BIG DATA IN OIL AND GAS: HOW TO TAP ITS FULL POTENTIAL

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The oil and gas industry is data-driven. The industry depends on information technology to increase the speed of finding oil, enhance oil production, and reduce health, safety, and environment risks that come with equipment failure or operator error. Join this informative 1-hour WebTech featuring IDC Energy Insights analyst Jill Feblowitz and leading energy experts from Hitachi Data Systems, who will explore key findings from a recent IDC Energy Insights examination of big data and analytics in upstream oil and gas.

By attending this webcast, you’ll learn how to

- Benefit from the newest technology innovations in upstream oil and gas
- Improve geoscience workflows, resulting in more accurate and reliable results
- Create big-data solutions that meet your scalability and performance requirements
- Build true big-data solutions that are easier to procure, service and support on a global basis
SPEAKERS

Jill Feblowitz, Vice President, IDC Energy Insights

Bert Beals, Chief Technologist, Energy Industries, Hitachi Data Systems

Larry Rice, Global Director, Energy Industries, Hitachi Data Systems

Bjorn Andersson, Director, Solutions Marketing, Energy Industries, Hitachi Data Systems

Nick Weston, Director, Alliances and Channels, Energy Industries, Hitachi Data Systems.
AGENDA

- Big data in upstream oil and gas, IDC insights – Jill Feblowitz
- Hitachi Data Systems industry solutions overview – Larry Rice
- Optimized workflows for energy exploration and production, HDS enhanced backup and recovery solution for the Schlumberger Petrel platform – Bert Beals
- High throughput storage for the energy industry, HDS with Lustre solution – Bjorn Andersson
Big Deal about Big Data in Upstream Oil and Gas

Jill Feblowitz, Vice President
Up for discussion…

- Business scenarios in upstream oil and gas
- Big Data potential
- Recommendations
Business Scenario
Economic, Political, Social/Environmental

**Economic**
- Oil prices - > Unconventional
- Natural Gas Prices - > Efficiency
- Impact of Incidents - > Manage EH&S Risk
- Large Capital Projects - > Management

**Political**
- Competitiveness/Partnership with NOC - > Security, JV Management
- Regulation of Commodity Trading - > Compliance
- Regulations of EH&S, Emissions - > Compliance
- Security Threats - > Compliance, Security

**Social/Environmental**
- Extreme Weather Events - > Supply Chain Risk Management
- Organized Opposition - > Manage PR, Security
- Talent Shortage - > Efficiency, Recruitment, Retention, Training
Security and the influx of data brings together engineering and operational disciplines with IT.
Business Scenario

A Period of Rapid Change

- New and more expensive resources
- Change in location of resources and demand
- More volatile and uncertain prices for oil and gas
- Need to address risks – health, safety and environment
- Talent wars
- Technology innovations
Big Data Potential

Defining Big Data and Analytics

Big Data and analytics technologies describe a new generation of technologies and architectures designed to economically extract value from very large volumes of a wide variety of data (structured and unstructured) by enabling high-velocity capture, discovery, and/or analysis.
Big Data Potential

Supporting Big Data & Analytics

Decision Support & Automation Interface

Applications with functionality required to support collaboration, scenario evaluation, risk management, and decision capture and retention.

Analytics & Discovery

This layer includes software for ad-hoc discovery, and deep analytics and software that supports real-time analysis and automated, rules-based transactional decision making.

Data Organization & Management

Refers to software that processes and prepares all types of data for analysis. This layer extracts, cleanses, normalizes, tags, and integrates data.

Infrastructure

The foundation of the stack includes the use of industry standard servers, networks, storage, and clustering software used for scale out deployment of Big Data technology.
Big Data Potential
Volume, Velocity and Variety

- **More Volume**
  - Exploration: WAZ and IsoMetrix
  - Drilling: Nuclear, electromagnetic, acoustic
  - Production: Optical sensors

  **Potential Value**
  - Clearer view of potential resources
  - Help guide a fracking process
  - Show the way to enhancing production

- **More Velocity**
  - Real-time data from SCADA, drill heads, flow sensors, or condition sensors
  - Stream vs. batch processing
  - Complexity involving many engineering disciplines

  **Potential Value**
  - When consequences of failure are great
  - When a delay in processing data may mean missing a bid for an oilfield

- **More Variety**
  - Structured: Time series, relational
  - Unstructured: CAD drawings, specifications, seismic, well log or daily drilling reports
  - Semi-structured: Processed data

  **Potential Value**
  - Access data previously inaccessible due to multiple access patterns or unstructured nature of data
Big Data Potential

Data Access Challenges

- Data locked in applications on the desktop and cannot be shared efficiently
- Legacy data that is in proprietary formats
- Storage I/O requirements can still be a challenge. There may not be enough capacity or upload bandwidth.
- The workloads may be random or sequential or both in an unpredictable pattern.
Big Data Potential

Potential Use Cases

- **Exploration and development**
  - **Identifying traces.** Advanced analytics, such as pattern recognition, applied to a more comprehensive set of data collected during seismic acquisition to identify potentially productive seismic trace signatures previously overlooked.
  - **Enhance exploration efforts.** Historical drilling and production data from a nearby to help geologists and geophysicists verify their assumptions in their analysis of a field where environmental regulations restrict new surveys.
  - **Acreage assessment and prospect generation.** Analytics applied to geospatial data, news feeds, oil and gas reports, or other syndicated feeds to provide competitive intelligence on where to submit bids for leases.

- **Drilling and completions**
  - **Predict drilling success.** Beyond monitoring and alerting based on limited data, apply to real-time "big" drilling data to identify anomalies based on multiple conditions or predict the likelihood of drilling success.
Big Data Potential

Potential Use Cases

- **Production and Operations**
  - **Performance forecasting.** Forecast production at tens of thousands of wells. Aging wells where the forecast does not meet a predetermined production threshold are flagged for immediate remediation.
  - **Enhanced oil recovery.** Analytics applied to a variety of Big Data at once — seismic, drilling, and production data — could help reservoir engineers map changes in the reservoir over time and provide decision support to production engineers for making changes in lifting methods. This type of approach could also be used to guide fracking in shale gas plays.
  - **Predictive maintenance.** Pressure, volume, and temperature can be collected and analyzed together and compared with the past history of equipment failure, advanced analytics can be applied to predict potential failures. With remote locations being able to plan maintenance on critical assets is important, especially if work requires purchase of specialized equipment.

- **Enterprise**
  - **Talent search.** Performing social business scans in the service of recruitment. Scan for image and reputation and create a strategy to enhance its reputation as a good place to work. Or identify likely recruitment targets who fit a desired profile.
Recommendations

What to Look for…

A solution that meets performance and I/O storage challenges:

✓ Reliability and availability of I/O storage
✓ High-performance file management
✓ More efficient workflow
Recommendations

- Recognize the value of untapped data assets; build use cases to address the challenges and connect those use cases to business value.
- Understand the competitive implications of operating without all the information at your disposal.
- Conduct a gap analysis to determine what new technology and staff investments are required.
Recommendations

- Formulate a Big Data strategy that includes the evaluation of decision makers' requirements, decision processes, existing and new technology, and the availability and quality of data.

- Take into account the requirements for a shared environment that supports the total workflow of a workgroup.

- Consider a shared services model with other oil and gas companies to reduce costs.
HITACHI DATA SYSTEMS
UNIQUELY STRUCTURED FOR BUILDING VERTICAL SOLUTIONS

LARRY RICE
GLOBAL DIRECTOR, ENERGY INDUSTRIES
HDS: TRUSTED BY LEADING ORGANIZATIONS

FORTUNE GLOBAL 500 COMPANIES

9/10 of technology firms
3/4 of healthcare and telco
>1/2 of energy, retail, manufacturing, insurance, transportation, financial services

82% of Fortune Global 100
HDS: GLOBAL REACH

5,900
EMPLOYEES

100+
COUNTRIES
HDS: GLOBAL DEVELOPMENT AND DISTRIBUTION

R&D
- UNITED STATES
- CALIFORNIA
- MASSACHUSETTS
- WASHINGTON
- UNITED KINGDOM
- JAPAN

MANUFACTURING AND DISTRIBUTION
- JAPAN
- UNITED STATES
- FRANCE
- NETHERLANDS
- SINGAPORE
“Hitachi [enterprise] growth rate of high-30s% was roughly 50 [percentage points] faster than EMC high-end growth rate.”

Shebly Seyrafi
FBN SECURITIES
MAY 2012
HITACHI, LTD.: DEEP INNOVATION RESOURCES

- Founded in 1910
- 900 subsidiaries
- 324,000 employees
- Over 760 PhDs

us$5B
INNOVATION BUDGET

#38 in the 2012 FORTUNE Global 500
HITACHI, LTD. AND HDS: GLOBAL FOOTPRINT

GLOBAL FOOTPRINT

- 138 Companies
- 9,488 Employees

EUROPE

- 270 Companies
- 99,216 Employees

ASIA (INCL. CHINA)

- 365 Companies
- 230,948 Employees

JAPAN

- 80 Companies
- 14,667 Employees

NORTH AMERICA

- 47 Companies
- 5,427 Employees

OTHER AREAS
HITACHI, LTD. MAKEUP

21% OF R&D FUNDS DIRECTED AT INFORMATION AND TELECOMMUNICATIONS BUSINESS

- Information and Telecommunications: 16%
- Social Infrastructure and Industrial: 11%
- Construction Machinery: 7%
- Electronics: 10%
- High Functional Materials: 13%
- Components and Devices: 7%
- Automotive: 8%
- Digital Media and Consumer: 8%
- Financial Services: 3%
- Other: 9%

US$118B FY11
BIG DATA DRIVING BIG INNOVATION TODAY

Hitachi Transportation: Bullet Trains
- Track/train sensors
- Keep trains on schedule
- Proactive maintenance

Hitachi Power: Power Stations
- Telemetry from seismic sensors
- Time series data

Hitachi Construction: Excavators
- Operational data from sensors
- Insight for fleet managers

Hitachi, Ltd.: Tokyo Stock Exchange
- High-speed index service
- 1/100th faster
LEADING AUTOMAKERS USE HITACHI FOR HYBRID MOTORS

“Hitachi is the greenest storage vendor in all the case studies by a wide margin.”

ITCentrix

SOURCE: The Business Case for Green Storage Equipment, ITCentrix, July 2011
### Hitachi Technology Use Cases

- Data acquisition (WesternGeco)
- Quality control (processing and analysis)
- Seismic processing (Omega, SeisSpace (IOP and Throughput))
- Interpretation (Petrel)
- Reservoir modeling/characterization
- Home directories
- Corporate IT

### Key Benefits

- Increasing speed to discovery
- Enhancing production
- Reducing risks, especially in the areas of health, safety, and environment
- Reducing costs, such as nonproductive time
HITACHI ENHANCED BACKUP AND RECOVERY SOLUTION FOR SCHLUMBERGER PETREL PLATFORM

BERT BEALS CHIEF TECHNOLOGIST, ENERGY INDUSTRIES
SCHLUMBERGER PETREL E&P WORKFLOW
ENVIRONMENT REQUIREMENTS

PETREL RUNS ON WINDOWS PC WORKSTATIONS

- Collaborative work on a project basis
- Workflows and data need to be shared
- Multiple scenarios need to be explored
- Data needs to be available and protected
ENHANCED BACKUP AND RECOVERY (EBR) FOR SCHLUMBERGER PETREL

INTEGRATED PLUG-IN TO THE PETREL PLATFORM

- Takes the Petrel platform to the next level
  - Transparently synchronize local storage with central NAS
    - Enable data consistency and sharing from central storage
    - Automatic synchronization after network failure or after being mobile
  - Easy and efficient exploration of what-if scenarios
    - Millions of snapshots per file system
    - Hierarchical view for intuitive management of copies
  - Built for workgroups
    - Permission-based access to data
    - Separate administration role for workgroup or system
  - Access to advanced NAS functionality
    - Efficient and hardware accelerated storage
    - Enterprise-class data management and protection
SIMPLE MANAGEMENT OF EBR SNAPSHOTS
EBR SOLUTION WITH HNAS

HNAS FUNCTIONALITY AVAILABLE FROM WITHIN PETREL

- Nondisruptive and transparent synchronization with central storage for sharing in workgroup
- Intuitive management of what-if scenarios with several orders of magnitude more snapshot capacity than the closest competitor
- Enterprise-class management and protection of data

- Enterprise-class performance and scalability
- Hardware accelerated architecture
- Transparent data migration
- Intelligent file tiering
- Replication and DR

EBR Solution with HNAS
HIGH-THROUGHPUT SOLUTION WITH LUSTRE

BJORN ANDERSSON DIRECTOR, SOLUTIONS MARKETING, ENERGY INDUSTRIES
BIG DATA: THE CHALLENGE AND OPPORTUNITY

TAXING THE LIMITS OF TRADITIONAL INFRASTRUCTURE AND TOOLS

Volume
- PB Petabytes
- EB Exabytes
- ZB Zettabytes

Variety
- Unstructured
- Semi-structured
- Rich media

Velocity
- High-velocity ingest
- Live feeds
- Real-time decisions

Complexity

Versatility

Vitality

Value

...
BIG DATA IN ACTION IN OIL AND GAS

Exploration
- Geo-technical applications

Production
- Resource planning
- Business intelligence

Refining
- Business intelligence

Distribution
- Databases

Marketing and retail
- Office applications

Seismic data
Bore hole sensors
Environmental sensors
Weather data

Production utilization
Storage capacities
Spot pricing (trading)
Transportation
Inventory levels
Demand and forecast
Location data

Petabyte to Real-Time Unstructured Data

Big Data Analysis
- Business Decisions
- Production levels
- Inventory locations
- Production planning
- Safety

Office applications
HDS HIGH-THROUGHPUT SOLUTION WITH LUSTRE

COMPLEMENTS HNAS FOR THE MOST CAPABLE FILE STORAGE

- Combines HDS high availability with Lustre scalability
- Easy design and deployment with pre-architected building blocks
- Simplified management with included management tools
- Streamlined vendor management with single infrastructure vendor
- Global presence and support

HNAS
High-Performance NAS

Portfolio
Scalability and Functionality

HDS High-Throughput Solution with Lustre
HITACHI DATA SYSTEMS HIGH THROUGHPUT STORAGE SOLUTION WITH LUSTRE

SINGLE RACK CONFIGURATION

2nd High Availability Object Storage Server (OSS) Pair

Management and Network

High Availability Meta Data Server (MDS) Cluster

1st High Availability Object Storage Server (OSS) Pair

Solution Framework
- 1RU x86 Rack Server (Running Intel Manager for Lustre and Hitachi Command Suite)
- Network Switch

MDS Building Block
- 1RU x86 Rack Server
- 1RU x86 Rack Server
- HUS 110 (int. disk)

OSS Building Block
- 2RU x86 Rack Server
- 2RU x86 Rack Server
- HUS 150
- 5RU 84 disk tray
- 5RU 84 disk tray

12 GB/s target performance, 720 TB Usable capacity (1PB raw)
EASY SCALABILITY OPTIONS FOR LUSTRE

ADD FOR CAPACITY AND PERFORMANCE OR JUST CAPACITY

2x More Performance
4 Additional OSS

2x More Capacity
8 More Ultra-Dense Disk Trays

Base Configuration
1 HA MDS, 4 OSS

(Examples only – more options available)
WHY HDS FOR BIG-DATA SOLUTIONS IN OIL AND GAS

- Solutions for more efficient application workflows
  - Reliability and availability of I/O storage for production environments
  - High-performance file management for demanding applications

- Broad solutions offerings from HDS
  - Integration of servers, storage, software and services

- Access to deep technology portfolio beyond traditional IT
  - >US$5B Hitachi innovation budget

- Strategic partnerships and industry knowledge
  - Industry-specific solutions for increased productivity and efficiency

- Global presence
  - 5,900 HDS employees in 100+ countries. Part of US$118B Hitachi Group
FOR NEXT STEPS AND TO LEARN MORE

- HDS Energy Resource Center
- HDS.COM Energy Solutions Site
- Hitachi Storage Adapter for Petrel™ solution
  - This is the solution that was formerly called “Hitachi Enhance Backup and Recovery (EBR)”
- HDS Lustre Solution Profile
- Speak to an HDS Expert (North America toll-free number 1-888-234-5601)
QUESTIONS AND DISCUSSION
UPCOMING WEBTECHS

- **Big Data Webcast Series**
  - Capitalize on Big Data, January 30, on-demand version available at www.hds.com/webtech
  - **Big Data in Oil and Gas: How to Tap Its Full Potential.** Today.
  - **A High-Performance, Scalable Big Data Appliance,** February 20, 9 a.m. PT, 12 p.m. ET
  - **Big Data: Shining the Light on Enterprise Dark Data,** April 17, 9 a.m. PT, 12 p.m. ET

And more to come.

Check [www.hds.com/webtech](http://www.hds.com/webtech) for

- Links to the recording, the presentation and Q&A (available next week)
- Schedule and registration for upcoming WebTech sessions
THANK YOU