

5000.0.0

Release Notes

Landmark

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3D Drill View, 3D Drill View KM, 3DFS, 3D Surveillance, 3DView, Active Field Surveillance, Active Reservoir Surveillance, ADC, Advanced Data Transfer, ARIES, ARIES DecisionSuite, AssetConnect, Asset Decision Solution, Asset Development Center, Asset Journal, AssetLink, AssetLink Advisor, AssetLink Director, AssetLink Observer, AssetObserver, AssetObserver Advisor, Asset Performance, AssetPlanner, AssetSolver, AssetSolver Online, AssetView, BLITZPAK, CasingSeat, COMPASS, Corporate Data Archiver, Corporate Data Store, Data Analyzer, DataManager, DataStar, DBPlot, DecisionSpace, DecisionsSpace 3D Drill View KM, DecisionSpace AssetLink, DecisionSpace AssetPlanner, DecisionSpace AssetSolver, DecisionSpace AssetView 2D, DecisionSpace AssetView 3D, DecisionSpace Atomic Meshing, DecisionSpace Decision Management Systems(DMS), DecisionSpace for Production, DecisionSpace Nexus, DecisionSpace PowerGrid, DecisionSpace PowerModel, DecisionSpace PrecisionTarget, DecisionSpace Reservoir, DecisionSpace TracPlanner, DecisionSpace Well Seismic Fusion, DecisionSpace Wellsolver, DecisionSuite, DepthTeam, DepthTeam Explorer, DepthTeam Express, DepthTeam Extreme, DepthTeam Interpreter, Desktop Navigator, DESKTOP-PVT, DESKTOP-VIP, DEX, DIMS, Discovery, Discovery Asset, Discovery PowerStation, DMS, Drillability Suite, Drilling Desktop, DrillModel, Drill-to-the-Earth Model, DSS, Dynamic Reservoir Management, Dynamic Surveillance System, EarthCube, EDM, EDT, eLandmark, Engineer's Data Model, Engineer's Desktop, Engineer's Link, ESP, Event Similarity Prediction, Executive Assistant, ezFault, ezSurface, ezTracker, FastTrack, FG+, FieldPlan, Field Scenario Planner, FZAP!, GeoAtlas, GeoDataLoad, GeoGraphix, GeoGraphix Exploration System, GeoLink, GeoProbe, GeoProbe GF DataServer, GES, GESXplorer, GMAplus, GMI Imager, GRIDGENR, Handheld Field Operator, HHFO, I² Enterprise, iDIMS, IsoMap, iWellFile, Landmark, Landmark Decision Center, Landmark & Design, Landmark Logo and Design, Landscape, Lattix, LeaseMap, LMK Resources, LogEdit, LogM, LogPrep, Magic Earth, MagicDesk, Make Great Decisions, MathPack, MIMIC, MIMIC+, Model Builder, MyLandmark, Nexus, Object MP, OpenBooks, Open Explorer, OpenJournal, OpenSGM, OpenVision, OpenWells, OpenWire, OpenWorks, OpenWorks Development Kit, OpenWorks Well File, OpenWorks Production, PAL, Parallel-VIP, PetroBank, PetroBank Master Data Store, PetroWorks, PetroWorks Asset, PetroWorks Pro, PetroWorks ULTRA, PlotView, Point Gridding Plus, Pointing Dispatcher, PostStack, PostStack ESP, PostStack Family, PowerCalculator, PowerExplorer, PowerExplorer Connect, PowerGrid, PowerHub, Power Interpretation, PowerJournal, PowerModel, PowerView, PrecisionTarget, Presgraf, PRIZM, Production Asset Manager, PROFILE, Project Administrator, ProMAGIC, ProMAGIC Connect, ProMAGIC Server, ProMAX, ProMAX 2D, ProMAX 3D, ProMAX 3DPDSM, ProMax 4D, ProMax Family, ProMAX MVA, ProMAX VSP, pSTAx, Query Builder, Quick, Quick+, QUICKDIF, QuickWell, QuickWell+, QUIKDIF, QUIKRAY, QUIKSHOT, QUIKVSP, RAVE, RAYMAP, RAYMAP+, Real Freedom, Real Time Asset Management Center, Real Time Decision Center, Real Time Operations Center, Real Time Production Surveillance, Real Time Surveillance, Real-Time View, Reference Data Manager, RESev, ResMap, RightTime, RTOC, SCAN, SeisCube, SeisMap, SeisModel, SeisSpace, SeisVision, SeisWell, SeisWorks, SeisWorks 2D, SeisWorks 3D, SeisWorks PowerCalculator, SeisWorks PowerJournal, SeisWorks PowerView, SeisXchange, Semblance Computation and Analysis, Sierra Family, SigmaView, SimConnect, SimConvert, SimDataStudio, SimResults, SimResults+, SimResults+3D, SIVA, SIVA+, smartSECTION, Spatializer, SpecDecomp, StrataAmp, StrataMap, StrataModel, StrataSim, StratWorks, StrataWorks 3D, StreamCalc, StressCheck, STRUCT, Structure Cube, Surf & Connect, SynTool, SystemStart, SystemStart for Clients, SystemStart for Servers, SystemStart for Storage, Tanks & Tubes, TDQ, Team Workspace, TERAS, The Engineer's Desktop, Total Drilling Performance, TOW/cs, TOW/cs Revenue Interface, TracPlanner, Trend Form Gridding, Turbo Synthetics, VESPA, VESPA+, VIP, VIP-COMP, VIP-CORE, VIPDataStudio, VIP-DUAL, VIP-ENCORE, VIP-EXECUTIVE, VIP-Local Grid Refinement, VIP-THERM, WavX, Web Editor, Wellbase, Wellbore Planner, Wellbore Planner Connect, WELLCAT, WELLPLAN, Well Seismic Fusion, Wellsolver, WellXchange, WOW, Xsection, You're in Control. Experience the difference, ZAP!, and Z-MAP Plus are trademarks, registered trademarks or service marks of Landmark Graphics Corporation.

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Third Party Applications

Landmark acknowledges that certain third party code has been bundled with, or embedded in, Landmark's software. The licensors of this third party code, and the terms and conditions of their respective licenses, may be found in the release notes of the appropriate point product.

Introduction

Welcome to Release 5000.0.0. Release 5000.0.0 is Landmark's first synchronous release of the DecisionSpace environment which accommodates your existing technologies whether that includes other vendor, proprietary, or Landmark solutions. Release 5000.0.0 delivers enhanced functionality and performance along with improved interoperability among applications for your E&P workflows. The DecisionSpace environment provides an open platform that allows you to adopt a "best-of-breed" strategy and leverage your current IT investments.

This release upgrades Landmark's product portfolio to support newer platforms, operating systems, processors, other vendors' software, video cards, and more.

New Workflows

In addition to the support for newer platforms this release includes significant data model changes and application interoperability driving visionary new workflows. Click on the page number's hyperlink to go to the workflow.

- [OpenWorks Software Project Optimization](#) on page **17**
- [High-Performance Geoscience Interpretation Workflow](#) on page **30**
- [Optimized Reservoir Decisions](#) on page **37**
- [Prestack Seismic on the Desktop](#) on page **46**

Major Improvements to Release Components

- **Interoperability of Applications.** The Landmark suite of products share the same project databases (for example, OpenWorks and EDM) and have common platforms that offer seamless interoperability and optimal performance.
- **Infrastructure.** Landmark continues to innovate in the DecisionSpace environment which is built on the principles of service-oriented architecture resulting in common components and services.
- **Supported Platforms and Components.** The release supports new platforms; operating systems; and third party applications (such as the Oracle Database and Macrovision FLEXnet Publisher). Providing such support helps you take advantage of the latest improvements in hardware and networking and offers better performance and larger processing capacities.
- **Software Development Kits.** New and updated Software Development Kits give you the flexibility to build your own workflows and solutions. The Engineer's Data Model and DecisionSpace Infrastructure software development kits are being added to the existing portfolio of the OpenWorks Development Kit (which also includes seismic data management).

The Release 5000.0.0 Program

Release 5000.0.0 will be delivered in several stages. The products that are scheduled to release in the first two stages are listed below.

December 2007

The tables below show the products that are included in the initial release of Release 5000.0.0. in December 2007.

Drilling and Completions	
CasingSeat (EDT application)	PROFILE (EDT application)
Collaborative Well Planning	Real-Time View (EDT application)
COMPASS (EDT application)	StressCheck (EDT application)
Data Analyzer	WELLPLAN (EDT application)
Information Management and Infrastructure	
AssetJournal	Team Workspace
EDM	
Reservoir Management	
DMS	Nexus simulator
FieldPlan	

First Quarter 2008

The following applications are expected to release in the first quarter of 2008.

Drilling and Completions	
3D Drill View KM	OpenWells
AFE Management System to EDT Link	OpenWire
EDT Epoch Resource Scheduler	Well Cost
iWellFile	Wellbore Planner
Geological and Geophysical Technologies	
DepthTeam Express	PowerCalculator
GeoProbe	PowerView
PetroWorks	Prestack Data Server
PostStack	SeisWorks

Geological and Geophysical Technologies (continued)	
StratWorks	Well Seismic Fusion
SynTool	Z-MAP Plus
TDQ	
Information Management and Infrastructure	
AssetView	PowerExplorer
DecisionSpace Infrastructure	PowerHub
OpenVision	WOW/CDA/PA
OpenWorks	
Reservoir Management	
Nexus	PowerGrid
Nexus Unified Desktop	VIP

Moving to Release 5000.0.0

Some applications require a specific version of the application before you upgrade to Release 5000.0.0. Below is a list of products along with the version of the application you must be on prior to moving to Release 5000.0.0.

Product	Version	Comments
Drilling and Completions		
3D Drill View KM	2003.19.1	
AFE Management System to EDT Link	2003.16.1.2	
CasingSeat	2003.21	Scripts are available to upgrade from 2003.11, 2003.14, or 2003.16 to 2003.21
Collaborative Well Planning	2003.19.1	
COMPASS	2003.21	Scripts are available to upgrade from 2003.11, 2003.14, or 2003.16 to 2003.21
Data Analyzer	2003.21	Scripts are available to upgrade from 2003.11, 2003.14, or 2003.16 to 2003.21
iWellFile	2003.21.1	
OpenWells	2003.21	Scripts are available to upgrade from 2003.11, 2003.14, 2003.16, or 2003.21.
OpenWire	2003.0.8.1 or greater	
Presgraf	2003.0.4	
PROFILE	2003.21	Scripts are available to upgrade from 2003.11, 2003.14, or 2003.16 to 2003.21
Real-Time View	2003.21	Scripts are available to upgrade from 2003.11, 2003.14, or 2003.16 to 2003.21

Product	Version	Comments
Drilling and Completions (continued)		
StressCheck	2003.21	Scripts are available to upgrade from 2003.11, 2003.14, or 2003.16 to 2003.21
Wellbore Planner	2003.12	
WELLCAT	2003.21.1 or 2003.0.4.x	
Well Cost	2003.16.1 or greater	
WELLPLAN	2003.21	Scripts are available to upgrade from 2003.11, 2003.14, or 2003.16 to 2003.21
Geological and Geophysical Applications		
PetroWorks	2003.12.1	Requires OW 5000.0.0
SeisWorks	2003.12.2	Requires OW 5000.0.0
StratWorks	2003.12.0	Requires OW 5000.0.0
SynTool	2003.12.0	Requires OW 5000.0.0 and SeisWorks 5000.0.0
TDQ	2003.12.1	Requires OW 5000.0.0 and SeisWorks 5000.0.0
Z-MAP Plus	2003.12.1	No requirements unless OW is installed, and then it must be OW 5000.0.0

Product	Version	Comments
Information Management and Infrastructure		
Corporate Data Store	2003.20.0.0 or newer	Database will be upgraded, application is a new install.
OpenWorks	2003.12.0, or newer	In OpenWorks 5000.0.0, the project upgrade process can upgrade individual projects as old as R98; however, if you want to upgrade projects with the batch upgrade process, the projects must be 2003.12.0, or newer. Projects can be migrated from an older version to Release 5000.0.0, but you must create a clean installation of OpenWorks 5000.0.0, and then migrate the old projects to the new installation one at a time.
PetroBank Master Data Store	2003.20.0.1	Database will be updated, application will be a new install
PowerExplorer	2003.20.0.0 or newer or 2003.20.1 or newer	
Reference Data Manager	N/A	This is always a new install.
Team Workspace	2003.20.0.0 or newer	
Production Optimization		
TOW/cs	TOW/cs 2003.14.0.2	

Discontinued Products

The following products will not be supported on the Release 5000.0.0 platforms. For more information, please contact your sales representative.

Drilling and Completions
DrillModel
Geological and Geophysical Technologies
PetroWorks ULTRA
GMI Imager
GeoProbe RSI
MVA/3DPSPDM
DepthTeam Extreme
SeisZip
Information Management and Infrastructure
Geoshare Half Links
Engineer's Link
OpenExplorer
Production Optimization
Desktop Navigator
OpenWire for Production

Before You Install

After confirming that your application is at the correct version for upgrading to Release 5000.0.0, you should review the application release notes *entirely*. The new Landmark Software Manager gives you the ability to read both the Release Notes and Installation Guides prior to downloading the application.

The Product Release Notes provide the necessary information about

- the specific platforms available for the application. (This information may be included in the Installation Guide.)
- enhancements and new functionality
- known problems affecting the release
- the defects fixed for the release.

About Electronic Software Delivery and DVDs

For Release 5000.0.0, Landmark is introducing Electronic Software Delivery. You will be able to download your software as soon as it is available instead of waiting for disks to be shipped to you. Landmark is working with its customers to determine who will have the ability to use this new system.

The customer interface for downloading products electronically is called Landmark Software Manager (LSM). It offers the opportunity to immediately download one or more applications or patches when it is convenient for you. LSM also gives you the opportunity to review the Release Notes and the Installation Guide prior to downloading the application or patch. You can then decide whether you want to download the release or patch.

In addition, if you cannot download the applications through LSM due to bandwidth problems or if you prefer media, Landmark will provide DVDs to customers who request them. You can use the LSM application to request the DVDs.

System Requirements

Supported Operating Systems

The chart below lists the Operating Systems for the Release 5000.0.0 supported platforms. All products will not be available on all systems. For example, most of the Drilling Applications are available only on Windows Operating Systems. In addition, some applications may run only on Linux and Solaris. Please refer to the Product Release notes or Installation Guide for the supported platforms for specific products.

<ul style="list-style-type: none"> Microsoft Products: <i>For DecisionSpace and Select Landmark Classic Technologies</i> 		
Microsoft Windows XP and Microsoft Windows 2003 Server 32 bit	IA32	X86_64
Microsoft Windows XP and Microsoft Windows 2003 Server 64 bit	X86_64	
<ul style="list-style-type: none"> Linux 		
Red Enterprise Linux 5.0 64 bit	X86_64 (<i>Note: The supported platform will be the x86_64 architecture, but some applications will be built in a 32-bit format.</i>)	
<ul style="list-style-type: none"> Solaris: <i>For Landmark Classic Technologies Only</i> 		
Sun Solaris 10 64 bit	SPARC (<i>Note: This supported platform will be the SPARC64 architecture, but some applications will be built in a 32-bit format.</i>)	
<ul style="list-style-type: none"> Application Hosting Environment 		

A note about Red Hat Linux support

The principal supported version of Red Hat Linux for the 5000.X Synchronous Release of Landmark's product suite is Red Hat Enterprise Linux (RHEL) 5. This is the platform on which Landmark will be testing its Release 5000 suite of products. However, because of the timing of the RHEL 5 release (March 2007), Landmark developed its 5000.X applications and performed initial testing on RHEL 4U4. Therefore, Landmark will provide support to customers who decide to deploy 5000.X solutions on RHEL 4U4 or RHEL 5.

Supported Components from Other Vendors

The charts below lists embedded and supported components that are used by many products. For a complete list of what is included in each product, please review the product's Release Notes.

Embedded
Oracle Database 10g Enterprise Edition
MacroVision FLEXnet Publisher
Blue Marble Geographics Calculator 6.3
Sun Java 1.6
ESRI MapObjects v2.4

Prerequisites
Microsoft .NET 2.0
Crystal Reports 11.5
Hummingbird Exceed 2007
Microsoft SQLServer 2005
Mozilla Firefox 1.4 or newer

Graphics Cards
NVIDIA Quadro FX family of cards

Installing Landmark Application Manager (LAM)

The Landmark Application Manager is delivered as a separate application and is not included in the OpenWorks application. For instructions on how to install this application, please review the *Landmark Application Manager Installation Guide*.

Third Party Applications License Agreements

Landmark uses various third party applications in its software. Information about third party applications is available for all products. The Release Notes will detail the third party information or define where the information is located. In addition, Landmark has included with most applications a file titled *Third_Party.pdf* which includes attribution and license information for all third party products used by Landmark. Third party information can be found at the following locations:

- the Release Notes
- at the location defined on page iii in the .pdf manuals
- in the online Help

Workflows

Four workflows have been created or enhanced for Release 5000.0.0. This section provides a description of each workflow and the products used in them. The index for the workflows is below.

- OpenWorks Software Product Optimization (page [17](#))
- High-Performance Geoscience Interpretation (page [30](#))
- Optimized Reservoir Decisions (page [37](#))
- Prestack Seismic on the Desktop (page [46](#))

OpenWorks Software Project Optimization

Applications Needed

- OpenWorks R2003 and Release 5000.0.0
- SeisWorks R2003
- Pre5000 Module (available from Landmark Customer Support)
- Text Editors (such as vi or Notepad)

Overview

Projects in OpenWorks and SeisWorks have been streamlined. Creating, restoring, and maintaining an OpenWorks project and the seismic data associated with the project have been simplified and enhanced. These changes were made to enhance the integration and data flow between all Landmark applications and to support the next generation of applications from Landmark.

These changes make it possible to:

- **Reduce data duplication** — An OpenWorks project (now called a *project database*) can be subsetted or viewed in an *interpretation project*, where the data in the interpretation project is shared dynamically by reference. Copies of data into multiple separate projects will not be required as they might have been in the past.
- **Enhance data security** — Access to the OpenWorks database is created only as an Oracle internal user. Access to project data, including seismic data, is controlled in each interpretation project. All seismic project data is now integrated into the OpenWorks project framework.
- **Support multiple CRSs (Cartographic Reference Systems)** — Each project database and each of its interpretation projects can have their own CRS. Cartographic conversion between the projects is automatic and dynamic.

- **Support processing history** — Seismic and horizon data can have a processing history attached to it.

The sections below provide more details on the changes. Click on the blue hyperlinks to read the information.

- [OpenWorks and SeisWorks Project Changes](#)
- [Data Changes](#)
- [Application Changes](#)
- [Interpretation Changes](#)
- [Accessing Data in Projects](#)

OpenWorks and SeisWorks Project Changes

SeisWorks projects and their management applications have been removed in Release 5000.0.0. Seismic projects and their interpretation data have been integrated into the OpenWorks project framework. OpenWorks projects have been expanded to include the concept of projects and subsets or views of projects. In Release 5000.0.0, the parent project is a *project database*, and a subset of a project database is an *interpretation project*. A project database is similar in concept to a SeisWorks master project, and an interpretation project is similar to a SeisWorks working project. The integration of OpenWorks and SeisWorks projects removes the need for `plist.dat`, `plist`, or `OW_PMPATH` for project data in Release 5000.0.0.

A project in an OpenWorks database contains some of the seismic and horizon data in the database itself and refers to other seismic and horizon files not contained in the database. In Release 5000.0.0, 2D and 3D seismic data sets and 3D horizons remain in files as well as other data such as color maps and format definitions.

This new structure allows you to have less duplication of data between projects. Previously, whether because of the need of a narrow area of interest or because of data security reasons, you may have duplicated the same data in a number of projects. This situation made it difficult to add or correct data across a number of projects. In Release 5000.0.0, a project database can hold all the data for an entire region, and interpretation projects can be created which focus on only parts of the region. All data in the interpretation project, except for interpretation data itself, refers to data in the project database. When data is added or changed, it

only needs to be added or changed in the project database. All the interpretation projects based on the project database will see the new data or changes. Also, since the non-interpretation data is in only one project database, fewer system resources are required than may have been required in previous versions of OpenWorks.

The subset of data in an interpretation project is determined by the coordinates of the interpretation project and by the well lists, 2D line lists, or 3D surveys you wish to include in the interpretation project. Each interpretation project can have a cartographic reference system (CRS) different from the project database or from other interpretation projects. Also, the manager of a project (project database or interpretation project) can determine who can access the project and the level of access each person will have in the project.

This new structure also relieves you from maintaining two sets of projects (OpenWorks and SeisWorks) and connecting the two. It also relieves you from the limitations of the old seismic project data model.

Data Changes

In Release 5000.0.0, OpenWorks and SeisWorks have changed where data and how data is stored in order to facilitate the integration of project data and to help facilitate the further integration of Landmark applications. For OpenWorks, the data model of the OpenWorks database has changed. For SeisWorks, the location of the seismic and horizon files as well as such files as color maps and format definitions can be fine-tuned for your needs.

OpenWorks Data Model

The data model of the OpenWorks database has been changed, adding new structures to store more data, and deleting unused older structures. The following changes were made in order to optimize and simplify data management in OpenWorks.

- 2D horizon data is stored in the OpenWorks database.
- Seismic and horizon data is cataloged in the database and can be given metadata.
- Seismic and horizon data can have processing history recorded (inputs, output, parameters, and process

information). Processing history can be viewed in Seismic Data Manager in either a textual format or a graphical format.

- Pre-stack seismic data is cataloged in the database and can be given metadata.
- Pre-stack processing history, as well as metadata and relationships between pre-stack data and its post-stack data, can be recorded.
- Version information can be recorded for interpretation data (such as fault or horizon attributes) and seismic data (such as seismic or pre-stack seismic attributes). The version information allows you to group data together.
- A structure horizon and its attribute horizon can be related.
- Multiple 2D line and multiple 3D survey interpretation are supported as a default.
- Horizon data can support multiple lines and multiple surveys.
- The WOW data model is integrated into the OpenWorks data model.
- The fault data model is improved and simplified.
- Interpretation notes and interpretation sets can be stored in the OpenWorks database.
- Remark fields are enlarged to 200 characters.
- Long remarks are added to allow you to create remarks or comments of practically any length.

Seismic and Horizon Files

The location of 2D and 3D seismic data sets and 3D horizon files is defined by the file `dir.dat`. As in R2003, `dir.dat` contains a list of file systems where seismic and horizon files can reside. However, instead of the old attributes (RO, SYS, and GLOBAL), the file has new attributes that let you determine where new files are created, allowing you to fine-tune the location and access of files. Files are created in a location based on the configuration of `dir.dat` and on the write permission of the user to file system.

The attributes for a file system are the following:

- **File suffixes (or extensions)** — Indicates that a file of that type can be created on the file system.
- **OTHER_FILES** — Indicates that any file type can be created on the file system. At least one file system must have this attribute.
- **fusion_seismic** — Indicates that prestack seismic data can be created on the file system. If `fusion_seismic` is not specified, then prestack seismic will be written to the `OTHER_FILES` file system.
- **fusion_horizon** — Indicates that prestack horizon data can be created on the file system. If `fusion_horizon` is not specified, then prestack horizons will be written to the `OTHER_FILES` file system.
- **No attributes** — If no attributes are applied (no file suffixes, nor the `OTHER_FILES` attribute), no application can create new files on the file system; however, applications can still read and update files that already exist on the file system.

An attribute (a file suffix or the `OTHER_FILES` attribute) can be configured for more than one location at a time. When that is the case, a Landmark application will create a new file in a location based on which file system has the most free space and on the user's write permissions for the file system.

When a Landmark application looks for an already created file, it will look in any file system listed in `dir.dat`, but it will only create files in a location allowed by `dir.dat` and by the read-and-write permissions of the user running the application.

Districts

Release 5000.0.0 formally supports the concept of districts. Depending on the company, districts might be called by various names, such as region, asset, or business unit. Districts are created:

- To subset OpenWorks projects and their seismic data.
- To allow a business unit or other group to focus on only the projects the business unit is working on.
- To provide additional security for the data in a project.

In previous releases, districts were implemented by configuring the OWSYSSID and OW_PMPATH environment variables and by configuring dir.dat, owdir.dat, and plist.dat for each district.

In Release 5000.0.0, as a default, at least one district must be created for each OpenWorks database. As in the past, dir.dat and owdir.dat are involved in the configuration of a district, but plist.dat is no longer needed for seismic data in Release 5000.0.0.

To create a new district or to modify an already created district, you edit a configuration file new to Release 5000.0.0, called district.dat (by default, it is located in *OpenWorksHome/conf*), and you create or edit the dir.dat and owdir.dat files for the district. A component of the entry in district.dat points to the location of the district's dir.dat and owdir.dat. Other components of an entry for a district include the name of the district, comments about the district, and the name of the OpenWorks database the district is associated with.

Districts function under the following principles:

- A district can be associated with only one OpenWorks database.
- An OpenWorks database can be associated with many districts.
- A project database can be associated with only one district.
- All interpretation projects for a project database belong to the same district as the project database.
- When a project database is created or restored, it is assigned to a district.
- OpenWorks Project Administration allows you to modify a project database and change its association with a district on the same OpenWorks database.

Application Changes

Landmark applications in Release 5000.0.0 access all data through an OpenWorks project, even SeisWorks applications. OpenWorks applications such as Well Data Manager and Seismic Data Managers have been rewritten to allow you to view and manage data in a project in ways the older applications did not allow.

For example, Seismic Data Manager (SDM) has changed in the way it can view data and can access more data types than before. SDM allows you to sort, search, and filter data in a simple way and with complex boolean expressions. With the inclusion of seismic project data and seismic and horizon data into the OpenWorks framework, SDM has been enhanced to manage seismic data in a more efficient way. SDM also allows you to manage new data types, such as processing history and long remarks about seismic and horizon data. It allows you to export seismic and horizon data that was loaded into one project database and to import it into another.

Interpretation Changes

Interpretation in OpenWorks has changed. In previous releases, the name of an interpreter, unless it was public, could only be used by the user who created the name. In Release 5000.0.0, interpreter names have become interpretation IDs. An ID can be public or private. Anyone with access to the project can use a public ID. Such an ID is similar to an interpreter name with the public owner in R2003. If the creator of the ID chooses, an ID can be private, where the creator, or owner, is the only person who can use the ID, which is similar to interpreter names in R2003. However, if the creator of the private ID chooses, the private IDs can be configured to allow other users to also use the ID. In this way, a team of users can use the same ID if desired.

As in previous releases, the access to a project is based on whether a user has access to the OpenWorks database, not based on an interpretation ID. With the merging of SeisWorks and OpenWorks projects, the access to project data, including SeisWorks data, is ultimately controlled by the creator or restorer of the OpenWorks project database. The creator can then allow other users to have *Manage* access and other types of access to the project. These changes help centralize the control over all data in a project, including seismic data, not just what might have been classically termed *OpenWorks data*.

Accessing Data in Projects

A Landmark application, even SeisWorks applications, access the data in a project by selecting an OpenWorks project database or an interpretation project. Any application that accesses seismic data can access any project whether the project has only 2D lines or 3D surveys or both. Each project can have zero or more lines, or zero or more surveys.

For example, typically, data from an entire region is loaded into an OpenWorks project database. Interpretation projects are created based more on the interpreter's needs instead of the requirements of the database, its data model, or other considerations. When an application opens the project, it will access whatever data has been included in the project. Old limitations about the construction of seismic projects no longer exist. An application that can access an OpenWorks project can access whatever data is included in it.

About the Workflows

The changes in the OpenWorks database facilitate integration and new workflows in most of Landmark's interpretation applications. The changes to project data management can be exemplified in the creation and restoration of projects. Click on the blue hyperlinks to learn more.

- [Create Project Workflow](#)
- [Restore and Upgrade Project Workflow](#)

These workflows do not demonstrate all the functionality of the software.

The intent of this workflow is to demonstrate integration between the applications and does not include all of the software's functionality. There are other possible ways the applications could be used together, as well as separately. Refer to the individual product's online help for more information.

Create Project Workflow

This workflow details the creation of a project database in OpenWorks. For more information, see the *OpenWorks Online Help*.

Edit district.dat

Programs Needed

- text editor

This step is only necessary if the new project should be in a district not already created. It is possible to assign the new project to an existing district, and then later to change the district of the project database using the **Modify** option in OpenWorks Project Administration.

Edit owdir.dat

Programs Needed

- text editor

Typically, this step is unnecessary for an established district. If the district is new, owdir.dat should provide the location of the OW_PROJ_DIR directories for the district.

Edit dir.dat

Programs Needed

- text editor

This step is only necessary if you will be adding seismic and horizon data to the project. This file should list all the file systems where OpenWorks should look for seismic and horizon data for the project databases and their interpretation projects. Each file system can have attributes which help determine, along with a user's write permissions on a files system, where Landmark applications can create new files.

Create project database

Programs Needed

- OpenWorks Project Administration

Create surveys or master grids for seismic data

Programs Needed

- Seismic Data Manager

Load data into the project database

Programs Needed

- ASCII Loader to load well data
- Curve Loader to load well log curves and other data
- Seismic Data Loader to load data into a 2D survey
- 2D Batch Control Monitor to extract line header and shotpoint information while loading trace data
- Poststack or 3D Batch Control Monitor to load trace data

Edit and manage data

Programs Needed

- Curve Dictionary
- Seismic Data Manager
- Well Data Manager

Create interpretation projects from the project database

Programs Needed

- OpenWorks Project Administration

The data in an interpretation project can be based on one or any combination of the following: area of interest, a well list, a 2D seismic line list, or one or more 3D surveys. Conversely, you can select all wells that are not in a well list, all 2D seismic lines not in a line list, or all 3D surveys not in a selected list of surveys.

Manage and interpret data

The OpenWorks data and the seismic and horizon data are now ready for interpretation applications in Release 5000.0.0.

Restore and Upgrade Project Workflow

To move data from R2003.12.x to Release 5000.0.0, you must first perform tasks in the R2003.12.x, and then perform tasks in Release 5000.0.0. This workflow refers to a single OpenWorks project and the SeisWorks data associated with it as an example.

In Release 2003.12.x

Install the Pre 5000.0.0 module

This module is available from Landmark Customer Support.

The module allows you to prepare seismic and horizon files and data (such as lists) for Release 5000.0.0. It provides information and tools to allow you to fix problems before they might arise when R2003 data is moved to the new project structure in Release 5000.0.0. For example, since SeisWorks projects might be combined, files with the same name must be renamed or otherwise dealt with.

Run the Pre 5000.0.0 module according to its documentation

The module guides you in doing the following:

- Create DistrictList.dat if the installation has more than one setting for the OWPM_PATH environment variable.
- Create a master staging project.
- Stage metadata.
- Run pre 5000.0.0 Report.
- Analyze the report to decide how to prepare the data.
- Make changes to the file names and data.

Back up OpenWorks project

Programs Needed

- OpenWorks Project Administration

Make SeisWorks project and data files available to Release 5000.0.0

This task may be merely making sure the file systems where the SeisWorks files are located are accessible to the Release 5000.0.0 OpenWorks database and its users.

Or, the task may involve backing up the current SeisWorks directories and files, and then restoring files on another file system that is accessible to the Release 5000.0.0 OpenWorks database and its users.

In Release 5000.0.0**Install OpenWorks 5000.0.0****Edit district.dat**

Programs Needed

- text editor

This step is only necessary if the restored project should be in a district not already created. It is possible to assign the new project to an existing district, and then later to change the district of the project database using the **Modify** option in OpenWorks Project Administration.

Restore the OpenWorks project

Programs Needed

- OpenWorks Project Administration.

Edit district and project files

Program Needed

- text editor

For the district associated with the restored project, edit:

- **owdir.dat**: Contains the paths to the OpenWorks project directories for the district.
- **dir.dat**: Contains the paths of the file systems where seismic and horizon files are stored and can be created. The file systems are locations of the SeisWorks project directories and data made available in a previous step. For the directories for this SeisWorks project, these file systems should have the attributes available in R2003 (SYS, RO, GLOBAL), not the new attributes in Release 5000.0.0.
- **plist.dat**: Contains the association between the OpenWorks project and the SeisWorks projects as they were in the previous release. The name of the OpenWorks project restored in a previous step must replace the OpenWorks project name used in R2003. In Release 5000.0.0, plist.dat is only needed during a restoration of an OpenWorks project that has one or more SeisWorks projects associated with it.

Upgrade project and migrate SeisWorks project data

Programs Needed

- OpenWorks Project Administration

Besides upgrading the project and migrating the data, the upgrade process allows you to create an interpretation project from each SeisWorks working project.

Manage and interpret data

The OpenWorks data and the SeisWorks project data are now ready for interpretation applications in Release 5000.0.0.

High-Performance Geoscience Interpretation Workflow

Applications Needed

- GeoProbe
- PowerView with PowerCalculator
- Well Seismic Fusion
- OpenWorks

Overview

The goal of the High-Performance Geoscience Interpretation Workflow is to provide a next-generation interpretation system that combines volume, seismic, and geological processes into a single seamless environment where quality prospects can be defined and rapidly explored.

The workflow consists of these three elements:

- An easy-to-use 1D/2D/3D interpretation environment in which a small number of powerful applications performs the majority of interpretation workflows. These applications have a common user interface that provides access to data, application, and process integration.
- Automated basic processes that let interpreters spend most of their time working on high-level tasks.
- Data management that includes all interpretation elements. With all seismic, well, and interpretation data stored or referenced by the project datamodel, applications can read the data directly from the database.

This example of the High-Performance GeoScience Interpretation Workflow uses GeoProbe, PowerView, PowerCalculator, and Well Seismic Fusion in the following manner:

1. **GeoProbe, PowerView, PowerCalculator and Well Seismic Fusion:** These applications are used in the first part of the workflow, Dynamic Integration, which focuses on interactive communication and updating of results among the applications.
2. **GeoProbe:** The second part of the workflow, Multi-Volume Interpretation and Frameworking, uses GeoProbe and modules within it to build a sealed structural model.
3. **PowerView, GeoProbe, and Well Seismic Fusion:** Basin Scale Interpretation, the third part of the workflow, combines the functionality of these three applications to build a simulation of basin evolution over time. The ultimate goal is to produce qualified play fairway maps.
4. **Well Seismic Fusion:** In Prestack Interpretation, the fourth part of the workflow, Well Seismic Fusion lets you interpret prestack seismic just as quickly and efficiently as you interpret poststack seismic.

This workflow does not demonstrate all the functionality of the software

This workflow demonstrates the integration between the applications and does not include all of the software's functionality. There are other possible ways the applications could be used together, as well as separately. Refer to the individual product's online help for more information.

Data Flow

In this section, the four subworkflows of the High-Performance Geoscience Interpretation Workflow are displayed in separate boxes. Each subworkflow lists

- the programs that are being used
- the names of the documents containing the specific instructions for the steps in the subworkflows.

Subworkflow 1 Dynamic Integration

GeoProbe, PowerView/PowerCalculator, and Well Seismic Fusion contain the following functionality for dynamic communication and updating of results among the applications:

PowerView/PowerCalculator

- With the smartFault tool, track fault segments directly on semblance data.
- Use interactive cursor tracking to exchange positional information with GeoProbe.

For details, refer to the PowerView and PowerCalculator Online Help.

GeoProbe

- Display GeoProbe Probe outlines in PowerView Sections and Maps.
- Use universal tracking to see where Probes are.
- Compute attributes in memory on Probe faces to improve attribute-parameters testing and reduce data storage.
- With 'data on demand,' view and interpret unlimited volumes of data in 3D space.
- Click once to access prestack seismic interpretation in Well Seismic Fusion.
- Simultaneously analyze multi-attribute/multi-volume seismic, and well and cultural data.

For details, refer to the GeoProbe Online Help.

Well Seismic Fusion

- Drag and drop 3D seismic data, horizons, wells, and log curves between Well Seismic Fusion and the PowerView Inventory Tree or Select Session Data dialog box.
- PD wellbore and seismic *x/y* locations between Well Seismic Fusion and both PowerView and GeoProbe.
- PD an arbitrary 3D seismic line from the PowerView Section to Well Seismic Fusion.
- Extract wavelets from GeoProbe shared memory volumes.
- View and process GeoProbe .vol files and shared memory volumes in Well Seismic Fusion.
- See location markers in PowerView's Map View for prestack gathers in Well Seismic Fusion.

For details, refer to the Well Seismic Fusion Online Help.

In any or all of these applications...

- Use interpretation notes to capture information about interpretation for future generations. The notes are stored in OpenWorks.
- Note a common look and feel.

Subworkflow 2**Multi-Volume Interpretation and FrameWork Construction**

The goal of this subworkflow is to apply 3D picking techniques to 2D and 3D data to build a sealed structural model.

GeoProbe

- As the interpretation progresses, use ezModel in GeoProbe to construct the framework model in these four steps:
 - Load all interpretation data to the GeoProbe 3D interpretation environment. Use ezFault or swFault in GeoProbe to check faults. Clean and interpolate surfaces.
 - Load initial fault interpretation to the ezModel module to built a fault network. Seal the network based on fault relationships.
 - Trim horizons and add polygons, if needed. The result is a sealed horizon and fault network with polygons.
 - Validate and export. Color-code the fault polygons by the fault attributes of heave, throw, and slip. Test the horizon and fault interpretation for lateral slip along faults; erroneous fault correlations; or incoherent horizon interpretation. Save the model-ready interpretation to SeisWorks, PowerView, and OpenWorks.

For details, see the GeoProbe Online Help.

**Subworkflow 3
Basin Scale Interpretation**

This subworkflow involves building a simulation of basin evolution over time to produce qualified play fairway maps.

PowerView

- In the Well Correlation view, set up log curve suite displays, save them, and recall them from OpenWorks. The result is rapid well log interpretation in detailed vertical track style displays that link to 2D and cross-section views.
- Access ESRI shape files and spatial database engines.
- Use interpretation sets to maintain a series of top prospect horizons or grids together with references to the velocity models used to generate them. Add more data as it becomes available so scenarios can be better evaluated.

For details, see the PowerView Online Help.

PowerView 2D Seismic Interpretation and GeoProbe 2D Seismic Visualization

- View and interpret unlimited volumes of 2D or 3D seismic in 2D or 3D space.

For details, see PowerView Online Help and GeoProbe Online Help.

PowerView and Well Seismic Fusion

- Select gather locations directly from PowerView Maps.
- Display prestack and stack seismic data in the same Sections to determine the validity of prospect attributes.
- When an amplitude observation is validated, model it in detail in Well Seismic Fusion.

For details, see the Well Seismic Fusion Online Help.

**Subworkflow 4
Prestack Interpretation**

When Well Seismic Fusion “publishes” prestack seismic data to the OpenWorks catalog, see the same prestack in place. In only hours, discover and use all the Prestack seismic data available to your company. With Release 5000.0.0 functionality, reduce risks in seismic quality and the accuracy of reservoir prediction.

Well Seismic Fusion

- In Well Seismic Fusion, calibrate seismic data to reservoir attributes by creating, accessing, and storing offset synthetics and VSPs in OpenWorks Well Data Manager.
- Also in Well Seismic Fusion, see prestack seismic on the desktop and receive access to reservoir information previously unavailable to interpreters.
- Click on a stack volume in any Landmark application and display the prestack seismic data used to create that stack volume without any knowledge of where the prestack is stored.
- Interpret on the prestack seismic data and create maps of prestack attributes.
- Have the processor or specialist work on the same prestack as the interpreter to enhance the interpretation.

For details, see the Well Seismic Fusion Online Help.

Optimized Reservoir Decisions

Applications Needed

To run this workflow, you must have the following applications installed on a Windows XP computer.

- Nexus simulators
- FieldPlan Offshore
- DMS

Additional Requirements

In addition to the Release 5000.0.0 applications listed above, the user must have a complete set of Nexus project input data and the results from a Nexus job that has been run with this data.

The user must have the following applications installed:

- Microsoft® Access® or MySQL
- Microsoft® Excel®

Overview

The Optimized Reservoir Decisions Release 5000.0.0 workflow combines the following:

- physics-based reservoir simulation (Nexus simulators)
- expert-system based facilities screening (FieldPlan Offshore)
- uncertainty analysis (DMS)
- decision optimization (DMS)
- data analysis (DMS)

The workflow can be used to examine a range of strategies for designing the production facilities for an offshore oil or gas field and evaluating the trade-offs and economic benefits of available solutions.

The workflow uses the Nexus simulators, FieldPlan Offshore, and DMS in the following manner.

1. **Nexus Simulator:** Used in batch mode to generate profiles of oil, gas, and water production in the reservoir over time. The project can include multiple reservoirs connected by a surface network plan.

Important: This workflow assumes that you already have a Nexus project that defines the input parameters for the reservoir to be used in the workflow. The Nexus desktop utilities that you might use to create the Nexus reservoir inputs and surface network inputs are not included in the 5000.0.0 initial release. However, you can create the Nexus project and surface network using the Nexus desktop tools available in the R2003.19.1 or R2003.19.3 release of Nexus.

2. **FieldPlan Offshore:** Used to model alternative production facility plans for developing a reservoir. The alternative strategies involve different engineering solutions that require different levels of capital investment and provide different production capabilities.
3. **DMS:** Used to assign “uncertainty variables” and “decision variables” to selected inputs in the Nexus model and to named ranges in a spreadsheet that is derived from FieldPlan.

“Uncertainty variables” represent uncertainties that are beyond the control of the development team (for example, reservoir permeability). “Decision variables” represent options that can be varied by the team (for example, the number of wells or the platform type).

Once you have assigned uncertainties and decision variables, you run DMS jobs that sample the uncertainty and decision variables and generate production profiles that show the impact of uncertainties or facilities decisions on production results. Outputs can be written to a DMS database (MS Access or MySQL).

4. **DMS, Spotfire, or third party data analysis tools:** DMS data analysis tools are used to analyze the results of the DMS uncertainty analysis and optimization jobs. Or, export the results to a filtered results database that can be loaded to Spotfire or other third party data analysis tools.

Note: You can modify this workflow to use a more complex economics spreadsheet while incorporating the costs data that is output from FieldPlan.

This workflow does not demonstrate all the functionality of the software

This workflow demonstrates the integration between the applications and does not include all of the software's functionality. There are other possible ways the applications could be used together, as well as separately. Refer to the individual product's online help for more information.

Data Flow

The data moves from application to application as shown below.

Nexus
<p>The Nexus simulators use Nexus data that has already been defined using a pre-Release 5000.0.0 version of the Nexus desktop. The data must be subsea data. It can include multiple reservoirs combined by a surface pipeline network.</p> <p>To expose a full range of reservoir properties for modeling with DMS, the Nexus model should include a structured grid.</p>



FieldPlan
<p>You do not import the Nexus data directly into FieldPlan. Instead, you create a FieldPlan project that approximates the Nexus data. The FieldPlan project should mirror the Nexus project in areas where the FieldPlan and Nexus inputs are equivalent.</p> <p>For example, the FieldPlan project should have the same number of reservoirs, reservoir types, reservoir volumes, depth to top of reservoir, etc.</p> <p>Once you have created a FieldPlan project that parallels the Nexus project and run a FieldPlan job, you export recommended facilities solution to a DMS-compatible Excel spreadsheet.</p>



DMS
<p>DMS uses both the Nexus project data (.fcs, etc.) and the Excel spreadsheet that has been output from FieldPlan. DMS creates copies of the original data from both of these sources.</p> <p>DMS output data is written to an Access database (.mdb) or a MySQL database.</p>



DMS, SpotFire, or Other Third Party Data Analysis Tool

Output data from DMS can be accessed directly from its database using the DMS results browser. Alternatively, the user can export the data to a database that has been optimized for viewing with Spotfire.

Note: Optimization jobs typically require multiple iterations. Outputs from each run are factored into the selections made by the optimizer as it submits subsequent runs. In this sense, the data can be said to move in a “loop.”

Workflow

To perform the Optimized Reservoir Decisions workflow, follow these steps:

Task 1: Analyze Nexus Project Data

1. Analyze the existing Nexus data that you will use. Your Nexus data should include both input data and output data (i.e., preliminary data describing reservoir conditions, production schedule, etc., and output spreadsheet data including well production results, field production results, etc.).

If you have the Nexus desktop installed, open the project's .vds in SimDataStudio and look at the project's input parameters there.

If you do not have SimDataStudio available, you can look at the Nexus .fcs file and the various ASCII files that it references. These will list most of the project input information.

For output information (cumulative production, etc.), look at the "ss" spreadsheets and the .out file that are produced after a job has been run.

2. Record the following in a text document or spreadsheet:

- type of reservoir
- number of reservoir(s)
- peak production rate
- number of production wells
- number of gas injection wells
- number of water injection wells
- size of reservoir
- projected production life cycle of reservoir
- number of wells
- well types (number of each type)
- well constraints
- total recoverable reserves
- production rate (per well)
- field production rate
- reservoir areal extent (in acres)
- water depth
- reservoir ratio (length to width)
- water depth
- reservoir depth from mudline
- initial production rate per well

For information on the Nexus keywords that appear in the Nexus case files, see the *Nexus Keyword Manual*.

Task 2: Create FieldPlan Project

1. Create a FieldPlan project that matches the features in the Nexus project data.

For example, the FieldPlan project should have the same number of reservoirs, reservoir types, reservoir volumes, etc.

2. Run a single FieldPlan evaluation job to identify the best solution for building the offshore facilities for developing the reservoir.

3. Export the FieldPlan solution to a spreadsheet using the **File > Prepare for DMS Analysis** option.

For information on how to create a FieldPlan project, see the FieldPlan Offshore help system.

Task 3: Create a DMS Project and Run Multiple DMS Iterations

1. Create a new DMS project.
2. Create a DMS/Nexus model that incorporates the Nexus .fcs file and its various include files.
3. Create a DMS/Excel model that incorporates a copy of the Excel spreadsheet that you generated with FieldPlan.
4. Assign uncertainty variables to the Nexus and Excel inputs that you want to vary when running Monte Carlo, sensitivity, or Latin Hypercube calculations.

Some examples of uncertainty variables are reservoir properties such as porosity, permeability, etc., and financial uncertainties such as capital costs, rig availability, etc.

5. Assign decision variables to the Nexus or Excel inputs that you want the optimizer to vary as it attempts to optimize a specified objective function.

Some examples of decision variables are number of wells, schedule start dates, etc.

6. Create a combined Nexus-spreadsheet model that uses the Nexus and FieldPlan models that you created in Steps 2 and 3.
7. Create a DMS optimization job that uses the combined simulator-spreadsheet model.

If you are running an optimization job, specify an appropriate objective function for the optimization job.

8. Run the DMS job.

Typically, the job will perform reservoir simulation and FieldPlan economic calculations several times.

For information on how to build DMS models and jobs, see the DMS help system.

Task 4: Perform Data Analysis

1. In DMS, use the results browser utility to view the outputs from the DMS job.
2. Alternatively, “flatten” the DMS results and import them into Spotfire or some other data analysis tool.

For information on how to perform data analysis in DMS, see the DMS help system.

Prestack Seismic on the Desktop

Applications Needed

- OpenWorks 5000.0.0
- PowerExplorer 5000.0.0
- PetroBank Master Data Store 5000.0.0
- SeisSpace 5000.0.0
- Well Seismic Fusion 5000.0.0

Overview

Prior to Release 5000.0.0, applications using prestack seismic data needed to maintain a private data store. In order to share data between applications, the prestack seismic data would typically need to be exported from one application and then imported into the other. This resulted in many copies of what is essentially the same data and a great deal of additional effort in converting and managing the separate data stores.

The goal of the Prestack Data to the Desktop workflow is to make all the prestack data within your organization available to the interpreter at the desktop and to allow each application in the prestack workflow to use a shared set of prestack data. The OpenWorks data model has been extended to include a catalog of information about the prestack data set, and, once the data is published to the OpenWorks catalog, it is available for use by each application. Prestack data can then be used by applications without the need for additional scanning, converting, or copying.

The workflow consists of five parts:

- Discover prestack gathers using **PowerExplorer**.
- Download prestack gathers to disk using **PetroBank Master Data Store**.
- Publish prestack gathers to **OpenWorks** using **Well Seismic Fusion** or **SeisSpace**.
- Interpret and analyze prestack gathers using **Well Seismic Fusion**, **PowerView**, and **GeoProbe**.
- Enhance and/or reprocess prestack gathers using **Well Seismic Fusion** or **SeisSpace**.

This workflow does not demonstrate all the functionality of the software.

This workflow demonstrates the integration between the applications and does not include all of the software's functionality. There are other possible ways the applications could be used together, as well as separately. Refer to the individual product's online help for more information.

Workflow

When Release 5000.0.0 versions of PowerExplorer, PetroBank Master Data Store, SeisSpace, and Well Seismic Fusion are released, the following Prestack Seismic to the Desktop workflow functionality will be enabled.

Workflow

Prestack Seismic to the Desktop

PowerExplorer, PetroBank Master Data Store, SeisSpace, Well Seismic Fusion and OpenWorks contain the following functionality to enable the Prestack Seismic on the Desktop workflow:

PowerExplorer

- Use PowerExplorer's map view to display seismic surveys with available prestack gathers in your area of interest. Then select the prestack gathers you are interested in and generate a data request for PetroBank Master Data Store to retrieve the gathers.

PetroBank Master Data Store

- Retrieve requested gathers from the PetroBank Master Data Store data repository and download the gathers to a network-accessible disk.

SeisSpace and Well Seismic Fusion

- Publish the prestack gather references to the OpenWorks seismic data catalog using Well Seismic Fusion or SeisSpace. Once published the gathers are available for any one on the asset team to interpret and analyze.

Well Seismic Fusion, PowerView, and GeoProbe

- Interpret and analyze prestack gathers using Well Seismic Fusion, PowerView and GeoProbe. This includes AVO crossplotting and generating fluid and lithology attribute maps and volumes based on the prestack gathers.

Well Seismic Fusion and SeisSpace

- Enhance a subset of prestack data using Well Seismic Fusion or reprocess the entire volume using the high-performance processing tools in SeisSpace. Changes to the prestack gathers are immediately available to all interpreters.

Enhancements, New Functionality, and Fixed Problems

Release 5000.0.0 contains major changes and new functionality. The primary new functionality for the Classic applications is the incorporation of the new Seismic Data Management functionality in OpenWorks. It offers a high value to the management of seismic data in the end application.

This section includes enhancements for many of the Release 5000.0.0 products that will be released throughout 2008. It also contains new functionality and fixed problems for the products.

Because OpenWorks enhancements are among the most far-reaching, they are listed first. After OpenWorks, the products are grouped according to business lines and listed alphabetically within the groupings. More details of new functionality can be found in the New Features manuals or Release Notes for each point product.

For information on other products, click on these hyperlinks:

[OpenWorks Release 5000.0.0](#) on page [49](#)

[Drilling and Completions](#) on page [55](#)

[Geological and Geophysical Technologies](#) on page [63](#)

[Information Management and Infrastructure](#) on page [70](#)

[Reservoir Management](#) on page [74](#)

OpenWorks Release 5000.0.0

Seismic Data Management in OpenWorks

- **Integration.** Seismic data is more tightly integrated in the OpenWorks 5000.0.0 database. Some seismic data is catalogued and referenced in the OpenWorks database. Other seismic data is stored in the OpenWorks database.
 - Catalogued: seismic data sets, 3D horizons, and prestack and poststack seismic data
 - Stored: 2D horizons, misties, static shifts, horizon lists, and fault lists
- The Seismic Data Manager in OpenWorks 5000.0.0 allows you to:
 - Manage the data it previously did: 2D and 3D surveys.
 - Manage the seismic data listed above, which SeisWorks utilities managed in previous releases.

- **Seismic Project Manager Eliminated.** With the change in project structure in OpenWorks, and because seismic data has been integrated into the OpenWorks database, the Seismic Project Manager no longer exists in Release 5000.0.0. Project Administration in OpenWorks now performs all project management.
- **Project Data Transfer (PDT).** To support the new data stored in the OpenWorks database, Project Data Transfer (PDT) has also been enhanced to support the transfer of 2D horizons, misties, and static shifts.

New Interpretation Project Optimizes Project Administration

Project administration has been simplified and optimized in OpenWorks 5000.0.0. A project can now be a view or subset of another project, and the master and working projects in SeisWorks have been integrated into the new OpenWorks project structure.

- ***Views of an OpenWorks Project***

Projects have been renamed *project databases*. Each project database contains one or more interpretation projects. The interpretation projects are subsets or views of the data in the project database. Each interpretation project can have its own Cartographic Reference System (CRS) and lists of lines, surveys, and wells. With this new design, one copy of the data can have separate views, lessening the demands on computing resources and project and data administration. If data updates are needed, only the project database needs to be updated. Each interpretation project can be configured to automatically refresh the data in its view.

- ***SeisWorks Projects Replaced by OpenWorks Projects***

OpenWorks projects are restored into the database, and the data from the SeisWorks projects are restored to the location where seismic data is to be stored in the environment. When the OpenWorks project is upgraded to Release 5000.0.0 in Project Administration, the SeisWorks project information is integrated into the OpenWorks project database. Each of the working projects from SeisWorks can become an interpretation project of the project database, depending on the configurations chosen by the person upgrading the restored OpenWorks project.

Projects and Districts

- **The Ability to Separate Data.** OpenWorks and its database now directly support districts. Districts allow a company to separate OpenWorks projects and seismic data into more manageable and secure groups. They become especially useful when a company may have large numbers of projects and when a company wants to separate data by business unit for better data security or storage ownership.
- **Implementing Districts.** In an installation of OpenWorks, a company can decide whether it will implement districts or not. To implement districts, *dir.dat* and *owdir.dat* must be configured for each district, and a new file, *district.dat*, must be configured with the name of each district and the directory of each district's *dir.dat* and *owdir.dat*. Utilities, such as Project Administration and Project Status Tool, support districts in their interfaces. For example, when a user of OpenWorks creates a new project in Project Administration, part of the project configuration includes selecting the district to which it will belong.

Data Model Enhancements and Removed Tables

The data model in Release 5000.0.0 contains enhancements and removes unused parts of the OpenWorks data model.

- **Enhancements**

- Storage for seismic data (2D horizons, misties, static shifts, horizon lists, and fault lists)
- References to seismic data stored in flat files (seismic data sets, 3D horizons, and prestack and poststack seismic data)
- Each Well Master table now has a Well Location table assigned to it. This table allows well data to be more easily transferred between an OpenWorks database and the Well/Wellbore model of an EDM database.
- Storage for processing history
- Simplification of the fault plane trimesh model
- Storage for offset synthetics and vertical seismic profiles (VSPs) for Well Seismic Fusion
- Some validation (VC) tables have been converted to reference tables (R), and each reference table now has timestamp and source fields.
- Storage for interpretation notes
- Storage for interpretation sets
- Storage for 3D earth model frameworks
- Remarks attributes increased to 200 characters
- ID's generated with sequences not OW_UID_VALUES
- Data Dictionary (support for Reference Data Manager)
- Storage of additional list tables (grid lists, fault lists, and horizon lists)
- Support for automatic position log computation when adding directional surveys
- Support for automatic handling of tie points
- Simplification of the data model for Depth Team Express

- **Removed Tables**

- PDEN production data model: The PDEN tables have been replaced with the PDM tables.
- ARIES Reserves Management
- VIP simulation grids
- Gocad model BLOBs
- OpenExplorer tables
- OpenWorks culture model: These tables were replaced by ZGF files in OpenWorks R2003.

Development Kit Enhancements

The Development Kit for OpenWorks 5000.0.0 has been updated to:

- include functions to access the data in new tables of the OpenWorks data model.
- include functions to support data change messaging provided by Oracle's Streams Advanced Queuing.
- remove functions related to tables that have been removed.

The Development Kit is built with Microsoft's Visual Studio 8. For detailed information about changes in the Development Kit for OpenWorks, see the documentation included in the Development Kit. The Development Kit for OpenWorks is available separately from OpenWorks. Consult your Customer Support Representative for more information about acquiring the Development Kit.

Redesigned Data Management Utilities

OpenWorks 5000.0.0 includes several redesigned project management utilities and data managers.

- **Project Utilities:** Project Administration and Project Status Tool
- **Data Managers:** Data Domain Manager (now allows editing of the data dictionary as well as reference data), Curve Dictionary, Map Data Manager, Seismic Data Manager, and Well Data Manager

These new utilities and managers have the following benefits:

- Cross-platform Java applications, which do not require X Window System or Motif support in any operating system.
- Enhanced integration with more Landmark applications, because they are based on components from Landmark's DecisionSpace products.
- Powerful table functions that allow users to search, sort, view, and manipulate the data displaying in a project utility or data manager.

Private Interpretation IDs

Interpretation ID Manager replaces the Interpreters utility. The manager allows you to create interpretation IDs that are comparable to the names you would have created in the Interpreters utility, plus more.

- **New Tables for Searching, Editing, And More.** The interpretation IDs, along with their associated data, are presented in a table that allow you to sort, filter, and search the table; change the appearance of the table to make some data more prominent; and export rows of data to a file.

- **Editing IDs.** You can edit an ID in the table or in a form view.
- **More Room for Remarks.** The Description field in the Interpreters utility has become a Long Remark field that allows remarks of indefinite length.

Interpretation IDs can be public or private. Public IDs are similar to the names created in the Interpreters utility and are accessible by any user of the OpenWorks database. Private IDs allow you to create an ID limited to only certain users. Each user added to a private ID has one of three security levels: owner, manager, or interpreter. An asset team can manage one or more private IDs to fit the purposes of the team.

Support for Oracle Streams Advanced Queuing (AQ) for Data Change Messaging

OpenWorks now uses Pointing Dispatcher (PD) just for communications between its client applications. Oracle's Streams Advanced Queuing (AQ) now conducts data change messaging with the OpenWorks database.

Advanced Queuing has several advantages:

- **Communication.** Changes to the data in an OpenWorks project are reliably communicated to any application accessing the project across a network.
- **Monitoring Updates.** AQ allows Landmark applications accessing the OpenWorks database to more easily and efficiently monitor data updates from multiple workstations on a network in real-time.
- **Configuration.** Previously, PD sometimes required special configurations and environment variables for some applications to be able to receive notifications about data changes. With AQ, those configurations are unnecessary. If the application can communicate with the OpenWorks database, the application can receive data change notifications.
- **Faster Communication.** AQ messages can indicate the boundaries of a transaction with the database. The applications accessing the OpenWorks database can then commit a set of change messages at the end of the transaction instead of at each individual change. This capability speeds up communication with the database.

OpenWorks Users are Now Internally Authenticated Users

OpenWorks now uses the Oracle Secure Enterprise Password Store (Oracle Wallet) to store passwords to the database and to handle the security of the passwords.

When a new user is added to the OpenWorks database, the user is associated with the user's name in the operating system. When the OpenWorks user first starts an OpenWorks application, the user must provide a password to the OpenWorks database. The user name in the operating system and the database must be the same, but the passwords can be different.

When a user accesses an OpenWorks database with a web-based application, the application prompts the user for a user name and password. Then, access to the data is allowed.

Data Model Rationalization Between OpenWorks and Engineering Data Model (EDM)

OpenWorks now includes a table for well locations. Each wellbore (Well Master table) is associated with a Well Location table that relates to the well/wellbore data model in EDM. The new well data model in OpenWorks allows well data to be more easily transferred between Open Works and EDM.

Other Changes

- **Processing History.** OpenWorks now captures the data types of the input and output data and captures the parameters that transform the data from input data to output data. Specifically, the processing history retains interpretation knowledge and the context of the data. It allows you to revise interpretations with new data, and makes cleaning and archiving projects easier. It allows one team to easily hand off a project to another team, and can minimize productivity loss when the composition of an asset team changes.
- **Application Preferences.** In the rewritten utilities and managers, a user can save preferences. Besides user preferences, each application has default preferences, and some preferences can be set for the entire OpenWorks site.
- **New Error Logging Console.** In the rewritten utilities and managers, a Tools menu allows you to display the Error Logging Console. The Error Logging Console allows you to view errors as they occur without resorting to a terminal window, and to dynamically set the error reporting level for the console window and the error log file separately.
- **Updated Geographic Component.** Release 5000.0.0 includes components from GeoCalc 6.3 (from Blue Marble Geographics) for coordinate transformations.

Drilling and Completions

Engineer's Desktop (Entire Suite of Products)

- **Platforms and Databases.** The Engineer's Desktop suite of applications is now available on Windows Vista Enterprise for the 5000.0.0 release. Supported databases for 5000.0.0 are Oracle 10g, Microsoft SQL Server 2005, and Microsoft SQL Server 2005 Express.

AFE Management System to EDT Link

- **Platform.** AFE Management System to AFE Link is an application on Engineer's Desktop 5000.0.0. For this release, AFE Management System to AFE Link is available on Windows Vista Enterprise.

CasingSeat

- **Platform.** CasingSeat is an application on Engineer's Desktop 5000.0.0. For this release, CasingSeat is available on Windows Vista Enterprise.
- **New Default Tabs.** Tabs are saved at the Design level. In the past, tab layout was saved by individual users. Now when a Design is saved, the tab layout and content are saved as the default view setting for the Design. The new tab settings become the view for all other users who open the Design.
- **Internationalization.** CasingSeat is now designed to support regional settings in Windows.
- **Well Explorer Virtual Folders Added to the Well Explorer Tree.** These folders allow users to organize data items (such as Projects, Wells, Designs, etc.) in a customizable hierarchy that can be up to three levels deep.
- **OpenWire 2003.0.8.** It can be launched directly from the Well Explorer with a right-click menu command at the Database level.
- **Formations Added to the Associated Data Viewer.** They allow formations to be copied between Designs.
- **New Assemblies Added to the Associated Data Viewer.** They have copy/paste functionality: Casing. Not valid for Actual Designs.
- **Catalogs Added for Well Completion Components.** Support for these catalogs was added to OpenWells, PROFILE, WELLPLAN, and Catalog Editor.

COMPASS

- **Platform.** COMPASS is an application on Engineer's Desktop 5000.0.0. For this release, COMPASS is available on Windows Vista Enterprise.
- **Targets.** They can now be assigned to additional hierarchical data levels, including Project, Site, Well, Wellbore, and Design.

- **Printing.** It is now possible to print, or use print preview, from the Survey and Plan Editors.
- **Column Order on the Survey and Plan Editors.** It can now be changed.
- **Well Explorer Virtual Folders Added to the Well Explorer Tree.** These folders allow users to organize data items (such as Projects, Wells, Designs, etc.) in a customizable hierarchy that can be up to three levels deep.
- **Integrated WITSML v. 1.2 Support.** It allows the creation of OpenWire 2003.0.8 pipelines from the Well Explorer tree to load data into the EDM database directly from a remote WITSML server.
- **OpenWire 2003.0.8.** It can be launched directly from the Well Explorer with a right-click menu command at the Database level.

Data Analyzer

- **Platform.** Data Analyzer is an application on Engineer's Desktop 5000.0.0. For this release, Data Analyzer is available on Windows Vista Enterprise.
- **Metadata Update.** The Selection Tree metadata used for both Data Analyzer and the Data Validation feature within OpenWells (including EDM Administration Rule Book Editor) has been updated to reflect data model changes and additions that are new for this release. This includes being able to query data in the new Completions Catalogues, Multi-Wellbore Well Planning, and Oilfield Waste Management extensions to OpenWells.
- **Fixed Defects.** The following significant defects for Data Analyzer were corrected:
 - Defect #728645: Catalog Editor tree should be in sort order.
 - Defect #730022: Fluids (CD_Fluid) View should not be linked in when reporting on Stimulation Views.
 - Defect #735916: Graph Wizard Step 3 Dialog Name is incorrect.

OpenWells

- **Platforms.** OpenWells is an application on Engineer's Desktop 5000.0.0. For this release, OpenWells is available on Windows Vista Enterprise.
- **Planning of Multilateral Wells.** The Well Planning input form was enhanced to enable planning of multilateral wells, so that multiple wellbores and designs are now supported.
- **Completions Catalogs.** Enhancements were added.
- **Well Explorer Virtual Folders Added to the Well Explorer Tree.** These folders allow users to organize data items (such as Projects, Wells, Designs, etc.) in a customizable hierarchy that can be up to three levels deep.
- **Catalogs Added for Well Completion Components.** Support for these catalogs was added to OpenWells, PROFILE, WELLPLAN, and Catalog Editor.

PROFILE

- **Platform.** PROFILE is an application on Engineer's Desktop 5000.0.0. For this release, PROFILE is available on Windows Vista Enterprise.
- **Extended Planning and Reporting.** The primary focus for this release of PROFILE has been to extend planning and reporting for Completions and Multi-Laterals (OpenWells) through new Completions equipment catalog selection architecture and associated completions-related enhancements. The goal is to enable completions and well services teams to better document and manage completions from planning to installation and management through to abandonment. In addition to the catalog selection architecture, assembly and component description interfaces are extended so that additional information and supporting documentation can be saved with the data. In addition, PROFILE is now extended to support description and visualization of equipment attached to Casing and Completion assemblies.
- **Completion Catalogs Selection.** This feature is now enabled in the Well Designer Wellbore Equipment and Wellheads tabs. In the Wellheads tab, Completion Catalogs are grouped by wellhead components and hangers in accordance with Catalog Editor organization.
- **New Equipment Section Types.** To support better segregation of different types of completion tools, a number of new equipment section types with supporting component type lists have been added to the Landmark standard list of equipment for this release.
- **Well Explorer Virtual Folders Added to the Well Explorer Tree.** These folders allow users to organize data items (such as Projects, Wells, Designs, etc.) in a customizable hierarchy that can be up to three levels deep.
- **Catalogs.** They were added for Well Completion components. Support for the catalogs was added to OpenWells, PROFILE, WELLPLAN, and Catalog Editor.

Real-Time View

- **Platform.** Real-Time View is an application on Engineer's Desktop 5000.0.0. For this release, Real-Time View is available on Windows Vista Enterprise.
- **Key New Features.** This release of Real-Time View sees the introduction of a number of key new features that enable operators to manage more effectively both time-based and depth-based log data within their Engineer's Desktop environment. These improvements include:
 - **Depth-based log storage and visualization.** Real-Time View has been extended to also support depth-based logs. A new LAS import feature is available for Depth-based logs so that log files available in that format can be imported, stored in EDM, and visualized within Real-Time View.
 - **Log and Curve Header Editor.** For active logs, a new Log Header Editor feature is available from the Tools menu (**Tools > Edit Log Header...**). This feature enables engineers to review and edit Log and Curve Header information inaccessible in previous versions of Real-Time View.
 - **Internationalization.** Real-Time View has been extended to enable the user interface text to be translated into other languages.

- **WELLPLAN Integration.** You can now use Real-Time View Template Viewer to display Depth-based drilling data logs within WELLPLAN. This feature allows real-time data imported into EDM via OpenWire to be displayed inside WELLPLAN for a particular Design/Case. The capability provides the engineer with a valuable reference when comparing predicted actual loads against those actually measured during well construction.
- **Well Explorer Virtual Folders Added to the Well Explorer Tree.** These folders let you organize data items (such as Projects, Wells, Designs, etc.) in a customizable hierarchy that can be up to three levels deep.

StressCheck

- **Platform.** StressCheck is an application on Engineer's Desktop 5000.0.0. For this release, StressCheck is available on Windows Vista Enterprise.
- **Tab Layout.** Default tabs were added. (Tabs are saved at the Design level.) In the past, tab layout was saved by individual users. Now, when a Design is saved, the tab layout and content are saved as the default view setting for the Design. The new tab settings become the view for all other users who open the Design.
- **Viewing of Classic Well Schematic.** You now have the option to view the Classic Well Schematic. When StressCheck is installed, the default schematic view displays. To change to the Classic view, select **Tools > Options** and activate the Classic Schematic View checkbox. Deactivation of this checkbox will return the schematic display to the default setting.
- **Internationalization.** StressCheck is now designed to support regional settings in Windows.
- **Well Explorer Virtual Folders Added to the Well Explorer Tree.** These folders allow users to organize data items (such as Projects, Wells, Designs, etc.) in a customizable hierarchy that can be up to three levels deep.
- **New Assemblies.** There were added to the Associated Data Viewer with copy/paste functionality: Casing, Tubing. Not valid for Actual Designs.
- **Catalogs.** These were added for Well Completion components. Support for these catalogs was added to OpenWells, PROFILE, WELLPLAN, and Catalog Editor.

WELLPLAN

- **Platform.** WELLPLAN is an application on Engineer's Desktop 5000.0.0. For this release, WELLPLAN is available on Windows Vista Enterprise.
- **New Friction Calibration Torque Drag Chart.** This new feature allows for graphical calibration of friction factors.
- **New Plot.** The pressure to break the gel strength at various times can be determined using the Pressure-ECD Chart (Pressure: Pump Rate Fixed).
- **Back Pressure Available in Analysis.** You can use the Pressure: Pump Rate Fixed Analysis Mode and the Pressure: Pump Rate Range Analysis Mode.

- **Reverse Circulation.** This procedure, which pumps cement and spacers directly down the annulus, can now be modeled.
- **Well Explorer Virtual Folders Added to the Well Explorer Tree.** These folders let you organize data items (such as Projects, Wells, Designs, etc.) in a customizable hierarchy that can be up to three levels deep.
- **Integrated WITSML v. 1.2 Support.** This feature allows creation of OpenWire 2003.0.8 pipelines from the Well Explorer tree to load data into the EDM database directly from a remote WITSML server.
- **OpenWire Pipelines.** These can be created directly from the Well Explorer. You can launch the Real-Time View application directly from the Associated Data Viewer and use it to compare actual and planned log data.
- **Catalogs.** These were added for Well Completion components. Support for the catalogs was added to OpenWells, PROFILE, WELLPLAN, and Catalog Editor.
- **New Assemblies.** These were added to the Associated Data Viewer with copy/paste functionality: Casing, Tubing, and Drillstrings. Not valid for Actual Designs.
- **Fixed WELLPLAN Problems.** The following significant defects were fixed:
 - Defect #743765: Java Exception warning when creating a WELLPLAN case from a StressCheck casing design.
 - Defect #748119: Backreaming results not updating when changing friction factors when all loads were selected on the Mode Data dialog.
 - Defect #750148: Cannot change the mud density units to specific gravity for an API-based custom unit set, or to ppg from an SI-based unit set.
 - Defect #752276: The cuttings loading option does not affect the Hydraulics drag chart analysis results.
 - Defect #752297: When using the Hydraulics Pump Rate Fixed analysis, the tool joint option does not affect the results displayed in the Hydraulics drag chart or the Annulus ECD plot.

3D Drill View KM

- **Platforms.** 3D Drill View KM is a DecisionSpace application. For Release 5000.0.0, 3D Drill View KM will be available on the official Release 5000.0.0 Linux and Windows XP platforms, and will access OpenWorks 5000.0.0 on Oracle 10g.
- **Create Knowledge Attachments in 3D View.** To create a Knowledge Attachment in the 3D View, right-click on a wellbore and select Add EDM Knowledge Attachment, or Add DIMS Knowledge Attachment depending on the drilling database you are using. Note that you must have checked the Enable box on the corresponding KM EDM or KM DIMS tab.
- **Knowledge Attachment Symbols Stored in EDM Database.** KM symbols are now stored in the EDM database. (Prior to R2003.19.1, the symbols were stored in files.) Any symbols stored in files will be uploaded into the EDM database the first time you open the database.

- **3DDV KM Runs on Linux.** 3DDV KM now runs on Linux and can connect to either Oracle or SQL Server EDM databases.
- **Select All and Clear All Buttons.** The buttons were added to the Choose Items dialog box to improve its usability.

Collaborative Well Planning

- **Software Family in the DecisionSpace Environment.** It now includes AssetPlanner, TracPlanner, PrecisionTarget, and the new Field Scenario Planner applications.
- **Platforms.** For Release 5000.0.0, the Collaborative Well Planning applications will be available on the official Release 5000.0.0 Linux, Solaris, and Windows XP platforms and will access OpenWorks 5000.0.0 on Oracle 10g.
- **Manual Targeting.** Several enhancements were included to allow better use of geologic models and to provide more control when creating targets for both manual and automatic planning.
- **References to OpenWorks Saved in OpenWorks WellPlanning Projects.** WellPlanning objects created from OpenWorks wells are saved with the OpenWorks Well-Planning project. Therefore, OpenWorks will automatically load these wells when the OpenWorks well is opened.
- **Recommended Surface Location or Kickoff Depth Based on Hold Angle.** The software can recommend a surface location or kickoff depth based on a specified hold angle. The surface location or kickoff depth will be calculated using a hold angle as close as possible to the requested hold angle.
- **Sidetrack Plan Type Added to the AssetPlanner Advanced Mode.** AssetPlanner can now create sidetracks from existing or planned wells. Sidetracks can be based on three plan types, including sidetrack, horizontal sidetrack, and S-shaped sidetrack. It is possible to restrict the creation of sidetracks to a certain well type such as shut-in, etc.
- **Snap Penetration Points in Reference Targets.** When working with TracPlanner, use **Plans > Snap Reference Targets** to move the reference target penetration point to the point where the wellbore intersects the target. (The default penetration point for the reference target is the center of the target.)
- **Casing and Liner Data.** A Casing tab has been added to the Well Plan Properties dialog box. Casing and liner data available in OpenWorks is displayed (read-only) on this tab. When creating a new plan, data can be entered into this tab. This data is used when creating sidetracks to ensure the minimum inside diameter criteria is met.
- **Improved Sidetrack Options.** Existing sidetracks now have the same planning options as new sidetracks. This functionality includes investigating alternative millout depths within a specified distance from the current millout depth. You can specify a minimum inside diameter to determine if a sidetrack is possible at any depth by comparing this diameter to the casing and liner data.
- **New Setting.** Set **Back TVD - Use Plans > Apply SetBack** to ensure the wellpath has the same inclination and azimuth from the last target to the specified (Set Back) TVD above the

second to last target as it does between these two targets. This functionality applies to surface or platform plans using Optimum Align and consisting of at least two targets.

- **Plan Optimization Enhancement - Optimization.** It now includes penetration points, kickoff depths, and millout points, as well as automatically testing for more efficient plans using reference targets. Anticollision and hazard avoidance will be considered if the AssetPlanner module is licensed.
- **Table Editing.** Several changes were made to improve table editing. Buttons were renamed for consistency, and cell contents are automatically overwritten when typing begins in the cell.
- **Editing of Well Types.** It is now possible to change the type of a well (producer, injector, etc.). If the well is an OpenWorks well, the change is only within the context of the current Well Planning project and does not change the actual OpenWorks type.
- **Saving and Retrieving Plan Parameters.** In AssetPlanner and ScenarioPlanner, plan setups can now be saved and retrieved for later use.
- **Improved Completion Calculation.** A parameter titled "Default Reservoir Penetration" has been added to the Costs tab in AssetPlanner. This field is used to determine where to begin completion costs. In the past, completion costs were based on the perforation length. For wells without a perforation length, a zero length completion interval resulted.
- **Editing Target, Plan, and Scenario Parameters.** Any numeric column can now be edited and saved to the project. Columns can also be added or deleted. Note that this save applies only to the WellPlanning project and does not affect OpenWorks data or wbp files.
- **Importing Paths as TurnPoints.** Turn points can now be derived from imported survey data.
- **New Plan Type Parameters.** Additional parameters were added to several plan types.
- **Field Scenario Planner.** A new module titled Field Scenario Planner has been added. This module includes three modes: Scenario Setup, View Scenario Set, and Scenario Target Analysis.
 - The **Scenario Setup** mode facilitates the creation and editing of a set of development scenarios.
 - The **View Scenario Set** mode is used to compare the scenarios created using the Scenario Setup mode.
 - The **Scenario Target Analysis** mode is used to compare scenarios on a target-by-target basis.
- **Scenes.** A new Scenes tab takes advantage of AssetView's multi-scene, multi-view functionality.
- **EDM Import and EDM Export - EDM Import and EDM Export Options.** These have been added to the File menu. Use these options to import or export data between Well Planning and an Oracle EDM database (version 2003.16.0 or later).
- **Surface Grids.** You can now use surface grids when you are working with AssetPlanner. For example, a sea floor grid can be used to obtain water depth. Using the water depth from the grid, AssetPlanner can put platforms in a specified water depth. You could also use a topography grid to place platforms or wells only where the surface is less than a certain inclination.

- **Site Slot Templates Setups.** These can now be saved. The site setup that is saved can include multiple templates and/or individual wells. After the setup is saved, it can be used as a basis for other sites.

OpenWire

- **Platforms.** For Release 5000.0.0, OpenWire is available on Windows Vista Enterprise Client (Vista Server is not supported), Windows XP Client, and Windows 2003 Server.
- **Supported Versions.** OpenWire will support WITSML version 1.3.1 as well as version 1.2.0 for the standard objects.
- **Integrated Workflow.** OpenWire supports an integrated workflow with the EDM-based applications, allowing simplified creation of Pipelines from within the Engineering applications.
- **Support for Reports Objects.** OpenWire now supports the reports objects for simplifying the data entry into OpenWells when data is available in a digital format.

Wellbore Planner

- **Platforms.** Wellbore Planner is now available on the official Release 5000.0.0 Linux and Solaris platforms and will access OpenWorks 5000.0.0 on Oracle 10g.
- **Wellbore Planner Fixed Problems:**
 - Defect #163061: Wellbore Planner does not populate the Original location information for a well when created from a well plan.
 - Defect #722088: Recalculation of wellpath (position log) causes duplicate line in poslog table. As a result, the wellpath will not display in OpenVision, and an error message will display indicating the wellpath cannot be loaded.
 - Defect #177358: When a WBP plan is saved as an OpenWorks well, the time/depth table created is not set to be the preferred time/depth table.
 - Defect #702580: Import of ASCII file containing survey data (knee points) is limited to 197 data points.
 - Defect #719633: Wellbore Planner freezes when importing a COMPASS ASCII file with more than 196 lines.
 - Defect #306010: COMPASS file fails to import if comment line exceeds 78 characters.
 - Defect #732053: Wellbore planner not saving platform wells correctly.
 - Defect #732054: Wellbore planner not saving turn point correctly for extend sections.
 - Defect #156683: Parent well not retained after saving plan and reopening second time.
 - Defect #118667: Entering large character strings into the **Uncertainty > Survey Tools > Edit Name** and **Description** fields produces an error when the **Add/Update** icon is selected.

Geological and Geophysical Technologies

These applications use the new Seismic Data Management functionality in OpenWorks. For more information, see [Seismic Data Management in OpenWorks](#) on page 49.

GeoProbe + ezModel

- **OpenWorks 5000.0.0. Port.** For Release 5000.0.0, the OpenWorks data model has been streamlined to reduce data duplication. Now, you can view subsets—called interpretation projects—of a project database; the data in the interpretation project is shared dynamically by reference. In addition, seismic and horizon data can have a processing history attached to them. GeoProbe's data structure has been modified to accommodate these changes.
- **Multi-Survey States.** GeoProbe's data structure has been re-configured to take into account individual surveys located within a larger project. Now, Multi-Survey instances in GeoProbe can be saved into a single state file.
- **Data on Demand.** In addition to loading volumes into shared memory, you can now load volumes directly from disk into GeoProbe using Data on Demand. When you use this new *.d3d disk caching format, loaded volumes are no longer limited to the amount of memory on a given system. Therefore, you can load large data volumes without compromising visualization speed.
- **Seismic 2D Data Direct from SeisWorks.** Seismic 2D Data can now be loaded into GeoProbe directly from SeisWorks. swFault segments are easily interpreted on these 2D lines and saved back to OpenWorks. In addition, horizons are picked using ManuTrack and can be interpolated on demand using the SeisWorks gridding library. To further improve the interpretation workflow with PowerView, 2D line locations are now shared via PD messaging.
- **Direct Data Access.** Data loading has been reconfigured to remove the requirement for an external DataServer. This change has greatly optimized the loading of swFaults, Horizons, and 2D Data; they are now loading 10 to 20 times faster than in previous versions.
- **Culture Object.** A new Culture object lets you load and manipulate ZGF layers. These culture files can be clipped to volume extents, and individual layers in single files can be enabled and disabled from view.
- **Blending Volumes into a Single Display.** Advances in graphics card development give GeoProbe the ability to “blend” two volumes into a single display. For example, by using a seismic amplitude volume as a base volume, you can now overlay a velocity volume on the seismic. The second volume still has a color map of its own, and transparency values on this color map determine the saturation of the volume on the display. In addition, when you use the new dynamic waveform display, wiggle traces can be displayed on the faces of a Probe. Parameters that determine the size, spacing, and overall appearance of these traces can be set.
- **Horizon Curvature.** A variety of Horizon Curvature attributes are now available for display on the selected horizon. These attributes aid in the prediction of fractures and faults.

- **ezTracker Fault Blocking Option.** ezTracker can now use a “fault blocking” volume created from within PowerView. Using this volume in conjunction with the tracking algorithm will quickly create horizons that are constrained by the faults in the survey. You will not have to interpret the fault network first.
- **ezModel Additions.** More options have been added for working with horizons in the structural model. Horizons can now be sealed against one another; based on the order they occur in time/depth. In addition, specifying each horizon interval's minimum thickness allows for a wider variety of stratigraphic models.
- **Well Section.** This new feature creates a vertical plane of seismic data through the path of the selected wellbore. These planes display the data around the wellbore as well as any enabled horizon and fault interpretations that intersect the plane.
- **Usability Improvements.** All objects in the GeoProbe viewer are now selectable and can be disabled using Mouse Button 2. The object's full menu can be accessed using MB3. Tabs for swFaults and ezFaults have been added to the User Preferences dialog box. They let you configure display and interpretation settings that will persist in the GeoProbe session.

PetroWorks

- **OpenWorks Project Optimization.** The 5000.0.0 release supports OpenWorks Project Optimization, which enhances the data model to support new workflows, reduce cycle time, and fully migrate all seismic project data into the OpenWorks project framework. Integration is built into the Data Model, not the application. Highlights include enhancements to the OpenWorks Data Model to enable the storage and management of seismic and associated data, major enhancements to the Interpretation ID Model, the addition of metadata and Processing History Model, redesigned Data Managers, and OpenWorks and Engineer's Data Model (EDM) rationalization.
- **Log Modeling Package.** The PetroWorks Log Modeling Package now includes log normalization and the ability to create pseudo logs.

PowerCalculator

- **New Data Types.** They include the following:
 - Support for 2D horizons for a variety of math computations.
 - Support for OpenWorks grids for complex math computations. In general, the grids can be used interchangeably with 3D horizons, making for some very powerful, yet simple, workflows.
 - OpenWorks polygons, which can be used in some new functions that support processing of the grid information.
- **New Calculations and Modes.** They include the following:
 - Calculations can be executed in “Multiple” mode, which enables operations between 3D horizons in different seismic projects.

- The QuickView now supports the display of multiple data simultaneously. This enhancement lets you quickly evaluate if and how disparate data types overlap within regions.
- A robust spatial interpolation algorithm is added for 3D horizon data. By being a part of the PowerCalculator processing flow engine, this algorithm enables a single button click to fill, smooth, and clip within the interpreter's favorite set of algorithms.
- The Blank function applies a specific polygon set, containing inclusive and/or exclusive polygons, to a 2D or 3D horizon, or to an OpenWorks grid.

PowerView

- **Interpretation Notes.** This enhancement provides advanced tools for interpreters to add x, y, z location markers containing text, images, and links to documents. Interpretation notes can also be attached to other data objects. This information is captured as a permanent part of the OpenWorks interpretation data record. Here are some of the many ways Interpretation Notes can be used:
 - As captured "To-Do" lists for completing the interpretation.
 - As "Why" notes that document the interpreter's reasoning at a key decision point.
 - As "Knowledge-Capture" notes that provide quick and easy access to published articles or previous interpretations.

These features combine for a significantly enhanced interpretation experience and provide opportunities for increased productivity and improved quality.

- **Interpretation Sets.** Effective data management is one of the more challenging tasks for today's interpreter. A multitude of different data types as well as different versions of data can collectively contribute to a specific decision. This combination of data can vary from the set of input horizons, picks, velocity model, and fault polygons that contribute to a particular surface grid construction to the appropriate set of horizons, faults, velocity model, and seismic that represent the properly versioned 85 percent confidence/risk prospect interpretation. Interpretation Sets allow the interpreter to create logical groupings of projects information, organized and named in hierarchical folders. These groupings, or mini-projects, can be easily and quickly recalled for scenario/version/risk-confidence workflows and operations.
- **GeoProbe 2D Line Probes.** With support for 2D seismic interpretation in GeoProbe, the tight GeoProbe > PowerView integration which syncs up a GeoProbe probe face to a PowerView Section is extended to include 2D seismic data.

SeisWorks

- **OpenWorks Project Optimization.** The 5000.0.0 release supports OpenWorks Project Optimization, which enhances the data model to support new workflows, reduce cycle time, and fully migrate all seismic project data into the OpenWorks project framework. Integration is built into the Data Model, not the application. Highlights include enhancements to the OpenWorks Data Model to enable the storage and management of seismic and associated data, major enhancements to the Interpretation ID Model, the addition of metadata and Processing

History Model, redesigned Data Managers, and OpenWorks and Engineer's Data Model (EDM) rationalization.

- **Horizons and 2D Lines.** There are no more limits on the number you can use.
- **Processing History.** You will be able to access this information for horizons and seismic. The enhancement eliminates the need for elaborate naming conventions.
- **Identification of Horizons.** They are identified by name, version, interpreter, and attribute.
- **Additional Meta Data.** This information is available for horizons, seismic, and faults.

StratWorks

- **OpenWorks Project Optimization.** The 5000.0.0 release supports OpenWorks Project Optimization, which enhances the data model to support new workflows, reduce cycle time, and fully migrate all seismic project data into the OpenWorks project framework. Integration is built into the Data Model, not the application. Highlights include enhancements to the OpenWorks Data Model to enable the storage and management of seismic and associated data; major enhancements to the Interpretation ID Model; the addition of metadata and the Processing History Model; redesigned Data Managers; and OpenWorks and Engineer's Data Model (EDM) rationalization.
- **Surface Mapping Enhancements.** StratWorks was enhanced to include dip and azimuth calculations with pick data and to grid dip data to use in surface mapping. The purpose of this enhancement is to calculate dip information to include with pick data in the PICK table. Dip meter table data is averaged to calculate values.

SynTool

- **OpenWorks Project Optimization.** The 5000.0.0 release supports OpenWorks Project Optimization, which enhances the data model to support new workflows, reduce cycle time, and fully migrate all seismic project data into the OpenWorks project framework. Integration is built into the Data Model, not the application. Highlights include enhancements to the OpenWorks Data Model to enable the storage and management of seismic and associated data; major enhancements to the Interpretation ID Model; the addition of the metadata and Processing History Model; redesigned Data Managers; and OpenWorks and Engineer's Data Model (EDM) rationalization.
- **Tighter integration with OpenWorks.** This release dramatically improves the way that seismic and associated data are managed and stored. SeisWorks projects have been eliminated, and OpenWorks is extended to manage seismic and other project data. Seismic data and 3D horizon data are stored externally but catalogued and managed through OpenWorks. 2D horizon data is stored within OpenWorks.
- **Datum Behavior.** Modifications in datum behavior make it work in conjunction with the automatic datuming of SeisWorks seismic data provided by the OpenWorks seismic data optimization in Release 5000.0.0. The changes mean there is both a datum and correctional

velocity tied to the Interpretation Project (IP) and a datum tied to the 3D survey and the 2D line seismic data. They work together to provide dynamic datuming of the seismic data to the datum of the IP. Because the datuming or start time modification of the seismic data is being performed on the OpenWorks side and is external to the SynTool application, SynTool now includes some minor changes concerning the initial Time datum setting and the updating of the datum when SeisWorks seismic data is selected for display.

In previous releases, the initial SynTool Time datum would be set by selecting a SeisWorks project. You could then modify the datum value before completing the initialization of the SynTool session. For Release 5000.0.0, the initial time datum will be set to the datum of the Interpretation Project that you are using. This change is required to maintain integration with SeisWorks, which also uses the IP datum when initializing. Because the SeisWorks seismic data is tied to this datum, you will not be able to modify the datum during initialization. You can, however, modify the datum setting once the session has initialized by using Datum Info. Another change revolves around the selection of SeisWorks seismic for display. In the previous release of SynTool, if the selected seismic data was from a different SeisWorks project at a different datum from the SynTool, the SynTool session would change the current datum to this datum and use its internal method for calculating the correctional velocity for setting the datum shifted time scale. In Release 5000.0.0, because the SeisWorks seismic data is being dynamically datumed to the Interpretation project datum using the correctional velocity in the IP, this option is no longer required and has been removed. To maintain consistency with SeisWorks, use or modify the settings in the Interpretation Project if the initial datum needs to be set to a different value. If the datum of the seismic data needs to be changed, do so in the 3D Survey or 2D Line setting in Seismic Data Manager, before you launch SynTool.

Once the SynTool session has initialized, you can make datum modifications by selecting **Datum Info** from within the SynTool application. Likewise, if you are looking for the same behavior as in earlier releases, set the **IP datum** to 0 and the **3D Survey** or **2D Line datum** to 0. Then use **Datum Info** and SynTool's internal datuming calculations to provide the datum modifications for the SynTool session.

- **SynTool Fixed Problems:**

- Defect #760430: When saving a synthetic to SEG-Y you can now enter up to 200 characters for the file name. This has been increased from 54.
- Defect #631615: Extraction process hangs when you extract Wellbore Seismic for a horizontal well.
- Defect #739567: It is taking too long to access a seismic volume list or SeisWell. Need a patch to improve performance. (Fixed with the OpenWorks Seismic data management.)

TDQ

- **OpenWorks Project Optimization.** The 5000.0.0 release supports OpenWorks Project Optimization, which enhances the data model to support new workflows, reduce cycle time, and fully migrate all seismic project data into the OpenWorks project framework. Integration is built into the Data Model, not the application. Highlights include enhancements to the OpenWorks Data Model to enable the storage and management of seismic and associated

data; major enhancements to the Interpretation ID Model; the addition of the metadata and the Processing History Model; redesigned Data Managers; and OpenWorks and Engineer's Data Model (EDM) rationalization.

- **Tighter integration with OpenWorks.** This release dramatically improves the way that seismic and associated data are managed and stored. SeisWorks projects have been eliminated, and OpenWorks is extended to manage seismic and other project data. Seismic data and 3D horizon data are stored externally but catalogued and managed through OpenWorks. 2D horizon data is stored within OpenWorks.
- **Sharing of Models.** TDQ models are stored in the master project and not the Interpretation Project, so the model can be shared.
- **Simplified and Optimized Project Administration.** This change eliminates the need for seismic projects in SeisWorks. Master and working projects have been integrated into the new OpenWorks structure.
- **Identification of Horizons.** They are identified by name, version, interpreter, and attribute.
- **TDQ Fixed Problems:**
 - Defect #717279: Setting Sample Interval less than one defaults back to one upon conversion.
 - Defect #730538: Does not convert OpenWorks grids properly when depth units differ from project units.
 - Defect #632665: Does not like sub-millisecond sample intervals.
 - Defect #702403: Creates line thickness value of -98765 in SFDM.

Well Seismic Fusion

- **Prestack Seismic Data Management via OpenWorks.** To make prestack seismic data accessible to any interpreter at any time, Well Seismic Fusion now catalogs the prestack data in OpenWorks. The catalog contains basic survey geometry, parent/child relationships, and a pointer to where the prestack actually exists on disk.
- **Offset Synthetics and VSP Data Managed via OpenWorks.** Well Seismic Fusion now stores 2D offset-synthetics and offset-VSP data directly in OpenWorks. This change allows any interpreter to access these data types at any time.
- **Working with Multiple 2D Lines; 3D Surveys; and Interpretation Projects.** Well Seismic Fusion can now manage any number of 2D lines or 3D surveys within any number of interpretation projects in a single session.
- **“Basic” and “Full” Licensing of Well Seismic Fusion.** A less-expensive “Basic” License is now available for users who just want to view and crossplot prestack data. The “Full License” allows for much more in-depth AVO analysis on all data types.

Z-MAP Plus

- **OpenWorks Project Optimization.** The 5000.0.0 release supports OpenWorks Project Optimization, which enhances the data model to support new workflows, reduce cycle time, and fully migrate all seismic project data into the OpenWorks project framework. Integration is built into the Data Model, not the application. Highlights include enhancements to the OpenWorks Data Model to enable the storage and management of seismic and associated data; major enhancements to the Interpretation ID Model; the addition of metadata and Processing History Model; redesigned Data Managers; and OpenWorks and Engineer's Data Model (EDM) rationalization.
- **File Manager Enhancements.** The time of file creation is now displayed as well as the date. This allows for sorting of files by date and time. In addition, the number of ZGFs that can be listed has been increased from 1000 to 12000. The number of MFD and OpenWorks files (such as grids, pointsets, etc.) has increased from 1000 to 9999.
- **Text Posting Enhancement.** You can now specify that you want to clip text files posted on maps at the map border.
- **Contour Enhancements.** Z-MAP Plus has enhanced the Contouring GUI to include distance between labels; and bold, hachure, and dash contour settings. (60657)

Information Management and Infrastructure

OpenWorks information is located on page [49](#).

Advanced Data Transfer (ADT)

- **Data Tree Editor.** This feature makes it significantly easier to build custom connections to third party data models.
- **Position Logs.** These are automatically computed when loading directional surveys to OpenWorks.

AssetJournal

- **Support for All Release 5000.0.0 Platforms.** AssetJournal is supported on the following Release 5000.0.0 platform standards: Windows XP & 2003 Server - 32 & 64 bit; RedHat ES Linux 5.0 – 64 bit; and Solaris 10 – 64 bit
- **Improved Performance.** The entire application and all associated components have been rebuilt and are bundled with the latest version of Java. These enhancements, coupled with some internal changes, make overall performance faster.
- **Project Storage Optimized.** Support for jpg output has been added as a project parameter. This enhancement can drastically reduce the disk usage per project. The original images are retained, however, so it is possible to switch back without any loss of image quality.
- **OpenJournal Functionality.** There is an ongoing effort to reproduce functionality from OpenJournal in AssetJournal. These enhancements include the introduction of project options, installation settings, TOC and HOME page settings, workflow changes, and more.

AssetView

- **Support for Release 5000.0.0 OpenWorks Data Model.** AssetView now supports the new OpenWorks and SeisWorks data model changes, which enable easier access to horizon data, 2D and 3D seismic data, and metadata.
- **Wellbore Analyzer Integrated with AssetView.** Wellbore Analyzer is an AssetView tool that extracts the intersections of geobodies with wellbores and well plans. It displays these intersections as lathes for seismic volumes, 3D grids, and as intercepts for horizons and surface grids in the 3D view and/or in a table view. For Release 5000.0.0, this tool is integrated with AssetView and does not require a separate license. As a result, you are provided with greater functionality in AssetView itself.
- **DecisionSpace Desktop.** AssetView 5000.0.0 launches in DecisionSpace Desktop. DecisionSpace Desktop provides a configurable launcher that can launch Landmark's DecisionSpace and Classic applications, plus external applications, even if they do not appear in the common tab-view-enabled frame. As a result, it provides a seamless viewing

experience. DecisionSpace applications that choose to launch in the Desktop display their initial interface as a tabbed view in the DecisionSpace Desktop.

DecisionSpace Infrastructure

- **DecisionSpace Desktop.** DecisionSpace Desktop is a new component in Release 5000.0.0 and is installed with all Release 5000.0.0 DecisionSpace applications that choose to launch in the Desktop. DecisionSpace Desktop provides a configurable launcher that can launch Landmark's DecisionSpace and Classic applications, and external applications, even if they do not appear in the common tab-view-enabled frame. As a result, it provides you with a seamless viewing experience. DecisionSpace applications that choose to launch in the Desktop display their initial interface as a tabbed view in the DecisionSpace Desktop.
- **Additional Platforms Supported.** DecisionSpace 5000.0.0 is now supported on Windows 64 bit and Red Hat ES Linux 5.0 64 bit. This version of DecisionSpace is also compatible with the new security changes in Windows Vista.

Engineer's Data Model (EDM)

- **Improved Coordinate Transformations.** This enhancement is available through support for Blue Marble 6.2.
- **EDM to OpenWorks Link Utility.** It uses the OpenWorks 5000.0.0 Development Kit to map data in the OpenWorks data model. The installed OpenWorks client is a prerequisite.
- **Fixed Problems.** The following significant defects were corrected:
 - Defect #745480: EDM properties of type java.util. Calendar should not have their ValueInfo implement UnitInfo since date properties should not have units, Date ValueInfo no longer implements UnitInfo.
 - Defect #749048: EDM ObjectConnect Login Screen should be more like what we see in EDM, dropdown of the databases available for user to choose. When setting an EDM ObjectConnect connection, users can now select available servers and databases from a dropdown list instead of typing the server and database.
 - Defect #745438: String properties should not have a unit. There are now no type-specific ValueInfo implementations for fields of type BLOB, CLOB and DATE type fields other than the default ValueInfoImpl.

OpenVision

- **Support for Release 5000.0.0 Platforms.** Besides supporting the new platforms, OpenVision includes corrections for several defects.

PowerExplorer

- **ASCII Macro Files.** The ASCII (xml) alternative offered in Release 5000.0.0 eliminates the following problems with PowerExplorer's session save/restore mechanism: Sessions cannot be shared across dictionaries, they cannot be edited, and they are not accumulative. The ASCII (xml) alternative also provides a basis for future workflow automations (macros).
- **Better GUI for Case-Sensitive Queries.** The cryptic operator names used in PE2003.20.0 have been replaced with a simple toggle in the task details area.
- **GISView Coordinate System Handling.** You now have better control over the coordinate systems. You will also see improved datum transformations when reading local shapefiles.
- **Usability.** These improvements include multi-column selection in the TaskBuilder GUI; a filtering mechanism in the data source selection dialog box; more and better pick lists and drilldowns in various OpenWorks tasks; and a progress indicator for TableView create/update/delete (CUD).
- **WellLogView Marker Support.** Various mechanisms now make it possible for you to overlay log curves with marker information, such as picks.
- **New Metadata Functions.** PowerExplorer/PowerHub provides a mechanism that allows topic attributes to be computed. There are new functions for unit and coordinate system conversions, as well as full access to wellbore path calculations (interpolation of tvd, tvdss, dx, dy, etc based on md). These calculations can be configured to use either OW or CDS poslog data. Creating pure computational tasks is easy when you use the mechanism with the new EchoAccessor. It can also be used in TaskBuilder tasks.
- **Cross Database Comparisons.** PowerExplorer's drilldown mechanism normally expects the drilldowns to be within the same database. In Release 5000.0.0, there is a self-drilldown for all tasks, as well as a new drilldown option that provides more flexibility in the attribute mappings.

PowerHub Server

- **AutoConnect Wizard.** It provides full Create, Read, Update, and Delete functionality, enhancing the Read capabilities of Release 2003.20.
- **Queries.** You can now perform queries using Area of Interest (AOI) as a constraint.
- **Fixed Problems.** The following defects have been corrected:
 - Defect #750194: Get WGS84 versions of coordinates from any location data served by PowerHub. User can now specify an output CRS for coordinates.
 - Defect #742064: View Relations in PowerExplorer are now configurable using relation and capability properties.
 - Defect #744846: Turkish character support in PowerExplorer for MDS Connect. A new JDBC driver wraps around (references) the real driver, translating problematic Unicode where necessary.

Team Workspace

- **User Interface Evolution.** Web application technology has been evolving at a fast pace. New techniques and tools enable the creation of richer end-user experiences. The Team Workspace end-user interface is undergoing an evolution to make use of some of these newer technologies. Changes will result in streamlined interfaces with applications, more intuitive functionality, and the ability to developer much richer applications. The platform for this migration is ASP.Net.
- **PetroBank Explorer.** This new feature is a customization of Team Workspace. It provides fast and simple access to data and data-driven workflows based on the PetroBank Master Data Store. One key aspect of this feature is its integration with a search engine. This functionality will provide a path for the future integration of index searching within Team Workspace. This will not be available until MDS 5000.0.0 is released in mid-2008.
- **Data Store Plug-In Framework.** To help Team Workspace sites start up quickly, this module plug-in has been developed. It allows you to create workspaces by using XML templates. These templates will create projects, connections, catalogues, applications, and more. Plug-in XML templates can be shared.
- **MDS Ordering Extension.** The interface with PetroBank Master Data Store currently supports the ordering of three data types: Well log curves, Seismic Projects, and Archive Objects. In Release 5000.0.0, two new types will be added: Individual Seismic Sections and Seismic Navigation Data.
- **Project Copy.** Many companies organize their Team Workspace deployments around projects. When a new project starts, they build a consistent Team Workspace Project to maintain this activity. To facilitate this function, a Project Copy feature is being added. This feature will enable duplication of an existing project. A project can be created as a clean Master Project, which can be used as the source project for the copy.

WOW/CDA/PA

- **Platform Support.** WOW/CDA/PA supports the new platforms in Release 5000.0.0.

Reservoir Management

DMS

- **Field Plan Workflow.** DMS now incorporates a FieldPlan workflow. To run this workflow, you use FieldPlan to create a spreadsheet. You then build a DMS Fieldplan spreadsheet model and run multiple iterations of FieldPlan from within DMS.
- **Expanded Set of Inputs.** When running with Nexus, DMS now has access to an expanded set of inputs that are provided by running Nexus in the “structured grid” mode.
- **New Gaslift Outputs.** These have been added to the VIP job builder.
- **New Job Monitor.** This feature provides graphical updates on the progress of a job.
- **Simplified Configuration Issues for Setting Up Grids.** When running simulation-spreadsheet workflows on a grid, the spreadsheet calculations are now performed on the job agent, while the simulation jobs are executed on the various nodes of the grid. This implementation simplifies the configuration issues for setting up the grid. The spreadsheet calculations are performed on the job agent for all three types of jobs: uncertainty only, optimization with no uncertainty, and optimization with uncertainty.
- **Redesigned Job Builder.** The following changes were made:
 - Building a job is now much easier. Many of the job inputs and outputs that previously had to be entered manually can now be selected from menus or pulldown lists.
 - Inputs and outputs can now be selected from pulldown lists.
 - Output combinations can be saved and restored as “configurations.”
 - Behaviors for building different types of jobs are more consistent.
 - Combined spreadsheet-simulation models can be created automatically by the job builder.
- **Expanded Post-Processing Functionality.** Post-processing is now licensed separately from the history-matching utility and can be used for general purpose data analysis. Post-processing provides analytical and visualization tools for examining data that is stored in a DMS database. Supported plots include the following:
 - histograms
 - time series plots
 - crossplots
 - tornado plots
 - correlation matrix plots

Particular sets of plots can be saved with a post-processing configuration tool so that they can be quickly restored during later sessions. History matching inputs can be imported from history matching jobs and viewed with the history matching results.

- **Fixed Problems.** The following significant defects were corrected:

- Defect #751478: GAP jobs require MBAL in order to run, even if the GAP model does not use MBAL data. If the user does not have an MBAL installation and a valid MBAL license, the GAP job will fail.

Some GAP results cannot be retrieved from OpenServer, even though the results appear in the GAP results table and the OpenServer string can be extracted from the table. This problem occurs with results that appear in the Results table after running prediction. The workaround is to use only OpenServer strings that are listed in the Results tables before running prediction.

- Defect #752162: In the PDF Finder tool invoked from the PDF and Correlation Finder utility, the beta distribution uses different inputs than are used to define by the model builders. These input parameters should be the same for both the model builder and the PDF Finder.

- Defect #752990: The post-processing utility requires input data to be loaded in order to display output data. Currently, the user must select some input data when loading the results from a job to the post-processing utility. If a job does not include uncertainty or decision parameter inputs, it cannot be loaded for viewing.

- Defect #751711: When building a job, the user can map different data entities to the same variable in a script. This should not be possible. For example, the user should not be able to assign two different outputs from a simulation job to a single variable named "a1." The workaround is for the user to assign only one data entity per variable in the script.

- Defect #744893: The new job builder provides a new Interim tab that lists application outputs that are used as inputs to calculators or to a spreadsheet. These outputs are listed in the Interim tab so that users can specify whether they want to output them to the DMS data store. However, the ability to select them for output has not yet been implemented.

The early access PDF and Correlation Finder utility is not documented in the DMS main workflow help. However, documentation for the different plot types is available from the Help buttons on each of the plot dialog boxes.

- Defect #746193: The job builder allows the user to select any correlation model when creating a job. However, if the user selects a correlation model not associated with the model used in the job, the job fails to run. The user should be restricted to selecting correlation models associated with the models in the job.

- Defect #730912: Post-processing Utility for History matching: Time series and vector data for same property have the same column headings.

- Defect #731222: Results browser: When launching the data browser, you can select a job that does not have data in the database because the data has been deleted or because the original database has been replaced. Making this selection will cause a DecisionSpace Recovery Dialog Box message to display.

DMS has been tested on Windows XP in English only. Applying different language settings to the Windows XP has not been tested.

- Defect #617355: The security setting on MS Access may prevent DMS from using Access database. The workaround is to set the Access security level to low.

Windows XP Service Pack 2 may cause problems displaying the help system. SP2 automatically sets the Internet Explorer security to a higher level than previous service packs did. As a result, you may have to approve the display of each page of the help system.

FieldPlan

- **Cost Database.** It has been updated to reflect the market trend to January 2007.
- **Integration.** FieldPlan is integrated with DMS to enable users to take advantage of other powerful Landmark application packages.
- **Offshore Cost Database Program Updates.** You can now display database properties and see modified data values in red colors. A new functionality is also implemented in the Offshore Cost Database program for users to add/delete benchmark projects in user-customized cost databases.
- **FieldPlan Benchmark Projects.** These are updated to include more projects. The benchmark data are also expanded with total project cost escalation factors and year of first production to account for inflation.
- **Selection of Benchmark Projects.** A new dialog box lets users select the benchmark projects to be included in the benchmark chart.
- **New Menu.** A **Tools/Options...** menu in the FieldPlan Offshore program lets users set the FieldPlan output directory, the directory path for standard cost database files from FieldPlan releases, and a few other options.
- **Help.** *FieldPlan Online Help* and user documentation have been updated for the new functionality.

Nexus

- **Satellite production may be modeled by including phase source terms** at any point along the surface network. This allows inclusion in the network calculations of estimated rate information from areas which are currently not being modeled as part of a given simulation. Any phase (OIL, WATER, or GAS) may be added for black-oil models and WATER and specified STREAM compositions may be added for EOS models.
- **Energy Balance.** Temperatures in the surface network can be calculated using a simplified heat transfer option. The option uses heat transfer coefficients (HTC) for connections and wells, and specific heat capacities for each fluid phase to perform an approximate heat loss calculation. A default heat transfer coefficient can be defined, or a heat transfer coefficient can

be defined for each connection from the SimDataStudio Surface Network Connections panel. A temperature profile (TEMPPR) must also be specified.

- **Gas Handling.** Gas burnt as fuel or lost to shrinkage can be modeled using the QFUEL, FFUEL, QSHRINK, and FSHRINK constraints in Nexus. These constraints specify the amount of gas that will be removed at any given connection.
- **Gas Lift Valves.** The location where gas lift gas is injected into a production network is specified by assigning one or more connections as having TYPE GASLIFT in a NODECON table. Gas lift connections can be located anywhere in the production network and must have a maximum gas rate (QGSMAX) constraint specified. Downstream of a gas lift connection, the fluid flowing in the network will include the fluids produced from the reservoir and the gas lift gas injected. Gas lift connections will shut in automatically if there are no other fluids flowing at the gas lift injection node.
- **Gas Lift Optimization.** A gas lift connection can be optionally assigned an OPTGLR table. The OPTGLR table specifies the optimal gas/liquid ratio or gas/oil ratio for a well (or connection) as a function of water cut, liquid, or oil rate and mobility-weighted pressure for the flowing perforations. The optimal GLR or GOR includes both gas lift gas and produced gas, so the gas lift injection rate is obtained by interpolating the optimal GLR (or GOR) from the table, multiplying by the liquid (or oil rate) production rate, and subtracting the gas production rate. If this calculation results in a negative gas lift injection rate, the gas lift connection is shut in. A new optimization algorithm has also been implemented which allows optimization to be performed based on user input stream values.
- **Gas Plant.** Another method of defining surface separators for well streams is designed to simulate the presence of a gas plant at the surface. This method can be used whenever the standard option of using a set of surface flashes at a fixed temperature and pressure is not satisfactory. This method uses liquid molar recovery fractions for each component. The fractions are input as a function of the key-component-plus composition in the well stream. The key-component-plus composition is defined as the sum of the over-all mole fractions for the key-component-plus components, which are explicitly defined by the user. The interpolated values of the liquid recovery fractions multiplied by the overall feed composition for each component are used to obtain the produced liquid composition. EOS parameters are then used to compute liquid densities. Liquid density plus surface total molar production rate for the liquid provides the standard surface rate. Gas composition and the densities are determined as the product of the quantity (1-liquid recovery fractions) and the overall feed composition. Again, the total molar production rate of gas and the density provide the standard surface production rate.
- **Dual Porosity.** Nexus models the dual porosity processes by using two continua representing the rock matrix and fractures. These continua are superposed, and the model assumes the two continually exchange fluids. Two finite-difference grid systems represent both continua. Consequently, you must supply the fracture properties as well as data for the rock matrix. The dual option simulates the performance of reservoirs which are naturally fractured, heterogeneous, or highly stratified.
- **Water Alternating Gas (WAG).** Any well can be declared a WAG well, capable of injecting either water or gas. The WAG well must be connected to both a water source and a gas source. The WAG procedures can be used to automatically cycle a WAG well (or wells)

between water and gas injection. The size of the water and gas slugs are input in a WAG table (WAG keyword).

- **Salinity Tracking.** The salinity level of water may be tracked, allowing for variation of water properties as a function of salinity.
- **Compound Residual Oil.** A residual oil saturation option lets you specify the portion of the residual oil that cannot be recovered in compositional processes. Without this option, it is possible for all the oil in a grid block to be recovered through vaporization and/or displacement.
- **Job Submitter.** A new job submittal utility provides an improved user interface and better feedback for determining the status of jobs submitted. The utility supports parallel jobs run locally on Windows or Linux workstations. It also supports parallel remote jobs submitted from a Windows workstation to a Linux cluster.
- **Upscaler Workflow.** An Upscaler Workflow wizard guides you through a basic workflow for upscaling grids. The wizard reduces the upscaling workflow to four simple steps.
- **Fixed Problems.** The following significant defects were corrected:
 - Defect # 740596: On Linux, SimDataStudio may hang when opening and parsing a large r.dat file that contains many wells. This issue may be related to the Wine Windows emulator. The problem does not occur on Windows.
 - Defect # 735204: The Nexus smart wells workflow may fail if the DecisionSpace meter unit is used.
 - Defect #753409: Nexus applications that run Nutcracker shell processes fail when "Microsoft Application Compatibility Toolkit 5.0 Data Collector" (ACT-DC) has been installed on the local machine. The Nexus applications affected are Job Submitter, 3DVIEW, PlotView, Gridgenr, and Array. To run these applications, please delete the ACT-DC installation with the Add or Remove Program utility in the Control Panel before launching Nexus.
 - Defect # 747750: When you import black oil PVT from an existing Nexus file (.fcs) for inclusion in a new SDS case, SimDataStudio does not recognize that the data is in a different oil table format. This problem occurs because Nexus and VIP use different formats for black oil PVT. The workaround is to change the PVT model format in SDS to "enhanced black oil table" (**Utility Data > Basic Options > Fluid Model > Enhanced Black Oil**). Once you have done this, you will be able to import the PVT data.
 - Defect # 734018: When working with an existing network in Network Planner, adding a valve out of sequence causes existing valves and pipelines to disappear and causes the NetworkPlanner tree to lose its proper structure.

Appendix A: Hummingbird Exceed Configuration Instructions

Many Landmark products used Hummingbird Exceed. Release 5000.0.0 uses Hummingbird Exceed 2007. Exceed is a third party purchase and should be installed using the standard installation instructions. This section will define how to configure Exceed for Landmark products.

Exceed 2007 works with 32- or 64-bit applications. Exceed 3D can be used with high-end OpenGL applications.

The Hummingbird Exceed X Server must be tuned manually after it is installed in order for all Landmark applications to function properly. After installing Exceed, perform the following steps to tune the Server:

1. Log in as Administrator.
2. Select **Start > All Programs > Hummingbird Connectivity 2007 > Exceed Tools > Xconfig**.

The Xconfig control panel opens.

3. In the Xconfig window, click **Screen Definition** in Classic View, or click **Display And Video** in Category view.
4. On the Screen 0 tab, do the following:
 - Select **Use All Monitors**.
 - In Window Mode, select **Multiple**.
 - In the Panning group box, check Panning, select Fast in the Speed dropdown list, and enter 25 in the Amount text box.
 - Deselect **Auto Load XRDB**.
 - In the Server Visual, select **True Color**. However, if the color depth of the computer is less than 24 or 32 bit, select PsuedoColor.
 - In Root Size, enter **0** in Width and Height.
 - In the Window Manager group box, select Default To Native in the dropdown list box, deselect **Fit Window To Display**, and

check **Cascade Windows**.

Other settings

Some dual-monitor video cards may require other settings on the Screen tab. Specifying settings for those cards are beyond the scope of this document.

5. Select the **Common Settings** tab.
6. Deselect the **Close Warning On Exit** box.
7. In the Xconfig window, click **Validate And Apply Changes**.
8. In the Xconfig window, click **Keyboard Input** in Classic View, or click **Mouse, Keyboard, And Other Input Devices** in Category view.
9. In the Keyboard Input tab, select **To X** in the Alt Key dropdown list box.
10. In the Xconfig window, click **Validate And Apply Changes**.
11. In the Xconfig window, click **Performance** in Classic view, or click **Other Server Settings** in Category view.
12. In the Performance tab, do the following:
 - In the Drawing group box, deselect **Draft Mode**; check the **Exact Zero-Width Lines** and **Batch Requests** boxes.
 - In the Backing Store group box, select **When Mapped** in both the Maximum and Default items. Select **None** in Minimum.
 - In the Advanced group box, check **Save Bits** and **Oversized Cursors**, and deselect the other checkboxes.
 - In the Performance tab, click **Tune** to start Xperf.
 - If the Exceed server is running, Xperf displays an Xperf question dialog asking to restart the server and an Xperf dialog.
13. If the Xperf question dialog displays, click **Yes**.
14. Click **Run All** in the Xperf dialog. Xperf runs the tests.

A series of graphics will appear in the upper left corner of the monitor, and the Xperf dialog box will become inactive.

15. When the tests are complete, click **OK** in the Xperf dialog.
16. In the Xconfig window, click **Validate And Apply Changes**.
17. In the Xconfig window, click **Protocol** in Classic view, or click **X Server Protocol** in Category view.
18. In the Extensions tab, and its Enable Extensions list box, check GLX (for OpenVision), and deselect XInputExtension.
19. Select GLX to highlight it in the Enabled Extensions list box, not to check or deselect its checkbox.
20. Click the **Configure button** to display the Configure GLX dialog.
21. Check the **Hardware Acceleration** and **One Visual Per Pixel Format** boxes, but deselect the other checkboxes.
22. Direct Rendering and Overlay Support should not be checked. Potentially bad behavior could result if they are enabled.
23. Click **OK** in the Configure GLX dialog box.
24. In the Xconfig window, click **Validate And Apply Changes**.
25. Select **File > Exit** to close the Xconfig control panel.
26. This completes the Hummingbird Exceed X Server configuration process. It is not necessary to reboot the computer.

Fonts in Hummingbird Exceed

Hummingbird Exceed can have difficulties dealing with many fonts. If some Landmark applications have problems displaying labels or other text, Exceed may have too many fonts or font servers.

To delete unnecessary fonts or servers, do the following:

1. Log in as Administrator.
2. Select **Start > All Programs > Hummingbird Connectivity 2007 > Exceed Tools > Xconfig**.

The Xconfig control panel opens.

3. Click **Font** in the Classic view, or click **Font Management** in Category view.
4. In the Font tab, click **Edit**.

The Font Database dialog box displays.

5. For each unnecessary font:
 - Select a font description in the list box.
 - Click **Delete**.
6. When finished deleting fonts, click **OK** to close the dialog.
7. Click **Validate And Apply Changes** in the Xconfig window.
8. Close the Xconfig window.
9. Restart the Exceed X server.

Appendix B: Helpful Internet Links

Name	Website Address
Landmark Graphics home page	http://www.halliburton.com/landmark
Oracle home page	http://www.oracle.com
FLEXIm license management software	http://www.macrovision.com
SQL Server Express 2005 home page	http://www.microsoft.com/sql/editions/express/default.msp
Adobe Acrobat Reader	http://www.adobe.com
Microsoft MSDE	http://www.microsoft.com/sql/default.asp

