

# The Application Grid Controller: Oracle WebLogic Operations Control

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## EXECUTIVE OVERVIEW

The application grid is an emerging architectural approach for middleware infrastructure that leverages existing technologies and new innovations. It makes infrastructure more flexible and efficient. By pooling, sharing, and dynamically adjusting the supply of hardware and infrastructure software resources, the application grid allows IT shops to be both agile and efficient.

Oracle WebLogic Operations Control is a critical component of the application grid. As the application grid controller, Oracle WebLogic Operations Control analyzes application demands and resource capacity at any point in time and determines the best allocation of resources. With this technology, IT departments can meet application service-level agreements (SLAs) while optimizing resource use across all applications.

## INTRODUCTION

Today's IT departments must be able to support volatile business needs while also meeting SLAs, managing costs, and implementing environmentally sustainable technologies. The ability to support rapid application changes, adapt to fluctuating workload demands, and increase the use of shared IT infrastructure are critical IT requirements. Unfortunately, traditional application architectures have fallen short of these requirements.

Enterprise application installations are traditionally architected as islands of software that are installed or provisioned to fixed, dedicated hardware assets and bound with thin pipes of integration technology. These have proven fragile as demand for rapid application change increases. IT departments are required to meet rapidly fluctuating business SLAs on an increasingly shared IT infrastructure.

Enterprise grid computing is an IT architecture that delivers more flexible, resilient, and efficient enterprise information systems. With grid computing, groups of independent, modular components can be pooled and provisioned on demand to meet changing business needs. The application grid is an infrastructure layer beneath the application layer that pools and dynamically provisions the resources on which those applications run. Because it is rare for all applications to hit peak demand at the same time, pooling resources can maintain desired service levels for

a group of applications while also reducing the physical resources needed to support those applications. Using the application grid increases the efficiency of the IT infrastructure.

## **ORACLE'S APPLICATION GRID PRODUCT PORTFOLIO**

Oracle's application grid product portfolio provides a runtime infrastructure for applications running on any of the following architectures:

- Traditional Java Platform, Enterprise Edition (Java EE) application servers such as Oracle WebLogic Server
- Distributed, transaction-processing platforms such as Oracle Tuxedo
- Highly distributed, parallel application architectures like those built on data grid technologies such as Oracle Coherence

Oracle's application grid capabilities support the definition, deployment, and management of complex, multinode applications in a way that is decoupled from the software and hardware infrastructure—the stack on which it ultimately runs. Applications can be dynamically deployed to shared physical resources that are called into service only as needed. With this flexible infrastructure, IT departments can support live service migration, real-time scale change, and new paradigms for high availability and disaster recovery.

Oracle WebLogic Operations Control—the application grid controller—is the “brains” orchestrating dynamic resource management for the entire application grid. Through a management framework that captures desired runtime application SLAs, it monitors runtime environments and automates the dynamic configuration and deployment of application instances onto available resources. It draws upon the available hardware resources of the grid to ensure application service-level objectives are met.

Long a pioneer in grid computing technologies such as Oracle Real Application Clusters, Oracle is taking grid computing to the next level. By introducing application grid technologies, Oracle brings the same kinds of efficiency, scalability, and quality of service to the application layer as Oracle Real Application Clusters did to the database layer. The benefits delivered by Oracle's application grid product portfolio include the following:

- Exceptional agility with dynamic and adaptive operations
- Superior Quality of Service (QoS) by continually monitoring and automatically enforcing application-level SLAs
- High efficiency with improved hardware, software, and human resource use

**Oracle WebLogic Operations Control enables centralized governance and control over applications running on an application grid. It provides dynamic activation and scale-out to meet ever-changing, mission-critical business demands.**

## **ORACLE WEBLOGIC OPERATIONS CONTROL DEFINED**

Oracle WebLogic Operations Control enables centralized governance and control over applications running on an application grid. It provides dynamic activation and scale-out to meet ever-changing, mission-critical business demands.

With Oracle WebLogic Operations Control, operations teams can define policies based on application-level SLAs that govern the allocation of hardware and software resources, ensuring that QoS goals are met for all applications running across the application grid. When predefined conditions occur, Oracle WebLogic Operations Control will dynamically reallocate resources to applications or services to address changes in workload conditions. Applications and services can be automatically deployed on hardware resources and dynamically extended or reconfigured to meet runtime requirements—without constant monitoring by system operators. This capability results not only from the huge increase in computing power that enables the concurrent running of multiple application instances, but it also results from the distributed architecture of the runtime infrastructure components in Oracle’s application grid product portfolio.

For example, if Oracle WebLogic Operations Control is used to manage the deployment of large-scale Java EE applications running on Oracle WebLogic Server, application administrators can set important policies. Similarly, Oracle WebLogic Operations Control will also be able to manage non-Java applications running on distributed transaction processing platforms such as Oracle Tuxedo. The policies specified might include rules about how many application servers must be available in a given application service, the maximum load those application servers could support, the response time required for application services, and other important SLA metrics. If any of the defined SLA conditions are violated, Oracle WebLogic Operations Control will immediately provision further application server instances, migrate existing application server instances to more-suitable resources, or take other actions to reconfigure the application’s runtime environment.

Oracle WebLogic Operations Control automatically maps application demands to the most appropriate resources available in the hardware pool for hosting application workloads. Oracle WebLogic Operations Control can be configured to start additional instances on pooled hardware wherever they have been defined—either within the data center or in spillover pools that are hosted off-site but made available when required to meet peak application loads.

## **COMPONENTS AND ARCHITECTURE**

There are two main components in the Oracle WebLogic Operations Control software architecture: the controller and the agents. The controller, as previously mentioned, is the brains of Oracle WebLogic Operation Control, storing and evaluating service definitions and policies. The agents act as so-called eyes, ears, and hands, monitoring the environment and providing a conduit for action on running instances.

## The Controller Component

**The controller component maintains a secure repository of service deployments and SLA policies that provide high-performance monitoring of a customizable rules engine so system administrators can specify what it should do when those service levels are at risk.**

The controller component maintains a repository of service deployments and SLA policies that continually monitor application behavior and evaluate the data through a customizable rules engine. System administrators can then specify what actions should be taken when those service levels are at risk. The controller monitors critical metrics from Java virtual machines (JVMs), application server containers, applications, and resources. It can also change configurations and provide start, stop, suspend, and resume process control for runtime containers. This means that operations teams can automate key tasks aimed at maintaining application QoS—such as provisioning new application instances or migrating existing deployments to alternative hardware resources—based on how applications and their underlying service-oriented architecture services behave at runtime. By itself, the controller can determine optimal application instance placement for service deployments by matching service-deployment requirements with specific resource pool capacities.

Action pipelines can be defined to initiate complex, sequenced activities in response to an event or condition, while calendar-based rules enable action scheduling on either a one-off or periodic basis. Where appropriate, Oracle WebLogic Operations Control can also be configured to require administrator approval (adjudication) before an action is executed. The controller can also surface alerts, notifications, and fault information using a variety of protocols, including Simple Mail Transfer Protocol, Simple Network Management Protocol, Java Message Service (JVM), and Java Management Extensions.

The controller maintains a complete aggregated view of all available resources in the Oracle WebLogic Operations Control management realm, providing a detailed dashboard view of the capabilities, performance, and resource usage. This gives the administrator a single view of each application's runtime behavior, the resources that the applications map to, and the use of those resources. The customizable Oracle WebLogic Operations Control console provides fully interactive views of service and resource topologies. With the ability to visually monitor the health and status of services, JVMs, and resources, the Oracle WebLogic Operations Control console provides a dynamic, runtime view of an entire application realm. It also provides full lifecycle and audit tracking as well as log and alert viewing.

The controller is also extensible through smart packs that enable it to manage multiple types of application instances. Smart packs provide out-of-the-box definitions for interfacing with Oracle's application grid runtime containers as well as gathering relevant metrics to populate the most commonly used policies and actions. Currently, smart packs for Oracle WebLogic Server and Oracle Coherence are provided out of the box. In the future, smart packs will be made available for additional Oracle Fusion Middleware products.

**The agent components within Oracle WebLogic Operations Control provide a connection to the resources that make up the application resource pool. Their responsibilities extend to collecting and aggregating a rich variety of information about the resources and services they monitor, which they then return to the controller component.**

## **The Agent Components**

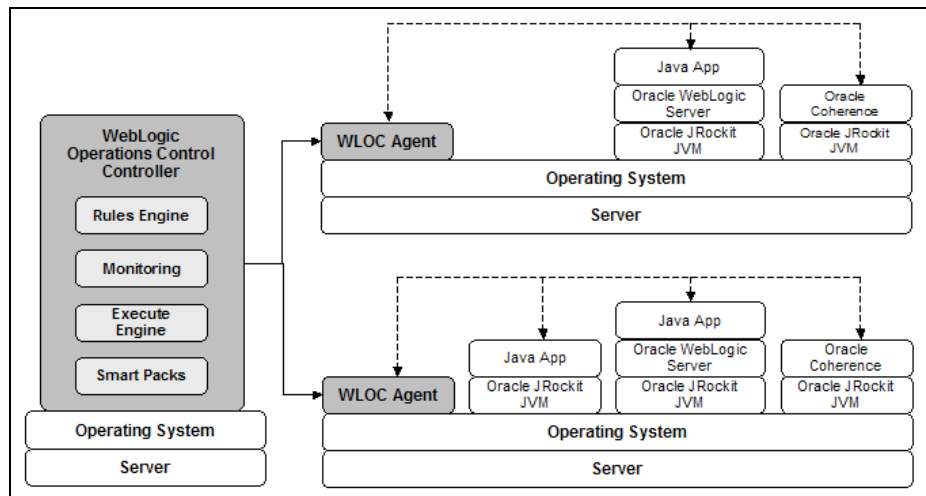
The agent components within Oracle WebLogic Operations Control provide a connection to the resources that make up the application resource pool. Agents determine the managed environment's resource capabilities and provide the appropriate process control operations and platform-specific runtime information using a pluggable, extensible architecture. Their responsibilities extend to collecting and aggregating a rich variety of information about the resources and services they monitor, which they then return to the controller component. In addition, agents serve as the conduit for gathering metrics as well as implementing configuration changes to the running application instances.

Currently, agents are available and supported for Windows, Linux, and Solaris operating system environments where the agent can manage JVMs, Oracle WebLogic Server, and Oracle Coherence instances. However, the agent framework is flexible enough to also be used for managing application instances deployed onto non-Java distributed transaction processing platforms such as Oracle Tuxedo and virtualized server environments such as Oracle VM. Over time, more agents will be made available to support additional virtualized and nonvirtualized resource environments.

## **Deployment Architecture**

An example deployment of Oracle WebLogic Operations Control that illustrates the role of and architecture behind the controller and agent components is shown in the figure. In this example, the controller is managing a domain with several Oracle WebLogic Server instances, along with Oracle Coherence and a custom Java application running directly within Oracle JRockit's JVM.

By having full visibility into the resources on all available servers, the controller automatically determines the placement of each instance of Oracle WebLogic Server, Oracle Coherence, and Oracle JRockit's JVM. This is based on the resource demands of the application instances and the available server resource capacity.



An example of Oracle WebLogic Operations Control's deployment architecture

## BENEFITS OF ORACLE WEBLOGIC OPERATIONS CONTROL

**With Oracle WebLogic Operations Control, an organization can control and optimize its entire application estate—regardless of how and where those applications run—using a single management framework that is able to take advantage of all the features of the underlying platforms.**

Oracle WebLogic Operations Control is a key component of Oracle's application grid portfolio architecture. It provides application-level adaptive automation for applications on the application grid. With Oracle WebLogic Operations Control, an organization can control and optimize its entire application estate—regardless of how and where those applications run—using a single management framework that takes advantage of all the features of the underlying platforms.

Oracle WebLogic Operations Control is able to observe the runtime behavior at the JVM, the application server, and the transaction processing layers of each application, giving it access to a wealth of information about the application's performance, health, and availability. Administrators can also use Oracle WebLogic Operations Control to establish and protect runtime priorities between application components and services. For example, administrators can configure it to start extra instances in support of a high-priority service while decommissioning instances of a lower-volume service. As a result, administrators save resources, accommodate higher-priority workloads, and even reduce power use.

## CONCLUSION

**With Oracle WebLogic Operations Control, IT is able to dynamically and efficiently meet the service-level objectives of all business applications.**

The movement toward next-generation data centers makes increasingly shared IT infrastructures inevitable. The volatile nature of business demands and SLAs makes agile IT operations a requirement. Oracle's application grid product portfolio offers a unique value proposition with its runtime and design time capabilities that make IT operations agile, service focused, and efficient. With Oracle WebLogic Operations Control, an organization can control and optimize its entire application estate—regardless of how and where those applications run—using a single management framework able to take advantage of all the features of the underlying platforms. With Oracle WebLogic Operations Control, IT is able to dynamically and efficiently meet the service-level objectives of all business applications.



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Oracle Corporation  
World Headquarters  
500 Oracle Parkway  
Redwood Shores, CA 94065  
U.S.A.

Worldwide Inquiries:  
Phone: +1.650.506.7000  
Fax: +1.650.506.7200  
[oracle.com](http://oracle.com)

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