



IBM Software Group

IBM® WebSphere® Extended Deployment V6

Business Grid - Overview



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This presentation will provide an overview of the Business Grid component offered in WebSphere Extended Deployment V6.

Agenda

- Business Grid
 - ▶ Description
 - ▶ Architecture
- Interfaces



This presentation will explain the basic uses of the Business Grid, as well as the architecture behind the component. It will also explain the interfaces that are available for working with the Business Grid.

Section

Description



This section will describe the Business Grid component.

Business Grid: Description

- WebSphere Application Server has traditionally focused on transactional applications
 - ▶ Applications typically are designed to handle large volumes of relatively small tasks
 - ▶ Not all applications fit this type of design
- Business Grid enhances WebSphere Application Server to support long-running applications
 - ▶ Provides capabilities to deploy long-running applications along with transactional applications
- It is preferable to run long-running applications and transactional work within different processors
 - ▶ Business Grid will balance the work amongst different nodes within a node group



WebSphere Application Server and Java™ 2 Enterprise Edition (J2EE) servers in general have classically focused on lightweight, transactional work. Typically, an individual request can be handled in a few seconds of processor time and relatively small amounts of memory. However, other styles of long-running applications require more resources and different types of support from the runtime environment. Business grid provides WebSphere Application Server support for long-running applications. In an enterprise environment, it is usually preferable to run long-running and transactional work on separate processors, because running them on the same processor can negatively affect performance for the application. Long-running work might take hours or even days to complete and consumes large amounts of memory or processing power while it executes. Business grid provides the capability to deploy different types of applications to different nodes within your environment, and balances the work based on policy information.

Business Grid: Description

- Long-running work often requires different capabilities
 - ▶ Asynchronous beans and message driven beans support some of these needs
- Business Grid will provide further support for long-running applications
 - ▶ Submission and execution must be asynchronous
 - ▶ Allow work to be specified declaratively rather than programmatically
 - ▶ Greater separation of submitter and execution environment
 - Support work being submitted from outside the WebSphere environment
 - ▶ Work needs to be persisted in highly available and non-volatile data store
 - ▶ Administrators need to be able to monitor and manage units of work
 - ▶ Work needs to be able to be prioritized and scheduled

Due to the nature of their work, long-running applications typically require different capabilities from the environment they are running within. Often the submission of a long-running job must be asynchronous from the job being executed. This separation of the submission and execution environment should also allow the submission of work from outside the WebSphere environment. Once long-running work has begun, it will need to be persisted to highly available data stores. Often administrators will also require the ability to monitor and manage the jobs that have been started. The environment must also be able to schedule and prioritize the work that needs to be done based on policy information users set. A number of these capabilities can be supported with existing J2EE features, such as asynchronous and message driven beans (MDBs). The business grid provides an enhanced environment for long-running applications, making it easier to support this type of work in a WebSphere environment.

Business Grid: Description

- WebSphere Extended Deployment V6.0 supports two styles of long-running work
- Batch applications focus on doing large amounts of work based on a specific task, for example record processing
 - ▶ Application will provide logic for a single unit of work (process one record)
 - ▶ Container manages transactions and mechanisms to checkpoint and restart work
- Compute-intensive applications focus on large amounts of processor-bound work
 - ▶ Container provides thread of execution and has limited contact with the work after it is started
 - ▶ Application provides all other logic



The business grid component supports two types of long-running applications in WebSphere Extended Deployment V6; batch and compute-intensive. A typical batch application will do large amounts of work based on repetitive tasks. A batch application must provide the logic for a single unit of work, and the container will provide support to run the job with transactions and the ability to checkpoint and restart the batch process. For example, a typical batch application would process records and the application would provide the logic to process a single record. The environment will then manage the process of repeatedly performing the task for a large number of records. Computationally intensive applications perform work that requires large amounts of system resources, in particular processor usage and memory. In this case, the application will provide all the logic for the work and the business grid will make sure that the application is appropriately situated within the environment.

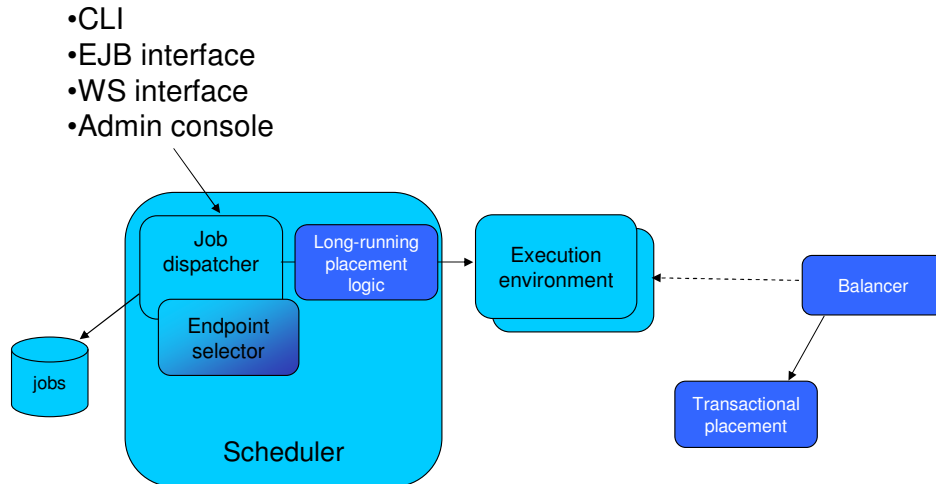
Section

Architecture



This section will explain the architecture of the Business Grid.

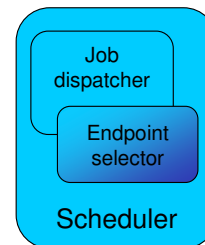
General Architecture



This graphic illustrates the components involved with the business grid. Each of the individual pieces shown here will be discussed further on the next slides. A user primarily interacts with the business grid by setting policy information for their environment and by interacting with the Job Dispatcher using one or more of the available interfaces. The command line interface allows you to submit and control long-running jobs in the system. The enterprise bean and Web service interfaces provide similar functionality to both J2EE and non-J2EE programs using programmatic interfaces. The administrative console provides a Graphical User Interface (GUI) that allows WebSphere administrators and operators to perform job management functions. All of the functionality from the other interfaces except submitting and storing jobs is also available on the administrative console.

Scheduler

- The scheduler contains two logically separate pieces
- Job dispatcher accepts job submissions, assigns job ids, persists jobs in a database, and sends jobs to execution environments
- Endpoint selector uses policy to select when and where jobs will be executed



The long-running scheduler is responsible for accepting, persisting and scheduling the execution of long-running jobs. It manages the job database, assigns job ids and selects where and when jobs should be run. As part of performing this function, the long-running scheduler is also responsible for starting and stopping instances of long-running dynamic clusters as dictated by the jobs to be run and administrator-defined service policies. This is analogous to the function provided by the Application Placement Controller, or APC, for transactional J2EE applications. The long-running scheduler is a J2EE application that can be made highly available by using APC-provided functionality.

Execution Environment



Execution environment

- The execution environment is an instance of WebSphere Application Server
- Responsible for actual execution of the work
- Can be started and stopped based on job placement

The execution environments provide the runtime environments needed by the long-running applications. WebSphere Extended Deployment V6 provides two execution environments in a single J2EE application, LREE.ear, which is deployed to the dynamic clusters that host long-running applications:

The computationally-intensive execution environment supports long-running applications that are expected to consume large amounts of processor time. This execution environment provides a relatively simple programming model based on asynchronous beans.

The batch execution environment supports batch-oriented applications. These applications are expected to perform record processing similar to more traditional J2EE applications, but are driven by batch inputs rather than interactive users. This environment builds on familiar J2EE entity beans to provide batch applications a programming model that supports container-managed restartable processing and the ability to pause and cancel executing jobs.

Long-running Placement Logic

- A user specifies policies that determine the placement of long-running applications
- Workload and policy data is used to determine where and when to start or stop instances of long-running applications
- Interacts with the balancer component to coordinate the allocation of nodes between long-running and transactional work



Long-running
placement
logic



Nodes that are to be used for long-running dynamic clusters are assigned to the long-running placement logic, which is part of the long-running scheduler. The long-running placement logic determines which long-running dynamic clusters should be started on these nodes. The balancer may switch a node between long-running and transactional work over time, but WebSphere Extended Deployment will never attempt to automatically start both types of work on the node concurrently. If a node is already running when the balancer component initializes, the balancer component attempts to determine how to assign the node based on the dynamic clusters that are running there. If no dynamic clusters are started on the node, the default assignment is to the application placement controller (transactional work).

Balancer



Balancer

- Using policy information, the balancer determines how to divide node group between transactional and long-running work
- Interacts with Tivoli® Intelligent Orchestrator (TIO) to allow XD to participate in enterprise-wide orchestration

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Business Grid

The balancer component serves as an arbiter of long-running and transactional work within a node group. Due to the nature of long-running work, co-locating it on the same node with transactional work usually has a negative impact on the performance of the transactional work. The balancer makes decisions about which nodes should be performing transactional work and which can be used for long-running work. These decisions are based on a number of factors, including how well the service policies for the two types of work are being met.

Section

Interfaces



This section will discuss the interfaces provided for the Business Grid.

Business Grid Scheduler Interface

- The scheduler can be invoked to perform operations by a number of interfaces
 - ▶ Command line interface
 - ▶ EJB interface
 - ▶ Web Services interface
- The interfaces provide the ability to manage and monitor jobs
 - ▶ Same set of operations is supported by all interfaces



As depicted on the architectural graphic, a number of interfaces are provided to interact with the business grid scheduler component. These interfaces are used to manage and monitor long-running applications within your environment. The same operations, which are detailed on the next slide, are supported by all the interfaces.

Scheduler Interface Operations

- **Submit Job**
 - ▶ Submits a job for work and returns the job id
- **Cancel Job**
 - ▶ Initiates cancellation of the job
- **Restart Job (Batch only)**
 - ▶ Restarts a job in the restartable state
- **Purge Job**
 - ▶ Removes persisted job information for jobs in final state
- **Show Status**
 - ▶ Returns the status of a job
- **Show Output**
 - ▶ Returns the output for a job



Using the provided operations, you can submit or cancel a job to the business grid scheduler. When the cancel operation is used, the state for the job is changed to cancel pending, until the business grid can take the appropriate steps to stop the job. You can also restart a batch job, to continue it's work. There is a purge job command to remove the persisted job information for a finalized job. There are also a number of options for receiving information from a running job, show status and show output.

Summary

- WebSphere XD provides an environment for managing and executing batch-style and compute-intensive applications
 - ▶ Jobs are scheduled using the Long Running Scheduler (LongRunningScheduler.ear)
 - ▶ Jobs are executed in the Long Running Execution Environment (LREE.ear)
- A WebSphere XD Business Grid can dynamically balance the needs of long-running work against the needs of transactional applications within a cell



In summary, this presentation:

- Explained the benefits of the business grid provided by WebSphere Extended Deployment V6.
- Discussed the differences between computationally intensive and batch programs.
- Explained the capabilities for the business grid to balance long-running work with transactional work in an environment.

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