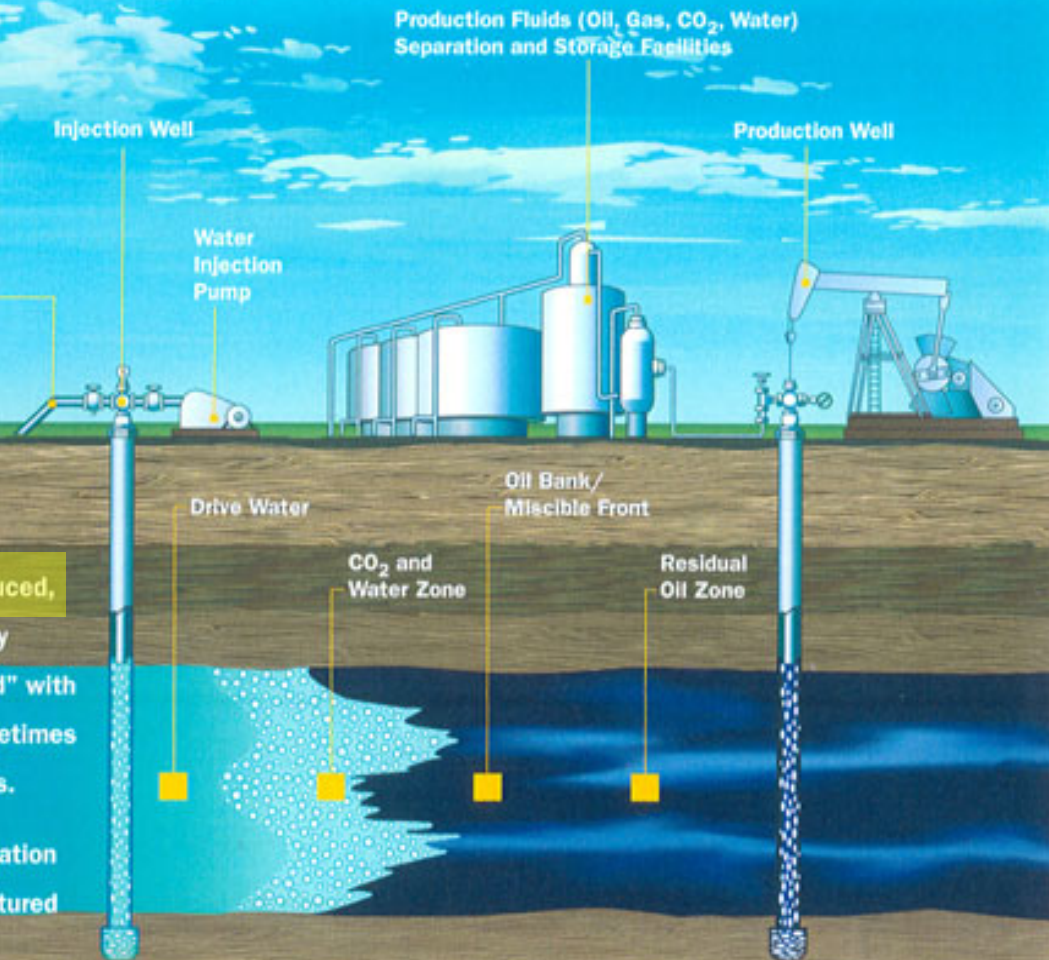
- Dr. Eric Frost
- Alex Lightman and IPv6 Team
- Silicon Graphics
- The many cooperative Oil and Oil Service Companies kind enough to share their experiences, dreams and challenges with me



Maximizing Oil

Often **two-thirds of the oil in known reservoirs cannot be produced**, even with advanced technology. Oil droplets can have difficulty moving through the pore spaces in rocks and must be "pushed" with water, steam, CO₂, or nitrogen to reach a producing well. Sometimes surfactants are used to "wash" the oil from the reservoir rocks.

Another option under evaluation is combining carbon sequestration efforts with enhanced oil recovery. The feasibility of using captured CO₂ to enhance oil recovery is under study.

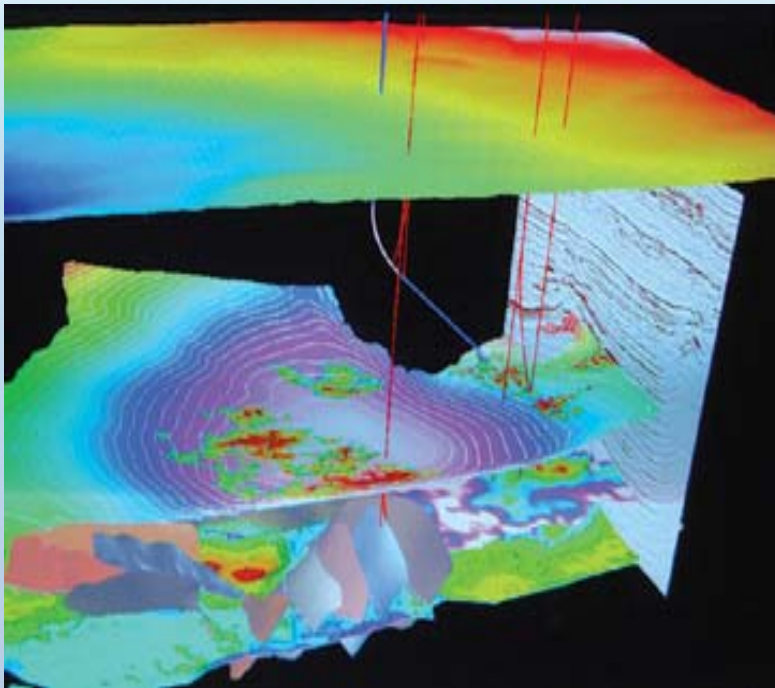


Techniques like these are crucial to enhance recovery, since each one-percentage point of additional recovery from known oil reservoirs can add up to 5 billion barrels of oil to our producible reserves.

Oil and Natural Gas

3D Seismic, Visualization and Success

ExxonMobil



Thirty years ago, explorers drilled 10 "dry holes" for every success. Today, nearly half of ExxonMobil's exploration wells strike oil or natural gas.

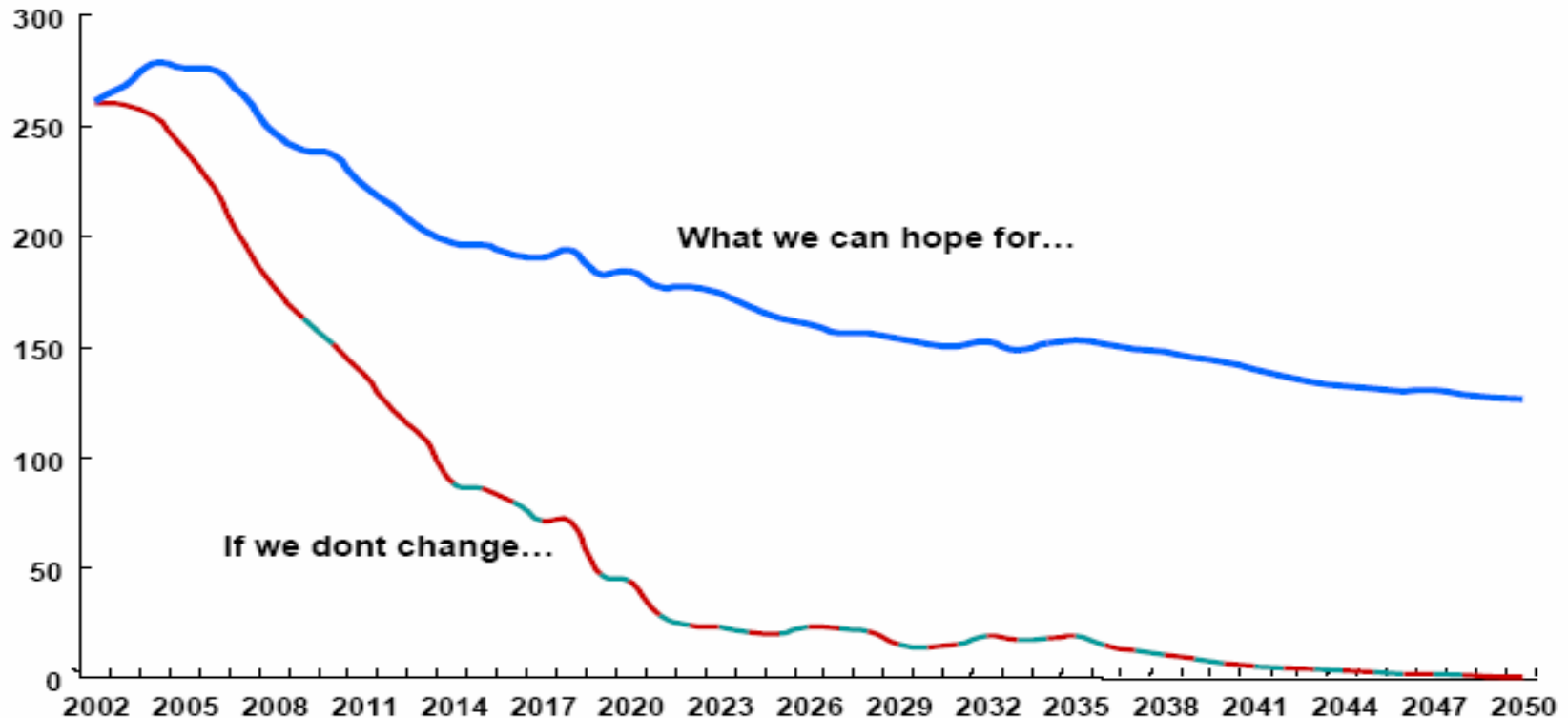
http://www2.exxonmobil.com/corporate/Campaign/Campaign_energydemand_3D.asp



But Oilfields are not forever ...

Estimated production profile in Norwegian Areas

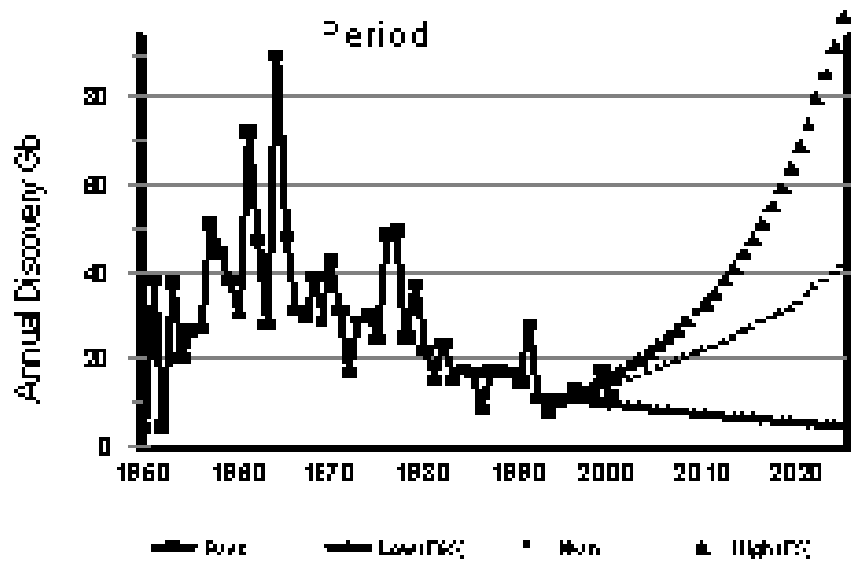
Mill Sm³ o.e.; Yearly production of oil, gas and NGL



Oil Futures

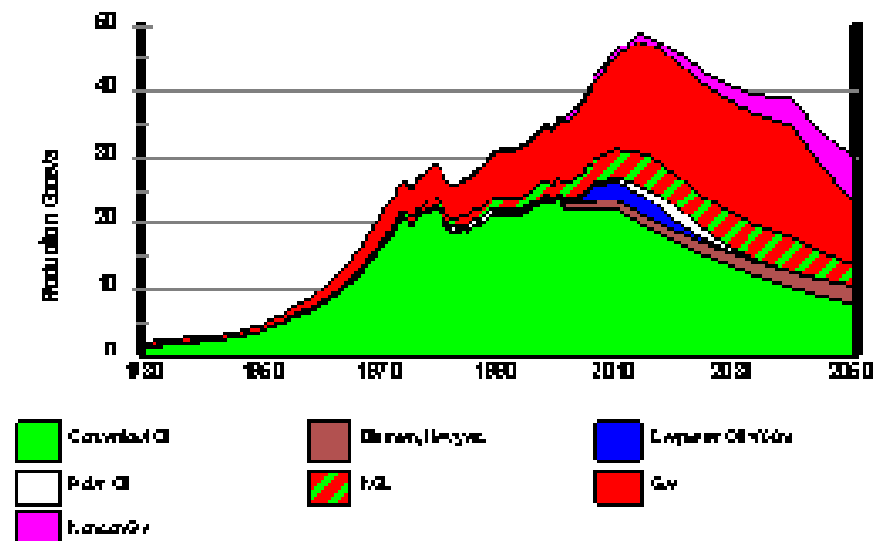
USGS

Alternative Estimates of Yet-to-Find

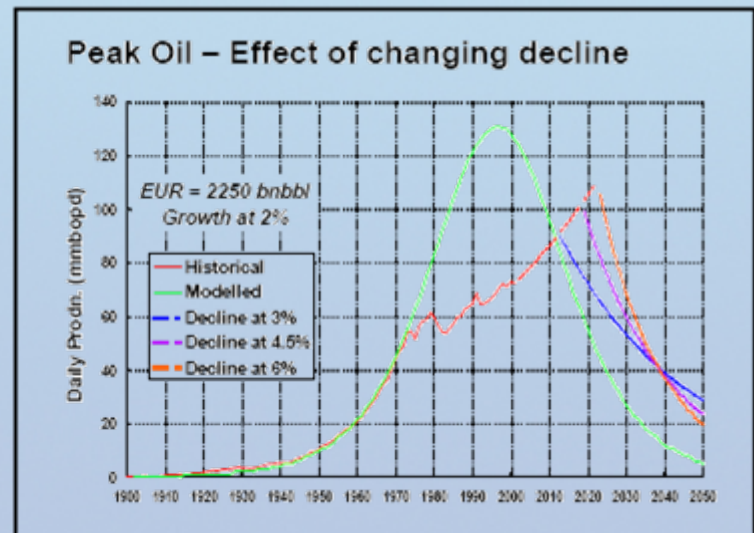
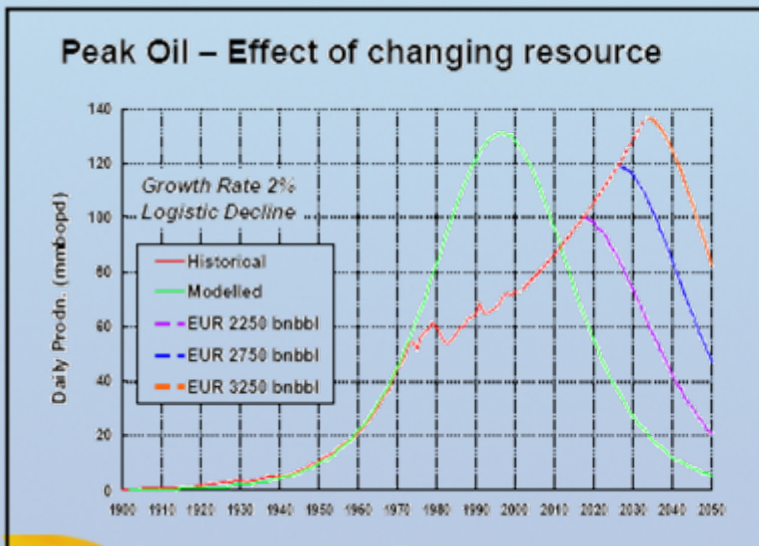
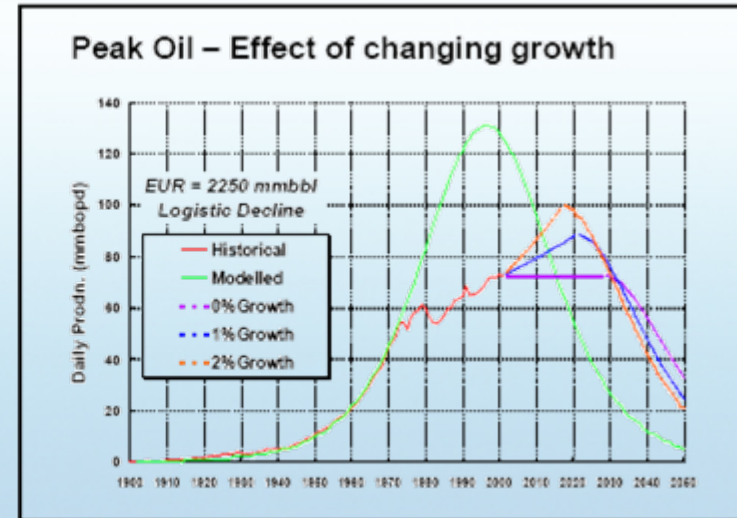
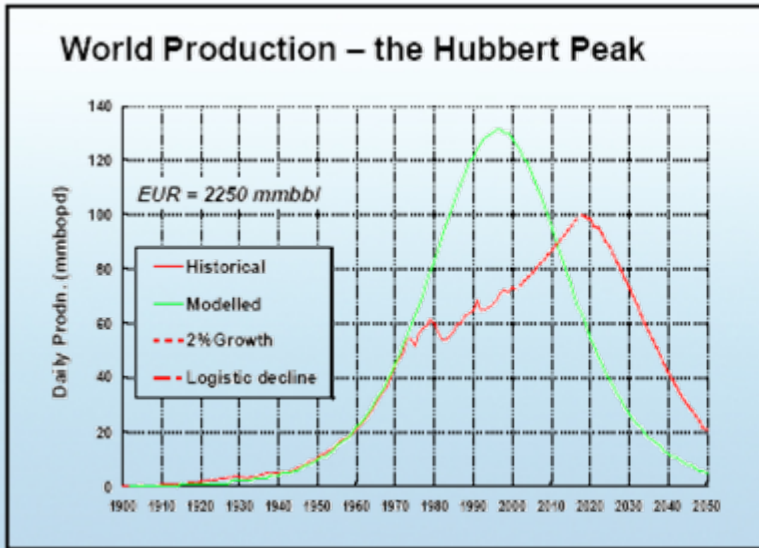


ALL HYDROCARBONS

2001 Ease Case Scenario



Shifting Hubbart's Peak



Hypothetically Speaking ...

Lets Do the Math

- **Production** – 2/3 of discovered oil never recovered
 - Lets use a round number of 1 trillion barrels of “Proven” oil reserves (recoverable).
 - **Double recovery (leave 1/3 of the oil in the ground) at \$50/bbl = \$50 TR**
- **Exploration**
 - “Nearly” half of EOM’s wells are successful, up from 10%
 - There are about 1450 rotary rigs active in the world – lets use 30 days per well average = 17,500 wells/year
 - Today’s wells in “big-prospect” areas cost \$10-50 million
 - Average economic discovery – maybe 30 million barrels
 - **Raise success for industry by 4x = \$10.5 TR in new reserves and at least \$70 B in “dry-hole” savings per year**
 - **Raise it by 5x = \$13 TR new reserves and \$87.5 B savings**

Realistically Speaking ... What is it Worth in Practice

Latin America

- Streamlined work process from months to weeks
- Brought asset teams together into common environment
- Allowed them to drill 14 fewer wells into a particular field.

***At \$15MM\$/well = \$210MM
Savings from a Single
Operation!!!!***

Norway

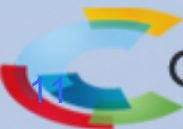
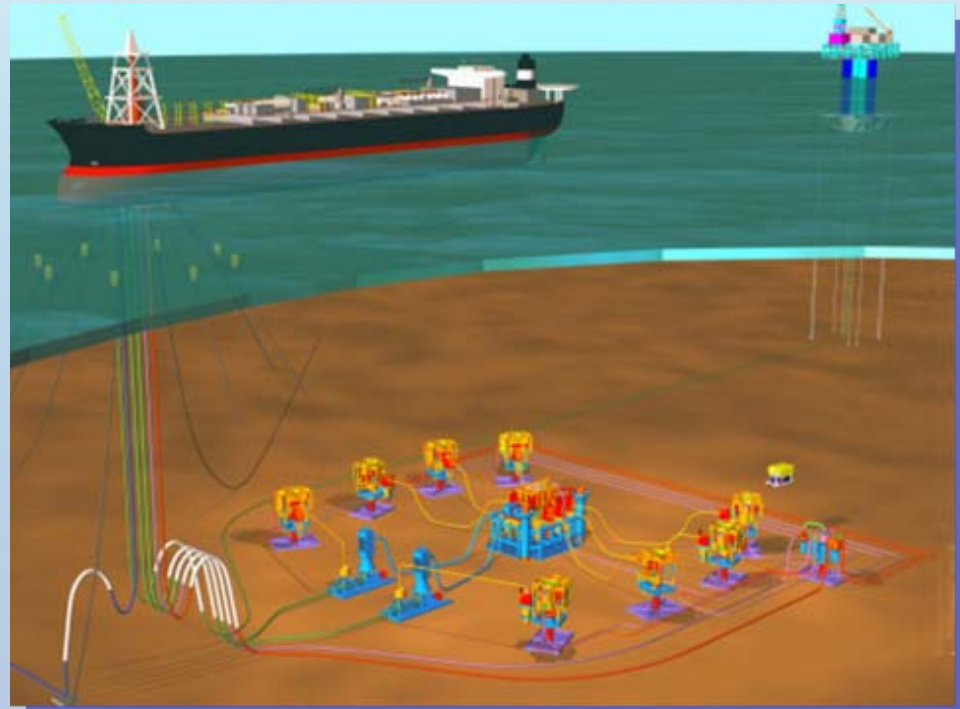
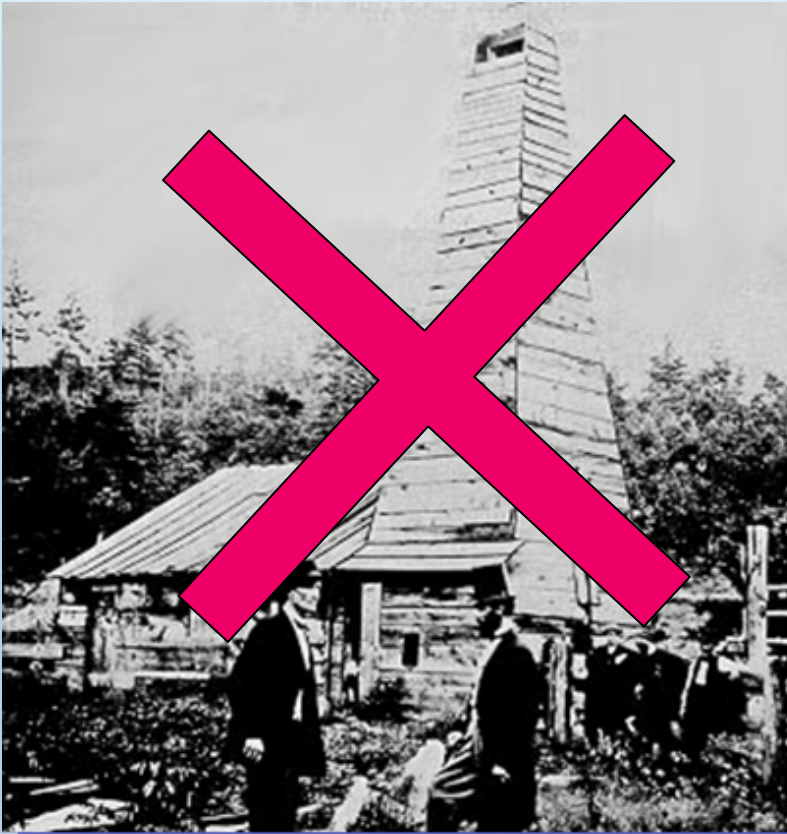
- Reduced drilling cost
One day of saved rig time per well = total of ***\$20 to \$40 million U.S. cost savings***
- Optimal well placement in the reservoir
Landing the well in the right position is critical!
Correct positioning adds of ***\$375 million U.S. in produced oil***

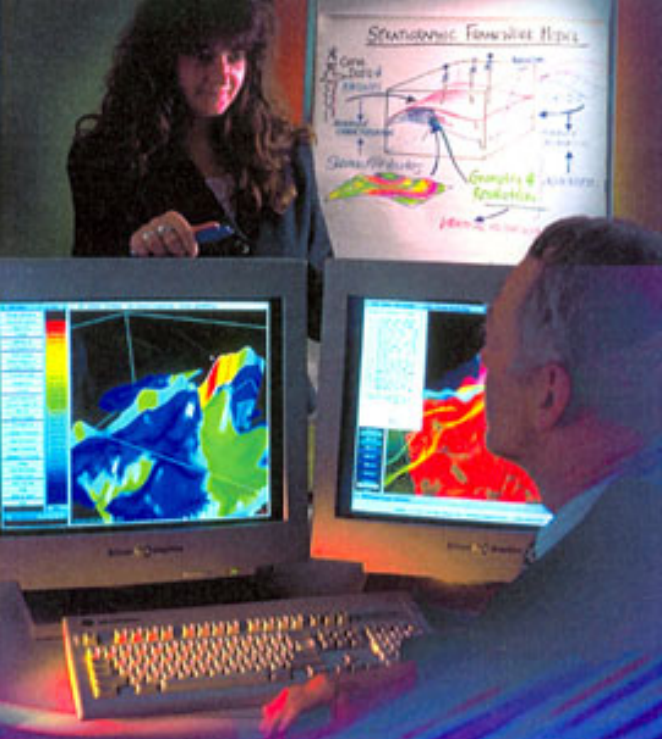
OK - We Get the Message ...
So How do we get there?



Or ...

OK - We Get the Message ... So How do we get there?





"The oil industry still produces oil, but it has been infused by so many new technologies that it should be thought of as one of the new man-made, brainpower industries like biotechnology."

- Lester Thurow

"Knowledge, not petroleum, is becoming the critical resource in the oil business; and though the supply of oil is fixed, the supply of knowledge is boundless."

- Jonathan Rauch

Atlantic Monthly, January 2001

Transforming an Industry

Technology has dramatically transformed how oil and natural gas are found and produced. Advances in computing power, miniaturization, and robotics in the past 10-15 years have given the industry the tools for recovering our nation's valuable oil and natural gas resources while enhancing efficiency, safety, and environmental protection.

Technology



Hoover/Diana platform photo courtesy of ExxonMobil.
3-D seismic technology photo courtesy of Landmark Graphics Corporation.

American Petroleum Institute

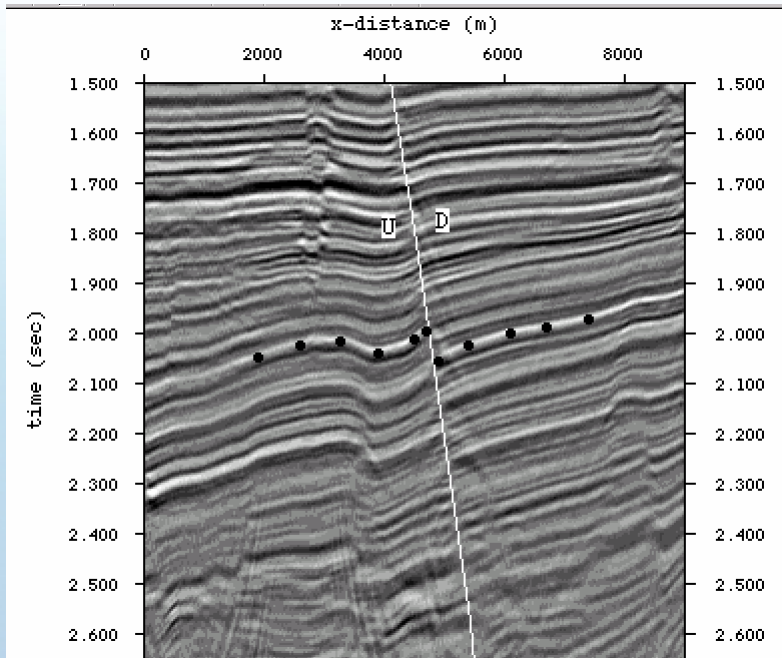
Standing in the library of congress doesn't make you a smart person



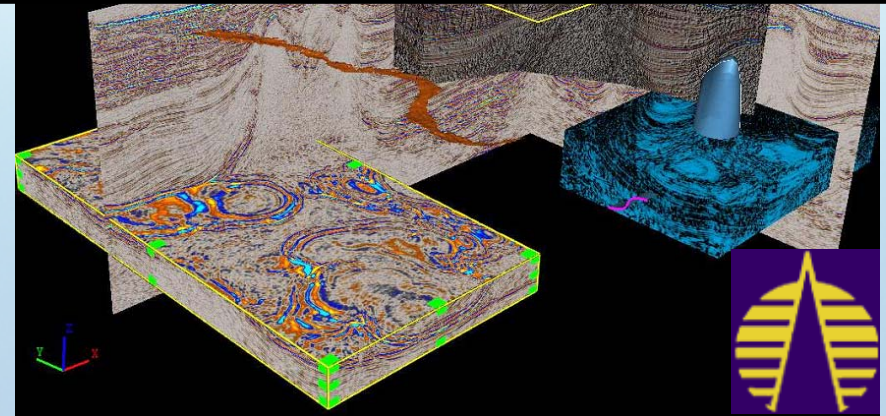
Knowing what is in every book does

Rapid visual insight to problems equates to advantage

Creating the Broadband Expert



This productivity improvement and real time capability enables an operations application and paves the way for IPv6 networks



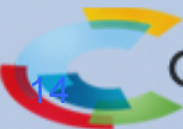
1993

100- MB
10% viewed
2-3 maps
12 months
800KB/month

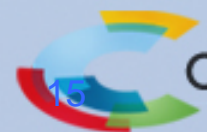
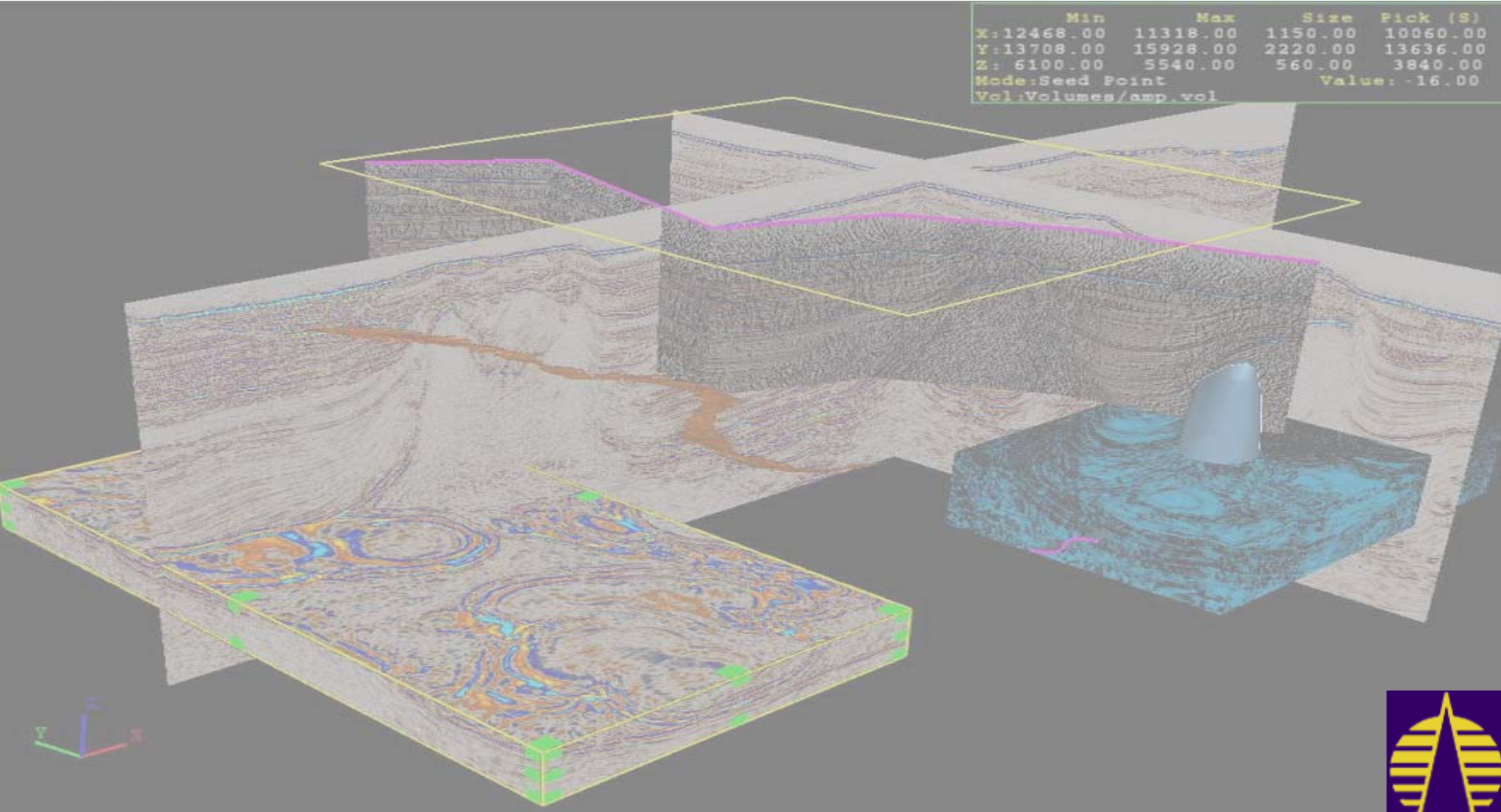
**400,000 fold
productivity
improvement**

2004

400+ GB
100% viewed
Volumes
1 month
400GB/month



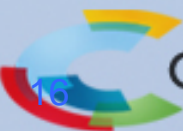
But I don't Have Big Data ... Except for



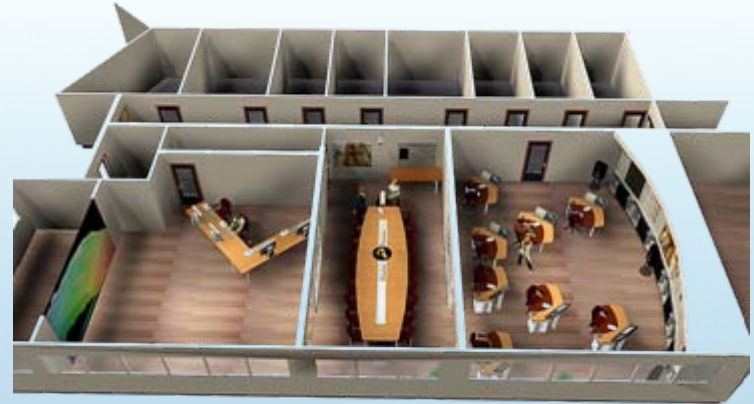
But I don't Have Big Data ... Except for

- **Regional Surveys**
 - Big view of the regional geology and trends
 - Linking together regional teams
- **Deeper Imaging**
 - Long offsets
 - Subsalt imaging
- **High Resolution Surveys**
- **Multi-Attribute visualization**
- **Shading**
- **Fully Populated, Time-Variant Reservoir Models**
 - Seismic
 - Earth models
 - Facilities
- **Time-Lapse Seismic**
- **High Resolution Simulations**
 - Multi-million cell models
 - Stochastic solutions
- **Digital Oilfield**
 - Merge of dynamic and static data

	Min	Max	Size	Pick (S)
X:	12468.00	11318.00	1150.00	10060.00
Y:	13708.00	15928.00	2220.00	13636.00
Z:	6100.00	5540.00	560.00	3840.00
Mode:	Seed Point			Value: -16.00
Vcl:	Volumes/amp_vol			

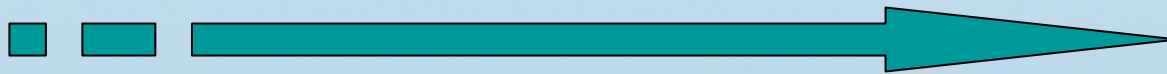
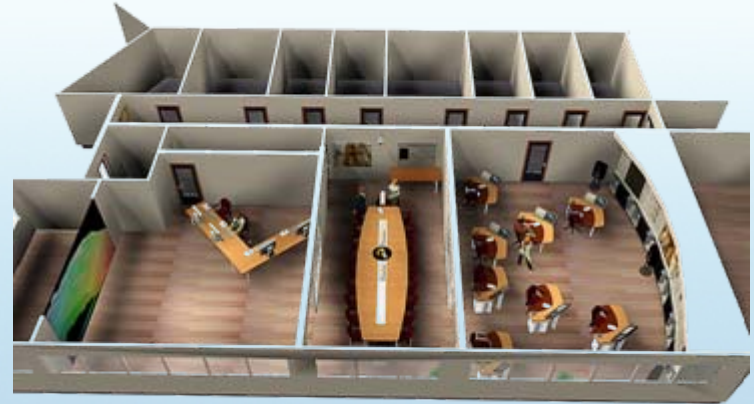


Energy Visualization



- **Additional emphasis: Exploration and Production (discovery and recovery)**
- **Investment center and profit center**
- **Focus on operations efficiency both in cost and recovery**

Energy Visualization



- Additional emphasis: Exploration and Production (discovery and recovery)
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But What to do with 1500 ip addresses per m²?



Sensor Fusion - Fibers and Nanotechnologies

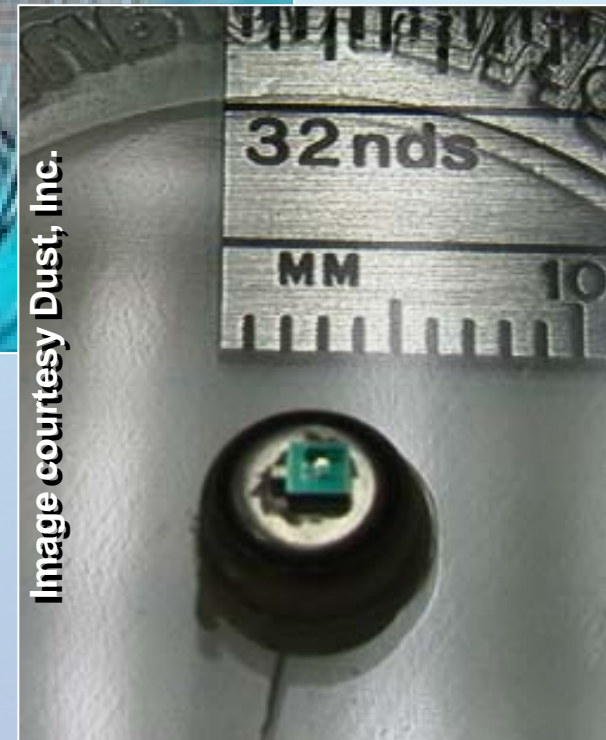
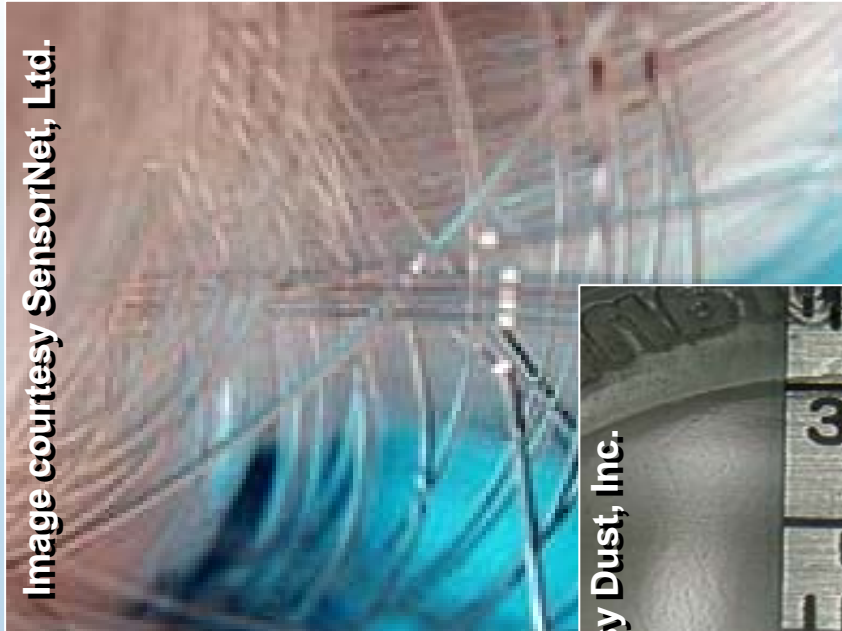
- Virtual Fields will be driven by sensor networks of varying types

- Conventional monitors such as SCADA systems
- Fiber optic sensor arrays monitoring:

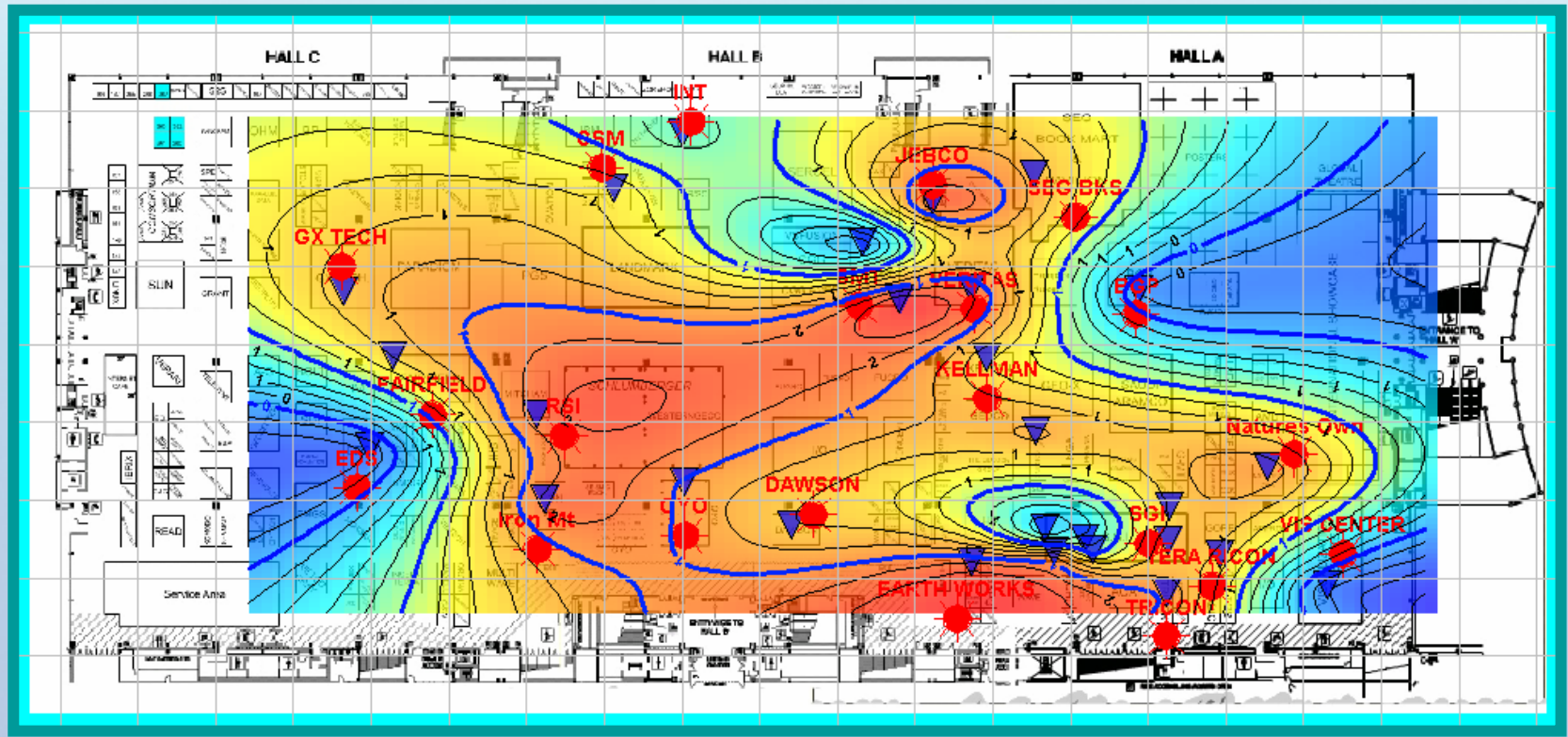
- temperature
- composition
- pressure
- sonic
- density

- Nanotechnologies such as SmartDust monitoring:

- temperature
- magnetics
- density
- composition
- vibration



The Digital, Virtual Oilfield: Distributed Operations in a Consolidated View Powered by Sensor Networks



Brought to you through a partnership of




Coalition Summit FOR IPv6



Sensors ,Computing, Analysis, Collaboration

Real Time Analysis and Data Fusion



Scalable, Distributed, Collaborative Graphics



Collaborate on any device



Application Layers - analysis, modeling, simulation, databases, integration

Field Based Sensor Arrays



Communication IPv6



Data Storage and Mgmt Systems



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