December 2011

Business rule mining: An introduction

Contents

1 Business rule modernization: Overview

2 Rule mining process: Introduction

2 Roles and skills

3 Preparation activities

5 Rule mining activities

11 For more information

Business rule modernization: Overview

Business decisions are made every day in business transactions incorporated in web, online and batch applications. However, business rules are embedded redundantly throughout the application source which is subject to incremental application maintenance updates. Over a period of time, this makes it difficult to identify and verify the accuracy of these rules. With an effective process for identifying and validating the rules that govern business decisions, you can be more responsive to business needs and changes in the marketplace. By managing the rules centrally outside of the individual application source, you can be better positioned for lower application maintenance and IT integration costs. Business application modernization projects can benefit from the inclusion of a business rule mining process, which can help identify what decisions are made using which rules and where in the source and/or data those rules reside, as well as designing those coded rules to be executed and managed in a decision management environment.

Business rule modernization, an integral part of business application modernization, addresses the challenge of inflexible applications, helping corporations become more agile by quickly adapting the rules that govern their key business decisions to changes in the marketplace.

IBM offers business rule modernization by combining the application understanding and rule mining functionality of IBM Rational® Asset Analyzer software with the capability of IBM WebSphere® Operational Decision Management (WODM) to forward design and manage these rules externally. IBM offers the benefits of an incremental application modernization approach by managing business logic independently of technical architecture to facilitate improved agility and faster time to market.

Rule mining process: Introduction

The goal of this document is to lay out an effective rule mining process that is both practical and practicable and to identify the key skills required to successfully execute a rule mining effort.

The rule mining process involves two sets of activities, preparation and execution. Preparation activities include defining the scope of the effort, pulling together the supporting materials, identifying the key skills, inventorying the application assets and establishing the business vocabulary to be used throughout the effort.

The execution activities build on the preparation work and include defining the business processes and activities using the tools and creating the terms and properties that identify the activity inputs and outputs. With these foundational elements in place, the actual rule mining work begins by identifying a decision activity, since a business decision is the anchor point for business rules. The candidate rules are identified in the application source. These rules are gathered and analyzed, which allows structured or formal rules to be authored and exported to WODM.

It is recommended to follow an iterative approach to rule mining that allows you to refine the business vocabulary with its terms and properties to better fit the rules pattern the process identifies. With each experience, the practitioners can improve their understanding of the rule patterns that drive the business decisions encoded in the applications and guide the subsequent iterations.

Roles and skills

Rule mining is a team sport. For a team to be effective, it is necessary to have the right set of skills in the team or available to the team for consultation. The following skills are essential for a rule mining effort:

Application Subject Matter Expert (SME): A subject matter expert on the application being mined is an essential member of the team. This individual provides awareness of the programming styles in use, an understanding of the role the application serves and, ideally, is aware of the application's programming history including the original purpose and design and how these have changed overtime.

Enterprise architect: The enterprise architect can provide valuable context for the role of the application being mined in formulating the business decisions. This role is a consultative one, performed during the preparation activities to help define the scope of the rule mining effort.

Business rule miner: This role is usually performed by the COBOL developer or a technical business analyst responsible for "driving through the code." The business rule miner identifies the candidate business rules and enters them in the rule authoring user interface.

Business rule analyst/rule designer: This role requires an understanding of what the business decision and rules should be for the new implementation. The business rule analyst/designer, who often performs the additional role of business rule designer/implementer, provides inputs about the rules for developing the new design.

Business object modeler: This role involves defining the business object model for the target application and mapping of the COBOL structures to the new rule application project. Generally, this role facilitates getting consensus of the business terms mapped to the COBOL structures.

Business rule repository administrator: This role involves ensuring that the business object model and rules are defined consistently for all the phases of the project, are entered into the repository correctly and that the rules can be shared across platforms.

Project manager: The project manager role in a rule mining process is essentially the traditional project management role with one important caveat: *Beware of Scope Creep!* One of the key tasks of the project manager is to keep a close eye on the scope so that it does not expand and swamp the rule mining effort.

Preparation activities

"*Success depends upon previous preparation, and without such preparation there is sure to be failure.*"

—Confucius

Given the likelihood of "scope creep" during rule mining, we cannot emphasize enough on the importance of extensive preparation for a rule mining effort. The preparation activities include the following:

1. Ensure that the following roles have been assigned:
   a. Business rule miner
   b. Business rule analyst/rule designer
   c. Subject matter expert

2. Ensure that the required technologies are in place for rule mining and business rule management for future rule design and management.

3. Ensure you have the business user buy-in. Adopting business rule management technology requires business and IT buy in.

The following sections describe in detail the preliminary steps involved in preparing for a rule mining project.

Define rule mining project scope

Before beginning a rule mining project you need to define the scope of the project. Scope definition should be guided by the intended business impact and level of effort/cost available to be invested. You should start with projects that have a small and feasible scope. This will help your team gain experience, tune the process to fit your organizational culture and deliver the desired business impact. Once you have initiated the process of building on vocabularies, skills and processes that work for you, subsequent projects can have a larger scope.

The project scope is, essentially, the business decisions you wish to mine the rules for, with the intent of extracting the rules and driving them from a rules engine. The steps involved in defining the scope of a rule mining project include:

1. **Define the overall scope of the rule mining effort in business terms.** For example, all rules related to loan eligibility, rules related to pricing of wireless family plans, and so on. It is not advisable to scope a rule mining project to a non-business centric objective such as mining the rules out of an existing module or application. Such a scope does not provide the necessary focus to deliver the business impact you need to show.

2. **Identify the processes that need to be changed.** Essentially, you need to identify the processes you intend to change with the rule mining effort. The process does not have to be formally defined using a process modeling tool. It can be identified and simply sketched. For example, a process can be sketched by looking at the job scheduler to identify workflows and job dependencies or by analyzing real-time scheduling based on external events and online transactions. The arrival of an order from a customer or a stock update from a store branch can be identified as a process.

3. **Develop high-level business models of the process.** The process model, which may be a high-level sketch, is used to define the events, activities, and gateways involved so that you can identify decision points in the process.

4. **Identify the business decision points in the process.** A decision point represents an activity in a business process that involves decision making. The business decision could be an evaluation of a business event, such as the acceptance or rejection of a loan application to flag it for future processing downstream in the business process. The decision may also involve computing some values as part of a business transaction or process; for example, the calculation of discounts based on customer categories. It is also helpful to identify a decision point in a business process by searching for verbs such as analyze, check, validate, evaluate, verify, assess and so on, which are indicative of a decision that describes the task. For more guidance see ABRD, "Identify Decision Points."

5. **Prioritize the decisions.** When there are multiple decision points in the selected process, prioritize the decisions in the order you would like to address them, based on the appropriate impact and scope. You do not need to address all the decisions in this effort but it is recommended to record them for future consideration. Decisions that are stable or change very infrequently do not need the business agility that rule engines offer and can be accorded a low-priority. Focus on the ones that need to be changed based on changing marketplace demands.

6. **Identify the input and outputs for a decision.** Identify the inputs and outputs for a decision in business terms and the applications associated with the inputs or outputs. The application logic acts on the inputs and outputs, which are usually data elements, to make the decision. These will be the starting points for the rule mining effort.

Now you have established a project scope based on business decisions for which rules can be identified and captured by the rule mining process.

Gather supporting materials

To prepare for a rule mining project, the teams need access to any external documentation or reference information that describes the application, such as documents and guides, glossaries or dictionaries and data files or database tables that are referenced by the code to perform look-ups. Any reference information that gives more insight into the application specifics will prove useful during rule mining.

Information about the business processes that the applications support can help shape the vocabulary used in the business rules that are created by this effort.

Be aware that not everything you need to know is written down. Much of the context and business value will be in the minds of the subject matter experts and project stake-holders. Take the time to interview them and, if possible, get their commitment to be available for consultation as the rule mining project proceeds.

Inventory application assets

The rule mining process can be done manually but a manual approach could be inefficient and prone to incomplete results. Rational Asset Analyzer (RAA) software is a static analysis tool designed to help the rule mining team efficiently locate the rule in the COBOL application source. It offers an inventory process to collect the knowledge required for understanding the application relationships, dependencies, execution flows through batch, IMS and CICS transactions, interactions with IBM DB2®, and IMS database and dataset data stores.

Establish the business vocabulary

An essential and often challenging part of a rule mining project is establishing the vocabulary that will form the backbone of the rule design. This vocabulary is a business oriented abstraction of the vocabulary of COBOL programmers, the database administrator (DBAs)defined in COBOL copybooks and the COBOL structures in the application. A key activity in rule mining is the mapping of the business vocabulary, terms and their properties to the programming vocabulary, variables and data element names.

If a business vocabulary based on the business rules managed by WODM software is already available, it can be imported using Rational Asset Analyzer software. In the absence of an established business vocabulary, we recommend a brainstorming session between the application subject matter expert and the business rule designer to lay out business terms and their properties corresponding to the decision points identified for the rule mining project. It is also recommended to have discussions to define these decision points in Rational Asset Analyzer software instead of importing them.

An alternative approach is to generate business terms from the COBOL copy book. This is useful if you know that all the data elements in a given level are referenced in statements that contain business rule logic. While this approach will certainly be convenient, the generated terms are not likely to be true business terms so you may need to adjust some of them as the mining process continues.

A business vocabulary is likely to build and change throughout the project. WODM software can be used to update the business vocabulary and incorporate these updates in the business rules.

Rule mining activities

The preparation activities have defined the team and organized the source code and supporting documentation. At this point, the team has a good understanding of the objective of the effort, sufficient background knowledge about the application and access to the source and tools they need. Now, you are ready to proceed with rule mining. Rule mining using Rational Asset Analyzer software is illustrated in Figure 1. Each process step is elaborated upon in the subsequent sections.

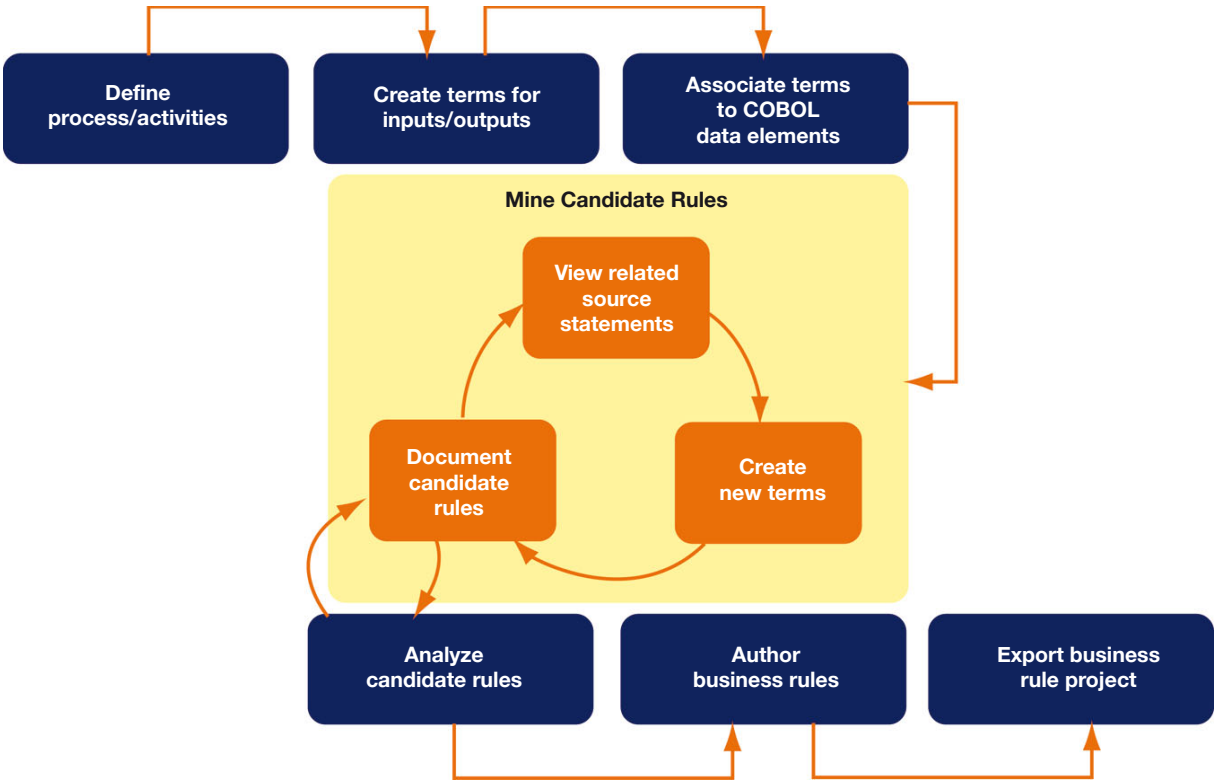

Figure 1: Rule mining execution process

Define business terms for decision inputs/outputs

The mining process begins by mapping the inputs or outputs to the decision selected during the preparation activities. Rational Asset Analyzer software is used to find the COBOL data elements that contain these inputs or outputs and associate them with corresponding business terms. It offers a number of ways to identify the relevant data elements. You can start with the data set assets and navigate your way to the key data elements in them. For example, if the output you are seeking appears in a report, you can start with the data set that contains the report and work your way to the data elements that map to the output field. You can start with the source code itself using the wildcard search capabilities to identify the likely candidate elements the developer may have used to hold the input or output element you are seeking. You can also use the Rational Asset Analyzer software custom query to do a more sophisticated search for the elements you need to find.

For transactional applications, it is best to start with an input element since the Customer Information Control System (CICS®) or Information Management System (IMS™) transaction can take different paths depending on the screen input value. Starting from an input field for transactions provides a clearer view of the alternative paths and helps find additional rule conditions. In the case of batch applications, the output fields are better starting points which you can then follow back to the application logic.

For applications that validate input data to determine eligibility or validity (for example, eligibility for an upgrade or discount or claim completeness and validity) and produce a list of error or violation messages as output, a good approach is to work backwards from the COBOL data field that indicates if the input data is 'eligible' or 'valid' or the COBOL data field that counts the number of errors or violations to identify the possible error messages or codes. The rule miner can then trace backwards from each error message or code to discover the business rules that resulted in the code or message.

After you identify the elements, associate them to their appropriate business term and property. Rational Asset Analyzer software discovers relevant synonyms for the elements you identified, providing a more detailed context for determining the rules that impact those elements. Unless you are starting from an adequate vocabulary imported from WODM or inherited from other rule mining efforts, you will need to define the business terms and their properties as you identify the COBOL data elements you are using for the rule mining process.

It is important to define business terms and their property names in business terminology so that the structured business rules are readable and understandable. This is best done in concert with an experienced rule designer or analyst. Business terms are an important abstraction of the COBOL elements that are essential to the design of effective business rules.

Mine COBOL logic for candidate rules

Candidate rules are rules written in unstructured natural language text to document business logic that may be translated into executable business rules. It is recommended to document the candidate rules using consistent business terms that have been defined as terms or properties using Rational Asset Analyzer software.

Once decision input and output data elements have been identified and associated to business terms as outlined in the previous steps, prioritize the list of terms you want to work with to help organize your efforts.

Rational Asset Analyzer identifies all the source statements that act on the elements associated with the business term. Select **View Related Source** to display those source statements and identify the statements (if any) that contain the business logic that drives the business decisions you are searching for. This is an iterative process with the following steps:

- **View related source statements.** Starting from a business term, view the related source to see the lines of code that reference the business term.
- **Document candidate rules.** Navigate the source view to look at source statements and associate rules with statements that contain business logic that you need to track. Create a rule or update an existing rule to document the business logic as needed. You will have the opportunity to consolidate these into formal rules later.
- **Create new terms.** As you navigate the source and associate source statements to rules you will find additional data elements of interest that need to be traced. Associate these data elements with business terms and continue the process of exploring the source for that term to find additional candidate business rules and terms.

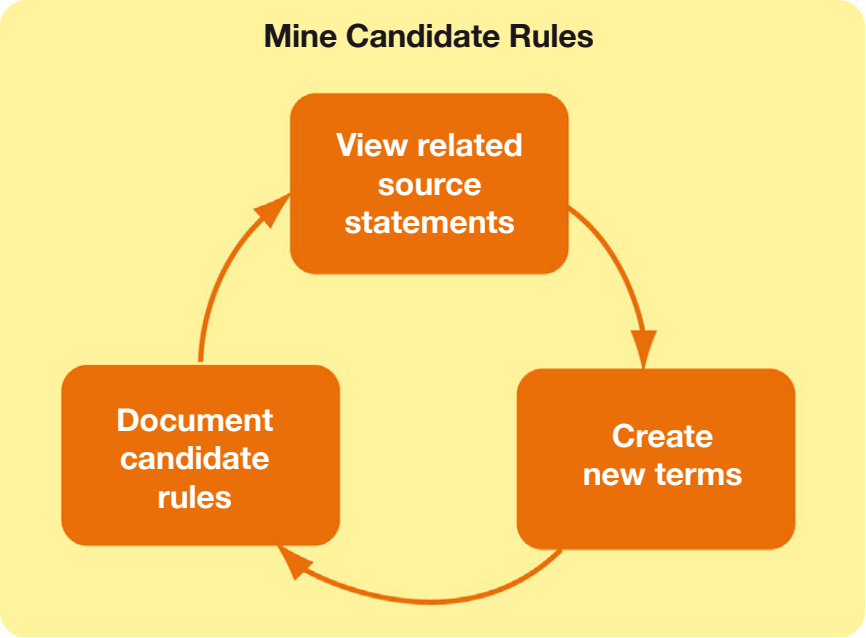

Figure 2: Candidate rule capture cycle

View related source

When you select **View related source** for a business term, all statements that reference a business term are displayed in a tab layout. Each tab represents a different file containing one or more statements referencing the COBOL data element associated with the selected business term.

In all tabs, explore each statement referencing the business term. If you are starting from an output data element, look through the tabs to find the statement that appears to represent the calculation or presentation of the final output value. As you trace backward, identify and create new business terms and create one or more candidate rules. At this stage it is important to capture the sequence of the logic to evaluate at a later stage if the sequence needs to be maintained.

If you are starting from an input data element, look through the tabs to find the statement that represents the input value and trace forward to the logic identifying alternative paths to the final output values. The process for tracing the logic forward from input elements is the same as the process for tracing backwards from output elements. Identify and create new business terms and new candidate rules while keeping track of the logic sequence.

The related source view offers features to help you navigate through the code. Expand the statement in source view to locate the paragraph containing the statement and search for business logic in the execution that leads to or from this statement.

Trace through the execution sequence looking for statements that contain business logic that may represent a business rule. Rational Asset Analyzer software highlights this customizable set for easier recognition:

- EVALUATE
- IF
- MERGE
- SEARCH
- SORT
- WHEN

Follow the execution logic from the business term of interest all the way back to the original inputs from which the term was derived or to the final output to which the term leads.

The source view also indentifies references to the business term in the **DATA DIVISION. VALUE** assignments other than spaces or zero may be important to rule authoring. It is important to keep track of this initialization when documenting candidate rules.

For each of the highlighted lines of code referencing a data element associated to a business term, it can be helpful to look at the **Data Element Details** page in Rational Asset Analyzer user interface to see if and where the data element is initialized or modified.

Document candidate rules

The process of capturing the candidate rules and refining them into rules that are closer to structured rules is iterative. When you identify business logic that represents a candidate rule, you

need to capture the COBOL source statements, which may be non-contiguous, and document the rule using defined business terms wherever possible.

Rational Asset Analyzer software offers the dialogs to create a business rule and associate it with the related source statements by selecting the source statement. Use the **Add New Rule** context menu option to create a new candidate rule or **Associate to a business rule** context menu option to associate the lines of code with an existing business rule.

Create new terms

As you identify candidate rules you will find new data elements of interest that need to be explored in the source statements already identified with business terms.

As an example, when mining rules for a customer discount decision, the output is the discount amount. Identify **WS-OUT-CUSTDISC-AMT** as the output and associate that data element to a term **Customer Discount Amount.** When you view the related source for this term you discover the code that calculates the discount:

MOVE HOLD-TOT-DSCNT-AMT TO WS-OUT-CUSTDISC-AMT

From this statement you know you need to look at **HOLD-TOT-DSCNT-AMT**. Since it is named 'HOLD' you decide not to associate it with a business term at this time. Instead, you view related source for **HOLD-TOT-DSCNT-AMT** to see where it is used and find the statement-

IF (WS-INP-DISC-LVL = CUS-DETM-LVL-CD (SUB2))

COMPUTE HOLD-TOT-DSCNT-AMT = (WS-INP-MNTHLY-AMT-PURCH ×
ST-CUST-LVL-DSCNT (SUB2))

ELSE GO TO 060-FIND-CUST-LVL-DSCNT-EXIT

In this statement you find that **HOLD-TOT-DSCNT-AMT** is calculated based on **WS-INP-MNTHLY-AMT-PURCH** multiplied by **ST-CUST-LVL-DSCNT**. Define business terms for each of these data elements so that you can later investigate those data elements and their synonyms.

When you associate a data element to a business term, Rational Asset Analyzer software discovers all the synonyms for that term going one level deep. This means that if you associate the term 'Customer Last Name' to **CST-LNM**, Rational Asset Analyzer software discovers a synonym for **WS-LN-OUT** if there were a statement in the code like **MOVE CST-LNM TO WS-LN-OUT**. Rational Asset Analyzer software would note that the relationship to the business term as **Discovered** rather than **Asserted**. If there were another statement in the code like '**MOVE WS-LN-OUT TO CUSTOMER-LAST-NAME**', it would not discover **CUSTOMER-LAST-NAME** as a synonym. You would have to first associate the discovered term **WS-LN-OUT** with the term 'Customer Last Name' and Rational Asset Analyzer software would keep track of which synonyms were asserted and which were discovered.

Analyze candidate rules

After you have traced through all business terms you should have a comprehensive set of candidate rules. You can view the set of candidate rules on the **Business Rules Summary** page. It is also helpful to look at the business terms and their properties to see if they contain all the inputs and outputs for the decision.

- Look at the candidate rules to determine their relationship with each other. Decide if and where sequence is important to the business logic.
- Try to rework the candidate rules into atomic rules (no OR conditions and a single action or conclusion). This helps clarify and simplify the business rules making it easier to write them in the rule language. It also simplifies maintenance of the business rules.

More information on analyzing candidate rules can be found in ABRD Rule Analysis. During rule analysis you are reworking the candidate rules and business term/properties into a form that is closer to implementation while keeping the meaning of the rules true to their business intent.

Author structured business rules

To support the authoring of structured rules, terms are translated into Business Object Model (BOM) classes and properties to members. Default verbalization is used to build the vocabulary used to author rules using the point and click Guided Editor in Rational Asset Analyzer software. To learn more about default verbalization see JRules documentation, Default verbalization. For more information on using the Guided Editor, see JRules documentation, Overview of the Guided Editor.

Categories are a way of filtering the choices in the drop-down lists in the rule editor so that only the choices applicable to the business rule being authored are displayed. By assigning a category filter on a business rule, only those vocabulary choices that belong to the same category are displayed. For more information on categories, see JRules documentation—Categories

Export to WebSphere Operational Decision Management (distributed and/or z/OS platforms)

Rational Asset Analyzer, with its source search and navigation capabilities, is ideal for identifying rules. WebSphere Operational Decision Management offers the tooling needed to take these rule candidates through the rest of the process.

Rational Asset Analyzer provides the dialogs to create export packages used by the Websphere Operational Decision Management product you can target distributed applications and z/OS® COBOL applications. The export includes a rules project containing Business Action Language (BAL) rules and the Business Object Model (BOM) with a default vocabulary. For Rules for COBOL, you get a Rules for COBOL project containing a Copybook, BOM, BAL rules and default vocabulary.

The documentation field of exported rules, which holds the free form of the business logic, including any source statements copied during the capture process, populates the documentation field on the rules in Rules for COBOL or JRules.

Within the JRules Rule Studio, the rule designer creates an executable object model (XOM) which can be Java classes or an XSD. You can alternatively use an existing XOM and map the Business Object Model (BOM) that was exported from Rational Asset Analyzer to the XOM using BOM to XOM mapping (B2X).

In Rules for COBOL, the copybook is a part of the export. The copybook importer in Rules for COBOL generates a method for each 88 level (to test the attribute for the specified value) to be used in authoring rules. Therefore, rule conditions that refer to 88 level values have to be completed in Rule Studio.

The rule project (and the rules) is reworked in Rule Studio (define packages, ruleflow, ruleset parameters, complete placeholders in rules and so on). After the rules are exported and the project is modified in Rule Studio, the governance and management of the rules is taken over by WODM. Traceability to the COBOL source is maintained in the documentation field.

For more information

To learn more about the IBM offerings for business rule modernization, please contact your IBM marketing representative or IBM Business Partner, or visit the following websites:

IBM Rational Asset Analyzer:
ibm.com/software/rational/products/raa

IBM Rational Cafes:
ibm.com/software/rational/cafe/index.jspa

IBM Rational Asset Analyzer on developerWorks:
ibm.com/developerworks/rational/products/raa/

IBM Rational Asset Analyzer Forum on developerWorks:
ibm.com/developerworks/forums/forum.jspa?forumID=2046

IBM WebSphere Operational Decision Management:
ibm.com/software/websphere/products/business-rule-management/

IBM WebSphere Operational Decision Management documents library:
ibm.com/software/websphere/products/business-rule-management/library/

IBM WebSphere Operational Decision Management on developerWorks:
ibm.com/developerworks/websphere/zones/brms/

Additionally, IBM Global Financing can help you acquire the IT solutions that your business needs in the most cost-effective and strategic way possible. We'll partner with credit qualified clients to customize an IT financing solution to suit your business goals, enable effective cash management, and improve your total cost of ownership. IBM Global Financing is your smartest choice to fund critical IT investments and propel your business forward. For more information, visit: **ibm.com**/financing

© Copyright IBM Corporation 2011

IBM Corporation
Software Group
Route 100
Somers, NY 10589 U.S.A.

Produced in the United States of America
December 2011
All Rights Reserved

IBM, the IBM logo, ibm.com, CICS, DB2, IMS, Rational, z/OS, and WebSphere are trademarks or registered trademarks of International Business Machines Corporation in the United States, other countries, or both. If these and other IBM trademarked terms are marked on their first occurrence in this information with a trademark symbol (® or ™), these symbols indicate U.S. registered or common law trademarks owned by IBM at the time this information was published. Such trademarks may also be registered or common law trademarks in other countries.

A current list of IBM trademarks is available on the web at "Copyright and trademark information" at **ibm.com**/legal/copytrade.shtml

Java and all Java-based trademarks and logos are trademarks or registered trademarks of Oracle and/or its affiliates.

Other company, product, or service names may be trademarks or service marks of others.

Please Recycle

RAW14287-USEN-00