

Oracle® Retail Invoice Matching
Operations Guide
Release 12.1

October 2008

Copyright © 2008, Oracle. All rights reserved.

Primary Author: Susan McKibbin

The Programs (which include both the software and documentation) contain proprietary information; they are provided under a license agreement containing restrictions on use and disclosure and are also protected by copyright, patent, and other intellectual and industrial property laws. Reverse engineering, disassembly, or decompilation of the Programs, except to the extent required to obtain interoperability with other independently created software or as specified by law, is prohibited.

The information contained in this document is subject to change without notice. If you find any problems in the documentation, please report them to us in writing. This document is not warranted to be error-free. Except as may be expressly permitted in your license agreement for these Programs, no part of these Programs may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose.

If the Programs are delivered to the United States Government or anyone licensing or using the Programs on behalf of the United States Government, the following notice is applicable:

U.S. GOVERNMENT RIGHTS Programs, software, databases, and related documentation and technical data delivered to U.S. Government customers are "commercial computer software" or "commercial technical data" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, use, duplication, disclosure, modification, and adaptation of the Programs, including documentation and technical data, shall be subject to the licensing restrictions set forth in the applicable Oracle license agreement, and, to the extent applicable, the additional rights set forth in FAR 52.227-19, Commercial Computer Software—Restricted Rights (June 1987). Oracle Corporation, 500 Oracle Parkway, Redwood City, CA 94065

The Programs are not intended for use in any nuclear, aviation, mass transit, medical, or other inherently dangerous applications. It shall be the licensee's responsibility to take all appropriate fail-safe, backup, redundancy and other measures to ensure the safe use of such applications if the Programs are used for such purposes, and we disclaim liability for any damages caused by such use of the Programs.

Oracle, JD Edwards, PeopleSoft, and Siebel are registered trademarks of Oracle Corporation and/or its affiliates. Other names may be trademarks of their respective owners.

The Programs may provide links to Web sites and access to content, products, and services from third parties. Oracle is not responsible for the availability of, or any content provided on, third-party Web sites. You bear all risks associated with the use of such content. If you choose to purchase any products or services from a third party, the relationship is directly between you and the third party. Oracle is not responsible for: (a) the quality of third-party products or services; or (b) fulfilling any of the terms of the agreement with the third party, including delivery of products or services and warranty obligations related to purchased products or services. Oracle is not responsible for any loss or damage of any sort that you may incur from dealing with any third party.

Value-Added Reseller (VAR) Language

Oracle Retail VAR Applications

The following restrictions and provisions only apply to the programs referred to in this section and licensed to you. You acknowledge that the programs may contain third party software (VAR applications) licensed to Oracle. Depending upon your product and its version number, the VAR applications may include:

- (i) the software component known as **ACUMATE** developed and licensed by Lucent Technologies Inc. of Murray Hill, New Jersey, to Oracle and imbedded in the Oracle Retail Predictive Application Server – Enterprise Engine, Oracle Retail Category Management, Oracle Retail Item Planning, Oracle Retail Merchandise Financial Planning, Oracle Retail Advanced Inventory Planning and Oracle Retail Demand Forecasting applications.
- (ii) the **MicroStrategy** Components developed and licensed by MicroStrategy Services Corporation (MicroStrategy) of McLean, Virginia to Oracle and imbedded in the MicroStrategy for Oracle Retail Data Warehouse and MicroStrategy for Oracle Retail Planning & Optimization applications.
- (iii) the **SeeBeyond** component developed and licensed by Sun Microsystems, Inc. (Sun) of Santa Clara, California, to Oracle and imbedded in the Oracle Retail Integration Bus application.
- (iv) the **Wavelink** component developed and licensed by Wavelink Corporation (Wavelink) of Kirkland, Washington, to Oracle and imbedded in Oracle Retail Store Inventory Management.
- (v) the software component known as **Crystal Enterprise Professional and/or Crystal Reports Professional** licensed by Business Objects Software Limited (“Business Objects”) and imbedded in Oracle Retail Store Inventory Management.
- (vi) the software component known as **Access Via™** licensed by Access Via of Seattle, Washington, and imbedded in Oracle Retail Signs and Oracle Retail Labels and Tags.
- (vii) the software component known as **Adobe Flex™** licensed by Adobe Systems Incorporated of San Jose, California, and imbedded in Oracle Retail Promotion Planning & Optimization application.
- (viii) the software component known as **Style Report™** developed and licensed by InetSoft Technology Corp. of Piscataway, New Jersey, to Oracle and imbedded in the Oracle Retail Value Chain Collaboration application.
- (x) the software component known as **DataBeacon™** developed and licensed by Cognos Incorporated of Ottawa, Ontario, Canada, to Oracle and imbedded in the Oracle Retail Value Chain Collaboration application.

Contents

Preface	xi
Audience	xi
Related Documents.....	xi
Customer Support.....	xi
Review Patch Documentation.....	xii
Oracle Retail Documentation on the Oracle Technology Network.....	xii
Conventions.....	xii
Third-Party Open-Source Applications in ReIM 12.1	xiii
1 Introduction	1
What Is Retail Invoice Matching?	1
A Note about Oracle Retail-Based Enterprises	2
Technical Architecture Overview	2
2 Backend System Administration and Configuration	3
System Assumptions	4
reim.properties File.....	5
Datasource Configuration Settings.....	5
Datasource Connection Pool Configuration Settings	5
Document Settings.....	6
Date Setting.....	7
Array Process Size Settings	7
EDI Properties	7
Lookout Timeout Variables	8
Credit Note AutoMatch Batch Multithreading Options	9
Credit Note AutoMatch Workspace Cleanup Setting	9
Invoice Automatch Specific Properties.....	10
Generic Threading Options (EdiUpload and AutoMatch)	10
Translation Caching Timeouts.....	11
Logging Configuration Settings.....	11
Authentication Settings.....	12
system.properties File.....	13
Dynamic / Non-Dynamic GL Options	13
Mapping of Document Types to Action Codes	14
Labeling Child Invoices	14
Setting the Audit Period	15
Data Translation Options.....	15
Set of Books Option	15
Duplicate Items Option.....	15
Logging Configuration.....	16
Log4J Conventions.....	16
Log4j Properties	16

Internationalization	17
Translation	17
Language Configuration	17
Supported Date Formats	17
Cache Sizes for Translation Service	17
ReIMResources.properties	17
IM_USER_AUTHORIZATION	18
3 Technical Architecture	19
Overview	19
The Layering Model	20
Presentation Layer	20
Middle Tier	21
Data Access Layer (DAL)	21
Database Layer	22
Technical Services	22
Third Party Libraries	24
ReIM-Related Java Terms and Standards	25
4 Functional Design	27
Integration Overview	27
From ReIM to the Financial / AP Staging Tables	28
Integration with Oracle E-Business Suite	28
Integration with Non-Oracle Financials System	32
Invoice and Credit Note Matching Process Flow	33
Invoice Auto-Matching	38
VAT on Header Level Only Invoices	38
Cost Pre-Matching	38
PO/Location Summary Group Matching	39
One-to-One Invoice Matching	42
Eligibility for Line-Level Matching	45
Line-Level Matching	45
Recycling and Overall Flow	48
Partially Matched Receipts	48
Matching Tolerances	50
History and Metrics	50
Best Terms Calculations	51
Terms Ranking Overview	51
Supplier Options	51
Terms Date	51
Assumptions and Dependencies	52
Credit Note Auto-Matching	53
Configurable Keys (Flexible Pool Keys)	54
Role of Reason Code Action Rollup Batch in Credit Note Matching	65

Tolerances	65
Currencies	65
VAT Matching	66
History and Record Keeping	66
Data Purge	66
5 Interfaces and File Layouts	67
The EDI Reject Table.....	67
The EDI Reject File.....	68
EDI Invoice Upload File Layout (Based on EDI 810)	68
EDI Invoice Download File Layout (Based on EDI 812).....	85
The Merchandise System Interface.....	91
Interface Data Flows.....	91
Porting.....	91
DAL Beans	91
Interface DAL Porting Example.....	92
Abstract and Interface Beans	93
Concrete Implementations of Abstract and Interface Beans.....	94
Porting Concrete Beans	98
Summary of Porting Steps for Custom Merchandising Systems	99
Staging Tables	99
The Financial System Interface.....	100
Foundation Financial Data	100
Financial Transactions.....	100
Major Tables	101
Tracking Receipt Posts	101
LDAP and Other User Interfaces	104
LDAP	104
ReIM User Table.....	104
Oracle Retail Workspace Integration	105
6 Technical Design	107
Locking Design Summary	107
Locking and Tables.....	107
Locking Management.....	108
Currency Design Summary	109
Merchandising System (such as RMS) and ReIM Assumptions	109
Currency Conversion Process for Amount Tolerances	109
Currency-Related System Validations	109
Java Currency Formatting	110
Oracle Single Sign-On Overview	111
What is Single Sign-On?.....	111
What Do I Need for Oracle Single Sign-On?	111

Can Oracle Single Sign-On Work with Other Single Sign-On Implementations?	111
Oracle Single Sign-On Terms and Definitions	112
What Single Sign-On is Not	113
How Oracle Single Sign-On Works	113
Installation Overview	115
User Management	116
Configuring ReIM for Oracle Single Sign-On	117
7 Batch Processes	119
Batch Architectural Overview	119
EDI-Related File-Based Batch Processes	119
Internal Batch Processes	120
Internal Batch Processes that Write to Staging Tables	120
Batch Processes that Extract from Merchandising System (RMS) Staging Tables	120
Functional Descriptions and Dependencies	121
Functional Descriptions and Dependencies	121
Features of the Batch Processes	124
Scheduler and the Command Line	124
Batch Return Values	124
Batch Log and Error File Paths	124
Multithreading Batch Processes	124
Restart and Recovery	125
Executing Batch Processes	125
Batch Purge Batch Design	125
Assumptions and Scheduling Notes	127
Major Modules	127
Primary Tables Involved	127
Discrepancy Purge Batch Design	127
Major Modules	127
Major Tables	128
EDI Invoice Upload Batch Design	128
Assumptions and Scheduling Notes	128
Restart and Recovery	128
Primary Tables Involved	129
Invoice Auto-Match Batch Design	129
Algorithms	130
Assumptions and Scheduling Notes	131
Post Processing	131
High-Level Flow Diagram	131
Primary Tables Involved	132
Credit Note Auto-Match Batch Design	132
Algorithms	134

Assumptions and Scheduling Notes	134
Post Processing.....	135
High-Level Flow Diagram.....	136
Primary Tables Involved.....	137
Receipt Write-Off Batch Design	138
Assumptions and Scheduling Notes	139
High-Level Flow Diagram.....	139
Primary Tables Involved.....	140
Reason Code Action Rollup Batch Design	140
Assumptions and Scheduling Notes	141
High-Level Flow Diagram.....	141
Primary Tables Involved.....	142
Disputed Credit Memo Action Rollup Batch Design.....	142
Assumptions and Scheduling Notes	142
Primary Tables Involved.....	142
Resolution Posting Batch Design	143
Assumptions and Scheduling Notes	143
Primary Tables Involved.....	144
EDI Invoice Download Batch Design.....	146
Assumptions and Scheduling Notes	146
Primary Tables Involved.....	146
Restart and Recovery.....	146
Complex Deal Upload Batch Design.....	146
Assumptions and Scheduling Notes	147
Primary Tables Involved.....	147
Fixed Deal Upload Batch Design	147
Assumptions and Scheduling Notes	147
Primary Tables Involved.....	148
8 RETL Program Overview for the ReIM Extraction Program	149
Architectural Design.....	149
ReIM Extraction Architecture	150
Configuration	150
RETL	150
RETL User and Permissions	150
Environment Variables	150
dwi_config.env Settings.....	151
Program Features	152
Program Status Control Files	152
Restart and Recovery.....	152
Bookmark File	153
Message Logging	153
Daily Log File	153

Format	153
Program Error File	154
ReIME Reject Files	154
Schema Files	154
Resource Files	155
Command Line Parameters	155
Typical Run and Debugging Situations	156
RETL Extraction Program List	157
Application Programming Interface (API) Flat File Specifications	157
API Format	157
File Layout	157
General Business Rules and Standards Common to All APIs	158
sincilddm.txt	159

Preface

Oracle Retail Operations Guides are designed so that you can view and understand the application's 'behind-the-scenes' processing, including such information as the following:

- Key system administration configuration settings
- Technical architecture
- Functional integration data flow across the enterprise

Audience

Anyone with an interest in developing a deeper understanding of the underlying processes and architecture supporting ReIM functionality will find valuable information in this guide. There are three audiences in general for whom this guide is written:

- Business analysts looking for information about processes and interfaces to validate the support for business scenarios within ReIM and other systems across the enterprise (within a merchandising system such as RMS, for example).
- System analysts and system operations personnel:
 - who are looking for information about ReIM processes internally or in relation to the systems across the enterprise.
 - who operate ReIM regularly.
- Integrators and implementation staff with overall responsibility for implementing ReIM.

Related Documents

For more information, see the following documents in the Oracle Retail Invoice Matching Release 12.1 documentation set:

- Oracle Retail Invoice Matching Data Model
- Oracle Retail Invoice Matching Installation Guide
- Oracle Retail Invoice Matching Online Help
- Oracle Retail Invoice Matching User Guide
- Oracle Retail Merchandising Batch Schedule
- Oracle Retail Merchandising Implementation Guide

Customer Support

<https://metalink.oracle.com>

When contacting Customer Support, please provide the following:

- Product version and program/module name
- Functional and technical description of the problem (include business impact)
- Detailed step-by-step instructions to re-create
- Exact error message received
- Screen shots of each step you take

Review Patch Documentation

If you are installing the application for the first time, you install either a base release (for example, 13.0) or a later patch release (for example, 13.0.2). If you are installing a software version other than the base release, be sure to read the documentation for each patch release (since the base release) before you begin installation. Patch documentation can contain critical information related to the base release and code changes that have been made since the base release.

Oracle Retail Documentation on the Oracle Technology Network

In addition to being packaged with each product release (on the base or patch level), all Oracle Retail documentation is available on the following Web site (with the exception of the Data Model which is only available with the release packaged code):

http://www.oracle.com/technology/documentation/oracle_retail.html

Documentation should be available on this Web site within a month after a product release. Note that documentation is always available with the packaged code on the release date.

Conventions

Navigate: This is a navigate statement. It tells you how to get to the start of the procedure and ends with a screen shot of the starting point and the statement “the Window Name window opens.”

Note: This is a note. It is used to call out information that is important, but not necessarily part of the procedure.

This is a code sample
It is used to display examples of code

A hyperlink appears like this.

Third-Party Open-Source Applications in ReIM 12.1

Oracle Retail Invoice Matching includes the following third-party open-source applications:

Software Provider: Apache Software Foundation
Software Name: Apache Struts
Software Version: 1.1
Jar File Name: struts-1.1.jar
Provider Web Site: <http://jakarta.apache.org/>

Software Provider: Apache Software Foundation
Software Name: org/apache/log4j/
Software Version: 1.2.14
Jar File Name: log4j-1.2.14.jar
Provider Web Site: <http://logging.apache.org/log4j/docs/>

Software Provider: IBM
Software Name: ICU Project
Software Version: n/a
Jar File Name: icu4j.jar
Provider Web Site: <http://www.icu-project.org/>

Software Provider: IBM
Software Name: IBM Alpha Works
Software Version: n/a
Jar File Name: decimal.jar
Provider Web Site: <http://www.ibm.com>

Software Provider: Apache Software Foundation
Software Name: org.apache.commons.logging
Software Version: 1.0.3
Jar File Name: commons-logging-1.0.3.jar
Provider Web Site: <http://jakarta.apache.org/commons/>

Software Provider: Apache Software Foundation
Software Name: Jakarta Commons Lang
Software Version: 2.0
Jar File Name: commons-lang.jar
Provider Web Site: <http://jakarta.apache.org/commons/>

Software Provider: Apache Software Foundation
Software Name: Jakarta Commons Digester
Software Version: 1.5
Jar File Name: commons-digester-1.5.jar
Provider Web Site: <http://jakarta.apache.org/commons/>

Software Provider: Apache Software Foundation
Software Name: org.apache.commons.collections
Software Version: 3.2
Jar File Name: commons-collections-3.2.jar
Provider Web Site: <http://jakarta.apache.org/commons/>

Software Provider: Apache Software Foundation
Software Name: org.apache.commons.beanutils
Software Version: 1.6
Jar File Name: commons-beanutils-1.6.jar
Provider Web Site: <http://jakarta.apache.org/commons/>

Software Provider: Apache Software Foundation
Software Name: i18n Tag library
Software Version: 1.1
Jar File Name: i18n.jar
Provider Web Site: <http://jakarta.apache.org/taglibs/doc/i18n-doc/intro.html>

Software Provider: iText
Software Name: iText
Software Version: 1.1
Jar File Name: iText.jar
Provider Web Site: <http://lowagie.com/iText/> or
<http://sourceforge.net/projects/iText/>

Introduction

Oracle Retail Invoice Matching (ReIM) provides a critical control function to verify invoices against corresponding merchandise purchase receipts prior to payment of the supplier invoice. ReIM naturally complements the Oracle Retail Merchandising System (RMS), which supports ordering, receiving and other inventory management functions in the purchasing cycle.

ReIM accurately and efficiently verifies supplier invoices against corresponding receipt data. When total invoice cost and quantity is supported by one or more receipts (that is, the quantity received in the system, valued at the negotiated purchase order cost) within pre-defined tolerances, the invoice is verified or 'matched' and is ready for payment. Where differences exist between invoice and receipt, a dialog supports the resolution process. Invoices with resolved discrepancies can be paid. Invoices verified for payment are staged in a table for a retailer to extract to their accounts payable and general ledger solutions.

ReIM is designed as a standalone application, with logic built in to reference any merchandising system. However, integration between ReIM and RMS is very robust and offers a compelling business case to the retailer.

What Is Retail Invoice Matching?

Invoice matching describes a control procedure designed to ensure the retailer pays the negotiated cost for actual quantities received. Invoice verification or matching is a fundamental and critical control procedure for every retailer.

ReIM is designed to support the invoice verification process with accuracy and efficiency, focusing resources on exception management. ReIM accepts electronic invoice data uploads (EDI), and provides for rapid on-line summary entry of invoices. ReIM supports automated and on-line processes allowing one or more invoices to be matched against one or more receipts. When an invoice cost and quantities are matched within tolerance, it is ready for payment and staged to a table to allow a retailer to extract to their accounts payable solution.

If a cost or quantity difference between the invoice and receipts is outside tolerance, a discrepancy is recognized and must be resolved. A flexible resolution process allows discrepancies to be directed to the most appropriate user group for disposition. Reviewers are empowered to assign one or more reason codes that they are authorized to use, to resolve the discrepancy.

Each reason code is associated to a type of action (for example, create chargeback or receiver cost adjustment). Many reason codes may be associated with a particular action type, allowing for more granular reporting, and so on. Actions drive document creation and EDI downloads to suppliers, inventory adjustments, and accounting activities. Actions also allow the invoice to be extracted by the retailer and posted for payment.

ReIM is highly integrated with RMS to drive efficiency, lower maintenance costs and improve control. ReIM integration provides access to the following data and more:

- RMS foundation data (organizational and merchandising hierarchies, supplier data, currency, exchange rates, and so on)
- Receipts tables and receiver adjustments
- Self-billing transactions (consignment purchases, direct store deliveries, and so on)
- RTV billings
- Deals and rebate bill-backs

Other functionality within ReIM supports credit note matching against credit note requests (issued in resolution of invoice discrepancies as well as for RTVs and so on), supplier-disputed debit memos, best terms and terms date processing, flexible tolerance definition dialog, and so on.

A Note about Oracle Retail-Based Enterprises

Although ReIM has been developed as a stand-alone product, the most efficient implementation would be as part of the Oracle Retail product suite. This integration provides the following important benefits:

- The number of interface points that need to be maintained is minimized.
- The amount of redundant data and processes within the retail organization is limited.
- Future enhancements allow for greater extensibility into the retail enterprise.
- Delays in product introductions can be minimized.

Technical Architecture Overview

The Java architecture is built upon a layering model. That is, layers of the application communicate with one another through an established hierarchy and are only able to communicate with neighboring layers.

For more information, see Chapter 3 – "Technical Architecture."

Backend System Administration and Configuration

This chapter of the operations guide is intended for administrators who provide support and monitor the running system.

The content in this chapter is not procedural, but is meant to provide descriptive overviews of the key system parameters that establish the ReIM environment.

See the ReIM Installation Guide for hardware and software requirements and Oracle Retail application software compatibility information.

System Assumptions

- Unit of measure
For invoices sent from RMS with quantities representing weight rather than number of eaches, ReIM assumes that the unit of measure (UOM) on the invoice and the UOM on the receipt are always the same--and equal to the cost unit of measure (CUOM). (Unit of measure is not displayed on the invoice nor on the receipt.)
- ReIM uses non-merchandise codes defined on the RMS table NON_MERCH_CODE_HEAD. The form that allows users to enter non-merchandise codes in RMS is not available when the RMS invoice match ind is set to N. Instead, non-merchandise codes should be added to the NON_MERCH_CODE_HEAD table using the database.
- A record must be inserted into the IM_SYSTEM_OPTIONS table in order to allow successful login to the application.
- Supplier options
All suppliers must have options defined in order for their invoices to be processed by the system, and the terms defined for those suppliers have to be completely updated in RMS. In order to support the use of suppliers in ReIM, the Enabled_Flag (set to Y), Start_Date_Active and End_Date_Active are the required entries in the TERMS_DETAIL table.
- GL account maintenance
All reason codes, non-merchandise codes, and basic transactions must be mapped through GL account maintenance to support posting to the retailer's financial solution. Transactions are posted to a staging table in ReIM, the extract to update the accounts payable/financial solution is the retailer's responsibility.
- Multiview
The Document Find, Group Entry List, and Group Entry pages allow the retailer to define how certain fields display in these screens. The Multiview functionality allows the user to move fields around on the pages and save those views for future use. In order for Multiview to work and for these screens to populate correctly, IM_GLOBAL_PREFERENCES must be populated.
- VAT
If VAT is turned on, the retailer must have VAT regions, VAT items, and VAT codes set up in the merchandising system (such as RMS) to support validation of invoiced VAT charges. Verify the following values on the IM_SYSTEM_OPTIONS table:

Note: The values below should not be changed after initial setup. Changing them can cause errors in the system.

- VAT_IND is set to Y.
- VAT_VALIDATION_TYPE is set to 'R'econcile VAT, Always Use 'I'nvoice VAT, or Always use 'S'ytem VAT.
- The DEFAULT_VAT_HEADER is set to Y or N.
- VAT_DOCUMENT_CREATION_LVL is set to ITEM or FULL_INVOICE.

reim.properties File

Retailer-defined configurations for ReIM are located in the reim.properties file. Every setting in the reim.properties file is configurable, according to the retailer's specific business requirements. Some of these settings also are discussed in the Internationalization section later in this chapter.

The key system parameters contained in this file are described in the tables below. Although default values are given in some instances, retailers are responsible for setting these fields appropriately for their installation and hardware profile, rather than assuming these default values are the best choice.

Datasource Configuration Settings

These settings are dependent on the retailer's unique database installation, except for the bean driver, which should remain at the default value (unless customization is performed.)

Parameter	Description	Comments
datasource.url	The URL connection string used to connect to the database	
datasource.username datasource.password	The datasource credentials for the application database user.	
datasource.schema.owner	The owning schema used to resolve database types.	
datasource.bean.driver	The bean driver for this installation. This should not change unless customization has been performed.	Default is com.retek.reim.foundation.rms12.

Datasource Connection Pool Configuration Settings

These settings are dependent on the retailer's implementation. The pool size refers to the number of available database connections that the retailer intends to keep available.

Parameter	Description	Comments
pool.name		Default is reim.
pool.min	The least number of database connections available, based on anticipated number of users.	Default is 20.
pool.max	The highest number of database connections available, based on anticipated number of users.	Default is 200.
pool.connectionWaitTimeout		Default is 5.
pool.propertyCheckInterval	Sets the time interval. The cache daemon thread "sleeps" between checks to enforce the timeout limits.	Default is 900 (seconds).
pool.timeToLiveTimeout	Sets the minimum time, in seconds. A checked-out connection can remain outside of the cache before it becomes a candidate to be closed by the connection cache thread.	For example, 1200. Default is 0, which disables timeout.

Parameter	Description	Comments
pool.inactivityTimeout	Sets the minimum time, in seconds. A connection can remain idle before it becomes a candidate to be closed by the connection cache thread when the current cache size is greater than the pool minimum.	For example, 600. Default is 0, which disables timeout.
pool.abandonedConnectionTimeout	Sets the minimum time, in seconds. A checked-out connection can remain unused (no SQL activity) before it becomes a candidate to be closed by the connection cache thread.	For example, 900. Default is 0, which disables timeout.

Document Settings

Parameter	Description	Comments
document.search.records.maximum	The maximum number of documents to be returned by the document search screens. This value will depend on the hardware profile. (Integer)	Default is 10000.
document.quantity.decimals.allowed	The decimal precision to which quantity is stored on a document. Typically used by grocery retailers. Value is expressed as an integer. For example, to display 4 decimals, this property is set to 4.	Default is 0.
document.batch.date.format	The date format used for processing and validating EDI files. (String)	Default format is yyyyMMddHHmmss.
document.header.quantity.required	For documents that contain a supplier that does not belong to a supplier group, the value of this field dictates if the total header quantity is required on that document. (Integer)	Default is true.
document.rtv.extdocid.separator	Character used to differentiate similar external document IDs for EDI upload. It allows documents with external document IDs already in use to pass EDI validation. Value must be a valid invoice number character, as defined by the parameter, document.validation.regexpr. If not, the underscore character is defaulted. (Character)	If this property is set to 1, for example, a posted document with an external ID of MYDOC will be named MYDOC_1. Default is _.
document.validation.regexpr	Indicates the characters allowed in an external document (invoice) ID. For example, 0-9, A-Z, space, minus sign, plus sign and underscore. If this property is omitted, the system defaults the setting to alphanumeric. The document.rtv.extdocid.separator value is validated against this field. (String)	For example, <code>^[0-9A-Za-z\ \+\-_\]+\\$</code> Default is alphanumeric, expressed as <code>\\p{Alnum}+</code>

Parameter	Description	Comments
document.number. allow.leading.zero	Indicates whether document IDs may be entered with a leading zero.	Valid values: <ul style="list-style-type: none"> true – document IDs may be entered with a leading 0. false – document IDs may NOT be entered with a leading 0.
document.purge.deals. days	Indicates when to purge deals from the Invoice Matching tables after they have been successfully uploaded (in number of days). This field is read during the purge batch.	Default is 10.

Date Setting

Parameter	Description	Comments
date.cache.poll.interval	This parameter dictates how frequently the system updates the stored VDATE. (Integer)	Default is 15 minutes, expressed as 900000. (1000 * 60 * 15 = 900000)

Array Process Size Settings

This setting establishes the size of the batch updates to the database. The value is expressed in number of records.

Parameter	Description	Comments
ARRAY_PROCESS_SIZE	The threshold representing the maximum number of records to be part of a single INSERT or UPDATE operation in classes created by the DALGenerator. (Integer)	Default is 30.

EDI Properties

Parameter	Description	Comments
edi.data.generator.path	The path used for the data generator files. (Ignore in production.) (String: @deploy.data.path@)	
edi.default.location	The default location assigned to non-merchandise invoices when they come in. (Integer)	Default is 10000000001.
edi.upload.multithreaded	Indicates whether EDI uploads are single-threaded (False) or multithreaded (True).	Default is true.
edi.docbulk.size	The maximum number of documents that EDI will process before issuing an INSERT statement.	Default is 1000.

Lookout Timeout Variables

These settings express the number of seconds until the timeout occurs. Variables are in milliseconds. Conversion: millisecond = 1; second = 1000; hour = 3600000; day = 86400000; month = 25992000000; no_expire = -1.

Invoice Matching locks records at the application level to prevent multiple users from manipulating the same data. The following settings dictate how long locks on these records can be maintained before timing out. Use any mathematical expression with the time units listed above. For example, 1 * hour.

Parameter	Description	Comments
business_roles_lock_timeout	Amount of time until the user's control of (or "lock" on) the business_roles table ends (times out).	Default is 1 * hour.
reason_codes_lock_timeout	Amount of time until the user's control of (or "lock" on) the reason_codes table ends (times out).	Default is 1 * hour.
doc_group_list_lock_timeout	Amount of time until the user's control of (or "lock" on) the doc_group_list table ends (times out).	Default is 12 * hour.
doc_head_lock_timeout	Amount of time until the user's control of (or "lock" on) the doc_head_lock table ends (times out).	Default is no_expire.
edi_reject_doc_lock_timeout	Amount of time until the user's control of (or "lock" on) the edi_reject_doc table ends (times out).	Default is 1 * hour.
supplier_options_lock_timeout	Amount of time until the user's control of (or "lock" on) the supplier_options table ends (times out).	Default is 1 * hour.
system_options_lock_timeout	Amount of time until the user's control of (or "lock" on) the system_options table ends (times out).	Default is 1 * hour.
tolerance_dept_lock_timeout	Amount of time until the user's control of (or "lock" on) the tolerance_dept table ends (times out).	Default is 1 * hour.
tolerance_supp_lock_timeout	Amount of time until the user's control of (or "lock" on) the tolerance_supp table ends (times out).	Default is 1 * hour.
tolerance_supp_trait_lock_timeout	Amount of time until the user's control of (or "lock" on) the tolerance_supp_trait table ends (times out).	Default is 1 * hour.
tolerance_system_lock_timeout	Amount of time until the user's control of (or "lock" on) the tolerance_system table ends (times out).	Default is 1 * hour.
receipt_lock_timeout	Amount of time until the user's control of (or "lock" on) the receipt_lock table ends (times out).	Default is 1 * hour.

Parameter	Description	Comments
parent_invoice_lock_timeout	Amount of time until the user's control of (or "lock" on) the parent_invoice table ends (times out).	Default is 1 * hour.

Credit Note AutoMatch Batch Multithreading Options

Thread Pool Sizing Guidelines are as follows:

- Nthreads = optimal number of threads
- Ncpu = number of available CPUs
- Ucpu = target CPU utilization, $0 \leq Ucpu \leq 1$
- W/C = ratio of wait time to compute time
- $Nthreads = Ncpu * Ucpu * (1 + ((W/C)))$

Parameter	Description	Comments
thread.creditnoteautomatchbatch.multithreaded	Indicates whether credit note automatch batch processing is in single-threaded mode (False) or multithreaded mode (True)	Valid values are: <ul style="list-style-type: none"> ▪ true - multithreaded mode ▪ false - single-threaded mode
thread.creditnoteautomatchbatch.consumerThreadKeepAlive	The amount of time (in milliseconds) that the batch will keep threads alive after they have completed processing when the current number of runnable threads exceeds the minimum pool size.	Default is 60000.
thread.creditnoteautomatchbatch.consumerThreadPoolMin	Minimum thread pool size.	Default is 10.
thread.creditnoteautomatchbatch.consumerThreadPoolMax	Maximum thread pool size.	Default is 20.

Credit Note AutoMatch Workspace Cleanup Setting

Parameter	Description	Comments
creditnoteautomatchbatch.workspace.cleanup	This setting determines whether IM_MATCH_* tables are purged after the Credit Note AutoMatch Batch runs. If not purged, data from the previous matching batch process will remain in the workspace tables.	Valid values are: <ul style="list-style-type: none"> ▪ true - After the Credit Note AutoMatch Batch runs, data is purged from IM_MATCH_* tables (except for IM_MATCH_*_HIST). ▪ false - After the Credit Note AutoMatch Batch runs, data remains in the workspace tables.

Invoice Automatch Specific Properties

Parameter	Description	Comments
thread.invoiceautomatch batch.threadBy	Indicates the criteria on which invoice automatch threading is based. This setting is depends on the hardware profile and the volume of the thread by groups in implementation (such as areas, locations, and chains). Value should be determined through testing. (String)	Valid values are: <ul style="list-style-type: none"> ▪ NoThread ▪ ThreadByLocation ▪ ThreadByDistrict (default) ▪ ThreadByRegion ▪ ThreadByArea ▪ ThreadByChain
invoiceautomatchbatch. process.locks	Indicates whether the automatch batch process should exclude locked documents.	Valid values are: <ul style="list-style-type: none"> ▪ true - Locked documents are excluded from matching. ▪ false - Locked documents are included in matching.

Generic Threading Options (EdiUpload and AutoMatch)

These threadings settings are expressed in milliseconds. They are utilized by the EdiUpload process and the Invoice AutoMatch batch process.

Parameter	Description	Comments
thread.background ThreadTimeout	The amount of time the log-writing thread polls the empty work queue before shutting down. Used only by EdiUpload for rejection files.	Default is 1800000.
thread.consumer ThreadTimeout	The amount of time the consumer pool threads. Used for executing the transactions for both EdiUpload and AutoMatch.	Default is 60000.
thread.consumer ThreadKeepAlive	The amount of time (in milliseconds) that the batch will keep threads alive after they have completed processing when the current number of runnable threads exceeds the minimum pool size.	Default is 60000.
thread.consumer ThreadPoolMin	Minimum thread pool size.	Default is 10.
thread.consumer ThreadPoolMax	Maximum thread pool size.	Default is 100.

Translation Caching Timeouts

Invoice Matching caches (or stores) translated descriptions for item names and supplier names, for example.

Parameter	Description	Comments
translation.caches_refresh_interval_in_seconds	The number of seconds that elapse before the translation cache is refreshed.	Default is 43200.
translation.locations_desc_cache_size	The number of entries within the locations' description cache that the system is allowed to use for processing of translated information.	Default is 100000.
translation.suppliers_desc_cache_size	The number of entries within the suppliers' description cache that the system is allowed to use for processing of translated information.	Default is 100000.
translation.items_desc_cache_size	The number of entries within the items' description cache that the system is allowed to use for processing of translated information.	Default is 100000.

Logging Configuration Settings

These settings are used only for installation. After installation, they can be changed by manually altering the logging configuration in log4j.properties.

Parameter	Description	Comments
log.online.file	Used to define the path for generating log files.	
log.batch.file	Establishes the name and directory of the batch log file.	
log.batch.error.file	Establishes the name and directory of the batch error files. All errors and routine processing messages for a given program on a given day go into this error file.	
log.level	Indicates the lowest level at which messages should be logged. For example, if value=4, all errors labeled warn, error and fatal are logged.	Valid values are: 2 – fatal 3 – error 4 – warn 5 – validation 6 – info 7 – debug 8 – performance 999 – unknown

Authentication Settings

These settings pertain to user security privileges.

Parameter	Description	Comments
authentication_source		
IConnectionSettingsDAO		Default is: com.retek.reim.merch.utils.PropertyFileLdap SettingsDao
ISecurityDao		Default is: com.retek.reim.merch.utils.ReIM LdapSecurityDao
ISecurityRelationshipDAO		Default is: com.retek.reim.merch.utils.LDAP SecurityRelationshipDAO
security.ssl_mode		Default is 2.
security.port_non_ssl		Default is 8080.
security.port_ssl		Default is 8443.
sso_url		
sso_conf		
sso_util		
sso_factory_initial		

system.properties File

This file includes system options settings that cannot be accessed through the graphical user interface (GUI)--because they cannot be changed once ReIM has been implemented.

Dynamic / Non-Dynamic GL Options

The parameters in this section of the file determine whether the retailer's segments for the IM_GL_OPTIONS table are dynamic or non-dynamic. Rather than being hard-coded, dynamic segments are populated by company/location or department/class numbers from the invoice. This reduces the amount of maintenance necessary to support posting to the retailer's financial solution.

If the retailer's segments are non-dynamic, all settings are "N".

If the retailer's segments are dynamic, note the following:

- The system allows a maximum of four dynamic segments.
- Those GL options that are dynamic can be set up to represent the following:
 - Company
 - Location
 - Department
 - Class

Note: Company and location are always paired together,
and department and class are always paired together.

The table below illustrates how dynamic GL options are set up to correspond with the retailer's hierarchy parameters. Where mapping occurs, the GL option assumes the value of the corresponding parameter, as determined by the invoice.

GL Options	Business Concept Mapping for Dynamic Segments
system.gl_option_dynamic_1=Y	system.gl_option_dynamic_mapping_1=COMPANY
system.gl_option_dynamic_2=Y	system.gl_option_dynamic_mapping_2=LOCATION
system.gl_option_dynamic_3=N	system.gl_option_dynamic_mapping_3=
system.gl_option_dynamic_4=Y	system.gl_option_dynamic_mapping_4=DEPARTMENT
system.gl_option_dynamic_5=Y	system.gl_option_dynamic_mapping_5=CLASS
system.gl_option_dynamic_6=N	system.gl_option_dynamic_mapping_6=
system.gl_option_dynamic_7=N	system.gl_option_dynamic_mapping_7=
system.gl_option_dynamic_8=N	system.gl_option_dynamic_mapping_8=
system.gl_option_dynamic_9=N	system.gl_option_dynamic_mapping_9=
system.gl_option_dynamic_10=N	system.gl_option_dynamic_mapping_10=
system.gl_option_dynamic_11=N	system.gl_option_dynamic_mapping_11=
system.gl_option_dynamic_12=N	system.gl_option_dynamic_mapping_12=
system.gl_option_dynamic_13=N	system.gl_option_dynamic_mapping_13=
system.gl_option_dynamic_14=N	system.gl_option_dynamic_mapping_14=

Mapping of Document Types to Action Codes

The table below lists default action codes, based on document type.

Parameter	Description	Action Code Default
CRDNT	Credit Note	
CRDNRC	Credit Note Request Price	CBC
CRDNRQ	Credit Note Request Quantity	CBQ
CRDNRV	Credit Note Request VAT Valid Values: CNRVI , if IM_SYSTEM_OPTIONS.VAT_DOCUMENT_CREATION_ LVL = ITEM CNRVE , if IM_SYSTEM_OPTIONS.VAT_DOCUMENT_CREATION_ LVL = FULL INVOICE	CNRVI
CRDMEC	Credit Memo Price	CMC
CRDMEQ	Credit Memo Quantity	CMQ
DEBMEC	Debit Memo Price	CBC
DEBMEQ	Debit Memo Quantity	CBQ
DEBMEV	Debit Memo VAT Valid Values: DMVI , if IM_SYSTEM_OPTIONS.VAT_DOCUMENT_CREATION_ LVL = ITEM DMVE , if IM_SYSTEM_OPTIONS.VAT_DOCUMENT_CREATION_ LVL = FULL INVOICE	DMVI

Labeling Child Invoices

When a parent invoice enters the system, the system can split the invoice into its child invoices. (A parent invoice can contain many locations; a child invoice contains only one.) The retailer determines a string, which the system uses to label a child invoice. This string contains the parent invoice ID plus the system.child_invoice_indicator value plus the location number to which the child invoice is associated. These

Parameter	Description	Default
system.child_invoice_indicator	Used in conjunction with the parent invoice ID and location number to label a child invoice.	LOC

Setting the Audit Period

The parameter determines how many days the system retains audit trail data before it is purged.

Parameter	Description	Default
system.purge_tolerance_audit_period	Number of days the system retains audit trail data before it is purged.	2

Data Translation Options

These options indicate types of language translation within the system.

Parameter	Description	Default
system.language_translation_active	Determines whether the system will perform language translation.	False
system.single_language_translation	Determines whether the system will perform single-language data translation.	SL
system.multiple_language_translation	Determines whether the system will perform multi-language data translation.	ML
system.item_description_language_option	Determines whether the system will perform single-language multi-language data translation of the Description parameter.	SL
system.location_name_language_option	Determines whether the system will perform single-language multi-language data translation of the Location parameter.	SL
system.supplier_name_language_option	Determines whether the system will perform single-language multi-language data translation of the Name parameter.	SL

Set of Books Option

Parameter	Description	Default
system.default_set_of_books_id	The default label assigned to the retailer's set of books.	1

Duplicate Items Option

Parameter	Description	Default
system.duplicate_items_lov	Determines whether the same item from a different supplier can appear more than once in the item list of values (LOV).	Y

Logging Configuration

Oracle Retail Invoice Matching utilizes the industry-standard Apache Log4j logging framework to log system messages and exceptions. This framework is embedded in the application code to allow for configurable logging to suit the needs of the retailer.

Log4J Conventions

The Log4j API system utilizes three main configurable entities:

- Loggers
- Appenders
- Layouts

Loggers are responsible for defining exactly what gets logged. Typically, loggers define a specific level of detail (the log level) for a specific java package name as well as an appender the logger is assigned to. These criteria are then delegated to the appropriate appender for the specific logger. A single logger can be assigned to multiple appenders.

Appenders are used to dictate where logged content is directed to for a given logger. For example, the retailer may wish to configure a log appender to publish a log to a database table, a flat file, or an e-mail address. For each of these options, a separate appender would be defined and assigned to a specific logger.

Layouts are leveraged by the appender to dictate the exact content of the log message. Relevant information may include: date, time, and origin of the error message. These values can all be configured through the log layout.

Log4j Properties

The log4j.properties file holds all of the information relevant to logging throughout the application. Oracle Retail Invoice Matching ships with a sample log configuration that will log basic messages to a standard file located on the application host machine. Retailers wishing to configure specific Invoice Matching loggers should consult the sample configuration log4j.properties file and the Apache Log4j documentation (<http://logging.apache.org/log4j>).

Internationalization

Internationalization is the process of creating software that is able to be translated more easily. Changes to the code are not specific to any particular market. ReIM has been internationalized to support multiple languages.

This section describes configuration settings and features of the software that ensure that the base application can handle multiple languages.

See also the section, Java Currency Formatting in Chapter 6 – “Technical Design.”

Translation

Translation is the process of interpreting and adapting text from one language into another. Although the code itself is not translated, components of the application that are translated may include the following, among others:

- Graphical user interface (GUI)
- Error messages

Language Configuration

The `reim.properties` file points the application to the location of the user’s properties file based on the locale specified for the user on the `IM_USER_AUTHORIZATION` table.

The properties files `ReIMResources` and `ReIMMessages` must include the translations for all user interface strings. The translated properties files are identified by the ISO language code for each language.

Supported Date Formats

The system’s date formats support either two or four digit year designations. Date formats support month name abbreviations or month numbers. Date formats support limited sequencing: year-month-day, month-day-year, and day-month-year. Date formats support either ‘-’ (dash) or ‘/’ (backslash) delimiters. Date formats must be specified in the `DateParameters.properties` file.

Cache Sizes for Translation Service

To enhance the system’s performance speed, the system utilizes a cache when performing data translations into another language.

If the system needs to retrieve the same translated location name at a later time (for another user, for example), the system would retrieve it from the cache rather than from the database. This `reim.properties` value represents the number of entries within the cache that the system is allowed to use for such processing.

For example:

```
translation.items_desc_cache_size=100000
```

See also the section, ReIM User Table, in Chapter 5 – “Interfaces and File Layouts.”

ReIMResources.properties

This file contains a key value pair for every label visible through the GUI at run time. Text labels and error messages have been identified, separated from the core source code, and placed into the properties file. The contents of the file can be used for retailer-specific configuration purposes (such as for the creation of custom labels or error messages).

IM_USER_AUTHORIZATION

Functionality exists within the system to allow a retailer to change the language displayed in the UI for a specific user. The retailer can write an update statement for the IM_USER_AUTHORIZATION table. The update statement would specify the following for the user name:

- A language for a user using the two letter language code.
- A country for the user using the two-letter country code.

Once the retailer has run the query, performed a commit, and logged out and into the application, the UI reflects the new language and locale.

Note: The language/locale combination must be valid and supported by the system, or when the retailer logs back into the application, the default language is displayed.

Technical Architecture

This chapter describes the overall software architecture for ReIM. The chapter provides a high-level discussion of the general structure of the system, including the various layers of Java code.

Note that at the end of this chapter, a description of ReIM-related Java terms and standards is provided for your reference.

Overview

The system's Java architecture is built upon a layering model. That is, layers of the application communicate with one another through an established hierarchy and are only able to communicate with neighboring layers.

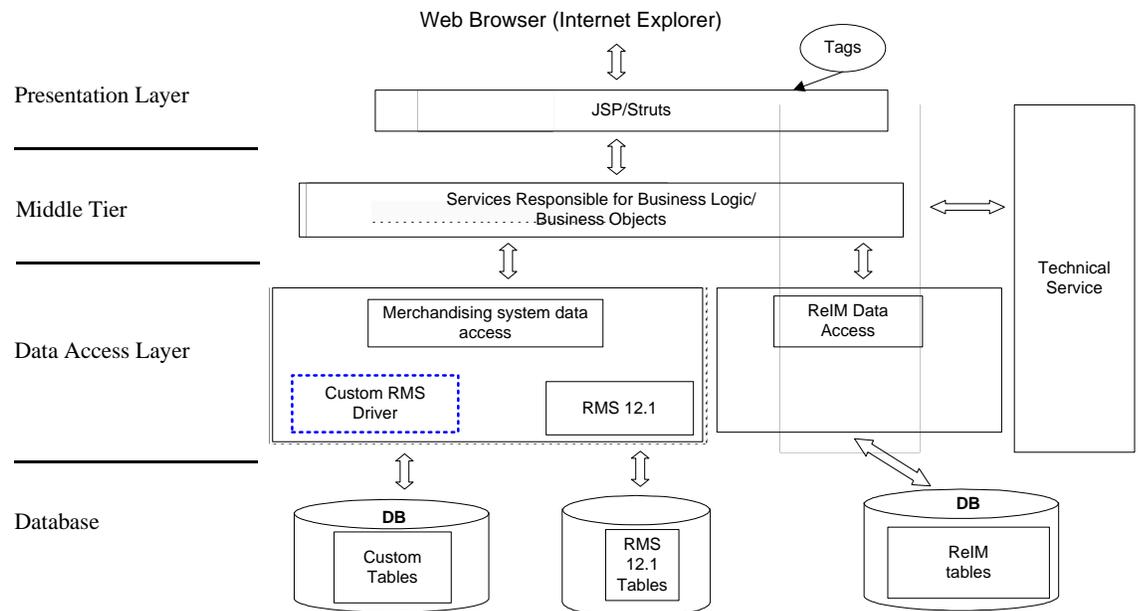
The application is divided into a presentation layer, a middle tier consisting of services and business objects, and a database access/driver layer. Technical services provide the glue that holds the application together, offering the application frameworks for error logging, internationalization, transaction management, application security, and so on.

The segregation of layers has the following advantages, among others:

- The separation of presentation, business logic, and data makes the software cleaner, more maintainable, and easier to modify.
- The look and feel of the application can be updated more easily because the GUI is not tightly coupled to the back end.
- A layered architecture has become an industry standard.
- Portions of the data access layer (DAL) can be radically changed without effecting business logic or user interface code.
- The application takes advantage of Java database connectivity (JDBC), minimizing the number of interface points that must be maintained.
- Market-proven and industry-standard technology is utilized (for example, JSPs, JDBC, and so on).

The Layering Model

The following diagram, together with the explanations that follow, offers a high-level conceptual view of the layers and their responsibilities within the architecture. Key areas of the diagram are described in more detail in the sections that follow.



ReIM Layered Architecture

Presentation Layer

This area of the architecture encapsulates the graphical user interface (GUI) processing. A Web browser accesses JSP pages using a Struts tag library.

JSPs consist of JavaScript and standard HTML. They make calls to tag-libraries. An extension of Java servlet technology, JSPs are compiled into servlets. JSPs provide a user interface that can be separated from most of the business logic that resides on the server. This separation of presentation from content offers a greater possibility for ease of maintenance, both with regard to the page that the user sees and the underlying logic. The look and feel of the GUI is easy to customize, and dynamic functionality is easy to create.

Struts provide an open source framework for building Web applications. The core of Struts is a flexible control layer based upon Java servlets, JavaBeans, ResourceBundles, and Extensible Markup Language (XML). Struts provide an industry standard approach to enforcing the division between user interface code and business logic. Struts also provide standard functionality for error display, internationalization/screen translation, and so on. The Struts framework is part of the Jakarta Project, sponsored by the Apache Software Foundation (<http://www.apache.org/>). The official Struts home page is <http://jakarta.apache.org/struts>.

The presentation layer only interacts with the middle tier services.

Middle Tier

Service Layer Responsible for Business Logic

The service layer consists of a collection of Java classes that implement business logic (data retrieval, updates, deletions, and so on) through one or more high-level methods. In other words, the service layer controls the workflow. For example, when a user clicks OK on a page, the server must follow a given series of steps to accomplish business functionality. The service layer controls how those steps are accomplished.

The service layer is the entry point to the middle tier and separates the presentation layer from the database layer. Generally the methods that are exposed by service layer classes accept and/or return business objects. The service layer encapsulates the business logic by calling down into business objects and the data access layer, thus making the code more maintainable.

Business Objects

Within ReIM, business objects are beans (that is, Java classes that have one or more attributes and corresponding set/get methods) that represent a functional entity. In other words, business objects can be thought of as data containers, which by themselves have almost no business functionality. (In those unusual cases where business logic resides within a business object, the logic pertains to a discreet business concept.) Two examples of business objects include 'Document' and 'Supplier'.

There is not necessarily a one-to-one relationship between a business object and a database table. The service layer may utilize more than one class from the data access layer in order to combine the data from more than one database table to fully populate a business object.

Data Access Layer (DAL)

The data access layer interacts only with the middle tier and the database. Classes in the DAL abstract the actual persistence mechanism that is being used to persist business objects. The DAL provides the mechanism that allows ReIM to be associated to a different persistence engine. Ideally, in those cases, only the DAL would need to be modified due to the change. The remainder of ReIM would continue to operate unchanged.

The ReIM DAL consists of two very distinct portions: a DAL to ReIM 'owned' tables and an interface DAL to merchandising system tables. The two distinct types of Java code are described below.

Access to Invoice Matching Tables

This code utilizes auto-generated 'row' beans, with corresponding 'access' classes, one per database table. Both the row and the access class for any given table are automatically generated using a Data Access Layer Generator (DALGen) tool. This tool partly helps mitigate the need for Java developers to manually write SQL code. On occasion, developers may have to 'extend' an Access class in order to implement custom SQL that is too specific to be automatically generated. The same tables and database access code is used regardless of the merchandising system's version. Different versions of the merchandising system's tables can thus be associated to the application with minimal impact to the code in the middle tier.

Access to Merchandising System (such as RMS) Tables

Data access driver beans are Java classes that are programmed to an abstract factory interface. Each class contains JDBC code that is implemented manually by the developer in order to meet the needs of the middle tier business logic. For a definition of JDBC, see the 'ReIM-Related Java Terms and Standards' section in this chapter.

The abstract factory design pattern allows for different versions of the merchandising tables to be associated to the application with minimal impact to the code in the middle tier.

Database Layer

The database layer is the application's storage platform, containing the physical data (user and system) used throughout the application. This layer is only intended to deal with the storage and retrieval of information and is not involved in the manipulation of the data.

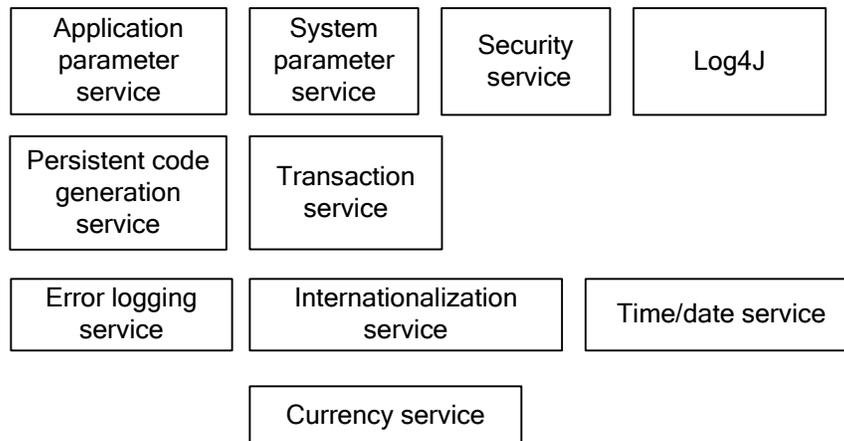
Technical Services

In order to increase the maintainability of the code, and enhance the rapid development of new business logic, a number of base technical services are provided.

Technical services hold the application together by providing common services to the application, services that are not necessarily driven by business requirements.

Technical services include application frameworks such as error logging, internationalization, transaction management, application security, and so on.

A brief description of each technical service follows the diagram.



ReIM Technical Services

Application Parameter Service

This service allows application configuration parameters to be stored within the database on a single database table. Developers can retrieve these parameters using a high level interface.

System Parameter Service

Similar to the application parameter service, this service is used only for technical configuration parameters. Although most configurable parameters are hosted in a system parameter table, some parameters are located in a properties file. See Chapter 2 – “Backend System Administration and Configuration” for more information.

Transaction Service

Note: The transaction service does not provide checkpoint transaction management or multi-phase commit.

This service provides a simplified management of rollback/commit semantics. In order to avoid the need to pass the database connection between the middle tier method calls and the data access layer classes, the transaction service uses thread local variables to maintain the current connection for a thread until that thread has committed or rolled back the transaction. This service thus simplifies transaction management.

Persistent Code Generation Service

This technical service consists of the Data Access Layer Generator (DALGen) tool. Having executed a number of queries against the Oracle metadata tables, this tool can generate generic JDBC code for accessing a specific table. DALGen generates a class for any given database table, based on a configuration file. The bean class is capable of the basic database operations: create, insert, update, and delete. As applicable, there are both bulk and single row versions of each database operation. In addition to promoting rapid application development, automated code generation can make broad sweeping changes to the manner in which the ReIM application makes JDBC calls. Those changes can be rolled out without an expensive re-engineering effort.

Error Logging Service

This service incorporates a standard ReIMException class to raise and handle Java exceptions (shown below). The ReIMException class automatically logs itself to the application log file. The level of logging may be raised or lowered in the properties file. For example, an operator could configure the system to only display INFO and above. See Chapter 2 – “Backend System Administration and Configuration” for more information.

The system’s coding pattern ensures that the error messages, no matter where they originate, remain detailed in their presentation to the operator. For example, if a business specific message is thrown near the database, such as that an item-supplier combination does not exist, the system does not genericize that exception under a “could not post transaction” message or something similar. Rather, the error message is presented in all of its original detail for the operator.

Log4J

This service provides the error logging services with a standard method for logging information to a flat text file. Log4J is an open source product.

Internationalization Service

This service uses resource files to provide configurability for on-screen messages (such as on screen labels or error messages). To change the language for the ReIM GUI screens, a replacement set of resource files can be created. Note that although this service supports any number of languages, the screen flow remains left to right, top to bottom.

Currency Service

This service provides a high-level mechanism for developers to represent a currency amount. This service provides the formatted representation of that currency.

Time/Date Service

This service provides a high level interface to the Java time/date constructs along with some formatting methods for displaying these constructs on the GUI screens.

Security Service

The security service provides basic authorization and authentication functionality during user logon. The association of the user to security roles controls user access to the functional areas of the application. The security service validates a user's identity against a security store and retrieves the role memberships and role authorizations for that user upon a successful logon. The physical implementation of the security information for each user, role, functional authorizations, and field authorizations is independently configurable among the database or LDAP server locations.

Third Party Libraries

ReIM base development uses the following third party libraries:

- Oracle JDBC library
- Log4J
- Junit from www.junit.org
- Struts from jakarta.apache.org
- ICU4J from IBM

ReIM-Related Java Terms and Standards

ReIM is deployed using the technologies and versions described in this section.

The Java 2 Enterprise Edition (J2EE)

The Java standard infrastructure for developing and deploying multi-tier applications. Implementations of J2EE provide enterprise-level infrastructure tools that enable such important features as database access, client-server connectivity, distributed transaction management, and security.

Java Database Connection (JDBC)

JDBC is a means for Java-architected applications such as ReIM to execute SQL statements against an SQL-compliant database, such as Oracle. JDBC is part of Sun J2EE specification. Most database vendors implement this specification. JDBC provides the support that allows ReIM to submit SQL queries to the database and receive the result set for further processing.

Java Development Kit (JDK)

Standard Java development tools from Sun Microsystems.

Java Server Pages (JSP)

JSPs enable Java and HTML to be combined within a Web page. To the user, a JSP appears in the Web browser as a file with a .jsp extension. The JSP source is dynamically compiled into a servlet by the servlet container running in the Web server. The servlet generates the necessary HTML content that the user sees.

Java Servlet

A servlet is a Java platform technology that allows a Web application easier access to server side resources. The HTTP request from the client's browser is routed to the servlet, which then can process it as necessary and provide the applicable response to the user.

LOG4J

LOG4J is an open source sub-project of the Jakarta Project. It provides a configurable framework for logging information gathered during the execution of an application.

Naming Conventions in Java

- Packages: The prefix of a unique package name is written in all-lowercase letters.
- Classes: These descriptive names are unabbreviated nouns that have both lower and upper case letters. The first letter of each internal word is capitalized.
- Interfaces: These descriptive names are unabbreviated nouns that have both lower and upper case letters. The first letter of each internal word is capitalized.
- Methods: Methods begin with a lowercased verb. The first letter of each internal word is capitalized.

Struts

An open source Web development framework from the Jakarta Project and sponsored by the Apache Foundation. The framework includes three major components:

- A controller servlet that dispatches requests to applicable ReIM Action classes.
- JSP custom tag libraries, and associated support in the controller servlet, that support ReIM in providing an interactive form-based application.
- Utility classes to support the following:
 - XML parsing
 - Automatic population of JavaBeans properties based on the Java reflection APIs
 - The internationalization of prompts and messages

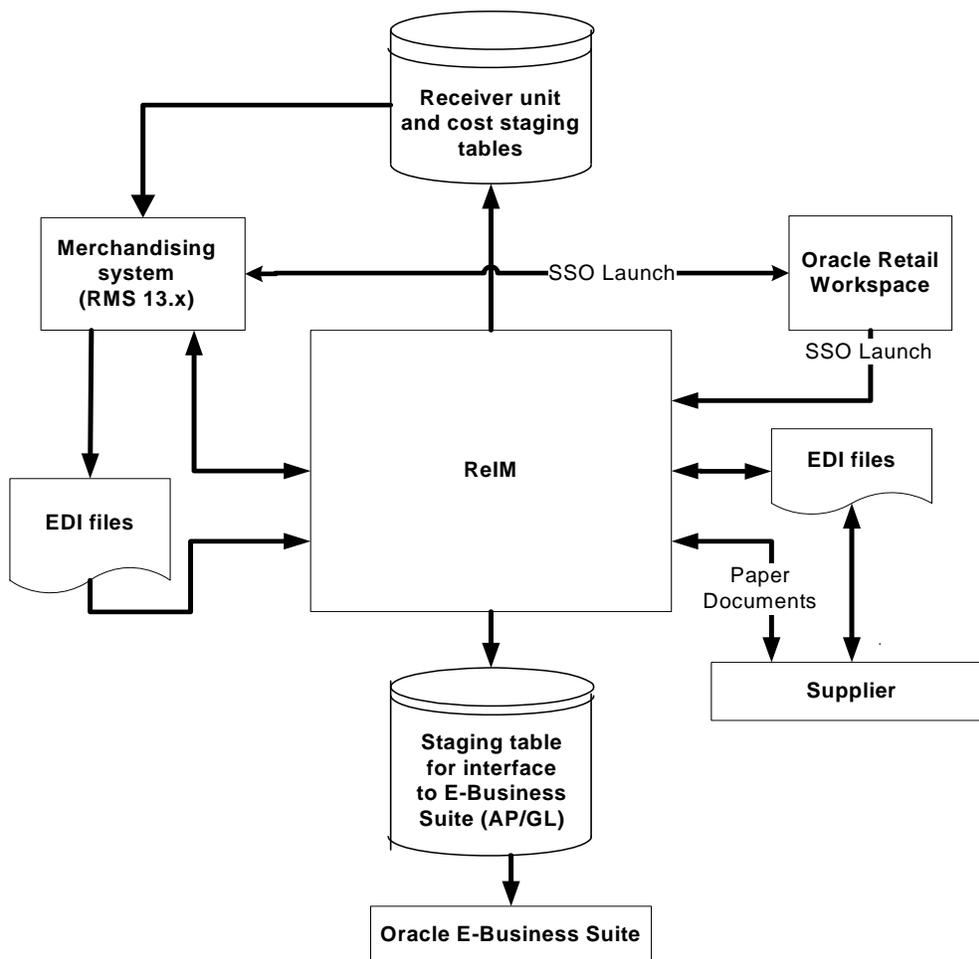
Functional Design

This chapter provides the following:

- An overview as to how ReIM is functionally integrated with other systems (including other Oracle Retail systems). The discussion primarily concerns the flow of ReIM-related business data across the enterprise.
- A diagram and description of the invoice matching process flow

Integration Overview

This section provides a diagram that shows the overall direction of the data among the applications and tables. The accompanying explanations are written from a system/staging table-to-system/staging table perspective, illustrating the movement of data.



ReIM Data Flow Across the Enterprise

From ReIM to the Financial / AP Staging Tables

ReIM exports data to financial staging tables. If integrated with Oracle E-Business Suite, there is a standard interface of data to Accounts Payable and General Ledger. However, if the retailer is using any other financials system, the retailer must create an interface to deliver this information to the applicable financial system.

Additional information about integration is provided in the *Oracle Retail Merchandising System Back-end Configuration and Operations Guide, Volume 3*.

Integration with Oracle E-Business Suite

When integrated with Oracle E-Business Suite, ReIM exports data to AP staging tables or to financial tables, depending on the specific types of transactions. This is done if the financial system for accounts payable and general ledger systems is Oracle Financials and the system options table has the following setting:

- FINANCIAL_AP = O

Matched Invoices and Approved Documents

Invoices can be matched through invoice auto-matching or on-line matching. The unit cost and quantities of all items (at a summary level) on the invoice are compared to the unit cost and quantities on the receipt. If the cost and quantity on the invoice and receipt agree within defined tolerances, there is a match.

Matched Credit Notes

Credit notes can be matched with credit note requests through auto-matching or through on-line matching processes.

Pre-Paid Invoices

Invoices may be paid before matching is complete in order to meet payment terms requirements. Users determine whether to “pre-pay” an invoice. Pre-paid invoices are still eligible for matching against receipts; however, an indicator on the invoice record prevents it from being paid twice. When a pre-paid invoice is matched the results are posted to the IM_FINANCIALS_STAGE table for interface to the General Ledger rather than the IM_AP_STAGE_HEAD and IM_AP_STAGE_DETAIL tables for interface to Accounts Payable.

Non-Merchandise Invoices

These invoices include bills for non-merchandise costs only. Non-merchandise invoices cannot contain items. Either suppliers or partners can create non-merchandise invoices. However, merchandise invoices can contain non-merchandise lines.

Posting Transaction Codes to AP Staging Table

Posting Transaction codes, along with Line Type Lookup codes, help clarify the source of the detail entry.

IM_AP_STAGE_HEAD

The Invoice Type Lookup Code in the IM_AP_STAGE_HEAD table is used to categorize header entries as either STANDARD or CREDIT.

The Invoice Type Lookup Code for merchandise invoices, non-merchandise invoices and credit memos (where IM_DOC_HEAD.TYPE is MRCHI, NMRCHI, CRDMEC or CRDMEQ) is STANDARD. Otherwise, the Invoice Type Lookup Code is CREDIT.

IM_AP_STAGE_DETAIL

The Line Type Lookup Code is used to identify the type of entity an entry in IM_AP_STAGE_DETAIL was created from. It is used to identify if the detail entry was calculated from merchandise items, non-merchandise components, or taxes.

The Line Type Lookup Code is determined using the following rules:

- If the posting transaction code is UNR, VWT, REASON, or CRN, then this value is ITEM.
- If this is a generated tax line, then this value is TAX.
- If none of the above, then this value is MISCELLANEOUS. This is typical for detail entries generated from non-merchandise components of invoices.

Below is a sample entry in IM_AP_STAGE_DETAIL for invoice 12345 with a total cost of 553.50:

DOC_ID	TRAN_CODE	LINE_TYPE_LOOKUP_CODE	AMOUNT
12345	UNR	ITEM	500
12345	UNR	TAX	50
12345	NMRCH	MISCELLANEOUS	3.50

Data Mapping

The following tables describe the mapping of data from Oracle Retail Invoice Matching to Oracle E-Business Suite Accounts Payable.

IM_AP_STAGE_HEAD to AP_INVOICES_INTERFACE

IM_AP_STAGE_HEAD	AP_INVOICES_INTERFACE	Comments
DOC_ID	INVOICE_ID	
SEQ_NO	NONE	
INVOICE_TYPE_LOOKUP_CODE	INVOICE_TYPE_LOOKUP_CODE	
INVOICE_NUMBER	INVOICE_NUM	
VENDOR	VENDOR_ID	
ORACLE_SITE_ID	VENDOR_SITE_ID	
CURRENCY_CODE	INVOICE_CURRENCY_CODE	
EXCHANGE_RATE	EXCHANGE_RATE	
EXCHANGE_RATE_TYPE	EXCHANGE_RATE_TYPE	Expecting the value USER in this column
DOC_DATE	INVOICE_DATE	
AMOUNT	INVOICE_AMOUNT	
BEST_TERMS_DATE	TERMS_DATE	
SEGMENT1	ACCTS_PAY_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to ACCTS_PAY_CODE_CONCATENATED.
SEGMENT2	ACCTS_PAY_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to ACCTS_PAY_CODE_CONCATENATED.
SEGMENT3	ACCTS_PAY_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to ACCTS_PAY_CODE_CONCATENATED.
SEGMENT4	ACCTS_PAY_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to ACCTS_PAY_CODE_CONCATENATED.
SEGMENT5	ACCTS_PAY_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to ACCTS_PAY_CODE_CONCATENATED.

IM_AP_STAGE_HEAD	AP_INVOICES_INTERFACE	Comments
SEGMENT6	ACCTS_PAY_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to ACCTS_PAY_CODE_CONCATENATED.
SEGMENT7	ACCTS_PAY_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to ACCTS_PAY_CODE_CONCATENATED.
SEGMENT8	ACCTS_PAY_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to ACCTS_PAY_CODE_CONCATENATED.
SEGMENT9	ACCTS_PAY_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to ACCTS_PAY_CODE_CONCATENATED.
SEGMENT10	ACCTS_PAY_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to ACCTS_PAY_CODE_CONCATENATED.
CREATE_DATE_TIME	CREATION_DATE	

IM_AP_STAGE_DETAIL to AP_INVOICE_LINES_INTERFACE

IM_AP_STAGE_DETAIL	AP_INVOICE_LINES_INTERFACE	Comments
DOC_ID	INVOICE_ID	
SEQ_NO	LINE_NUM	
TRAN_CODE	NONE	
LINE_TYPE_LOOKUP_CODE	LINE_TYPE_LOOKUP_CODE	
AMOUNT	AMOUNT	
VAT_CODE	TAX_CODE	
SEGMENT1	DIST_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to DIST_CODE_CONCATENATED.
SEGMENT2	DIST_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to DIST_CODE_CONCATENATED.
SEGMENT3	DIST_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to DIST_CODE_CONCATENATED.
SEGMENT4	DIST_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to DIST_CODE_CONCATENATED.
SEGMENT5	DIST_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to DIST_CODE_CONCATENATED.
SEGMENT6	DIST_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to DIST_CODE_CONCATENATED.
SEGMENT7	DIST_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to DIST_CODE_CONCATENATED.
SEGMENT8	DIST_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to DIST_CODE_CONCATENATED.
SEGMENT9	DIST_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to DIST_CODE_CONCATENATED.
SEGMENT10	DIST_CODE_CONCATENATED	All segments (1-10) concatenated with '-' are mapped to DIST_CODE_CONCATENATED.
CREATE_DATE_TIME	CREATION_DATE	

IM_FINANCIALS_STAGE_V to GL_INTERFACE

IM_FINANCIALS_STAGE_V	GL_INTERFACE	Comments
STATUS	STATUS	Hard-coded value of NEW in the view definition.
ACTUAL_FLAG	ACTUAL_FLAG	Hard-coded value of A in the view definition.
TRAN_CODE	REFERENCE23	
DEBIT_CREDIT_IND		
DOC_ID	REFERENCE22	
PARENT_ID		
DOC_DATE	ACCOUNTING_DATE	
RECEIPT_ID	REFERENCE25	
RECEIPT_DATE		
VENDOR_TYPE		
VENDOR	REFERENCE20	
ORDER_NO	REFERENCE24	
CURRENCY_CODE	CURRENCY_CODE	
AMOUNT		
BEST_TERMS		
BEST_TERMS_DATE		
MANUALLY_PAID_IND		
PRE_PAID_IND		
CREATE_ID	CREATED_BY	
CREATE_DATETIME	DATE_CREATED	
SEGMENT1	SEGMENT1	
SEGMENT2	SEGMENT2	
SEGMENT3	SEGMENT3	
SEGMENT4	SEGMENT4	
SEGMENT5	SEGMENT5	
SEGMENT6	SEGMENT6	
SEGMENT7	SEGMENT7	
SEGMENT8	SEGMENT8	
SEGMENT9	SEGMENT9	
SEGMENT10	SEGMENT10	
VAT_CODE	TAX_CODE	
VAT_RATE		
DEAL_ID		
LOCAL_CURRENCY		
INCOME_LOCAL_CURRENCY		
TOTAL_COST_INC_VAT		
EXT_DOC_ID	REFERENCE21	
SET_OF_BOOKS_ID	SET_OF_BOOKS_ID	
USER_JE_SOURCE_NAME	USER_JE_SOURCE_NAME	Constant value: Retail Invoices
USER_JE_CATEGORY_NAME	USER_JE_CATEGORY_NAME	One of these values: Writeoffs, Prepayments, or Manual Payments
ENTERED_DR	ENTERED_DR	
ENTERED_CR	ENTERED_CR	

Integration with Non-Oracle Financials System

When integrated with a financials system other than Oracle Financials, ReIM exports data to a financial staging table with data intended for both Accounts Payable and General Ledger. Retailers need to develop their own interface from the financial staging table to their systems, based on the requirements of their financials systems.

The following are examples of exported items:

Matched Invoices and Approved Documents

Invoices can be matched through auto-matching or on-line matching. The unit cost and quantities of all items (at a summary level) on the invoice are compared to the unit cost and quantities on the receipt. If the cost and quantity on the invoice and receipt agree within defined tolerances, there is a match.

Matched Credit Notes

Credit notes can be matched with credit note requests through auto-matching or through on-line matching processes.

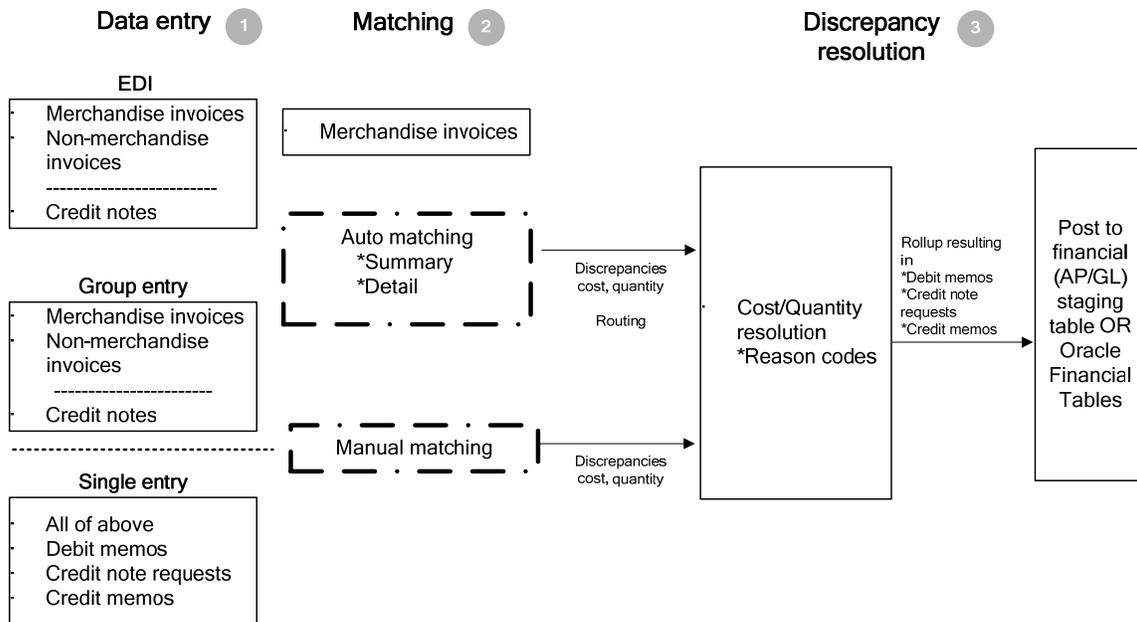
Non-Merchandise Invoices

These invoices include bills for non-merchandise costs only. Non-merchandise invoices cannot contain items. Either suppliers or partners can create non-merchandise invoices. However, merchandise invoices can contain non-merchandise lines.

Invoice and Credit Note Matching Process Flow

This section provides a high-level explanation of the process flow in ReIM for each of the following areas:

- Data entry
- Matching
- Discrepancy resolution



High-Level View of the Invoice Matching and Credit Note Matching Processes

Note: Documents drop out of the flow when they need no further processing. For example if an invoice is matched in step 2, Matching, the document would not continue to step 3, Discrepancy resolution. The document would be posted directly to the financial (AP/GL) staging table after step 2.

1. Data entry

There are three ways in which invoices and other documents enter the ReIM system:

- Electronic Data Interchange (EDI)

Invoices and credit notes uploaded as part of a batch are assigned a common control number, which is retained on the invoice table as a reference. The control number is assigned by the sender of the EDI file. It is displayed on the Invoice Maintenance screen and may be used for client reporting purposes.

As necessary, the EDI load process allows for the uploading of supplier's vendor product number (VPN) when neither the document number nor the UPC has been provided. The VPN and the supplier number, then, are used to look up the Oracle Retail item number. ReIM assumes the VPN is related to the supplier associated with the document. Note that the VPN number is not stored in ReIM; it is used to find the Oracle Retail item number which is then retained and used for processing within ReIM.

Allowing VPN to be used to find the Oracle Retail item number is optional.

EDI allows ReIM to upload the following documents:

- Merchandise invoices
The bills for goods or services received from a supplier or partner. Merchandise invoices may have both of the following:
 - Merchandise costs
Costs that are associated with items on documents. Any other costs on an invoice are non-merchandise costs. The sum of the merchandise costs and non-merchandise costs is the total document cost.
 - Non-merchandise costs
Costs that are indirectly associated with invoice items, such as freight or handling charges.
- Non-merchandise invoices
Bills for non-merchandise costs only (a snow plowing service, for example). Non-merchandise invoices cannot contain items. Either suppliers or partners can create non-merchandise invoices.
- Credit notes
Documents received from the supplier, often issued in response to a credit note request from the retailer, which results in a reduction of the retailer's balance owing to a supplier. A credit note request may be raised in place of a deduction from invoice (that is, a debit memo) resulting from invoice over-charges, RTVs, rebate bill backs, and so on. Credit notes follow a functional process flow separate from the invoice flow, where credit notes are matched against credit note requests.

2. Group entry

Group entry facilitates summarized, on-line entry of paper documents. The group entry process accommodates the same types of documents as supported through the EDI process.

Invoices are entered as part of a batch and assigned a group number, which is retained on the invoice table as a reference. This group number is displayed on the Invoice Maintenance screen and may be used for reporting purposes.

Because group entry is intended to quickly get invoices into ReIM, entry of item details is not required. Adding item details for an invoice can be done later through the Invoice Maintenance screen.

3. Single entry

Single entry is designed as an exception-handling tool made for invoices and documents not entered (for whatever reason) within a group.

Note: Merchandise invoices entered by way of single entry also are assigned a group/transaction number. However, since each document will be assigned its own group number, some retailers may not want to generate so many additional group IDs. Retailers that require a group/transaction number for tracking purposes may want to restrict access to the single invoice entry screen. Single entry may be controlled for a user group by setting the Invoice Entry option on the User Group Details screen to Modify only. This allows users to change an existing invoice but prevents them from creating a single-entry invoice. In turn, this forces all manual entry to be done as group entry.

Single entry accommodates the same types of documents supported in the EDI and group entry processes, as well as the following items (if not created automatically through other processes):

- Debit memo
A document created to support a deduction from the invoice being paid. Deductions may result from a price or quantity discrepancy. A debit memo also refers supplier billing for rebates, RTVs, and so on. Debit memos also can be created as stand-alone documents (that is, created on-line, but not supported by any processes in ReIM or the merchandising system).
- Credit note request (CNR)
A document sent from the retailer to the supplier requesting a credit note for an over-invoiced amount (discrepancy), or in support of various billing activities (for example, rebates, RTVs). If a credit note request is not satisfied by the supplier in a timely manner, ReIM provides the ability to convert it into a debit memo (and include the number of the invoice to which it is assigned). Credit note requests also may be created as stand-alone documents.
- Credit memo
A document created to refund a supplier for an under-invoiced or over-billed amount (for example, for rebates not meeting threshold performance levels). Credit memos also may be created as stand-alone documents.

Note: If the credit memo is the result of a reversed debit memo, the ID number of the invoice to which the debit memo is associated should be assigned to the credit memo, particularly if the invoice is being held for payment. Doing so ensures related documents are released to accounts payable at the same time.

4. Matching

- Invoice Auto-Matching
The invoice auto-matching process attempts to support invoice cost and quantities against receipt quantities at PO cost within user defined tolerances. Merchandise invoices are grouped by common PO/location; ReIM requires these attributes in all merchandise invoices. ReIM accesses the merchandising system to determine what shipments (receipts) were created for the PO/location. If the invoice auto-matching process identifies cost or quantity differences outside of the pre-established tolerance range, the system creates corresponding discrepancies (cost or quantity). Otherwise, matched invoices are posted to the financial staging table.
For header- level-only invoices, VAT validation is performed as a final validation step, after cost and quantity matching has been performed. For more functional information about summary and detail-level invoice auto-matching, see "Invoice Auto-Matching" later in this chapter.
- Credit Note Auto-Matching
For more functional information, see "Credit Note Auto-Matching" later in this chapter.

- On-line matching

- Invoices

The on-line matching dialog provides users with the ability to match invoices with even greater flexibility than the invoice auto-match process. Invoices are initially grouped by their PO/location, but the groups can be modified beyond the common PO/location relationship based on available (unmatched) invoices and receipts, to support matches.

On-line matching either matches a document posted to the financial staging table, or it supports creation and resolution of a cost and/or quantity discrepancy.

- Credit notes and CNRs

Typically, invoices for which CNRs are generated are sent to accounts payable even if matching credit notes have not yet been received. The retailer, then, is issued an invoice that actually is higher than it should be and will have to wait until credit notes are processed before receiving credit for the overcharge. The supplier, in turn, may be overpaid. To avoid this inefficiency, ReIM allows invoices with unmatched CNRs to be held (not paid) until all corresponding credit notes are received—at which time the invoice automatically is sent to accounts payable. Depending on user group security, the user can manually control when the invoice is released to accounts payable—even before all credit notes are received.

When a credit note request is matched to a credit note through online matching, the ID number of the invoice to which they are associated is assigned to the credit note. In this way, the invoice and all related documents may be released to accounts payable at the same time.

When matching CNRs to credit notes on a held invoice, the original invoice should be checked for other open discrepancies. If none exist, the Hold Invoice indicator on the Supplier Options screen should be “turned off” so that the invoice and all related documents can be released to the financial system.

5. Discrepancy resolution

Users assign pre-defined reason codes against cost and quantity discrepancies to support resolutions. The reason codes direct the system to take a specific action.

Cost and quantity discrepancies are routed to on-line lists by user group. (Pre-established user groups and routing rules determine which discrepancies populate which user group list). For example, in many companies the merchant/buyer is responsible for verification of invoice cost against the PO. To support this functionality, a user group of buyers by department or class might be a logical association to assign to an on-line Cost Discrepancy Review List. (Each user group would see only discrepancies assigned to it.) Each user group is empowered to resolve discrepancies according to its authorization. Similarly, it may be logical to assign users groups to Quantity Discrepancy Review Lists based on receiving location.

ReIM does not require the resolution of discrepancies through the routing process; the application will support a more centralized business process for resolving discrepancies using only the on-line matching dialog.

Once all discrepancies are resolved for the document, it is posted to the financial staging table along with any corresponding debit memos, and so on, for posting to the retailer’s accounts payable solution.

Documents supporting discrepancy resolution (such as debit memos, credit note requests, and credit memos) are available for EDI download to the supplier. (Or the

retailer may develop reporting from these values stored in the ReIM tables.) These document records (except credit note requests) also are posted to the financial staging table.

If there is a discrepancy between a credit note and a credit note request, a new credit note should be created. Further, CNRs created inadvertently can be voided and fully reversed to expedite resolution. (It is assumed that if all CNRs related to a “held” invoice are voided, that invoice is released for payment.)

Invoice Auto-Matching

Invoices in ready-for-match, unresolved, and multi-unresolved status are retrieved from the database to be processed through the invoice auto-match algorithm. These invoices are grouped with receipts based upon PO/location.

If no receipts exist for the PO/location, invoices process through the cost pre-matching algorithm.

If receipts do exist, the system attempts to match all invoices and receipts for the common PO/location (referred to as “group matching”), within summary-level tolerances.

If group matching fails, the system attempts to match each invoice to a single receipt in the one-to-one matching algorithm. If all invoices are matched in this fashion, then the next PO/location is processed.

If only some of the invoices can be matched and a multi-unresolved scenario results, the matched invoices remain matched and the non-matched invoices are given a multi-unresolved status. No further processing occurs for this PO/location.

If an unmatched invoice is eligible for line level matching, an attempt is made to match each line on the invoice to an unmatched receipt line.

VAT on Header Level Only Invoices

The invoice auto-matching process determines whether the VAT values on header level-only invoices are correct. The system only processes invoices that do not have any unresolved VAT discrepancies.

The invoice status determines whether an invoice can be processed by the invoice auto-match batch process. Only invoices in ready-for-match status are processed. Those with a status of VAT discrepancy are not processed by the batch. See Chapter 7 – “Batch Processes” for more information.

Invoices created without details are not able to have their VAT information validated at invoice creation. All header level-only invoices are created with a status of ready-for-match. These invoices must have a VAT validation executed as part of the invoice matching process. This validation determines whether a header level-only invoice that was matched to a receipt should continue in the matching and posting process or whether it should be marked as having a VAT discrepancy and removed from the matching process.

Cost Pre-Matching

Cost pre-matching occurs only for PO locations that meet the following conditions:

- Invoices that have never been processed by invoice auto-match exist.
- No receipts exist.

Each invoice line unit cost is compared with the PO item location’s unit cost. If the unit costs match within tolerance, the invoice and lines are processed again by invoice auto-match once receipts come in for the PO location.

If there is a discrepancy, then the invoice is processed again once receipts arrive. However, the lines that contain a discrepancy are immediately routed for cost resolution. Once invoices are run through the cost pre-matching algorithm, they are not re-run when the next invoice auto-match run occurs if there are still no receipts.

Scenarios can arise where no receipt lines exist, and no order line corresponds to an invoice line. The assumption is that validation occurs in the EDI upload process and in

the manual invoice entry screens prevent these invoices from entering the system. Therefore, invoice auto-match ignores this situation.

PO/Location Summary Group Matching

PO/location summary group matching processes the following:

- Invoices that have never been processed before by invoice auto-match.
- Invoices that have been processed previously by invoice auto-match but remain unresolved.
- Invoices that have been processed previously by invoice auto-match but that have been identified as multi-unresolved.

First, the system attempts to match the total extended cost of the invoices with the total extended cost of the receipts. Extended cost is defined as the unit cost for an item multiplied by the quantity received or the quantity invoiced. For this comparison, all extended costs are summed for the group of invoices and receipts and compared. The total extended cost for each invoice is taken from the invoice header. The process, however, calculates the receipts' total extended cost.

Quantity matching is also sometimes required. Whether quantity matching is performed is determined by a supplier option. Quantity matching compares the total quantity invoiced for the PO location with the total quantity received for the PO location. As in cost matching, the total quantity invoiced for each invoice is taken from the invoice header. For receipts, the process calculates this sum.

For invoices with quantities representing weight rather than number of eaches, total quantity displayed in the invoice header is represented as the sum of item quantities in "abstract UOM."

Invoice auto-match processing first attempts to match the total extended costs, and optionally the total quantities, exactly. If the costs and quantities do not match exactly, then the system attempts to match them within tolerance. If a match is achieved, all of the invoices, receipts, and their lines for the PO location are assumed to be matched. If a match is not achieved, all invoices and receipts for the PO location are unresolved. These invoices and receipts are processed further with one-to-one invoice matching.

Invoice auto-match accounts for the actions taken by cost reviewers that fully resolve a cost discrepancy when attempting to match at the summary level. If a match is achieved at the summary level, invoice auto-match deletes any outstanding unresolved cost discrepancies and any partially resolved cost discrepancies along with their partial resolutions for the PO location from the system.

Example 1

The following example illustrates a successful match:

Invoices for a PO/Location	Total Extended Cost	Total Quantity
Invoice 1	\$50,000	1,000
Invoice 2	\$150,000	5,000
Totals:	\$200,000	6,000

Receipts for a PO/Location	Total Extended Cost	Total Quantity
Receipt 1	\$50,000	2,000
Receipt 2	\$50,000	2,000
Receipt 3	\$100,000	2,000
Totals:	\$200,000	6,000

In the example, the total extended costs and the total quantities match for the PO location. Therefore, all invoices and receipts will be set to matched status.

Example 2

The following example illustrates a successful match, but where quantity matching is not required by the supplier.

Receipts for a PO/Location	Total Extended Cost	Total Quantity
Invoice 1	\$50,000	2,000
Invoice 2	\$150,000	5,000
Totals:	\$200,000	7,000

Receipts for a PO/Location	Total Extended Cost	Total Quantity
Receipt 1	\$50,000	2,000
Receipt 2	\$50,000	2,000
Receipt 3	\$100,000	2,000
Totals:	\$200,000	6,000

In the example, only the total extended costs match. However, quantity matching is not required for this supplier. Therefore, these invoices and receipts are considered matched by the invoice auto-matching algorithm.

Example 3

The following example illustrates an unsuccessful match, where quantity matching is required by the supplier.

Receipts for a PO/Location	Total Extended Cost	Total Quantity
Invoice 1	\$50,000	1,000
Invoice 2	\$150,000	5,500
Totals:	\$200,000	6,500

Receipts for a PO/Location	Total Extended Cost	Total Quantity
Receipt 1	\$50,000	2,000
Receipt 2	\$50,000	2,000
Receipt 3	\$100,000	2,000
Totals:	\$200,000	6,000

In the example, because quantity matching is required for the supplier, the match is unsuccessful despite the fact that the costs do match. The invoices and receipts will be set to unresolved status, and an attempt will be made to match them at a one-to-one level.

Example 4

The following example illustrates a successful match within tolerance.

Receipts for a PO/Location	Total Extended Cost	Total Quantity
Invoice 1	\$50,035	1,000
Invoice 2	\$150,100	5,000
Totals:	\$200,135	6,000

Receipts for a PO/Location	Total Extended Cost	Total Quantity
Receipt 1	\$50,000	2,000
Receipt 2	\$50,000	2,000
Receipt 3	\$100,000	2,000
Totals:	\$200,000	6,000

In the example, even though there is not an exact match, the extended costs match within tolerance (assuming the \$135 difference is within summary-level tolerance settings). Therefore, the receipts and invoices are set to matched status.

One-to-One Invoice Matching

One-to-one invoice matching attempts to match each invoice for the PO/location with a single receipt for the PO/location. First, the system attempts a match between the total extended costs. If the extended costs match, the system may, depending upon a supplier option, attempt a match between the total quantities. If there is either an exact match or a match within tolerance, the invoice and receipt along with their lines are considered to be matched. If no match can be found for the invoice, it is left unresolved.

One-to-one matching may result in a multi-unresolved scenario. If any invoices within the PO/location can be successfully matched with one and only one receipt and that receipt can be matched to only one invoice for the PO location, then those invoices and receipts are considered to be matched. If no unmatched invoices remain, then processing stops for the PO/location and all invoices are considered matched. Only when one unmatched invoice exists for the PO/location can line level matching occur. If more than one invoice remains after one-to-one matching, then all remaining unmatched invoices and receipts are considered to be multi-unresolved.

One-to-one matching is driven by invoices. Therefore, if there are unmatched receipts remaining but no unmatched invoices for the PO/location, no further processing occurs. The receipts remain unresolved but no discrepancies are generated.

Example 1

The following example illustrates how one invoice matches with one and only one receipt. One invoice and two receipts are unresolved.

Invoices for a PO/Location	Total Extended Cost	Total Quantity	Status Post Matching
Invoice 1	\$50,000	5,000	Matched
Invoice 2	\$100,000	10,000	Unresolved

Invoices for a PO/Location	Total Extended Cost	Total Quantity	Status Post Matching
Receipt 1	\$50,000	5,000	Matched
Receipt 2	\$25,000	2,500	Unresolved
Receipt 3	\$35,000	2,500	Unresolved

In the example, Invoice 1 matches with Receipt 1. However, the remaining invoice and receipts do not match one-to-one. Because there are two unmatched receipts remaining and only one unmatched invoice, the remaining unmatched invoice and receipts are considered to be unresolved. If they are eligible for detail matching, they are sent to the detail-matching algorithm.

Example 2

The following example illustrates a multi-unresolved match, with no successful matches.

Invoices for a PO/Location	Total Extended Cost	Total Quantity	Status Post Matching
Invoice 1	\$50,000	5,000	Multi-unresolved
Invoice 2	\$25,000	2,500	Multi-unresolved
Invoice 3	\$35,000	3,000	Multi-unresolved

Invoices for a PO/Location	Total Extended Cost	Total Quantity	Status Post Matching
Receipt 1	\$40,000	4,000	Multi-unresolved
Receipt 2	\$25,000	2,500	Multi-unresolved
Receipt 3	\$25,000	2,500	Multi-unresolved
Receipt 4	\$10,000	1,000	Multi-unresolved

In the example, Invoice 2 can be successfully matched to both Receipt 2 and Receipt 3. Therefore, no match can be obtained for Invoice 2. All invoices and receipts are set to multi-unresolved status.

Example 3

The following example illustrates another multi-unresolved match, with no successful matches.

Invoices for a PO/Location	Total Extended Cost	Total Quantity	Status Post Matching
Invoice 1	\$40,000	4,000	Multi-unresolved
Invoice 2	\$25,000	2,500	Multi-unresolved
Invoice 3	\$25,000	2,500	Multi-unresolved
Invoice 4	\$10,000	1,000	Multi-unresolved

Invoices for a PO/Location	Total Extended Cost	Total Quantity	Status Post Matching
Receipt 1	\$50,000	5,000	Multi-unresolved
Receipt 2	\$25,000	2,500	Multi-unresolved
Receipt 3	\$35,000	3,000	Multi-unresolved

In the example, Receipt 2 can be successfully matched to both Invoice 2 and Invoice 3. All invoices and receipts are set to multi-unresolved status.

Example 4

The following example illustrates a multi-unresolved match, but one with successful matches.

Invoices for a PO/Location	Total Extended Cost	Total Quantity	Status Post Matching
Invoice 1	\$50,000	5,000	Multi-unresolved
Invoice 2	\$25,000	2,500	Multi-unresolved
Invoice 3	\$35,000	3,000	Matched

Invoices for a PO/Location	Total Extended Cost	Total Quantity	Status Post Matching
Receipt 1	\$40,000	4,000	Multi-unresolved
Receipt 2	\$25,000	2,500	Multi-unresolved
Receipt 3	\$25,000	2,500	Multi-unresolved
Receipt 4	\$35,000	3,000	Matched

In the example, Invoice 2 can be successfully matched with both Receipt 2 and Receipt 3. Invoice 3, however, can be successfully matched only with Receipt 4. Therefore, Invoice 3 and Receipt 4 are set to matched status. All other invoices and receipts for the PO location are set to multi-unresolved status.

Example 5

The following example illustrates a scenario in which all invoices match, but there are remaining unresolved receipts.

Invoices for a PO/Location	Total Extended Cost	Total Quantity	Status Post Matching
Invoice 1	\$50,000	5,000	Matched
Invoice 2	\$25,000	2,500	Matched
Invoice 3	\$35,000	3,000	Matched

Invoices for a PO/Location	Total Extended Cost	Total Quantity	Status Post Matching
Receipt 1	\$50,000	5,000	Matched
Receipt 2	\$25,000	2,500	Matched
Receipt 3	\$15,000	2,500	Unresolved
Receipt 4	\$35,000	3,000	Matched
Receipt 5	\$75,000	10,000	Unresolved

In the example, all three invoices can be successfully matched to one and only one receipt. However, two unmatched receipts remain. The invoices are still considered matched, and the receipts remain unresolved.

Eligibility for Line-Level Matching

In invoice auto-matching, matching can be performed for entire invoices or broken down to the line level. PO location level matching and one-to-one invoice matching are performed for entire invoices and receipts. Line level matching is performed by item.

In order to be eligible for line level matching, an invoice or receipt must meet the following conditions:

1. Neither the invoice nor receipt can be in multi-unresolved status.
If the invoice or receipt is in multi-unresolved status, it is assumed that human intervention is required. No further attempts are made to match the applicable invoice at the line level.
2. Lines must be present on the invoice.
Invoice auto-matching assumes that invoices either have all lines in the system or no lines. The system neither validates nor processes partial invoices. If any lines are present, invoice auto-matching assumes that all lines are present.
3. The number of days to routing must be exceeded.
The system uses settings and a formula to arrive at its determination of routing days. A supplier option is used to define how long the system should wait before routing discrepancies for invoices for that supplier. However, if the invoice is due sooner than the routing date, then discrepancies may be routed earlier than the route date. A system option determines the maximum number of days before an invoice due date that discrepancies will be routed. The earliest date between the routing date defined by the supplier option and the routing date dictated by the system option is the date on which invoice auto-match routes discrepancies for an invoice.

Supplier option: routing days = x days

System option: maximum days before due date = y days

Supplier driven routing date = invoice date + x days

System driven routing date = invoice due date – y days

The date of actual routing is the earlier of the supplier driven routing date and the system-driven routing date.

Line-Level Matching

If only one invoice remains unmatched and zero-to-many receipts are unmatched for the PO location and the invoice is eligible, the system attempts to match each line item on the invoice to receipt line items on the receipts for the same item. If a match is not found, price and/or quantity discrepancies are created and routed. Once line level matching is complete for a PO location, if all lines have been matched, then the entire invoice and all of the receipts are considered matched. Otherwise, they remain unresolved.

When invoice lines are sent through line level matching, all existing unresolved or partially resolved cost discrepancies are deleted along with any partial resolutions. If line level matching produces new discrepancies, they are created and routed, thus ensuring that discrepancies are routed with the latest information available about the invoice and receipt lines.

If no receipt lines correspond to an invoice line, cost matching is attempted for the applicable invoice line using the PO's unit cost. The system assumes the invoice line exists on the order. If there is a discrepancy, a cost discrepancy is created and routed. In

this scenario, a quantity discrepancy is automatically created and routed where the entire invoiced quantity is the discrepant quantity.

For line-level matching, cost and quantity matching are always performed. If cost matching fails, quantity matching is still performed in order to route potential quantity discrepancies that may be discovered. When discrepancies are created, the PO's supplier is associated with the discrepancy.

For quantity line level matching, the comparison is made between the quantity invoiced and the sum of the quantities received across the receipts for that item. If a quantity match cannot be obtained, then a quantity discrepancy is generated and routed for the invoice line and the receipt lines for that item.

Example 1

The following example illustrates a scenario in which all lines match, and the invoices and receipts are set to matched status.

Invoice Lines for a PO/Location	Item	Unit Cost	Quantity	Status Post Matching
Invoice 1			550	Matched
- Invoice line	Item 1	\$5.00	100	Matched
- Invoice line	Item 2	\$10.00	200	Matched
- Invoice line	Item 3	\$15.00	250	Matched

Invoice Lines for a PO/Location	Item	Unit Cost	Quantity	Status Post Matching
Receipt 1			565	Matched
- Receipt line	Item 1	\$5.02	105	Matched
- Receipt line	Item 2	\$10.10	210	Matched
- Receipt line	Item 3	\$15.03	250	Matched

In the example, assume line-level tolerances are set such that all lines match, and the line-level statuses are set to matched accordingly.

Example 2

The following example illustrates a scenario in which some lines match, and the invoices and receipts remain in unresolved status.

Invoice Lines for a PO/Location	Item	Unit Cost	Quantity	Status Post Matching
Invoice 1			550	Unresolved
- Invoice line	Item 1	\$12.00	100	Unresolved
- Invoice line	Item 2	\$10.00	200	Matched
- Invoice line	Item 3	\$12.00	250	Unresolved

Invoice Lines for a PO/Location	Item	Unit Cost	Quantity	Status Post Matching
Receipt 1			550	Unresolved
- Receipt line	Item 1	\$5.00	100	Unresolved
- Receipt line	Item 2	\$10.00	200	Matched
- Receipt line	Item 3	\$10.00	250	Unresolved

In the example, the lines value for Item 2 is matched. However, because Items 1 and 3 do not match within tolerance, the receipt and invoice are unmatched.

Example 3

The following example illustrates a scenario in which some lines match, and the invoices and receipts remain in unresolved status. Note that one invoice line has no corresponding receipt item.

Invoice Lines for a PO/Location	Item	Unit Cost	Quantity	Status Post Matching
Invoice 1			550	Unresolved
- Invoice line	Item 1	\$12.00	100	Unresolved
- Invoice line	Item 2	\$10.00	200	Matched
- Invoice line	Item 3	\$12.00	250	Unresolved

Invoice Lines for a PO/Location	Item	Unit Cost	Quantity	Status Post Matching
Receipt 1			550	Unresolved
- Receipt line	Item 1	\$5.00	100	Unresolved
- Receipt line	Item 2	\$10.00	200	Matched

Order Lines for a PO/Location	Item	Unit Cost
- Order line	Item 1	\$5.00
- Order line	Item 2	\$10.00
- Order line	Item 3	\$12.00

In the example, Item 2 matches. A cost discrepancy is created for Item 1. No cost discrepancy is created for Item 3 because its unit cost matches the PO's unit cost. A quantity discrepancy is created for Item 3 where the received quantity is zero because the item is not on the receipt.

Example 4

The following example illustrates a scenario in which one invoice line is matched to many receipt lines.

Invoice Lines for a PO/Location	Item	Unit Cost	Quantity	Status Post Matching
Invoice 1				Matched
- Invoice line	Item 1	\$5.00	100	Matched

Invoice Lines for a PO/Location	Item	Unit Cost	Quantity	Status Post Matching
Receipt 1				Matched
- Receipt line	Item 1	\$5.00	70	Matched
Receipt 2				Matched
- Receipt line	Item 1	\$5.00	30	Matched

In the example, one invoice line can be matched with two receipt lines.

Recycling and Overall Flow

As soon as invoices arrive, the next invoice auto-matching batch run processes them. If there are no receipts, invoices are sent to cost pre-matching immediately - allowing for early identification of cost discrepancies and correction of PO, if necessary, to improve match rates when receipts arrive.

Once receipts arrive, the invoices and receipts are matched at the PO/location level and at the one-to-one level. If no match exists, these invoices and receipts are recycled through summary level matching until the routing days parameter has passed. If there is a match, then any unresolved or partially resolved cost discrepancies are removed from the system.

For discrepancies that have been fully resolved, the actions taken are reflected in the adjusted total extended cost and adjusted total quantity of the invoices and the receipts. The adjusted cost and quantity values will be available to support summary matching on-line.

After the routing days parameter has passed, an invoice in unmatched status will undergo line-level matching. In this type of scenario, all existing unresolved or partially resolved cost discrepancies are deleted. New cost and quantity discrepancies are created if any exist.

After line level matching is performed for an invoice (through either the invoice auto-matching or on-line matching), that invoice is never processed by invoice auto-matching again.

Partially Matched Receipts

Users may choose to 'split' a receipt item. Splitting a receipt a portion of the receipt quantities to support a match or resolve a discrepancy online. The unmatched portion of the receipt is available to match against future invoices. Partially matched receipts (that is, the unmatched portion) are available to both on-line and invoice auto-match processes to support matches.

Example 1

The following example illustrates summary level matching:

Invoice Lines for a PO/Location	Item	Extended Cost	Quantity	Status Prior to Matching	Status After Matching
Invoice 1		\$30,000	500	Unresolved	Matched

Invoice Lines for a PO/Location	Item	Extended Cost	Quantity	Status Prior to Matching	Status After Matching
Receipt 1		\$60,000	1,000	Partially Matched	Matched
- Receipt line	Item 1	\$30,000	500	Previously matched	Matched
- Receipt line	Item 2	\$15,000	250	Unresolved	Matched
- Receipt line	Item 3	\$15,000	250	Unresolved	Matched

In the example, a partially matched receipt is used to match an unprocessed invoice. Only the unmatched lines for the receipt are used to determine whether the invoice and receipt match at the summary level.

Example 2

The following example illustrates line level matching:

Invoice Lines for a PO/Location	Item	Unit Cost	Quantity	Status Prior to Matching	Status After Matching
Invoice 1				Unresolved	Unresolved
- Invoice line	Item 2	\$15.00	250	Unresolved	Unresolved
- Invoice line	Item 3	\$15.00	250	Unresolved	Matched

Invoice Lines for a PO/Location	Item	Unit Cost	Quantity	Status Prior to Matching	Status After Matching
Receipt 1				Partially Matched	Matched
- Receipt line	Item 1	\$30.00	500	Previously matched	Matched
- Receipt line	Item 2	\$15.00	250	Previously matched	Matched
- Receipt line	Item 3	\$15.00	250	Unresolved	Matched

In the example, the invoice remains unresolved and the receipt becomes matched. Even though Item 2 of Invoice 1 matches with Item 2 of Receipt 1, Item 2 of Receipt 1 had already been matched to a different line on a different invoice. Therefore, it is not reused here to make a match. Item 3 of Receipt 1 is unresolved and is therefore available to be matched to Item 3 of Invoice 1.

Matching Tolerances

Matching tolerances are defined for:

- Costs and quantities, for both summary and detail (line-level) matching.
- Discrepancies in favor of the retailer and those in favor of the supplier.
- Tolerance ranges.
- Supplier, department, or system level (default)

Tolerances are set up for total invoice (merchandise) cost to support summary level matching during the invoice auto-match and on-line processes. Summary level quantity matching is optional, per supplier parameter; the tolerance dialog. Detail (line-level) cost matching is performed based on the unit cost of the item. Quantity matching is always done at the line-level, requiring a tolerance provision. Tolerances may be set up as percentages or nominal amounts. A system option provides for definition of the maximum percentage tolerance that can be used.

Tolerances are defined separately for discrepancies in favor of the retailer and those in favor of the supplier. To illustrate, if the invoice cost is \$20.00 and the purchase order (receipt) cost is \$30.00, the discrepancy of 10 is in favor of the retailer because the invoice cost is less than expected.

Discrete tolerance amounts or percentages may be defined for value and quantity ranges to hone the matching process. Ranges are defined for summary and line-level matching. In general, when attempting to match invoices with quantities representing weight, the “percentage” tolerance type at the system level should be used. For these invoices, the system would apply the same logic regardless of whether the invoice shows number of **pounds** or number of **packs**. So using a percentage rather than an amount would be the more effective choice.

Tolerances may be defined at the supplier level, the department level, or the system-wide level. The matching processes first determine whether a supplier-level tolerance applies to the invoice being matched. If a supplier-level tolerance does not exist, a check will be made for department level. If line-level matching is being performed, then ReIM will use the department for that item to retrieve tolerances. In the summary matching case, an item is selected at random from the corresponding PO, and the department for that item is used to retrieve tolerances. Finally, if supplier- and department-level tolerances do not exist, the system-level tolerance will default.

History and Metrics

ReIM records summary and detail history for matched invoices and receipts. In addition, the system records whether or not each match was exact or not. At the summary level, the group of receipts and invoice numbers is stored. At the detail level, receipt lines matching to a particular invoice line is also stored.

For each invoice auto-match run, the following metrics about the run are stored:

- The run date.
- The number of invoices that matched exactly.
- The number of invoices that matched within tolerance.
- The total number of invoices processed.

Best Terms Calculations

The best terms calculation process compares the terms on the invoice and the terms on the PO, selects the most favorable term (according to each term's ranking), and determines a terms date. Best terms and terms date are subject to supplier-level option. The best terms calculation process is called after the invoice auto-matching and on-line matching processes, and for pre-paid invoices.

After the best terms are calculated and the terms date is determined, the results are written to IM_DOC_HEAD for the invoice.

Terms Ranking Overview

Terms are ranked numerically. Terms with a lower ranking are preferable to terms with a higher ranking. During the best terms calculation, the ranks of the invoice terms and the PO terms are compared, and the terms with the lowest rank are selected as the best terms.

Supplier Options

The following supplier options (IM_SUPPLIER_OPTIONS) affect the best terms calculation:

- Always Use Invoice Terms (USE_INVOICE_TERMS_IND)
When this indicator is set to Y, only invoice terms will be used, and the comparison against PO terms is not performed.
- ROG Date Allowed (ROG_DATE_ALLOWED_IND)
When this indicator is set to Y, the supplier allows the receipt of goods (ROG) date to be used when determining the terms date. This indicator can only be set to Y if the Always Use Invoice Terms indicator is set to N.

Terms Date

The terms date is the later of the invoice date or the receipt of goods (ROG) date. The ROG date replaces invoice date as the terms date when all of the following are true:

- Always Use Invoice Terms (USE_INVOICE_TERMS_IND) on the supplier options table is set to N.
- ROG Date Allowed (ROG_DATE_ALLOWED_IND) on the supplier options table is set to Y.
- The ROG date is later than the invoice date.

Note: If there are multiple receipts for an invoice, the ROG date is the date of the last receipt.

Assumptions and Dependencies

- Best terms calculation applies only to merchandise invoices.
- Merchandise invoices must be in “matched” status before the best terms calculation is performed.
- When the supplier option, “Always Use Invoice Terms,” is set to “Y”, the invoice terms are always used. The due date is calculated using the invoice date. The PO terms are never considered.
- The payment of invoices prior to or during matching does not update the matching status of the invoice. In these situations, a pre-paid invoice indicator is tripped to ensure the invoice is not paid a second time after matching and to trigger the correct accounting distribution. The best terms process is not re-invoked if the pre-paid indicator is set to “Y”.

Credit Note Auto-Matching

Credit Note Auto-Matching pairs credit note requests to corresponding credit notes sent by the supplier. The CreditNoteAutoMatchBatch attempts auto-matching of credit notes from suppliers, to credit note requests from the retailer without manual intervention. The batch also creates and resolves detail level discrepancies utilizing a predefined set of reason codes. These reason codes are defined within Invoice Matching through the System Options Maintenance screen. In addition, the batch utilizes a variety of configurable “keys” to allow for document groups to be matched in ways other than just distinct purchase order and location combinations.

The following table describes under which circumstances credit notes and credit note requests are eligible to be matched by the CreditNoteAutoMatchBatch process:

Document Status	Document Hold Status	Holding Supplier	Credit Notes	Credit Note Requests
Approved	Never held	Yes	N/A	Eligible
Approved	Held	Yes	Eligible	N/A
Approved	Released	Yes	Eligible	N/A
Approved	Never held	No	Ineligible	Eligible
Posted	Never held	No	Eligible	N/A

In addition to the requirements listed above, the following criteria must apply for documents to be processed by the CreditNoteAutoMatchBatch:

- Credit notes must never have had a discrepancy created against them.
- Credit notes must never have been previously detail matched.

If the documents are eligible for matching, they are collected into a pool of matchable documents by the batch. The batch process is multithreaded. It performs matching on eligible documents by first grouping the eligible documents with respect to the supplier. Once grouped with respect to the supplier, the documents are processed for each configurable key. Each document-key set is further processed using the following three distinct matching algorithms:

- Summary matching
- One-to-one matching
- Detail (line level) matching

In summary matching, documents are matched in groups at the summary level by comparing the total extended costs for all the documents in the group. Quantity matching is only attempted if the supplier options indicate it as required. If a match is achieved, the documents are marked with the matched status, and drop out of the matching pool.

If the summary match attempt fails for the group, the batch attempts matching at the one-to-one level. One-to-one matching attempts to match each distinct eligible credit note to a single credit note request. The match is again attempted by comparing the extended cost on the credit note to that of the credit note request, and quantity matching is only attempted depending on the supplier options. If one-to-one matches are found, they are flagged as such and will not be processed by subsequent match attempts.

Line level matching is the last attempted match algorithm. This algorithm attempts to match documents at the item line level. To avoid item matching between unrelated credit notes and credit note requests, this algorithm expects just one unmatched credit note to be remaining in the matchable pool. In case there is more than one credit note still in unmatched status, no match attempt will be made. Line level matching also automatically creates and resolves discrepancies, if the appropriate system options have been set. Once these discrepancies are created, the algorithm also attempts to resolve the discrepancies by creating resolution actions in the system in accordance with the nature of the discrepancies.

On the next run of the ReasonCodeActionRollupBatch, documents are generated for any resolution action generated by the CreditNoteAutoMatchBatch.

Configurable Keys (Flexible Pool Keys)

Grouping documents into sets using configurable (flexible) pool keys allows for matching in combinations beyond just the PO / Location combination. Note that when we refer to a document set, the set can only contain documents within the **same** supplier.

These document-key sets are categorized by common attributes which are defined on the document itself (credit notes and credit note requests). These attributes are referred to as Configurable or Flexible Pool Keys. By default, the credit note auto match process aggregates document sets based on the following keys:

- Credit Note Request ID
- Original Invoice ID
- PO / Location combination

In case of Credit Note Request ID and Original Invoice ID, two of the four customizable reference fields of the documents are used as place holders for the key values. For instance, the Ref No.3 field is used to store the Credit Note Request ID, and the Ref No. 4 field is used to store the original Invoice ID.

A document can exist in only one document-key set at a time. Note that a document-key set will exist only if it contains both credit notes and credit note requests. Matching will be attempted only for sets not containing both credit notes and credit note requests. This makes it impossible to create, route and resolve discrepancies for credit notes that are yet to be received by the retailer.

Within each document-key set, matches are attempted using three different matching algorithms. If a match is obtained with an algorithm, the matched documents are flagged as such, and processing continues on to the next document-key set. When all configurable three algorithms are finished processing within a document-key sets, processing moves to the next configurable key-set and starts again from the first matching algorithm.

Below is the order for attempting a match in a document-key set when no match is found:

1. Credit Note Request ID (configurable key)
 - Summary Matching (matching algorithm)
 - One to One Matching (matching algorithm)
 - Line -level Matching (matching algorithm)
2. Original Invoice ID (configurable key)
 - Summary Matching (matching algorithm)
 - One to One Matching (matching algorithm)
 - Line -level Matching (matching algorithm)

3. PO / Location (configurable key)
 - Summary Matching (matching algorithm)
 - One to One Matching (matching algorithm)
 - Line -level Matching (matching algorithm)

Summary Group Matching Algorithm

Summary matching attempts to match the total extended cost of the credit notes with the total extended cost of the credit note requests. Extended cost is defined as the unit cost for an item multiplied by the quantity of the item on the document. The total extended cost for each credit note and credit note request is taken from the document header.

Quantity matching also is sometimes required. Whether quantity matching is performed is determined by supplier options. Quantity matching compares the total quantity on the credit note, with the total quantity on the credit note request. As in cost matching, the total quantity for each credit note and credit note request is taken from the header.

If the costs and quantities do not match exactly, then the system attempts to match them within tolerance. (See Tolerances in this section of the guide for more details). If a match is achieved, all of the credit notes, credit note requests, and their lines for that document-key set are assumed to be matched. If a match is not achieved, all credit notes and credit note requests for that document-key set are left in their original approved status. After summary matching has been completed, the credit notes and requests become eligible to be processed with a different matching algorithm if no match was found at the summary level.

Consider an attempted summary match where two credit notes were received for two credit note requests. Assuming that the invoice and receipt data in the application is as follows:

- Purchase Order: 89890
- Location: 1000001

Document Type	Document ID	Unit Cost	Extended Cost	Quantity
Invoice	INV555	\$11.00	\$440	40
Receipt	SHP444	\$10.00	\$200	30

When matched, the invoice and receipt will create a cost discrepancy of \$40, and a quantity discrepancy of \$100--which will generate a credit note request cost for \$40 and a credit note request quantity for \$100.

The default Invoice Matching Pool Key configuration will have the following priority and values:

1. Credit Note Request ID
2. Invoice ID
3. PO / Location

Example 1: Matchable by Credit Note Request ID; Quantity Matching Not Required by Supplier.

The following example illustrates a successful match using the first Pool Key attribute, Credit Note Request ID.

Credit Note Request ID	Total Extended Cost	Ref No 3	Ref No 4	Quantity
CRDNRC-123	40	CRDNRC-123	INV555	40
CRDNRQ-456	100	CRDNRQ-456	INV555	10

Credit Note Request ID	Total Extended Cost	Ref No 3	Ref No 4	Quantity
CRDNT-246	40	CRDNRC-123	INV555	40
CRDNT-369	100	CRDNRQ-456	INV555	10

The credit note request associated with a credit note is determined from the Ref No 3 field that should contain the credit note request Id. In the example, the total extended cost for a credit note matches exactly with the extended cost of its respective Credit Note Request. Therefore, all credit notes and credit note requests will be set to matched status.

Example 2: Quantity Matching Required by Supplier, Outside Tolerance

The following example illustrates an unsuccessful match, where quantity matching is required by the supplier, and the tolerance level is set to 10%. It is assumed that the documents are matchable by credit note request ID.

Credit Note Request ID	Total Extended Cost	Ref No 3	Ref No 4	Quantity
CRDNRC-123	400	CRDNRC-123	INV555	20
CRDNRC-456	100	CRDNRQ-456	INV555	2

Credit Note Request ID	Total Extended Cost	Ref No 3	Ref No 4	Quantity
CRDNT-246	500	CRDNRC-123	INV555	25

In the example, the match is unsuccessful, despite the fact that the extended costs do match. The failed match is due to the requirement by the supplier to match quantities, and the difference in quantities on the credit note request--and the credit note is more than the allowed tolerance of 10 percent. The credit notes and credit note requests will remain in their original status.

Example 3: Quantity Matching Required by Supplier, Within Tolerance

The following example illustrates an unsuccessful match when the pool key is the credit_note_request_ID (Ref No 3), but a successful match when the pool key is Invoice_ID. In this scenario, quantity matching is required by the supplier, and tolerance level is set to 10.

Credit Note Request ID	Total Extended Cost	Ref No 3	Ref No 4	Quantity
CRDNRC-123	400	CRDNRC-123	INV555	20
CRDNRC-456	100	CRDNRQ-456	INV555	4

Credit Note Request ID	Total Extended Cost	Ref No 3	Ref No 4	Quantity
CRDNT-246	500	CRDNRC-123	INV555	25

In the example, the match is not successful when using Credit Note Request ID (reference field 3) as the pool key, because the extended cost difference (500 – 400) is outside of tolerance.

However, if the batch process was using the Invoice ID (reference field 4) as the pool key the match would be successful because the extended costs (400 + 100 = 500) match, and the quantities match within tolerance (20 + 4 = 24, where 24 is within 10% of 25). All the credit note requests and credit notes will be set to the status of matched. Example 4 illustrates a scenario in which Invoice ID is used as the pool key.

Note: In case of cost discrepancies, the costs will match if the extended cost differences between the credit note request and the credit note are within tolerance.

Example 4: Matchable by Invoice ID

If the credit notes and credit requests are not matchable by the credit note request ID. The matching process will attempt a one-to-one, and then a line-level match before moving to the next document key-set which is the 'invoice ID'. The invoice id is populated in the Ref 4 field of the credit note. The following example illustrates an attempted summary match which had failed when using credit note request ID, but is successful when the match is attempted using the second priority Pool Key attribute, Invoice ID.

Credit Note Request ID	Total Extended Cost	Ref No 3	Ref No 4	Quantity
CRDNRC-123	20	CRDNRC-123	INV555	2
CRDNRC-456	80	CRDNRQ-456	INV555	8

Credit Note Request ID	Total Extended Cost	Ref No 3	Ref No 4	Quantity
CRDNT-246	100		INV555	10

In the example, the Ref 3 field is empty. Therefore a match attempted with the Credit Note Request ID fails. Assuming that one-to-one and line-level matches also fail, a second attempt to summary match will be made in the next document-key set i.e. using the invoice ID. In this case, since the credit note and credit note requests match by their invoice ID, all credit notes and credit note requests will be set to matched status.

Example 5: Matchable by PO Location

If a credit note and credit request is not matchable in the document-key sets utilizing credit note request ID, or invoice ID, then the match will be attempted using the PO and Location combination which is the third priority in the default Pool Key Attributes of the system.

Assuming that the invoice and receipt data in the in application is as follows:

- Purchase Order: 89890
- Location: 1000001

Document Type	Document ID	Unit Cost	Extended Cost	Quantity
Invoice	INV555	\$11.00	\$440	40
Receipt	SHP444	\$10.00	\$200	30

When matched, the invoice and receipt will create a cost discrepancy of \$40, and a quantity discrepancy of \$100 which will generate a credit note request cost for \$40 and a credit note request quantity for \$100.

Credit Note Request ID	Total Extended Cost	Ref No 3	Ref No 4	Quantity
CRDNRC-123	40	CRDNRC-123	INV555	40
CRDNRC-456	100	CRDNRQ-456	INV666	10

Credit Note Request ID	Total Extended Cost	Ref No 3	Ref No 4	Quantity
CRDNT-246	140			50

In the example, both the Ref No 3 and Ref No 4 fields on the credit note are empty. Therefore matching is not even attempted at the Credit Note Request ID or invoice ID pool keys. A third attempt to match will be made with the PO and Location combination. As calculated from the above data, the PO and location combination for all three documents is: 89890-1000001. Since this combination is the same for all three documents, and the extended cost of the credit note requests match with the credit note, all credit notes and credit note requests will be set to matched status.

One-to-One Invoice Matching Algorithm

One-to-one credit note matching is considered another form of summary matching. The only addition to the rule is that instead of attempting matches in groups, one-to-one matching attempts to match a single credit note with a single credit note request.

The batch first attempts a match between the total extended costs. If the total extended costs do not match exactly for the credit note and the credit note request pair, then tolerances are applied to check if the cost discrepancy is within tolerance. In case quantity matching is required by the supplier, header level quantity matching is also attempted for the document pair within tolerance. If no match can be found, the documents are left in their original status.

One-to-one algorithm will attempt a match only when at least one unmatched credit note exists in the document-key set. If no unmatched credit notes remain, then processing stops for the document-key set.

Some scenarios of one-to-one matching are listed below. Note that the examples are given to demonstrate an understanding of one-to-one matching algorithm. It is assumed that quantity matching is required in the supplier options, and documents are matchable only by credit Note Request ID

Example 1: Exact Match

The following example illustrates how one credit note matches with one and only one credit note request. One credit note and two credit note requests are left in their original approved status.

Credit Note	Total Extended Cost	Total Quantity	Status Post Matching
CRDNT 1	\$50,000	5,000	Matched
CRDNT 2	\$100,000	10,000	Approved

Credit Note Request	Total Extended Cost	Total Quantity	Status Post Matching
CRDNRC 1	\$50,000	5,000	Matched
CRDNRC 2	\$25,000	2,500	Approved
CRDNRC 3	\$35,000	2,500	Approved

In the example, CRDNT 1 matches with CRDNRC 1. However, the remaining credit (CRDNT 2) does not match with either of the two remaining credit note requests so it remains unmatched. The remaining credit note requests (CRDNRC 2 and CRDNRC 3) are also left in their original state. The matching algorithm will now move to the next matching algorithm within the document-key set to consider matching these documents.

Example 2: Match Unsuccessful; One Credit Note but Two Credit Note Requests

The following example illustrates an unsuccessful match (no successful matches).

Credit Note	Total Extended Cost	Total Quantity	Status Post Matching
CRDNT 1	\$50,000	5,000	Approved
CRDNT 2	\$25,000	2,500	Approved
CRDNT 3	\$35,000	3,000	Approved

Credit Note Request	Total Extended Cost	Total Quantity	Status Post Matching
CRDNRC 1	\$40,000	5,000	Approved
CRDNRC 2	\$25,000	2,500	Approved
CRDNRC 3	\$25,000	2,500	Approved
CRDNRC 4	\$10,000	1,000	Approved

In the example, CRDNT 2 can be successfully matched to both CRDNRC 2, and CRDNRC 3. Therefore, no match can be obtained for Invoice 2. All credit notes and credit note requests are left in their original status.

Example 3: Match Unsuccessful; Two Credit Notes For One Credit Note Request

The following example illustrates another multi-unresolved match, with no successful matches.

Credit Note	Total Extended Cost	Total Quantity	Status Post Matching
CRDNT 1	\$40,000	4,000	Approved
CRDNT 2	\$25,000	2,500	Approved
CRDNT 3	\$25,000	2,500	Approved
CRDNT 4	\$10,000	1,000	Approved

Credit Note Request	Total Extended Cost	Total Quantity	Status Post Matching
CRDNRC 1	\$50,000	5,000	Approved
CRDNRC 2	\$25,000	2,500	Approved
CRDNRC 3	\$35,000	3,000	Approved

In the example, CRDNRC 2 can be successfully matched to both CRDNT 2 and CRDNT 3. All credit notes and credit note requests are left in the original Approved status.

Example 4: All Credit Notes Are Matched, but Credit Note Requests Remain.

The following example illustrates a scenario in which all credit notes match, but there are remaining unresolved credit note requests.

Credit Note	Total Extended Cost	Total Quantity	Status Post Matching
CRDNT 1	\$50,000	5,000	Matched
CRDNT 2	\$25,000	2,500	Matched
CRDNT 3	\$35,000	3,000	Matched

Credit Note Requests	Total Extended Cost	Total Quantity	Status Post Matching
CRDNRC 1	\$50,000	5,000	Matched
CRDNRC 2	\$25,000	2,500	Matched
CRDNRC 3	\$15,000	2,500	Approved
CRDNRC 4	\$35,000	3,000	Matched
CRDNRC 5	\$75,000	10,000	Approved

In the example, all three credit notes are successfully matched to one and only one credit note request. However, two unmatched credit note requests remain. Since there are no credit notes left for matching, processing will stop for this document-key set.

Line Level Matching Algorithm

Once summary matching and one-to-one matching pools have been exhausted, the CreditNoteAutoMatchBatch proceeds to attempts match at the line level.

In addition to the eligibility requirements for summary matching, lines must be present on the documents for Line-level matching to proceed. The batch assumes that all lines are present and valid for that credit note and credit note request. Moreover, the algorithm attempts matches only if there is just one credit note left unmatched in the document-key set.

Considering that only one eligible credit note and zero-to-many credit note requests are unmatched for a document key-set, the system attempts to match each line item on that credit note to a credit note request line item. When a detail level match is found, the detail on the credit note and credit note request documents are both flagged as matched. Once line level matching is complete for a document key-set, and all lines have been matched, then the entire credit note and all of its related credit note requests are considered matched. Otherwise, they remain in their original approved status.

For line-level matching, cost and quantity matching are always performed. If cost matching fails, quantity matching is still performed in order to route potential quantity discrepancies that may be discovered.

For quantity line level matching, the comparison is made between the sum of quantities from the credit notes and sum of the quantities on the credit note request for that item. If a quantity match cannot be obtained, then a quantity discrepancy is generated and routed for the credit note and the credit note request lines for that item.

Example 1: Match Within Tolerance

The following example illustrates a scenario in which all lines match within tolerance, and the credit notes and credit note requests are set to matched status.

Credit Note	Item	Unit Cost	Quantity	Status Post Matching
CRDNT 1			550	Matched
▪ Credit note line	1	\$5.00	100	Matched
▪ Credit note line	2	\$10.00	200	Matched
▪ Credit note line	3	\$15.00	250	Matched

Credit Note Request	Item	Unit Cost	Quantity	Status Post Matching
CRDNRC			565	Matched
▪ Credit note req. line	1	\$5.02	105	Matched
▪ Credit note req. line	2	\$10.100	210	Matched
▪ Credit note req. line	3	\$15.03	250	Matched

In the example, assume line-level tolerances are set such that all lines match, therefore the line-level statuses are set to matched accordingly.

Example 2: Match by Resolving Discrepancy

The following example illustrates a scenario in which tolerances allow only one line to matches, but the CreditNoteAutoMatchBatch is able to resolve the discrepancies in other items, and match the credit note and credit note request.

Credit Note	Item	Unit Cost	Quantity	Status Post Matching
CRDNT 1			550	Matched
▪ Credit note line	1	\$12.00	100	Matched (by resolving discrepancy)
▪ Credit note line	2	\$10.00	200	Matched
▪ Credit note line	3	\$12.00	250	Matched (by resolving discrepancy)

Credit Note Requests	Item	Unit Cost	Quantity	Status Post Matching
CRDNRC 1			600	Matched
▪ Credit note req. line	1	\$12.00	110	Matched (by resolving discrepancy)
▪ Credit note req. line	2	\$10.100	200	Matched
▪ Credit note req. line	3	\$10.00	250	Matched (by resolving discrepancy)

In the example, the lines value for Item 2 is matched. However, Items 1 and 3 do not match within tolerance. If however, reason codes are entered in the appropriate default columns for automatically handling Credit Note matching discrepancies in the system options table, then discrepancies are created automatically for Item1 and Item 3 and the two items are set to matched status on both documents.

Discrepancy Creation and Resolution in Line Level Matching

When discrepancies are created as part of the line-level matching process, they are automatically resolved by the batch process. This resolution takes place by selecting the appropriate reason code from the system options and then resolving those discrepancy by creating resolution actions in the system. For instance, if a cost discrepancy is detected, then a resolution action in the form of a Credit Note Request for cost or a Credit Memo is generated. On the next run of the reason code action rollup process, these newly created resolution actions will be rolled up to create the appropriate resolution documents.

It is important to distinguish the differences between overages that are in favor of the retailer as opposed to the supplier. In credit note matching, when a credit note is greater than the credit note request issued for it, the overage is in the favor of the retailer and a credit memo is issued to reconcile the discrepancy. This is because the credit note already represents an asset to the retailer. The supplier has issued more credit to the retailer than was appropriate based on the credit note request. If the retailer does not wish to automatically issue credit memos when the credit note is larger than the credit note request, then the system options, "Auto-resolution Reason Code for Credit Memo – Cost" and "Auto-resolution Reason Code for Credit Memo-Qty" should be left blank.

Note that if the applicable system option for a resolution action code type does not have a reason code defined in the System Options Maintenance screen then discrepancies of that type are not generated. It is assumed that the retailer will handle these discrepancies manually. This means that the credit note will not be matched and processing will stop for the document set. This allows for the retailer to have the batch resolve only specific discrepancy types. For example, many retailers may not want to automatically generate Credit Memos in response to Credit Note overages.

Example 1: Cost Discrepancy

The following example illustrates a scenario in which the first line on the credit note matches with the first line on the credit note request. The second line has a cost discrepancy.

Credit Note	Item	Unit Cost	Quantity	Status Post Matching
CRDNT 1			300	Matched
▪ Credit note line	1	\$12.00	100	Matched
▪ Credit note line	2	\$5.00	200	Matched (by resolving discrepancy)

Credit Note Requests	Item	Unit Cost	Quantity	Status Post Matching
CRDNTR 1			600	Matched
▪ Credit note req. line	1	\$12.00	110	Matched (by resolving discrepancy)
▪ Credit note req. line	2	\$10.100	200	Matched
▪ Credit note req. line	3	\$10.00	250	Matched (by resolving discrepancy)

In the above scenario Item 2 in credit note and credit note request has a cost discrepancy of \$5. The Line level match algorithm automatically generates a cost discrepancy for the item, and generates a Resolution Action in the system for a Credit Note Request – Cost, where the total extended cost on the credit note request is \$1000.00.

Example 2: Quantity Discrepancy

The following example illustrates a scenario in which the first line on the credit note matches with the first line on the credit note request. The second line has a quantity discrepancy.

Credit Note	Item	Unit Cost	Quantity	Status Post Matching
CRDNT 1			300	Matched
▪ Credit note line	1	\$12.00	100	Matched
▪ Credit note line	2	\$10.00	200	Matched (by resolving discrepancy)

Credit Note Requests	Item	Unit Cost	Quantity	Status Post Matching
CRDNTR 1			310	Matched
▪ Credit note req. line	1	\$12.00	110	Matched (by resolving discrepancy)
▪ Credit note req. line	2	\$10.100	210	Matched

In the above scenario Item 2 in credit note and credit note request has a quantity discrepancy of 10 (assumed to be above tolerance values). The Line level match algorithm automatically generates a quantity discrepancy for the item, and generates a resolution action in the system for a Credit Note Request - Quantity.

Note that the above discrepancies are in the favor of the supplier. In case of the discrepancy being in the favor of the retailer, resolution actions would have been Credit Memos (cost or quantity).

Example 3: Orphan Items – Credit Memo

A case might exist when an item on the credit note does not exist on the credit note request. The CreditNoteAutoMatchBatch will resolve the discrepancy of the orphan items by utilizing the resolution actions for Credit Memos.

Credit Note	Item	Unit Cost	Quantity	Status Post Matching
CRDNT 1			300	Matched
▪ Credit note line	1	\$12.00	100	Matched
▪ Credit note line	2	\$10.00	200	Matched (by resolving discrepancy)

Credit Note Request	Item	Unit Cost	Quantity	Status Post Matching
CRDNTR 1			150	Matched
▪ Credit note req. line	1	\$12.00	110	Matched

In this scenario Item 2 in credit note does not exist in the credit note request. This orphan item creates a cost discrepancy. Since the discrepancy is in the favor of the retailer, the Line level match algorithm will automatically generate a Resolution Actions in the system for a Credit Memo-Cost, where total cost on the memo is \$2000.00.

Role of Reason Code Action Rollup Batch in Credit Note Matching

The ReasonCodeActionRollupBatch facilitates the CreditNoteAutoMatchBatch process in the following ways:

- Document Creation
Resolution actions created as part of the discrepancy creation process of the CreditNoteAutoMatchBatch are converted to first class documents on the next run of the ReasonCodeActionRollupBatch. This is an existing feature of the ReasonCodeActionRollupBatch.
- Transfer of Customizable Reference Fields
Currently, documents in the system have a set of four (4) customizable reference fields. These fields are completely optional and their population is left to the discretion of the retailer and their suppliers. If applicable (*see Users Guide: System Options Screen section for more details*), the CreditNoteAutoMatchBatch utilizes the third and fourth customizable reference fields to facilitate matching. In such cases the ReasonCodeActionRollupBatch makes sure that the values of those fields are transferred to the newly created documents.

Tolerances

Tolerances are handled in a manner similar to the invoice auto match batch process, and tolerance values used for credit note auto match are same as the tolerance values used for invoice matching.

Matching tolerances are defined at the following levels:

- Summary or Line
- Cost or Quantity
- Favor of Retailer or Supplier
- Amount or Percentage

Summary matching and one-to-one matching are both considered types of summary matching. Therefore, one-to-one matching also uses summary level tolerances.

During the matching process, tolerances are selected in the following order:

1. Supplier
2. Department
3. System

If no supplier level tolerances are defined, then departmental tolerances are used for a random item in the document set. If departmental tolerances are not defined for that item, then system level tolerances are used for the document set. Note that a document set must have items to use department level tolerances.

Currencies

Tolerance values are stored using the primary system currency. If the credit note and the credit note request both have the same currency but that currency differs from the system currency, an attempt will be made to convert the currency on the documents to the system currency. This conversion is attempted only if the applicable Merchandising system is RMS. The CreditNoteAutoMatchBatch process will attempt conversion to the system currency utilizing the RMS currency APIs and then determine if the documents fall within appropriate tolerances. Note that the CreditNoteAutoMatchBatch process will not attempt to match a credit note with a credit note request if the currency between the two documents is not the same.

VAT Matching

CreditNoteAutoMatchBatch only detects VAT discrepancies at the detail level. This means that when documents are being processed by the detail matching algorithm, a check is performed prior to matching, ensuring that for each item the VAT codes and rates on the credit note match those on the credit note request for the corresponding item. When a discrepancy is detected, processing for that document stops and detail matching is not performed for that document. In this circumstance, the Invoice Matching user will have to match and resolve the VAT discrepancy manually through the user interface.

History and Record Keeping

ReIM records summary and detail history for matched credit notes and credit note requests. The existing credit note matching history data model will be leveraged to ensure than an accurate accounting of match data is stored in the system. In addition, a new history data model has been introduced which holds history data for a specific match. The new history tables are populated after the completion and success of a match.

Data Purge

When document data becomes dated, it is purged from the system through the BatchPurgeBatch. This is also true for the CreditNoteAutoMatchBatch related data. See the BatchPurgeBatch description for further information.

Interfaces and File Layouts

Electronic Data Interchange (EDI) facilitates the computer-to-computer transmission of business information and transactions, such as invoices and purchase orders. EDI represents a convenient method by which a retailer and its suppliers can transfer information back and forth. The Voluntary Interindustry Commerce Standard (VICS) EDI is used by the general merchandise retail industry.

ReIM has two file-based EDI interfaces. Note that neither follows the VICS EDI standard. The ReIM EDI interfaces have been customized, and the retailer must translate them.

The interfaces represent the upload of invoices or other documents from a supplier or another application and the download of documents to suppliers. These two common types of EDI are described below:

- EDI invoice upload is the standard description for an EDI process that uploads documents.
- EDI invoice download is the standard description for an EDI process that downloads Debit Memo, Credit Note Request, and Credit Memo data from ReIM to suppliers.

For information about ReIM batch processes related to both of these types of EDI, see Chapter 7 – “Batch Processes.” Note that although the vast majority of invoices are created through either EDI upload or batch entry, users can also create invoices online and add details, or use the online dialog to add details to an invoice that was EDI uploaded.

The EDI Reject Table

The EDI invoice upload (ediupinv) batch process uploads invoices and credit notes from the EDI into the invoice-matching tables. This process validates the information in the file against itself and against the RMS (or equivalent merchandising system)/ReIM database. A limited set of data validation errors cause the invalid transaction to be written to error tables (IM_EDI_REJECT_DOC_XXX) where the data can be corrected through an online process.

The following errors are written to the EDI reject table for the user to manually correct through the front end:

- Supplier number (or Partner ID)
This value must be a valid supplier (SUPS table) or partner (PARTNER table) in RMS (or the equivalent merchandising system).
- Order numbers
Order numbers must be approved and created for the supplier or linked suppliers in RMS (or the equivalent merchandising system) on the ORDHEAD table. Non-merchandise invoices may not have any order numbers associated, so this validation should be skipped for this type of invoice.
- Order/location combination
The system validates that all order number/location combinations in the file are valid within RMS or the equivalent merchandising system (meaning that the relationship must exist on the ORDLOC table).
- Terms code
All terms must exist within RMS or the equivalent merchandising system on the TERMS table.

- Invoice date
A document cannot be older than the v-date minus the post-dated document days' system level parameter value or newer than the v-date.
- Item number
Item numbers must exist within RMS on the ITEM_MASTER table. Items must be transaction level. If a UPC or reference number is passed, this number should also be validated. The item number should also exist for the supplier.
- Merchandise invoices cannot be associated with a partner; they must only be associated with a supplier.
- Credit notes from a partner cannot have item records attached unless the partner type is a manufacturer, distributor, or wholesaler (type S1, S2, or S3).
- The system determines whether the invoice ID is valid if given.
- If the total quantity is given, the system determines whether the individual item quantities sum to total (the system only needs to check this if the supplier -level Match Total Qty indicator is Yes).
- The system determines whether the total merchandise cost on the THEAD line matches the sum of costs from the TDETL lines (the sum of unit cost *qty).
- Either an item or a reference item must be specified on all documents except non-merchandise invoices or credit notes from a partner.
- The paid indicator must be either 'Y'es or 'N'o.

The EDI Reject File

A limited set of data validation errors (identified in the file layout 'Validation' column) cause the invalid transaction to be written to the reject file (named by the retailer). When VAT processing is active within ReIM, all failed validations result in EDI uploads' being rejected to a file. There are no reject-to-table cases, and the EDI Maintenance screens are not accessible to the retailer.

EDI Invoice Upload File Layout (Based on EDI 810)

I/O Specification

All Files Layouts Input and Output

Input file format:

FHEAD (1): Start of file.

THEAD (1...n): Transaction (document) level info. Each file must have at least 1 THEAD.

TDETL (0...n): Item detail records for this transaction. TDETL is optional for Credit Note docs and debit memo docs.

TALLW (0...n): Allowance records for this item. TALLW is optional.

TNMRC (0...n): Non-merchandise records for this transaction. Required on non-merchandise documents, optional otherwise.

TVATS (0...n): VAT breakdown by VAT code. TVATS is optional.

TTAIL (1...n): Marks the end of a THEAD record. Each THEAD requires exactly one TTAIL.

FTAIL (1): Marks the end of the file.

TDETL and TNMRC do not need to occur in order. TALLW must follow TDETL

If records are encountered in any order other than specified above, execution of program will halt.

Example:

```
FHEAD
THEAD
TNMRC
FTAIL (no TTAIL encountered)
```

If a record descriptor is encountered other than those specified in this document, execution of program will halt.

Reject file will have an identical format. If no records are rejected, it will consist of only the FHEAD and FTAIL lines.

All character variables should be right-padded with blanks and left justified; all numerical variables should be left-padded with zeroes and right-justified. Null variables should be blank.

Single location invoices will be inserted into IM_DOC_HEAD, IM_INVOICE_DETAIL and IM_DOC_NON_MERCH. Multi-location invoices will be inserted into IM_PARENT_INVOICE, IM_PARENT_INVOICE_DETAIL and IM_PARENT_NON_MERCH.

It is assumed all values that have dependent information included in the file (for example, location has dependent information of order no, upc, upc-supply, and so on) are valid for the RMS system. The following is never anticipated to happen: only locations A, B, and C exist in RMS; EDI reads a transaction that has location D. This sort of file may not be flagged as invalid in any way.

Uploaded documents with details must have at most one associated UPC, item or VPN identifier. When system VAT processing is enabled, documents that fail to meet this criteria will be rejected to the file by the EDI Upload batch process. When VAT is disabled, the document will be available for review and correction through the Invoice Matching user interface in the EDI Maintenance screen.

FHEAD – File Header

The file header is the first record of an upload file.

Field Name	Field Type	Description	Req	Validation
Record descriptor	Char(5)	Describes file record type.	Y	Halt execution if not FHEAD.
Line id	Number(10)	Sequential file line number.	Y	Halt execution if not 0000000001.
Gentran ID	Char(5)	The type of transaction this file represents.	Y	Halt execution if not UPINV.
Current date	Char(14)	File date in YYYYMMDDHH24MISS format.	Y	Halt execution if invalid date format.

THEAD – Transaction Header

This information is the start of a document transaction.

Field Name	Field Type	Description	Req	Validation
Record descriptor	Char(5)	Describes file record type.	Y	THEAD
Line id	Number (10)	Sequential file line number.	Y	Halt execution if not in sequence.
Transaction number	Number (10)	Sequential transaction number. All records within this transaction will also have this transaction number.	Y	Reject entire file if: <ul style="list-style-type: none"> Transaction number is not numeric or not in sequence. First transaction number is not 0000000001.
Document Type	Char(6)	Describes the type of document being uploaded. The document type will determine the types of detail information that are valid for the document upload. Stored in IM_DOC_HEAD.TYPE. Valid values are: <ul style="list-style-type: none"> MRCHI – Merchandise Invoice NMRCHI – Non Merchandise Invoice CRDNT – Credit Note DBMC – Debit Memo Cost DBMQ – Debit Memo Qty CRDMC – Credit Memo Cost CNRC- Credit Note Request Cost CNRQ- Credit Note Request Qty 	Y	Reject transaction to file if document type is null document type is not MRCHI (merchandise invoice), NMRCHI (non-merchandise invoice), CRDNT (credit note), DBMC (Debit Memo-Cost), DBMQ (Debit Memo-Qty), CNRC (Credit Note Request-Cost), CNRQ (Credit Note Request-Qty), CRDMC (Credit Memo Cost) document type is CRDNT (credit note); vendor is not a supplier, manufacturer, distributor, or wholesaler. document type is CRDNT and TALLW records exist document type is MRCHI and item detail records DO exist for this transaction (this type of transaction must have no item detail records) document type is CRDNT,NMRCHI, DBMC, DBMQ, CRDMC, CNRC, CNRQ and any error occurs with the document
Vendor Document Number	Char (30)	Vendor's document number. Stored in IM_DOC_HEAD.EXT_DOC_ID with all characters converted to their upper case (for example, ThisDocId -> THISDOCID).	Y	Reject entire upload file if: <ul style="list-style-type: none"> The same vendor document number occurs more than once in the file. Reject transaction to file if: <ul style="list-style-type: none"> Vendor document number is null Vendor document number is not unique for this vendor. Vendor document number is not alphanumeric and the property

Field Name	Field Type	Description	Req	Validation
				<p>"INVOICE_NUMBER_VALIDATION_REGULAR_EXPRESSION" in reim.properties is commented out.</p> <ul style="list-style-type: none"> ▪ Vendor document number contains special characters that are not specified in the property "INVOICE_NUMBER_VALIDATION_REGULAR_EXPRESSION" in reim.properties and the property is not commented out. ▪ Vendor document number has leading zero and the property "INVOICE_NUMBER_VALIDATION_ALLOW_ZERO" in reim.properties is commented out or set to false.
Vendor Type	Char(6)	<p>Type of vendor (either supplier or partner) for this document. Stored in IM_DOC_HEAD.VENDOR_TYPE</p> <p>Valid values are:</p> <ul style="list-style-type: none"> ▪ SUPP – Supplier ▪ BK – Bank ▪ AG – Agent ▪ FF – Freight Forwarder ▪ IM – Importer ▪ BR – Broker ▪ FA – Factory ▪ AP – Applicant ▪ CO – Consolidator ▪ CN – Consignee ▪ S1 – Merch Supp level 1 ▪ S2 – Merch Supp level 2 ▪ S3 – Merch Supp level 3 	Y	<p>Reject transaction to file if:</p> <ul style="list-style-type: none"> ▪ Vendor type is null or if it is not valid vendor type (from Vendor class) ▪ Document type is MRCHI (merchandise invoice) and vendor type is not 'S'upplier
Vendor ID	Char(10)	<p>Vendor for this document. Stored in IM_DOC_HEAD.VENDOR_TYPE</p>	Y	<p>Reject transaction to file if:</p> <ul style="list-style-type: none"> ▪ Vendor ID is null ▪ Vendor type is partner and vendor ID is not valid partner <p>Reject transaction to tables if:</p> <ul style="list-style-type: none"> ▪ Vendor is a supplier and supplier is not valid ▪ Vendor is a supplier and vendor ID is not completely numeric

Field Name	Field Type	Description	Req	Validation
Vendor Document Date	Char(14)	Date document was issued by the vendor (in YYYYMMDDHH24MISS format). Stored in IM_DOC_HEAD.DOC_DATE	Y	Reject transaction to file if: <ul style="list-style-type: none"> ▪ Vendor document date is null ▪ Date is not a valid date format Reject transaction to tables if: <ul style="list-style-type: none"> ▪ Vendor document date is after the vdate or before (vdate – post_dated_doc_days) (from im_system_options)
Order Number/RTV order number	Number (10)	Merchandising system order number for this document. Required for merchandise invoices and optional for others. Store in IM_DOC_HEAD.ORDER_NO. This field can also contain the RTV order number if the RTV flag is Y.	N	Reject transaction to file if: <ul style="list-style-type: none"> ▪ Order/RTV order number exists and is not numeric ▪ Order/RTV order number is null and vendor type is a supplier ▪ Order/RTV order number is null and deal_id is null ▪ Order/RTV order number exists and vendor type is NOT a supplier ▪ Order/RTV order number exists and location or location type are null Reject transaction to tables if RTV flag is null or 'N' AND: <ul style="list-style-type: none"> ▪ Order number exists but is not valid for the supplier or the supplier's linked suppliers ▪ Order number exists but is not valid for the location/location type Reject transaction to file if RTV flag is Y AND: <ul style="list-style-type: none"> ▪ RTV order number exists but is not valid for the supplier or the supplier's linked suppliers ▪ RTV order number exists but is not valid for the location/location type
Location	Number (10)	Merchandising system location for this document. Required for merchandise invoices and optional for others. Stored in IM_DOC_HEAD.LOCATION.	Y	Reject transaction to file if: <ul style="list-style-type: none"> ▪ Location or location type do not exist ▪ Location exists and is not numeric ▪ Location exists and location type is not 'S'tore or 'W'arehouse Reject transaction to tables if: <ul style="list-style-type: none"> ▪ Location and location type exist but are not valid

Field Name	Field Type	Description	Req	Validation
Location Type	Char(1)	Merchandising system location type (either 'S'tore or 'W'arehouse) for this document. Required for merchandise invoices and optional for others. Stored in IM_DOC_HEAD.LOC_TYPE.	N	Reject transaction to file if: <ul style="list-style-type: none"> Location type exists and location is null
Terms	Char(15)	Terms of this document. If terms are not provided, the vendor's default terms are associated with this record. Stored in IM_DOC_HEAD.TERMS. This value is used to get the Terms Discount Percentage to be stored on IM_DOC_HEAD.TERMS_DSCNT_PCT.	N	Reject transaction to tables if: <ul style="list-style-type: none"> Terms exist and are not valid
Due Date	Char(14)	Date the amount due is due to the vendor (YYYYMMDDHH24MISS format). If due date is not provided, default due date is calculated based on vendor and terms. Stored in IM_DOC_HEAD.DUE_DATE.	N	Reject transaction to file if: <ul style="list-style-type: none"> Due date exists and is not a valid date format Due date is before the vendor document date
Payment method	Char(6)	Method for paying this document. Stored in IM_DOC_HEAD.PAYMENT_METHOD.	N	Reject transaction to file if: <ul style="list-style-type: none"> Payment method exists and is not valid
Currency code	Char(3)	Currency code for all monetary amounts on this document. Stored in IM_DOC_HEAD.CURRENCY_CODE.	Y	Reject transaction to file if: <ul style="list-style-type: none"> Currency code is null Currency code is not valid Order number exists and currency code does not match the order's currency
Exchange rate	Number (12,4)	Exchange rate for conversion of document currency to the primary currency. Stored in IM_DOC_HEAD.EXCHANGE_RATE.	N	Reject transaction to file if: <ul style="list-style-type: none"> Exchange rate exists and is not numeric
Sign Indicator	Char(1)	Indicates either a positive (+) or a negative (-) total cost amount.	Y	Reject transaction to file if sign indicator is null or if it is not '+' or '-'.

Field Name	Field Type	Description	Req	Validation
Total Cost	Number (20,4)	Total document cost, including all items and costs on this document. This value is in the document currency. Stored in IM_DOC_HEAD.TOTAL_COST and IM_DOC_HEAD.RESOLUTION_ADJUSTED_TOTAL_COST.	Y	Reject transaction to file if: <ul style="list-style-type: none"> Total cost is null Total cost is not numeric Total cost does not equal the sum of extended costs for all item detail records in this transaction Total cost is not negative and vendor document type is CRDNT
Sign Indicator	Char(1)	Indicates either a positive (+) or a negative (-) total VAT amount.	Y	Reject transaction to file if sign indicator is null or if it is not '+' or '-'.
Total VAT Amount	Number (20,4)	Total VAT amount, including all items and costs on this document. This value is in the document currency.	N	Treat as zero if null. Reject transaction to file if: <ul style="list-style-type: none"> Total VAT amount is not null but is not numeric Total VAT amount does not equal the sum of VAT for all item detail records PLUS the sum of VAT for all non-merch items in this transaction PLUS the sum of VAT for all allowances in this transaction.
Sign Indicator	Char(1)	Indicates either a positive (+) or a negative (-) total quantity amount.	Y	Reject transaction to file if sign indicator is null or if it is not '+' or '-'.
Total Quantity	Number (12,4)	Total quantity of items on this document. This value is in EACHES (no other units of measure are supported in ReIM). Stored in IM_DOC_HEAD.TOTAL_QTY and IM_DOC_HEAD.RESOLUTION_ADJUSTED_TOTAL_QTY.	Y	Reject transaction to file if: <ul style="list-style-type: none"> Total quantity is null Total quantity is not numeric Total quantity does not equal the sum of quantities for all item detail records in this transaction Total quantity is not zero when vendor document type is 'NMRCHI'
Sign Indicator	Char(1)	Indicates either a positive (+) or a negative (-) total discount amount.	Y	Reject transaction to file if sign indicator is null or if it is not '+' or '-'.
Total Discount	Number (12,4)	Total discount applied to this document. This value is in the document currency. Stored in IM_DOC_HEAD.TOTAL_DISCOUNT	Y	Reject transaction to file if: <ul style="list-style-type: none"> Total discount is null Total discount is not numeric
Freight Type	Char(6)	The freight method for this document.	N	Reject transaction to file if: <ul style="list-style-type: none"> Freight type exists and is not valid

Field Name	Field Type	Description	Req	Validation
Paid Ind	Char(1)	Indicates if this document has been paid. Stored in IM_DOC_HEAD.MANUALLY_PAID_IND.	Y	Reject transaction to file if: <ul style="list-style-type: none"> ▪ Paid ind is null ▪ Paid ind is not Y or N
Multi-Location	Char(1)	Indicates if this invoice goes to multiple locations. If Yes, the record should be inserted to IM_PARENT_INVOICE table.	Y	Reject transaction to file if: <ul style="list-style-type: none"> ▪ Multi-location is null ▪ Multi-location is not Y or N ▪ Multi-location is Y and Consignment is Y
Consignment indicator	Char(1)	Indicates if this invoice is a consignment invoice.	Y	Reject transaction to file if: <ul style="list-style-type: none"> ▪ Consignment indicator is null ▪ Consignment indicator is not Y or N Do not reject transaction to table if Consignment is Y.
Deal Id	Number (10)	Deal Id from RMS if this invoice is a deal bill back invoice.	N	If Deal Id is not null, Deal Approval indicator must be M or A. Do not reject transaction to table if deal id is not null.
Deal Approval Indicator	Char(1)	Indicates if the document on IM_DOC_HEAD is to be created in Approved or Submitted status.	N	Reject to file if not blank, M Submitted status or A approved. Do not reject transaction to table if value is not null.
RTV indicator	Char(1)	Indicates if this invoice is a RTV invoice.	Y	Reject transaction to file if: <ul style="list-style-type: none"> ▪ RTV indicator is null ▪ RTV indicator is not Y or N Do not reject transaction to table if RTV is Y.
Custom Document Reference 1	Char(30)	This optional field is included in the upload file for client customization. No validation is performed on this field. Stored in IM_DOC_HEAD.CUSTOM_REF_1.	N	
Custom Document Reference 2	Char(30)	This optional field is included in the upload file for client customization. No validation is performed on this field. Stored in IM_DOC_HEAD.CUSTOM_REF_2.	N	

Field Name	Field Type	Description	Req	Validation
Custom Document Reference 3	Char(30)	This optional field is included in the upload file for client customization. No validation is performed on this field. Stored in IM_DOC_HEAD.CUSTOM_REF_3.	N	
Custom Document Reference 4	Char(30)	This optional field is included in the upload file for client customization. No validation is performed on this field. Stored in IM_DOC_HEAD.CUSTOM_REF_4.	N	
Cross-reference document number	Number (10)	Document that a credit note is for. Blank for all document types other than merchandise invoices. Stored in IM_DOC_HEAD.REF_DOC.	N	Reject transaction to file if: <ul style="list-style-type: none">▪ Cross-reference document number exists and is not numeric

TVATS – VAT breakdown by VAT code

This information is inserted in IM_DOC_VAT.

Field Name	Field Type	Description	Req	Validation
File record descriptor	Char(5)	Marks costs at VAT rate line	Y	TVATS Reject entire transaction to file if this type of record exists and the transaction has any error. See technical design for additional validations. Reject to file if in im_system_options VAT is on, but there is no TVATS.
Line id	Char(10)	Sequential file line number	Y	Halt execution if not in sequence.
Transaction number	Number (10)		Y	Reject entire file if: <ul style="list-style-type: none"> ▪ Transaction number is not numeric ▪ Transaction number is not the same as the current transaction
VAT code	Char(6)	VAT code that applies to cost	Y	Reject to file if VAT code is not valid
VAT rate	Number (20,10)	VAT Rate corresponding to the VAT code	Y	Reject to file if VAT rate is not numeric
Sign Indicator	Char(1)	Indicates either a positive (+) or a negative (-) Original Document Quantity amount.	Y	Reject transaction to file if sign indicator is null or if it is not '+' or '-'.
Cost at this VAT code	Number (20,4)	Total amount that must be taxed at the above VAT code	Y	Reject to file if not numeric

TDETL – Item Detail Record

This information is inserted into the IM_INVOICE_DETAIL table for Merchandise Invoice and IM_DOC_DETAIL_REASON_CODES for Credit Notes.

Field Name	Field Type	Description	Req	Validation
Record descriptor	Char(5)	Describes file record type.	Y	TDETL
Line id	Number (10)	Sequential file line number.	Y	Halt execution if not in sequence.
Transaction number	Number (10)	Transaction number for this item detail record.	Y	Reject entire file if: <ul style="list-style-type: none"> Transaction number is not numeric Transaction number is not the same as the current transaction
UPC	Char(25)	UPC for this detail record. Valid item number is retrieved for the UPC. Stored in IM_INVOICE_DETAIL.ITEM or IM_DOC_DETAIL_REASON_CODES.ITEM.	Y Exclusive with item	Reject transaction to file if: <ul style="list-style-type: none"> UPC is null and Item is null Both UPC and Item are not null Reject transaction to tables if: <ul style="list-style-type: none"> Valid item is not found for UPC and UPC supp Valid item is not associated with the supplier The item found is identical to another detail item for this transaction (no duplicate items).
UPC Supplement	Number (5)	Supplement for the UPC. Note: UPC Supp is only valid for 9.0 implementation. For 10.1 implementation, this field will ALWAYS be blank.	N	Reject transaction to file if: <ul style="list-style-type: none"> UPC supplement exists and UPC doesn't exist UPC supplement exists and is not numeric
Item	Char(25)	Item for this detail record. Item number is verified and stored in IM_INVOICE_DETAIL.ITEM or IM_DOC_DETAIL_REASON_CODES.ITEM.	Y Exclusive with UPC	Reject transaction to file if: <ul style="list-style-type: none"> UPC is null and Item is null Both UPC and Item are not null Valid item is not associated with the supplier The item found is identical to another detail item for this transaction (no duplicate items).

Field Name	Field Type	Description	Req	Validation
VPN	Char(30)	Vendor Product Number provided by the supplier. It is used to identify an item when an item number has not been provided. VPN is displayed on the Invoice Maintenance screen and may be used during the on-line matching process.	Y (exclusive with item and UPC)	Reject transaction to file if: <ul style="list-style-type: none"> VPN is null and Item is null and UPC is null. At least two of the following are not null: UPC, VPN and ITEM. Reject transaction to tables if: <ul style="list-style-type: none"> Valid item is not found for VPN for the supplier. The item found is identical to another detail item for this transaction (no duplicate items). There are multiple items for the supplier with the VPN provided and: No items on the PO for the document, OR multiple items on the PO for the document.
Sign Indicator	Char(1)	Indicates either a positive (+) or a negative (-) Original Document Quantity amount.	Y	Reject transaction to file if sign indicator is null or if it is not '+' or '-'.
Original Document Quantity	Number (12,4)	Quantity, in EACHES, of the item on this detail record. Stored in IM_INVOICE_DETAIL.I NVOICE_QTY and IM_INVOICE_DETAIL.RESOLUTION_ADJUSTED_QTY.	Y	Reject transaction to file if: <ul style="list-style-type: none"> Original document quantity is null Original document quantity is not numeric
Sign Indicator	Char(1)	Indicates either a positive (+) or a negative (-) Original Unit Cost amount.	Y	Reject transaction to file if sign indicator is null or if it is not '+' or '-'.
Original Unit cost	Number (20,4)	Unit cost, in document currency, of the item on this detail record. Stored in IM_INVOICE_DETAIL.U NIT_COST and IM_INVOICE_DETAIL.RESOLUTION_ADJUSTED_UNIT_COST.	Y	Reject transaction to file if: <ul style="list-style-type: none"> Original unit cost is null Original unit cost is not numeric
Original VAT Code	Char (6)	VAT code for item	Y	Reject to file if VAT code is invalid
Original VAT rate	Number (20,10)	VAT Rate for the VAT code/item	Y	Reject to file if VAT rate is not numeric

Field Name	Field Type	Description	Req	Validation
Sign Indicator	Char(1)	Indicates either a positive (+) or a negative (-) total allowance. Default is "+" if no allowances exist for this detail record.	Y	Reject transaction to file if: <ul style="list-style-type: none"> Sign indicator is null Sign indicator is not '+' or '-'
Total Allowance	Number (20,4)	Sum of allowance details for this item detail record. If no allowances exist for this item detail record, value is 0.	Y	Reject transaction to file if: <ul style="list-style-type: none"> Total allowance is null Total allowance is not numeric Total allowance does not equal the sum of allowance amounts for all allowance records in this item detail record Total allowance is not 0 and vendor document type is CRDNT

TALLW – Allowance Record

This information is inserted into IM_INVOICE_DETAIL_ALLOWANCE table.

Field Name	Field Type	Description	Req	Validation
Record descriptor	Char(5)	Describes file record type.	Y	TALLW
Line id	Number(10)	Sequential file line number.	Y	Halt execution if not in sequence.
Transaction Number	Number(10)	Transaction number for this item allowance record.	Y	Reject entire file if: <ul style="list-style-type: none"> Transaction number is not numeric Transaction number is not the same as the current transaction
Allowance code	Char(6)	Allowance code for this allowance record. Stored in IM_INVOICE_DETAIL_ALLOWANCE.ALLOWANCE_CODE.	Y	Reject transaction to file if: <ul style="list-style-type: none"> Allowance code is null Allowance code is not valid
Sign Indicator	Char(1)	Indicates either a positive (+) or a negative (-) allowance amount.	Y	Reject transaction to file if sign indicator is null or if it is not '+' or '-'.

Field Name	Field Type	Description	Req	Validation
Allowance Amount	Number (20,4)	Amount of allowance in document currency. Stored in IM_INVOICE_DETAIL_ALLOWANCE.ALLOWANCE_AMOUNT.	Y	Reject transaction to file if allowance amount is null or not numeric.
Allowance VAT Code	Char (6)	VAT Code for Allowance	Y	Reject to file if VAT code is not valid.
Allowance VAT rate at this VAT code	Number (20,10)	VAT Rate corresponding to the VAT code	Y	Reject to file if not numeric

TNMRC – Non-Merchandise Record

Records of this type will contain non-merchandise costs. These costs are inserted into the IM_DOC_NON_MERCH table. Non-merchandise costs records are only required when the document type is non-merchandise. Non-merchandise cost records are also associated with merchandise type documents if the vendor associated with the document allows non-merch costs on merchandise invoices (IM_SUPPLIER_OPTIONS.MIX_MERCH_NON_MERCH_IND).

Field Name	Field Type	Description	Req	Validation
Record descriptor	Char(5)	Describes file record type.	Y	TNMRC
Line id	Number (10)	Sequential file line number.	Y	Halt execution if not in sequence.
Transaction number	Number(10)	Transaction number for this non-merchandise record.	Y	Reject entire file if: <ul style="list-style-type: none"> ▪ Transaction number is not numeric ▪ Transaction number is not the same as the current transaction
Non Merchandise Code	Char(6)	Non-Merchandise code that describes this cost. Stored in IM_DOC_NON_MERCH.NON_MERCH_CODE.	Y	Reject transaction to file if: <ul style="list-style-type: none"> ▪ Non-merchandise code is null ▪ Non-merchandise code is not valid
Sign Indicator	Char(1)	Indicates either a positive (+) or a negative (-) Non Merchandise Amt.	Y	Reject transaction to file if sign indicator is null or if it is not '+' or '-'.

Field Name	Field Type	Description	Req	Validation
Non Merchandise Amt	Number (20,4)	Cost in the document currency. Stored in IM_DOC_NON_MERCH.NON_MERCH_AMT.	Y	Reject transaction to file if: <ul style="list-style-type: none"> Non-merchandise amount is null Non-merchandise amount is not numeric. Non-merchandise amount does not have a negative value and this is part of a credit note document (THEAD.Vendor Document Type = 'CRDNT').
Non Merch VAT Code	Char (6)	VAT Code for Non-Merchandise	Y	Reject to file if VAT code is not valid.
Non Merch VAT code at this VAT code	Number (20, 10)	VAT Rate corresponding to the VAT code	Y	Reject to file if not numeric
Service Performed Indicator	Char(1)	Indicates if a service has actually been performed. Stored in IM_DOC_NON_MERCH.SERVICE_PERF_IND.	Y	Reject transaction to file if: <ul style="list-style-type: none"> Service performed indicator is null Service performed indicator is not Y or N
Store	Number (10)	Store at which the service was performed. Stored in IM_DOC_NON_MERCH.STORE.	N	Reject transaction to file if: <ul style="list-style-type: none"> Store exists and is not numeric Service performed indicator is Y and store is not valid

TTAIL – Transaction Tail

This information marks the end of a transaction.

Field Name	Field Type	Description	Req	Validation
Record descriptor	Char(5)	Describes file record type.	Y	TTAIL
Line id	Number(10)	Sequential file line number.	Y	Halt execution if not in sequence.
Transaction number	Number(10)	Transaction number for the transaction that this record is closing.	Y	Reject entire file if: <ul style="list-style-type: none"> Transaction number is not numeric Transaction number is not the same as the current transaction.
Transaction lines	Number(6)	Total number of detail lines within this transaction.	Y	Reject transaction to file if transaction lines is not numeric, if it does not match the count of lines within the transaction, or if it is zero (transaction must have details).

FTAIL – File TAIL

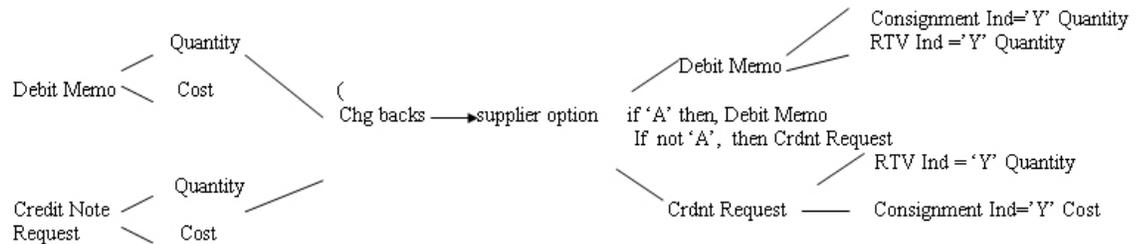
This information marks the end of the upload file.

Field Name	Field Type	Description	Req	Validation
Record descriptor	Char(5)	Describes file record type.	Y	FTAIL
Line id	Number(10)	Sequential file line number.	Y	Halt execution if not in sequence.
Number of lines	Number(10)	Total number of lines within this file not counting FHEAD and FTAIL.	Y	Halt execution if number of lines is not numeric, if it does not match the count of lines within the file (excluding FHEAD and FTAIL), or if it is 2 (FHEAD and FTAIL only, file has no transactions).

Appendix

Notes:

1. The EDI document upload process only has the ability to recognize a new document type. In FHEAD of the EDI flat file, the Document Type does not include CRDMC (credit memo cost). When the document type in the flat file is Debit Memo Cost, Debit Memo Qty, Credit Note Request Cost, or Credit Note Request Qty, and if the amount (Total Cost) for a Deal Charge Back Document that is sent over from RMS is negative a Credit Memo Cost is created.
2. For the charge back documents, to decide what document type to be populated in the database, a flow chat is displayed as follows:



3. If the document type is “merchandise invoice”, and if the consignment indicator is ‘Y’, the status would be “matched”, if the consignment Indicator is not ‘Y’, the status would be “ready for match”.
If the document type is not “merchandise invoice”, the status would be “approved”.
4. If the consignment indicator is ‘Y’, then set the terms to the “Due Immediately” terms (term id = “48”), and set the terms discount percentage 0.
5. That VAT codes and rates in the detail of documents are those known for the item and location when the document is not an import Document. Given a combination of TDETL.item and location, we could find a VAT. The VAT code and VAT rate in the VAT should be the same as the original VAT code and original VAT rate in the TDETL.
6. The merchandises header VAT and detail VAT are consistent. (For example, VAT basis by VAT rate and VAT amount by VAT rate). Total header Merchandise VAT information is calculated from total document VAT information and VAT information for non merchandise costs.
For example, for each VAT Code in TDETL and TNMRC: Thead.Total VAT Amount at this VAT code = total VAT from TDETL at this VAT code + total VAT from TNMRC at this VAT code
Total VAT from TDETL at this VAT code = sum(original document quantity * original unit cost * original VAT rate)
Total VAT from TNMRC at this VAT code =sum(Non Merch VAT rate * Non Merch Amt)
Thead.Total VAT Amount at this VAT code = sum(TVATS.VAT rate * TVATS.cost at this VAT code)
7. For an EDI upload document, if the VAT Region of the header is different from the VAT region of the supplier, it is an import document. Import document will not contain VAT information. (LocVatRegion != SupplierVatRegion, then it is an import document). If a document is not an import document, plus the system_option.vat is on; if the TVATS is null, reject to file.

8. To decide whether a VAT code is valid in the TDETL, first find the VAT code given the information of item and location. If they are equal, Then the VAT code is valid, if they are not equals, check if the VAT code exists in the effective VAT codes, if the VAT code exists, then it is valid, but is populated to the audit table.
9. If RTV indicator or consignment indicator is 'YES' and deal id is not null, must reject to file.
10. If Item field is populated and there is an error it should always reject to file. In order to reject to the tables, we must have the UPC field populated and not the Item field.

EDI Invoice Download File Layout (Based on EDI 812)

I/O Specification

All Files Layouts Input and Output

Output file format:

FHEAD (1): Start of file.

THEAD (1...n): Transaction (document) level info. Each file must have at least 1 THEAD.

TDETL (0...n): Item detail records for this transaction.

TNMRC (0...n): Non-merchandise records for this transaction.

Required on non-merchandise documents, optional otherwise.

TVATS (0...n): Doc VAT detail records for this transaction, optional.

TTAIL (1...n): Marks the end of a THEAD record. Each THEAD requires exactly one TTAIL.

FTAIL (1): Marks the end of the file.

If records are encountered in any order other than specified above, execution of program will halt.

Example:

FHEAD

THEAD

TNMRC

TVATS

FTAIL (no TTAIL encountered)

If a record descriptor is encountered other than those specified in this document, execution of program will halt.

All character variables should be right-padded with blanks and left justified; all numerical variables should be left-padded with zeroes and right-justified. Null variables should be blank.

Note: The file is not threaded, but rather ordered by vendor id (THEAD). It is assumed that this file is broken out by vendor id during the translation process.

FHEAD – File Header. First record of an upload file.

Field Name	Field Type	Description	Req	Validation
Record descriptor	Char(5)	FHEAD	Y	
Line id	Number(10)	Generated Sequential file line number.	Y	
Gentran ID	Char(5)	DNINV	Y	
Current date	Char(14)	File date in YYYYMMDDHH24MISS format.	Y	

THEAD – Transaction Header. Start of a document transaction.

Field Name	Field Type	Description	Req	Validation
Record descriptor	Char(5)	THEAD	Y	
Line id	Number (10)	Generated Sequential file line number.	Y	
Transaction number	Number(10)	Sequential transaction number. All records within this transaction will also have this transaction number.	Y	
Document Type	Char(6)	Describes the type of document being downloaded. The document type will determine the types of detail information that are valid for the document downloaded. Retrieved from IM_DOC_HEAD.TYPE where type is debit memo, credit note request or credit memo and in Approved or Posted Status.	Y	Debit memo, credit note request cost, credit note request quantity, credit memos in approved status
Vendor Document Number	Char (30)	Vendor's document number. Retrieved from IM_DOC_HEAD.EXT_DOC_ID.	Y	
Invoice Number	Char(6)	Corresponding invoice resolved by the document. Retrieved from IM_DOC_HEAD.REF_DOC.	Y	
Vendor ID	Number(10)	Vendor for this document. Retrieved from IM_DOC_HEAD.VENDOR	Y	
Document Date	Char(14)	Date the document was entered into the system in YYYYMMDDHH24MISS format. Retrieved from IM_DOC_HEAD.DOC_DATE	Y	

Field Name	Field Type	Description	Req	Validation
Order	Number(10)	Order number for this document, if any. Retrieved from IM_DOC_HEAD.ORDER_NO	N	
Location	Number(10)	Location for this document, if any. Retrieved from IM_DOC_HEAD.LOCATION.	N	
Location Type	Char(1)	Location type for this document, if any. Retrieved from IM_DOC_HEAD.LOC_TYPE.	N	
Terms	Char(15)	Terms of this document. Retrieved from IM_DOC_HEAD.TERMS.	N	
Due Date	Char(14)	Date the amount due is due from the vendor (YYYYMMDDHH24MISS format). Retrieved from IM_DOC_HEAD.DUE_DATE.	N	
Currency Code	Char(3)	Currency code for this document. Retrieved from IM_DOC_HEAD.CURRENCY_CODE.		
Exchange rate	Number(12,4)	Exchange rate for conversion of document currency to the primary currency. Retrieved from IM_DOC_HEAD.EXCHANGE_RATE.	N	
Sign indicator	Char(1)	Indicates either a positive (+) or a negative (-) total cost.	Y	
Total Cost	Number(20,4)	Total document cost, including all items and costs on this document. This value is in the document currency. Retrieved from IM_DOC_HEAD.TOTAL_COST.	Y	
Sign indicator	Char(1)	Indicates either a positive (+) or a negative (-) total VAT amount	Y	
Total VAT Amount	Number(20,4)	Total VAT amount, including all items and costs on this document. This value is in the document currency.	N	
Sign indicator	Char(1)	Indicates a positive (+) or negative (-) quantity	Y	
Total Quantity	Number(12,4)	Total quantity of items on this document. This value is in EACHES (no other units of measure are supported in ReIM). Retrieved from IM_DOC_HEAD.TOTAL_QTY.	Y	

TDETL – Item Detail Record. This information is inserted into the IM_DOC_DETAIL_REASON_CODES table.

Field Name	Field Type	Description	Req	Validation
Record descriptor	Char(5)	TDETL	Y	
Line id	Number(10)	Generated Sequential file line number.	Y	
Transaction number	Number(10)	Generated Transaction number for this item detail record.	Y	
Item	Char(25)	Internal SKU/Item for this document. This is always sent. Retrieved from IM_DOC_DETAIL.ITEM.	Y	
UPC	Char(25)	UPC for this detail record. Retrieved from UPC_EAN.UPC (RMS 9.0) or ITEM_MASTER.ITEM (RMS 10.1). This field is sent if available. Note: UPC is used for RMS 9.0 and Ref-Item is used for RMS 10.1. Ref-Item consists of UPC and UPC-Supp appended together with a separating hyphen(-).	N	
UPC Supplement	Number(5)	Supplement for the UPC. Retrieved from UPC_EAN.UPC_SUPPLEMENT. This field is sent if available. Note: UPC Supp is only valid for 9.0 implementation. For 10.1 implementation, this field will always be blank.	N	
VPN	Char(30)	Vendor Product Number. This field is sent if available. Retrieved from ITEM_SUPPLIER.VPN.	N	
Comments	Char(200)	Comments associated with Reason Code. Retrieved from IM_DOC_DETAIL_COMMENTS.TEXT	Y	
Reason Code	Char(6)	Reason Code for this document. Retrieved from IM_DOC_DETAIL_REASON_CODES.REASON_CODE_ID	Y	
Reason Code description	Char(50)	Description associated with Reason Code. Retrieved from IM_REASON_CODES.REASON_CODE_DESC		
Sign indicator	Char(1)	Indicates a positive (+) discrepant qty.	Y	

Field Name	Field Type	Description	Req	Validation
Discrepant Quantity	Number(12,4)	Quantity, in EACHES, of the item that is discrepant for this detail record. Retrieved from IM_DOC_DETAIL_REASON_CODE S.ADJUSTED_QTY.	Y	
Sign Indicator	Char(1)	Indicates either a positive (+) or a negative (-) discrepant cost.	Y	
Discrepant cost	Number(20,4)	Unit cost, in document currency, of the item that is discrepant for this detail record. Retrieved from IM_DOC_DETAIL_REASON_CODE S.ADJUSTED_UNIT_COST.	Y	
Original VAT Code	Char (6)	VAT code for item		
Original VAT rate	Number (20,10)	VAT Rate for the VAT code/item		

TNMRC – Non-Merchandise Record. Records of this type will contain non-merchandise costs. These costs are retrieved from the IM_DOC_NON_MERCH table. Non-merchandise cost records are only required when the document type is non-merchandise. Non-merchandise cost records are also associated with merchandise type documents if the vendor associated with the document allows non-merch costs on merchandise invoices (IM_SUPPLIER_OPTIONS. MIX_MERCH_NON_MERCH_IND).

Field Name	Field Type	Description	Req	Validation
Record descriptor	Char(5)	TNMRC	Y	
Line id	Number (10)	Generated Sequential file line number.	Y	
Transaction number	Number(10)	Generated Transaction number for this non-merchandise record.	Y	
Non Merchandise Code	Char(6)	Non-Merchandise code that describes this cost. Retrieved from IM_DOC_NON_MERCH.NON_MERCH_CODE.	Y	
Sign indicator	Char(1)	Indicates either a positive (+) or a negative (-) non merchandise amount.	Y	
Non Merchandise Amt	Number(20,4)	Cost in the document currency. Retrieved from IM_DOC_NON_MERCH.NON_MERCH_AMT.	Y	
Non Merch VAT code	Char(6)	VAT Code for Non_merchandise	Y	
Non Merch VAT code at this VAT code	Number(20, 10)	VAT Rate corresponding to the VAT code	Y	

TVATS – VAT Detail record.

Field Name	Field Type	Description	Req	Validation
Record descriptor	Char(5)	TVATS	Y	
Line id	Char(10)	Sequential file line number	Y	
Transaction number	Number(10)		Y	
VAT code	Char(6)	VAT code that applies to cost	Y	
VAT rate	Number (20, 10)	VAT Rate corresponding to the VAT code	Y	
Sign indicator	Char(1)	Indicates either a positive (+) or a negative (-) Original Document Quantity amount.	Y	
VAT Basis	Number(20,4)	Total amount that must be taxed at the above VAT code	Y	

TTAIL – Transaction Tail. Marks the end of a transaction.

Field Name	Field Type	Description	Req	Validation
Record descriptor	Char(5)	TTAIL	Y	
Line id	Number(10)	Generated Sequential file line number.	Y	
Transaction number	Number(10)	Generated Transaction number for the transaction that this record is closing.	Y	
Transaction lines	Number(6)	Total number of detail lines within this transaction.	Y	

FTAIL – File TAIL. Marks the end of the upload file.

Field Name	Field Type	Description	Req	Validation
Record descriptor	Char(5)	FTAIL.	Y	
Line id	Number(10)	Generated Sequential file line number.	Y	
Number of lines	Number(10)	Total number of lines within this file, not including FHEAD and FTAIL.	Y	

The Merchandise System Interface

The retailer's merchandising system provides basic data about the purchase orders and receipts to which ReIM matches invoices. ReIM accesses this reference information for invoices (for example, supplier details, purchase order information, receipt information, and so on) using an interface data access layer (DAL) to the merchandising system. The DAL is a series of isolated SQL statements that involve merchandising system tables.

ReIM holds invoice matching-specific information in its own tables. The vast majority of the DAL reads information from the merchandising system. A small portion of the DAL writes the results of invoice matching to the merchandising system's record for the receipt.

Interface Data Flows

To understand the type of data that is exchanged between ReIM and the merchandising system, see Chapter 4 – "Functional Design."

Porting

If a retailer wishes to implement ReIM with another merchandising system (or with a custom version of RMS), the retailer must port the interface DAL so that ReIM has access to the correct merchandising system reference information. Porting the interface DAL is a straightforward process.

The interface DAL code is segmented from the rest of the application code. The main task in porting the interface DAL is in the changing of the SQL code to reference the tables in the applicable merchandising system. The primary skill needed for the porting process is knowledge of the merchandising system's schema and some basic SQL. Java knowledge is needed to compile, test, and deploy the application using the new interface DAL.

DAL Beans

Each element of the ReIM interface DAL has two to three components: an abstract bean that defines the bean signature, a concrete bean implementation that connects to the database, and possibly an interface bean that is similar to the abstract bean. The interface beans were put in place to provide for a mock testing framework of the database. ReIM provides concrete beans that reference base RMS 13.x.

At runtime, a bean factory controller determines which concrete DAL implementation to use by consulting the properties file, `com.retek.reim.reim.properties`.

The following tables illustrate the ReIM DAL to the RMS 13.x interface:

RMS 13.x referencing beans and APIs	
AddrBean	ClassBean
CurrenciesBean	CurrencyRateBean
DealBean	DeptBean
ItemBean	ItemSuppCountryBean
ItemSupplierBean	LangBean
LocationBean	NonMerchCodeHeadBean
OrderBean	OrderLocationBean
PartnerBean	PeriodBean
RtvBean	ShipmentBean
ShipmentAPI	ShipSkuBean
StagePurgedShipmentsBean	StagePurgedShipskusBean
SupplierBean	SupTraitBean
SupTraitMatrixBean	SystemOptionsBean
TermsBean	TLShadowBean
TLShadowItemBean	TLShadowItemSupplierBean
UpcBean	VendorBean
VatCodeRatesBean	

Interface DAL Porting Example

As mentioned above, the DAL layer of ReIM is designed to support the replacement of the persistence mechanism that stores the actual data that is used to create the business objects used in the upper layers of ReIM.

As an example of this replacement process, this section illustrates the replacement of the AddrBean within ReIM. For the retailer, this example serves as a starting guide for the way to replace any general interface DAL object implementation within ReIM.

The AddrBean provides the data for the business object that represents a particular supplier's invoice address.

In general, the following steps provide the easiest method of modifying the ReIM interface DAL implementations:

1. Copy the interface DAL to your own java package.
2. Locate the SQL statements within the bean code and modify them to suit your own merchandising system.
3. Compile the new classes and place the class files into your http server environment.
4. Modify the beanDriver property in the com.retek.reim.reim.properties file to point to the new implementation.

ReIM Interface DAL Components

Properties File

The properties file `com.retek.reim.reim.properties` contains one property that is of importance when porting the ReIM interface DAL. The 'beanDriver' is the path to the applicable interface DAL beans. For example, if the retailer is using the standard RMS 13.x interface beans, this property would be:

```
com.retek.reim.foundation.rms12
```

If your implementation requires either a DAL to another merchandising system, you should add a folder to the package structure (for example, `com.retek.reim.foundation.xyz8`) to hold the interface DAL beans. Reference this path as the beanDriver in your `com.retek.reim.reim.properties` file.

Interface DAL Classes Overview

The interface DAL is comprised of two or three types of classes: abstract bean, (possibly) interface beans, and concrete implementation of the abstract and interface beans.

The abstract and interface beans provide the 'signature' of the interface DAL. That is, they provide the type information that is passed into a specific bean and the type of information that the service layer expects to be passed out of the bean. The abstract or interface beans are referenced in the application code using the BeanFactory pattern. The BeanFactory checks to see which version of the concrete implementation should actually be called and makes the call.

The concrete implementations of abstract or interface beans actually perform database operations. ReIM is shipped with concrete beans that provide interfaces to base RMS 13.x. The properties file 'beanDriver' determines which set of queries is actually used.

If the retailer is porting the ReIM interface DAL to another version of RMS or to another merchandising system, the retailer need not change the presentation layer, service layer, or abstract or interface bean code. Instead, the retailer must create concrete implementations of the abstract or interface beans. These concrete beans must provide the correct information for the applicable merchandising system. Creating these concrete implementations is fairly simple if the retailer has a through knowledge of its schema, especially as it relates to the business functions of the merchandising system.

Abstract and Interface Beans

The ReIM DAL abstract and interface classes are located in the Java package `com.retek.reim.foundation`. These all follow the naming convention `ABusinessConceptBean.java` (meaning 'A'bstact version of the Business Concept Bean). In the case of an interface bean, the convention is `IBusinessConceptBean.java`. Each is a Java interface that declares the methods (and their parameters) that need to be provided by an implementation DAL class.

The following code represents a very simple example of the abstract bean, AAddrBean.java.

```
package com.retek.reim.foundation;

import com.retek.reim.merch.utils.ReIMException;

abstract public class AAddrBean
{
    abstract public long selectAddrKey(String vendor, String vendorType)
        throws ReIMException;
}
```

The AAddrBean provides the signature for any concrete implementations of the bean. The AAddrBean defines one method: selectAddrKey. The bean also defines the parameters of the method, returns a long and takes in a string that represents a vendor and a string that represents a vendor type. The AAddrBean does not have nor need any additional visibility as to how this information is actually retrieved.

This abstract AAddrBean is referenced in the application code using a BeanFactory. The BeanFactory package looks at the properties file and determines which concrete implementation of this bean should be used to actually retrieve data from the database.

Concrete Implementations of Abstract and Interface Beans

Abstract or interface beans do not actually access the database and retrieve data. Abstract or interface beans provide the signature, and concrete beans actually do the work of interfacing with the database.

The RMS 13 standard implementation of the abstract AAddrBean (com.retek.reim.foundation.AAddrBean) is AddrBean (com.retek.reim.foundation.rms13.AddrBean). The concrete implementation of the bean is represented by the following:

```
package com.retek.reim.foundation.rms13;

import java.sql.Connection;
import java.sql.PreparedStatement;
import java.sql.ResultSet;
import java.sql.Statement;

import com.retek.reim.business.vendor.Vendor;
import com.retek.reim.foundation.AAddrBean;
import com.retek.reim.merch.utils.ReIMException;
import com.retek.reim.merch.utils.ReIMSeverity;
import com.retek.reim.merch.utils.ReIMTransactionManager;

public class AddrBean extends AAddrBean



---



---

Note: In case an interface bean exists, the line above would read as follows:

---



---



```
public class AddrBean extends AAddrBean implements IAddrBean
{
 public long selectAddrKey(String vendor, String vendorType)
 throws ReIMException
 {
 long addrKey = -1L;
 Statement stmt = null;
 ResultSet rs = null;

 try
 {
```


```

```

        Connection conn = ReIMTransactionManager.getConnection();

        stmt = conn.createStatement();

        String query =
            "SELECT ADDR_KEY FROM ADDR "
            + "WHERE (MODULE = 'SUPP' "
            + "AND KEY_VALUE_1 = '"
            + vendor
            + "')"
            + " OR (MODULE = 'PTNR' "
            + "AND KEY_VALUE_1 = '"
            + vendorType
            + "' AND KEY_VALUE_2 = '"
            + vendor
            + "')"
            + " AND ADDR_TYPE = '01' ";

        rs = stmt.executeQuery(query);

        while (rs.next())
        {
            addrKey = rs.getLong(1);
        }

        return addrKey;
    }
    catch (Exception e)
    {
        throw new ReIMException(
            "error.sql_error",
            ReIMSeverity.ERROR,
            e,
            this);
    }
    finally
    {
        try
        {
            if (rs != null)
            {
                rs.close();
            }
            if (stmt != null)
            {
                stmt.close();
            }
        }
        catch (Exception e)
        {
            throw new com.retek.reim.merch.utils.ReIMException(
                "Error.sql_error",
                ReIMSeverity.ERROR,
                e,
                this);
        }
    }
}

public Long getDocumentAddressKey(String vendorType, String vendorId) throws
ReIMException
{
    PreparedStatement stmt = null;

```

```
ResultSet rs = null;

String supplierQuery = "SELECT * FROM ADDR WHERE MODULE = 'SUPP' AND KEY_VALUE_1
= ? AND ADDR_TYPE = '05' ";
String partnerQuery = "SELECT * FROM ADDR WHERE MODULE = 'PTNR' AND KEY_VALUE_1 =
? AND KEY_VALUE_2 = ? AND ADDR_TYPE = '05' ";

try
{
    Connection conn = ReIMTransactionManager.getConnection();
    if (vendorType.equals(Vendor.SUPPLIER))
    {
        stmt = conn.prepareStatement(supplierQuery);
        stmt.setString(1, vendorId);
    }
    else
    {
        stmt = conn.prepareStatement(partnerQuery);
        stmt.setString(1, vendorType);
        stmt.setString(2, vendorId);
    }

    rs = stmt.executeQuery();
    if (rs.next())
    {
        return (new Long(rs.getLong("ADDR_KEY")));
    }
    return null;
}
catch (Exception e)
{
    throw new ReIMException(
        "Error.sql_error",
        ReIMSeverity.ERROR,
        e,
        this);
}
finally
{
    try
    {
        if (rs != null)
        {
            rs.close();
        }
        if (stmt != null)
        {
            stmt.close();
        }
    }
    catch (Exception e)
    {
        throw new com.retek.reim.merch.utils.ReIMException(
            "Error.sql_error",
            ReIMSeverity.ERROR,
            e,
            this);
    }
}

public boolean validAddressKey(String vendorType, String vendorId) throws
ReIMException
```

```

    {
        PreparedStatement stmt = null;
        ResultSet rs = null;

        String supplierQuery = "SELECT * FROM ADDR WHERE MODULE = 'SUPP' AND KEY_VALUE_1
= ? ";
        String partnerQuery = "SELECT * FROM ADDR WHERE MODULE = 'PTNR' AND KEY_VALUE_1 =
? AND KEY_VALUE_2 = ? ";

        try
        {
            Connection conn = ReIMTransactionManager.getConnection();
            if(vendorType.equals(Vendor.SUPPLIER))
            {
                stmt = conn.prepareStatement(supplierQuery);
                stmt.setString(1,vendorId);
            }
            else
            {
                stmt = conn.prepareStatement(partnerQuery);
                stmt.setString(1,vendorType);
                stmt.setString(2,vendorId);
            }

            rs = stmt.executeQuery();
            if(rs.next())
            {
                return true;
            }
            return false;
        }
        catch (Exception e)
        {
            throw new ReIMException(
                "Error.sql_error",
                ReIMSeverity.ERROR,
                e,
                this);
        }
        finally
        {
            try
            {
                if (rs != null)
                {
                    rs.close();
                }
                if (stmt != null)
                {
                    stmt.close();
                }
            }
            catch (Exception e)
            {
                throw new com.retek.reim.merch.utils.ReIMException(
                    "Error.sql_error",
                    ReIMSeverity.ERROR,
                    e,
                    this);
            }
        }
    }
}

```

This concrete implementation of the bean actually accesses the database and gets information.

Because the main application code references the abstract or interface bean, and the abstract or interface bean (through the bean factory) references the concrete bean, only concrete beans need to be changed to interface ReIM with a different merchandising system (one other than 13.x). The distinct layering of the application architecture makes the changes needed to port to a different merchandising system very minimal.

Porting Concrete Beans

If the retailer's implementation requires either a DAL to another merchandising system or to another version of RMS, the retailer must create an applicable DAL.

For example:

Suppose RMS 13.x holds supplier invoice addresses in the exact same manner as the next version of RMS, RMS x. If the retailer wishes to implement ReIM against RMS x, the retailer would set its `com.retek.reim.reim.properties` beanDriver to `com.retek.reim.foundation.rmsx` and create the directory in the package structure. The retailer could then copy `com.retek.reim.foundation.rms13.AddrBean` to `com.retek.reim.foundation.rmsx.AddrBean`. Because RMS 13.x and RMS x handle supplier invoice addresses identically, the retailer then is finished porting the `AddrBean`. The retailer also needs to copy the RMS 13.x versions of all other concrete interface beans into the RMS x bean driver directory. Some of these other beans (`ItemBean`, and so on) might be modified to make ReIM work with RMS x because of schema differences between versions of RMS.

The retailer would need to create a concrete bean for each of the abstract beans in the ReIM DAL. Depending upon the differences between RMS 13.x and the system the retailer is implementing against, the retailer is able to simply copy and paste all the beans into its new driver package. However, the retailer would most likely need to modify the SQL code (and not the Java) in some of these concrete beans to make them return the correct data from the merchandising system.

If the retailer defined its `com.retek.reim.reim.properties` beanDriver as `com.retek.reim.foundation.xyz8`, the retailer would need to create an `AddrBean` in the `com.retek.reim.foundation.xyz8` package structure. This `AddrBean` should do whatever is necessary to extract the invoice address for a supplier from whatever data structures hold this information. The `AddrBean` must take the vendor and vendor type as input parameters and return an address ID key as a long. The most likely changes to the `AddrBean` would occur in the SQL code.

As long as it extends the `AAddrBean` and therefore has the same signature, the `AddrBean` could perform any type of additional processing. The retailer must create concrete implementations for each abstract or interface bean.

Summary of Porting Steps for Custom Merchandising Systems

To implement ReIM with a custom merchandising system (in other words, a merchandising system other than RMS 13.x), follow these high-level steps:

1. Determine the DAL data source.
2. Set the `com.retek.reim.reim.properties` beanDriver to the data source.
3. Create the directory specified as the beanDriver.
4. Copy the RMS13.x beans into the beanDriver directory. Make sure that you have a concrete bean for each of the abstract or interface beans.

or

Copy some RMS13.x concrete beans. Make sure that you have a concrete bean for each of the abstract or interface beans.

5. Modify the SQL in the beanDriver concrete beans (as needed) to fetch the appropriate information from the data source.
6. Compile, test, and deploy.

Staging Tables

The receiver cost adjustment and receiver unit adjustment interfaces to the merchandising system are handled through staging tables. These interfaces involve particularly complex business processes that are often modified by retailers as part of RMS (or merchandising system-equivalent) implementations.

Because no standard path is satisfactory to all retailers, ReIM does not attempt to execute all of the business processes in RMS (or its equivalent). Rather, ReIM writes pertinent information to staging tables. There is an interface (non-RIB) between ReIM and RMS that feeds receiver adjustments to RMS, and updates RMS tables accordingly. Depending upon what is specified by ReIM users when requesting an adjustment, the updates can be to quantity received, PO unit cost, and item-supplier-level unit cost.

For receiver cost adjustments, ReIM writes a record containing the purchase order, item, location, old cost, and corrected cost to a receiver cost adjustment staging table.

For receiver unit adjustments, ReIM writes a record containing the shipment, the sequence number (in case of multiple containers), purchase order, location, old quantity, and corrected quantity to a receiver unit adjustment staging table.

The Financial System Interface

ReIM has two types of financial interfaces: foundation financial data and transactional information. Both are described in this section.

Foundation Financial Data

The following types of financial information are imported in ReIM:

- Terms ranking data
- Variable department/class account segments
- Variable company/location account segments

Terms ranking information is used in the best terms calculation to choose the best term for each document. This best terms information is posted to the financial system.

Variable department/class and company/location segments are used to determine the account segments to which a document is posted.

The retailer is responsible for populating variable department/class and company/location segments. No API is provided.

Location Account Segments

ReIM uses location account segments in general ledger (GL) account mappings. ReIM does not provide an interface for this information because it does not directly relate to other information in ReIM. ReIM expects the retailer to directly populate the ReIM location account segments table and keep it in sync with the financial application.

Department/Class Account Segments

ReIM uses department account segments in GL account mappings. ReIM does not provide an interface for this information because it does not directly relate to other information in ReIM. ReIM expects the retailer to directly populate the ReIM department account segment table.

Financial Transactions

To be independent of any single financial product, such as Oracle Financials, Oracle Retail has created a generic interface. That is, Oracle Retail writes records to a single generic table from which custom retailer code can read records and process data as necessary. The retailer is responsible creating a process that sends transactions to the financials system.

Complex and Fixed Deal-Related Posting

For complex and fixed deals, batch processes copy most of the data from the RMS staging tables into ReIM detail tables (IM_COMPLEX_DEAL_DETAIL, IM_FIXED_DEAL_DETAIL). Some of the data on these tables is later referenced during the posting process for the created documents, including:

- Location
- Item

Resolution Posting

To understand the process that posts data from ReIM to the financials staging table (IM_FINANCIAL_STAGE), see the section “Resolution Posting Batch Design” in Chapter 7 – “Batch Processes.”

Major Tables

- IM_DYNAMIC_SEGMENT_DEPT_CLASS
- IM_DYNAMIC_SEGMENT_LOC

Tracking Receipt Posts

Receipt tracking functionality allows the retailer to track what receipts have posted. This processing helps the retailer check the integrity of its financial data.

Note that Oracle Retail does not provide packaged reporting in conjunction with this processing. Rather, the retailer builds its own processes and creates its own reporting mechanisms against the data resulting from the receipt tracking functionality.

Tables Related to Tracking Receipt Posts

In-Process Tables

The tables illustrated below are for the retailer's understanding, but the data on these tables should not be used by the retailer as it builds its processes and reports.

Each area of the system that matches receipts to invoices updates the IM_RECEIPT_ITEM_POSTING table. This table tracks how much of an individual receipt item has been matched and posted.

IM_RECEIPT_ITEM_POSTING

Column Name	Type	Nullable
SEQ_NO	NUMBER(10)	N
RECEIPT_ID	NUMBER(10)	N
ITEM_ID	VARCHAR(25)	N
QTY_MATCHED	NUMBER(12,4)	Y
QTY_POSTED	NUMBER(12,4)	Y

IM_RCPT_ITEM_POSTING_INVOICE

Column Name	Type	Nullable
SEQ_NO (from IM_RECEIPT_ITEM_POSTING)	NUMBER(10)	N
DOC_ID	NUMBER(10)	N
STATUS	VARCHAR2(1)	Y

Staging Tables to be Used for Reporting

Once posting is completed, the following staging tables contain all currently posted entries. Thus, to build processes and reporting that tracks receipt posts, the retailer should use only the data from these staging tables.

IM_RECEIPT_ITEM_POSTING_STAGE

Column Name	Type	Nullable
SEQ_NO	NUMBER(10)	N
RECEIPT_ID	NUMBER(10)	N
ITEM_ID	VARCHAR(25)	N
QTY_POSTED	NUMBER(12,4)	N
CREATE_DATE	DATE	N

IM_RCPT_ITEM_POSTING_INV_STAGE

Column Name	Type	Nullable
SEQ_NO	NUMBER(10)	N
DOC_ID	NUMBER(10)	N

Multiple Lines for an Individual Receipt Item

For a given line item on a receipt, a line item can be split between multiple invoices. For example, one invoice could match half of a line item; another invoice could match the other half of the line item. Two separate lines would thus appear. The retailer should note that these values (and those in equivalent business scenarios) need adding together to indicate how much of a given receipt item is posted.

Matching and Tracking Receipt Posts Processing

When a match is made, the system creates an IM_RECEIPT_ITEM_POSTING record for each invoice item matched, setting the qty_matched value to the amount matched. In addition, the system creates an IM_RCPT_ITEM_POSTING_INVOICE record for each invoice matched, setting the status to 'M'. Rather than adding IM_RCPT_ITEM_POSTING_INVOICE records each time a portion of the line is matched, the system creates new sets of records for each match to a receipt item.

With regard to summary match processing, an IM_RCPT_ITEM_POSTING_INVOICE record exists for each invoice for each receipt line item. This record is not used to track which invoice and receipt line are matched, but the record allows the system to detect when to set the qty_posted amount in IM_RECEIPT_ITEM_POSTING. Also, when the system matches at a summary level, all associated records are deleted before current ones are created.

The quantity matched amount is set to either the receipt amount or the resolution amount.

Posting

With regard to the posting process, the system finds each record on the IM_RCPT_ITEM_POSTING_INVOICE table associated with the invoice being posted. When that line is posted, the system changes the status on that table to 'P'. The system then checks whether or not more records exist on that table for the same seq_no. If there are more records, the system engages in no further processing steps. If there are not more records, the system sets the qty_posted value to the amount in qty_matched for that seq_no in IM_RECEIPT_ITEM_POSTING. Because posting can only happen when both the cost and quantity discrepancies are resolved for an invoice, the resolution of cost discrepancies is not tracked.

Once posting is completed, all posted records are moved to the corresponding staging table for each table (IM_RECEIPT_ITEM_POSTING_STAGE and IM_RCPT_ITEM_POSTING_INV_STAGE). The processing involving the staging tables has been designed to enhance performance, so that matching and resolution functionality is not impacted adversely by the receipt tracking functionality.

Reporting

Reporting must be run after the posting batch job has completed. Both ReIM and the merchandising system (such as RMS) must be disabled from user input, and all other batch jobs should be completed or disabled.

To determine the remaining amount available to be posted, all entries for a given receipt item's qty_posted should be rolled up and subtracted from the related SHIPSKU entry. Any receipt write-offs should be added in order to determine the final number remaining against the receipt.

Again, the staging tables, IM_RECEIPT_ITEM_POSTING_STAGE and IM_RCPT_ITEM_POSTING_INV_STAGE, are used in building processes and/or reports against this data. Once posting is completed, these staging tables contain all currently posted entries.

LDAP and Other User Interfaces

There are two types of user authentication supported in ReIM: LDAP and database. A simple switch in the `reim.properties` file instructs the application as to which method to utilize. See Chapter 2 – “Backend System Administration and Configuration” for more information.

LDAP

LDAP stands for Light Directory Access Protocol. The LDAP standard defines a network protocol for accessing information in a directory.

LDAP is one of the means of user authentication that ReIM supports. If it is used, LDAP is only used within ReIM for user authentication. Because ReIM has specific requirements for ReIM user roles and permissions that are easily retailer configurable, these are defined in the application itself. ReIM reads standard user information from an LDAP server.

If the retailer already stores user information using LDAP, the only interfacing configuration that needs to be done is in an LDAP-specific properties file. The entries in this file point ReIM to the appropriate machine, port, and so on to find the LDAP server. Other properties may need to be modified to reflect the names of attributes that the retailer uses in its LDAP schema.

Additional LDAP Resources

- <http://www.openldap.org/>
This site contains the OpenLDAP main page. This site contains introduction, downloads, and documentation.
- <http://www.iit.edu/~gawojar/ldap/>
This site is the LDAP browser site.
- <http://ldap.akbhome.com/>
This site contains an LDAP schema view with some definitions of the standard LDAP object classes and attributes.

ReIM User Table

A retailer that does not use LDAP has the option of entering valid users into the ReIM user table. Note, however, that ReIM does not provide any method for inserting user information into the ReIM user table. The retailer is responsible for this interface associated with user information.

Oracle Retail Workspace Integration

The Oracle Retail Workspace (ORW) installer prompts you to enter the URL for your supported Oracle Retail applications. However, if a client installs a new application after Oracle Retail Workspace is installed, the `retail-workspace-page-config.xml` file needs to be edited to reflect the new application.

The file as supplied comes with all appropriate products configured, but the configurations of non-installed products have been "turned off". Therefore, when "turning on" a product, locate the appropriate entry, set "rendered" to "true", and enter the correct URL and parameters for the new application.

The entry consists of the main URL string plus one parameter named "config". The value of the config parameter is inserted by the installer. Somewhere in the installer property files there is a value for the properties "deploy.retail.product.reim.url" and "deploy.retail.product.reim.config".

For example, suppose ReIM was installed on `mycomputer.mycompany.com`, port 7777, using a standard install and reim configured with the application name of "reim130sedevhpsso". If you were to access ReIM directly from your browser, you would type in:

```
http://mycomputer.mycompany.com:7777/forms/frmservlet?config=reim130sedevhpsso
```

The entry in the `retail-workspace-page-config.xml` after installation would resemble the following:

```
<url>http://mycomputer.mycompany.com:7777/forms/frmservlet</url>
  <parameters>
    <parameter name="config">
      <value>reim130sedevhpsso</value>
    </parameter>
  </parameters>
```

Prior to configuring ORW, you must set up single sign-on. See the Oracle Single Sign-On Overview section in the Technical Design chapter for additional information.

Technical Design

This chapter contains information related to the technical design of ReIM.

Locking Design Summary

ReIM locking is accomplished using database tables that hold record level locks. The locking of tables is performed for several reasons, including the following:

- ReIM does not necessarily maintain a single connection throughout an entire screen/process. That is, the system opens a connection, fetches information, and then closes the connection. At a later moment in time, the system opens another connection to save changes and close the connection.
- ReIM cannot maintain locks in some kinds of Java session structures because the system may be involved with more than one Java virtual machine (JVM).

Locking and Tables

Base tables that contain information to be locked (for example, IM_SUPPLIER_OPTIONS) have a corresponding ..._LOCK table (for example, IM_SUPPLIER_OPTIONS_LOCK). The ..._LOCK table contains the same columns as the primary key of the base table.

When the system creates a lock, it writes the primary key values for the base table records to be locked to the appropriate ..._LOCK table. For example, if data in the IM_SUPPLIER_OPTIONS table is to be locked for supplier '12345', a record is written to the IM_SUPPLIER_OPTIONS_LOCK table for supplier with the primary key value '12345'.

When records in a base header table are locked, all detail records related to each locked header record are implicitly locked. Detail records are not explicitly locked because:

- ReIM functionality must 'go through' the header information to access detail information. In other words, the entry point to detail records is generally through the header.
- On screens and within backend processes that include header information, some kind of summary of the details also exists.

The following two examples represent this type of header detail locking:

Example 1

If user A is looking at the header, and user B changes the details, user A does not have visibility to the changes and might perform an invalid action. Invoices are stored on IM_DOC_HEAD, and the non-merchandise costs on invoices are stored on IM_DOC_NON_MERCH. On the invoice header screen, user A can see a sum of all of the non-merch costs for invoice 99999. If user B could somehow at the same time add new non-merchandise costs for invoice 99999, the information that user A sees as the summary of non-merchandise costs would be invalid.

Example 2

If auto-match has selected all documents 'ready for match' and is processing and then additional data is entered for a document, the details with which the auto-match is working would no longer be valid.

Locking Management

- When a user that has an active lock exits a screen (that is, the user selects OK or Cancel buttons on the screen), data changes are committed (if necessary) and then any locks on data displayed on that screen are removed. If any expired locks on the screen data exist, they are also released upon screen exit.
- When a user tries to commit information to the database, the locking service checks to ensure that the user has valid locks on any changed data being committed (for example, locks could have timed out as noted below). If the user does not have valid locks, the user receives a message noting that the user's changes cannot be saved. In this case, the user must exit the screen, enter the screen again, and re-enter the data changes that could not be committed due to invalid/expired locks.
- In situations where accidental system exits occur (for example, the server shuts down unexpectedly from power loss), locks are not released immediately. After the system is restored from outage, the user will log into the system and access the main menu. At that point, any existing data locks are removed. Because this data is no longer locked, any user with adequate security permissions can acquire new locks on this data.
- The lock timeout interval is defined in the reim.properties file. See Chapter 2 – “Backend System Administration and Configuration” for more information.
- When locks are written to the ..._LOCK table, they include an ‘end time’ value. When checking to see if a row of data is locked, the system inspects the related lock row ‘end time’ value. If the commit time is before the end time on the ..._LOCK table record, the base table data changes may be committed. If the commit time is equal to or exceeds the end time, the data lock will be treated as ‘expired’ and the data changes will not be committed.
- If a user needs immediate access to already locked data and cannot wait for data locks to expire or be released by the user holding the locks, a database administrator can manually delete existing lock records from the appropriate ..._LOCK table to release the locks. However, this does not guarantee that the user that needs immediate access will be the next user to acquire locks on the just-released data. The manual release of locks should be a rare event due to the other lock release methods in the system.

Currency Design Summary

ReIM has been designed to handle a multiple number of currencies. This section addresses the system's assumptions, conversion process, and validations that are related to this capability.

Merchandising System (such as RMS) and ReIM Assumptions

- RMS defines one currency as the primary currency of the system (held on the RMS SYSTEM_OPTIONS table in the CURRENCY_CODE field).
- RMS specifies that each purchase order can have one currency. This purchase order currency does not have to be the same as the RMS primary system currency or the RMS supplier currency.
- ReIM requires that each document have its currency stated (im_doc_head.currency_code). This invoice currency does not have to be the same as the system primary currency.
- ReIM assumes that a purchase order and any invoices associated with that purchase order are in the same currency. This assumption is based on the business reality that these currencies are almost always the same and on the development consideration that currency conversion processes have an adverse impact on system performance.

Currency Conversion Process for Amount Tolerances

- Amount tolerances are established in the primary currency of the system. However, because the invoices and POs to be matched could reflect a different currency, amount tolerances must be converted before they can be applied. In other words, the currency established for amount tolerances is converted when the invoice/PO combination is not in the primary currency of the system. For example, a tolerance defined as 10 US dollars (USD) has a much different meaning than a purchase order/invoice defined in Thai Bhat (10 Thai Bhat is about 0.23 USD). If the system merely utilized the number 10 and failed to perform a currency conversion, the amount tolerances would not apply correctly.
- Currency conversion rates are stored on the RMS CURRENCY_RATES table. The conversion factors on this table are in terms of the primary currency of the system.

For example, suppose a retailer wishes to convert from Thai Bhat to Uruguayan Pesos and the system's primary currency is USD. First, the system performs a conversion from Thai Bhat to USD. Secondly, the system converts the USD value to Uruguayan Pesos. In other words, to perform its conversions, the system always must 'go through' the primary currency of the system.

Currency-Related System Validations

- One of the validations performed by the EDI upload process is that it determines whether the currency on the invoice is the same as the currency on the purchase order. If the invoice currency is not the same as the purchase order currency, the invoice is rejected.
- The graphical user interface (GUI) invoice entry (both single invoice entry and batch invoice entry) process also validates that the currency on the invoice is the same as the currency on the PO associated with the invoice. If the currencies are not the same, the user receives a warning message.

Java Currency Formatting

Currency must be properly formatted according to its applicable locale. For example, US currency uses a comma as a thousands separator whereas other currencies do not use a comma as a thousands separator. Java has built-in libraries for currency formatting that are based on locales.

ReIM uses built-in Java localization functionality mapped through the table `IM_CURRENCY_LOCALE` to RMS existing currency structure. ReIM provides an installation script that populates this table. The script creates records for every currency that RMS supports. Note that ReIM cannot guarantee the accuracy of RMS language data.

Oracle Single Sign-On Overview

What is Single Sign-On?

Oracle Application Server Single Sign-On is a term for the ability to sign onto multiple Web applications through a single user ID/Password. There are many implementations of single sign-on. Oracle currently provides three different implementations: Oracle Application Server Single Sign-On, Java single sign-on (with the 10.1.3.1 release of OC4J) and Oracle Access Manager (provides more comprehensive user access capabilities).

Most, if not all, single sign-on technologies use a session cookie to hold encrypted data passed to each application. The single sign-on infrastructure has the responsibility to validate these cookies and, possibly, update this information. The user is directed to log on only if the cookie is not present or has become invalid. These session cookies are restricted to a single browser session and are never written to a file.

Another facet of single sign-on is how these technologies redirect a user's Web browser to various servlets. The single sign-on implementation determines when and where these redirects occur and what the final screen shown to the user is.

Most single sign-on implementations are performed in an application's infrastructure and not in the application logic itself. Applications that leverage infrastructure managed authentication (such as deploying specifying "Basic" or "Form" authentication) typically have little or no code changes when adapted to work in a single sign-on environment.

What Do I Need for Oracle Single Sign-On?

The nexus of the Oracle Application Server Single Sign-On system is the Oracle Identity Management Infrastructure installation. This consists of the following components:

- An Oracle Internet Directory (OID) LDAP server, used to store user, role, security, and other information. OID uses an Oracle database as the back-end storage of this information.
- An Oracle Application Server Single Sign-On servlet, used to authenticate the user and create the Oracle Application Server Single Sign-On session cookie. This servlet is deployed within the infrastructure Oracle Application Server (OAS).
- The Delegated Administration Services (DAS) application, used to administer users and group information. This information may also be loaded or modified through standard LDAP Data Interchange Format (LDIF) scripts.
- Additional administrative scripts for configuring the Oracle Application Server Single Sign-On system and registering HTTP servers.

Additional OAS servers will be needed to deploy the business applications leveraging the Oracle Application Server Single Sign-On technology.

Can Oracle Single Sign-On Work with Other Single Sign-On Implementations?

Yes, the Oracle Application Server Single Sign-On system has the ability to interoperate with many other single sign-on implementations, but some restrictions exist.

Oracle Single Sign-On Terms and Definitions

Authentication

Authentication is the process of establishing a user's identity. There are many types of authentication. The most common authentication process involves a user ID and password.

Dynamically Protected URLs

A "Dynamically Protected URL" is a URL whose implementing application is aware of the Oracle Application Server Single Sign-On environment. The application may allow a user limited access when the user has not been authenticated. Applications that implement dynamic Oracle Application Server Single Sign-On protection typically display a "Login" link to provide user authentication and gain greater access to the application's resources.

Identity Management Infrastructure

The Identity Management Infrastructure is the collection of product and services which provide Oracle Application Server Single Sign-On functionality. This includes the Oracle Internet Directory, an Oracle HTTP server, and the Oracle Application Server Single Sign-On services. The Oracle Application Server deployed with these components is typically referred to as the "Infrastructure" instance.

MOD_OSSO

mod_osso is an Apache Web Server module an Oracle HTTP Server uses to function as a partner application within an Oracle Application Server Single Sign-On environment. The Oracle HTTP Server is based on the Apache HTTP Server.

Oracle Internet Directory

Oracle Internet Directory (OID) is an LDAP-compliant directory service. It contains user ids, passwords, group membership, privileges, and other attributes for users who are authenticated using Oracle Application Server Single Sign-On.

Partner Application

A partner application is an application that delegates authentication to the Oracle Identity Management Infrastructure. One such partner application is the Oracle HTTP Server (OHS) supplied with the Oracle Application Server. OHS uses the MOD_OSSO module to configure this functionality.

All partner applications must be registered with the Oracle Application Server Single Sign-On server. An output product of this registration is a configuration file the partner application uses to verify a user has been previously authenticated.

Realm

A Realm is a collection users and groups (roles) managed by a single password policy. This policy controls what may be used for authentication (e.g. passwords, X.509 certificates, biometric devices). A Realm also contains an authorization policy used for controlling access to applications or resources used by one or more applications.

A single OID can contain multiple Realms. This feature can consolidate security for retailers with multiple banners or to consolidate security for multiple development and test environments.

Statically Protected URLs

A URL is considered to be “Statically Protected” when an Oracle HTTP server is configured to limit access to this URL to only single sign-on authenticated users. Any attempt to access a “Statically Protected URL” results in the display of a login page or an error page to the user.

Servlets, static HTML pages, and JSP pages may be statically protected.

What Single Sign-On is Not

Single sign-on is NOT a user ID/password mapping technology.

However, some applications can store and retrieve user IDs and passwords for non-SSO applications within an OID LDAP server. An example of this is the Oracle Forms Web Application framework, which maps Oracle Application Server Single Sign-On user IDs to a database logins on a per-application basis.

How Oracle Single Sign-On Works

Oracle Application Server Single Sign-On involves a couple of different components. These are:

- The Oracle Application Server Single Sign-On servlet, which is responsible for the back-end authentication of the user.
- The Oracle Internet Directory LDAP server, which stores user IDs, passwords, and group (role) membership.
- The Oracle HTTP Server associated with the Web application, which verifies and controls browser redirection to the Oracle Application Server Single Sign-On servlet.
- If the Web application implements dynamic protection, then the Web application itself is involved with the Oracle Application Server Single Sign-On system.

Statically Protected URLs

When an unauthenticated user accesses a statically protected URL, the following occurs:

The Oracle HTTP server recognizes the user has not been authenticated and redirects the browser to the Oracle Single Sign-On servlet.

The Oracle Application Server Single Sign-On servlet determines the user must authenticate, and displays the Oracle Application Server Single Sign-On login page.

The user must sign in through a valid user ID and password. If the Oracle Application Server Single Sign-On servlet has been configured to support multiple Realms, a valid realm must also be entered. The user ID, password, and realm information is validated against the Oracle Internet Directory LDAP server.

The Oracle Application Server Single Sign-On servlet creates and sends the user’s browser an Oracle Application Server Single Sign-On session cookie. This cookie is never persisted to disk and is specific only to the current browser session. This cookie contains the user’s authenticated identity. It does NOT contain the user’s password.

The Oracle Application Server Single Sign-On servlet redirects the user back to the Oracle HTTP Server, along with Oracle Application Server Single Sign-On specific information.

The Oracle HTTP Server decodes the Oracle Application Server Single Sign-On information, stores it with the user’s session, and allows the user access to the original URL.

Dynamically Protected URLs

When an unauthenticated user accesses a dynamically protected URL, the following occurs:

The Oracle HTTP server recognizes the user has not been authenticated, but allows the user to access the URL.

The application determines the user must be authenticated and sends the Oracle HTTP server a specific status to begin the authentication process.

The Oracle HTTP Server redirects the user's browser session to the Oracle Application Server Single Sign-On Servlet.

The Oracle Application Server Single Sign-On servlet determines the user must authenticate, and displays the Oracle Application Server Single Sign-On login page.

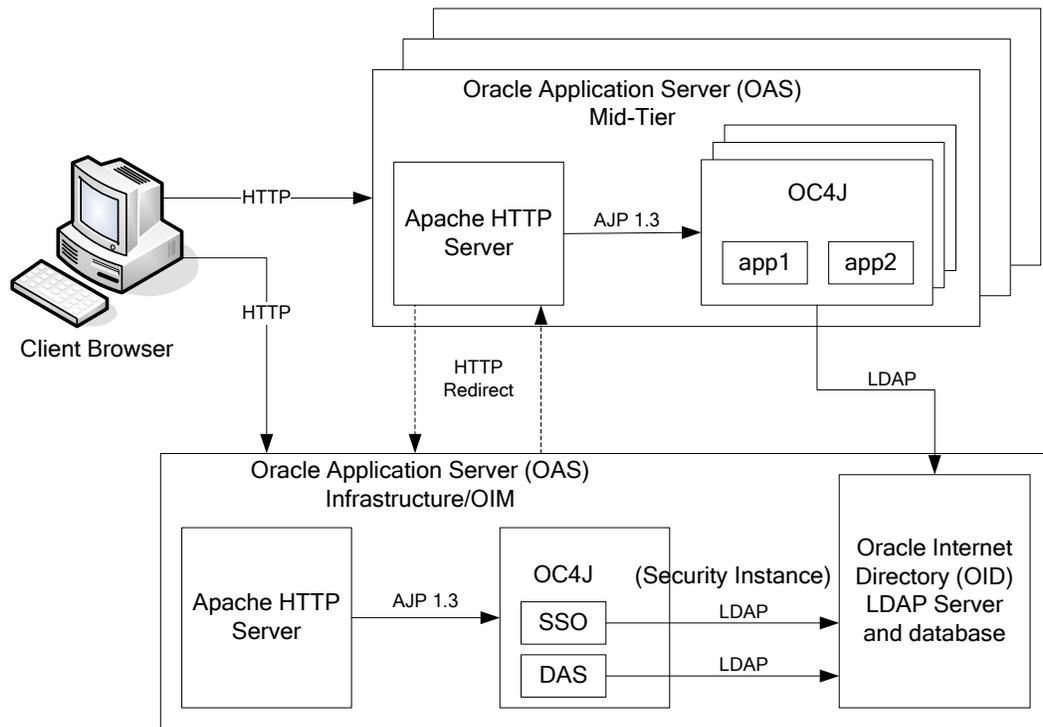
The user must sign in through a valid user ID and password. If the Oracle Application Server Single Sign-On servlet has been configured to support multiple Realms, a valid realm must also be entered. The user ID, password, and realm information is validated against the Oracle Internet Directory LDAP server.

The Oracle Application Server Single Sign-On servlet creates and sends the user's browser an Oracle Application Server Single Sign-On session cookie. This cookie is never persisted to disk and is specific only to the current browser session. This cookie contains the user's authenticated identity. It does NOT contain the user's password.

The Oracle Application Server Single Sign-On servlet redirects the user back to the Oracle HTTP Server, along with Oracle Application Server Single Sign-On specific information.

The Oracle HTTP Server decodes the Oracle Application Server Single Sign-On information, stores it with the user's session, and allows the user access to the original URL.

Single Sign-On Topology



Installation Overview

Installing Oracle Application Server Single Sign-On consists of installing the following components:

1. Installing the Oracle Internet Directory (OID) LDAP server and the Infrastructure Oracle Application Server (OAS). These are typically performed using a single session of the Oracle Universal Installer and are performed at the same time. OID requires an Oracle relational database and if one is not available, the installer will also install this as well.

The Infrastructure OAS includes the Delegated Administration Services (DAS) application as well as the Oracle Application Server Single Sign-On servlet. The DAS application can be used for user and realm management within OID.

2. Installing additional OAS 10.1.2 midtier instances for the Oracle Retail applications, such as RMS, that are based on Oracle Forms technologies. These instances must be registered with the Infrastructure OAS installed in step 1).
3. Installing additional application servers to deploy other Oracle Retail applications and performing application specific initialization and deployment activities.

Infrastructure Installation and Configuration

The Infrastructure installation for Oracle Application Server Single Sign-On is dependent on the environment and requirements for its use. Deploying an Infrastructure OAS to be used in a test environment does not have the same availability requirements as for a production environment. Similarly, the Oracle Internet Directory (OID) LDAP server can be deployed in a variety of different configurations. See the *Oracle Application Server Installation Guide* and the *Oracle Internet Directory Installation Guide* for more details.

OID User Data

Oracle Internet Directory is an LDAP v3 compliant directory server. It provides standards-based user definitions out of the box.

The current version of Oracle Single Sign-On only supports OID as its user storage facility. Customers with existing corporate LDAP implementations may need to synchronize user information between their existing LDAP directory servers and OID. OID supports standard LDIF file formats and provides a JNDI compliant set of Java classes as well. Moreover, OID provides additional synchronization and replication facilities to integrate with other corporate LDAP implementations.

Each user ID stored in OID has a specific record containing user specific information. For role-based access, groups of users can be defined and managed within OID. Applications can thus grant access based on group (role) membership saving administration time and providing a more secure implementation.

OID with Multiple Realms

OID and Oracle Application Server Single Sign-On can be configured to support multiple user Realms. Each realm is independent from each other and contains its own set of user IDs. As such, creating a new realm is an alternative to installing multiple OID and Infrastructure instances. Hence, a single Infrastructure OAS can be used to support many development and test environments by defining one realm for each environment.

Realms may also be used to support multiple groups of external users, such as those from partner companies. For more information on Realms, see the *Oracle Internet Directory Administrators Guide*.

User Management

User Management consists of displaying, creating, updating or removing user information. There are two basic methods of performing user management: LDIF scripts and the Delegate Administration Services (DAS) application.

OID DAS

The DAS application is a Web based application designed for both administrators and users. Users may update their own password, change his/her telephone number of record, or modify other user information. Users may search for other users based on partial strings of the user's name or ID. An administrator may create new users, unlock passwords, or delete users.

The DAS application is fully customizable. Administrators may define what user attributes are required, optional or even prompted for when a new user is created.

Furthermore, the DAS application is secure. Administrators may also what user attributes are displayed to other users. Administration is based on permission grants, so different users may have different capabilities for user management based on their roles within their organization.

LDIF Scripts

Script based user management can be used to synchronize data between multiple LDAP servers. The standard format for these scripts is the LDAP Data Interchange Format (LDIF). OID supports LDIF script for importing and exporting user information. LDIF scripts may also be used for bulk user load operations.

User Data Synchronization

The user store for Oracle Application Server Single Sign-On resides within the Oracle Internet Directory (OID) LDAP server. Oracle Retail applications may require additional information attached to a user name for application-specific purposes and may be stored in an application-specific database. Currently, there are no Oracle Retail tools for synchronizing changes in OID stored information with application-specific user stores. Implementers should plan appropriate time and resources for this process. Oracle Retail strongly suggests that you configure any Oracle Retail application using an LDAP for its user store to point to the same OID server used with Oracle Application Server Single Sign-On.

Configuring ReIM for Oracle Single Sign-On

If you are planning to use Oracle Application Server Single Sign-On, verify that Oracle Infrastructure Server 10g (10.1.2.2) has been installed and that the OAS HTTP server is registered with the Infrastructure Oracle Internet Directory as a partner application.

Note: This section assumes that the Oracle Application Server HTTP Server has already been registered with the Oracle Application Server Single Sign-On server through the `regsso.sh` script. See the Oracle Application Server Single Sign-On documentation for details.

ReIM is a statically single sign-on protected application. When ReIM is being used in an Oracle Application Server Single Sign-On environment, the ReIM root context must be protected. Edit the `mod_osso.conf` file, `$ORACLE_HOME/Apache/Apache/conf/mod_osso.conf`. The following lines should be inserted immediately before the line consisting of `</IfModule>`

```
<Location /reim >  
  require valid-user  
  AuthType Basic  
</Location>
```

Batch Processes

This chapter provides the following:

- An overview of the batch architecture
- A functional summary of each batch process, along with its dependencies
- A description of some of the features of the batch processes (batch return values, batch threading, and so on)
- Development designs for each batch process

Batch Architectural Overview

ReIM batch processes are run as Java applications. Batch processes engage in their own primary processing. However, they utilize services when they must engage in actions outside their primary processing (for example, when they utilize a helper method, touch the database, and so on).

Services retrieve the data on which the batch processes work to complete their tasks. As noted in Chapter 3 – “Technical Architecture,” the service layer consists of a collection of Java classes that implements business logic (data retrieval, updates, deletions, and so on) through one or more high-level methods.

The business logic occurs within the service code, while the technical processing occurs within the batch code.

Note the following characteristics of the ReIM batch processes:

- They are not accessible through a graphical user interface.
- They are scheduled by the retailer.
- They are designed to process large volumes of data.

Although ReIM is a system that never stops running, it is recommended that batch processes are executed when users typically are not using the application (at night, for example).

EDI-Related File-Based Batch Processes

ReIM EDI-related batch processes are file based. For example, they either input a flat file into the system (EDI invoice upload) from outside the system, or they output a flat file from the system (EDI invoice download) to be sent to another system (that of a vendor). Both the EDI invoice upload and the EDI invoice download batch processes are described later in this chapter.

Internal Batch Processes

Other batch processes within ReIM do not input or output files. Rather, the goal of these batch processes is to take a snapshot of potentially large amounts of data from the key tables within the database, transform that data through processing, and then return it.

Internal batch processes that are described later in this chapter include:

- Auto-match
- Batch purge
- Discrepancy purge
- Disputed credit memo action rollup
- Reason code action rollup

Internal Batch Processes that Write to Staging Tables

The third type of batch process within ReIM takes a snapshot of potentially large amounts of data from the key tables within the database, transforms that data through processing, and then writes that data to staging tables.

This communication process has been designed with the assumption that, during production, ReIM will reside within the same database as the merchandising system. Presumably, during implementation, the retailer will develop an optimum way to move the applicable data from the staging tables to the appropriate location for that data.

The internal batch processes that write to staging tables are described later in this chapter. They include the following:

- Resolution posting
- Receiver adjustment

Batch Processes that Extract from Merchandising System (RMS) Staging Tables

The fourth type of batch process within ReIM extracts data from merchandising system staging tables, create documents with the data, and write the data to ReIM tables. The batch processes that follow this processing pattern include the following:

- Complex deal upload
- Fixed deal upload

Functional Descriptions and Dependencies

The following table summarizes ReIM batch processes and includes both a description of each batch process's business functionality and its batch dependencies.

Batch Processes	Details	Batch Dependencies
BatchPurgeBatch	This process deletes data from database tables while maintaining database integrity. This process deletes records from the ReIM application that meet certain business criteria (for example, records that are marked for deletion by the application user, records that linger in the system beyond certain number of days, and so on).	
DiscrepancyPurgeBatch	The discrepancy purging program deletes data from database tables while maintaining database integrity. This program deletes records from ReIM that have discrepancies of zero.	
EdiUploadBatch	This batch process uploads merchandise, non-merchandise invoices, credit notes, debit memos, and credit note requests from the EDI into the invoice-matching tables.	
InvoiceAutoMatchBatch	InvoiceAutoMatchBatch is a system batch process that attempts to match invoices to receipts without manual intervention. Invoices that are in ready for match, unresolved, or multi-unresolved status are retrieved from the database to be run through the auto-match algorithm. The processing consists of three levels – summary, detail, and header (VAT only).	EDI upload (Invoice Matching) Receipt upload (Merchandising system, such as RMS)
CreditNoteAutoMatchBatch	CreditNoteAutoMatchBatch is a system batch process that attempts to match credit notes to credit note requests without manual intervention. Within a chosen grouping, matching attempts are made at the summary level, on a one-to-one level (credit note to CNR) and on a detail level. As matches are made, the document ID of invoice to which the CNR is associated is assigned to the credit note.	EDI upload (Invoice Matching) Receipt upload (Merchandising system, such as RMS)
ReceiptWriteOffBatch	In order for retailers to track received goods not invoiced, they must have the ability to write-off these goods for financial tracking. ReIM has a system parameter (which can be overwritten at the supplier level) defining the maximum amount of time an open, non-fully matched receipt will be available for matching. Every time the Receipt write-off process is run, each non-fully matched open receipt received date is compared with the current date minus the system parameter. If the received date is before this difference, the receipt is written-off, and the invoice match status is closed.	Auto-match and any associated processing must run prior to this batch processing.

Batch Processes	Details	Batch Dependencies
ReasonCodeActionRollup Batch	<p>This batch process sweeps the action staging table and creates debit memos, credit memos and credit note requests as needed.</p> <p>Only a single debit or credit memo is created per invoice/discrepancy type, with line details from all related actions for the same discrepancy type. If hold invoice functionality is on, each generated document is assigned the invoice number to which it corresponds to ensure all related documents are released to accounts payable at the same time. This process deletes these records when completed; they are deleted after posting.</p> <p>Note that a separate, retailer-created batch process sweeps the receiver adjustment table. The action staging table is used during posting to post the reason code actions to the financial staging table. A separate, retailer-created batch process sweeps the receiver adjustment table.</p> <p>The process compares the unit cost and/or quantity received for the item on the shipment with the expected unit cost and/or quantity on the IM_RECEIVER_COST_ADJUST and/or IM_RECEIVER_UNIT_ADJUST tables. If a match exists, the receiver cost and/or unit adjustment has occurred in RMS (or the equivalent merchandising system). As a result, the process sets the pending adjustment flag on IM_INVOICE_DETAIL table to false for the invoice line. The reason code actions are rolled up for an invoice only if no invoice lines on the invoice have any pending adjustments.</p>	
DisputedCreditMemo ResolutionRollupBatch	<p>The disputed credit memo action rollup process checks the records on the IM_REVERSAL_RESOLUTION_ACTION table and rolls up the credit memo detail lines by document/item/reason code. The rollup occurs only if all lines on a disputed credit memo have been completely resolved (that is, no cost or quantity discrepancy records remain for the credit memo).</p> <p>After the rollup, a new set of detail lines associated with the resolution reason codes replace the original set of detail lines associated with the debit reason codes on the IM_DOC_DETAIL_REASON_CODES table.</p>	The disputed credit memo action rollup must occur before resolution posting and after receiver adjustment.
FinancialPostingBatch	<p>A recurring resolution posting process retrieves all matched invoices, and approved documents. If hold invoice functionality is used, then matched Credit Notes rather than approved Credit Notes are processed.</p> <p>For each invoice, the batch process writes applicable financial accounting transactions to either of the following tables: IM_FINANCIALS_STAGE</p> <p>The AP staging tables, IM_AP_STAGE_HEADER and IM_AP_STAGE_DETAIL, if the RMS System-Options table: FINANCIAL_AP = O</p>	For the invoice and associated documents to be picked up and processed, the Hold Invoice indicator must not be "Hold".

Batch Processes	Details	Batch Dependencies
EdiDownloadBatch	<p>The EdiDownload module creates a flat file to match the EDI invoice download file format. The module retrieves all header, detail, and non-merchandise information and formats the data as needed.</p> <p>In other words, the EDI invoice download process retrieves debit memos, credit note requests, and credit memos in 'approved' status from the resolution posting process and creates a flat file. The client converts the flat file into an EDI format by the client and sends it through the EDI invoice download transaction set.</p>	Auto-match must run prior to the EDI invoice download.
ComplexDealUploadBatch	This module reads data from RMS staging tables, creates credit memos, debit memos, and credit note requests out of the data, and stores the supporting deal data on a ReIM table for later use during posting.	The RMS staged data must be purged after the upload.
FixedDealUploadBatch	This module reads data from RMS staging tables, creates credit memos, debit memos, and credit note requests out of those, and stores the supporting deal data on a ReIM table for later use during posting.	The RMS staged data must be purged after the upload.

Features of the Batch Processes

Scheduler and the Command Line

If the client uses a scheduler, batch process arguments are placed into the scheduler.

If the client does not use a scheduler, batch process parameters must be passed in at the UNIX command line.

Each of these scripts interacts with the generic shell script. These scripts take any and all arguments that their corresponding batch process would take when executing.

Batch Return Values

The following guidelines describe the batch process return values that ReIM batch processes utilize:

- SUCCESS = 0
- FAILED_INIT = 1
- FAILED_PROCESS = 2
- FAILED_WRAPUP = 3
- SUCCESS_WITH_REJECTS_TO_DB = 4
- SUCCESS_WITH_REJECTS_TO_FILE = 5
- SUCCESS_WITH_REJECTS_TO_DB_AND_FILE = 6
- UNKNOWN = -1

Batch Log and Error File Paths

Log file locations are determined by the retailer through the logj4.properties file. If an error occurs that causes a batch process to suddenly come to a complete halt, the system writes to the configured log appender. See Chapter 2 – “Backend System Administration and Configuration” for more information.

Multithreading Batch Processes

The following batch processes shown below have multithreading capabilities. The settings related to the multithreading options for each batch process are established in the reim.properties file. See Chapter 2 – “Backend System Administration and Configuration” for more information.

Complex Deal Upload (ComplexDealUploadBatch)

This process is threaded by a group (or, ‘bulk’) of deals. Each group (or, bulk) constitutes a thread.

Fixed Deal Upload (FixedDealUploadBatch)

This process is threaded by a group (or, ‘bulk’) of deals. Each group (or, bulk) constitutes a thread.

EDI Invoice Upload (EdiUploadBatch)

This process is threaded by each transaction in the file (THEAD record to TTAIL record). Each thread handles transaction validation and insertion into the database (as valid or rejected) or facilitates the writing to a reject file.

Auto-Match (AutoMatchBatch)

Auto-match can either be run as a single thread or it can be threaded by the location hierarchy.

Restart and Recovery

Most ReIM batch processes do not utilize any type of restart and recovery procedures. Rather, if a restart is required, the process can simply be restarted, and it will start where it left off.

This solution is true for all batch processes other than those noted below:

- EDI invoice upload (its restart and recovery methods is described in its design below).
- EDI invoice download (its restart and recovery methods is described in its design below).

Executing Batch Processes

Batch processes are executed through the BatchRunner framework. This framework is responsible for bootstrapping the Spring container and ensuring that the batch job is passed the appropriate arguments. The arguments for the batch runner are as follows:

Batch job class name

Username and password

Batch arguments

Below is an example of how the batch runner would be utilized to execute the EdiUploadBatch process:

```
BatchRunner EdiUploadBatch userID/password /dir/input.dat /dir2/output.dat
```

Note that the BatchRunner requires the application libraries (JAR files) to be on the class path in order to execute successfully. Retailers wishing to configure the BatchRunner manually should consult the `generic` UNIX batch script generated during the install process for assistance in determining which libraries should be included for a particular batch process.

Batch Purge Batch Design

The batch purging process deletes data from database tables while maintaining database integrity. This process deletes records from the ReIM application that meet certain business criteria (for example, records that are marked for deletion by the application user, records that linger in the system beyond certain number of days, and so on). The BatchPurge process does not generate any cascade relationships and/or SQL queries on the fly. The main features of the process are illustrated below:

Usage

The following arguments are applicable for the BatchPurgeBatch process:

```
BatchPurgeBatch userid/password PURGE [ALL|<table name>] [NOCOMMIT|COMMIT]
```

The first argument is a combination of user id and password. The second argument is the word PURGE. The third argument is either ALL or a single table name. Table name can be any one of the following:

1. IM_DOC_GROUP_LIST
2. IM_DOC_HEAD

3. IM_PARENT_INVOICE
4. IM_REASON_CODES
5. IM_PARTIALLY_MATCHED_RECEIPTS
6. IM_TOLERANCE_DEPT_AUDIT
7. IM_TOLERANCE_SUPP_AUDIT
8. IM_TOLERANCE_SUTRT_AUDIT
9. IM_TOLERANCE_SYS_AUDIT

ALL deletes data from all of the above tables. Finally, the fourth argument can be either NOCOMMIT or COMMIT. If there is no fourth argument, the default is NOCOMMIT.

SQL Queries

Delete statements have been optimized by minimizing the usage of nested SELECT statements and by maximizing the table joins in the WHERE clause. Any additions and/or modifications to the database require manual additions and/or modifications, respectively, to the existing SQL queries. All of the delete statements belonging to one cascade structure are added to a batch and executed at the end. It uses a single connection for each parent/children tree. Every cascade structure is a logical group.

Manual Propagation (Cascade) of Deletes to Child Tables

Every time there is a change in the relationship between tables, this process must be modified to reflect that change. Table relationship changes occur when clients decide to make significant customizations to the application.

Cascade Relationships

The developer must manually code the parent/child relationships between tables. For example, in order to delete records for the IM_DOC_HEAD table, records must be deleted from children tables in the following sequence of steps. Note that table sequence is not important within a single step.

Step 1

```
Delete from: IM_DETAIL_MATCH_INVC_HISTORY
Delete from: IM_INVOICE_DETAIL_ALLOWANCE
Delete from: IM_QTY_DISCREPANCY_ROLE
Delete from: IM_QTY_DISCREPANCY_RECEIPT
```

Step 2

```
Delete from: IM_DOC_DETAIL_COMMENTS
Delete from: IM_MANUAL_GROUP_INVOICES
Delete from: IM_DOC_HEAD_COMMENTS
Delete from: IM_INVOICE_DETAIL
Delete from: IM_DOC_HEAD_LOCK
Delete from: IM_FINANCIALS_STAGE
Delete from: IM_COST_DISCREPANCY
Delete from: IM_RESOLUTION_ACTION
Delete from: IM_REVERSAL_RESOLUTION_ACTION
Delete from: IM_SUMMARY_MATCH_INVC_HISTORY
Delete from: IM_QTY_DISCREPANCY
Delete from: IM_DOC_DETAIL_REASON_CODES
Delete from: IM_FINANCIALS_STAGE_ERROR
Delete from: IM_DOC_NON_MERCH
Delete from: IM_DOC_VAT
```

Step 3

```
Delete from: IM_DOC_HEAD
```

Cascade relationships are wired in the BatchPurge.java.

Assumptions and Scheduling Notes

Every time there is a change in the relationships among tables, the BatchPurge process has to be updated to accommodate these changes.

Major Modules

BatchPurgeBatch

This class implements the batch delete process for the ReIM base application.

Primary Tables Involved

The following list includes the tables on which the purging algorithm is applied:

- IM_DOC_GROUP_LIST
- IM_DOC_HEAD
- IM_PARENT_INVOICE
- IM_REASON_CODES

Other tables of less significance also get purged.

Discrepancy Purge Batch Design

The discrepancy purging program (DiscrepancyPurge.java) deletes data from database tables while maintaining database integrity. This program deletes records from ReIM that have discrepancies of zero. Main features of the process are as follows:

- Usage

The following arguments are applicable for the DiscrepancyPurgeBatch process:

```
DiscrepancyPurgeBatch userid/password PURGE [ALL|<table name>]
[NOCOMMIT|COMMIT]
```

Where the first argument is combination of user id and password. The second argument is the word PURGE. The third argument is either ALL or a single table name. Table name can be any one of the following:

- IM_COST_DISCREPANCY
- IM_QTY_DISCREPANCY

ALL will delete data from all of the above-mentioned tables. Finally, the fourth argument can be either NOCOMMIT or COMMIT. If there is no fourth argument, the default will be NOCOMMIT.

- SQL Queries

The tables mentioned above are checked for merchandise invoices with cost and/or quantity discrepancies of zero. If they exist, the record is deleted from the table and the corresponding invoice detail line to will be updated to cost or qty matched. If the invoice line is now cost and qty matched the status of the line is set to matched and in return if all of the invoice lines are matched, the invoice itself is set to matched.

Major Modules

DiscrepancyPurge

Major Tables

- IM_COST_DISCREPANCY
- IM_QTY_DISCREPANCY
- IM_QTY_DISCREPANCY_RECEIPT
- IM_QTY_DISCREPANCY_ROLE
- IM_DOC_HEAD
- IM_INVOICE_DETAILS
- ORDSKU (RMS)
- ORDLOC (RMS)

EDI Invoice Upload Batch Design

EDI invoice upload is a standardized file format specification designed for vendors to send invoicing information electronically. The EDI invoice upload batch process performs the following:

- Reads each transaction within the file.
- Runs a file format validation (verifying file descriptors and line numbers; ensuring that numeric fields are all numeric and that character fields are all characters; looking for the invalid ordering of record type—THEAD followed directly by another THEAD; and so on). Certain file formatting errors cause the process to terminate with a message indicating the problem. A limited set of data validation errors cause the invalid transaction to be written to error tables (IM_EDI_REJECT_DOC_XXX) where the data can be corrected through an online process. The rest of the data validation errors cause the invalid transaction to be written to a reject file where a user must correct the problems and re-run the file.
- Validates the data against the ReIM system and the merchandising system (such as RMS).
- Any errors found are recorded in an error log so that users can fix any transactions that were rejected to file.
- Adds the data to the ReIM system. All valid transactions are written to the IM_DOC_XXX, IM_INVOICE_XXX, IM_PARENT_XXX tables.

Assumptions and Scheduling Notes

- This process must be run before the auto-match process.
- All quantities are assumed to be in 'EA'ches when uploaded.

Restart and Recovery

If the EDI invoice upload aborts without processing an entire file, the file needs to simply be rerun. When this action is completed, there will be multiple errors for the transactions that were successfully uploaded and the other transactions will be uploaded at that time as well. If the cause of the aborted process is software related, this fix may not solve the issue. Other steps may be required to ensure that the process completes its entire initial run.

Primary Tables Involved

- IM_DOC_HEAD
- IM_INVOICE_DETAIL
- IM_INVOICE_DETAIL_ALLOWANCE
- IM_DOC_NON_MERCH
- IM_DOC_DETAIL_REASON_CODES
- IM_PARENT_INVOICE
- IM_PARENT_INVOICE_DETAIL
- IM_PARENT_NON_MERCH
- IM EDI_REJECT_DOC_DETAIL
- IM EDI_REJECT_DOC_DETAIL_ALLOW
- IM EDI_REJECT_DOC_HEAD
- IM EDI_REJECT_DOC_NON_MERCH
- IM_DOC_VAT

Invoice Auto-Match Batch Design

Invoice Auto-match is a system batch process that attempts to match invoices to receipts without manual intervention. Invoices that are in ready-for-match, unresolved, or multi-unresolved status are retrieved from the database to be run through the auto-match algorithm.

The three inputs into the auto-match process include the following:

- Invoices
- Receipts
- Purchase orders

ReIM “owns” invoices, while receipts and purchase orders are owned by a merchandising system, such as RMS.

The processing consists of three levels: summary, detail, and header. Summary-level matching attempts to match all invoices to receipts at a summary level. Detail-level matching attempts to match all invoices (that do not match at a summary level) to receipts at a line item level. Header-level matching attempts to validate VAT before continuing to attempt to match all invoices.

The auto-match process attempts to match the invoices to receipts to the best of its abilities. The process assigns different statuses according to the level of matching achieved.

If an invoice arrives prior to a receipt (for a particular PO), the auto-match process attempts only to match invoice unit cost to PO unit cost.

When a complete match cannot be made, manual intervention is required through online processes.

Algorithms

The following algorithms comprise the auto-match process:

- 1. Cost pre-matching**

This process identifies any cost discrepancies prior to the arrival of receipts. If no receipts exist for the PO location, the invoices are sent to the cost pre-matching algorithm. Cost pre-matching is where unit costs on the invoice are compared with unit costs on the purchase order at a line level. If a match can be obtained, the invoice remains in ready-for-match status and is retrieved again for matching once the receipt comes in. If no match can be obtained, a cost discrepancy is created and routed immediately.
- 2. Summary matching**

Invoices are grouped with receipts based upon purchase order location. A match is attempted for all invoices and receipts for the PO location. The invoices' total extended costs are summed and compared with the receipts' total extended costs. Based on a supplier option, the invoices' total quantity is summed and compared with the receipts' summed total quantity. If a match is achieved, all invoices and receipts are set to matched status. Otherwise, one-to-one matching is attempted for the PO location.
- 3. One-to-one invoice matching**

This processing attempts to match a single invoice to a single receipt for the applicable PO location. If all invoices and receipts are set to matched status, the next PO location is processed. If a multi-unresolved scenario exists (where more than one invoice can be matched with one or more receipts), all un-matched invoices are given the multi-unresolved status and no further processing occurs for this PO location.
- 4. Detail matching**

During detail matching processing, an attempt is made to match each line on the invoice to an unmatched receipt line for the same item. Both the unit cost and quantity are always compared at the line level. If both the cost and quantity match, the invoice line and receipt line are placed into matched status. If the cost fails or the quantity fails, the cost or quantity discrepancies are generated and routed.
- 5. Header matching – (VAT only)**

Invoices created without details are not able to have their VAT information validated at invoice creation. All header level only invoices are created with a status of 'Ready for Match'. For VAT validation, this processing determines whether a header level only invoice that has been matched to a receipt should continue in the matching and posting process or whether it should be marked as having a VAT discrepancy and removed from the matching process.

Assumptions and Scheduling Notes

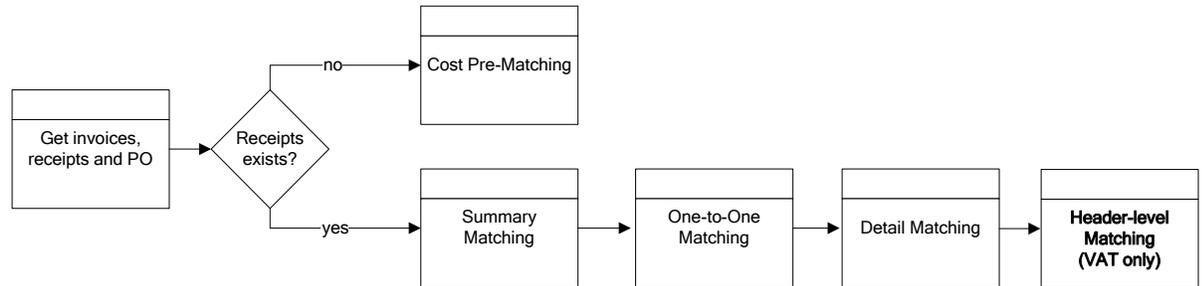
- Although not recommended, auto-match can be run during the day when there are users online interacting with the system.
- Both the invoice unit cost and the unit cost of the PO must be expressed in the same currency. In order to compare the invoice unit costs with the PO's unit costs, auto-match does not engage in currency conversion.
The system assumes that tolerance costs are always in the system's primary currency. If RMS is the applicable merchandising system, auto-match performs currency conversion if the currency on the order is different from the primary currency. RMS existing currency conversion engine is used to perform this conversion. If RMS is not being utilized, another currency conversion engine must be provided to support this functionality.
- The quantities on the invoice must be expressed in the same unit of measure as the quantities on the receipt. Auto-match performs no unit of measure conversion.
- The batch process runs after EDI upload (Invoice Matching) and Receipt upload (Merchandising system, such as RMS).
- Supplier options
All suppliers must have options defined in order for their invoices to be processed by the system, and the terms defined for those suppliers have to be completely updated in RMS. In order to support the use of suppliers in ReIM, the Enabled_Flag (set to 'Y'), Start_Date_Active and End_Date_Active are the required entries in the TERMS_DETAIL table in RMS.

Post Processing

Auto-match automatically invokes the 'best terms calculation' for invoices that it matches.

High-Level Flow Diagram

The following diagram offers a high-level view of the processing logic utilized within the invoice auto-match batch process.



ReIM Auto-Match Flow

Primary Tables Involved

- IM_DOC_HEAD
- IM_INVOICE_DETAIL
- SHIPMENT (RMS)
- SHIPSKU (RMS)
- IM_PARTIALLY_MATCHED_RECEIPTS
- ORDHEAD (RMS)
- ORDSKU (RMS)
- ORDLOC (RMS)
- IM_TOLERANCE_DEPT
- IM_TOLERANCE_SUPP
- IM_TOLERANCE_SYSTEM
- IM_COST_DISCREPANCY
- IM_QTY_DISCREPANCY
- IM_QTY_DISCREPANCY_RECEIPT
- IM_QTY_DISCREPANCY_ROLE
- IM_SUPPLIER_OPTIONS
- IM_SYSTEM_OPTIONS

Credit Note Auto-Match Batch Design

The CreditNoteAutoMatchBatch attempts auto-matching of credit notes with credit note requests without manual intervention. Depending on the matching algorithm being used, the batch can also create and resolves detail level discrepancies utilizing a predefined set of reason codes.

When invoked, the batch creates a pool of matchable credit notes and credit note requests. The candidates are selected depending on which customizable fields are populated and a status of credit notes and credit note requests.

Once a pool of matchable documents is established, the batch proceeds to group the documents with respect to unique suppliers listed on the documents. Basically, suppliers are the first layer of grouping, which facilitates further processing of each group in parallel using threads.

If threading is enabled for the batch, each supplier based group is processed in its own thread. Each supplier based group further divides the documents for that supplier into smaller document-key sets. These document-key sets are categorized by common attributes defined on the document itself. The attributes, also referred to as Configurable or Flexible Pool Keys allow documents to be grouped in several combinations in addition to the distinct purchase order and location combination (which is the only combination possible in the current Invoice Auto-Matching framework).

Matching will not be attempted for groups not containing both credit notes and credit note requests. By default the CreditNoteAutoMatch process creates document-key sets based on the following key distinctions:

- Credit Note Request ID
- Original Invoice ID
- PO / Location combination

To enable the use of all three keys, the customizable reference fields in the credit notes and credit note requests must be populated. The customizable Ref No 3 field holds the credit note request ID, and the Ref No 4 field holds the original invoice ID. In case none of the customizable fields are populated with the required data, the PO/Location combination will be the only key available to the CreditNoteAutoMatchBatch process.

Within each document-key set, matching is attempted using three algorithms: summary, one-to-one matching, and detail level matching. Summary-level matching attempts to match all credit notes with credit note requests at a summary level by comparing extended costs, or quantities within tolerance. One-to-one matching requires that extended costs or quantities of one distinct credit note match to only one distinct credit note request within tolerance. Line-level matching is only attempted if there is one unmatched credit note left. It attempts to match the line items of an unmatched credit note with line items of all unmatched credit note requests.

Below is the flow for attempting a match in a document-key set when no match is found:

1. Credit Note Request ID (configurable key)
 - Summary Matching (matching algorithm)
 - One to One Matching (matching algorithm)
 - Line -level Matching (matching algorithm)
2. Original Invoice ID (configurable key)
 - Summary Matching (matching algorithm)
 - One to One Matching (matching algorithm)
 - Line -level Matching (matching algorithm)
3. PO / Location (configurable key)
 - Summary Matching (matching algorithm)
 - One to One Matching (matching algorithm)
 - Line -level Matching (matching algorithm)

If VAT is enabled in the system, CreditNoteAutoMatchBatch only detects VAT discrepancies at the detail level. This means that when documents are being processed by the detail matching algorithm, a check is performed prior to matching, ensuring that the VAT codes and rates for each item on the credit note match those on the credit note request for the corresponding item. When a discrepancy is detected, processing for that document stops and detail matching is not performed for that document. In such a case, the Invoice Matching user will have to match and resolve the VAT discrepancy manually through the user interface.

Tolerances are handled in a manner similar to the Invoice auto-match batch process. The tolerances are first selected with respect to supplier, then the department and lastly with respect to the system (refer to Ops Guide: Functional Design section on CreditNoteAutoMatchBatch for more details).

If a match is achieved, the information related to the matched document is migrated to the history tables, and all CreditNoteAutoMatch Batch related tables are purged for those documents. The migration process is enabled depending on the value of the `creditnoteautomatchbatch.workspace.cleanup` property in the `reim.properties` file.

In case of an unsuccessful match manual intervention is required through online processes, and the match attempt related data for those documents is not cleaned up from the respective tables. (See Primary Tables Involved in this section of the guide.)

Algorithms

The CreditNoteAutoMatch process is composed of the following algorithms:

- **Summary Matching**

Credit notes and credit note requests in the document set are matched at the summary level by comparing extended costs. If the extended costs of the document set falls within tolerances, the documents are considered matched and flagged as such, processing continues with the next set. Note that since total extended costs are being compared, only total merchandise amounts will be factored into the actual matching calculations. If the documents in the set are from a supplier that requires quantity matching, quantity matching will be performed within tolerances as well.
- **One to One Matching**

One to one matching is a variation of summary matching. It requires that one distinct credit note matches to only one distinct credit note request within tolerance for the document set. Extended costs are compared and quantities are also compared if the supplier option for quantity matching is enabled.
- **Detail Matching**

For a given document set, when only one credit note remains unmatched and multiple credit note requests remain unmatched, the system will attempt to match line items from the credit note to the credit note request at the line level. If a match is not found, discrepancies are created and routed for resolution. When discrepancies are created as part of the detail (line-level) matching process, they are automatically resolved by the batch process. This resolution will take place by selecting the appropriate pre-defined reason code from the system options and resolving the discrepancy. During the reason code action rollup process, these newly created resolution actions will be rolled up to create the appropriate resolution documents. In case no applicable reason codes exist in the system for the discrepancy, the credit note will not be matched and processing will stop for the document set.

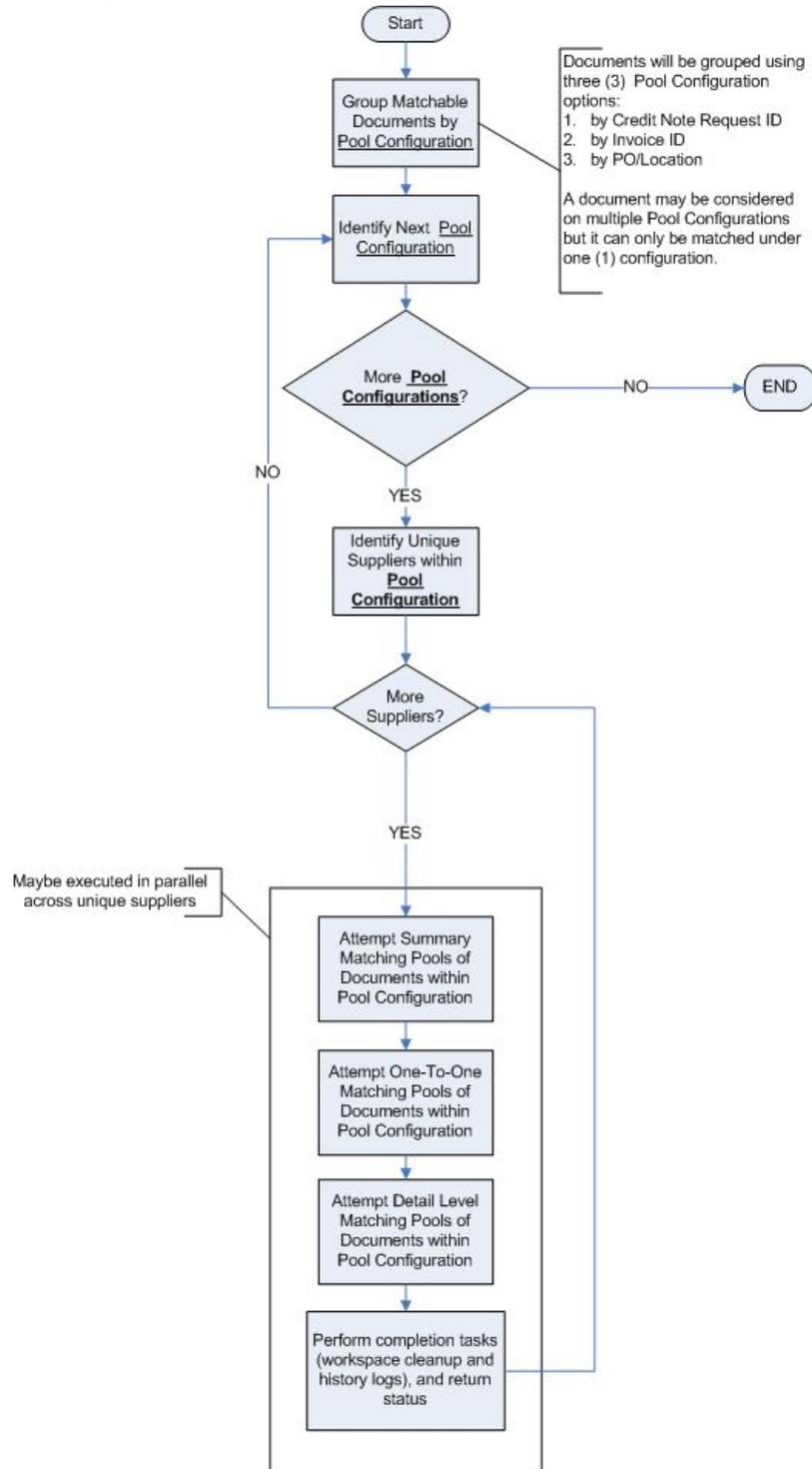
Assumptions and Scheduling Notes

- Both the credit note and credit note request unit cost must be expressed in the same currency. If the currency on the credit note and credit request is the same, but differs from the primary system currency, then an attempt will be made to perform currency conversion only if RMS is the applicable merchandising system.
- The quantities on the credit note must be expressed in the same unit of measure as the quantities on the credit note requests. The batch performs no unit of measure conversion.

Post Processing

- CreditNoteAutoMatch updates the status of qualified documents that have been matched.
- The CreditNoteAutoMatch workspace is cleaned up depending on the related setting in the reim.properties file (refer to the Credit Note AutoMatch Workspace Cleanup Setting section in the reim.properties section).
- The batch creates and resolves discrepancies by utilizing pre-defined reason codes. The Reason Code Rollup Batch must ensure that the respective documents are created.

High-Level Flow Diagram



ReIM Credit Note Auto-Match Batch Flow

Primary Tables Involved

The following are lookup tables that must be populated:

- **IM_DOC_HEAD**
Holds the credit notes and credit note requests with relevant information e.g. supplier, status etc.
- **IM_SUPPLIER_GROUP_MEMBERS**
Holds the supplier group related information.
- **IM_DOC_DETAIL_REASON_CODES**
Holds the Item Detail Record for Credit Notes. Data related to items needs to exist in this table to enable Line level matching.
- **IM_TOLERANCE_SUPP**
Holds the tolerance properties associated with a supplier. The data is required when performing matches within tolerances, at the supplier level.
- **IM_TOLERANCE_DEPT**
Holds the tolerance properties associated with a department. The data is required when performing matches within tolerances, at the department level.
- **IM_TOLERANCE_SYSTEM**
Holds the tolerance properties associated with the system. The data is required when performing matches within tolerances, at the system level.
- **IM_SYSTEM_OPTIONS**
Holds properties associated with the Invoice Matching application, e.g. enable VAT, or enable tolerances, etc.

The following table contains configuration data for the matching process:

- **IM_MATCH_POOL_CONFIG**
The table stores data for the actual matching process. This data will determine which groupings the system will utilize when attempting to match and also dictate which order those groupings will run in.

The following tables are populated during the auto batch process with data related to potential matches. Successful matches will be moved from these tables to history tables (described later in this section) at the end of the batch run. Unsuccessful matches will be removed from these tables at the end of the match process:

- **IM_MATCH_DOC**
Holds the pool of documents that CreditNoteAutoMatchBatch will attempt to match.
- **IM_MATCH_POOL_TOLERANCES**
Holds the calculated tolerances for the each candidate document to be matched.
- **IM_MATCH_POOL_RESULTS**
Holds the cost and qty total for a document set being matched, and the variance between the documents being matched, and also indicate which party the variance favors (retailer or supplier).
- **IM_MATCH_POOL_ITEM**
Holds the actual item detail unit cost and quantities to be used for matching. Details may be from **IM_DOC_DETAIL_REASON_CODES** or **IM_INVOICE_DETAILS** depending on the type of match being performed.
- **IM_MATCH_QTY_VAR**
- **IM_MATCH_COST_VAR**
The two tables hold the quantity and cost discrepancy calculated while attempting a match in a document set.

The following tables are populated for compatibility with the existing Invoice Matching discrepancy related data model:

- IM_QTY_DISCREPANCY
Holds quantity discrepancy records
- IM_QTY_DISCREPANCY_ROLE
Holds the Associate roles who'll have access to generated discrepancies
- IM_QTY_DISCREPANCY_CNR
Holds Qty discrepancies on credit note gets associated with participating credit note requests
- IM_COST_DISCREPANCY
Holds cost discrepancy records
- IM_COST_DISCREPANCY_CNR
Holds Cost discrepancies on credit note gets associated with participating credit note requests

The following new history tables are being populated on the successful completion of the CreditNoteAutoMatchBatch. The tables allow the retailer to track match history and locate aggregate data in the other match history tables based on the appropriate match and document type:

- IM_MATCH_DOC_HIST
On successful completion of the matching process, documents contained in IM_MATCH_DOC are moved to this history table.
- IM_MATCH_POOL_ITEM_HIST
Holds the history of the items that were on the credit note when matched
- IM_MATCH_POOL_RESULTS_HIST
Data from the MATCH_POOL_RESULTS table is moved to history table after a successful match
- IM_MATCH_QTY_VAR_HIST
- IM_MATCH_COST_VAR_HIST
Hold the history related to any quantity or cost variance detected during the match.

The following tables are populated for compatibility with the existing Invoice Matching history maintenance data model:

- IM_CN_SUMMARY_MATCH_HIS
- IM_CN_SUMMARY_MATCH_HIS
- IM_CN_DETAIL_MATCH_HIS

Receipt Write-Off Batch Design

Retailers track received goods that are not invoiced, and they must have the ability to 'write-off' these goods for financial tracking. Two types of processes can determine when these written-off goods will be written to financials: purged receipts from merchandising system, and 'close open receipts' from invoice matching. Because receipts can be purged outside of the invoice matching dialogue, these purged receipts must be maintained until their unmatched amount has been accounted for. These receipts are tracked through STAGE_PURGED_SHIPMENTS and STAGE_PURGED_SHIPSKUS. Every purged shipment record that is not fully matched will have a record by item written to the stage tables. In addition, invoice matching has a system parameter (which can be overwritten at the supplier level) defining the maximum amount of time an open, non-fully matched receipt will be available for matching. Every time the write-off process is ran, each non-

fully matched open receipt received date is compared with the current date minus the system parameter. If the received date is before this difference, then the receipt will be written-off and the invoice match status is closed.

The department/class of each receipt item must be identified to ensure accurate accounting. The form of the accounting distribution is as follows:

Transaction Type	Sign	Value	Notes
Unmatched receipt	Debit	Value of unmatched items on receipt	
Receipt write-Off	Credit	Same as above	
Trade accounts payable	Credit	0	Written as a matter of form

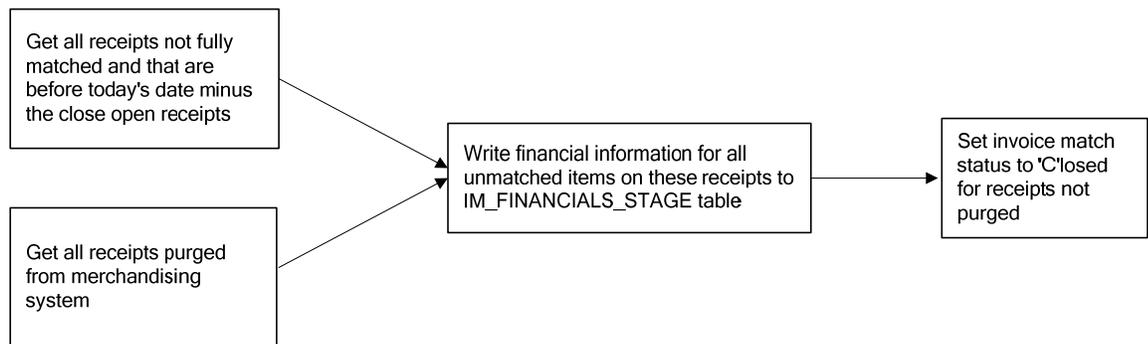
This account distribution mapping is set up through the account cross-reference screen.

Note: If IM_SUPPLIER_OPTIONS.CLOSE_OPEN_RECEIPT_MONTHS is not defined, the value is retrieved from IM_SYSTEM_OPTIONS.CLOSE_OPEN_RECEIPT_MONTHS.

Assumptions and Scheduling Notes

- When setting up the Close Open Receipt Months in ReIM Supplier Options and/or System Options, the value should be less than or equal to RMS UNIT_OPTIONS.ORDER_HISTORY_MONTHS if the intention is to have invoice matching pick up receipts prior to purging.
- The methods from ResolutionPostingService.java should be used to write to the financial staging table. If necessary, create new methods in this class to accomplish this processing.
- Auto-match and any associated processing must be run prior to this batch processing.

High-Level Flow Diagram



Primary Tables Involved

ReIM

- IM_FINANCIALS_STAGE
- IM_SYSTEM_OPTIONS
- IM_SUPPLIER_OPTIONS
- IM_PARTIALLY_MATCHED_RECEIPTS

RMS

- UNIT_OPTIONS
- SHIPMENT
- STAGE_PURGED_SHIPMENT
- SHIPSKU
- STAGE_PURGED_SHIPSKU

Reason Code Action Rollup Batch Design

Reason code actions are resolutions assigned at the discrepancy line level. A number of fixed actions are available to resolve a line item discrepancy; the specific results depend on the action.

The resolution posting process sweeps the IM_RESOLUTION_ACTION table and creates debit and credit memos as needed. Only a single debit or credit memo is created per invoice/discrepancy type, with line details from all related actions for the same discrepancy type.

This process does not delete these records when completed; rather, they are deleted after posting.

A separate, client-created batch process sweeps the receiver adjustment table. The action staging table is used during posting to post the reason code actions to the financial staging table.

To resolve a cost discrepancy, the user can select a 'Receiver Cost Adjustment' action from the cost resolution screen. Similarly, to resolve a quantity discrepancy, the user can select a 'Receiver Unit Adjustment' action from the quantity resolution screen. The actions are written to the IM_RESOLUTION_ACTION table in an unrolled status with the amount of adjustment. The IM_INVOICE_DETAIL table also receives a flag that signifies 'pending adjustment' for the invoice line.

At the same time, the actions are written to the IM_RECEIVER_COST_ADJUST and IM_RECEIVER_QTY_ADJUST tables to indicate the expected receiver adjustment amount on the RMS (or equivalent merchandising system) side. In sum, these two tables serve as the staging tables for the RMS (or equivalent merchandising system) process to actually perform the adjustment.

For a receiver cost adjustment, IM_RECEIVER_COST_ADJUST holds the order unit cost for the item after the adjustment. For a receiver unit adjustment, IM_RECEIVER_UNIT_ADJUST holds the received quantity for the item on the shipment after the adjustment.

The process compares the unit cost and/or quantity received for the item on the shipment with the expected unit cost and/or quantity on the IM_RECEIVER_COST_ADJUST and/or IM_RECEIVER_UNIT_ADJUST tables. If a match exists, the receiver cost and/or unit adjustment has occurred in RMS (or the

equivalent merchandising system). As a result, the process sets the 'pending adjustment' flag on IM_INVOICE_DETAIL table to false for the invoice line. The reason code actions are only rolled up for an invoice if no invoice lines on the invoice have any pending adjustments.

Because ReIM cannot control when and how the receiver adjustments are happening on the RMS side (or the equivalent merchandising system), records written to the IM_RECEIVER_COST_ADJUST and IM_RECEIVER_UNIT_ADJUST tables are considered final.

As a result, when the user resolves a cost or quantity discrepancy, the receiver adjustment must fully resolve a discrepancy before the user leaves the screen, and there should be no re-route actions involved. On the RMS side, the amount of adjustment must be exactly the same as expected.

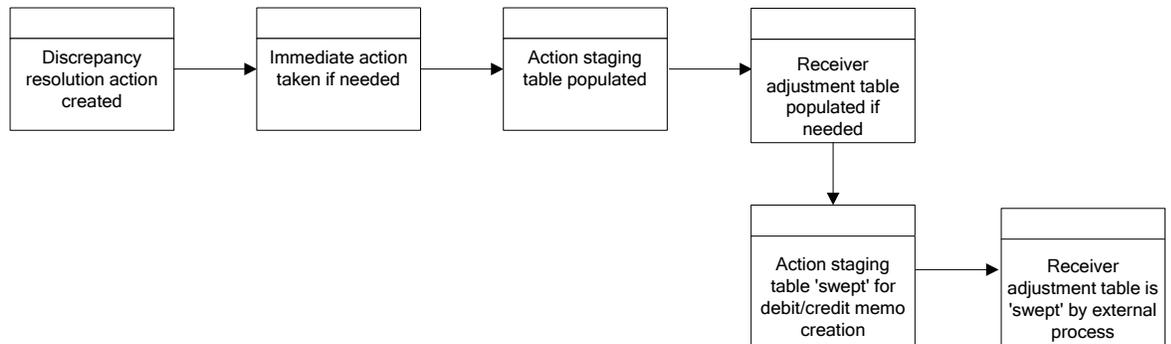
The IM_PARTIALLY_MATCHED_RECEIPTS table holds the amount of a receipt item that has been matched during invoice matching. The quantity received on the SHIPSKU table subtracts the quantity matched on the IM_PARTIALLY_MATCHED_RECEIPT table, giving the available to match quantity for the receipt item. Auto-match, summary matching, detail matching and quantity discrepancy resolution processes all keep track of the matched quantity bucket to determine how much of the receipt item has already been matched and how much of the receipt item remains available to be matched. In the case of a Receiver Unit Adjustment, the IM_PARTIALLY_MATCHED_RECEIPTS table is updated to reserve the entire remaining unmatched bucket for the receipt item. This logic prevents the adjusted receipt quantity from being used for any other matching or quantity resolutions.

Assumptions and Scheduling Notes

The memo staging table sweep must occur before the posting batch process, or a delay of one day results before posting can occur.

High-Level Flow Diagram

The following diagram offers a high-level view of the processing logic utilized within the reason code action rollup batch process.



ReIM Reason Code Action Rollup Flow

Primary Tables Involved

- IM_DOC_HEAD
- IM_INVOICE_DETAIL
- IM_PARTIALLY_MATCHED_RECEIPTS
- IM_RESOLUTION_ACTION
- IM_RECEIVER_COST_ADJUST
- IM_RECEIVER_UNIT_ADJUST

Disputed Credit Memo Action Rollup Batch Design

When a disputed credit memo is first created as a reversal to a debit memo, cost, or quantity discrepancies are generated for each line on the credit memo, and the original debit memo reason codes are associated with the new credit memo detail lines.

As the user takes actions to resolve the discrepancy online, a record is written to the IM_REVERSAL_RESOLUTION_ACTION table for each resolution action taken. The only actions allowed to resolve the discrepancy are Deny Dispute or Approve Credit in Disputed Status. However, the user can choose multiple reason codes associated with Deny or Approve actions to resolve the disputed line. Also, the user can either resolve the disputed line completely, or partially resolve it. Upon complete resolution of a disputed line, the cost or quantity discrepancy is deleted from the system.

The disputed credit memo action rollup process checks the records on the IM_REVERSAL_RESOLUTION_ACTION table and rolls up the credit memo detail lines by document/item/reason code. The rollup occurs only if all lines on a disputed credit memo have been completely resolved (that is, no cost or quantity discrepancy records remain for the credit memo).

After the rollup, a new set of detail lines associated with the resolution reason codes replace the original set of detail lines associated with the debit reason codes on the IM_DOC_DETAIL_REASON_CODES table. The new credit memo lines are in Approved or Denied status depending on the resolution action. The credit memo header status is updated to Approved status. The lines that are approved are rolled up to calculate the header level total cost and total quantity. Non-merchandise costs can be associated with a credit memo that is created as a debit memo reversal, but no resolution actions can be taken on non-merchandise costs. Non-merchandise costs should be included in the credit memo's total cost.

Assumptions and Scheduling Notes

The disputed credit memo action rollup must occur before resolution posting and after receiver adjustment.

Primary Tables Involved

The following tables are used for the debit memo reversal, resolution, and rollup processes:

- IM_DOC_HEAD
This table holds the document header information.

- **IM_DOC_DETAIL_REASON_CODES**
This table holds the document detail information by item/reason code. Before resolution rollup, this table holds the document detail information based on the original debit reason codes. After resolution rollup, this table holds the document detail information based on the reason codes used to resolve the disputed credit memo lines.
- **IM_REVERSAL_RESOLUTION_ACTION**
This table holds the resolution actions the user takes to approve or deny the disputed credit memo line.
- **IM_COST_DISCREPANCY**
This table holds the disputed credit memo lines for a debit memo cost reversal.
- **IM_QTY_DISCREPANCY**
This table holds the disputed credit memo lines for a debit memo quantity reversal.
- **IM_QTY_DISCREPANCY_ROLE**
This table holds the routing information for a credit memo quantity.

Resolution Posting Batch Design

For each invoice, the batch process writes applicable financial accounting transactions to either of the following tables:

- The Financials staging table, **IM_FINANCIALS_STAGE**
- The AP staging tables, **IM_AP_STAGE_HEADER** and **IM_AP_STAGE_DETAIL**, or the **IM_FINANCIALS_STAGE**, depending on the transaction type (if the RMS System-Options table: **FINANCIAL_AP = O**)

The processing occurs after discrepancies for documents have been resolved by resolution documents. Once all of the resolution documents for a matched invoice are built, and all of the RCA/RUA external processing has been confirmed, the process inserts financial accounting transactions to the financials staging table, to represent the resolution and consequent posting of the invoice. The process also inserts financial accounting transactions for the approved documents that are being handled.

Once all of the transactions have been written, the process switches the status of the current invoices/documents to 'Posted', and then moves on to the next invoice/document.

If a segment look-up fails, the failed record is written to a financials error table.

Assumptions and Scheduling Notes

Before posting can occur, the following information must be set up:

- Set up segment definitions in the system.properties.
- Define GL account segments on the GL Options screen.
- Specify all the accounts using the GL Cross Reference screen.

The dynamic segments for a GL account can be any or all of the following designated segments:

- Country
- Location
- Dept
- Class

If dynamic segments are defined, the values for the segments must be defined in the applicable tables, IM_DYNAMIC_SEGMENT_DEPT_CLASS or IM_DYNAMIC_SEGMENT_LOC.

Primary Tables Involved

- IM_DOC_HEAD
Holds the matched and approved documents.
- IM_DOC_NON_MERCH
Holds the non-merchandise costs for invoices.

Lookup Tables that Must be Populated

- IM_GL_OPTIONS
Order of segments and dynamic segments defined.
- IM_GL_CROSS_REF
Account values defined for account types and account codes.
- IM_DYNAMIC_SEGMENT_DEPT_CLASS
Accounts defined for each department/class combination.
- IM_DYNAMIC_SEGMENT_LOC
Accounts defined for each location/company combination.

Table to Which the Process Posts Data

- IM_FINANCIALS_STAGE
 - Transaction code
 - Debit/credit indicator
 - Invoice ID
 - Invoice date
 - Supplier
 - Purchase order (if available)
 - Shipment/receipt (only if an unmatched receipt record is being written)
 - Currency
 - Amount
 - Best terms ID
 - Terms date
 - Pre-paid indicator
 - Comments
 - Create user ID
 - Create date-time
 - Segments that determine the mapping account in the external financial system (as defined in the IM_GL_CROSS_REF table).

OR

IM_AP_STAGE_HEAD

- Sequence Number: Automatically generated line numbers 1, 2, 3, and so on; incremented for each detail record per DOC ID; for identification purpose.
- Doc_id: Same as in current im staging table.
- Invoice Type Lookup Code: If document type = MRCHI or NMRCHI, this value is set to 'STANDARD'. Otherwise this value is set to 'CREDIT'.

- invoice_number: The concatenated data is as follows:
 - chars 1-34: the first 34 characters from the EXT DOC ID
 - char 35: a hyphen
 - chars 36-50: the DOC ID
- Vendor: Same as for current im staging table.
- Oracle_site_id:
 - The loc from this transaction to read new RMS Location/Org Unit data to find the Org Unit.
 - The Org Unit to read new RMS Supplier Addr/Org Unit/Site ID data to find Oracle Site ID.
- Currency Code: Valued if this is a foreign currency invoice, otherwise null.
- Exchange Rate: If exchange rate is valued, this should be the literal 'USER'; otherwise blank.
- Exchange Rate Type:
- Document Date: Same as in current im staging table.
- Amount: The TOTAL amount including tax.
- Best Terms Date: Same as in current im staging table.
- Segment1: Same as in current IM financials staging table.
- Segment2: Same as in current IM financials staging table.
- Segment3: Same as in current IM financials staging table.
- Segment4: Same as in current IM financials staging table.
- Segment5: Same as in current IM financials staging table.
- Segment6: Same as in current IM financials staging table.
- Segment7: Same as in current IM financials staging table.
- Segment8: Same as in current IM financials staging table.
- Segment9: Same as in current IM financials staging table.
- Segment10: Same as in current IM financials staging table.
- Create Date: Same as in current IM financials staging table.
- Best Terms ID: Same as in current IM financials staging table.

IM_AP_STAGE_DETAIL

- Doc_id
- Sequence number: Automatically generated line numbers 1, 2, 3, and so on; incremented for each detail record per DOC ID; for identification purpose.
- Transaction Code
- Line Type Lookup Code: This value varies. The rules are:
 - If the tran-code is 'UNR' or 'VWT' or 'REASON' or 'CRN' then this value is 'ITEM.'
 - If this is a generated tax line, then this value will be 'TAX'.
 - If none of the above, then this value will be 'MISCELLANEOUS'.
- Amount
- VAT Code: Same as in current im staging table. EXCEPT - for generated tax lines, the amount for this line should be the amount from the taxable line times the tax rate

- Segment1: For regular lines: same as in current staging table. For generated tax line: use values from source line.
- Segment2: See rules for segment 1.
- Segment3: See rules for segment 1.
- Segment4: See rules for segment 1.
- Segment5: See rules for segment 1.
- Segment6: See rules for segment 1.
- Segment7: See rules for segment 1.
- Segment8: See rules for segment 1.
- Segment9: See rules for segment 1.
- Segment10: See rules for segment 1.
- Create Date: Same as in current IM staging table.

EDI Invoice Download Batch Design

The EDI invoice download process retrieves debit memos, credit note requests, and credit memos in 'approved' or 'posted' status from the resolution posting process and creates a flat file. The client converts the flat file into an EDI format and sends it through the EDI invoice download transaction set to the respective vendors.

Assumptions and Scheduling Notes

- All data is valid in the IM_DOC_HEAD tables. ReIM does not validate details.
- Auto-match must run prior to the EDI invoice download.

Primary Tables Involved

The EDI invoice download batch process reads from the following tables:

- IM_DOC_HEAD
- IM_DOC_DETAIL_REASON_CODES
- IM_DOC_NON_MERCH
- IM_DOC_DETAIL_COMMENTS

Restart and Recovery

If the EDI invoice download aborts while processing, an incomplete file is generated. To generate a complete file, the process simply needs to be rerun and allowed to fully process. If the cause of the aborted process is software related, this action might not solve the issue; other steps may be required to ensure that the process completes its entire initial run.

Complex Deal Upload Batch Design

The Complex Deal Upload batch process reads data from header and detail complex deals staging tables in RMS.

For each combination of deal ID and deal detail ID on the RMS staging tables, the batch process creates a credit memo, a debit memo, or a credit note request, depending upon an indicator on the staging tables.

The batch process also copies most of the data from the RMS staging tables into one ReIM detail table (IM_COMPLEX_DEAL_DETAIL). This data is later referenced during the posting process for the created documents.

Assumptions and Scheduling Notes

The RMS staging header and detail must be purged nightly after the upload has run.

Primary Tables Involved

Note: For descriptions of RMS tables, see the latest RMS Data Model.

- STAGE_COMPLEX_DEAL_HEAD (RMS table)
- STAGE_COMPLEX_DEAL_DETAIL (RMS table)
- IM_DOC_HEAD
This table holds general information for documents of all types. Documents include merchandise invoices, non-merchandise invoices, consignment invoices, credit notes, credit note requests, credit memos, and debit memos. Documents remain on this table for SYSTEM_OPTIONS.DOC_HISTORY_MONTHS after they are posted to the ledger.
- IM_DOC_DETAIL_REASON_CODES
This table contains quantity/unit cost adjustments for a given document/item/reason code.
- IM_DOC_VAT
This table associates the document with its value added tax (VAT) information.
- IM_COMPLEX_DEAL_DETAIL
This table holds the details of the complex deal stored in ReIM. It is used during complex deal detail posting.

Fixed Deal Upload Batch Design

The Fixed Deal Upload batch process reads data from header and detail fixed deals staging tables in RMS.

For each deal ID on the RMS staging tables, the batch process creates a credit memo, a debit memo, or a credit note request, depending upon an indicator on the staging tables.

The batch process also copies most of the data from the RMS staging tables into one ReIM detail table (IM_FIXED_DEAL_DETAIL). This data is later referenced during the posting process for the created documents.

For non-merchandise fixed deals that are not associated with an RMS location, the org unit has been added to the RMS staging table. During the Fixed Deal upload process, the set of books ID associated with this org unit is used to access a new table (FIXED_DEAL_SOB_LOC_DEFAULT) to get the location to use for the deal document in IM_DOC_HEAD. Then, the resolution posting job populates the financial staging tables with the set of books ID associated with the location just like it does with all other documents.

Assumptions and Scheduling Notes

The RMS staging header and detail must be purged nightly after the upload has run.

Primary Tables Involved

Note: For descriptions of RMS tables, see the latest RMS Data Model.

- STAGE_FIXED_DEAL_HEAD (RMS table)
- STAGE_FIXED_DEAL_DETAIL (RMS table)
- IM_DOC_HEAD
This table holds general information for documents of all types. Documents include merchandise invoices, non-merchandise invoices, consignment invoices, credit notes, credit note requests, credit memos, and debit memos. Documents remain on this table for SYSTEM_OPTIONS.DOC_HISTORY_MONTHS after they are posted to the ledger.
- IM_DOC_NON_MERCH
This table holds various user-defined non-merchandise costs associated with an invoice. Non merchandise costs can be associated with merchandise invoice if the IM_SUPPLIER_OPTIONS.MIX_MERCH_NON_MERCH_IND for the vendor is 'Y'. If the MIX_MERCH_NON_MERCH_IND for the vendor is 'N', non merchandise expenses can only be on non merchandise invoice documents.
- IM_DOC_VAT
This table associates the document with its value added tax (VAT) information.
- IM_FIXED_DEAL_DETAIL
This table holds the details of the fixed deals in the ReIM system. It will be used during fixed deal detail posting.

RETL Program Overview for the ReIM Extraction Program

To facilitate the extraction of data from ReIM (that could be eventually loaded into a data warehouse for reporting purposes, for example), ReIM works in conjunction with the Retail Extract Transform and Load (RETL) framework. This architecture optimizes a high performance data processing tool that can let database batch processes take advantage of parallel processing capabilities.

Oracle Retail streamlined RETL code provides for less data storage, easier implementation, and reduced maintenance requirements through decreased code volume and complexity. The RETL scripts are Korn shell scripts that are executable from a UNIX prompt. A typical run and debugging situation is provided later in this chapter.

These extractions were initially designed for Retail Data Warehouse (RDW) but can be used for some other application in the retailer's enterprise.

For more information about the RETL tool, see the latest RETL Programmer's Guide.

Architectural Design

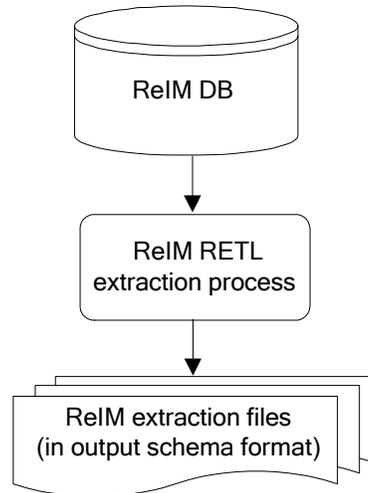
The diagram below illustrates the extraction processing architecture for ReIM. Instead of managing the change captures as they occur in the source system during the day, the process involves extracting the current data from the source system. The extracted data is output to flat files. These flat files are then available for consumption by a product such as Retail Data Warehouse (RDW).

The target system, (RDW, for example), has its own way of completing the transformations and loading the necessary data into its system, where it can be used for further processing in the environment.

ReIM modules use the same libraries, resource files, and configuration files as RMS. All these libraries, resource files, and configure files are packed with RMS. ReIM must have RMS installed before any ReIM RETL scripts can be 'kicked off'.

ReIM Extraction Architecture

The architecture relies upon the use of well-defined flows specific to the ReIM database. The resulting output is comprised of data files written in a well-defined schema file format. This extraction includes no destination specific code.



RETL Extraction Processing for ReIM

Configuration

RETL

Before trying to configure and run ReIM ETL, install RETL version 12.0 or later, which is required to run ReIM RETL. Run the `verify_retl` script (included as part of the RETL installation) to ensure that RETL is working properly before proceeding.

RETL User and Permissions

ReIM ETL is installed and run as the RETL user. Additionally, the permissions are set up as per the RETL Programmer's Guide. ReIM ETL reads data, creates, deletes, and updates tables. If these permissions are not set up properly, extractions fail.

Environment Variables

See the RETL Programmer's Guide for RETL environment variables that must be set up for your version of RETL. You will need to set `MMHOME` to your base directory for ReIM RETL. This is the top level directory that you selected during the installation process. In your `.kshrc`, you should add a line such as the following:

```
export MMHOME=<base directory for RMS ETL>\dwi12.0\dev
```

Note: Because ReIM modules share the same libraries and configuration files as RMS, `MMHOME` is the same as what is defined in RMS.

dwi_config.env Settings

Make sure to review the environmental parameters in the `dwi_config.env` file before executing batch modules. There are several variables you must change depending upon your local settings:

For example:

```
export DBNAME=int9i
export RIM_OWNER=steffej_reim1102
export BA_OWNER=rmsint1102
export ORACLE_PORT="1524"
export ORACLE_HOST="mspdev38"
```

You must set up the environment variable `PASSWORD` in `dwi_config.env`. In the example below, adding the line to the `dwi_config.env` causes the password 'mypasswd' to be used to log into the database:

```
export PASSWORD=mypasswd
```

Steps to Configure RETL

1. Log in to the UNIX server with a UNIX account that will run the RETL scripts.
2. Change directories to `$MMHOME/rfx/etc`.
3. Modify the `dwi_config.env` script:
 - a. Change the `DBNAME` variable to the name of the ReIM database.
 - b. Change the `RIM_OWNER` variable to the username of the ReIM schema owner.
 - c. Change the `BA_OWNER` variable to the username of the ReIME batch user.
 - d. Change the `ORACLE_HOST` variable to the database server name.
 - e. Change the `ORACLE_PORT` variable to the database port number
 - f. Change the `MAX_NUM_COLS` variable to modify the maximum number of columns from which RETL selects records.

Note: All ReIM tables must be under the RMS database. ReIM has the same `BA_OWNER` as RMS. Thus, the only piece that ReIM modifies in `dwi_config.env` file is to assign a value to `RIM_OWNER`. The configuration file, `dwi_config.env`, as well as all other configuration files, are packed with RMS.

Program Features

RETL programs use one return code to indicate successful completion. If the program successfully runs, a zero (0) is returned. If the program fails, a non-zero is returned.

Program Status Control Files

To prevent a program from running while the same program is already running against the same set of data, the ReIME code utilizes a program status control file. At the beginning of each module, `dwi_config.env` is run. It checks for the existence of the program status control file. If the file exists, then a message stating, `'${PROGRAM_NAME} has already started'`, is logged and the module exits. If the file does not exist, a program status control file is created and the module executes.

If the module fails at any point, the program status control file is not removed, and the user is responsible for removing the control file before re-running the module.

File Naming Conventions

The naming convention of the program status control file allows a program whose input is a text file to be run multiple times at the same time against different files.

The name and directory of the program status control file is set in the configuration file (`dwi_config.env`). The directory defaults to `$MMHOME/error`. The naming convention for the program status control file itself defaults to the following dot separated file name:

- The program name
- The first file name, if one is specified on the command line
- status
- The business virtual date for which the module was run

For example, the program status control file for the `invildex` program would be named as follows for the `VDATE` of March 21, 2004:

```
$MMHOME/error/sincildex.sincilddm.txt.status.20040321
```

Restart and Recovery

Because RETL processes all records as a set, as opposed to one record at a time, the method for restart and recovery must be different from the method that is used for Pro*C. The restart and recovery process serves the following two purposes:

- It prevents the loss of data due to program or database failure.
- It increases performance when restarting after a program or database failure by limiting the amount of reprocessing that needs to occur.

The ReIM extract module (ReIME) extracts from a source transaction database writes to a text file.

To limit the amount of data that needs to be re-processed, more complicated modules that require the use of multiple RETL flows utilize a bookmark method for restart and recovery. This method allows the module to be restarted at the point of last success and run to completion. The bookmark restart/recovery method incorporates the use of a bookmark flag to indicate which step of the process should be run next. For each step in the process, the bookmark flag is written to and read from a bookmark file.

Note: If the fix for the problem causing the failure requires changing data in the source table or file, then the bookmark file must be removed and the process must be re-run from the beginning in order to extract the changed data.

Bookmark File

The name and directory of the restart and recovery bookmark file is set in the configuration file (`dwi_config.env`). The directory defaults to `$MMHOME/rfx/bookmark`. The naming convention for the bookmark file itself defaults to the following dot-separated file name:

- The program name
- The first file name, if one is specified on the command line
- `'bkm'`
- The business virtual date for which the module was run

The example below illustrates the bookmark flag for the `invildex` program run on the `VDATE` of January 5, 2004:

```
$MMHOME/rfx/bookmark/sincildex.sincilddm.txt.bkm.20040105
```

Message Logging

Message logs are written daily in a format described in this section.

Daily Log File

Every RETL program writes a message to the daily log file when it starts and when it finishes. The name and directory of the daily log file is set in the configuration file (`dwi_config.env`). The directory defaults to `$MMHOME/log`. All log files are encoded UTF-8.

The naming convention of the daily log file defaults to the following 'dot' separated file name:

- The business virtual date for which the modules are run
- `'.log'`

For example, the location and the name of the log file for the business virtual date (`VDATE`) of March 21, 2004 would be the following:

```
$MMHOME/log/20040321.log
```

Format

As the following examples illustrate, every message written to a log file has the name of the program, a timestamp, and either an informational or error message:

```
sincildex 12:51:07: Program starting...
sincildex 12:51:07: last max post date is 20010311000000
sincildex 12:51:07: Retrieve current max post date
sincildex 12:51:10: Loading invc_exchng_rate_temp table ...
sincildex 12:51:15: Loading po_exchng_rate_temp table ...
sincildex 12:51:20: Process all records between last post date and current max
post date
sincildex 12:51:27: Drop table rmsint110buser1.INVC_EXCHNG_RATE_TEMP
sincildex 12:51:27: Drop table rmsint110buser1.PO_EXCHNG_RATE_TEMP
sincildex 12:51:27: Number of records in sincilddm.txt = 15
sincildex 12:51:27: Program completed successfully
```

If a program finishes unsuccessfully, an error file is usually written that indicates where the problem occurred in the process. There are some error messages written to the log file, such as `'No output file specified'`, that require no further explanation written to the error file.

Program Error File

In addition to the daily log file, each program also writes its own detail flow and error messages. Rather than clutter the daily log file with these messages, each program writes out its errors to a separate error file unique to each execution.

The name and directory of the program error file is set in the configuration file (`dwi_config.env`). The directory defaults to `$MMHOME/error`. All errors and *all routine processing messages* for a given program on a given day go into this error file (for example, it will contain both the `stderr` and `stdout` from the call to RETL). All error files are encoded UTF-8.

The naming convention for the program's error file defaults to the following 'dot' separated file name:

- The program name
- The first file name, if one is specified on the command line
- The business virtual date for which the module was run

For example, all errors and detail log information for the `invildex` program would be placed in the following file for the batch run of March 21, 2004:

```
$MMHOME/error/sincildex.sincildm.txt.20040321
```

ReIME Reject Files

The ReIME extract module may produce a reject file if it encounters data related problems, such as an inability to find data on required lookup tables. The module tries to process all data and then indicates that records were rejected so that all data problems can be identified in one pass and corrected; then, the module can be re-run to successful completion. If a module does reject records, the reject file is *not* removed, and the user is responsible for removing the reject file before re-running the module.

The records in the reject file contain an error message and key information from the rejected record. The following example illustrates a record that is rejected due to problems within the currency conversion library:

```
Unable to convert currency for LOC_IDNT, DAY_DT|3|20011002
```

The name and directory of the reject file is set in the configuration file (`dwi_config.env`). The directory defaults to `$MMHOME/data`.

Note: A directory specific to reject files can be created. The `dwi_config.env` file would need to be changed to point to that directory.

Schema Files

RETL uses schema files to specify the format of incoming or outgoing datasets. The schema file defines each column's data type and format, which is then used within RETL to format/handle the data. For more information about schema files, see the latest RETL Programmer's Guide. Schema file names are hard-coded within each module since they do not change on a day-to-day basis. All schema files end with ".schema" and are placed in the "rfx/schema" directory.

Resource Files

The ReIM Kornshell program uses resource files so that the same RETL program can run in various language environments. For each language, there is one resource file.

Resource files contain hard-coded strings that are used by extract programs. The name and directory of the resource file is set in the configuration file (dwi_config.env). The default directory is `${MMHOME}/rfx/include`.

The naming convention for the resource file follows the two-letter ISO code standard abbreviation for languages (for example, en for English, fr for French, ja for Japanese, es for Spanish, de for German, and so on).

Note: Resource files are packed only with RMS.

Command Line Parameters

The module handles command line parameters as described in this section. See the section, "RETL Extraction Program List," to determine the command line parameters for a module.

Note: For some RETL modules across Oracle Retail products, default output file names, and schema names correspond to RDW program names.

Parameters for Non-File Based RETL Module

In order for the non-file based RETL module to run, command line parameters need to be passed in at the UNIX command line. This ReIME module requires an `output_file_path` and `output_file_name` to be passed in. This module may allow the operator to specify more than one output file.

For example:

```
sincildex.ksh output_file_path/output_file_name
```

Typical Run and Debugging Situations

The following examples illustrate typical run and debugging situations for types of programs. The log, error, and so on file names referenced below assume that the module is run on the business virtual date of March 9, 2004. See the previously described naming conventions for the location of each file.

For example:

To run sincildex.ksh:

1. Change directories to \$MMHOME/rfx/src.
2. At a UNIX prompt enter:

```
%sincildex.ksh $MMHOME/data/sincilddm.txt
```

If the module runs successfully, the following results:

- **Log file:** Today's log file, 20040309.log, contains the messages "Program started ..." and "Program completed successfully" for sincildex.ksh.
- **Data:** The sincilddm.txt file exists in the \$MMHOME/data directory and contains the extracted records.
- **Error file:** The program's error file, sincildex.sincilddm.txt.20040309, contains the standard RETL flow (ending with "All threads complete" and "Flow ran successfully") and no additional error messages.
- **Program status control:** The program status control file, sincildex.sincilddm.txt.status.20040309, does not exist.
- **Reject file:** The reject file, sincildex.sincilddm.txt.rej.20040309, does not exist.

If the module does *not* run successfully, the following results:

- **Log file:** Today's log file, 20040309.log, does not contain the "Program completed successfully" message for sincildex.ksh.
- **Data:** The sincilddm.txt file may exist in the data directory but may not contain all the extracted records.
- **Error file:** The program's error file, sincildex.sincilddm.txt.20040309, may contain an error message.
- **Program status control:** The program status control file, sincildex.sincilddm.txt.status.20040309, exists.
- **Reject file:** The reject file, sincildex.sincilddm.txt.rej.20040309, does not exist because this module does not reject records.
- **Bookmark file (in certain conditions):** The bookmark file, sincildex.sincilddm.txt.bkm.20040309, exists because this module contains more than one flow. The error occurred after the first flow (for example, during the second flow).

To rerun a module from the beginning, perform the following actions:

1. Determine and fix the problem causing the error.
2. Remove the program's status control file.
3. Remove the bookmark file from \$MMHOME/rfx/bookmark
4. Change directories to \$MMHOME/rfx/src. At a Unix prompt, enter:

```
%sincildex.ksh $MMHOME/data/sincilddm.txt
```

Note: To understand how to engage in the restart and recovery process, see the section, 'Restart and Recovery' earlier in this chapter.

RETL Extraction Program List

This section serves as a reference to the RETL extraction ReIM program.

Program	Functional Area	Source Table or File	Schema File	Target File	Arguments
sincildex.ksh	Supplier Invoice Cost	IM_DOC_HEAD, IM_INVOICE_DE TAIL, ORDLOC, ITEM_ MASTER	sincilddm.sc hema	sincilddm.txt	output_file_path/file name

Application Programming Interface (API) Flat File Specifications

This section contains APIs that describe the file format specifications for all text files. In addition to providing individual field description and formatting information, the APIs provide basic business rules for the incoming data.

API Format

Each API contains a business rules section and a file layout. Some general business rules and standards are common to all APIs. The business rules are used to ensure the integrity of the information held within RDW. In addition, each API contains a list of rules that are specific to that particular API.

File Layout

- **Field Name:** Provides the name of the field in the text file.
- **Description:** Provides a brief explanation of the information held in the field.
- **Data Type/Bytes:** Includes both data type and maximum column length. Data type identifies one of three valid data types: character, number, or date. Bytes identifies the maximum bytes available for a field. A field may not exceed the maximum number of bytes (note that ASCII characters usually have a ratio of 1 byte = 1 character)
 - **Character:** Can hold letters (a,b,c...), numbers (1,2,3...), and special characters (\$,#,&...)
 - **Numbers:** Can hold only numbers (1,2,3...)
 - **Date:** Holds a specific year, month, day combination. The format is YYYYMMDD, unless otherwise specified.
- Any required formatting for a field is conveyed in the Bytes section. For example, Number (18,4) refers to number precision and scale. The first value is the precision and always matches the maximum number of digits for that field; the second value is the scale and specifies, of the total digits in the field, how many digits exist to the right of the decimal point. For example, the number -12345678901234.1234 would take up twenty ASCII characters in the flat file; however, the overall precision of the number is still (18,4).
- **Field Order:** Identifies the order of the field in the schema file.
- **Required Field:** Identifies whether the field can hold a null value. This section holds either a 'yes' or a 'no'. A 'yes' signifies the field may not hold a null value. A 'no' signifies that the field may, but is not required, to hold a null value.

General Business Rules and Standards Common to All APIs

- Complete 'snapshot' (of what RDW refers to as dimension data):
A majority of RDW dimension code requires a complete view of all current dimensional data (regardless of whether the dimension information has changed) once at the end of every business day. If a complete view of the dimensional data is not provided in the text file, invalid or incorrect dimensional data can result. For instance, not including an active item in the prditmdm.txt file causes that item to be closed (as of the extract date) in the data warehouse. When a sale for the item is processed, the fact program will not find a matching 'active' dimension record. Therefore, it is essential, unless otherwise noted in each API's specific business rules section, that a complete snapshot of the dimensional data be provided in each text file.

If there are no records for the day, an empty flat file must still be provided.

- Updated and new records of (what RDW refers to as fact data):
Facts being loaded to RDW can either be new or updated facts. Unlike dimension snapshots, fact flat files will only contain new/updated facts exported from the source system once per day (or week, in some cases). Refer to each API's specific business rules section for more details.

If there are no new or changed records for the day, an empty flat file must still be provided.

- Primary and local currency amount fields
Amounts will be stored in both primary and local currencies for most fact tables. If the source system uses multi-currency, then the primary currency column holds the primary currency amount, and the local currency column holds the local currency amount. If the location happens to use the primary currency, then both primary and local amounts hold the primary currency amount. If the source system does not use multi-currency, then only the primary currency fields are populated and the local fields hold NULL values.
- Leading/trailing values:
Values entered into the text files are the exact values processed and loaded into the datamart tables. Therefore, the values with leading and/or trailing zeros, characters, or nulls are processed as such. RDW does not strip any of these leading or trailing values, unless otherwise noted in the individual API's business rules section.
- Indicator columns:
Indicator columns are assumed to hold one of two values, either "Y" for yes or "N" for no.
- Delimiters:

Note: Make sure the delimiter is never part of your data.

- Dimension Flat File Delimiter Standards (as defined by RDW): Within dimension text files, each field must be separated by a pipe (|) character, for example a record from prddivdm.txt may look like the following:

```
1000|1|Homewares|2006|Henry Stubbs|2302|Craig Swanson
```

- Fact Flat File Delimiter Standards (as defined by RDW): Within facts text files, each field must be separated by a semi-colon character (;). For example a record from exchngratedm.txt may look like the following:

```
WIS;20010311;1.73527820592648544918
```

See the latest RETL Programmer's Guide for additional information.

- End of Record Carriage Return:
Each record in the text file must be separated by an end of line carriage return. For example, the three records below, in which each record holds four values, should be entered as:

```
1|2|3|4
5|6|7|8
9|10|11|12
```

- and not as a continuous string of data, such as:

```
1|2|3|4|5|6|7|8|9|10|11|12
```

sincilddm.txt

Business rules:

- This interface file contains invoice and order cost information for each item on a matched invoice.
- This interface file cannot contain duplicate transactions for an item_idnt, po_idnt, invc_idnt, supp_idnt, day_dt, and loc_idnt combination.
- This interface file follows the fact flat file interface layout standard.
- This interface file contains neither break-to-sell items nor packs that contain break-to-sell component items.

Name	Description	Data Type/Bytes	Field Order	Required Field
ITEM_IDNT	The unique identifier of an item.	CHARACTER(25)	1	Yes
PO_IDNT	The unique identifier of a purchase order	VARCHAR2(8)	2	Yes
INVC_IDNT	The unique identifier of an invoice.	VARCHAR2(10)	3	Yes
SUPP_IDNT	The unique identifier of a supplier.	CHARACTER(10)	4	Yes
DAY_DT	The calendar day on which the transaction occurred.	DATE	5	Yes
LOC_IDNT	The unique identifier of the location.	CHARACTER(10)	6	Yes
F_SUPP_INVC_UNIT_COST_AMT	The invoice cost, in the system primary currency.	NUMBER(18,4)	7	No
F_SUPP_INVC_UNIT_COST_AMT_LCL	The invoice cost, in the local currency	NUMBER(18,4)	8	No

Name	Description	Data Type/Bytes	Field Order	Required Field
F_SUPP_INVC_QTY	The quantity of an item shown on the invoice	NUMBER(12,4)	9	No
F_PO_ITEM_UNIT_COST_AMT	The item's purchase order unit cost, in primary currency.	NUMBER(18,4)	10	No
F_PO_ITEM_UNIT_COST_AMT_LCL	The item's purchase order unit cost, in local currency.	NUMBER(18,4)	11	No