

# FIELD DEVELOPMENT ENGINE

The Flexible and Powerful Solution  
for Reservoir Decisions



**Landmark**  
A Halliburton Company

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DEVICES**

**T**oday's E&P professionals are required to make complex technical and economic field development decisions in ever-shorter timeframes. With the right combination of innovative technology solutions, companies can easily become equipped with the tools to dramatically accelerate field development workflows, increase productivity, and ultimately make better and faster decisions.

Landmark has teamed with IBM, United Devices and Intel to develop Field Development Engine (FDE), a flexible solution for optimized field development planning, supporting both parallel and grid-enabled high performance computing. FDE includes **DecisionSpace® DMS multiple scenario simulation software; Parallel-VIP™ parallel reservoir simulation software; DecisionSpace Nexus™ next generation simulation software; Intel® processor-based IBM Cluster and Grid installation/optimization services; and United Devices Grid MP™ technology.**

Landmark continues to be a consistent innovator in the upstream E&P technology sector. Collaborating and partnering with industry leaders such as IBM, Intel and United Devices allows Landmark to develop and deliver solutions like FDE, promising increased operational efficiency and improved decision-making.

### **Take Field Development Planning to a New Level**

With FDE, E&P companies have access to a proven, pre-configured resource of exceptional capability. Whether the need is to run a large, precise simulation of a reservoir over its life, to run hundreds or thousands of sensitivities, or to determine the optimal development decision under uncertainty, FDE is the solution. Using Landmark's best-in-class simulation software on a powerful Intel-based IBM cluster that is grid-enabled by United Devices' Grid MP technology, FDE results in an optimized solution for field development planning. For the first time, E&P companies can access the hardware and software they need for robust simulation in a pre-configured bundle. FDE delivers real business value by enhancing a company's understanding of their reservoir, reducing development planning timeframes, and minimizing costs.

### **The Grid Advantage**

Today's petroleum environment requires fast, accurate decision-making to help manage the associated reservoir assets and support reservoir analyses. A shorter amount of time to reach optimal decisions translates to a competitive edge in the petroleum market. Grid computing can help E&P companies accelerate their reservoir management operations by increasing computational output. Grid computing helps increase throughput by unlocking untapped compute and processing resources to considerably accelerate analytical processes – reaching end results far more rapidly than with conventional computing environments. In addition, grid computing helps improve system flexibility by creating a virtualized infrastructure of resources for a true on-demand computing environment.

The inclusion of United Devices' Grid MP technology in FDE is a unique differentiator, enabling Landmark's simulation software to run optimally on IBM's cluster based on Intel® architecture by maximizing the power of Intel® Xeon™ processors and additional nodes for added scalability as needed. United Devices' Grid MP platform enables devices – regardless of their operating characteristics – to be virtually shared, managed and accessed across an enterprise, region or workgroup. Incorporating this technology in FDE allows upstream petroleum companies to aggregate disparate IT systems (such as compute resources, data storage, and filing systems) to create a single, unified system that can intelligently address fluctuating workload requirements. This resource virtualization provides the necessary access, data and processing power to rapidly solve complex business problems, conduct compute-intensive research and data analysis, and engage in real-time business on demand.

### **Reduced cycle time to reach better decisions**

The ability to model field development scenarios before capital investment can optimize oil extraction and yield tremendous business savings. However, such simulation can often be time and compute intensive, forcing an asset team to choose between higher resolution and accuracy and acceptable turnaround time. With the Field Development Engine, companies can accelerate processing time by an order of magnitude – allowing higher-resolution models to be run without prolonged timeframes and for the evaluation of multiple scenarios and uncertainties. The result is better information faster for optimized decision accuracy.

FDE's grid capabilities and powerful hardware resources mean that Landmark's simulation software runs at maximum performance levels without increasing project runtimes. And because FDE hardware is grid-ready, companies can expand their cluster into a grid, including in-house resources as well as additional peak capacity from IBM. With FDE, companies can accelerate processing time by an order of magnitude – allowing higher-resolution models to be run without prolonged cycle time or need for upscaling. The result is better information faster, leading to smarter, more accurate decisions.

### **A proven, reliable solution from industry leaders**

Why struggle with the complexity of building and trying to optimize both IT resources and software tools? Through the Landmark, IBM, Intel and United Devices alliance, upstream E&P companies have access to a scalable, flexible field development planning solution that is pre-configured and pre-tested for top performance. The collective knowledge, innovation and experience of these four companies deliver performance and reliability you can count on. By providing this bundled solution, we have significantly reduced the complexity of implementing an optimal simulation solution.

For instance, factory assembly and testing using a repeatable manufacturing process helps eliminate errors and can translate to less downtime. Additionally, the system is designed to automatically recover from storage or network failures. Testing and tuning of the complete system in our laboratories ensures optimum reliability, and because we install and test FDE in your IT environment, you can expect peak performance.



## Reduced risk and total cost of ownership

FDE offers dramatically improved price/performance over proprietary operating systems and helps minimize total cost of ownership (TCO) beyond the initial capital cost of the system. This comprehensive solution of best-in-class products can help reduce your risk and TCO—from initial assessment to ongoing technical support—while protecting your investment into the future. The pre-configured and pre-tested system reduces the risk of an incorrect digital technology decision and helps ensure that you are not spending valuable time troubleshooting a new system. Our pre-configured, grid-ready system saves you considerable research and decision time, and rapid onsite setup ultimately reduces the time to deploy. Your simulations can be quickly transitioned to FDE, which is easily integrated with your existing technology infrastructure resulting in minimal disruption to your daily business. Costs are further reduced through the grid component's ability to both optimize the cluster's performance and harness additional compute nodes outside the cluster, ensuring all IT resources are utilized to their maximum capacity.

End-to-end service and support can also help reduce risk and cost. Comprehensive delivery of training and 24/7 technical support will meet your business needs to maximize operational efficiency and help ensure that your staff is productive at every part of the workflow. The value of rapid system deployment, innovative simulation software, reliable hardware, grid-enabling technology, training and world-class technical support is reflected in reduced cost of ownership and ultimately measured in your productivity and competitive advantage.

## Scalable to your business requirements

FDE is scalable to meet both your current business needs and future requirements as you manage your portfolio of assets and as your internal grid computing demands grow. The IBM Cluster offers 8-, 16-, or 32- node CPU flexibility, which features the performance, scaling and flexibility of the Intel Xeon processor; while Landmark's simulation software and United Devices' grid technology scale to accommodate multiple users and clusters. The grid-ready capabilities of the solution let you extend the cluster's capacity to non-dedicated heterogeneous nodes, seamlessly scheduling work to these computing resources as needed. The grid-ready features also mean FDE resources can be made available to other groups within the organization, reflecting the departmental usage policies you've defined. These unique capabilities allow you to maximize the use of all existing hardware, ensure optimal workload balancing, and scale easily to meet changing business needs.

## Software

### DecisionSpace Decision Management System (DMS)

DMS is a business simulation and integration tool which enables rapid evaluation of multiple investment scenarios prior to capital expenditure. DMS leads to optimized decisions in light of associated uncertainties by maintaining technical rigor and ensuring focus on common business objectives. DMS Grid is a component of DMS powered by the United Devices Grid MP platform to enable multiple simulation jobs to be rapidly executed on a distributed grid of computers.

### Landmark's Parallel Simulation Software: Parallel-VIP and DecisionSpace Nexus

Landmark is proud to offer the most scalable parallel simulation solution on the market today with Parallel-VIP and DecisionSpace Nexus. VIP is a black oil and compositional simulator that takes advantage of parallel architecture hardware to accommodate larger models, or to run existing models faster by subdividing the simulation model into smaller pieces and distributing the workload among a cluster of systems. DecisionSpace Nexus is Landmark's next-generation, unstructured simulator designed for parallel simulation. Nexus is proven to be the fastest simulator available with fully integrated workflows enabling the asset team to make quick and robust rate and reserve forecasts and, ultimately, optimize the value of assets faster than any other simulation solution.



## Grid MP Platform

United Devices combines industry-leading technology with extensive domain experience to offer the most flexible, scalable and secure grid solutions available today. The Grid MP platform creates a dynamic virtual infrastructure to transform existing compute systems, storage and networks into a powerful resource. By allowing Grid MP to manage the scheduling of jobs among cluster nodes and other networked resources, companies optimize both the performance of their clusters and the value of their entire IT infrastructure. Grid MP can power a cluster-only installation and then easily scale as organizations add both dedicated and non-dedicated resources—including nodes within the cluster, other clusters, or any compute resource within the enterprise. This "grid-ready" feature of Grid MP allows other nodes to be added and managed easily without manual interventions or additional software packages.

## Hardware

The computing and networking components of FDE include:

### IBM Cluster 1350

The Intel Xeon processor offers outstanding platform dependability, value and versatility. Additionally, Intel processing power provides outstanding performance and increased headroom for peak front-end and departmental workloads resulting in faster response times, increased computer power, support for more users, and enhanced scalability.

IBM eServer™ systems are the world's leading servers—robust, reliable powerhouses for every size business and every business requirement. The IBM eServer Cluster 1350, based on Intel architecture nodes, offers excellent price/performance, scalability and manageability for high-performance parallel or multiple scenario simulation workloads. IBM's integrated e1350 cluster technology reduces deployment time, simplifies integration into existing IT environments, and reduces administration and operating costs through advanced systems management. This computing system scales to meet your dynamic processing requirements.

- 8, 16, or 32 nodes
- Rack mounts with gigabit switching
- Cluster Systems Management (CSM) software
- Advanced cable management and remote service processors

## Switch Technology

Conventional Gigabit-Ethernet or Myricom's Myrinet switching technology are utilized for cost-effective, high performance interconnection solutions for cluster computing.

## Services and Support

Landmark, IBM Global Services, and United Devices provide a total solution approach, leveraging experience and technical expertise to focus on your business needs and help ensure that you maintain your competitive edge. Beginning with a single point of contact, we can deliver complete system planning and configuration, hardware and software installation, training, ongoing technical support, and consulting for FDE. We provide worldwide, 24/7 support for your reservoir simulation or multiple scenario simulation software, IBM cluster, and grid-computing environment. World-class call centers and parts centers are located worldwide to keep your **field development center** up and running efficiently wherever you are.

Grid MP technology can be adapted to unique business requirements, and IBM Global Services supports all elements of this architecture—servers, operating systems, middleware and networks—with a full range of grid-related services. IBM and United Devices can help you define a pilot implementation project to validate the wider benefits of grid computing across your organization. Piloting services may include: grid assessment in the customer environment, business case development, pilot implementation, IT/performance optimization, skill transfer to users, and implementation planning.

For additional information:

Landmark: [www.lgc.com](http://www.lgc.com).

IBM: [www.ibm.com/grid](http://www.ibm.com/grid)

Customers in the United States and Canada may call 1-800-IBM-7777 and reference Priority Code 103C3101

United Devices: [www.ud.com](http://www.ud.com)

Intel: [www.intel.com](http://www.intel.com)

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