Oracle® Configurator

Performance Guide

Release 11*i*

Part No. B10616-01

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This book provides detailed information about optimizing configuration model designs and setting up the Web server for optimal performance at runtime, as well as Configurator-specific setup parameters for LoadRunner and case studies that illustrate the Configurator data relevant to performance testing.

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Oracle Configurator Performance Guide, Release 11*i*

Part No. B10616-01

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Preface

Welcome to the *Oracle Configurator Performance Guide*. This book contains information you need for optimizing runtime performance of Oracle Configurator. Using this document, you can prepare for and implement high performance configuration model designs, Web server configuration, and runtime testing. This book should not be used alone, but together with the other books in the Oracle Configurator documentation set.

This preface describes how the book is organized, who the intended audience is, and how to interpret the typographic conventions.

For details about what is and is not included in this book, see Section 1.1, "Scope of this Guide" on page 1-1.

Intended Audience

This guide is intended for Oracle Consultants and implementers who are deploying a Web-based Configurator. You should have a working knowledge of your business processes, tools, configuration models, and the other books in the Oracle Configurator documentation set. You should also be familiar with Oracle Applications and the Oracle Applications database.

If you have never used a configurator application, we suggest you attend one or more of the Oracle Configurator training classes available through Oracle University.

Additional specifics about audience are included in the Structure section of this preface.

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Structure

This book contains a table of contents, lists of examples, tables, and figures, a reader comment form, a preface, several chapters, appendixes, a glossary, and an index.

Introduction

Useful for anyone planning, implementing, or testing Oracle Configurator, this chapter explains the scope of the guide, defines terms, and provides background information about Oracle Configurator that is relevant to evaluating and tuning runtime performance.

Tuning

Useful for anyone preparing Oracle Configurator for deployment, this chapter describes the tuning process and best practices for tuning performance over the lifetime of your project, as well as important tuning recommendations not included in Configuration Model Design and Web Server Configuration.

Configuration Model Design

Intended principally as a reference for implementers using Oracle Configurator Developer, this chapter contains details about how to avoid having your configuration models be the cause of performance problems at runtime.

Web Server Configuration

Intended principally as a reference for the Web server administrator or the database administrator responsible for configuring and maintaining Web servers, this chapter lists default and recommended values for parameters of the Web server that affect Oracle Configurator performance.

Tools and Collecting Data

Intended principally as a reference for anyone involved in testing Oracle Configurator, this chapter explains what and under what conditions to collect data for performance evaluation and tuning. LoadRunner (Mercury Interactive Corporation) is the sample tool. Appendix C, "LoadRunner Settings" lists specific LoadRunner settings

Case Studies

Intended principally as a reference for anyone involved in planning, implementing, or testing a production Oracle Configurator, this appendix contains examples of performance data for various Oracle Configurator deployments based on types of configuration models and environments. The appendix includes the queries used for determining number of nodes in these models. The appendix also contains the specifications of the database server, Web server, and client machine configuration used in conducting these case studies.

LoadRunner Settings

Intended principally as a reference for anyone setting up LoadRunner tests, this appendix describes some LoadRunner parameters that are specific to Oracle Configurator and that must be set in order to collect performance data.

Summary of Web Configuration Parameters

Intended for the Web server administrator or the database administrator responsible for configuring and maintaining Web servers, as an overview at a glance of the Apache Web server parameters that affect Oracle Configurator, their recommended values, and the file in which the parameter is set.

Glossary of Terms and Acronyms

This manual contains a glossary of terms used throughout the Oracle Configurator documentation set.

Related Documents

For more information about Oracle Configurator, see the following manuals in the Oracle Configurator documentation set:

- *Oracle Configurator Implementation Guide* (Part No. B10615-01)
- *Oracle Configurator Installation Guide* (Part No. B10619-01)
- *Oracle Configurator Developer User's Guide* (Part No. B10614-01)
- *Oracle Configuration Interface Object (CIO) Developer's Guide* (Part No. B10617-01)

The following documents may also be useful:

- *Oracle Configurator Release Notes* (Part No. B10620-01)
- *Oracle Applications System Administrator's Guide (Part No. A75396–08)*
- *LoadRunner: Creating GUI Vuser Scripts Online Guide*
- *Oracle Applications User's Guide (Part No. A75394–04)*
- *Oracle Applications Developer's Guide (Part No. A75545–03)*
- *Maintaining Oracle Applications* (Part No. A90810–01)
- *Oracle 8i Tuning* (Part No. A67775-01)
- *Oracle 8i Designing and Tuning for Performance* (Part No. A76992-01)
- Oracle 9i Database Performance Methods (Part No. A87504-02)
- Oracle 9i Database Performance Planning (Part No. A96532-01)
- Oracle 9i Database Performance Tuning Guide and Reference (Part No. A96533-01)

The following documents represent a possible starting point in researching tuning and benchmarking methodology:

- *Quality Web Systems: Performance, Security, and Usability* by Elfriede Dustin, Jeff Rashka, Douglas McDiarmid, Jakob Nielson (Addison-Wesley Longman, 2001, ISBN: 0201719363)
- *Performance Evaluation and Benchmarking with Realistic Applications*, Rudolf Eigenmann, Editor (MIT Press, 2001, ISBN 0262050668)

Additional white papers and information about benchmarking and tuning are available at:

- http://www.benchmarkresources.com
- http://www.ideasinternational.com/benchmark/bench.html
- http://www.oracle.com/apps_benchmark/html/index.html?results.html

Other sites of interest are:

- http://httpd.apache.org/docs-project/
- http://apache.us.oracle.com

Conventions

In examples, an implied carriage return occurs at the end of each line, unless otherwise noted. You must press the Return key at the end of a line of input.

The following conventions are also used in this manual:

Convention	Meaning
. . .	Vertical ellipsis points in an example mean that information not directly related to the example has been omitted.
. . .	Horizontal ellipsis points in statements or commands mean that parts of the statement or command not directly related to the example have been omitted
boldface text	Boldface type in text indicates a new term, a term defined in the glossary, specific keys, and labels of user interface objects. Boldface type also indicates a menu, command, or option, especially within procedures
italics	Italic type in text, tables, or code examples indicates user-supplied text. Replace these placeholders with a specific value or string.
[ ]	Brackets enclose optional clauses from which you can choose one or none.

Convention	Meaning
>	The left bracket alone represents the MS DOS prompt.
$	The dollar sign represents the DIGITAL Command Language prompt in Windows and the Bourne shell prompt in Digital UNIX.
%	The per cent sign alone represents the UNIX prompt.
`name()`	In text other than code examples, the names of programming language methods and functions are shown with trailing parentheses. The parentheses are always shown as empty. For the actual argument or parameter list, see the reference documentation. This convention is *not* used in code examples.

Product Support

The mission of the Oracle Support Services organization is to help you resolve any issues or questions that you have regarding Oracle Configurator Developer and Oracle Configurator.

To report issues that are not mission-critical, submit a Technical Assistance Request (TAR) using Metalink, Oracle's technical support Web site at:

`http://www.oracle.com/support/metalink/`

Log into your Metalink account and navigate to the Configurator TAR template:

1. Choose the **TARs** link in the left menu.
2. Click on **Create a TAR**.
3. Fill in or choose a profile.
4. In the same form:
   a. Choose **Product**: Oracle Configurator or Oracle Configurator Developer
   b. Choose **Type of Problem**: Oracle Configurator Generic Issue template
5. Provide the information requested in the iTAR template.

You can also find product-specific documentation and other useful information using Metalink.

For a complete listing of available Oracle Support Services and phone numbers, see:

`www.oracle.com/support/`

1 Introduction

This Introduction explains the scope of the *Oracle Configurator Performance Guide* and relevant terms used in the book.

For an overview of Oracle Configurator architecture, see the *Oracle Configurator Implementation Guide*.

1.1 Scope of this Guide

This guide focuses primarily on the Applications or middle tier of Oracle Configurator's classic three-tier architecture. See Section 2.3, "Tuning Key Components of the Oracle Configurator Architecture" on page 2-6 for details about what the middle tier includes.

Within the Applications tier, this guide focuses on the issues involved in accurately measuring performance and scalability, as well as the analysis tools used to measure performance. The guide discusses how to plan and conduct a comprehensive benchmark for a Oracle Configurator implementation.

The main areas of potential performance gain are those where most of the processing takes place:

- Configuration Model Design
- Web Server Configuration

This guide focuses on information specific to Oracle Configurator in these areas, but also provides explanations of tuning potential in other Oracle Configurator components of a deployment (Chapter 2, "Tuning").

To help you assess what configuration model data is relevant to performance testing, this guide includes several case studies of performance tests by Oracle Configurator Development.

The following topics are also important for tuning performance, but *not* the focus of this book:

- Tuning the database or database server (some suggestions are presented in Chapter 2, "Tuning")
- Tuning the client machine setup (some suggestions are presented in Chapter 2, "Tuning")
- Determining machine sizes for your deployed application
- Tuning non-runtime performance such as Oracle Configurator Developer, configuration model publication, or data import and refresh performance
- Tuning the host application

1.2 Relevant Terms

For a complete list of terms used in Oracle Configurator documentation, see the Glossary at the end of this book. To locate more information about the highlighted concepts in this section, refer to this book's Table of Contents and Index.

Runtime refers to a launched Oracle Configurator window, either while unit testing directly from within **Oracle Configurator Developer**, or invoked from a hosting application. When an Oracle Configurator is deployed, it is invoked from a hosting application either for system testing or production.

Starting up Oracle Configurator makes a configuration model accessible to end users. A **configuration model** consists of model structure and rule definitions. It also commonly includes user interface definitions and possibly UI customizations, as well as **Functional Companions**. Functional Companions extend the behavior of the configuration model beyond what can be implemented in Oracle Configurator Developer. These elements of the model are also called the **Active Model** and the **UI**. The Active Model represents the valid configurations allowable by the rules defined in the configuration model.

Launching or initializing an Oracle Configurator window **loads** a **configuration model**, unless the model is **preloaded**. Preloading the configuration model means it is cached in memory before launching the Oracle Configurator window and starting a **configuration session**. **Load time** can be a critical element in performance.

Once a configuration model is loaded, end users work through a **configuration session** by making selections on a **client** machine connected to the **Web server** running the **Oracle Configurator Servlet**.

Response time is a critical element in session performance. The total end-user response time is the total **throughput** time under load, including the server response time, display time, and network latency.

Normally, a configuration session results in a completed or valid **configuration**. A single configuration session is limited to the one configuration model that is loaded when the session is initialized.

Performance measures the operation of a product, in this case the runtime Oracle Configurator. For the purposes of this guide, performance is the speed with which the product loads and responds to end-user actions under various conditions. When performance is poor—commonly too slow—the configuration model, Web server, or other elements of the deployment can be **tuned** to improve performance.

The configuration model data in the database and the application software running on a Web server should be running on different machines in a **distributed computing** environment on a single network.

Project goals, end-user expectations, and previous performance influence the decision to tune the various components of a deployment. A **benchmark** represents performance data collected during a runtime test under various conditions that emulate expected or extreme use of the product.

Based on throughput and other performance data, you can refine the **sizing** of your deployment environment, meaning determine the machines and software configuration needed to run your tuned application.

2 Tuning

This chapter explains the fundamentals of performance tuning and how various components of Oracle Configurator architecture affect performance.

Note: Good tuning starts with good design. You can reduce your tuning efforts by designing your configuration model with performance in mind (see Chapter 3, "Configuration Model Design").

The sections are:

- Fundamentals of Performance Tuning
- The Tuning Process
- Tuning Key Components of the Oracle Configurator Architecture
- Isolating Performance Problems and Intervening

See the Section "Structure" on page xviii in the Preface to verify the audience for whom this chapter is intended.

2.1 Fundamentals of Performance Tuning

Performance tuning is a complex, iterative process. Deriving meaningful results requires using a proven methodology and understanding the environment, how the application will be used, and the required throughput. Using a proven methodology minimizes confusion and gaps in the process. By understanding the environment, application, and throughput, you will be able to define the kind of benchmarks you need to accurately reflect the scenario in which you operate.

Warning: **The performance tuning methodology presented here introduces the topic and is not meant to be exhaustive or definitive. Consult the "Related Documents" section in the Preface of this book for help in researching a tuning methodology for your implementation.**

2.1.1 Methodology

A methodology provides a general approach to performance tuning that helps you avoid gaps or missed opportunities. At the core of a useful methodology is a repeatable process for evaluating, diagnosing, and intervening to improve performance.

Note: The tuning process should begin when you first design the configuration model. Once the configuration model has been built, modifying the design to improve performance may delay your deployment unnecessarily.

In the case of Oracle Configurator, intervention can consist of

- modifying the configuration model design
- changing the Web server configuration
- upgrading to a more recent release
- applying available patches
- modifying the hardware setup

Additional intervention can occur in the database and integration points with hosting applications.

Depending on your needs, intervention should generally maximize the largest potential benefit for the broadest range of circumstances.

Evaluating or analyzing the problem includes understanding what has been done to date and comparing performance with baselines and previous benchmarks. Comprehensive documentation of baselines and benchmarks is prerequisite to effective analysis and comparisons.

Diagnosing performance bottlenecks or hot spots and deciding on appropriate intervention requires access to expertise in your business model, the application, and the environment and technology stack.

Successful diagnosis and tuning requires:

- understanding your expectations of success and determining what are reasonable and achievable goals
- dividing the application’s key components into measurable units and evaluating their performance separately, as well as collectively
- having access to expert knowledge of your business model, the life of the application, the workflow of operation, and the environment and technology stack
- having access to expert knowledge of Oracle Configurator, including Oracle Configurator Developer, for understanding the configuration model’s role in performance
- benchmarking the application at various usage levels
- repeating the tuning process when measurements fall short
- diligently recording steps and documenting results to make the process reliable and repeatable

For more information about collecting and analyzing data, see Chapter 5, "Tools and Collecting Data".

2.1.2 Documenting Results

It is important to maintain detailed notes during each phase of the data collection, analysis, and tuning process. Detailed documentation of setup, actions, and results helps ensure that the process is reproducible and reliable. See Appendix B, "Case Studies" for examples of how to document final tuning results.

2.1.3 Defining Success Criteria

You will need to determine at what point in the tuning process your configuration model performance is good enough for deployment. This requires balancing what can be expected from your software and hardware with what your end users find acceptable. Conduct usability studies with sample end users to determine additionally what your performance goals should be.

2.2 The Tuning Process

The tuning process, following a repeatable and reliable methodology, allows you to make decisions and changes based on appropriate analysis of the data. Tuning Oracle Configurator effectively requires following a proven, iterative sequence of tasks and specific steps within those tasks.

2.2.1 Steps in the Process

Tuning Oracle Configurator is a step-by-step process.

1. Collect performance data for various operations within Oracle Configurator using the tools described in Chapter 5, "Tools and Collecting Data". See Section 2.4, "Isolating Performance Problems and Intervening" on page 2-11 for a list of runtime events and other functionality where performance problems may occur.
2. Document the results. If the performance numbers are not satisfactory, begin tuning.

   If the Oracle Configurator implementation has never been performance tested or tuned before, continue on with the process described here.

   If the Oracle Configurator implementation has previously performed better, either repeat this process or see the suggestions in Section 2.4.5, "Tuning Hot Spots" on page 2-13.
3. Start with tuning the configuration model design, as described in Chapter 3, "Configuration Model Design".

   The sequence of tuning tasks within the configuration model design should be, in order:

   - Model Structure
   - User Interface
   - Rules
   - Functional Companions
4. Collect incremental performance numbers after every few changes. Document the changes made and the resulting performance numbers.
5. Iterate over the previous two steps until either the performance numbers are satisfactory or no more changes are possible to the model structure, rules, user interface, or Functional Companions.

6. Focus next on the Web server configuration. Web server tuning is generally, but not exclusively indicated when performance for a single user is good, but significantly degraded with multiple users.

   Monitor CPU utilization and memory usage for the most costly events:

   a. model load
   b. configuration save
   c. Functional Companions

7. Start the iterative process of tuning the Web server.

   The sequence of tuning tasks within the Web server configuration should be, in order:

   - change configuration parameters as described in Chapter 4, "Web Server Configuration".
   - modify number of Java Virtual Machines (JVM) per CPU
   - modify maximum number of end users per JVM to avoid 100% CPU utilization and dropping the JVM

8. Document the changes made to the Web server and collect the resulting performance numbers.

9. Iterate over the previous two steps until either the performance numbers are satisfactory or no more changes are possible.

10. For performance improvement in the area of loading or preloading configuration models and saving configurations, attention to database tuning would be helpful. Database tuning information is not within the scope of this book. See also Section 3.3.3, "Memory Usage and Model Load Setting" on page 3-6 for considerations in loading and preloading configuration models.

11. For additional performance benefits, tune the setup of the client machine. Although client machine setup tuning is not within the scope of this book, see Section 2.3.3, "Client Machine Tuning" on page 2-10 for some suggestions.

    The sequence of tuning tasks within the client machine setup should be, in order:

    - browser settings
    - swap space
    - memory

12. For additional performance improvement in the area of rendering UI controls, screens, and propagations of selection changes in the Oracle Configurator window, attention to network tuning between the client and the Web server could be helpful.

    Although network tuning information is not within the scope of this book, see Section 2.3.1.7, "The Network" on page 2-9 for suggestions.

It is important to maintain detailed notes during each phase of the tuning process. This makes the process reproducible and reliable. Appendix B, "Case Studies" presents such documentation of final results in several example benchmarks.

2.3 Tuning Key Components of the Oracle Configurator Architecture

Oracle Configurator operates in a classic three-tier environment. The configuration model, user interface definitions and business rules are *stored* in the Database tier. These definitions are *processed* in the Applications tier and *rendered* in the User Interface tier or layer. Most of the processing for Oracle Configurator is performed in the middle or Applications tier. In that sense, Oracle Configurator is a typical middle-tier application.

See the *Oracle Configurator Implementation Guide* for details about the architecture and application flow among tiers and elements of an Oracle Configurator deployment.

For best performance, set up your Oracle Configurator deployment with different server machines for the database and the application or Web server (middle tier). For details about this, see Section 2.3.2, "Server Machine Tuning" on page 2-9. Size the middle tier (where the OC Servlet with the Oracle Configurator engine and UI Server are installed) according to the complexity and size of your configuration model, as well as the end-user demands on your runtime Oracle Configurator.

2.3.1 Components Affecting Performance

The optimal performance of a Web-based Oracle Configurator depends on the performance of the following elements.

- Configuration Model Design
- Configuration Interface Object (CIO)
- Custom User Interface Design and Implementation
- Web Server

- Oracle Configurator Servlet
- Database Server
- The Network

These components require careful analysis to get the best possible performance out of the system. Tuning requires iterating over all these essential components, tuning each of them independently and collectively.

2.3.1.1 Configuration Model Design

All parts of a configuration model participate in performance. You benefit from designing each part thoroughly to optimize performance before starting model construction. For a review of what a configuration model entails, review Section 1.2, "Relevant Terms" on page 1-2. For details about tuning model design, see Chapter 3, "Configuration Model Design".

2.3.1.2 Configuration Interface Object (CIO)

The CIO is an API layer that handles communication between the Active Model and the UI. Functional Companions and custom UIs communicate with the Active Model through the CIO.

There is generally no tuning that can be done in the CIO interactions. However, the design and implementation of code that uses CIO methods to access the configuration model can be tuned to use the CIO most effectively.

Functional Companions and custom UI code can affect runtime performance by less than optimal use of the CIO methods. You can optimize (or minimize) the sequence of changes to a configuration model that a Functional Companion invokes by avoiding expensive intermediary transactions in the CIO. For details on tuning Functional Companions, see Section 3.5, "Functional Companions" on page 3-10.

2.3.1.3 Custom User Interface Design and Implementation

In some deployments, the user interface is entirely custom, meaning it is not generated as a UI using Oracle Configurator Developer. If the custom UI code interfaces with the Configuration Interface Object (CIO), then it is important to optimize how the UI code calls the CIO. For details about designing a custom UI for better performance, see Section 3.3.5, "Custom User Interface" on page 3-7.

2.3.1.4 Web Server

Most of Oracle Configurator processing occurs in the Web server portion of the middle tier. Data retrieved from the database is processed in memory in the Web server.

Oracle Configurator uses the high performance Apache Web server in the Oracle Internet Application Server (*i*AS).

For details about the parameters in various configuration files that are used to tune performance, see Chapter 4, "Web Server Configuration".

2.3.1.5 Oracle Configurator Servlet

The Oracle Configurator Servlet is the machinery responsible for rendering the User Interface and brokering the communication between the configuration model, the database, and the client. The Oracle Configurator Servlet is installed on the Web server.

Typical OC Servlet transactions are longer than database transactions and compete for CPU time. See Section 2.4.1, "System Transactions" on page 2-11 for details.

There is generally no tuning that can be done in the OC Servlet interactions. However, the design and implementation of the configuration model can be tuned to use the OC Servlet most effectively.

2.3.1.6 Database Server

Oracle Configurator in the middle tier accesses the database during the initialization and saving of configurations. Data is retrieved from the database in intervals and processed in memory in the Web server. See Section 2.4.1, "System Transactions" on page 2-11 for data transaction scheduling.

For more efficient use of database server resources, purge records flagged for deletion before creating the production-ready version. See *Oracle Configurator Implementation Guide* for more information about purging records.

While there is no specific database tuning required for Oracle Configurator, following the general recommendations for Oracle Applications is likely to improve performance.

Note: Tune first the configuration model design and then the Web server configuration before tuning the database.

2.3.1.7 The Network

Network latency may affect production end users. Network latency may not be accounted for in benchmarking test results.

The Web server and database servers should be on separate machines, but on the same high bandwidth network. Timeout settings of any firewall should be set to `none` to prevent killing the database connection.

Network latency between client and server could be an issue if there is a big difference between client side response times (recorded in the `czSource.htm` file) and the time the same action takes on the Web server (recorded in the appropriate `cz_session` log file). See Section 5.2.2, "Client Side Data" for details about the `czSource.htm` file.

See the *Oracle Configurator Implementation Guide* for additional details about network considerations in an Oracle Configurator deployment.

2.3.2 Server Machine Tuning

Because Oracle Configurator processes compete with database processes for CPU time and OC Servlet transactions are longer than typical database transactions, the Web server and database server are never installed on the same machine.

Note: Oracle strongly recommends that the Web server and the database server and the client all be installed on separate machines, but on the same network.

See Section 2.4.1, "System Transactions" on page 2-11 for more information about how Oracle Configurator and database processes compete.

Garbage collection (GC) is an important part of tuning a Java Web server application. Be sure to increase the memory as you increase the number of processors, since allocation can be parallelized, but GC is not parallel.

If server machine memory is an issue, a router may be needed to spread the end users to particular CPUs dedicated to supporting a subset of the possible configuration models. Routing end user access to specific servers running a subset of models requires additional planning and testing. See the *Oracle Configurator Implementation Guide* for additional details about using routers in an Oracle Configurator deployment.

Appendix B, "Case Studies" describes the Web server and database server configuration used internally for testing by Oracle Development.

2.3.3 Client Machine Tuning

The client machine configuration is not generally under the control of the Web-based Oracle Configurator in a typical business-to-consumer production environment. However, it is possible to include guidance on the host application Web site recommending machine and browser specifications that provide the best performance.

When client machines *are* under your control, such as during testing or for internal deployments, tune the client machines for optimal performance. Tuning the client machine configuration is likely to produce performance improvements.

Appendix B, "Case Studies" describes a client configuration used internally for testing by Oracle Development.

If you have control over the client machine setup, you can improve client side performance by:

- Setting up adequate swap space and keeping disks de-fragmented on the client machine
- Increasing the client machine memory, virtual memory, CPU
- Verify that browser settings support DHTML (see the *Oracle Configurator Implementation Guide* for details)
- Tuning browser settings, browser types, browser versions

For optimal runtime performance on a client running Microsoft Internet Explorer, make sure the following browser settings are in place:

1. In the **Tools** menu, **Internet Options** command, **General tab**, **Temporary Internet Files** section:

   a. Verify that **Check for newer versions of stored pages** is set to **Automatically**.

      Setting **Check for newer versions of stored pages** to **Every visit to the page** slows runtime performance by from 10 to 20 seconds per screen flip

   b. Verify that **Temporary Internet Files Folder** section is set to a large temporary area (at least 20 MB, preferably 50-100 MB) for storing Configurator pages.

2. If the end user repeatedly accesses a configuration model, it is helpful to preserve the browser cache. In the **Tools** menu, **Internet Options** command, **Advanced** tab, **Security** heading (bottom of the list):

a. Verify that **Do not save encrypted pages to disk** is *not* selected. In other words, you want encrypted pages saved to disk.

b. Verify that **Empty Temporary Internet Files folder when browser is closed** is *not* selected In other words, when you close the browser, the temporary Internet Files folder is not emptied and the browser cache is preserved.

If these two settings *are* selected, you will not get optimal performance because the effect is the same as clearing the browser cache.

2.4 Isolating Performance Problems and Intervening

Optimizing the following can lead to significant performance gains the next time you test the system or run a benchmark:

- System Transactions
- Pricing and ATP
- Database Commits
- Oracle Applications Debugger Tool
- Tuning Hot Spots

Beyond these common problem areas, you can explore and tune hot spots, as presented in Section 2.4.5 on page 2-13.

2.4.1 System Transactions

Runtime performance involves distinct events:

- Transmission of user action
- Processing of UI event by the Oracle Configurator Servlet
- Processing of logic changes by the Oracle Configurator engine
- Creation of UI changes by Oracle Configurator Servlet
- Transmission to and rendering by the client browser

Commonly, most of the processing occurs in the client to Web server network and UI rendering. Logic transactions are *relatively* faster when measured against that network and UI processing. However, rule design and number do affect performance of logic transactions in the OC engine (see Section 3.4, "Rules").

Oracle Configurator is a Central Processing Unit (CPU) intensive application. Data is retrieved from the database in intervals and processed in memory in the Web server. The default UNIX "round robin" CPU scheduling favors short transactions. Typical database transactions are short transactions. Typical Oracle Configurator Servlet transactions are long-running transactions.

Note: In a busy system where CPU utilization is high, Oracle Configurator processes lose out to the database processes and get only a small slice of the CPU at a time. This radically affects performance (server response time and display time). For this reason, running the database and Web server on separate machines in a distributed computing environment is critically important. See also Section 2.3.2, "Server Machine Tuning" on page 2-9.

2.4.2 Pricing and ATP

You can improve performance by fetching pricing data only when it is needed for the end user of your application. Runtime performance problems could arise from pricing and Available to Promise (ATP) processing within Oracle Configurator.

If pricing and ATP are needed, isolate them as a performance problem by turning them off. Intervene by tuning the frequency of transactions involving retrieval of pricing and ATP data. See Section 4.2.4.6, "cz.activemodel" and Section 4.2.4.10, "cz.activemodel.lazyloadlistprice" for additional details.

For more information about pricing and ATP, see the *Oracle Configurator Implementation Guide*.

2.4.3 Database Commits

In some cases, hosting applications must commit end-user changes before launching Oracle Configurator. Initializing and loading the configuration model can be slow if an implicit save occurs. If the end user explicitly saves work in the host application before trying to start a configuration session, the perceived performance of the Oracle Configurator improves. Order Management is an example where an explicit save before clicking the Configurator button significantly improves the configuration model load time.

2.4.4 Oracle Applications Debugger Tool

The Oracle Applications Forms Debugger tool (Help -> Diagnostics -> Debug if the form was started in debug mode) can influence performance of Oracle Configurator. Isolate the Forms Debugger as a performance problem by turning it off. Intervene by keeping the Forms Debugger off during production deployment.

2.4.5 Tuning Hot Spots

Ideally, you tune Oracle Configurator following the overall sequence outlined in Section 2.2.1, "Steps in the Process". When tuning for hot spots, the sequence may be different, particularly if limited changes have occurred in a runtime Oracle Configurator that previously performed well.

Hot spot tuning involves identifying the area of change in the implementation since the previous performance test, and tuning that area if the results show degradation. It is critical to have baseline performance data with which to compare the changes. In Section 2.4.5.1 through Section 2.4.5.6, the assumption is that only one factor in the implementation has changed. For example, if your configuration model has changed and nothing else has, why might your performance results have changed.

2.4.5.1 If Your Configuration Model Has Changed

If your configuration model has changed, performance problems could manifest themselves in the following areas:

- Model load time, if the number of nodes has increased significantly (see Section 3.2.1, "Size" on page 3-2)
- Web server performance, if the rules or UI customizations have changed
- Client machine performance, if the UI customizations or number of options to render in option lists have changed.

Reducing the number of nodes in a configuration model is not usually an option. However, you can optimize configuration model load time by changing the way a large model is loaded, or by pre-loading it (see Section 3.3.3, "Memory Usage and Model Load Setting" on page 3-6).

If rule and UI customizations changes adhere to the design suggestions in Chapter 3, "Configuration Model Design" and there are no further design optimizations possible, you can improve Web server performance by adjusting parameters in the Web server configuration. For example, you may need to adjust the timeout parameters in the Web server configuration. See Chapter 4, "Web Server Configuration".

If there are no further optimizations possible in your UI customization changes, and the Web server performance cannot be improved, consider the role the client machine setup may have in the degraded performance (Section 2.3.3, "Client Machine Tuning" on page 2-10).

2.4.5.2 If Your Web Server Setup or Configuration Has Changed

Document any changes made to the Web server so that you can evaluate why your performance may have changed and so you can go back to a Web server configuration that performed better. For example, routine maintenance or installation of a database or additional software could adversely affect performance. Changing one `jserv.properties` parameter to resolve a new issue may have runtime implications that require other parameters to be adjusted as well in order to sustain an acceptable level of performance.

Inadvertent changes could be the cause of performance degradation. For example, one of the CPUs has failed and needs to be repaired or replaced.

2.4.5.3 If You Upgraded Oracle Applications

After an upgrade of your Oracle Applications release (for example from 11.5.7 to 11.5.9) identify what now performs more slowly. If there were no changes in the Oracle Configurator setup, but its runtime performance has changed, the change could be in the hosting application.

For example, if it takes longer to save a configuration (performance of the Done button in Oracle Configurator), then the Order Management upgrade may have introduced a change that needs to be examined. Or if you have pricing enabled and you now see slower rendering of Oracle Configurator screens, the Advanced Pricing upgrade may have introduced a change that needs to be examined. In this case, you can easily isolate pricing as the problem by disabling it temporarily (see Section 2.4.2, "Pricing and ATP").

2.4.5.4 If You Applied Oracle Configurator Patches

Absent any other changes, a patch upgrade may introduce functionality that causes changes in performance.

Note: *Before* applying an Oracle Configurator patch, read the ARU Patch Readme and the *Oracle Configurator Release Notes*.

Based on information in the ARU Patch Readme and the *Oracle Configurator Release Notes*, you may need to make adjustments to new functionality and changes that are introduced by the patch, such as disabling or changing the default value of new functionality.

If you are applying an Oracle Configurator patch that upgrades the Oracle Configurator release without upgrading the rest of Oracle Applications, you may encounter problems in reading and writing to the Oracle Applications database. For example, a patch upgrade may cause indexes to be dropped, which affect performance in initializing Oracle Configurator and saving configurations. A database analysis can reveal such defects and areas of deadlock in the database transactions. Applying a subsequent patch can fix the problem.

2.4.5.5 If End-User Activity or the Client Machine Has Changed

Compare the degraded performance on a changed or different client machine to a machine where performance was acceptable. If additional software was installed on the client machine, this could affect performance. If other applications are also running more slowly, this could be an indication of a full disk or insufficient memory.

2.4.5.6 If Your User Community or Site Traffic Has Changed

It is important to plan for user volume appropriately and monitor site use. If you are rolling your implementation out to more clients or the number of users hitting the site has increased, you probably need to adjust the Web server configuration parameters. For instance, you can control the number of clients that can simultaneously connect to the server by adjusting the `MaxClients` parameter (see Section 4.2.3.7, "MaxClients").

3 Configuration Model Design

The design of the configuration model is critically important to the performance of your runtime Configurator. Good design that considers performance implications could avoid the need for tuning the design during performance testing. Careful design and tuning of the configuration model, with special emphasis on size and complexity, yields large performance dividends.

Configuration models should be based on production-ready data. Developing a configuration model based on BOM data that is under development may easily result in poor design, which in turn may negatively affect performance and usability.

Furthermore, the breadth of functionality offered by Oracle Configurator Developer allows you to define a wide range of model types, but does *not* prevent you from designing ones that perform poorly at runtime. For that reason, this chapter presents known best practices for optimizing configuration model design. See the *Oracle Configurator Developer User's Guide* for details about using Oracle Configurator Developer to implement the suggestions in this chapter.

See the Section "Structure" on page xviii in the preface to verify the audience for whom this chapter is intended.

3.1 Overview

You develop the configuration model in Oracle Configurator Developer based on designs that best map your business needs to the characteristics of the Oracle Configurator product. Where various design choices result in equivalent runtime effects and behavior, it is prudent to choose the ones proven to perform best.

The key areas that influence the performance of the configuration model at runtime are:

- Model Structure
- User Interface
- Rules
- Functional Companions

Tuning the configuration model design involves an iterative process of tuning structure, UI customizations, rules, and the role of Functional Companions in the model. Each of these areas is explored in this chapter.

Configuration model complexity affects performance. Complex configuration models result from the following factors:

- Large BOMs or model structure
- Complex rules
- Large numbers of rules (depending on the rule design)

See Section 3.4, "Rules" on page 3-7 for details about complex, redundant, and large numbers of rules.

3.2 Model Structure

In general, the size, hierarchical depth, or complexity of the model structure is likely to affect the performance at load time and during the configuration session. Additionally, the number and logic state of Options in an Option Features affect performance.

3.2.1 Size

The size of the model directly affects the time it takes to load the model and display the UI. The bigger the model, the longer the initial load. Oracle recommends preloading the model so that end users experience better performance throughout the configuration session. See also Section 3.3.3, "Memory Usage and Model Load Setting" on page 3-6.

The database size of a configuration model is measured in total number of nodes. Section B.4, "SQL*Plus Queries For Determining Number of Nodes" on page B-10 presents queries used to find out how many nodes are in your configuration model.

Table 3–1 shows general guidelines for identifying the size of your models.

Table 3–1 Configuration Model Size

Size	Number of Nodes
Small	less than 2,000 nodes
Medium	2,000 to 4,000 nodes
Large	greater than 4,000 nodes

Typically, configuration models are small, or 800 to 1,000 nodes. Configuration models containing 5,000 to 10,000 nodes are rare and considered to be very large.

3.2.2 Hierarchical Depth

The hierarchical depth and number of Reference nodes affect performance at runtime. Hierarchical depth or nesting is generally not an issue, since typically configuration models are not deeply nested. If user requirements are best satisfied with nesting, there is only a slight performance cost in implementing the configuration model with greater hierarchical depth. Using mandatory Components (min=1, max=1) improves performance of configuration models with nesting.

Reference nodes should only be used for structure that is being used repeatedly in the model. Sometimes implementers design and create reference models expecting to reuse the structure, but finally only refer to that reference model once. This results in unnecessary performance loss. Tuning a configuration model design should include making single-use references explicit structure in the model.

The cost of uncovering this performance tuning improvement is having to manually rebuild the referenced structure in the parent Model. Good design and project planning should avoid the need for making underused referenced structure explicit.

3.2.3 Complexity

The number of elements in support of intermediary rules, effectivity and Usage settings, Totals and Resources, and the ratio of imported BOM nodes to non-imported nodes, do not affect performance at runtime. See Section 3.4.1, "Number and Complexity of Rules" on page 3-8 for more details about structure in support of intermediary rules.

It is more efficient to assign constant values to Properties than in Options or Numeric Features.

3.2.4 Option Features and Options

An Option Feature is a Feature whose data type is a List of Options.

- Option Features with large numbers of Options can cause slow performance.

  In the Oracle Configurator engine, propagation of a rule that has as a participant one of the Options of an Option Feature triggers an evaluation of all that Feature's other Options. This does not apply to Option Classes and Standard Items in an Oracle BOM.

  A possible solution is to use a Component having Boolean Features instead of Option Features. Another alternative is to use BOM structure for all selectable Options.

- Option Features with a very large number of Options (hundreds) and MAX value can cause slow performance. This also applies to Option Classes and Standard Items in an Oracle BOM.

  The best way to improve performance is to restructure the Model or BOM Model to contain Option Features or Options Classes with fewer Options or Items. If your business requirements demand large numbers of options, consider setting MAX to no value.

  In the Oracle Configurator engine, propagation of a rule that has as a participant one of the Options of an Option Feature triggers a count of the current number of selected Options. If the maximum number of Options is reached, this rule propagates Logic False to all unselected Options.

  If you need the remaining options to be LFALSE after a maximum is reached, then you must set a MAX and incur the performance cost. However, since both LFALSE (from MAX reached) and UNKOWN states are displayed as Available in the UI, your logic requirements may permit you to set the MAX to no value. You can limit the number of allowable selections even without setting MAX to a value by creating a rule to count the selected Options:

  Always_True REQUIRES *Feature.#Selection.#Count* <= MAX

  This rule expresses a hard constraint to set Options Logic True. In this rule, Feature.#Selection.#Count is an advanced expression of an Option Feature. Always_True is the only Option of a (1,1) Option Feature. MAX is the maximum number of options the end user can select. A maximum number of selections can be enforced by combining it with a Contributes rule.

- Large configuration models with many Options and Features might be inefficient if reaching a solution requires a minimal number of Unknowns.

Design your configuration model so that valid configurations are allowed even when numerous Options are Unknown. That way the CIO and the Oracle Configurator engine process fewer number of delta changes on each end user action. For example, use the suggested approach for enforcing the MAX to minimize the propagated Logic False states, instead of the regular MAX.

If performance is not an issue and it doesn’t matter to your implementation whether Options are Unknown or Logic False, then having them be Logic False is better. Instead of enforcing a MAX, create a separate rule that applies min / max (1,1).

3.3 User Interface

For Web-based Oracle Configurators, it is possible to create a user interface several ways:

- generate the UI using the Create New UI command in Oracle Configurator Developer
- customize the generated User Interface (DHTML) in Oracle Configurator Developer
- create an entirely custom UI that accesses the model through custom code invoking the CIO API.

A custom UI is created using tools not available in Oracle Configurator Developer or Oracle Applications and is necessarily an entirely custom project.

The design of the user interface may affect performance. The key areas of influence are:

- Number and Type of Screens and Controls
- Visibility Settings
- Memory Usage and Model Load Setting
- Graphics

Additionally, the client browser and server architecture affect UI performance. For details, see Section 2.3.3, "Client Machine Tuning" on page 2-10 and Section 2.3.2, "Server Machine Tuning" on page 2-9.

3.3.1 Number and Type of Screens and Controls

The number of Oracle Configurator screens and the number of UI controls on each screen, influences runtime performance. Increasing the number of controls increases the time needed to render or paint the screen. This is due to browser resource limitations, not an inherent limitation in Oracle Configurator. The recommended maximum number of UI controls per screen is 8 to 10. The recommended maximum number of graphics per screen is 5.

The type of controls on a page does not influence server performance. Dropdown Lists and Selection Lists take the same amount of time to render. When being painted in the client browser, it is possible that Dropdown Lists paint faster than Selection Lists. Painting time of a Selection List UI control is dependent on how many Options are displayed.

When configuring Option Classes with a very large number (for example, hundreds) of Items, the Java applet does not perform faster than the DHTML window. With the DHTML window you can use multiple screens to display Option Classes with large numbers of Items. If you are using guided selling (DHTML only), hide the Items and have the guided selling questions drive the selections.

3.3.2 Visibility Settings

Using dynamic visibility is generally more expensive than allowing all options to be displayed. Hiding unavailable Options incurs additional server processing because Oracle Configurator must distinguish between purely unavailable (false) options and locally negated options (based on the maximum of the OptionFeature).

3.3.3 Memory Usage and Model Load Setting

Depending on the size of the configuration model, initial load could take a long time to render the first screen. It is possible to set load to on-demand or lazy loading, but this delays throughput of individual screens and screen elements, resulting in overall slow performance of Oracle Configurator.

Oracle recommends preloading models. In a production environment operating on nonstop (24X7) schedule, choose times of least end user activity for preloading your configuration models.

For details about loading, preloading, and lazy loading models, see Chapter 4, "Web Server Configuration", in particular Section 4.2.4.4, "cz.uiserver.lazyload" and Section 4.2.4.5, "cz.uiservlet.pre_load_filename".

3.3.4 Graphics

The number and size of GIFs in a page does not increase the time needed to render the screen on the server. Reducing the number of controls and GIFs on the page may improve the performance of painting the browser page on the client machine.

The HTML template affects UI performance. If you modify the template to do more than the default OC HTML template, performance may be worse depending on elements such as screen layout, UI controls, and custom images.

For additional details about changing the HTML template, see the *Oracle Configurator Implementation Guide*.

3.3.5 Custom User Interface

A custom UI is not created using Create New UI in Oracle Configurator Developer. Since it is created by writing custom code to interface with the Configuration Interface Object (CIO), it is important to optimize the CIO calls to get the best performance. For guidance, see how Functional Companions use CIO calls effectively (Section 3.5, "Functional Companions" on page 3-10).

If you are using a custom UI, note that DHTML controls that use JavaScript for browser events take longer to display on the client than straight HTML does. If the dynamism of JavaScript is not needed in your application, then implementing straight HTML using a custom HTML template could result in a significant performance gain.

3.4 Rules

Rule design has a critical effect on Configurator performance at runtime. The key areas of influence are:

- Number and Complexity of Rules
- Redundancy
- Rule Types and Relations

The number and complexity of the rules affect the scope and complexity of the generated Active Model. Many complex rules slow runtime performance. Complex rules do not slow load time of the configuration model.

Large numbers of rules is a deceptive factor in performance because many rules that use intermediate nodes effectively or avoid unnecessary redundancy can perform better than fewer rules that repeat identical subexpressions or result in cycles.

Similarly, rule complexity is a deceptive factor because the greater complexity introduced by use of intermediate nodes can perform better than the simpler rule design of repeating an identical subexpression in many rules. See Section 3.4.1, "Number and Complexity of Rules" on page 3-8 for details.

For a review of logic states and other information related to rules, see the *Oracle Configurator Developer User's Guide*.

3.4.1 Number and Complexity of Rules

Complex or large numbers of rules within a configuration model could cause slow performance. Whenever possible, use effectivity dates or Usages to turn off rules that are not necessary in certain contexts of the calling application. That lets the Oracle Configurator engine ignore those rules and propagate among the enabled rules more efficiently. When debugging configuration models, disable rules explicitly at the rule or rule folder level to let the Oracle Configurator engine ignore them.

Large numbers of rules with commonly used subexpressions also cause slow performance. When the Oracle Configurator engine propagates such rules, even if there are commonly used patterns of operators and operands, the engine needs to evaluate and propagate each instance of the common subexpression separately.

Consider Example 3–1 showing two rules with a common calculation contributing to a Resource.

Example 3–1 Rules With Common Subexpressions

[(A + B) * C] contributes to R1
[(A + B) * C] + D contributes to R2

Create an intermediate node (I1) for the commonly used subexpression and create an intermediate rule that contains the subexpression [(A + B) * C] and the intermediate node.

[(A + B) * C] contributes to I1

The original rules can then be rewritten by replacing the common subexpression with the new node that expresses the intermediary rule.

I1 contributes to R1
I1 + D contributes to R2

Although this technique creates an additional rule, the net effect of replacing repeating patterns in rules with nodes that represent those patterns is that the Oracle Configurator only computes the subexpression once, thereby reducing the amount of calculation required for each rule that contains the common subexpression.

WARNING: When you use the technique of replacing common subexpressions with intermediate nodes, you must customize the violation message of the intermediary rule to explain the contradiction in terms of the rules that contain the intermediary rule. In other words, the default violation message for I1 in Example 3–1, which is displayed to the end user when Oracle Configurator encounters a problem with R1 or R2, describes a contradiction in I1 unless you customize the message to explain the error in terms of R1 and R2.

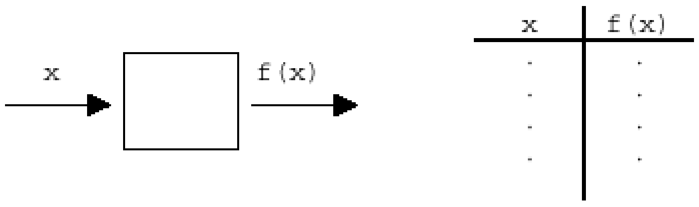
3.4.2 Redundancy

Redundant rules create logic or numeric cycles, which cause slow performance. Example 3–2 shows two rules that would cause the Oracle Configurator engine to cycle.

Example 3–2 Redundant Rules That Create Cycles

(A AND B AND C) implies X
((A AND B AND C) OR D) implies X

Use case analysis to explore the possible propagation paths and eliminate the redundant rules. Case analysis allows you to examine the list of all possible inputs and their results, showing where the propagation path does not settle on a result but cycles through the rule again and again. The generic diagram below shows a case analysis where x is the input and f(x) is the result.



When using case analysis, set one node (x) to a state such as Logic True and determine how that affects the states of other nodes (f (x)) in the model, thus exposing redundancy.

Optimize the configuration problem to avoid creating rules that only create cycles.

To turn on or off rules during debugging, explicitly disable them at the rule or rule folder level.

3.4.3 Rule Types and Relations

When the rule implementers intention is to express compatibility, it is better to use Compatibility rules than Logic rules. The Oracle Configurator engine performs the calculations over a large number of Options faster with Compatibility rules than with any other rule type.

The following rule relations and types typically cause slow performance of the configuration model:

- Defaults rules
- Boolean Features with initial values
- Numeric rules driving quantities of one

Implementing many Defaults rules can be detrimental to runtime performance and you must be careful not to create overlapping conditions. For example, selections initially made by a Defaults rule could be changed by the end user later in the configuration session. This causes the system to reevaluate all parts of the model and reset the logic states of all affected options before the end user can continue. Therefore, Defaults rules should be used as infrequently as possible. In some rare cases, an Implies rule can be used instead of Defaults.

When designing a configuration model, add Default rules at the end of the design process and weigh the performance cost of adding them against the perceived end-user benefit.

Boolean Features with initial values cause slow performance because they behave like Defaults rules.

3.5 Functional Companions

The design of Functional Companions and how they interact with the configuration model as well as other software may affect performance.

The key areas of influence are:

- Runtime Nodes
- Functional Companion Event Sequence
- Adding and Deleting Optional Components
- Optimization of Validation Functional Companions

Functional Companions must use the Configuration Interface Object (CIO) to interact with the configuration model. See Section 2.3.1.2, "Configuration Interface Object (CIO)" on page 2-7 and the *Oracle Configuration Interface Object (CIO) Developer's Guide* for additional information about the CIO.

3.5.1 Runtime Nodes

- The method `RuntimeNode.getChildByID()` is likely to cause slow performance if used on any runtime nodes with many children It is better to use `RuntimeNode.getChildByName()`, which has been optimized.
- Use Java `HashMap` objects to map from names, IDs, and paths to RuntimeNodes so that you can use `RuntimeNode.getChildren()`. If `HashMaps` cannot be used, use localized search by starting only at the Components where you can certainly find the nodes. For better performance, use localized search only once.
- Design your structure appropriately to tune the performance. See Section 3.2, "Model Structure" on page 3-2 for details about structure.
- Functional Companions or custom code invoking the CIO that make many state and count assertions can be inefficient. Use `IState.getState` or `IState.getCount()` and ignore the assertion if the node is already in the desired state or count.

  You can also ignore the assertion if the node is in the opposite state, which if asserted may cause a contradiction, and there is no requirement for getting the contradiction message back.

  WARNING: When you use this technique of ignoring assertions, the contradiction is not obvious for opposite states if the contradictory state is due to defaults, in which case the assertion might succeed.

- Functional Companions and custom CIO code making many calls to `IState.getState()` to check for certain states can be slow.

For each node on which to check the state, call `IState.getState()` only once. Then use the following static methods on the returned int:

- `StateNode.isTrueState()`
- `StateNode.isFalseState()`
- `StateNode.isUserState()`
- `StateNode.isLogicState()`
- `StateNode.isUnknownState()`

You can also use the following methods to combine state checks:

- `StateNode.isSelected()`
- `StateNode.isTrue()`
- `StateNode.isFalse()`
- `StateNode.isUser()`
- `StateNode.isLogic()`
- `StateNode.isUnknown()`

- Functional Companions and custom CIO code making many calls to `IState.getState()` or `OptionFeature.getSelectedOptions()` to get the Options selected as a result of a transaction can be slow. Instead, Use `Configuration.getSelectedItems()`, which uses already-calculated information about the all the TRUE items in the whole configuration.
- If this is done in addition to any number of user selections directly to the CIO (`setState`, `setCount`, `setValue`, and so on) use a transaction to wrap all those assertions.
- In order for the CIO mechanism to be able to update the selected item list, make sure you commit the transaction before calling `Configuration.getSelectedItems()`.
- CIO methods may or may not be expensive, depending on the circumstances of the configuration model. Making many calls to any CIO method that is expensive can be slow. Call the method once and then cache the results for reuse. For example, the information from `Configuration.getAvailableNodes` should be queried only when necessary, such as on screen flips and after user assertions.

  Use profiling tools to evaluate the performance cost of called CIO methods.

3.5.2 Functional Companion Event Sequence

Programmatic changes to the configuration model are dependent on the sequence of events. For example, to instantiate some Components and programmatically set some Features in each Component, you could use either of these approaches:

- set the Features as you add each of the Components
- add all Components and then set all the Features

It turns out that the second approach is faster, because the creation of each Component requires the retraction of all previous inputs (all user selections and all default selections). In the second approach, you can assert inputs and defaults only once, between when you add all the Components and when you set all the Features in all the added Components. The expensive events that you are avoiding in this second approach are the assertions *and retractions* of inputs and defaults, which are processed every time that a Component is added.

3.5.3 Adding and Deleting Optional Components

This section explains performance problems that can arise when adding and deleting several optional Components, and provides a generalized solution, with examples.

Problems

Adding or deleting an instance of a `ComponentSet` can be very expensive in terms of performance:

- Adding an instance entails a retraction of all previous requests, then the addition and reassertion of the requests.
- Adding an instance is particularly expensive when there are default values set by configuration rules. Retracting default assertions is time-consuming and iterative. The initial values set in Configurator Developer for Features, Resources, and Totals should also be regarded as default values.
- Deleting instances is a very expensive operation, and may not be necessary at the end of the Functional Companion event sequence, since the Functional Companion may need to add the same number of Components back into the Component Set anyway.

Solution Guidelines

To avoid these performance problems, follow these guidelines for adding instances of a `ComponentSet`:

- Try to delay setting the states or values of nodes until after you add all your instances. Add an instance when there are as few settings as possible.
- Before adding instances, roll back all the requests that the end user made before triggering the Functional Companion (for instance, by clicking the Auto-Configuration button). To ensure retaining the user's requests correctly, get the nodes' states or values before you retract the requests. After adding the instances, reapply the requests.
- When deleting instances, and if you have retracted all the requests, you can reuse the instantiated Components by computing the number of children in the `ComponentSet` and keeping track of the index number of the Component that you are setting Feature values for. Then you can delete the Components that you have not reused, if any.

Strategy for Structure

Based on the preceding guidelines, the strategy for optimizing the performance of an Auto-Configuration Functional Companion is to structure it according to the following sequence:

1. Store all needed values in temporary variables.

   These are those values that are needed for later calculations and which would be lost by retracting requests.

2. Retract all requests.

   a. Get user requests. Use `Configuration.getUserRequests()`.

   b. Iterate over the user requests, getting the runtime node for each. Use `Request.getRuntimeNode()`.

   c. If these are state nodes, retract them. Use `IState.unset()`.

3. Add or reuse Component instances. Use `ComponentSet.add()`.

4. Reassert applicable requests.

   a. Iterate over the user requests, getting the runtime node for each. Use `Request.getRuntimeNode()`.

   b. If the request is a state request, use `Request.isStateRequest()`. Query the state by using `Request.isTrueStateRequest()`, `Request.isFalseStateRequest()`, and so on.

      Set the node value by using `((IState) IRuntimeNode).setState(`*`state`*`)`.

c. If the request is a numeric request, use `Request.isNumericRequest()`. Query the value by using `Request.getNumericValue()`.

   Set the node value by using `IRuntimeNode.setDecimalCount(`*value*`)`, `.setCount(...)`, `.setIntValue(...)`, `.setDecimalValue(...)`.

d. If the request is a text request, query it with `Request.getValue()`.

   Set the node value by using `IRuntimeNode.setTextValue(`*value*`)`.

5. Set values on Components instances. Use `.setState()`.
6. Delete extra Components

Pseudocode Example

Consider an example of creating instances of a certain number of optional Components, and setting the values of Features in each one. Example 3–3, "Approach A (Slower)" on page 3-15 creates a Component, then sets its Features before creating the next Component. Example 3–4, "Approach B (Faster)" on page 3-15 creates all the Components, then sets all of their Features.

Example 3–3 Approach A (Slower)

```
Add Component1 to ComponentSet
Set Feature1 in Component1
Set Feature2 in Component1
Add Component2 to ComponentSet
Set Feature3 in Component2
...
```

Example 3–4 Approach B (Faster)

```
Add Component1 to ComponentSet
Add Component2 to ComponentSet

Set Feature1 in Component1
Set Feature2 in Component1
Set Feature3 in Component2
...
```

Approach A (Slower) is subject to the negative performance effects identified in Problems on page 3-13. Approach B (Faster) demonstrates the principles identified in Solution Guidelines on page 3-13. Approach B (Faster) results in significantly faster runtime performance.

The reason why Approach A (Slower) is slower is shown by comparing Example 3–5, "Detailed Approach A (Slower)" on page 3-16 with Example 3–6, "Detailed Approach B (Faster)" on page 3-16. The operations that have to be performed by the CIO when adding `ComponentSet` instances are highlighted in **boldface**. Detailed Approach A (Slower) repeats *all* of the operations for *each* addition of an instance, so that each addition takes longer than the preceding one, and the total processing time is proportional to the number of instances to be added. If there are many instances to be added, the impact is great. Detailed Approach B (Faster) performs the operations once, greatly lessening the effect of adding many instances.

Example 3–5 Detailed Approach A (Slower)

```
Retract requests
Add Component1 to ComponentSet
Assert requests
Set Feature1 in Component1
Set Feature2 in Component1
...
Retract requests
Add Component2 to ComponentSet
Assert requests
Set Feature3 in Component2
...
```

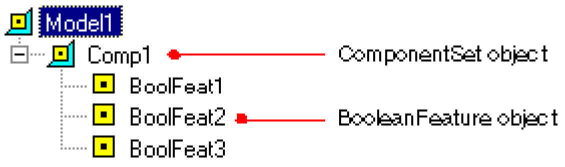
Example 3–6 Detailed Approach B (Faster)

```
Retract requests
Add Component1 to ComponentSet
Add Component2 to ComponentSet
...
Assert requests
Set Feature1 in Component1
Set Feature2 in Component1
Set Feature3 in Component2
...
```

Code Example

Consider the simple runtime Model structure shown in Figure 3–1 on page 3-17. At run time, this Model contains a `ComponentSet` object and several `BooleanFeature` objects.

Figure 3–1 Model Structure for Adding Components



Assume that you have written an Auto-Configuration Functional Companion that sets the state of the Boolean Features as illustrated in Example 3–7, "Setting Features (Slower Code)" on page 3-17.

Example 3–7 Setting Features (Slower Code)

```
...

for(int i=0; i<100; i++) {
    comp = Comp1.add();
    ((BooleanFeature)comp.getChildByName("BoolFeat1")).setState(IState.TRUE);
    ((BooleanFeature)comp.getChildByName("BoolFeat2")).setState(IState.FALSE);
    ((BooleanFeature)comp.getChildByName("BoolFeat3")).setState(IState.TRUE);
}
...
```

You can significantly improve the performance of this operation by modifying the code as shown in Example 3–8, "Setting Features (Faster Code)" on page 3-17. The differences are highlighted in **boldface**.

Example 3–8 Setting Features (Faster Code)

```
...
for(int i=0; i<100; i++){
    comp[i] = Comp1.add();
}
for(int i=0; i<100; i++){
    ((BooleanFeature)comp[i].getChildByName("BoolFeat1")).setState(IState.TRUE);

((BooleanFeature)comp[i].getChildByName("BoolFeat2")).setState(IState.FALSE);
    ((BooleanFeature)comp[i].getChildByName("BoolFeat3")).setState(IState.TRUE);
}
...
```

Example 3–8 achieves a performance improvement by adding all the `ComponentSet` instances, then setting all the `BooleanFeature` values. This follows the principles identified in Solution Guidelines on page 3-13, and the example shown in Approach B (Faster) under Pseudocode Example on page 3-15.

3.5.4 Optimization of Validation Functional Companions

In general, Oracle Configurator applies validation tests and defaults more often than would be expected. Defaults should be used as judiciously as possible. Validation tests must be minimal. You should arrange the code so that it is only called when necessary, and the condition test is quick.

Example 3–9 and Example 3–10 show two ways of applying a validation test. Example 3–9 performs better because it sets up the validation (finding the node in each call) within the `initialize ()` method rather than within the validation test, and then does the validation only after all other calls are completed.

Example 3–9 Minimizing Validation Test on a Configuration Model

```
OptionFeature f = null
initialize () {
      f = (OptionFeature) root.getChildByName("feature_name");
   }
validate ()
      if (f.isTrue()) {
   }
}
```

Example 3–10 Causing More Validation Tests on a Configuration Model

```
initialize () {
   // empty
   }
   validate () {
      OptionFeature f = (OptionFeature) root.getChildByName("feature_name");
      if (f.isTrue()) {
   }
}
```

4 Web Server Configuration

A well-tuned Web server is very important to get good performance from any Web-based application, including Oracle Configurator. There are several configuration parameters in the Apache Web server and the JServ module, including Configurator-specific parameters, which must be tuned for optimal performance.

Additionally, you can improve performance by load balancing the Apache Web listener (HTTPD) and adjusting heap size during startup.

For instructions in configuring, verifying, and—most importantly *troubleshooting*—the Apache Web server and the JServ module, see the *Oracle Configurator Installation Guide*.

See the Section "Structure" on page xviii in the preface to verify the audience for whom this chapter is intended.

4.1 Overview

See Section 2.3, "Tuning Key Components of the Oracle Configurator Architecture" on page 2-6 for information about how the Web server participates in a deployed Configurator environment.

Tuning the Web server is an iterative process. Several parameters in various configuration files play a significant role in Oracle Configurator performance. Section 4.2, "Apache Web Server Parameters" presents these parameters, their role in runtime performance, and their default and recommended values. Tuning the Web server consists of tweaking the values appropriately and iteratively.

In addition to setting parameter values in the configuration files, you can load balance the Apache Web listener (HTTP) or install multiple instances of the JServ servlet engine to handle requests from multiple clients. If the Web server is running on a multi-CPU machine, then it is important to set up the Apache configuration to load balance across the CPUs for optimal performance. For details about how to load balance Apache for Oracle Configurator, see the *Oracle Configurator Installation Guide*.

4.2 Apache Web Server Parameters

The high performance Apache Web server in the Oracle Internet Application Server (*i*AS) is part of the Oracle Configurator architecture. Apache Web server parameters are set in the following configuration files:

- The jserv.conf File
- The zone.properties File
- The httpd.conf and httpds.conf Files
- The jserv.properties File

For an overview at a glance of the Apache Web server parameters that affect Oracle Configurator, their recommended values, and the file in which the parameter is set, see Appendix A, "Summary of Web Configuration Parameters".

For details about correct configuration and location of these Web server files for running Oracle Configurator, see the *Oracle Configurator Installation Guide*.

4.2.1 The jserv.conf File

The `jserv.conf` file is used to configure Apache and JServ. The following parameters should be checked and set as needed while configuring Apache.

4.2.1.1 `ApJServManual`

See the *Oracle Configurator Installation Guide* for basic information about this parameter.

`ApJServManual` contributes to performance by affecting whether or not you can load balance the Apache Web listener.

Default Value

The ApJServManual parameter is set to `Off` by default. The `Off` value ignores load balancing. When you are using load balancing, this value *must* be `On`.

Recommended Value

The recommended value for optimal Oracle Configurator performance is `On`.

4.2.1.2 `ApJServVMTimeout`

See the *Oracle Configurator Installation Guide* for basic information about this parameter, including how to test if the value is appropriate for your server load.

`ApJServVMTimeout` contributes to performance by affecting the amount of time to wait for the JVM to start up or respond. If this value is too low, the JVM shuts down when left idle. Slow or heavily loaded machines benefit from a high value.

Default Value

The `ApJServVMTimeout` parameter is set to `10` seconds by default, which is also the timeout if this parameter is commented out in the `jserv.conf` file.

Recommended Value

The recommended value is `1800` seconds (30 minutes).

4.2.2 The zone.properties File

See the *Oracle Configurator Installation Guide* for basic information about this file, including its precedence over and interaction with settings in other configuration files such as `jserv.properties`.

In the `zone.properties` file, there is a `repositories` directive that contains a comma delimited list of servlet repositories controlled by a given servlet zone. Repository is a directory path or Java archive (`.jar` file). Parameters in this file, such as the `session.timeout` parameter apply to the servlets listed.

4.2.2.1 `session.timeout`

The `session.timeout` parameter applies to all sessions or end users on the server and contributes to performance by allowing you to determine the number of milliseconds to wait before invalidating an idle session. An idle session causes some performance loss because the CPU continues to poll the OC Servlet until reaching the `session.timeout` parameter setting.

The `session.timeout` parameter should be set as low (short timeout) as possible on a heavily loaded server. This setting potentially frees up the memory consumed by the configuration session of those end users who became idle, walked away, or killed their browsers. Exercise care to get the right value for the typical maximum end user's length of idle time on the Oracle Configurator window’s pages and any link flows (such as marketing material) that produce an idle event for the runtime Oracle Configurator.

Default Value

The `session.timeout` parameter is set to `1800000` milliseconds (30 minutes) by default.

Recommended Value

The value of this parameter is generally not changed. There is a small performance loss when restarting an OC Servlet, so 30 minutes is the recommended value.

4.2.3 The httpd.conf and httpds.conf Files

See the *Oracle Configurator Installation Guide* for basic information about these file and how they are used to configure the Apache Web listener in *i*AS. Both files contain the same information, including the directives: `Port`, `Documented`, `Alias`, and `Includes`.

The difference between these two files is that `httpds.conf` is used when there is a secure socket.

The `httpd.conf` and `httpds.conf` files contain the following parameters that affect performance:

- Timeout
- KeepAlive
- MaxKeepAliveRequests
- KeepAliveTimeout
- MaxSpareServers
- MinSpareServers
- MaxClients

4.2.3.1 `Timeout`

The `Timeout` parameter contributes to performance by allowing you to determine the amount of time in seconds that Apache waits for receipt of TCP packets on a POST request, or the amount of time it takes to receive a GET request. This means that when loading a configuration model, there is no response back to the client until the `Timeout` parameter's value is reached, or the JServ responds, whichever comes first. With large models loading into the JServ, you will need a correspondingly long timeout to keep the HTTP listener waiting for a response until the model is loaded.

Default Value

The `Timeout` parameter is set to `300` seconds (5 minutes) by default.

Recommended Value

The recommended value is `3600` seconds (60 minutes). The value should be at least `1800` seconds (30 minutes) for adequate Oracle Configurator performance. There is no performance loss from having the `Timeout` parameter set to a large value, unless the JServ hangs.

4.2.3.2 `KeepAlive`

The `KeepAlive` parameter provides long-lived HTTP sessions, which allow multiple requests to be sent over the same TCP connection. Setting this parameter to `On` can result in up to 50% decrease in latency times for HTML documents containing many images.

Recommended Value

The recommended value is `On`.

4.2.3.3 `MaxKeepAliveRequests`

The `MaxKeepAliveRequests` parameter limits the number of requests allowed per connection when KeepAlive is "On". If `MaxKeepAliveRequests` is set to `0`, unlimited requests are allowed.

Default Value

The `MaxKeepAliveRequests` parameter is set to `100` by default.

Recommended Value

The recommended value is `0`.

4.2.3.4 `KeepAliveTimeout`

The `KeepAliveTimeout` parameter determines the number of seconds Apache waits for a subsequent request before closing the connection. Once a request has been received, the timeout value specified by the `Timeout` directive applies.

Default Value

The `KeepAliveTimeout` parameter is set to `15` seconds by default.

Recommended Value

The recommended value is `15` seconds.

4.2.3.5 `MaxSpareServers`

The `MaxSpareServers` parameter sets the desired maximum number of idle child server processes. An idle process is one that is not handling a request. If more than the number of processes specified by MaxSpareServers are idle, then the parent process kills off the excess processes.

Tuning this parameter should only be necessary on very busy sites. Setting this parameter to a large number is almost always inadvisable. This parameter has no effect on a Microsoft Windows platform.

Recommended Value

The recommended value is `10` spare child server processes.

4.2.3.6 `MinSpareServers`

The `MinSpareServers` parameter sets the desired minimum number of idle child server processes. An idle process is one that is not handling a request. If fewer than the number of processes specified by MinSpareServers are idle, then the parent process creates new child server processes at a maximum rate of one every second.

Tuning this parameter should only be necessary on very busy sites. This parameter has no effect on a Microsoft Windows platform.

Recommended Value

The recommended value is `5` spare child server processes.

4.2.3.7 `MaxClients`

The `MaxClients` parameter determines the limit on the total number of servers running, meaning the limit on the number of clients that can simultaneously connect. When this limit is reached clients are locked out, so `MaxClients` should not be set too low. The main purpose of `MaxClients` is to keep a runaway server from taking the system down with it.

The `MaxClients` parameter is often used to prevent an overload of CPU. By limiting the number of users on a given number of JVMs running on a CPU, one can assume that the often fatal 100% CPU utilization is not reached.

Default Value

The `MaxClients` parameter is set to `150` by default.

Recommended Value

The recommended value is `150`.

4.2.4 The jserv.properties File

The following adjustments and parameters in the `jserv.properties` file are specific to Oracle Configurator and affect runtime performance.

For additional details about the parameters in the `jserv.properties` file and how to set them, see the *Oracle Configurator Installation Guide*.

For better performance of a production system, Oracle recommends the following combination of settings:

- set `cz.uiservlet.dio_share` to `true`
- set `cz.uiservlet.lazyload` to `false`
- set `czuiservlet.pre_load_filename` to preload the configuration model

4.2.4.1 Heap Size

The C and Java code of Oracle Configurator run in the Web server. Therefore, it is worthwhile to consider the heap size allocation during startup.

The initial Java parameters for the Solaris™ Operating Environment should be:

```
-Xms600m; initial heap
-Xmx1500m; max heap
-Xss1m; native stack size
```

These options are non-standard, subject to change, and vary from platform to platform. Users should have a small initial heap and a maximum heap that is smaller than the platform maximum. This is necessary to minimize the chances of running out of memory for the C heap.

Note: The maximum allowable heap size on Windows NT is 1000 MB

4.2.4.2 `cz.uiservlet.dio_share`

See the *Oracle Configurator Installation Guide* for basic information about this parameter.

The `cz.uiservlet.dio_share` parameter contributes to performance by improving the load performance of configuration sessions after the initial load for a given configuration model. The `cz.uiservlet.dio_share` parameter should be set to true when benchmarking.

The setting of this parameter interacts with the setting of `czservlet.pre_load_filename` and `cz.uiserver.lazyload`. For instance, `czservlet.pre_load_filename` essentially precaches the model, making the initial load no longer than subsequent load times. On the other hand, setting `cz.uiserver.lazyload` may minimize the advantages of preloading the model.

Setting this parameter to `false` disables sharing the cached configuration model, which implies that every user experiences the initial load time.

Default Value

The `cz.uiservlet.dio_share` parameter is set to `true` by default.

Recommended Value

For better runtime performance, the recommended value is `true`. Even when this parameter is set to `true`, testing configuration models from Oracle Configurator Developer always reloads the configuration models so that changes are visible.

4.2.4.3 `cz.uiserver.lfalse_is_not_available`

See the *Oracle Configurator Installation Guide* for basic information about this parameter and how it interacts with the **Hide unselectable Controls and Options** setting in Oracle Configurator Developer.

The `cz.uiserver.lfalse_is_not_available` parameter contributes to performance by allowing you to suppress the display of the Logic False icon (such as a red "X") on logic false Options when the parameter is set to false. In complex configurations models, or ones with many Options, displaying such icons may impose some performance cost. However, the default setting (false) causes the OC Servlet to perform additional calculations to determine which options are available for selection. This may also affect the runtime performance of configuration models that are complex or have many options.

If you set `cz.uiserver.lfalse_is_not_available` to true, the OC Servlet does not check the logic state of all options in the configuration model to determine which options are available. In this case, all Logic False options appear with the Logic False icon, by default.

Default Value

The `cz.uiserver.lfalse_is_not_available` parameter is set to `false` by default, meaning Logic False options are displayed as if they have never been selected, meaning as if their logic state were actually UNKNOWN.

Recommended Value

The recommended value of this parameter depends on your configuration model. Less complex models with fewer options likely perform better when the OC Servlet avoids displaying the Logic False icon, even though it does check the state of all options (`cz.uiserver.lfalse_is_not_available` = false). But more complex models with many options likely perform better when the OC Servlet does not have to check availability of all options, but has to display the Logic False icon of logically false options to show what isn't available (`cz.uiserver.lfalse_is_not_available` = true).

4.2.4.4 `cz.uiserver.lazyload`

See the *Oracle Configurator Installation Guide* for basic information about this parameter and how to choose its setting based on screen size and usage of your Oracle Configurator.

The `cz.uiserver.lazyload` parameter contributes to performance by determining whether the configuration model is loaded entirely during initialization (slower initial load but faster subsequent screen flips), or lazily and incrementally as controls need to be displayed (faster initial load but slower subsequent screen flips).

Default Value

The `cz.uiserver.lazyload` parameter is set to `true` by default, meaning the initial load is fast but subsequent screen flips may be slower than if this parameter were set to `false`.

Recommended Value

For better runtime performance, the recommended value of this parameter is `false` if you are preloading the configuration model, meaning initial load may be slower than if this parameter were set to `true`, but subsequent screen flips are fast.

4.2.4.5 `cz.uiservlet.pre_load_filename`

See the *Oracle Configurator Installation Guide* for basic information about this parameter and its interaction with other parameters such as `cz.uiservlet.dio_share` and `servlets.startup`.

The `czuiservlet.pre_load_filename` parameter contributes to performance by determining whether the configuration model is cached when the OC Servlet starts up.

Note: If the configuration model is preloaded, the OC Servlet takes longer to start up.

Default Value

The `czuiservlet.pre_load_filename` parameter is not set by default.

Recommended Value

For better runtime performance, the recommended value of this parameter is the absolute path to a file containing the initialization message that preloads the configuration model so the OC Servlet is initialized when the first user starts a configuration session. The parameter `cz.uiservlet.dio_share` must be set to `true` so the configuration model can be cached.

Do not use the **Test** button in Oracle Configurator Developer as the source for your initialization message.

4.2.4.6 `cz.activemodel`

See the *Oracle Configurator Installation Guide* for basic information about this parameter, including examples of how settings on the various switches affect pricing and ATP behavior.

The `cz.activemodel` parameter contributes to performance by allowing you to suppress display of prices, which can be very expensive.

The switches for displaying list prices, discount prices, and ATP should only be turned on if it is essential to display prices on the Oracle Configurator screens.

See also the *Oracle Configurator Implementation Guide* for additional information about pricing in Oracle Configurator.

Default Value

The `cz.activemodel` parameter is set to /nolp|/nodp|/noatp| by default, meaning list pricing, discount pricing, and ATP are *not* displayed.

Recommended Value

The recommended values of this parameter are `/nolp|/nodp|/noatp|`.

4.2.4.7 `cz.uiserver.poll_timeout_applet`

See the *Oracle Configurator Installation Guide* for basic information about this parameter, including how it interacts with `cz.uiserver.check_heartbeat_timeout`.

The `cz.uiserver.poll_timeout_applet` parameter contributes to performance by determining the time interval in milliseconds within which the Java applet client polls the DHTML client to find out from the UI Server session of a DHTML Oracle Configurator window whether the DHTML client browser has been closed (configuration data has been written to the database).

If the timeout is short, then closing the DHTML client browser results in a quicker return to the Forms, because the Java applet's UI Server checked more often whether to exit to Forms. However, frequent polling slows performance.

If the timeout is long, then performance is better, but it could take a longer time to return to the parent Form after closing the DHTML client browser.

The `cz.uiserver.poll_timeout_applet` parameter setting is only meaningful when you are launching a DHTML Oracle Configurator window from a Forms-based application such as Order Management.

Default Value

The `cz.uiserver.poll_timeout_applet` parameter is set to `20000` milliseconds by default.

Recommended Value

The recommended range is `30000` to `60000` milliseconds.

4.2.4.8 `cz.uiserver.poll_timeout_applet_to_dhtml`

See the *Oracle Configurator Installation Guide* for basic information about this parameter, including how it interacts with `cz.uiserver.check_heartbeat_timeout`.

The `cz.uiserver.poll_timeout_applet_to_dhtml` parameter contributes to performance by determining the time interval in milliseconds within which the UI Server session of a DHTML Oracle Configurator window polls the UI Server session of the parent Java applet to find out if the Java applet is still running.

If the timeout is short (frequent polling), then performance is slower but the DHTML session knows sooner if it has been orphaned and no commits to the database will be possible (configuration cannot be saved).

If the timeout is long, then performance is better, but end users could go through long configuration sessions without realizing the DHTML session has been orphaned and they can’t save their configuration.

This is only meaningful when you are launching a DHTML Oracle Configurator window from a Forms-based application such as Order Management.

Default Value

The cz.uiserver.pollTimeoutToDhtml parameter is set to `30000` milliseconds by default.

Recommended Value

The recommended range is `30000` to `60000` milliseconds.

4.2.4.9 `cz.uiserver.check_heartbeat_timeout`

See the *Oracle Configurator Installation Guide* for basic information about this parameter, including what heartbeat events are and how the parameter interacts with `cz.uiserver.poll_timeout_applet`, `cz.uiserver.poll_timeout_applet_to_dhtml`, and `cz.uiserver.heartbeat_interval`.

The `cz.uiserver.check_heartbeat_timeout` parameter contributes to performance by determining the timeout for the UI Server’s checking of heartbeat events. If the UI Server doesn’t receive any heartbeats from the DHTML client browser after this time value, then the UI Server shuts itself down and the guided selling session in the DHTML user interface sends a terminate message back to the Java applet client.

The `cz.uiserver.check_heartbeat_timeout` parameter is meaningful only when you are launching a DHTML Oracle Configurator window from a Forms-based application such as Order Management.

Default Value

The `cz.uiserver.check_heartbeat_timeout` parameter is set to `30000` milliseconds by default.

Recommended Value

If you are loading a large configuration model in a DHTML Oracle Configurator window, this parameter should be set to a value close to the time it takes to load the configuration model. For example, if the configuration model takes 60 seconds to load, the value of the parameter should be set to approximately `60000` milliseconds.

4.2.4.10 `cz.activemodel.lazyloadlistprice`

See the *Oracle Configurator Installation Guide* for basic information about this parameter.

The `cz.activemodel.lazyloadlistprice` parameter contributes to performance by determining whether the initial load or incrementally displaying a screen includes fetching list prices from the database. Setting this parameter to `false` causes eager fetching of list prices, which can impose a significant performance cost at initial load, especially if your configuration model is large.

Default Value

The default value of this parameter is `true`.

Recommended Value

The recommended value of this parameter is `true`.

4.2.5 Pre-Loading the Oracle Configurator Servlet

You can improve performance when initializing the Oracle Configurator Servlet by preloading your Active Models. Initializing means loading an Active Model for the first time during an OC Servlet session. When preloading Models:

- Create a text file containing an initialization message. For details about getting the OC Servlet to process this file, see the information in the *Oracle Configurator*

Installation Guide about the OC Servlet property `cz.uiservlet.pre_load_filename`.

When composing your initialization message:

1. Omit the pricing callback parameters (`pricing_package_name`, `configuration_session_key`, `price_multi_item_proc`).
2. Omit the ATP callback parameters (`atp_package_name`, `configuration_session_key`, `get_atp_dates_proc`, `requested_date`).
3. Omit the parameter `config_creation_date`. This will ensure that you always preload the latest published Active Model. The date will default to the system date (SYSDATE).
4. Either of the parameters `alt_database_name` or `database_id` can be used for prelodaing.

If loading Models for specific languages, then `database_id` and the `icx_session_ticket` parameter are required for the database session in that language.

1. When preloading set the OC Servlet property `cz.uiserver.lazyload=false`. This ensures that all the screens in your Model's user interface are also cached at startup.

4.2.6 Load Testing

To prepare your application for realistic conditions, you should use a testing tool that allows you to set up reasonable tests that emulate what your end users will do. There are various types of testing you should employ, such as:

- Section 4.2.6.1, "Stress Testing"
- Section 4.2.6.2, "User Activity Testing"

4.2.6.1 Stress Testing

In stress testing, the testing tool fires as many commands as possible at the server, to test CPU utilization rate. Try to measure the number of hits per second you can trigger while keeping the load at 80-85% CPU utilization, which is a recommended level.

4.2.6.2 User Activity Testing

In user activity testing, you use the testing tool to build scripts that represent what your real end users will be doing, with the kinds of delays that a user would experience.

After creating scripts that emulate users, run that number of users against the server, at randomly sequenced times, so that you represent a close approximation of what the application will handle.

Examples

- The user might pause and click Next, Back, and Next several times.
- The user might click a number of checkboxes rapidly, because he knows what he wants, since he has previously visited that part of your application.
- The user might pause, thinking, between each click.

The variability of these different scripts, all running within the same time span, gives you a good sense of what your system can actually handle in terms of number of users.

4.2.7 Load Balancing

See the *Oracle Configurator Installation Guide* for details about the mechanics of load balancing the machines and processes in your deployment.

5

Tools and Collecting Data

The goal of collecting data is to determine whether the production architecture supports all possible end users accessing every available configuration model.

Use a benchmarking tool to test the performance of your configuration model(s) and determine software and hardware sizing that is appropriate for the full range of possible end user scenarios.

Note: Benchmarking tools cannot account for the client-side rendering time, which may be very important.

The sections in this chapter are:

- Data Collection and Analysis
- Data Collection Timing and Scope
- Tool: LoadRunner

See the Section "Structure" on page xviii in the preface to verify the audience for whom this chapter is intended.

5.1 Data Collection and Analysis

There is a wide range of data that you can collect for analysis to identify modifications that might or have been proven to improve performance.

5.1.1 Areas To Examine

Areas that may yield useful data for performance analysis include:

- database or database server size and setup

- client machine size and setup
- server machine size and setup
- host application session time
- configuration session data

Another area that may yield important data for analysis is end-user response time. End-user response time is the sum of the server response time, the display time, network latency, and think time. This is the total throughput under load. There is an amount of time that end users will wait for an application to respond before moving on to something else. That end-user walk away time depends on the business and the task. The end-user response time must be less than the end-user walk away time.

For a more specific listing of areas to examine, see Section 2.3, "Tuning Key Components of the Oracle Configurator Architecture" on page 2-6 and Section 2.4, "Isolating Performance Problems and Intervening" on page 2-11.

5.1.2 Benchmarking

Benchmarks allow you to compare performance measurements across changes in the configuration model, machine and server configuration, and other elements affecting performance.

Benchmarks also allow you to size your hardware appropriately to best match your current requirements, as well as handle your future requirements.

The results of benchmarks referred to in this guide are relevant to Oracle Configurator only (see Appendix B, "Case Studies").

Planning and executing the appropriate benchmark tests of any distributed computing system is both critical and complex. Fundamentally, any benchmark you undertake should reflect the actual deployment environment. This means that it should be carried out:

- using the appropriate server-class hardware platform
- over a long duration
- with multiple end users

For example, if your deployment involves dial-up users, your benchmark should test for the slowest expected dial-up speeds.

WARNING: Do not benchmark using the Test button in Oracle Configurator Developer. The Test button invokes initialization code that sets the internal equivalent of the `cz.uiservlet.dio_share` parameter to false, which causes every end user to experience the initial load time. Using an HTML launch page or the host application to test Oracle Configurator requires explicitly setting the `cz.uiservlet.dio_share` parameter.

Conducting a benchmark involves answering the following:

- What is important to measure?
- How are the results to be interpreted?
- What is the minimum necessary test duration?
- How often should the measurements be sampled?
- How can a realistic deployment be constructed for the purposes of measuring a benchmark?

5.1.3 Analyzing Data

You analyze data to determine performance and where to tune your system. The data comes from your careful documentation of benchmark test conditions and results, including the data collected by an analysis tool such as LoadRunner. Data analysis often involves making calculations that provide the limits within which your system can perform acceptably, such as the number of concurrent sessions a single CPU can support.

When analyzing your data, keep in mind that approximately 30% CPU utilization needs to be available for running operating system processes. That is equivalent to tuning the runtime Oracle Configurator performance to 70% CPU utilization. Tests with different numbers of end users can help you determine how many end users 70% CPU utilization supports. For examples of CPU utilization data, see Appendix B, "Case Studies". For details about how components of the Oracle Configurator architecture compete for CPU utilization, see Section 2.3.2, "Server Machine Tuning" on page 2-9 and Section 2.4.1, "System Transactions" on page 2-11.

You can narrow down what runtime events require large numbers of transactions, and thus processing, by comparing the number of transactions logged by your analysis tool. See Table B–4, " Case A Server Performance Times" and Table B–9, "Case B Server Performance Times" for examples.

When determining total client rendering time from your raw data, it is necessary to add the elapsed model update time to the elapsed layout time. See Section 5.2.2, "Client Side Data" on page 5-4 for details about collecting this data.

5.2 Data Collection Timing and Scope

You should conduct tests that include the hosting application.

Collect performance numbers for individual operations within a configuration session, such as screen flips and option clicks.

Collect data when the most useful performance data occurs, which is when 90% of the end users are actively engaged in a configuration session. For this reason, the case studies documentation shows the response time on various operations for the 90th percentile of the full load (see for example, Table B–4, " Case A Server Performance Times").

When an application goes into production, it will likely be operating on a nonstop (24X7) schedule. Any benchmark you undertake should be designed to reflect these requirements, and as such should be run over a period of time. A useful benchmark should run at least 24 hours, longer if possible.

You should conduct tests that include the hosting application, such as *i*Store.

5.2.1 Sever Side Data

While collecting server side performance numbers, keep several recommendations in mind:

1. CPU utilization should not exceed 70%
2. If the end-user response time is unacceptable when CPU utilization is below 70%, decrease concurrent users or repeat the tuning process to obtain better response times.

For additional details about collecting server side data, see Section 5.3, "Tool: LoadRunner" on page 5-6.

5.2.2 Client Side Data

You can collect client side rendering time by setting the debug mode to true in the `czSource.htm` file (set `bDebugMode = true`).

Note: Since setting `bDebugMode - true` involves modifying the `czSource.htm` file on the middle tier where Oracle Configurator is installed, it is best to collect this client-side data in a test environment.

When `bDebugMode - true`, a window opens on the client machine (see Figure 5–1). For each action taken in the Oracle Configurator window, the debug mode displays the following in the `czSource.htm` file.

Elapsed Time Laying Out Controls and Screens

Elapsed Layout Time in `the czSource.htm` file is the time taken to paint the UI controls and screens.

Elapsed Time Updating Model

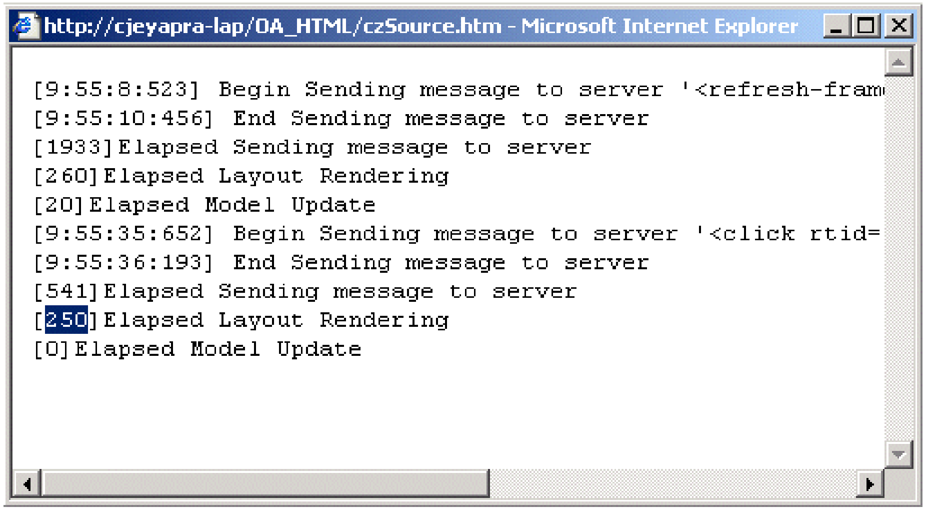
Elapsed Model Update Time in `the czSource.htm` file is the time taken to update the UI controls with values.

Elapsed Time Sending Message to Server

Elapsed sending message to server time in `the czSource.htm` file is the time taken to send a message from the client browser to the Web server (network time).

The Total Client Rendering Time is the sum of Elapsed Layout Time and the Elapsed Model Update Time

Figure 5–1 Elapsed Times in `czSource.htm` File


http://cjeyapra-lap/OA_HTML/czSource.htm - Microsoft Internet Explorer

```
[9:55:8:523] Begin Sending message to server '<refresh-fram
[9:55:10:456] End Sending message to server
[1933]Elapsed Sending message to server
[260]Elapsed Layout Rendering
[20]Elapsed Model Update
[9:55:35:652] Begin Sending message to server '<click rtid=
[9:55:36:193] End Sending message to server
[541]Elapsed Sending message to server
[250]Elapsed Layout Rendering
[0]Elapsed Model Update
```

You will have to record which rtid in the `czSource.htm` file maps to which end user action in the user interface. The **Begin Sending message to server** times, both at session initialization and at the submit or done action, are partial times, so are not as directly meaningful as the elapsed times on option clicks and screen flips.

During a LoadRunner benchmark test, set the debug mode to false in the `czSource.htm` file (set `bDebugMode = false`). LoadRunner can only simulate end users and does not start an interactive client session, so the client side data cannot be captured during a benchmark test.

5.3 Tool: LoadRunner

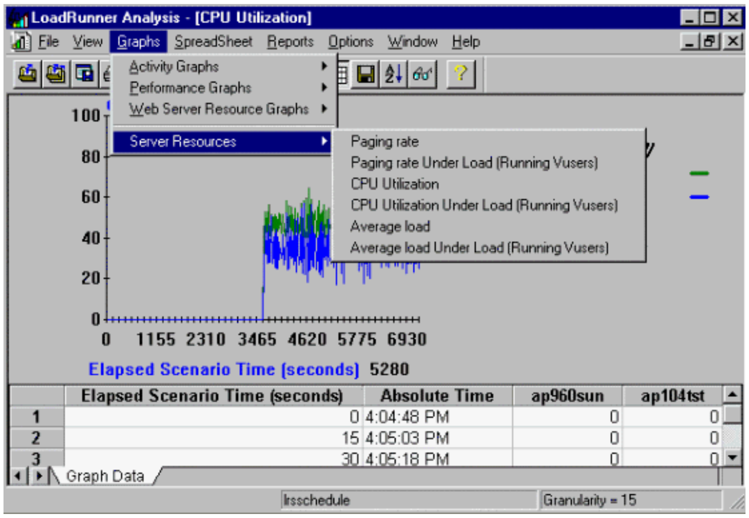
LoadRunner is one of the many tools used to perform load testing. Load testing involves stressing the product or observing server side performance under specific loads. You can use LoadRunner to collect performance numbers for individual operations within a configuration session.

Use LoadRunner's Analysis tool to get such data as:

- Response time
- CPU utilization
- Number of transactions per hour

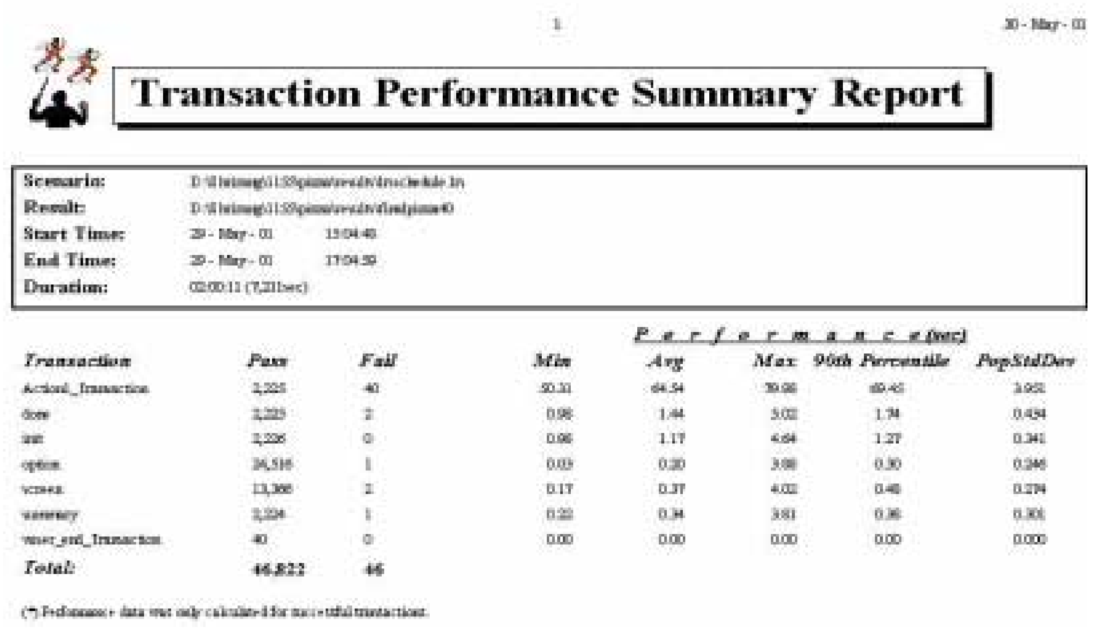
- Throughput
- Hits per second

Figure 5–2 Screen Capture of LoadRunner CPU Utilization Analysis


LoadRunner Analysis - [CPU Utilization]
File View Graphs SpreadSheet Reports Options Window Help
Activity Graphs
Performance Graphs
Web Server Resource Graphs
Server Resources
Paging rate
Paging rate Under Load (Running Vusers)
CPU Utilization
CPU Utilization Under Load (Running Vusers)
Average load
Average load Under Load (Running Vusers)
100
80
60
40
20
0
0 1155 2310 3465 4620 5775 6930
Elapsed Scenario Time (seconds) 5280
Graph Data
lrsschedule
Granularity = 15

	Elapsed Scenario Time (seconds)	Absolute Time	ap960sun	ap104tst
1	0	4:04:48 PM	0	0
2	15	4:05:03 PM	0	0
3	30	4:05:18 PM	0	0

Figure 5–3 Example of a LoadRunner Transaction Performance Summary Report



1 30 - May - 01

Transaction Performance Summary Report

Scenario:	[illegible]
Result:	[illegible]
Start Time:	29 - May - 01 15:04:40
End Time:	29 - May - 01 17:04:50
Duration:	02:00:11 (7,211sec)

			Performance (sec)				
Transaction	*Pass*	*Fail*	*Min*	*Avg*	*Max*	*90th Percentile*	*PopStdDev*
Action1_Transaction	2,225	40	50.31	64.54	79.98	69.45	3.951
done	2,223	2	0.98	1.44	5.02	1.74	0.454
init	2,226	0	0.98	1.17	4.64	1.27	0.341
option	26,518	1	0.03	0.20	3.98	0.30	0.246
screen	13,388	2	0.17	0.37	4.02	0.48	0.274
summary	2,224	1	0.22	0.34	3.81	0.38	0.301
vuser_end_Transaction	40	0	0.00	0.00	0.00	0.00	0.000
Total:	46,822	46					

(*) Performance data was only calculated for successful transactions.

5.3.1 Settings Specific to Oracle Configurator

See Appendix C, "LoadRunner Settings" for details about setting LoadRunner parameters that are specific to Oracle Configurator and necessary for collecting Oracle Configurator performance data.

5.3.2 General Tips and Guidelines

Load simulation does not require running a wide variety of test cases. Select a group of test cases that represent different usages of the application (such as configuring small, medium, and large systems). There is no need to have multiple test cases representing different input values for one particular use of the application.

Use only test cases that succeed in saving a configuration because each user should go through multiple iterations of the test scripts.

Have written test plans to follow because several recording iterations may be required and repeatability is critical to the correctness of the scripts. During

LoadRunner recording sessions, you see the captured commands inserted in the Vuser scripts in real time as you walk through the test plan.

To execute the Vuser scripts for Oracle Configurator testing, see Appendix C, "LoadRunner Settings".

A

Summary of Web Configuration Parameters

Table A–1 lists all the parameters described in Chapter 4, "Web Server Configuration" in alphabetical order, indicating the recommended value, what file contains the parameter, and where to turn for additional information.

Table A–1 Web Server Parameters That Affect Oracle Configurator Performance

Parameter	Recommended Value	File	Details
ApJServManual	`On`	`jserv.conf`	Section 4.2.1.1 on page 4-2
ApJServVMTimeout	`1800`	`jserv.conf`	Section 4.2.1.2 on page 4-3
cz.activemodel	`/nolp|/nodp|/noatp|`	jserv.properties	Section 4.2.4.6 on page 4-10
cz.activemodel.lazyloadlistprice	`true`	jserv.properties	Section 4.2.4.10 on page 4-13
cz.uiservlet.dio_share	`true`	jserv.properties	Section 4.2.4.2 on page 4-8
cz.uiserver.check_heartbeat_timeout	# of milliseconds it takes to load the model	jserv.properties	Section 4.2.4.9 on page 4-12
cz.uiserver.lazyload	`false`	jserv.properties	Section 4.2.4.4 on page 4-9
cz.uiserver.lfalse_is_not_available	`false`	jserv.properties	Section 4.2.4.3 on page 4-8
cz.uiserver.poll_timeout_applet	`20000` to `60000`	jserv.properties	Section 4.2.4.7 on page 4-11
cz.uiserver.poll_timeout_applet_to_dhtml	`30000` to `60000`	jserv.properties	Section 4.2.4.8 on page 4-12

Table A–1 Web Server Parameters That Affect Oracle Configurator Performance

Parameter	Recommended Value	File	Details
cz.uiservlet.pre_load_filename	text file with initialization message	jserv.properties	Section 4.2.4.5 on page 4-10
KeepAlive	`On`	httpd.conf httpds.conf	Section 4.2.3.2 on page 4-5
KeepAliveTimeout	`15`	httpd.conf httpds.conf	Section 4.2.3.4 on page 4-5
MaxClients	`150`	httpd.conf httpds.conf	Section 4.2.3.7 on page 4-6
MaxKeepAliveRequests	`0`	httpd.conf httpds.conf	Section 4.2.3.3 on page 4-5
MaxSpareServers	`10`	httpd.conf httpds.conf	Section 4.2.3.5 on page 4-6
MinSpareServers	`5`	httpd.conf httpds.conf	Section 4.2.3.6 on page 4-6
session.timeout	`1800000`	`zone.properties`	Section 4.2.2.1 on page 4-3
Timeout	`3600`	httpd.conf httpds.conf	Section 4.2.3.1 on page 4-4

B
Case Studies

When performance testing new configuration models, the performance data collected on similar, already tuned models can be a guide in setting your success criteria.

This appendix presents several case studies of models that have been tested by Oracle using LoadRunner.

Note: The models used in these studies were not necessarily optimized for best design or peak performance, and are not necessarily recommended by Oracle as examples of how you should design your model.

These studies demonstrate

- what kind of performance you can expect given a similar model and a similar layout (controls per screen)
- what kind of data you should collect to evaluate performance, and how to collect it

In addition, this appendix lists a workable Web server, database server and client machine configuration used by Oracle in internal testing, and intended here as a guide for a benchmarking environment setup.

See Section 3.2.1, "Size" on page 3-2 for a general definition of small and medium configuration models in numbers of nodes.

See Chapter 5, "Tools and Collecting Data" for additional information about collecting this kind of data and analyzing it.

See the Section "Structure" on page xviii in the preface to verify the audience for whom this appendix is intended.

B.1 Machine Configuration for Cases A and B

This section lists a workable Web server, database server and client machine configuration used by Oracle in internal testing, and intended here as a guide for your environment setup. These specifications are valid for running and testing Oracle Configurator Release 11*i*, patchset E.

B.1.1 Web Server

The following is the Web server configuration used in internal testing at Oracle:

- Sun E420 with 4 x 400-Mhz UltraSPARC CPUs
- 4 Gbytes of RAM
- Sun Solaris™ Operating Environment 2.6
- Apache Web server installed on RAID5 file system

B.1.2 Database Server

The following is the database server configuration used in internal testing at Oracle:

- Sun Ultra-60 with 2 x 400-Mhz UltraSPARC CPUs
- 1 Gbyte of RAM
- Sun Solaris™ Operating Environment 2.6
- Database files striped across 3 files systems on software RAID 0+1 with 64k stripe width

B.1.3 LoadRunner Client Machine

The following is the client machine configuration used for running LoadRunner internally at Oracle:

- Dell PowerEdge 2300 with 4 x 500-Mhz CPUs
- 1 Gbyte of RAM
- MS Windows NT 4.0
- Citrix 4.20

For details about the LoadRunner parameters that are specific to Oracle Configurator and necessary for collecting Oracle Configurator performance data, see Appendix C, "LoadRunner Settings".

B.1.4 Software

The following is the software used for running LoadRunner tests on Oracle Configurator internally at Oracle:

- Oracle Configurator (Patchset E, Build 15-85)
- Oracle8 Server 8.1.6
- iAS 1.0.2 (Apache Server 1.3.9)
- JDK 1.3 using Java “green” threads
- Mercury LoadRunner 6.5

B.1.5 Network

During these LoadRunner tests, the Web server, database server, and LoadRunner client machine all resided in the same building with fiber optic network connection.

B.2 Case A: Small Configuration Model

The response time data presented in this case study is specific to the model, UI, and Oracle Configurator release used in the benchmark. See Section B.1.4, "Software" for the Oracle Configurator version used in this benchmark.

Company A is deploying a Web based application that is used to configure a multiplexer. This application is used internally by the company for their sales group to configure the system. The configuration model is presented below by listing the model structure nodes, rules, and User Interface (UI) display elements. The performance data collected on this model is CPU utilization, number of transactions in an hour, and 90th percentile response times (see Table B–4).

Table B–1 describes the product structure in the Oracle Configurator schema as a list of node types and the number of records of each.

Table B–1 Case A Model Structure

Node Type	Records
BOM Model nodes	6

Table B–1 Case A Model Structure

Node Type	Records
BOM Option Class nodes	36
BOM Standard Item nodes	229
Component nodes	4
Feature (Boolean)	8
Feature (Integer)	37
Feature (Listed Options)	24
Feature (String)	5
Option	111
Product	1
Resources	9
Root nodes	1
Totals	6
Records in Project	470
BOM nodes	271
Non-BOM nodes	199

Table B–2 lists the types and numbers of rules in the model. The Auto-Configuration Functional Companion sets values and adds a new Component that needs to be configured.

Table B–2 Case A Rule Types and Operators

Rule Type	Operator	Number of Rules
Comparison Rule	Implies	5
Logic Rule	Defaults	1
	Excludes	13
	Implies	57
	Negates	1
	Requires	10
Numeric Rule	Consumes	74

Table B–2 Case A Rule Types and Operators

Rule Type	Operator	Number of Rules
	Contributes	228
Functional Companions	Auto-Configuration	2

Note: The Case A model does not contain any Compatibility rules.

The following table displays the number and type of UI controls in the application

Table B–3 Case A User Interface Controls

Screen	Controls	Clicks
Main Screen	1 Functional Companion button	1
First Screen	4 Dropdown elements	4
	1 Checkbox element	1
	1 Title bitmap	0
	1 Text element	0
Second Screen	6 Dropdown elements	6
	3 Checkbox elements	3
	1 Selection list with 22 options	1
	1 Title bitmap	0
	1 Text element	0
Third Screen	9 Dropdown elements	9
	2 Checkbox elements	2
	1 Functional Companion Delete button	1
	7 Numeric edit control elements	7
	7 Resource value displays	0

Table B–3 Case A User Interface Controls

Screen	Controls	Clicks
	1 Title bitmap	0
	5 Text labels	0

Table B–4 and Table B–5 describe the server performance times for the application. Case A performed at 83% CPU utilization with 100 users. In order to determine the total throughput time, you must add the client response time (not provided here) to the server response time.

Table B–4 Case A Server Performance Times

Users	Operations	Arrival Rate (transactions/hour)	90th Percentile Response Times in Seconds
60 User Scenario	Initialization	918	2.091
	Instantiation	2,450	0.854
	Screen Flip	7,612	0.341
	Option Click	32,906	0.341
	Save Configuration	918	5.59
80 User Scenario	Initialization	1,254	2.791
	Instantiation	3,774	1.059
	Screen Flip	4,7758	0.414
	Option Click	11,296	0.414
	Save Configuration	1,254	8.31
100 User Scenario	Initialization	1,494	3.29
	Instantiation	4,570	1.119
	Screen Flip	57,718	0.484
	Option Click	13,680	0.484
	Save Configuration	1,494	11.94

Table B–5 Case A CPU Utilization

	60 User Scenario	80 User Scenario	100 User Scenario
Max	60%	68%	76%
Min	36%	48%	62%
Average	42%	53%	54%

B.3 Case B: Medium Configuration Model

The response time data presented in this case study is specific to the model, UI, and Oracle Configurator release used in the benchmark. See Section B.1.4, "Software" for the Oracle Configurator version used in this benchmark.

Company B is deploying a Telesales application where an end user can call in and order a pizza over the phone. A sales representative takes the call and helps the end user configure a pizza. The configuration model is presented below by listing the model structure nodes, rules, and User Interface (UI) display elements. The performance data collected on this model is CPU utilization, number of transactions in an hour, and 90th percentile response times (see Table B–9).

Table B–6 describes the product structure in the Oracle Configurator schema.

Table B–6 Case B Model Structure

Node Type	Records
BOM Model nodes	8
BOM Option Class nodes	47
BOM Standard Item nodes	565
Component nodes	10
Feature (Boolean)	69
Feature (Integer)	44
Feature (Listed Options)	27
Feature (String)	0
Option	450
Product	0
Resources	7

Table B–6 Case B Model Structure

Node Type	Records
Root nodes	1
Totals	6
Records in Project	1241
BOM nodes	619
Non-BOM nodes	622

Table B–7 lists the types and numbers of rules in the model.

Table B–7 Case B Rule Types and Operators

Rule Type	Operator	Number of Rules
Comparison Rule	Implies	1
Logic Rule	Defaults	30
	Excludes	102
	Implies	468
	Negates	0
	Requires	72
Numeric Rule	Consumes	64
	Contributes	64
Functional Companions	N/A	0

Table B–8 displays the number and type of UI controls in the application

Table B–8 Case B User Interface Controls

Screen	Controls	Clicks
Main Screen	4 Buttons	1
	1 Title bitmap	0
Pizza1 Screen	1 Title bitmap	0
	4 Buttons	1
	3 Dropdown elements	3

Table B–8 Case B User Interface Controls

Screen	Controls	Clicks
	108 Checkbox element	108
Pizza2 Screen	1 Title bitmap	0
	4 Buttons	1
	3 Dropdown elements	3
	108 Checkbox element	108
Drink Screen	12 Numeric edit control elements	12
	1 Title bitmap	0
Appetizer Screen	27 Numeric edit control elements	27
	1 Title bitmap	0

Table B–9 and Table B–10 describe the server performance times for the application. Case B performed at 85% CPU utilization with 60 users. In order to determine the total throughput time, you must add the client response time (not provided here) to the server response time.

Table B–9 Case B Server Performance Times

Users	Operations	Arrival Rate (transactions/hour)	90th Percentile Response Times in Seconds
Single User Scenario	Initialization		1.03
	Summary		0.23
	Screen Flip		0.39
	Option Click		0.22
	Save Configuration		1.14
40 User Scenario	Initialization	2,225	1.27
	Instantiation	2,225	0.38
	Screen Flip	13,366	0.48
	Option Click	24,516	0.30

Table B–9 Case B Server Performance Times

Users	Operations	Arrival Rate (transactions/hour)	90th Percentile Response Times in Seconds
	Save Configuration	2,224	1.74
60 User Scenario	Initialization	3,278	1.50
	Instantiation	3,278	0.42
	Screen Flip	19,702	0.53
	Option Click	36,084	0.33
	Save Configuration	3,278	2.27

Table B–10 Case B CPU Utilization

	40 User Scenario	60 User Scenario
Max	64%	85%
Min	41%	60%
Average	47%	68%

B.4 SQL*Plus Queries For Determining Number of Nodes

The following SQL*Plus queries are useful for calculating the total number of nodes in a configuration model, and the number of different types of nodes in a configuration model.

B.4.1 Number of Nodes by Type in a Configuration Model

Example B–1 shows the query for determining the number of nodes by type in a configuration model. Table B–11 provides the numeric identification of the node types that need to be inserted in the query.

Table B–11 Numeric Identification of PS_NODE_TYPE

PS_NODE_TYPE	Description
258	Product
259	Component
261	Feature

Table B–11 Numeric Identification of PS_NODE_TYPE

PS_NODE_TYPE	Description
262	Option
272	Total
273	Resource
436	Root node
263	BOM Model
437	BOM Option Class
438	BOM Standard Item

Example B–1 Determine Number of Nodes by Type in a Configuration Model

```
SQL> SELECT count(*)
FROM cz_ps_nodes
WHERE deleted_flag = '0'
and ps_node_type = ps_node_type
START WITH ps_node_id = devl_project_id
CONNECT BY DECODE(PRIOR ps_node_type,263,PRIOR reference_id, PRIOR ps_node_id) =
DECODE(PRIOR ps_node_type,263,ps_node_id,parent_id)
/
```

In Example B–1, insert the PS_NODE_TYPE number shown in Table B–11 for the variable *ps_node_type*, and insert the DEVL_PROJECT_ID of the configuration model for the variable *devl_project_id* (see Example B–4).

Example B–2 shows the query for determining the number of BOM nodes in a configuration mode, and Example B–3 shows the query for determining the number of non-BOM nodes in a configuration model.

Example B–2 Determine Number of BOM Nodes in a Configuration Model

```
SQL> SELECT count(*)
FROM cz_ps_nodes
WHERE deleted_flag = '0'
and ps_node_type in ( 263,436,437,438)
START WITH ps_node_id = devl_project_id
CONNECT BY DECODE(PRIOR ps_node_type,263,PRIOR reference_id, PRIOR ps_node_id) =
DECODE(PRIOR ps_node_type,263,ps_node_id,parent_id)
/
```

Example B–3 Determine Number of non-BOM Nodes in a Configuration Model

```
SQL> SELECT count(*)
FROM cz_ps_nodes
WHERE deleted_flag = '0'
and ps_node_type  not in ( 263,436,437,438)
START WITH ps_node_id = devl_project_id
CONNECT BY DECODE(PRIOR ps_node_type,263,PRIOR reference_id, PRIOR ps_node_id) =
DECODE(PRIOR ps_node_type,263,ps_node_id,parent_id)
/
```

Example B–4 Determine DEVL_PROJECT_ID of a Configuration Model

```
SQL> SELECT devl_project_id, name
FROM cz_devl_projects
WHERE name like '%Sen%'
and deleted_flag=’0’
```

This returns both the ID and the name:

```
DEVL_PROJECT_ID             NAME
2020                        Sentinel Custom Desktop(204 137)
```

B.4.2 Number of Features by Type in a Configuration Model

Example B–5 shows the query for determining the number of Features by type in a configuration model.

Table B–12 Numeric Identification of FEATURE_TYPE

FEATURE_TYPE	Description
0	Option
1	Integer
2	Decimal
3	Boolean
4	Text

Example B–5 Determine Number of Features by Type in a Configuration Model

```
SQL> SELECT count(*)
FROM cz_ps_nodes
```

```
WHERE deleted_flag = '0'
and ps_node_type = 261
and feature_type = feature_type
START WITH ps_node_id = devl_project_id
CONNECT BY DECODE(PRIOR ps_node_type,263,PRIOR reference_id, PRIOR ps_node_id) =
DECODE(PRIOR ps_node_type,263,ps_node_id,parent_id)
/
```

In Example B–5, insert the FEATURE_TYPE number shown in Table B–12 for the variable *feature_type*, and insert the DEVL_PROJECT_ID of the configuration model for the variable *devl_project_id* (see Example B–4).

B.4.3 Number of Rules by Type in a Configuration Model

Example B–6 shows the query for determining the number of rules by type in a configuration model.

Table B–13 Numeric Identification of RULE_TYPE

RULE_TYPE	Description
21	Logic rule
22	Numeric rule
23	Compatibility rule
24	Compatibility Table
25	Func Preselect
26	Func Validate
27	Comparison rule
29	Functional Companion
30	Design Chart

Example B–6 Determine Number of Rules by Type in a Configuration Model

```
SQL> SELECT count(*)
FROM cz_rules
WHERE rule_type = rule_type
and devl_project_id in (
SELECT distinct ps_node_id
FROM cz_ps_nodes
WHERE deleted_flag = '0'
and ps_node_type in(436,263)
START WITH ps_node_id = devl_project_id
CONNECT BY DECODE(PRIOR ps_node_type,263,PRIOR reference_id, PRIOR ps_node_id) =
DECODE(PRIOR ps_node_type,263,ps_node_id,parent_id))
/
```

In Example B–6, insert the RULE_TYPE number shown in Table B–13 for the variable rule_type, and insert the DEVL_PROJECT_ID of the configuration model for the variable *devl_project_id* (see Example B–4).

B.4.4 Number of Rules by Relation in a Configuration Model

Example B–7 shows the query for determining the number of rules by relation type in a configuration model.

Table B–14 Numeric Identification of EXPR_RULE_TYPE

EXPR_RULE_TYPE	Description
1	Requires
2	Implies
3	Excludes
4	Negates
5	Defaults
6	NumSelections
8	Contributes
10	Consumes

Example B–7 Determine Number of Rules by Relation in a Configuration Model

```
SQL> SELECT count(*)
FROM cz_rules
WHERE rule_type = rule_type
and expr_rule_type = expr_rule_type
and devl_project_id in (
SELECT distinct ps_node_id
FROM cz_ps_nodes
WHERE deleted_flag = '0'
and ps_node_type in(436,263)
START WITH ps_node_id = devl_project_id
CONNECT BY DECODE(PRIOR ps_node_type,263,PRIOR reference_id, PRIOR ps_node_id) =
DECODE(PRIOR ps_node_type,263,ps_node_id,parent_id))
```

```
/
```

In Example B–7, insert the RULE_TYPE number shown in Table B–13 for the variable rule_type, insert the EXPR_RULE_TYPE number shown in Table B–14 for the variable *expr_rule_type*, and insert the DEVL_PROJECT_ID of the configuration model for the variable *devl_project_id* (see Example B–4).

C
LoadRunner Settings

This appendix describes some LoadRunner parameters that are specific to Oracle Configurator and necessary for collecting Oracle Configurator performance data. The sections are:

- Virtual User (Vuser) Generator
- Vuser Parameterization
- Modifying Vuser Scripts
- Debugging Vuser Scripts

This information is based on LoadRunner 6.5. LoadRunner places a load, so must be installed and run on a separate machine from the Web server being tested for load performance.

For information about LoadRunner settings generally, see the LoadRunner documentation listed in the Section "Related Documents" in the preface of this guide.

For additional tips and guidelines on running tests, see Section 5.3.2, "General Tips and Guidelines".

See the Section "Structure" on page xviii in the preface to verify the audience for whom this chapter is intended.

C.1 Virtual User (Vuser) Generator

Before recording the Vuser scripts, log in to LoadRunner selecting the Vuser type **WebHTTP/HTML**, and set parameters described in this section. Selecting **WebHTTP/HTML** loads the appropriate libraries for recording Vuser scripts emulating Oracle Configurator users.

- Tools Menu: Recording Options
- Tools Menu: General Options
- Vuser: Runtime Settings

C.1.1 Tools Menu: Recording Options

From the menu toolbar, select Tools: Recording Options. Make the following section in the tabs of the Recording Options window.

Browser Tab

Specify the path to Netscape or Internet Explorer browser.

Recording Proxy Tab

Select **Obtain the proxy settings from the recording browser**. Make sure your browser proxy is set up correctly, in particular if you need to traverse a firewall.

Recording Tab

Select **HTTP**. Then select **Record all HTTP requests as custom requests**. No other selections should be checked in this tab.

Correlation and Advanced Tabs

No options should be selected in these tabs.

C.1.2 Tools Menu: General Options

From the menu toolbar, select Tools: General Options. Make the following selection in the tabs of the General Options window.

Display Tab

Show browser during replay should not be selected. The runtime viewer does not support JavaScript, so it does not correctly display the screens for Oracle Configurator during replay.

C.1.3 Vuser: Runtime Settings

Runtime Settings are used to specify the runtime settings for the Vuser scripts. These settings are associated with Vuser scripts. You can modify the runtime settings in this section or from the LoadRunner Controller tool.

From the menu toolbar, select Vuser: Runtime Settings. Make the following selection in the tabs of the Runtime Settings window.

Iterations Tab

When debugging or during single user scenarios, initially set **Iteration Count** to `1`. When simulating multi-user loads, set **Iteration Count** to a large number such as `100`. Set **Iteration Pace** to **As soon as possible**. If iterations can't be started at a specified time, it may not be effective or useful to select **Start new iteration**.

Log Tab

Select **Standard log** initially or during debugging. Disabling logging allows the script to run faster. **Extended log** is not necessary unless you suspect a bug in LoadRunner or need more information for debugging.

Think Time Tab

Set **Use a percentage of recorded think time** to the range of 50% to 200% for random think time. During debugging, it is appropriate to select **Ignore think time**.

Network Tab

In the section **Timeouts**, set both **Connect timeout** and **Receive timeout** to `300` seconds.

HTTP Tab

In the section **HTTP Request Profile**, set **HTTP Version** to `Http 1.0`

Select the appropriate browser software version from the list of values. If the list of values does not contain your browser software version, select **Custom user agent** and enter the appropriate identification. For example, for Netscape 4.73, enter:

Mozilla/4.73 [en] (WinNT; I)

`Http 1.1` is not compatible with the **Advanced Options** used. The custom user agent information is passed to the Apache server so that the right template is returned to the client (such as Internet Explorer or Netscape). This data can be found in the Oracle Configurator session log file during an interactive session (search for `user-agent` in the log).

Advanced Options Tab

Select (enable) the following options:

Analog Mode

Enable HTTP Keep Alive

Enable loading of web resources

Allow DNS caching

Reset context/state between iterations

Do not select **Use WinInet reply engine**. This parameter does not work for Oracle Configurator.

Proxy Tab

Select **Obtain the proxy settings from the default browser**.

General Tab

In the **Multithreading** section, select **Run Vuser as a thread**. *No* other options should be selected.

C.2 Vuser Parameterization

To make the Vuser scripts more portable for tests running on different machines, parameterize the host and port information. See the LoadRunner documentation listed in the Section "Related Documents" in the preface of this guide for details.

C.3 Modifying Vuser Scripts

The following modifications of recorded Vuser scripts are specifically useful to LoadRunner testing of Oracle Configurator.

C.3.1 Parameterize the Session ID

The session ID is created at the Proxy page. Parameterize the session ID by inserting the following line of code right before the line containing the OC Servlet URL proxy, such as `oracle.cz.servlet.Proxy`:

```
web_create_html_param("Session_Id","sessionId\" value=\"","\"");
```

Refer to the LoadRunner for more help (see "Related Documents" on page xx). For debugging, check if the ID is being populated correctly by inserting the following line after the line containing the OC Servlet URL proxy:

```
lr_output_message("*********** Session_Id==>  \"%s\"",
lr_eval_string ("{Session_Id} " ) ) ;
```

Example C–1 shows an example of parameterizing the session ID in a LoadRunner Vuser script.

Example C–1 Obtaining Parameterized Session ID in LoadRunner Vuser Script

```
web_create_html_param("Session_Id","sessionId\" value=\"","\"");
web_custom_request("oracle.apps.cz.servlet.Proxy",
         "URL=http://{Host}:{Port}/servlet/oracle.apps.cz.servlet.Proxy",
         "Method=GET",
         "TargetFrame=",
         "Resource=0",
         "RecContentType=text/html",
         "SupportFrames=0",
         LAST);
lr_output_message("*********** Session_Id==> \"%s\"",lr_eval_string("{Session_
Id}"));
```

Search for the strings `sessionId` and `session-id` and replace the original value assigned to them (typically `DHTML#`, such as `DHTML3`) with the parameter `{Session_Id}`. The session ID is used numerous times throughout the script, and each occurrence needs to be changed to reference the parameter.

C.3.2 Think Times

LoadRunner records all pauses and many `lr_think_time()` commands are inserted into a Vuser script during recording. You only need one `lr_think_time()` command at the beginning of the script and between each transaction, so clean out all the excess think time commands. This better simulates a real user pausing between mouse clicks.

C.3.3 Use Host and Port Parameter

Replace all occurrences of the hostname and port number with the user-defined Host and Port parameter.

Using a global find and replace, replace *mytestcomputer.mycompany*`.com` with `{Host}` and *myport#* with `{Port}`.

C.3.4 Parameterize User Name and Password

If multiple database accounts are used to test different schema versions, parameterize the user name and password as well.

C.3.5 Leverage Cookies

Another helpful debugging tool is to print out the cookie, which contains the JServ name. This is helpful when multiple JServs are running. Place the following command before the proxy page.

```
/* get the cookie which contains the jserv name */
web_create_html_param("jserv_cookie", "JServSessionIdroot=", ";")
```

Example C–2 shows the command to use for printing out the cookie name.

Example C–2 Code for Printing Out Cookie Names

```
/* print the cookie */
lr_output_message("+++++ jserv cookie ==> \"%s\"", lr_eval_string("{jserv_
cookie}"));
```

C.3.6 Optimize Vuser Scripts

The start of each test script's `Action()` section should contain the following commands:

```
web_cleanup_cookies();
web_set_max_retries("0");
web_set_timeout (RECEIVE, "300");
```

The `web_cleanup_cookies()` command makes sure the previous sessionID is cleared before starting a new configuration session (before the `Init` transaction).

The `web_set_max_retries("0")` command prevents the Vuser script from trying to connect to the server again if the first connection request failed.

The `web_set_timeout()` command sets the timeout limit (also a runtime setting).

Example C–3 shows how to segment scripts into transactions to get the performance response times for specific actions, such as selecting an Option.

Example C–3 Transactions in Test Scripts

```
lr_think_time( 3 );

lr_start_transaction("OptionClick");

web_add_header("Content-Type", "application/x-www-form-urlencoded");
```

```
web_custom_request("oracle.apps.cz.servlet.UiServlet",
"URL=http://{Host}:{Port}/servlets/oracle.apps.cz.servlet.UiServlet",
"Method=POST",
"TargetFrame=",
"Resource=0",
"RecContentType=text/html",
"SupportFrames=0",
"Body=XMLmsg=%3Cclient-event+session-id%3D%27{Session_
Id}%27%3E%3Cinput+rtid%3D%27294%27%3E1%3C%2Finput%3E%3C%2Fclient-event%3E&sessio
nId={Session_Id}",
LAST);

lr_end_transaction("OptionClick", LR_AUTO);
```

C.4 Debugging Vuser Scripts

The only way to check correctness of a script's execution is to put validation checks into the test script itself. For a benchmark, have all configuration sessions end in a saved and valid configuration. Place checks at the end of the script for complete and saved configuration status.

1. Declare the following variables at the beginning of the `Action()` section:

   ```
   LPCSTR vuser_group;
   int Vuser;
   ```

2. Before the `Save` transaction, insert the following:

   ```
   /*
    * Determine test success through these variables:
    * config_hdr_id, is_valid, is_complete, and exit_status.
    */
   web_create_html_param("config_hdr_id", "<b>Configuration Header ID:</b>",
   "</p>");
   web_create_html_param("is_valid", "<b>Configuration Valid:</b>", "</p>");
   web_create_html_param("is_complete", "<p><b>Configuration Complete:</b>",
   “</p>");
   web_create_html_param("exit_status", "<b>Exit Status:</b>","</p>");
   ```

3. After the `Save` transaction, insert the following:

   ```
   /*
    *Test completed successfully only when is_valid is true, is_complete is
   true, and
   ```

```
 *exit_status is save.  Otherwise, the test failed.
 * No other verifications are done in the script to cause slow execution.
 */
/* Get vuser number and vuser group name. */
lr_whoami(&vuser, &vuser_group, NULL);
if ( (strcmp(lr_eval_string("{is_valid}"), lr_eval_string("true")) == 0) &&
(strcmp(lr_eval_string("{is_complete}"), lr_eval_string("true")) == 0) &&
 (strcmp(lr_eval_string("{exit_status}"), lr_eval_string("save")) == 0) )
{
lr_log_message("+++++ Config Hdr ID %s done by VUser %d in group %s.",
lr_eval_string("{config_hdr_id}"), vuser, vuser_group);
}
else
{
lr_output_message("Verification Failure: VUser %d in group %s failed; %s in
%s.",
vuser, vuser_group, lr_eval_string("{Session_Id}"),
lr_eval_string("{jserv_cookie}"));
}
```

Even if the test succeeds, a validation check error message is written to the LoadRunner Controller window and log file. If there is a way to directly assert a test failure, place it inside the else statement after the Save transaction in the Vuser script.

Glossary of Terms and Acronyms

This glossary contains definitions that you may need while working with Oracle Configurator.

Active Model

The compiled structure and rules of a **configuration model** that is loaded into memory on the Web server at **configuration session** initialization and used by the **Oracle Configurator engine** to validate runtime selections. The Active Model must be generated either in **Oracle Configurator Developer** or programmatically in order to access the configuration model at **runtime**.

API

Application Programming Interface

applet

A Java application running inside a Web browser. *See also* **Java** and **servlet**.

application architecture

The software structure of an application at **runtime**. Architecture affects how an application is used, maintained, extended, and changed.

architecture

See **application architecture**.

ATO

Assemble to Order

ATP

Available to Promise

attribute

The defining characteristic of something. Models have attributes such as Effectivity Sets and Usage. Components, Features, and Options have attributes such as Name, Description, and Effectivity.

benchmark

Represents performance data collected during **runtime** tests under various conditions that emulate expected and extreme use of the product.

beta

An external release, delivered as an installable application, and subject to acceptance, **validation**, and **integration testing**. Specially selected and prepared **end users** may participate in beta testing.

bill of material

A list of Items associated with a parent Item, such as an assembly, and information about how each Item relates to that parent Item.

Bills of Material

The application in Oracle Applications in which you define a **bill of material**.

BOM

See **bill of material**.

BOM item

The **node** imported into **Oracle Configurator Developer** that corresponds to an Oracle **Bills of Material** item. Can be a **BOM Model**, **BOM Option Class node**, or **BOM Standard Item node**.

BOM Model

A model that you import from Oracle **Bills of Material** into **Oracle Configurator Developer**. When you import a BOM Model, effective dates, **ATO** rules, and other data are also imported into Configurator Developer. In Configurator Developer, you can extend the structure of the BOM Model, but you cannot modify the BOM Model itself or any of its **attributes**.

BOM Model node

The imported **node** in **Oracle Configurator Developer** that corresponds to a **BOM Model** created in Oracle **Bills of Material**.

BOM Option Class node

The imported **node** in **Oracle Configurator Developer** that corresponds to a BOM Option Class created in Oracle **Bills of Material**.

BOM Standard Item node

The imported **node** in **Oracle Configurator Developer** that corresponds to a BOM Standard Item created in Oracle **Bills of Material**.

Boolean Feature

An **element** of a **component** in the **Model** that has two **options**: true or false.

bug

See **defect**.

build

A specific **instance** of an application during its construction. A build must have an install program early in the project so that application **implementers** can **unit test** their latest work in the context of the entire available application.

CIO

See **Oracle Configuration Interface Object (CIO)**.

client

A **runtime** program using a **server** to access functionality shared with other clients.

Comparison rule

An **Oracle Configurator Developer** rule type that establishes a relationship to determine the selection state of a logical **Item** (Option, Boolean Feature, or List-of-Options Feature) based on a comparison of two numeric values (numeric **Features**, **Totals**, **Resources**, **Option** counts, or numeric constants). The numeric values being compared can be computed or they can be discrete intervals in a continuous numeric input.

Compatibility rule

An **Oracle Configurator Developer** rule type that establishes a relationship among **Features** in the Model to control the allowable combinations of **Options**. *See also*, **Property-based Compatibility rule**.

Compatibility Table

A kind of Explicit Compatibility rule. For example, a type of compatibility relationship where the allowable combination of **Options** are explicitly enumerated.

component

A piece of something or a configurable element in a **model** such as a **BOM Model**, **Model**, or **Component**.

Component

An element of the **model structure**, typically containing **Features**, that is configurable and instantiable. An **Oracle Configurator Developer** node type that represents a configurable element of a **Model**. Corresponds to one UI screen of selections in a runtime **Oracle Configurator**.

Component Set

An element of the **Model** that contains a number of instantiated **Components** of the same type, where each Component of the set is independently configured.

concurrent manager

A process manager that coordinates the **concurrent processes** generated by **users' concurrent requests**. An Oracle Applications product group can have several concurrent managers.

concurrent process

A task that can be scheduled and is run by a **concurrent manager**. A concurrent process runs simultaneously with interactive functions and other concurrent processes.

concurrent processing facility

An Oracle Applications facility that runs time-consuming, non-interactive tasks in the background.

concurrent program

Executable code (usually written in SQL*Plus or Pro*C) that performs the function(s) of a requested task. Concurrent programs are stored procedures that perform actions such as generating reports and copying data to and from a database.

concurrent request

A user-initiated request issued to the concurrent processing facility to submit a non-interactive task, such as running a report.

configuration

A specific set of specifications for a product, resulting from selections made in a runtime **configurator**.

configuration attribute

A characteristic of an **item** that is defined in the **host application** (outside of its inventory of items), in the **Model**, or captured during a **configuration session**. Configuration attributes are inputs from or outputs to the host application at initialization and termination of the configuration session, respectively.

Configuration Interface Object

See **Oracle Configuration Interface Object (CIO)**.

configuration model

Represents all possible configurations of the available **options**, and consists of **model structure** and **rules**. It also commonly includes **User Interface** definitions and **Functional Companions**. A configuration model is usually accessed in a **runtime Oracle Configurator window**. *See also* **model**.

configuration rules

The **Oracle Configurator Developer Logic rules**, **Compatibility rules**, **Comparison rules**, **Numeric rules**, and **Design Charts** available for defining **configurations**. *See also* **rules**.

configuration session

The time from launching or invoking to exiting **Oracle Configurator**, during which **end users** make selections to configure an orderable product. A configuration session is limited to one **configuration model** that is loaded when the session is initialized.

configurator

The part of an application that provides custom configuration capabilities. Commonly, a window that can be launched from a hosting application so **end users** can make selections resulting in valid **configurations**. *Compare* **Oracle Configurator**.

connectivity

The connection between **client** and database **server** that allows data communication.

The connection across components of a model that allows modeling such products as networks and material processing systems.

Connector

The **node** in the **model structure** that enables an **end user** at **runtime** to connect the Connector node's parent to a referenced **Model**.

Container Model

A type of **BOM Model** that you import from Oracle **Bills of Material** into **Oracle Configurator Developer** to create configuration models containing **connectivity** and trackable components. Configurations created from Container Models can be tracked and updated in Oracle Install Base

context

The surrounding text or conditions of something.

Determines which context-sensitive segments of a flexfield in the Oracle Applications database are available to an application or **user**. Used in defining **configuration attributes**.

Contributes to

A relation used to create a specific type of **Numeric rule** that accumulates a total value. *See also* **Total**.

Consumes from

A relation used to create a specific type of **Numeric rule** that decrementing a total value, such as specifying the quantity of a **Resource** used.

count

The number or quantity of something, such as selected **options**. *Compare* **instance**.

CRM

See **Customer Relationship Management**

CTO

Configure to Order

customer

The person for whom products are configured by **end users** of the **Oracle Configurator** or other **ERP** and **CRM** applications. Also the end users themselves directly accessing **Oracle Configurator** in a Web store or kiosk.

customer-centric extensions

See **customer-centric views**.

customer-centric views

Optional extensions to core functionality that supplement configuration activities with **rules** for **preselection**, **validation**, and **intelligent views**. View capabilities include generative geometry, drawings, sketches and schematics, charts, performance analyses, and **ROI** calculations.

Customer Relationship Management

The aspect of the enterprise that involves contact with customers, from lead generation to support services.

customer requirements

The needs of the customer that serve as the basis for determining the configuration of products, **systems**, and services. Also called needs assessment. *See* **guided buying or selling**.

CZ

The product shortname for **Oracle Configurator** in Oracle Applications.

data import

Populating the **Oracle Configurator schema** with enterprise data from **ERP** or legacy systems via **import tables**.

Data Integration Object

Also known as the DIO, the Data Integration Object is a **server** in the **runtime** application that creates and manages the interface between the **client** (usually a **user interface**) and the **Oracle Configurator schema**.

data maintenance environment

The environment in which the runtime **Oracle Configurator** data is maintained.

data source

A programmatic reference to a database. Referred to by a data source name (DSN).

DBMS

Database Management System

default

A predefined value. In a **configuration**, the automatic selection of an **option** based on the **preselection** rules or the selection of another option.

Defaults rule

An **Oracle Configurator Developer** Logic rule that determines the logic state of **Features** or **Options** in a default relation to other Features and Options. For example, if A Defaults B, and you select A, B becomes Logic True (selected) if it is available (not Logic False).

defect

A failure in a product to satisfy the **users**' requirements. Defects are prioritized as critical, major, or minor, and fixes range from corrections or workarounds to enhancements. Also known as a bug.

defect tracking

A system of identifying defects for managing additional tests, testing, and approval for release to **users**.

deliverable

A work product that is specified for review and delivery.

demonstration

A presentation of the tested application, showing a particular usage scenario.

Design Chart

An **Oracle Configurator Developer** rule type for defining advanced Explicit Compatibilities interactively in a table view.

design review

A technical review that focuses on application or **system** design.

developer

The person who uses **Oracle Configurator Developer** to create a **configurator**. *See also* **implementer** and **user**.

Developer

The tool (**Oracle Configurator Developer**) used to create **configuration models**.

DHTML

Dynamic Hypertext Markup Language

DIO

See **Data Integration Object**.

distributed computing

Running various **components** of a **system** on separate machines in one network, such as the database on a database **server** machine and the application software on a Web server machine.

DLL

Dynamically Linked Library

DSN

See **data source**.

element

Any entity within a **model**, such as **Options**, **Totals**, **Resources**, UI controls, and **components**.

end user

The ultimate user of the runtime **Oracle Configurator**. The types of end users vary by project but may include salespeople or distributors, administrative office staff, marketing personnel, order entry personnel, product engineers, or customers directly accessing the application via a Web browser or kiosk. *Compare* **user**.

enterprise

The **systems** and **resources** of a business.

environment

The arena in which software tools are used, such as operating system, applications, and **server** processes.

ERP

Enterprise Resource Planning. A software system and process that provides automation for the customer's back-room operations, including order processing.

Excludes rule

An **Oracle Configurator Developer** Logic rule determines the logic state of **Features** or **Options** in an excluding relation to other Features and Options. For example, if A Excludes B, and if you select A, B becomes Logic False, since it is not allowed when A is true (either User or Logic True). If you deselect A (set to User False), there is no effect on B, meaning it could be User or Logic True, User or Logic False, or **Unknown**. *See* **Negates rule**.

extended functionality

A release after delivery of core functionality that extends that core functionality with **customer-centric views**, more complex proposal generation, discounting, quoting, and expanded integration with **ERP**, **CRM**, and third-party software.

feature

A characteristic of something, or a configurable element of a **component** at **runtime**.

Feature

An element of the **model structure**. Features can either have a value (numeric or Boolean) or enumerated **Options**.

Functional Companion

An extension to the **configuration model** beyond what can be implemented in Configurator Developer.

An object associated with a **Component** that supplies methods that can be used to initialize, validate, and generate **customer-centric views** and outputs for the **configuration**.

functional specification

Document describing the functionality of the application based on **user** requirements.

guided buying or selling

Needs assessment questions in the **runtime** UI to guide and facilitate the configuration process. Also, the **model structure** that defines these questions. Typically, guided selling questions trigger **configuration rules** that automatically select some product **options** and exclude others based on the **end user's** responses.

host application

An application within which **Oracle Configurator** is embedded as integrated functionality, such as Order Management or *i*Store.

HTML

Hypertext Markup Language

ICX

Inter-Cartridge Exchange

implementation

The stage in a project between defining the problem by selecting a configuration technology vendor, such as Oracle, and deploying the completed configuration application. The implementation stage includes gathering requirements, defining test cases, designing the application, constructing and testing the application, and delivering it to **end users**. *See also* **developer** and **user**.

implementer

The person who uses **Oracle Configurator Developer** to build the **model structure**, rules, and UI customizations that make up a **runtime** Oracle Configurator. Commonly also responsible for enabling the integration of **Oracle Configurator** in a **host application**.

Implies rule

An **Oracle Configurator Developer** Logic rule that determines the logic state of **Features** or **Options** in an implied relation to other Features and Options. For example, if A Implies B, and you select A, B becomes Logic True. If you deselect A (set to User False), there is no effect on B, meaning it could be User or Logic True, User or Logic False, or **Unknown**. *See* **Requires rule**.

import server

A database **instance** that serves as a source of data for **Oracle Configurator**'s Populate, Refresh, and Synchronization concurrent processes. The import server is sometimes referred to as the remote server.

import tables

Tables mirroring the Oracle Configurator schema Item Master structure, but without integrity constraints. Import tables allow batch population of the Oracle Configurator schema's Item Master. Import tables also store extractions from Oracle Applications or **legacy data** that create, update, or delete records in the Oracle Configurator schema **Item Master**.

incremental construction

The process of organizing the construction of the application into **builds**, where each build is designed to meet a specified portion of the overall requirements and is **unit tested**.

initialization message

The **XML** message sent from a **host application** to the **Oracle Configurator Servlet**, containing data needed to initialize the runtime Oracle Configurator. *See also* **termination message**.

install program

Software that sets up the local machine and installs the application for testing and use.

Instance

An **Oracle Configurator Developer** attribute of a **component's node** that specifies a minimum and maximum value. *See also* **instance**.

instance

A **runtime** occurrence of a **component** in a configuration. *See also* **instantiate**. *Compare* **count**.

Also, the memory and processes of a database.

instantiate

To create an instance of something. Commonly, to create an **instance** of a **component** in the runtime **user interface** of a **configuration model**.

integration

The process of combining multiple software **components** and making them work together.

integration testing

Testing the interaction among software programs that have been integrated into an application or **system**. *Compare* **unit test**.

intelligent views

Configuration output, such as reports, graphs, schematics, and diagrams, that help to illustrate the value proposition of what is being sold.

IS

Information Services

item

A product or part of a product that is in inventory and can be delivered to customers.

Item

A Model or part of a Model that is defined in the **Item Master**. Also data defined in Oracle Inventory.

Item Master

Data stored to structure the Model. Data in the Item Master is either entered manually in **Oracle Configurator Developer** or imported from Oracle Applications or a legacy system.

Item Type

Data used to classify the Items in the Item Master. Item Catalogs imported from Oracle Inventory are Item Types in **Oracle Configurator Developer**.

Java

An object-oriented programming language commonly used in internet applications, where Java applications run inside Web browsers and **servers**. *See also* **applet** and **servlet**.

LAN

Local Area Network

LCE

Logical Configuration Engine. *Compare* **Active Model**.

legacy data

Data that cannot be imported without creating custom extraction programs.

load

Storing the **configuration model** data in the **Oracle Configurator Servlet** on the Web server. Also, the time it takes to initialize and display a configuration model if it is not preloaded.

The burden of transactions on a **system**, commonly caused by the ratio of **user** connections to CPUs or available memory.

log file

A file containing errors, warnings, and other information that is output by the running application.

Logic rules

Logic rules directly or indirectly set the logical state (User or Logic True, User or Logic False, or **Unknown**) of **Features** and **Options** in the Model.

There are four primary Logic rule relations: Implies, Requires, Excludes, and Negates. Each of these rules takes a list of Features or Options as operands. *See also* **Implies rule**, **Requires rule**, **Excludes rule**, and **Negates rule**.

maintainability

The characteristic of a product or process to allow straightforward **maintenance**, alteration, and extension. Maintainability must be built into the product or process from inception.

maintenance

The effort of keeping a **system** running once it has been deployed, through **defect** fixes, procedure changes, infrastructure adjustments, data replication schedules, and so on.

Metalink

Oracle’s technical support Web site at:

`http://www.oracle.com/support/metalink/`

Model

The entire hierarchical "tree" view of all the data required for **configurations**, including **model structure**, variables such as **Resources** and **Totals**, and elements in support of intermediary rules. Includes both imported **BOM Models** and Models created in Configurator Developer. May consist of BOM Option Classes and BOM Standard Items.

model

A generic term for data representing products. A model contains **elements** that correspond to **items**. Elements may be **components** of other objects used to define products. A **configuration model** is a specific kind of model whose elements can be configured by accessing an **Oracle Configurator window**.

model-driven UI

The graphical views of the **model structure** and rules generated by **Oracle Configurator Developer** to present **end users** with interactive product selection based on **configuration models**.

model structure

Hierarchical "tree" view of data composed of **elements** (**Models**, **Components**, **Features**, **Options**, **BOM Models**, **BOM Option Class nodees**, **BOM Standard Item nodes**, **Resources**, and **Totals**). May include reusable **components** (**References**).

MS

Microsoft Corporation

Negates rule

A type of **Oracle Configurator Developer** Logic rule that determines the logic state of **Features** or **Options** in a negating relation to other Features and Options. For example, if one **option** in the relationship is selected, the other option must be Logic False (not selected). Similarly, if you deselect one option in the relationship, the other option must be Logic True (selected). *See* **Excludes rule**.

node

The icon or location in a **Model** tree in **Oracle Configurator Developer** that represents a **Component**, **Feature**, **Option** or variable (**Total** or **Resource**), **Connector**, **Reference**, **BOM Model**, **BOM Option Class node**, or **BOM Standard Item node**.

Numeric rule

An **Oracle Configurator Developer** rule type that express constraint among model elements in terms of numeric relationships. *See also*, **Contributes to** and **Consumes from**.

OC

See **Oracle Configurator**.

ODBC

Open Database Connectivity. A database access method that uses drivers to translate an application's data queries into **DBMS** commands.

OCD

See **Oracle Configurator Developer**.

opportunity

The workspace in Oracle Sales Online in which products, **systems**, and services are configured, quotes and proposals are generated, and orders are submitted.

option

A logical selection made by the **end user** when configuring a **component**.

Option

An element of the **Model**. A choice for the value of an enumerated **Feature**.

Oracle Configuration Interface Object (CIO)

A **server** in the **runtime** application that creates and manages the interface between the **client** (usually a **user interface**) and the underlying representation of **model structure** and rules in the **Active Model**.

The CIO is the **API** that supports creating and navigating the Model, querying and modifying selection states, and saving and restoring **configurations**.

Oracle Configurator

The product consisting of development tools and **runtime** applications such as the **Oracle Configurator schema**, **Oracle Configurator Developer**, and runtime Oracle Configurator. Also the runtime Oracle Configurator variously packaged for use in networked or Web deployments.

Oracle Configurator architecture

The three-tier **runtime** architecture consists of the **User Interface**, the **Active Model**, and the **Oracle Configurator schema**. The application development architecture consists of **Oracle Configurator Developer** and the Oracle Configurator schema, with test instances of a runtime **Oracle Configurator**.

Oracle Configurator Developer

The suite of tools in the **Oracle Configurator** product for constructing and maintaining **configurator**s.

Oracle Configurator engine

Also **LCE**. *Compare* **Active Model**.

Oracle Configurator schema

The implementation version of the standard runtime **Oracle Configurator** data-warehousing schema that manages data for the **configuration model**. The implementation schema includes all the data required for the **runtime** system, as well as specific tables used during the construction of the **configurator**.

Oracle Configurator Servlet

Vehicle for **Oracle Configurator** containing the UI Server.

Oracle Configurator window

The **user interface** that is launched by accessing a **configuration model** and used by **end users** to make the selections of a **configuration**.

Oracle SellingPoint Application

No longer available or supported.

output

The output generated by a **configurator**, such as quotes, proposals, and **customer-centric views**.

performance

The operation of a product, measured in throughput and other data.

Populator

An entity in **Oracle Configurator Developer** that creates **Component**, **Feature**, and **Option nodes** from information in the **Item Master**.

preselection

The default state in a **configurator** that defines an initial selection of **Components**, **Features**, and **Options** for configuration.

A process that is implemented to select the initial element(s) of the **configuration**.

product

Whatever is ordered and delivered to customers, such as the output of having configured something based on a model. Products include intangible entities such as services or contracts.

project manager

A member of the project team who is responsible for directing the project during implementation.

project plan

A document that outlines the logistics of successfully implementing the project, including the schedule.

Property

A named value associated with a **node** in the **Model** or the **Item Master**. A set of Properties may be associated with an Item Type. After importing a BOM Model, Oracle Inventory Catalog Descriptive Elements are Properties in **Oracle Configurator Developer**.

Property-based Compatibility rule

A kind of compatibility relationship where the allowable combinations of **Options** are specified implicitly by relationships among Property values of the Options.

prototype

A construction technique in which a preliminary version of the application, or part of the application, is built to facilitate **user** feedback, prove feasibility, or examine other implementation issues.

PTO

Pick to Order

publication

A unique deployment of a **configuration model** (and optionally a **user interface**) that enables a developer to control its availability from hosting applications such as Oracle Order Management or *i*Store. Multiple publications can exist for the same configuration model, but each publication corresponds to only one **Model** and **User Interface**.

publishing

The process of creating a **publication** record in **Oracle Configurator Developer**, which includes specifying applicability parameters to control **runtime** availability and running an Oracle Applications concurrent process to copy data to a specific database.

QA

Quality Assurance

RAD

Rapid Application Development

RDBMS

Relational Database Management System

reference

The ability to reuse an existing **Model** or **Component** within the structure of another Model (for example, as a subassembly).

Reference

An **Oracle Configurator Developer** node type that denotes a **reference** to another **Model**.

regression test

An automated test that ensures the newest **build** still meets previously tested requirements and functionality. *See also* **incremental construction**.

Requires rule

An **Oracle Configurator Developer** Logic rule that determines the logic state of **Features** or **Options** in a requirement relation to other Features and Options. For example, if A Requires B, and if you select A, B is set to Logic True (selected). Similarly, if you deselect A, B is set to Logic False (deselected). See **Implies rule**.

resource

Staff or equipment available or needed within an enterprise.

Resource

A variable in the **Model** used to keep track of a quantity or supply, such as the amount of memory in a computer. The value of a Resource can be positive or zero, and can have an Initial Value setting. An error message appears at **runtime** when the value of a Resource becomes negative, which indicates it has been over-consumed. Use **Numeric rules** to contribute to and consume from a Resource.

Also a specific node type in **Oracle Configurator Developer**. *See also* **node**.

reusable component

See **reference** and **model structure**.

reusability

The extent to and ease with which parts of a **system** can be put to use in other systems.

RFQ

Request for Quote

ROI

Return on Investment

rules

Also called business rules or **configuration rules**. Constraints applied among elements of the product to ensure that defined relationships are preserved during configuration. Elements of the product are **Components**, **Features**, and **Options**. Rules express logic, numeric parameters, implicit compatibility, or explicit compatibility. Rules provide **preselection** and **validation** capability in **Oracle Configurator**.

See also **Comparison rule**, **Compatibility rule**, **Design Chart**, **Logic rules** and **Numeric rule**.

runtime

The environment and context in which applications are run, tested, or used, rather than developed.

The environment in which an **implementer** (tester), **end user**, or **customer** configures a product whose model was developed in **Oracle Configurator Developer**. *See also* **configuration session**.

sales configuration

A part of the sales process to which configuration technology has been applied in order to increase sales effectiveness and decrease order errors. Commonly identifies **customer requirements** and product configuration.

schema

The tables and objects of a data model that serve a particular product or business process. *See* **Oracle Configurator schema**.

SCM

Supply Chain Management

server

Centrally located software processes or hardware, shared by **clients**.

servlet

A Java application running inside a Web server. *See also* **Java**, **applet**, and **Oracle Configurator Servlet**.

SFA

Sales Force Automation

solution

The deployed **system** as a response to a problem or problems.

SQA

Software Quality Assurance

SQL

Structured Query Language

system

The hardware and software **component**s and infrastructure integrated to satisfy functional and **performance** requirements.

termination message

The **XML** message sent from the **Oracle Configurator Servlet** to a **host application** after a **configuration session**, containing configuration outputs. *See also* **initialization message**.

test case

A description of inputs, execution instructions, and expected results that are created to determine whether a specific software feature works correctly or a specific requirement has been met.

Total

A variable in the **Model** used to accumulate a numeric total, such as total price or total weight.

Also a specific node type in **Oracle Configurator Developer**. *See also* **node**.

UI

See **User Interface**.

Unknown

The logic state that is neither true nor false, but unknown at the time a **configuration session** begins or when a Logic rule is executed. This logic state is also referred to as Available, especially when considered from the point of view of the **runtime Oracle Configurator end user**.

unit test

Execution of individual routines and modules by the application **implementer** or by an independent test consultant to find and resolve **defects** in the application. *Compare* **integration testing**.

update

Moving to a new version of something, independent of software release. For instance, moving a production **configurator** to a new version of a **configuration model**, or changing a **configuration** independent of a model **update**.

upgrade

Moving to a new release of **Oracle Configurator** or **Oracle Configurator Developer**.

user

The person using a product or system. Used to describe the person using **Oracle Configurator Developer** tools and methods to build a **runtime Oracle Configurator**. *Compare* **end user**.

User Interface

The part of **Oracle Configurator architecture runtime** architecture that is generated from the **model structure** and provides the graphical views necessary to create **configurations** interactively. Interacts with the **Active Model** and data to give **end users** access to customer requirements gathering, product selection, and **customer-centric views**.

user interface

The visible part of the application, including menus, dialog boxes, and other on-screen elements. The part of a **system** where the **user** interacts with the software. Not necessarily generated in **Oracle Configurator Developer**.

user requirements

A description of what the **configurator** is expected to do from the **end user's** perspective.

user's guide

Documentation on using the application or **configurator** to solve the intended problem.

validation

Tests that ensure that configured **components** will meet specific criteria set by an enterprise, such as that the components can be ordered or manufactured.

Validation

A type of **Functional Companion** that is implemented to ensure that the configured **components** will meet specific criteria.

VAR

Value-Added Reseller

variable

Parts of the **Model** that are represented by **Totals**, **Resources**, or numeric **Features**.

VB

Microsoft Visual Basic. Programming language in which portions of **Oracle Configurator Developer** are written.

verification

Tests that check whether the result agrees with the specification.

WAN

Wide Area Network

Web

The portion of the Internet that is the World Wide Web.

WIP

Work In Progress

XML

Extensible Markup Language, a highly flexible markup language for transferring data between **Web** applications. Used for the **initialization message** and **termination message** of the **Oracle Configurator Servlet**.

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