amdocs rating

Rating 6.0
Overview

Document Information

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Contents

1. INTRODUCTION

Amdocs Rating is the component of the Amdocs Billing Platform (ABP) responsible for determining the cost of a service used by the customer, for providing quotes and advice of charge, and for a variety of other rating-related operations.

The intelligent Amdocs Rating design separates the rating functionality from the business logic, thus generating an independent and stable rating mechanism that can cope with whatever business logic is defined. The business logic is part of the ABP Product Catalog, which contains the definitions of all the services, offers, pricing elements and rating schemes required by the Communication Service Provider (CSP), meaning they can easily be extended as new services need to be introduced without affecting Rating. Tightly integrated with the Product Catalog, Amdocs Rating can rate every type of service the CSP is likely to ever offer its customers and to support a wide range of marketing strategies.

Currently, Amdocs Rating supports the following categories of services: next-generation, packet-based, public-switched, private network (physical and virtual), mobile, IP, circuit-switched voice, and intelligent network voice.

Additionally, Amdocs Rating supports convergence across lines of business, networks, and payment channels. The Rating component supports convergence of:

- Voice, data, content and commerce
- Wireless, wireline and IP
- Prepaid, postpaid and nowpaid

The heart of the Amdocs Rating component is its powerful pricing engine, which provides rating and other operations, such as advice of charge, across ABP. This flexible pricing engine is also central to the operation of Online Charging for real-time rating, Billing for bill day rating, and Customer Management for subscriber usage and accumulator queries. This document reflects the overall impact of the pricing engine.

The Amdocs Rating system architecture enables the pricing engine to support all the business needs of the CSP using the same service and charge definitions. Although the pricing engine carries out the same general collection of activities for all ABP components, its rating of a particular service is highly dynamic and corresponds to a particular business demand. This is made possible by the collection of functions enveloping the pricing engine and encompassing the various business needs, such as online charging, offline charging, recurring charge rating, one-time charge rating, quote or advice of charge rating, re-rating, queries rating, and so forth. These functions can be extended as necessary to encompass new business demands.

Highlights and Benefits

Highly Configurable Real-Time Pricing Engine

The Amdocs Rating pricing engine is capable of creating charges for any type of event based on customer or service (event) attributes.

Integrated Online and Offline Charging

The Amdocs Rating pricing engine supports integrated online and offline charging, making it possible to perform integrated rating of hybrid accounts. Its online charging capability supports prepaid with pre-delivery service authorization and service termination for enhanced revenue assurance. It allows for the delivery of advice of charges and spending limits (budget control) for all customers.

Rapid Introduction of Rating Schemes

Amdocs Rating allows fast introduction of complex rating schemes, discounting schemes, cross-product marketing initiatives and multi-attribute pricing.

Product Extendibility

As all the services, proposals, offers, pricing elements and rating schemes are maintained in the Amdocs Product Catalog, the Rating component can be extended quickly and smoothly without affecting the Rating code.

Support for Business Organization Hierarchy (BOH)

Amdocs Rating performs its operations for subscribers within a BOH according to the dictates of the BOH. Rating takes into consideration all the pricing packages owned by the relevant levels in the hierarchy and not only those owned by the subscriber.

Smart Implementation

The Amdocs Rating design contributes to smart implementation. Most of the business logic is not embedded within Rating so tailoring the business logic to conform to the world of a particular CSP does not affect the Rating code.

Open, Flexible and Scalable Architecture

Amdocs Rating communicates with other ABP components and external systems through open Application Programming Interfaces (APIs).

These APIs are part of the Amdocs open system architecture that enables application developers to access Amdocs system components.

Seamless Integration with 3rd-Party Mediation Platforms

Although pre-integrated with the Acquisition and Formatting component of the Amdocs Billing Platform, Amdocs Rating can work with the Amdocs Xacct product or any 3rd-party mediation system.

Interaction with Other Components and Systems

The following diagram illustrates the interaction between Amdocs Rating and other ABP components and external systems:

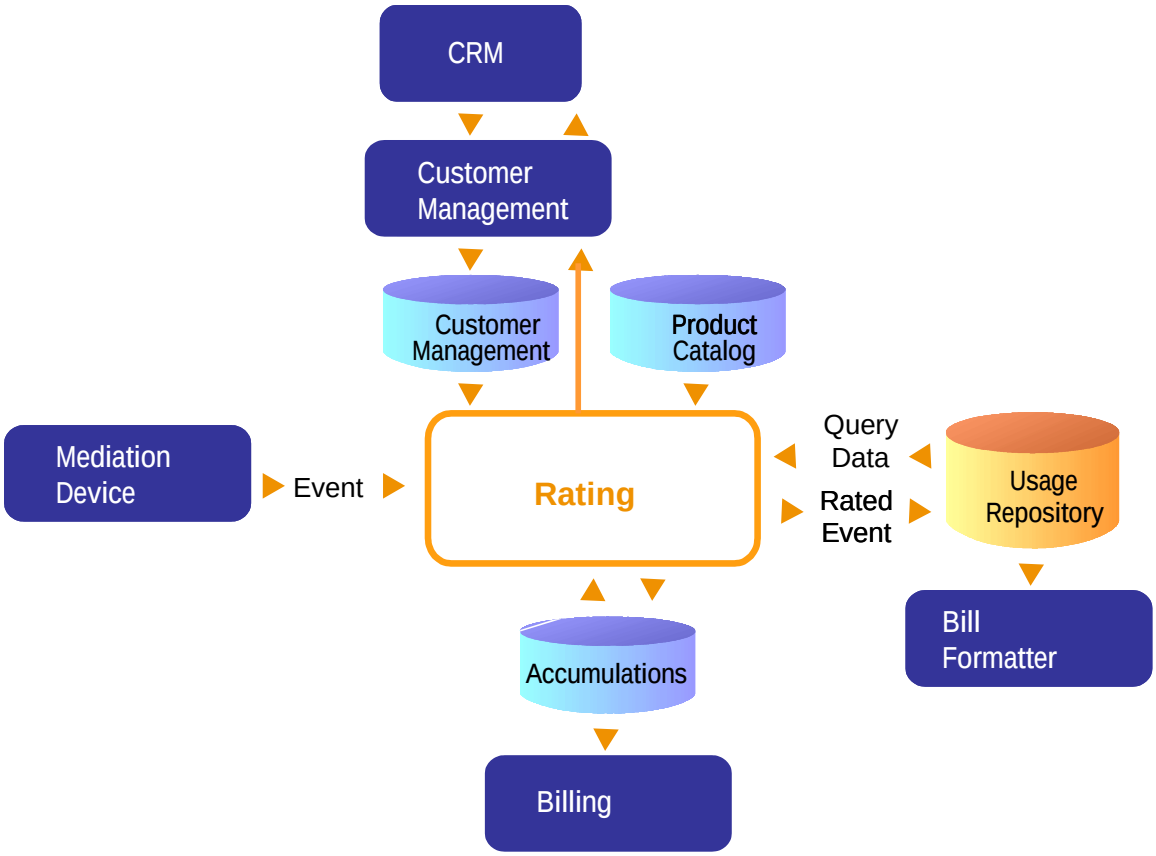

Figure 1-1: Rating Interaction with Other ABP Components and Systems

Mediation Device

Whenever a customer uses a service, an event (event record) is generated. The mediation device collects and formats the event for Rating. The mediation device can be the ABP Acquisition and Formatting component, the Amdocs Xacct product, or any 3rd-party mediation device. The mediation device that sends the event to Amdocs Rating must include the identity of the paying customer.

CRM

CRM is used by subscribers and customer service reps to request unbilled usage information, to obtain quotes for one-time charges and recurring charge rates for ordering, and to obtain advice of charges for services. CRM communicates with Rating via the ABP Customer Management component.

Customer Management (CM)

Customer Management is the ABP component that sends Rating the relevant customer information from its own Customer Management database for in-memory use.

Customer Management Repository

The Customer Management repository provides the customer data used for rating events.

Product Catalog Repository

The Product Catalog repository provides the service, offer, price package, and rating scheme data used for rating events.

Accumulations Repository

The Accumulations repository provides a wide variety of customer and usage accumulation information for rating and billing purposes.

Billing

Billing is the ABP component that calculates the billing information for the bill document. Rating provides Billing with the information needed to perform the calculations: event usage accumulations and one-time and recurring charge rates.

Rating

Rating is the ABP component that produces a rated event for Bill Formatter, provides one-time and recurring charges for Billing, and provides unbilled usage information to customer service reps and subscribers.

Usage Repository

Rating dispatches the rated event to the Usage repository. At the end of the cycle, the data is extracted to the Billing system.

Bill Formatter

Bill Formatter is an ABP component or an external system that produces the billing document. Bill Formatter utilizes the rated events to produce the call detail sections on the cycle bills.

Document Scope

This document provides an overview of the Amdocs Rating component, focusing on its robust and flexible functionality.

Chapter 1 provides an introduction to the document.

Chapter 2 describes the pricing engine.

Chapter 3 discusses the business functions.

Chapter 4 presents the APIs and interfaces within Amdocs Rating.

Chapter 5 discusses the advantages of the Amdocs Rating technical architecture.

Chapter 6 presents the tools and utilities accompanying Amdocs Rating.

For an overview of the new functionalities introduced in Amdocs Rating Version 6.0, see the "Rating 6.0 Release Notes" document.

Terminology

The table below defines terms and acronyms used in this document that have a special meaning in relation to Amdocs Rating.

Term and Acronyms	Definition
3GPP	Third Generation Partnership Project
Accumulators	Event or customer attributes used as counters for accomplishing the marketing strategies of the CSP, e.g., a data volume usage accumulator.
AoC	Advice of Charge
CRM	Customer Relationship Management
CSP	Communications Service Provider
Event	Whenever the subscriber uses a service, an event (event record) containing all the details of the use is generated.
Event type	Events are categorized by type. The different event types have different event record structures. Some examples of event types are voice calls, GPRS calls, SMS, and MMS.
OC	One-time Charge
Offer	A collection of pricing packages that corresponds to a marketing strategy of the CSP, e.g., a collection of pricing packages that are expected to appeal to students, such as Video on Demand, Games, Free Minutes Allowance from Midnight, etc.
Pricing item	A marketing element containing pricing logic.
Pricing item role	Every pricing item has a role: rate, discount, allowance, benefit, and so forth.
Pricing package	A collection of pricing items for the services included in the pricing package. The pricing package may have one or more rate items, allowance items, discount items and benefit items.
Proposal	The proposal provides a structure for defining how offers and groups of offers are to be sold to customers. It is used as a guideline for the ordering process. The CSR uses the proposal to assign offers, which are the salable units, to customers.
PRM	Partner Relationship Management

Term and Acronyms	Definition
QoS	Quality of Service
Rate item	A pricing item that contains a rating scheme (rate table) for rating a service.
Rating scheme	A rating scheme is the formula to be used for rating the service and it includes the rates to be used for different configurations of usage.
RC	Recurring Charges
VoD	Video on Demand

2. PRICING ENGINE

The pricing engine is a supremely versatile rater capable of supporting whatever marketing strategies the CSP is likely to devise. The pricing engine can support highly-complex rating schemes involving multiple attributes and multiple dimensions of attributes (see "Rate Item" below). While rating a service, the pricing engine can apply an array of marketing elements: a rating scheme, discounts, allowances, benefits, budget control monitoring, and dynamic accumulators.

The pricing engine is summoned to perform rating by the business functions, each having a different business objective. Although the business objectives are different, the pricing engine carries out the same group of functions for all of the business functions. See the "Business Functions" chapter for further information about the business functions.

This chapter focuses on the pricing engine functionality:

- Guiding to service
- Rating
- Updating accumulators
- Dispatching to downstream systems
- Recording rated events and accumulators

Briefly, the pricing engine operation can be viewed as follows: The pricing engine determines the service associated with an event and then the pricing items (rate, allowances, discounts, benefits, etc.) qualifying for rating the event, as well as the exact sequence of their application during rating. This is accomplished using flexible and rule-based selection criteria, as well as dynamic accumulators reflecting an endless variety of subscriber accumulations conforming to the CSP's marketing strategies. The pricing engine rates the event accordingly and updates the relevant accumulators impacted by the event itself. The pricing engine is also responsible for dispatching the rated events and updated accumulators to downstream systems and for recording them in permanent repositories.

Event

Understanding what is meant by *event* is central to understanding the pricing engine. Whenever a customer uses any service provided through any of the CSP's networks, an *event* (event record) is generated with all the information about the use of that service at that particular time. This information is used to determine how to handle and rate the event.

Clearly, different information is necessary for rating different types of services. For example, SMS calls may be rated according to a fixed price per SMS, while mobile-to-mobile calls may be rated based solely on call

duration. Therefore, events of different types must have different types of information. To simplify the situation, events are categorized according to event type and events of the same type all have the same attributes.

The event type, together with its attributes, is an important factor in mapping the event to a rating scheme and to the specific rate to be used for rating the event.

Guiding to Service

A subscriber may have multiple offers for a particular service, an offer may contain multiple pricing packages for that same service, and a pricing package may have multiple pricing items for that same service. In addition, the subscriber may be part of a business entity that purchases offers for that service for the entire organization. Furthermore, there may be a market offer for that service for all subscribers within the market. The pricing engine filters all these possibilities to identify the pricing items for rating the service.

Pricing items are the elements that define the pricing logic. Pricing items are categorized by role: rate, discount, allowance, benefit, and budget control. See "Rating" below for more information about their use.

The pricing engine performs an iterative qualification process to determine exactly how an event is to be rated. The qualification process is performed according to the following sequence:

Element	Action
Offer	Filters all the offers applicable for the event
Pricing packages	Filters all the relevant pricing packages within those offers
Pricing items	Filters all the relevant pricing items within the pricing packages
Pricing item sequence	Defines the sequence in which the selected pricing items are to be applied to the event

The diagram below illustrates the qualification process logic:

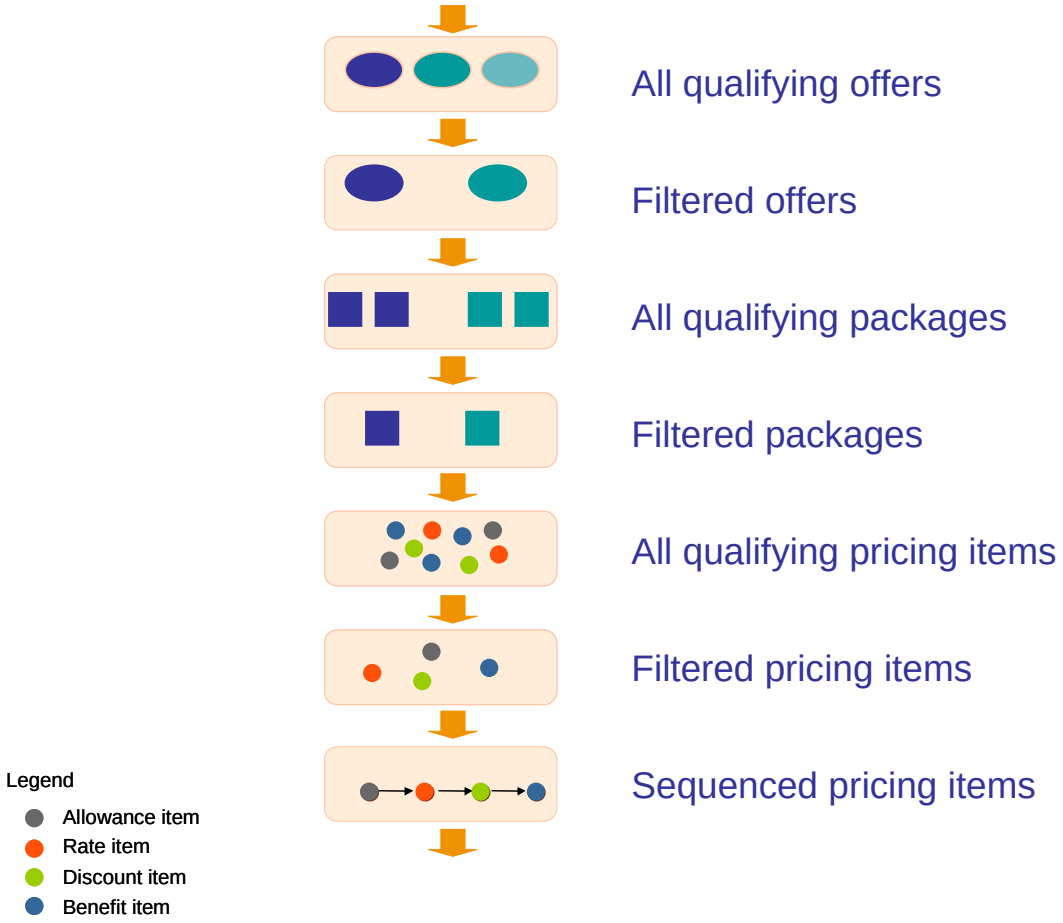

Figure 2-1: Qualification Process Logic

Qualification of Offers, Pricing Packages and Pricing Items

The pricing engine determines which of the subscriber's offers are suitable for rating the event. The offers may include:

- Offers purchased by the subscriber.
- Offers purchased by a higher level in the business entity to which the subscriber belongs (that is, the customer or a unit within the customer organization, if the customer has a corporate hierarchy structure). For example, a corporate customer can define a corporate price package, which is automatically assigned to all corporate employees.
- Market-level offers providing default rates or special promotions to all customers in the market.

Once all the relevant offers (from all origins) are identified, the pricing engine utilizes flexible selection criteria to determine which of the pricing packages and pricing items are suitable for rating the event. Selection criteria may be as

simple as using the event type as the sole selection mechanism (such as selecting all pricing items for SMS). Alternatively, selection criteria can be complex, such as using any of the event and customer attributes in an expression whose role it is to perform the selection. Following are some examples:

Attribute Type	Example
Event	The whole called party telephone number or its prefix can be used to select the subscriber's "Friends & Family" rating scheme.
Event	The area code of the called party can be used to select the subscriber's designated calling area special rates.
Geographical	Cells and location areas can be used for selecting the subscriber's home zone rating scheme.
Customer	The customer's age can be used to select a rating scheme or a special discount for particular age groups, such as senior citizens or teenagers.

For a full description of the pricing packages, pricing items and pricing definitions, refer to the "Amdocs Product Catalog Overview" document.

Prioritization of Pricing Items

Once the list of pricing items for the event is finalized, the pricing engine prioritizes them in the sequence in which they are to be applied.

Prioritization is achieved through the following logic:

- Pricing item role – The role determines the quantity of the pricing items. Only one rate item but multiple allowance and discount items can be used to rate an event. The role also determines the order. For example, allowance items are always applied first (even before the rate item) and discount items are always applied last.
- Priority of the pricing packages – If two packages have rating definitions for the same service, only the rate item from the higher priority package will be activated. If two packages have allowance items for the same service, the allowance item of the higher priority package will be executed first.
- Priority of pricing items within the pricing package. If two pricing items of the same kind qualify for rating the service, the item with the higher priority will be executed first. For example, a pricing package may provide two discounts for GPRS services:

Discount	Qualification Condition	Priority
$0.50 off total charge	Event volume is higher than 5 MB	5
10% off total charge	Over 150 total minutes have been used	3

If an event meets the first condition and the customer performance meets the second condition, both discounts will be applied.

Based on discount item priority, the discounts will be executed as follows for an event rated at $5.5:

- Apply event discount: $5.5 – $0.5 = $5
- Apply customer performance discount: $5 – 10%*$5 = $4.5

The final charge for this event would be $4.5.

A different order of the discount items would result in a different final charge.

Rating

The pricing engine determines the cost of an event by executing the pricing logic in the pricing items delivered by the guiding to services activity, in the sequence determined by that activity. The pricing logic is rule-based and utilizes event and customer attributes, as well as dynamic accumulators. Dynamic conditions, statements and function invocations can also be specified in the pricing logic. For more details, see the "Amdocs Product Catalog Overview" document.

One of the factors determining the sequence in which the pricing items are executed is the pricing item role – rate, discount, allowance, benefit or budget control. Each role is discussed below.

Whereas multiple pricing items of most roles can be applied to the same event, only one rate item can be utilized for an event.

Rate Item

An event is rated on the basis of the rate table in the rate item. The rate table contains the rating scheme.

Example 1: Simple rating scheme for wireline voice calls

Rate per minute
$ 0.20

Example 2: Rating scheme for mobile voice calls based on period of day

Period	Rate per minute
Peak	0.35
Off Peak	0.25

The above rate table provides cheaper rates for off-peak calls.

Rating needs certain information to determine how to access the rate table. This information can come from the processing of the event (e.g., the period, step, or distance), from the customer database (e.g., the customer type, line type, or negotiated QoS), and from any of the accumulators (e.g., total voice call minutes). These attributes compose the key for accessing the rate table.

This mechanism makes it possible to specify rates that are dependent on factors specific to the event, to the customer, and to accumulations from previous events (of the same or different event types).

Preparations for Rate Table Access

Rating often needs to perform activities on the event information before it can access the rate table, because the outcome of these activities determines which part of the rating scheme to apply to the event (the activities determine the access key for the rate table).

The following activities may be applied to an event:

- Rounding of chargeable attributes (up, down, or mathematical).
- Determination of the step(s) to be used for rating, for example, the step(s) of chargeable or qualifying attributes (duration, volume, number of messages, etc.). The step(s) can be determined on the basis of the individual event or on the basis of accumulations from past events plus the current event. See "Example 4: Stepped rating scheme for voice calls" in "Rating Based on Accumulators/Attributes Identified during Rating" below.
- Identification of the period(s) covered by the event, e.g., peak, offpeak, etc. See "Example 2: Rating scheme for mobile voice calls based on period of day" above.
- Calculation of the distance band that corresponds to the distance between the event originating number (e.g., calling number) and event destination number (e.g., called number).

  Example 3: Distance band

Distance band	Distances in KM
1	1 – 100
2	101 – 200
3	201 – infinity

  If the distance between the originating and destination numbers is 300 KM, Rating would use band 3 as part of the rate table access key.
- Use of external functions to execute the logic of the rating scheme on the event. External functions are used to execute rating logic that is not part of the core product.

These activities are performed on the whole event or separately on logical segments of the event, in which case, the segment rates are combined to determine the rate to apply to the event. Examples of logical segments are: peak and offpeak and different steps within an event.

Rating Based on Accumulators/Attributes Identified during Rating

A rating scheme can also be based on accumulators or attributes whose relevant values are only made available during rating.

The rating scheme may be based on the use of accumulators of the same event type as the event being rated. See Example 4 below.

Example 4: Stepped rating scheme for voice calls

Step	Rate per minute
0 - 100 minutes	$ 0.20
101 - 200 minutes	$ 0.15
201 - 300 minutes	$ 0.10

To determine which rate to apply for the call, the pricing engine first needs to check how many minutes the subscriber has used up to that point, including the number of minutes in the event being rated. The pricing engine adds the event's number of minutes to the relevant accumulator and uses the new total to determine which step to use for rating the event.

On the other hand, the rating scheme may be based on the use of accumulators of one event type for rating another event type. This is a common technique used to enable cross-product discounting (product bundles). For example, a CSP might define a data traffic accumulator and use it to compute the step to apply to voice calls. Thus, whenever a subscriber consumes enough data traffic, voice calls may become cheaper. See Example 5. Or the CSP might define a voice minutes accumulator and use it to compute the step to apply to SMS messages. See Example 6.

Example 5: Stepped rating scheme for voice calls dependent on data traffic

Data traffic step (MB)	Rate per minute
0 - 100	$ 0.20
101 - 200	$ 0.15
201 - 300	$ 0.10

To determine which rate to apply to the call, the pricing engine first needs to check the data traffic volume used by the subscriber up to that point. The pricing engine determines which step to use to rate the voice call based on this total volume.

Example 6: Stepped rating scheme for SMS messages based on total voice minutes used during month

Total voice minutes used in month	Rate per SMS
0 – 60 minutes	$ 0.20
61 – 120 minutes	$ 0.15
121 - minutes	$ 0.10

To determine which rate to apply for the SMS, the pricing engine first needs to check how many voice minutes the subscriber has used up to this point. According to this sum, the pricing engine determines which step to use to rate the SMS event.

Multi-Attribute Rating

The pricing engine performs multi-attribute rating, allowing the CSP to develop marketing and pricing strategies focused on a variety of factors.

The following example encourages higher video usage during off peak hours.

Example 7: Video on Demand (VoD) rating scheme

The rate item can have the stepped rating scheme below, where the rate to be applied is based on three attributes:

- Volume – download volume in kilobytes
- Period - viewing period or periods
- Duration - per period

Period	Duration step (minutes)	Rate per Kilobyte
Peak	0 – 100	0.35
Peak	101 – 200	0.30
Peak	201 – …	0.28
Off Peak	0 – 100	0.25
Off Peak	101 – 200	0.20
Off Peak	201 – …	0.17

Although the event includes the volume, the pricing engine determines the period and accumulated duration per period during rating. (The period definitions are maintained in the Product Catalog.)

Multi-Dimensional Rating

The pricing engine carries out multi-dimensional rating, allowing the CSP to set marketing strategies that price a service having several rating attributes according to the rate arrangement most advantageous to the CSP.

The following example is for IP service. The subscriber can browse the Internet and can download files.

Example 8: IP Service Rating Scheme

Duration	Rate per minute
0 – 100 minutes	$ 0.06
101 – 200 minutes	$ 0.05
201 – 300 minutes	$ 0.04
300 - …..	$ 0.02

Volume	Rate per Kilobyte
0 – 1000 Kb	$ 5.00
1001 – 2000 kb	$ 4.50
2001 – 3000 kb	$ 3.00
3000 - …..	$ 1.00

Assume that the subscriber browsed the internet for five minutes and downloaded a 1 MB file. The duration rate is $ 0.06 per minute or $ 0.30 for the five minutes; the volume rate is $5.00. Which rate should the subscriber be charged for the event?

Actually, the rates are determined on the basis of accumulated duration and accumulated volume and not on the basis of the current event alone, but this is being ignored for the sake of easier comprehension.

The CSP can define a rating scheme that charges the subscriber the lower rate, the higher rate, an average of the two rates, the total of the two rates, or any desired formula to achieve marketing objectives. This rating scheme may use an external function to execute its logic.

Allowance Item

Allowance items provide free units. These units can be specific (such as free minutes for voice calls, free SMS events, free directory assistance calls or free volume for data transfer). They can also be general, in which case, a unit transformation table is provided. This table permits the use of the same allowance package across different event types with different chargeable units. An example would be an allowance package of 100 units, where each unit is equivalent to 1 minute, 0.5 KB of traffic, or three free SMS messages.

The consumption strategy specifies the way units are consumed, for example, *use it or lose it* or *roll over* strategies – prohibiting or allowing non-consumed units to roll to the next cycle, respectively. The replenishment strategy specifies the way units are to be replenished. For example, replenishment can occur only once or every cycle. Other options or parameters can be easily added as required by various business scenarios.

Discount Item

Discounts may be expressed as a percentage reduction or as an absolute discount value. Discounts are generally applied when a certain threshold has been reached. For example, a discount of 10% may be applied on all voice calls if the total commerce expenditure has exceeded $200.

Rating calculates usage discounts during event processing. Billing calculates discounts based on the total performance achieved at the end of the billing period.

Benefit Item

Benefits may be granted to the subscriber based on performance thresholds. Benefits can include:

- Additional allowances (for postpaid subscribers) - For example, when a subscriber purchases more than $50 of commerce services, the subscriber is entitled to another 100 free voice minutes for local calls.
- Credits (for postpaid subscribers) – For example, when a subscriber purchases more than $50 of commerce services, the subscriber is given a credit of 60 minutes for game playing.
- Recharges (for prepaid subscribers) – For example, when a prepaid subscriber purchases service for over $100, the subscriber's account may be recharged with an additional $10. Or, once a prepaid subscriber has used accumulated service of over $200 during the month, the subscriber's account may be recharged with an additional $20.

Other types of benefits can be introduced and event processing can monitor and report when the benefit should be granted to a subscriber. External systems can be used to physically grant the benefit, for example, to send a letter or an SMS to notify the subscriber of eligibility for a handset upgrade.

Budget Control Item

Budget control items monitor subscriber consumption within a defined period. These can be credit limits imposed by the CSP to control fraud or unwarranted usage, or credit watches imposed by the subscriber to limit consumption.

Most commonly, budget control is associated with the total performance of a subscriber.

Most commonly, budget control is based on the total debt accumulated by the subscriber. However, budget control can be based on arbitrary accumulations determined by the subscriber or the CSP. One example might be separate budget control for personal and business calls. Another example might be budget control based on a group of event types, such as commerce transactions and Internet-based services.

Different limits can be defined for the same subscriber, where crossing each limit results in a different action. For example, crossing the charge limit of $50 in Internet usage could dispatch an SMS message to the subscriber, while crossing the $100 limit for the same service could trigger barring of service for the rest of the cycle.

Updating Accumulations

Amdocs Rating has a robust accumulator design capability. Rating allows the CSP to quickly and easily set up whatever accumulators are necessary to implement its business scenarios: total number of minutes for voice calls, total number of minutes for Internet browsing, total amount of prepaid purchases, total amount of prepaid usage, and endless others.

Variety of Accumulators

Accumulators serve as counters for business-oriented customer or event information. They are generally aggregated for a subscriber or a group of subscribers for a cycle. Some of the most common accumulators used by CSPs include:

- Total number of events or total charges for each event type for use by Billing (e.g., for charge creation)
- Number of minutes for determining the step or tier value to be used in step or tier rating calculations
- Performance accumulators for discount models (for example, applying a 15% discount for every voice call once the total data traffic accumulation reaches 20 MB)
- Performance accumulators to determine if benefits (such as allowances, recharges, or credits) are to be granted

- Accumulators to determine when notifications based on credit limit thresholds are to be sent to various systems
- Accumulators for use by budget-control functions

The full scope of accumulation possibilities is much broader and encompasses all of the following:

- The CSP can set up an accumulator for any customer or event attribute – usually the chargeable attributes.
- The CSP can set up an accumulator to collect charges or other information from events of more than one event type, for example, for applying a discount when the total subscriber usage reaches a threshold.
- The CSP can set up an accumulator to aggregate only a portion of the chargeable attributes or calculated amounts of an event, for example, one accumulator for peak period GPRS volume and charges and another for off-peak GPRS volume and charges. These accumulators may be used to display separate charges on the bill. These accumulators can also be used for detailed reporting or for granting benefits, e.g., lower voice rates based on peak period GRPS volume usage.
- The CSP can set up an accumulator comprised of a vector of related attributes to facilitate rating, such as an IP accumulator aggregating both duration and volume.

Accumulator Update Methodology

The pricing engine updates all the accumulators for which an event qualifies.

An accumulator contains the event qualification criteria and the accumulation logic. The highly-flexible event qualification criteria can be any combination of customer or event attributes. The accumulation logic covers the attribute(s) to be accumulated and the accumulation method: add to the accumulator, subtract from the accumulator, or use a mathematical operation.

The implementer might want to use the subtraction method to obtain a subscriber's remaining usage quota (subtract the current event usage from the total usage allowance) or a mathematical operation to send a budget control notification when 95% and 105% of a specified amount is reached.

An accumulator can influence the rating of an event – to determine if a threshold has been reached or to determine which step in a stepped rating scheme has been achieved.

An event may contribute to more than one accumulator. For example, a VoD event may contribute to its event type accumulator (which counts the number of VoD events), to the total media streaming charge accumulator, and to the holiday accumulator (if the event occurred on a holiday).

Dispatching to Downstream Systems

The pricing engine dispatches the rated event to Amdocs Billing and to external systems such as Partner Relationship Management (PRM) or Data Warehouse.

Recording the Rated Event and Accumulators

The pricing engine records the rated event in the Usage repository and the updated accumulators in the Accumulation repository. This is a standalone process and does not interfere with the real-time event rating mechanism.

3. BUSINESS FUNCTIONS

Amdocs Rating envelops the pricing engine with a collection of business functions for different business operations. Each business function summons the pricing engine to perform the relevant operation and provides the pricing engine with the necessary information and guidelines.

The following diagram depicts this system architecture.

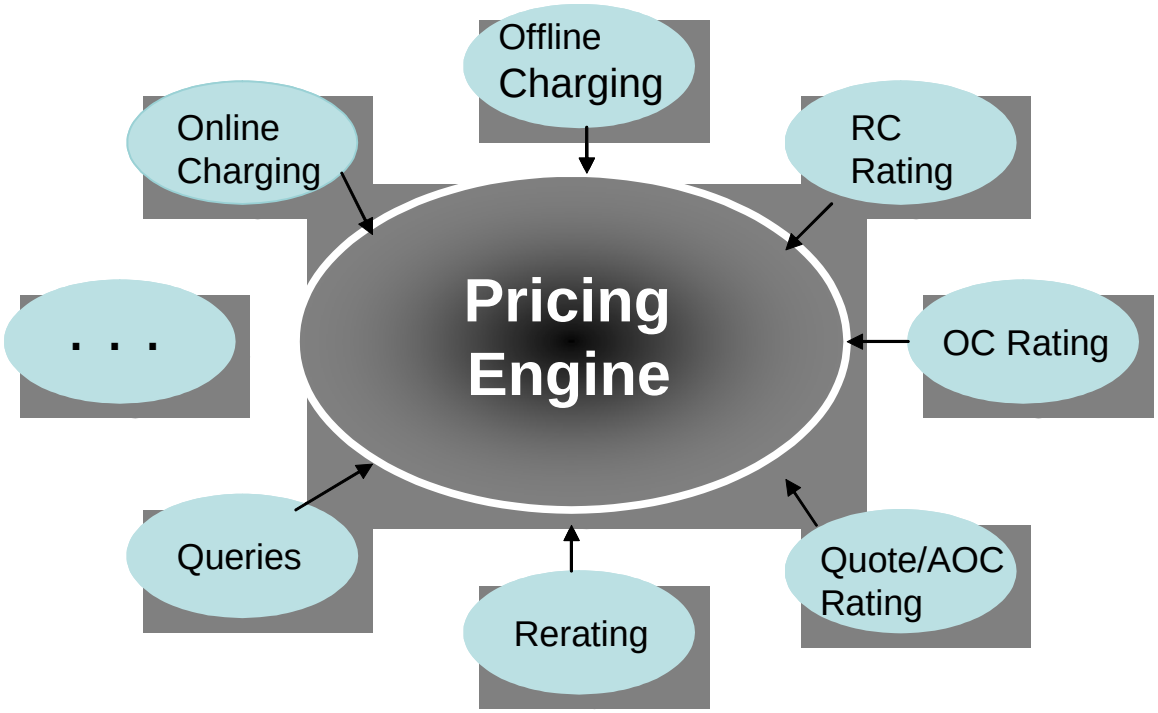

Figure 3-1: System Architecture

The following table provides a description of what the pricing engine accomplishes for each business function and the ABP components and other systems they may serve.

Business function	What pricing engine does	For components / systems
Online Charging	Provides authorizations and charge calculations for events in real time. This mode of operation affects the service rendered in real-time, providing a direct interaction with session/service control.	Online Charging (OLC)

Business function	What pricing engine does	For components / systems
Offline Charging	Rates events in files received from the mediation device or in queues.	Rating
RC Rating	Calculates recurring charges whenever recurring charges need to be calculated. See further explanation below.	Billing – on bill day Customer Management – during service ordering
OC Rating	Calculates one-time charges whenever one-time charges need to be calculated. See further explanation below.	Customer Management – during service ordering
Quote/ Aoc Rating (including AOC for price, tariff, and accumulated charges)	Supports AOC requests in full compliance with Third Generation Partnership Project (3GPP) standards. Provides quotes and AOC in real-time.	CRM – during service ordering
Re-Rating	Re-rates events that were rated incorrectly because 1) they arrived out of order, 2) customer care activities rendered them incorrect, or 3) the Product Catalog contained errors. See further explanation below.	Billing – on bill day
Queries	Collects billed and unbilled usage data from the Usage repository: subscriber usage or subscriber accumulators for a specified period of time.	Customer Management CRM Self-Service

Recurring Charges and One-Time Charges

Recurring charges and one-time charges do not depend on event usage. They may be based on a customer attribute, customer accumulation, or qualitative attribute of an event. For example, a pricing package may have a recurring charge that varies according to the subscriber's e-mail box size. Another pricing package may have a recurring charge that varies based on the total charge accumulation of a subscriber.

Re-Rating

Re-rating may be required for the following scenarios:

- An event may arrive in the wrong order. If the offer includes allowances (free units), the allowances may be incorrectly applied to this event because it is out of sequence. For stepped offers, the step used to calculate the rate will be incorrect due to inaccurate chronology.
- Customer care activities may make the rating of an event erroneous. Example 1: A subscriber cancels an offer that includes prorated allowances (that is, allowances that should be allocated according to the

portion of the time-period the offer is in effect). Example 2 is retroactive assignment of an offer.

- Errors in Product Catalog entries that are discovered after transactions have been sent to Billing make it necessary to re-rate all the affected events.

Re-rating is generally performed at the end of the cycle on the relevant customers and events. If necessary, the events are guided to another service, such as when a price plan is changed retroactively.

4. APIs and Interfaces

Amdocs Rating has a collection of APIs and XML file interfaces for communicating with other ABP components and external systems. This chapter describes the APIs and the file interfaces.

Billed and Unbilled Usage Queries APIs

Amdocs Rating includes two APIs that allow Customer Management, CRM and Self-Service users to query billed and unbilled usage information in the Usage repository. One API provides a list of all the subscriber's rated events for a specified period of time. The second API provides a list of all the subscriber's accumulators for a period of time. Each API incorporates the attributes necessary for it to perform the query, for example, subscriber, cycle information and date range.

The APIs are implemented utilizing EJB.

File Interface Flow Diagram

The following diagram depicts the flow of the file interfaces.

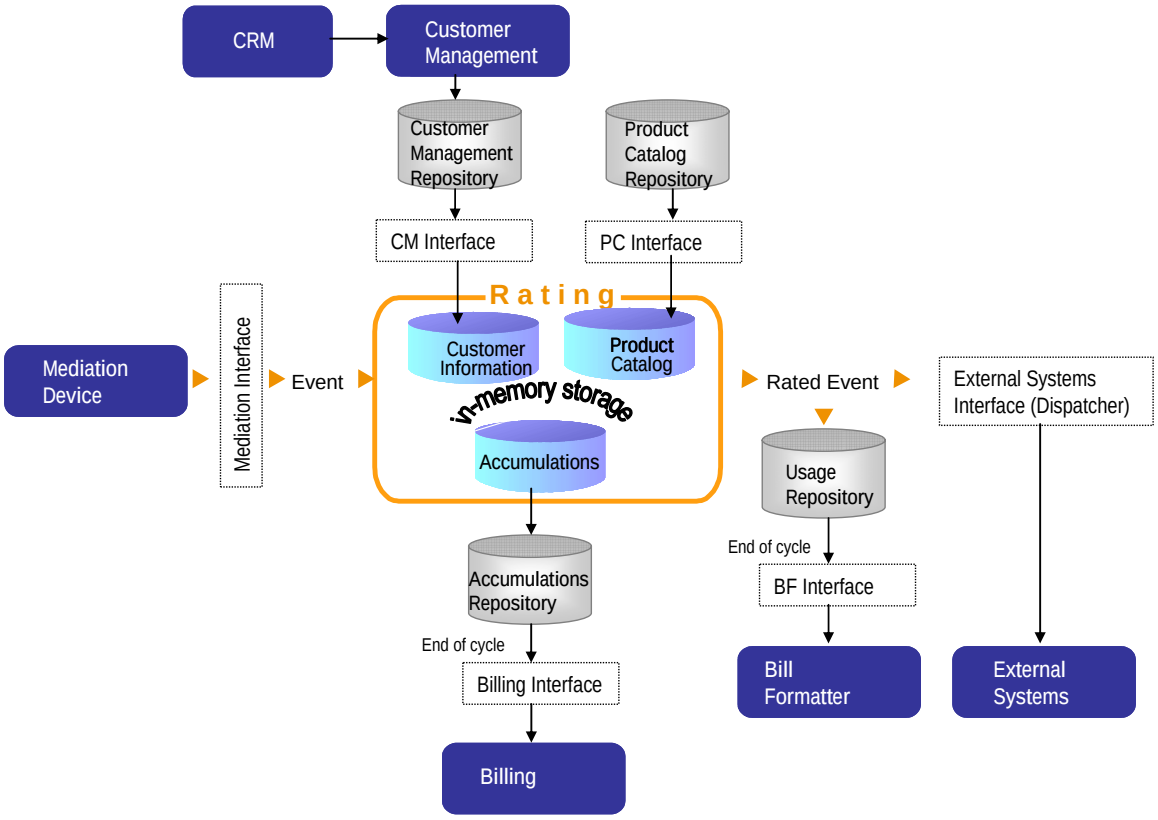

Figure 4-1: Rating Interfaces Flow

Input File Interfaces

Mediation Interface

The mediation device collects events from all sources (switches, partners, and the rater (for split rating)). The mediation device can be ABP's Acquisition and Formatting component, the Amdocs Xacct product, or any 3rd-party mediation device. The Mediation interface formats the events according to the structure expected by Amdocs Rating.

Product Catalog Interface

The Product Catalog interface provides Amdocs Rating with an XML file containing all the Product Catalog information necessary for handling the events. The information includes the detailed structure of the offers, pricing packages, and pricing items, of the event and customer, and of the output file format required for the destination system (for example, for the Billing system).

The XML file is inserted into the Rating in-memory storage, eliminating the need for continuous access of the Product Catalog.

Customer Management Interface

Many rating functions rely on customer information, such as the offers the customer purchased and customer-specific parameters. Such parameters may include the friend numbers for a Friends & Family rate pricing item, the customer's home zone, the customer's birthday (if free calls are provided on this day), and so on.

The Product Catalog maintains the definitions of all the possible types of customer information within its Customer entity. The core Customer entity can easily be extended through the addition of new attributes in a fashion similar to the introduction of event types. Customer attributes are defined using elementary types.

The Customer Management interface transfers XML files containing the above information to Amdocs Rating for use in the rating process. The XML files are inserted into the Rating in-memory storage (into the Customer Information repository), eliminating the need for continuous access of the Customer Management repository.

Output File Interfaces

The CSP can define flexible output file formats for all the destination components or systems below in the Product Catalog. This allows each CSP to tailor the output file formats without affecting the Rating component.

Billing Interface

The Billing application requires the subscriber accumulated usage data to calculate bill information. The Billing interface provides Billing with all the relevant accumulations for billing a specific cycle population. This interface can accommodate the ABP Billing component or an external billing system.

Bill Formatting Interface

Bill Formatting systems require a full list of subscriber rated events to create detailed bills on customer demand. This interface provides Bill Formatter with all the rated events for specific subscribers or groups of subscribers.

External System Interfaces

Various external systems (such as data warehouse systems, partner management systems, value-added service providers, and others) may require the rated events or accumulators from Amdocs Rating. The Amdocs Product Catalog can be used to mark events for distribution to any external system. Whenever the marked events are rated they are transferred to the respective external system.

5. TECHNICAL ARCHITECTURE

Sophisticated Infrastructure

Amdocs Rating has a sophisticated infrastructure, ensuring carrier-grade support.

Amdocs Rating uses a real-time multi-threaded C++ infrastructure, based on the ACE framework, for ensuring carrier grade support. This is the same infrastructure used by the Amdocs Online Charging system.

Scalability

Amdocs Rating provides both vertical and horizontal scalability.

Vertical scalability is achieved through the use of multi-threaded rating processes and the ability to deploy multiple instances of these processes.

Horizontal scalability is achieved by partitioning the customer population into multiple segments, with each segment having its own database, rating process instances and CPU resources. Maximal throughput is achieved by dividing EDR (event detail record) files into small units and dispatching these units to the multiple processing threads. Parallel processing of multiple EDR files ensures that the processing threads do not remain idle while an EDR file is being prepared for processing. The overhead of handling too-small EDR files is avoided by combining them into a larger logical file.

Audit & Control

The pricing engine continually communicates with the Audit and Control tool that is part of the ABP infrastructure to prevent the loss of event record information in unsynchronized environments. The need for audit and control functionality is especially important in a next generation (IP) environment, which may be less mature (reliable) than traditional voice service environments.

Performance

Amdocs Rating allows the CSP to use Oracle and TimesTen data repositories in the most optimal configuration for enhanced performance. For example, Oracle can be used for customer data, while TimesTen (an in-memory database) can be used for the accumulator data.

6. TOOLS AND UTILITIES

Amdocs Rating comes with a package of highly useful tools.

Pricing Studio

Pricing Studio (PS) is a Windows application designed to serve as a testing environment for the ABP Product Catalog.

The key advantage of Pricing Studio is the emulation of the various ABP clients, processes and tools in a single software package that is intuitive and easy to use. Pricing Studio requires no UNIX services and is run in standalone mode on a Windows machine.

Pricing Studio allows business or marketing personnel to simulate the effect of the pricing engine on combinations of products, offers and pricing items for specific customers. This tool can be used to identify the impact of changes in the Product Catalog, to compare two price plans, and so forth, without affecting the live environment.

Pricing Studio has an easy-to-use GUI, permitting CSP personnel to implement their changes and see the effects quickly.

Rater eXpert

Rater eXpert is a Windows application that allows browsing, editing and reporting of Rater-related encoded entities (e.g., Oracle LOBs) that cannot be browsed nor edited using standard database administration tools.

Rater eXpert handles the following Rater-related entities:

- Rated events
- Rejected events
- Performance indicators
- Customer parameters
- Customer offers

Rater eXpert is a multi-purpose tool for use by the CSP's maintenance team. Rater eXpert allows the maintenance team to investigate erred events, that is, to review customer data and offers and the customer accumulations. If necessary, Rater eXpert allows the user to correct the information in the event and to recycle the event for rating.

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