



IBM Systems & Technology Group

IBERGRID 2008:

The role of specialised devices within commoditised infrastructures

John Easton – IBM Systems & Technology Group - Infrastructure innovation

Grid motivations



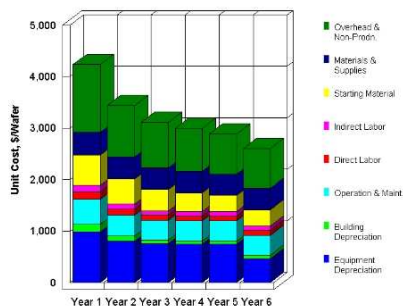
Faster, more accurate decision making

Accelerate



Access to distributed data, information insight

Collaborate



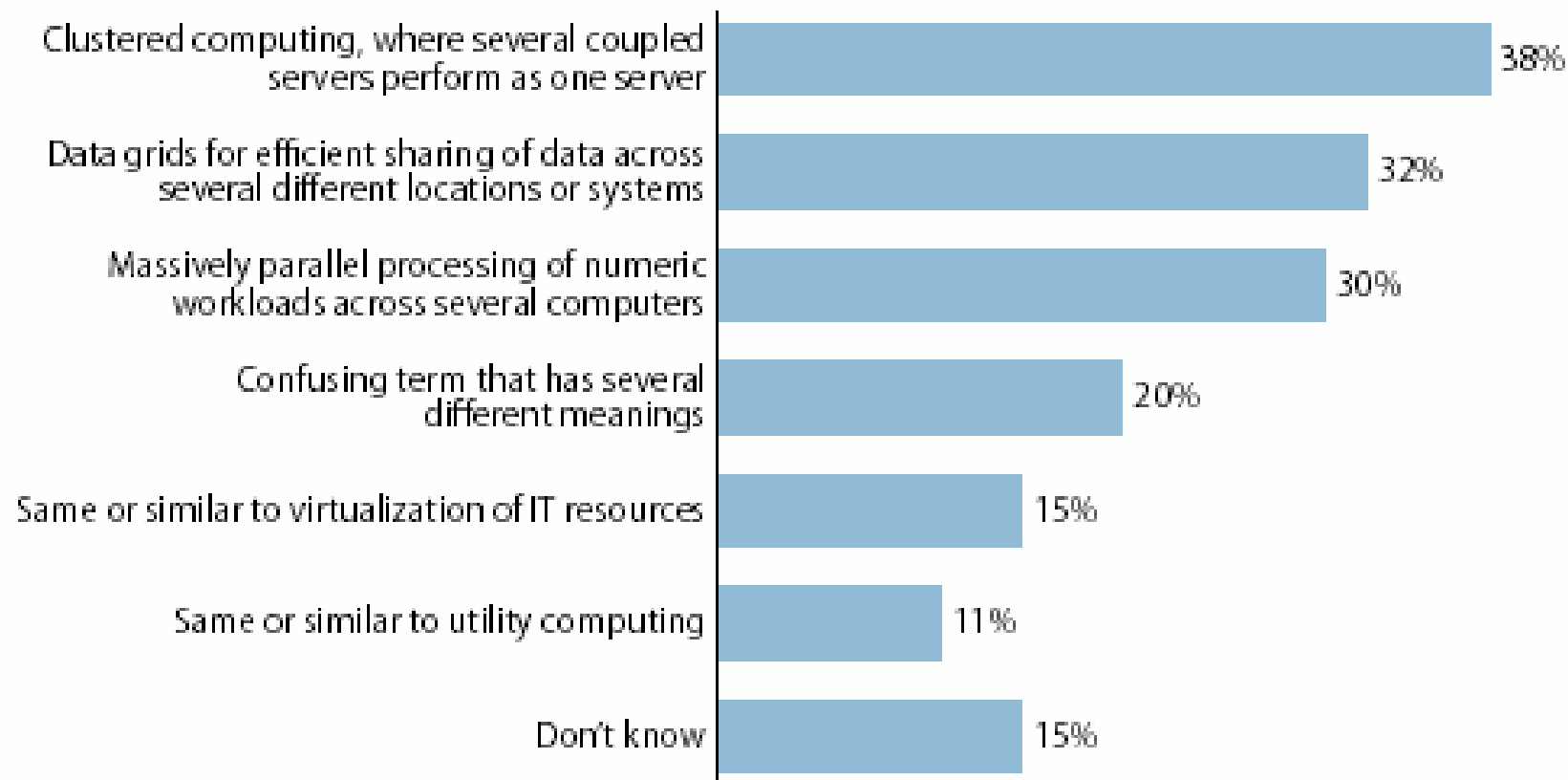
Improve efficiency and cost structure

Optimise

<p>Research and Development</p>	<p>Accelerate and enhance the R&D process by enabling the sharing data and computing power seamlessly for <u>research intensive applications</u></p>	<p>Life Sciences Education Industrial</p>	
<p>Engineering and Design</p>	<p>Share data and computing power, for computing intensive <u>engineering and scientific applications</u>, to accelerate product design</p>	<p>Industrial</p>	
<p>Business Analytics</p>	<p>Enable <u>faster and more comprehensive business planning and analysis</u> through the sharing of data and computing power</p>	<p>Financial Industrial Life Sciences</p>	
<p>Government Development</p>	<p>Create large-scale IT infrastructures to <u>drive economic development and/or enable new government services</u></p>	<p>Government</p>	
<p>Enterprise Optimisation</p>	<p>Optimize computing and data assets to <u>improve utilisation, efficiency and business continuity</u></p>	<p>Financial Industrial Government Education Life Sciences</p>	

What actually is a grid?

"What do you think the term 'grid' or 'grid computing' means?"



Base: 149 North American companies
(multiple responses accepted)

Source: Forrester Research, Inc.

A problem statement for today...

- IT as a commodity
- The “innovation agenda”
- It's NOT just about doing things cheaper
- So how do you differentiate your business?

A problem statement for today...

- IT as a commodity
- The “innovation agenda”
- It's NOT just about doing things cheaper
- So how do you differentiate your business?

...and future challenges

- Computational growth / new workloads
- Volume and richness of data
- Adoption on Web2.0 technologies

Financial Services Sector Trends, 2007-2015

FSS Industry Trends

Informed clients are increasing demands

Global integration is reshaping industries

Regulatory burdens are growing

Innovation is becoming imperative

Challenges

Speed & Transparency

Data Explosion

Managing Complexity

Managing Business Integrity

Collaboration & Partnering

IBM Global Business Services

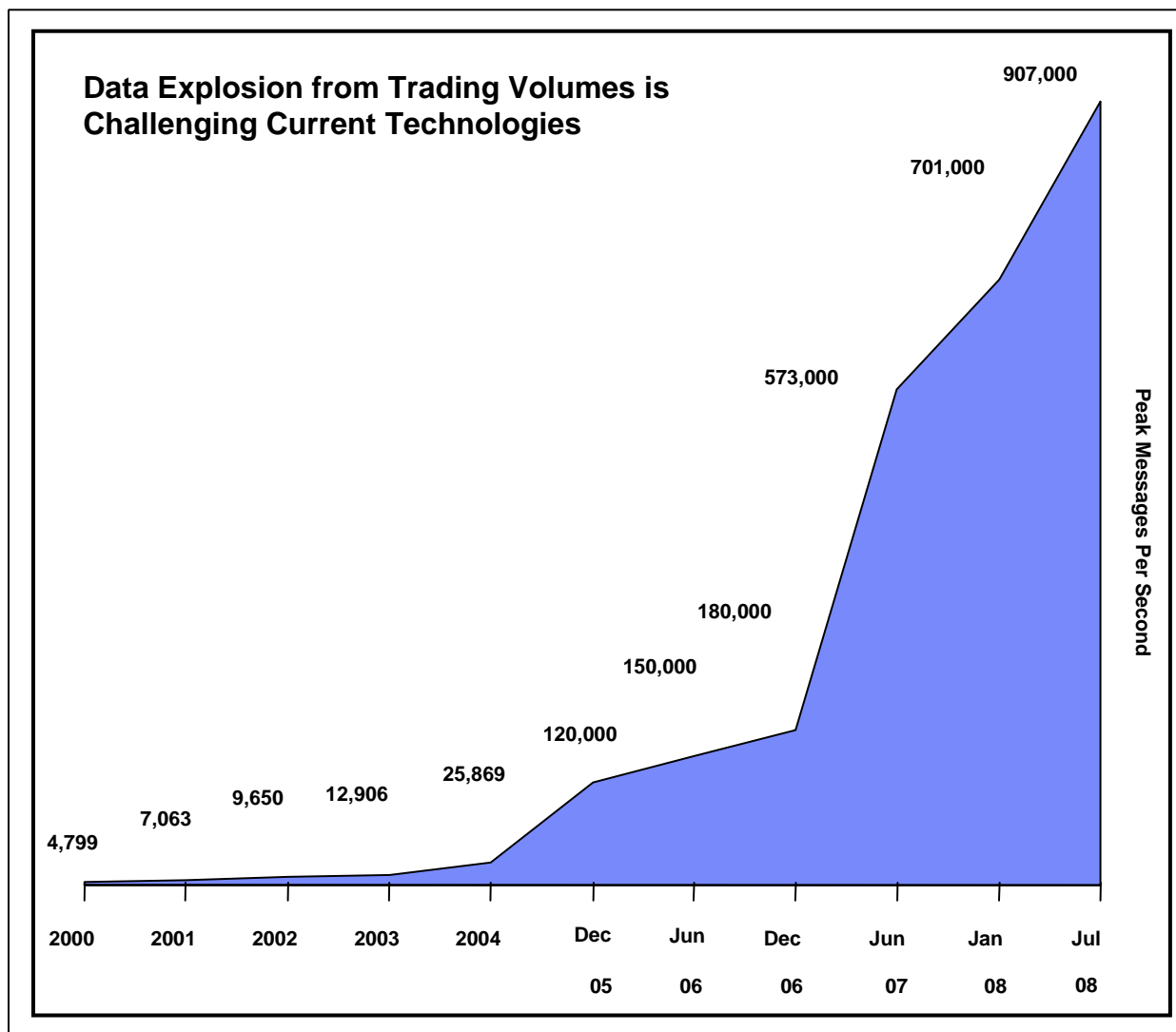
IBM Institute for Business Value

The trader
is dead,
long live the
trader!

A financial markets
renaissance

Financial Markets

Analytics problem is large and growing fast



Financial Market Analytics

The screenshot shows the IBM Financial Markets website. At the top, there is a navigation bar with the IBM logo, a search bar, and a dropdown menu for 'Financial services'. Below this is a secondary navigation bar with links for Home, Solutions, Services, Products, Support & downloads, and My IBM. A welcome message and links for 'IBM Sign in' and 'Register' are also present.

The main content area is titled 'Financial markets' and includes a breadcrumb trail: 'Industries > Financial services >'. A prominent banner features the headline 'HOW MUCH IS A MICROSECOND WORTH?' with the subtext 'Into the future: The fast track for financial markets'. Below the banner are links to 'Get the paper' and 'Previous features'. A 'Contact us' box offers to connect with an IBM financial services specialist.

On the left side, there is a vertical navigation menu with categories like 'Financial services', 'Banking', 'Financial markets', 'Insurance', 'Solutions', 'Case studies', 'News', 'Events', 'Resource library', 'Partner directory', 'Contacts', and 'Financial services search'. Below this menu is a 'Related links' section with links to 'Executive briefing and competency centers' and 'Financial markets country Web sites'.

The 'What we offer' section is divided into two parts: 'Business solutions' and 'Business consulting'. The 'Business solutions' part lists several offerings with descriptions:

Business solutions	Description
• Customer insight	Manage and utilize customer information
• Data management	Integrate data and optimize processes
• Governance, risk and compliance	Enhance risk management and compliance
• Payments	Support more efficient payment processes
• Trade processing	Automate, integrate and optimize trading
• Enterprise transformation	Streamline and integrate business processes

The 'Business consulting' part includes a link for 'Business consulting for financial markets'.

Additional content on the right includes a 'Trading volumes reek havoc' section with a link to a CNBC interview, and a 'SIFMA Tech 2007' section with a link to a post-event wrap-up.

Why grid is 'struggling'

- Divergence between vision and reality
- Very slow progress on grid standards
- Commercial readiness of standards-based grid software
- Business needs to move faster than the current technological 'state of the art' is allowing them to

Data centers are at a tipping point

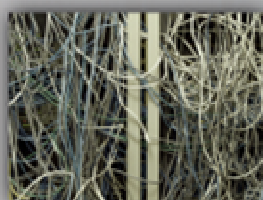
“According to Gartner, by 2008, 50 percent of current data centers will have insufficient power and cooling capacity to meet the demands of high density equipment.”¹



Increased Computing Demand



Changing Cost Dynamics



Data Center Lifecycle Mismatch

Energy usage is a common theme impacting IT capability

The Discontinuity



Then (~2003)

- Scaling drove performance
- Scaling drove down cost
- Performance constrained
- Active power dominates
- Focus on processor performance

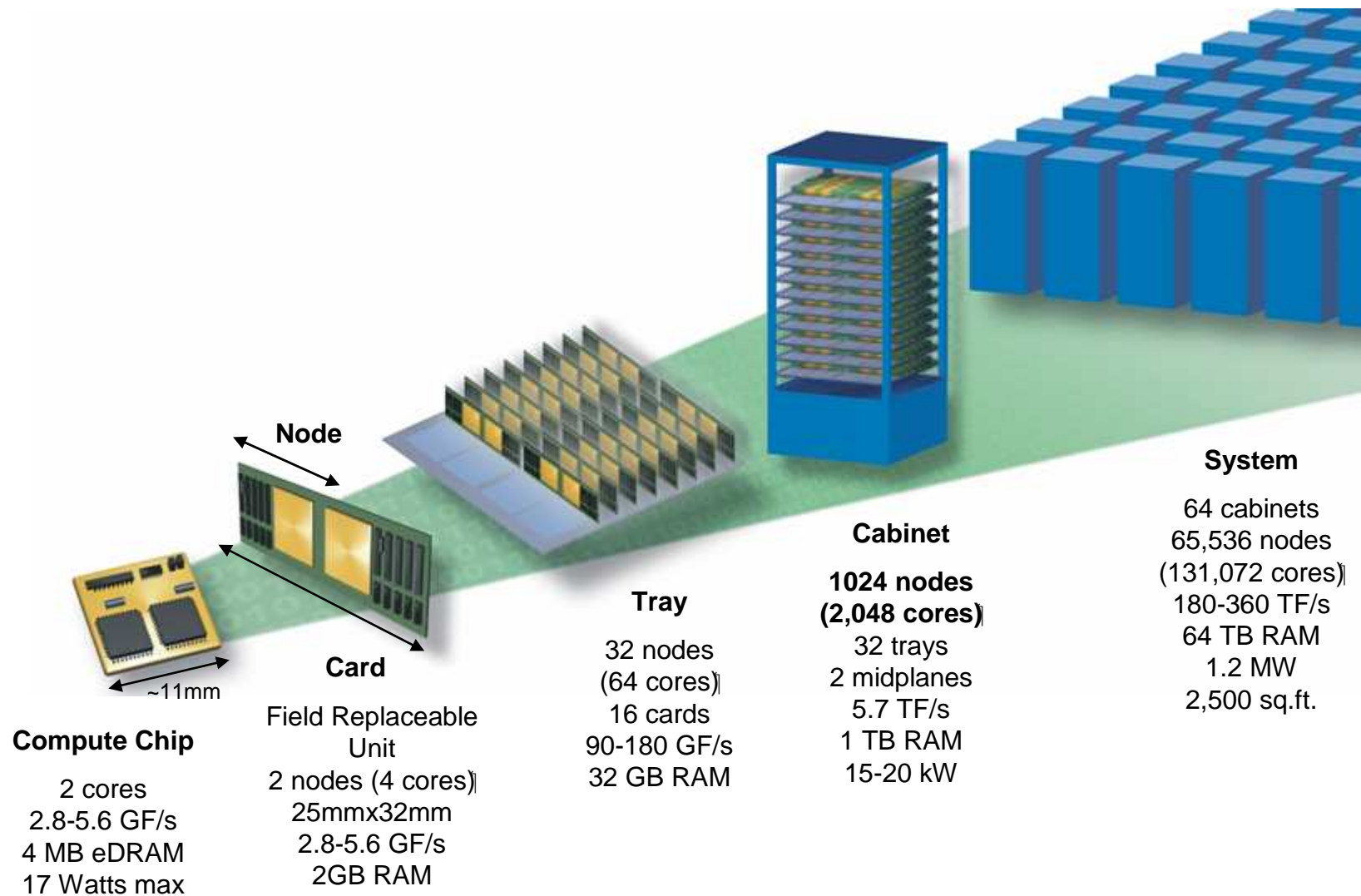
Now

- **Innovation** drives performance
- Scaling drives down cost
- Power constrained
- Standby power dominates
- Focus on **system** performance

Application-optimised systems examples

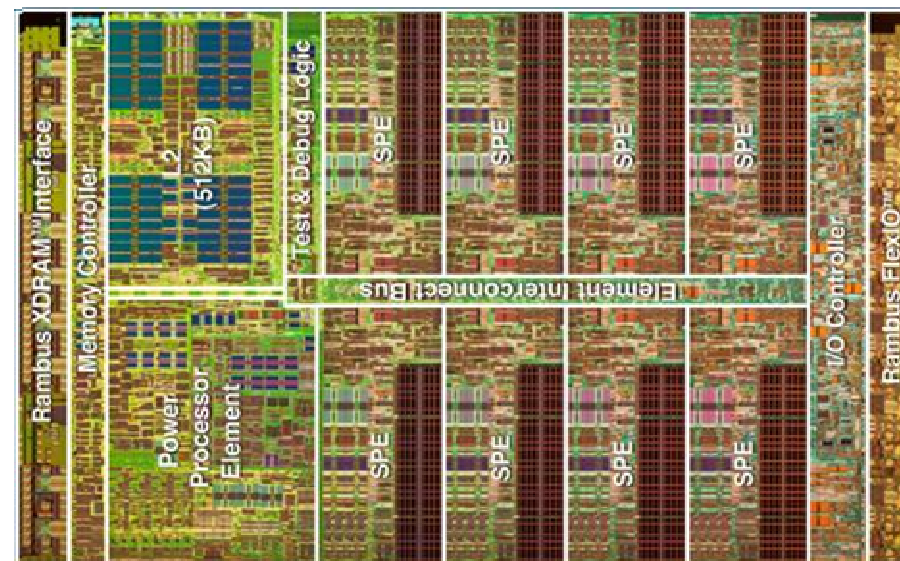
- **Processing**
 - Blue Gene
 - Cell broadband Engine,
 - FPGAs (Field-Programmable Gate Arrays) & CPLDs (Complex Programmable Logic Devices)
 - Utility computing
 - Computational appliances (e.g Azul Systems / DataPower)
 - AGEIA's PhysX processor
 - Google Enterprise Search appliances
 - Graphics Processing Units (GPUs)
 - Deep Computing
- **Storage appliances**
 - Application-optimised Network-attached storage
- **Communication**
 - Network accelerators
 - Specialised interconnects

Blue Gene



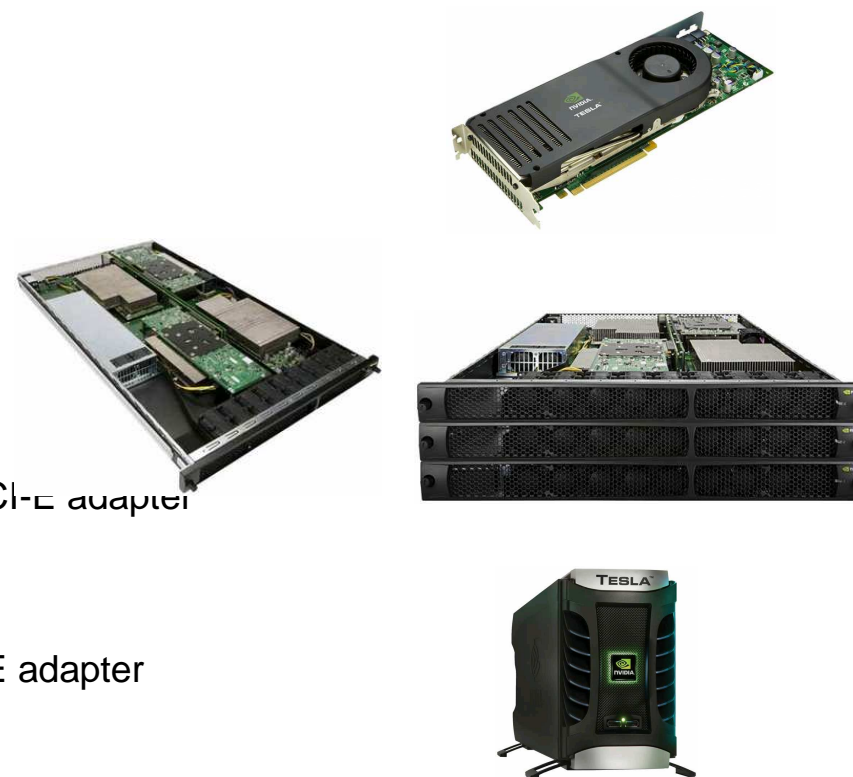
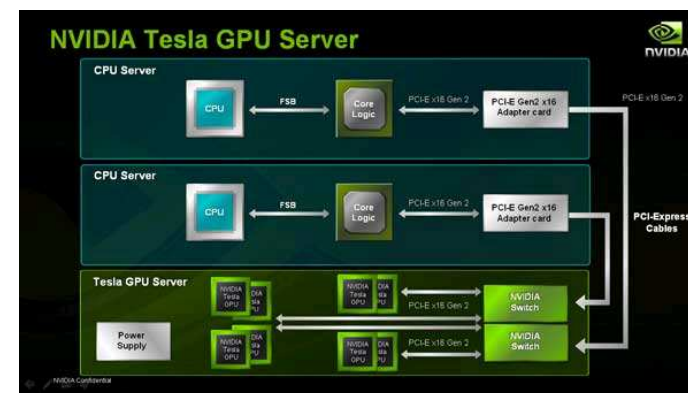
Cell Broadband Engine

- Cell is the IBM processor inside the Sony PlayStation 3
 - Jointly developed by IBM, Sony & Toshiba
- Cell is a 2nd generation multicore processor
 - Five years after IBM ships the first multicore processor
- Cell is a high performance processor
 - Delivering substantial performance improvements for complex workloads
- Cell is here today!
 - Sept 2006 – QS20 blade announced
- Cell is the start of a long-term alliance
 - Jan 2006: 6 year STI alliance extended by 5 more years



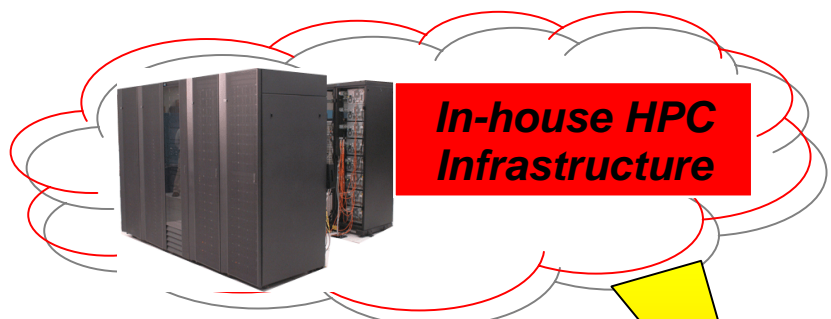
nVIDIA Tesla Hardware Offerings

- Processor
 - Single precision IEEE 754 floating point
 - ~140W (estimate)
 - 518GF/s Peak
 - 76.8GB/s peak memory
 - IEEE 754 single-precision floating point
 - Windows and Linux support
- Single GPU chip PCI-E(16) add-in board
 - 170W
 - 2 slot width
 - 1.5GB dedicated memory
- 1U Server
 - 550W – 800W
 - 4 GPU (2.07 TF/s)
 - Connection to 1-2 x86 server via x16 PCI-E adapter
- Dual GPU desktide offering
 - 2 GPU (1 TF/s)
 - Connection to x86 workstation via PCI-E adapter



Deep Computing Capacity on Demand

A security-rich extension of the client's in-house environment



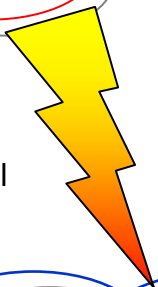
In-house HPC Infrastructure

*Fixed Capacity
Fixed Cost*

- Security-rich encrypted IPsec tunnel
- Ongoing access via the Internet
- Administrative commands and control
- Data transfer

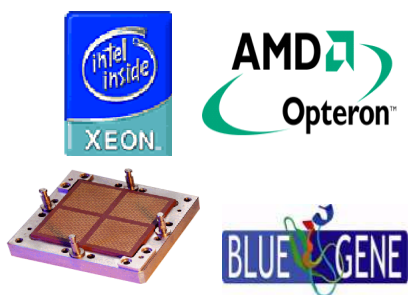
Virtual Private Network

- 9,768 CPUs
- 4,773 Servers
- 10's TB Storage



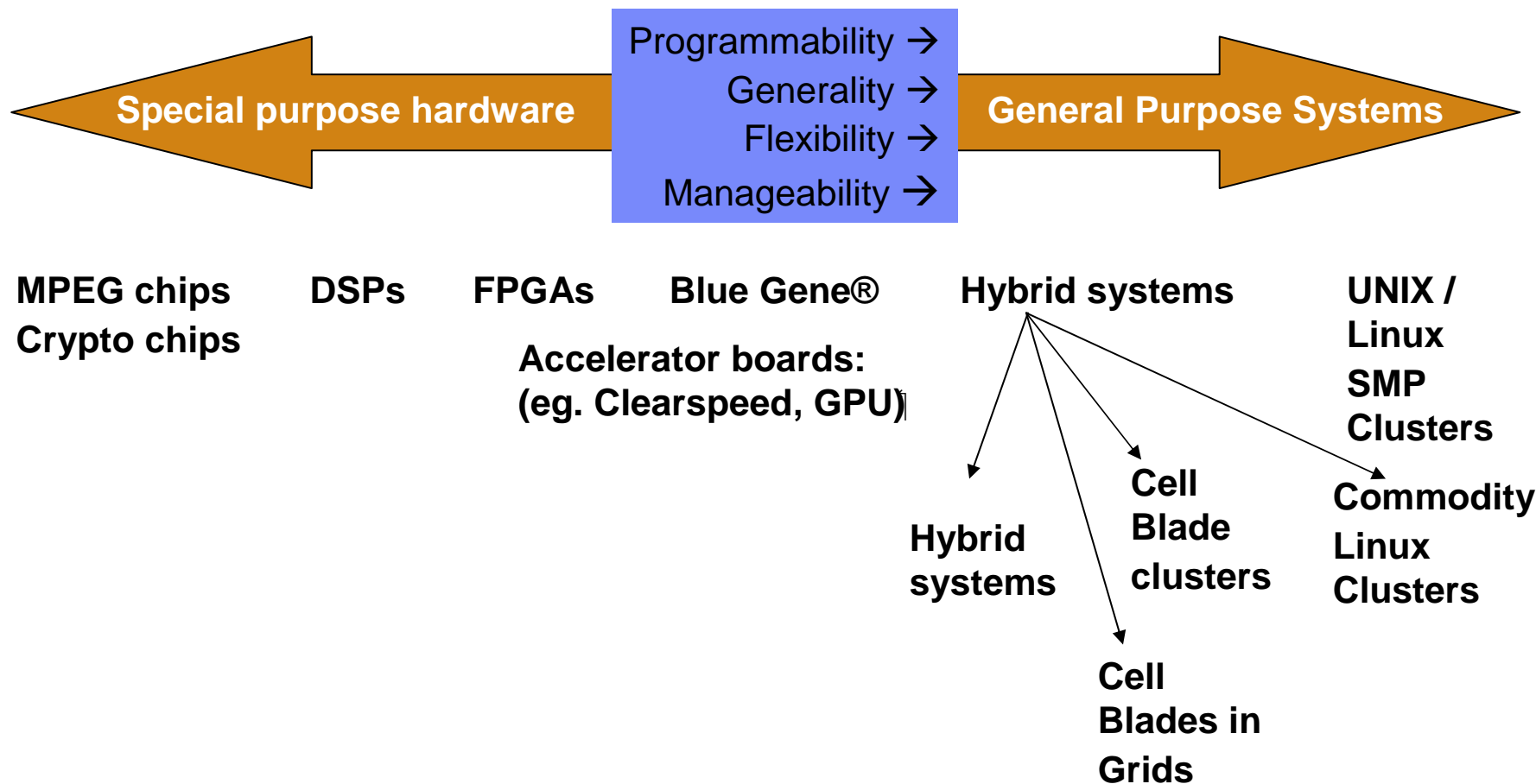
IBM DCCoD Centers

*Variable Capacity
Variable Cost*

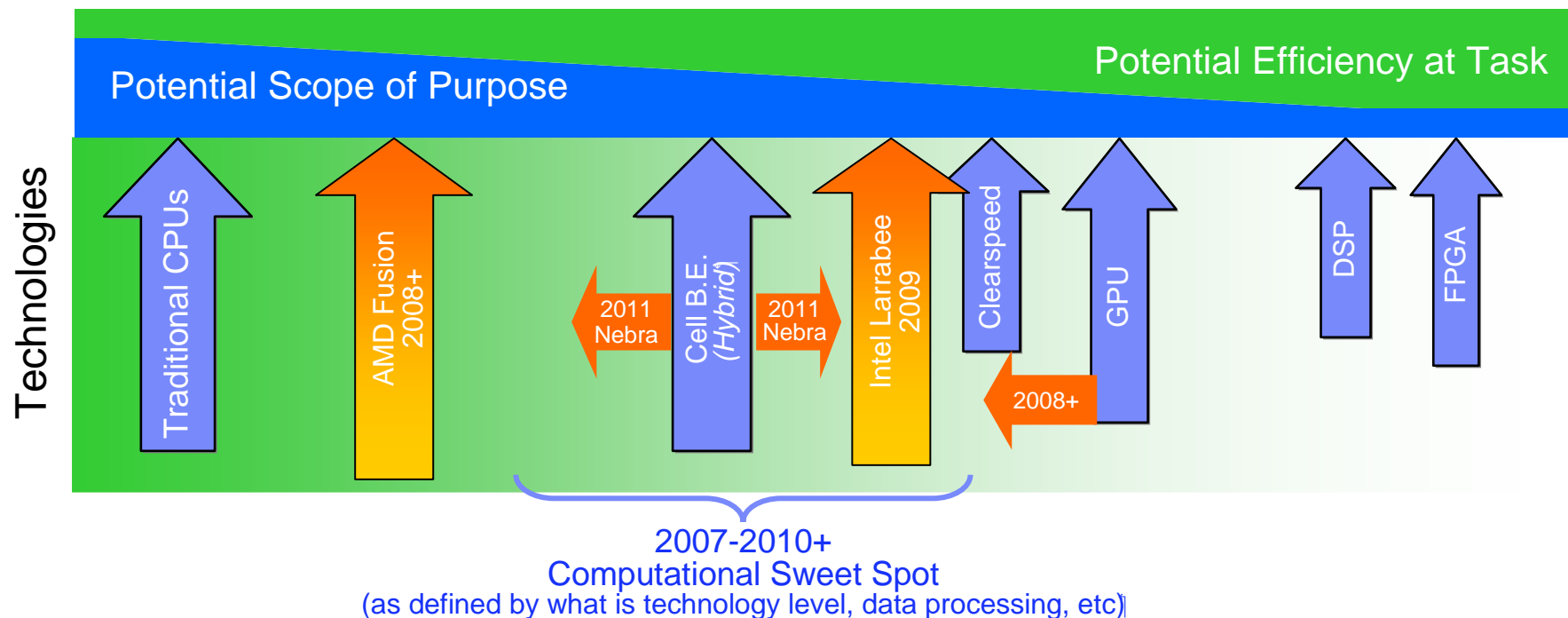


IBM POWER

Accelerator computing models



Technology Positioning



Cell/B.E.'s Hybrid Core Approach to cores allows it to cover a greater range

IBM to Build World's First Cell Broadband Engine™ Based Supercomputer (“RoadRunner”)

Revolutionary Hybrid Supercomputer at Los Alamos National Laboratory will harness Cell Broadband Engine and AMD Opteron™ technologies

Designed for 1.6 PetaFLOPS Peak DOUBLE Precision Floating Point Performance

**x86 Linux
Master Cluster**
AMD Opteron™
Intel® Xeon®
(Blade or 1U)



**Cell BE
Accelerator
Cluster**



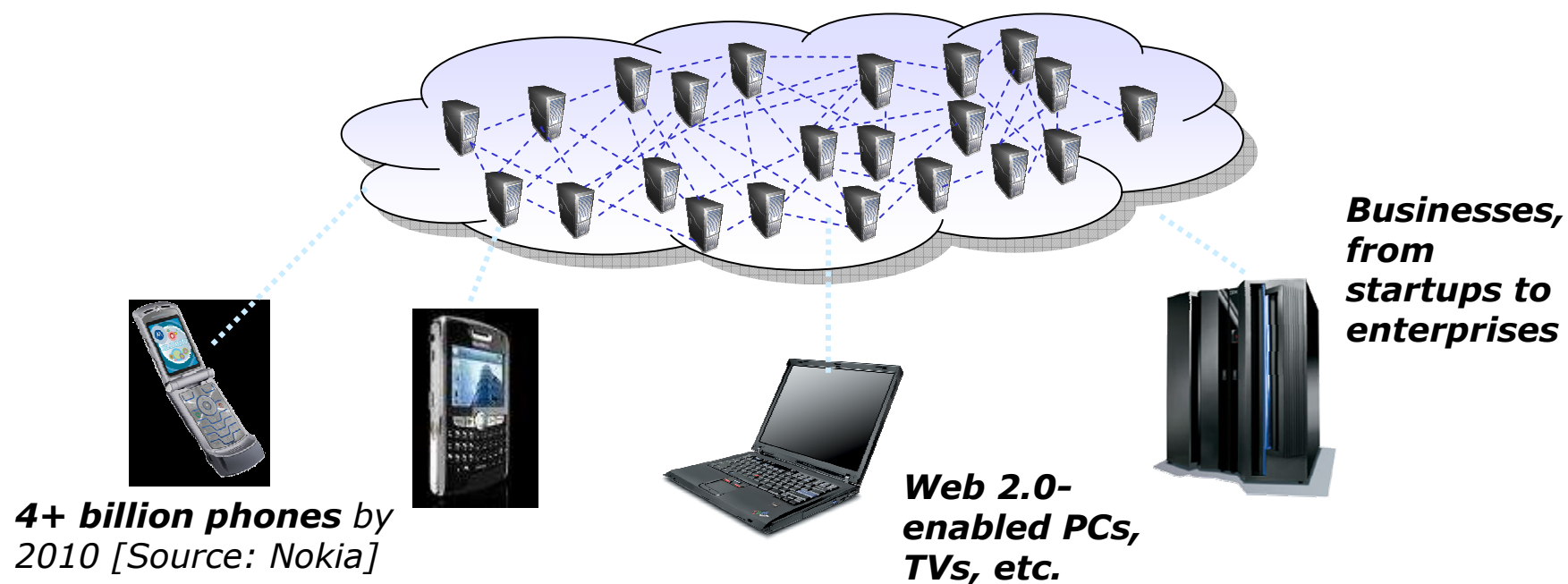
GFlop/sec summary:

- ~7,000 dual-core Opterons
 - ~50 TeraFlop/s (total)
- ~13,000 eDP Cell chips
 - 1.4 PetaFlop/s (Cell)



What is Cloud Computing?

*An emerging computing paradigm where data and services reside in **massively scalable** data centers and can be ubiquitously accessed from any connected devices over the internet.*



Technology Incubation Cloud for IBM Employees



Enabling the Global IBM community to collaborate, incubate and deploy their latest innovations



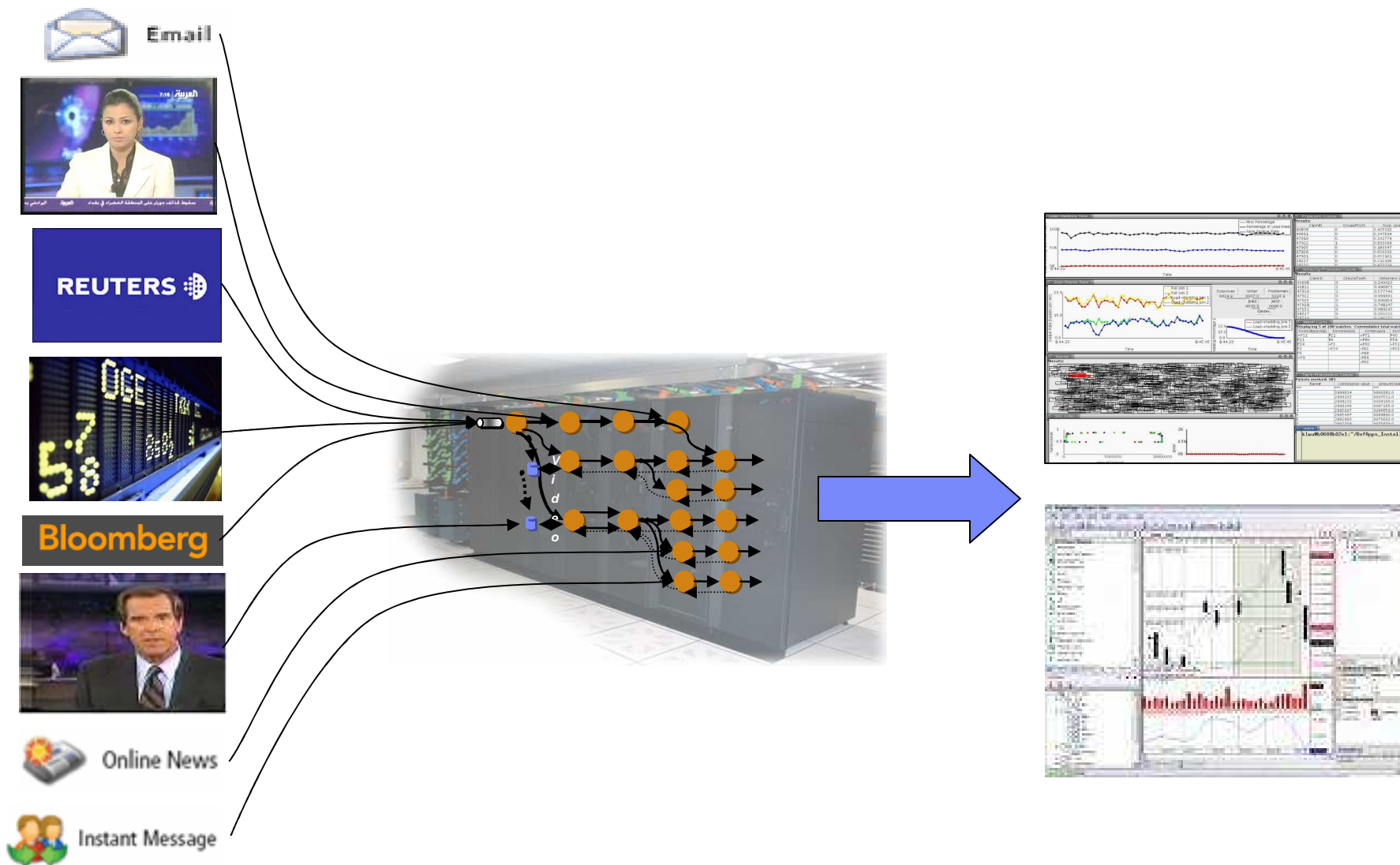
IBM Research: Stream processing

- New computing architecture
- Pull information from anywhere in real time
- Ultra-low latency, ultra-high throughput
- Financial market uses:
 - Market data feed processing
 - Algorithmic / automated trading
 - Risk management
 - Compliance management and market surveillance



IBM “System S”
prototype running
at T.J. Watson
Research Center

Many types of streaming data – one platform



Demo Scenario: Fear and Opportunity in the Gulf

Hurricane Dean Upgraded to Category 5 Path Projected through Gulf... Oil Stocks Uniformly Down

on Dean

Associated Press 08.20.07, 12:49 PM ET

Popular Videos	
SportsMoney: Wreckless Robby	
The T-Shirt That Texts	
The King?s Business Lives On	
Nick Cannon "The Entrepren-tainer"	
Hip Hop Cash Kings	

NEW YORK -Following is a summary of top stories in the energy sector at midday Monday.

Oil Prices Drop as Dean's Gulf Threat Diminishes

Energy prices slumped lower Monday as Hurricane Dean muscled its way toward Mexico's Gulf Coast, apparently posing little risk to major U.S. oil rigs and refineries farther north.

Related Quotes		
BP	63.89	-0.69
COP	78.67	-0.16
CVX	85.57	-1.83
MRQ	51.25	-2.19
SUN	85.57	-1.83
VLO	63.06	-1.53
XOM	83.08	-1.06

Light, sweet crude for September delivery fell \$1.40 to \$70.58 a barrel in midday trading on the New York Mercantile Exchange. Gasoline futures lost 9.8 cents to \$1.941 a gallon.

Hurricane Dean, a Category 4 storm, was forecast to cross over Mexico's Yucatan Peninsula Monday and travel west. Last week, prospects that the developing storm could threaten the U.S. Gulf Coast led traders to push oil prices up over \$73 a barrel.

Royal Dutch Shell PLC said it would evacuate 275 nonessential personnel from the Gulf, adding to the 188 evacuated before Tropical Storm Erin struck Texas last week. Chevron Corp. plans to evacuate a small number of nonessential personnel from deep water facilities, but said production would continue at normal levels.

Exxon Mobil Corp., BP PLC and Valero Energy Corp. said they are monitoring Dean, but have not yet evacuated any workers.

Aluminum maker Alcoa Inc. temporarily suspended production at its Jamalco alumina refinery in Clarendon, Jamaica, as a safety precaution before the arrival of Hurricane Dean. The storm hit Jamaica on

Same story, viewed 2 hours later

Associated Press

Energy Midday Roundup: Oil Down on Dean

Associated Press 08.20.07, 12:49 PM ET

Popular Videos	
SportsMoney: Wreckless Robby	
The T-Shirt That Texts	
The King?s Business Lives On	
Nick Cannon "The Entrepren-tainer"	
Hip Hop Cash Kings	

NEW YORK -Following is a summary of top stories in the energy sector at midday Monday.

Oil Prices Drop as Dean's Gulf Threat Diminishes

Energy prices slumped lower Monday as Hurricane Dean muscled its way toward Mexico's Gulf Coast, apparently posing little risk to major U.S. oil rigs and refineries farther north.

Related Quotes		
APA	76.18	-0.53
ATPG	41.50	-1.74
BBG	37.49	-1.13
BEXP	4.66	+0.03
BP	64.55	-0.03
CVX	82.99	-1.58
MRQ	52.82	-0.98
CVX	83.09	-0.79
GE	38.23	-0.32
HFG	60.57	-1.33
HNR	11.30	+0.13
KET	31.67	-0.38
XOM	83.08	-1.06
PTEN	22.00	-0.18

Light, sweet crude for September delivery fell \$1.40 to \$70.58 a barrel in midday trading on the New York Mercantile Exchange. Gasoline futures lost 9.8 cents to \$1.941 a gallon.

Dean, a Category 4 storm, was forecast to cross over Mexico's Yucatan Peninsula Monday and travel west. Last week, prospects that the developing storm could threaten the U.S. Gulf Coast led traders to push oil prices up over \$73 a barrel.

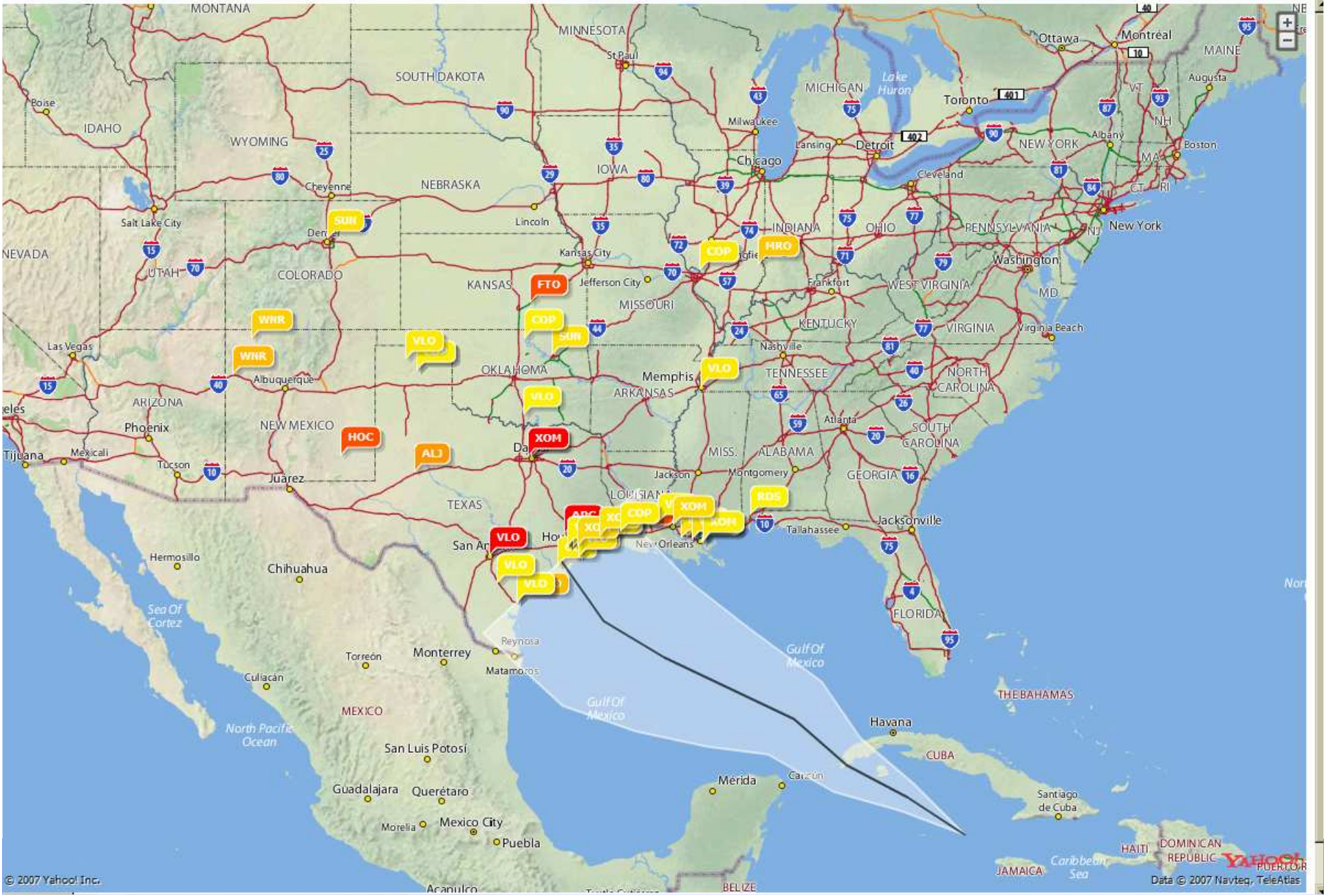
Royal Dutch Shell PLC said it would evacuate 275 nonessential personnel from the Gulf, adding to the 188 evacuated before Tropical Storm Erin struck Texas last week. Chevron Corp. plans to evacuate a small number of personnel from deep water facilities, but said production would continue at normal levels.

Exxon Mobil Corp., BP PLC and Valero Energy Corp. said they are monitoring Dean, but have not yet evacuated any workers.

Aluminum maker Alcoa Inc. temporarily suspended production at its Jamalco alumina refinery in Clarendon, Jamaica, as a safety precaution before the arrival of Hurricane Dean. The storm hit Jamaica on

Others are up, showing recovery

Properties with significant assets in path are still down





IBM Systems & Technology Group

Thank you