Compaq ActiveAnswers

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Contents

ISP Billing Systems

Abstract

All businesses large and small face the challenge of charging customers for services rendered. Internet Service Providers (ISPs) are confronted with many hardware and software options that serve as partial solutions to their long-term billing needs. The ISP business environment is highly competitive with new product and service offerings occurring daily. ISPs need flexible billing solutions that can adapt to ever changing environments, while continuing to service existing customers.

This white paper gives an overview of ISP billing systems. It outlines many questions that should be considered when selecting a billing system. The document does not provide details of any specific vendor product, although vendor references are provided. ISP infrastructures vary, as do billing systems. The ISP must determine the billing system that best fits their needs.

The target audience for this document includes Compaq customers, systems integrators, and Compaq sales and support personnel who need a better understanding of ISP billing systems.

Send your comments and questions on this solution or this document to activeanswers_support@compaq.com. Please include the Document Number (shown in the upper left corner of this page) in the Subject line of your message.

Notice

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1 Introduction to ISP Billing Solutions

Accurate billing is essential to any business. In most traditional business segments, once you define the billing process, you execute it for years to come. This is not the case for ISPs. The incredible growth of the Internet has driven the addition of new products and new services almost daily. ISPs must adapt their billing infrastructure to accommodate these advancements in technology if they are to receive the benefits of these new opportunities.

Your billing system is a mission-critical operation. The decision to write your own billing system or select a third party solution is a difficult undertaking. Available third party solutions will not satisfy all of your requirements. Take the time to map a long-term strategy. Look for vendors that have capable products and a similar future direction.

A growing trend among ISPs is to charge customers for value added services in addition to charging a flat rate for basic services. Customers will pay for resources consumed. An example would be to charge for every Voice Over IP (VOIP) call. This has several benefits for both the customer and the ISP. The customer is only charged for what they use, and the ISP can compete in many business segments on a product by product basis. In addition, the ISP can better control the products and services provided, measure product use and calculate profitability.

The real question for the ISP, is at what costs do these benefits come. How much does it cost to have a flexible, scaleable and profitable billing infrastructure? What are the risks and issues involved, where do I begin, and who can help? Another thought to keep in mind: In growing your business, can you afford not to invest in its billing infrastructure?

1.1 History and Background

Most well-established telecommunications corporations (a.k.a. telcos) invested millions of dollars to produce the monthly phone bill that you receive every month. Most of these custom projects were developed by internal IS staffs. Each telco provider perceived their billing system as a core value to their business and a competitive advantage.

Most hardware switch vendors developed their own format for call detail records. As new products and services were added, IS departments faced tremendous integration efforts. Thus, billing solutions became increasingly proprietary, difficult to manage and complex to maintain.

Very little has changed over the years. The explosive growth of the Internet has developed many Request For Comments (RFCs) documents which have evolved into supported industry standards. The telcos, ISPs and billing vendors have been slow to propose and adopt standard interfaces between billing systems. For example, most billing systems support RFC-2138, the Remote Authentication Dial-In User Service (RADIUS) Protocol, but many of these billing products only support their modified version of RADIUS.

Billing infrastructures have become so complex that service providers will sometimes add new products and services with their own independent billing system instead of attempting to integrate the new services into the existing system environment.

1.2 The Billing Dilemma

Most ISPs need to attract new subscribers, add new services, increase availability, and most of all lower costs. Attracting and provisioning new customers, maintaining a knowledgeable staff, and providing 24 hours a day by 7 days a week support for users is costly for the ISP, especially if you provide unlimited access for a flat rate.

Customer management is usually addressed by integrating a customer care solution. Very few billing packages address customer care, although several have added self-provisioning that can interface directly into the billing package. This form of self-provisioning usually provides limited features of a customer care system, such as account set-up, and a Web-based interface to lookup account and billing information. These systems usually lack trouble ticketing, knowledge databases, asset management, and workflow with role-based security. Role-based security grants customer service managers and supervisor's additional privileges to view and modify account information.

1.3 The Compaq Solution

ISPs want to increase revenue and profit, differentiate service, reduce churn and reduce operating expenses. ISPs that market their services, that charge for value added services, and deploy the proper billing solution can accomplish these goals.

Compaq and its business partners provide world class billing solutions globally. Compaq delivers scaleable, high-performance, highly available solutions on multiple hardware and software platforms. This document will help you to understand the critical areas of functionality when evaluating different solutions.

2 Billing System Architecture

Billing systems must be designed for growth. Your infrastructure should handle a doubling or tripling in the number of subscribers. With the record number of Internet mergers and acquisitions, planning for growth can also mean planning for integration into other existing environments.

Planning the system architecture is vital to sustained availability, scalability and performance. Benchmarks can provide valuable information regarding system performance under peak conditions. While most test results will focus on one aspect of functionality, look for composite tests that measure overall usage and conditions.

Few billing systems can distribute their product functionality across several hardware systems. Work with vendors to define your existing environment and a recommended upgrade to support five times the number of current subscribers, or a similar metric to over achieve your forecast. This will provide a product road map in addition to identifying potential architectural bottlenecks.

2.1 Platform

Selecting the hardware and software platform can be a difficult task. Platform decisions are not always dependent on price and performance. Often employee skill sets, existing hardware, corporate relationships and product availability will dictate platform selection.

The majority of the billing products are supported on UNIX or Windows NT. A few vendors' do provide cross-platform support. Billing is mission critical and requires platforms that are reliable, available, scaleable, manageable and supportable.

2.2 Sizing

Billing systems offer many data storage options. They range from flat file storage to large databases. A very rough estimate of the number of supported subscribers can be derived from the type of data storage used. This estimate is subjective and is not based on testing or any benchmark results.

Most low-end billing solutions use a flat file, Intuit's Quicken, or Microsoft Access database to store subscriber records. These solutions are not recommended for greater than 20,000 subscribers. The mid-range solutions generally run on Microsoft's Windows NT and use Microsoft's SQL server database as the data storage. These mid-range solutions are not recommended for greater than 50,000 subscribers. The high-end solutions generally run on UNIX and use databases like Oracle, Informix, or Ingres. These solutions can handle several million subscribers.

2.3 Maintenance

Often overlooked when selecting a solution, system maintenance requires planning and scheduling. Today's ISP environments require 7 by 24 availability. Any downtime of the billing solution could cost the ISP valuable revenue.

Performing routine backups and having a plan for disaster recovery will ensure minimal losses due to downtime. Your database will continue to grow over time. Look for a solution that will allow you to archive records and purge old data from the database.

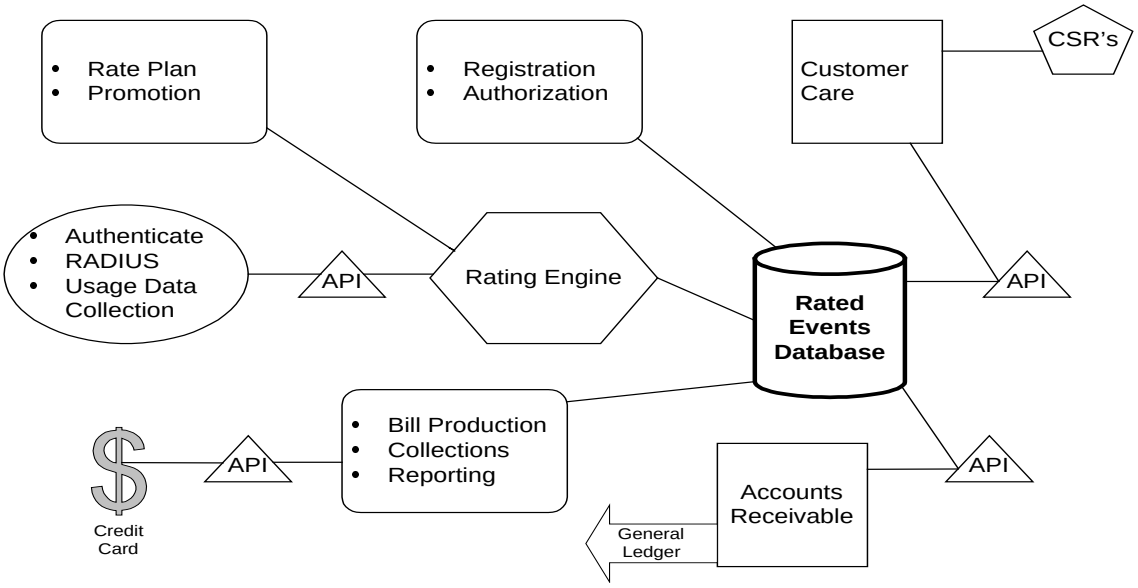
What is required when upgrading system functionality to a new version? Does the vendor support rolling upgrades? It's important to stay current with the development direction of your billing vendor. How are customizations supported when upgrading to a future version?

3 Billing Functionality

Most billing solutions include several core components, optional additions, and services to customize the product to fit your needs. Understanding the core components will allow you to specify your requirements in more detail and determine differences between billing vendors and their products. This will be instrumental to selecting the proper solution.

Figure 1 shows a diagram of a billing solution. The core components are tied directly to the billing system database. Additional components are usually integrated using an API. Not all-billing systems will have all components. Several components may be supplied through another third party or not at all.

Figure 1. Typical Billing Solution



3.1 Rating Engine

The rating engine is the heart of your billing system. It is the rating engine that must be totally understood. The functionality and flexibility of the rating engine will determine how you run your business and which items you charge for. Rating is the process of converting billable events into data records that can be processed during billing.

Most people are very familiar with rating when they review their monthly phone bill. Often, customers are charged different rates for calls placed at different times. For example, night and weekend calls are usually charged at a lower rate than prime time calls. It's the rating engine that matches the customer call event with the appropriate rate to charge.

The benefit of rating events to an ISP is increased revenue, better resource management, better control over cost of service, and the ability to add new services based on resources.

3.1.1 Characteristics

The two types of rating engines are batch and real-time. Small and medium sized ISPs typically use a batch rating engine. RADIUS accounting records are processed as a batch job on a nightly, weekly or monthly basis. The schedule usually depends on the number of subscribers, how quickly the events can be processed, and your policy for updating customer account usage data.

ISPs who offer up to the minute account information typically use real-time or continuous rating. Events are usually rated at the completion of the event or when the subscriber disconnects. For example RADIUS accounting records are sent directly to the rating engine. This allows better control of users, system resources and up-to-date customer information. Real-time rating can be more compute intensive, especially if the same database is also used for authentication.

Table 1 summarizes some key issues to consider.

Table 1. Key Issues for Rating Engines

Rating Engine	Key Issues to Evaluate
1.	Does the business model require a real-time rating engine, or will a batch-rating engine suffice? What are your true benefits?
2.	What types of events can be rated? What are the supported types? (e.g. flat rate, usage, reoccurring), and what must be customized? (e.g. A collector to charge for the amount of disk storage utilized).
3.	Does the rating engine support pre-payment events?
4.	How does the rating engine support long-term events? (e.g. Cable modem subscribers are always connected; there are no start and stop events. If the ISP wants to charge for usage, what usage parameter can or should be measured and forwarded to the rating engine.)
5.	How many transactions can the system perform? What is the average rating time per record under various system loads?

3.2 Plans and Promotions

Another key to growing your business is being able to compete effectively with your competition. Many ISPs offer similar subscriber plans to existing customers. ISPs are constantly changing their promotions to attract new customers. As a result, ISPs continue to experience heavy churn as users switch between service providers.

Successful subscriber growth relies on your ability to quickly and easily adopt new price plans and promotions. Generally it's the business manager or the marketing department that requires new price plans and promotions. Look for products that support Web-based or user friendly graphical tools to develop and deploy these plans. These tools should be designed for the business user and should not require low-level programming.

A good way to understand this requirement is to write down a simple price plan and promotion. Determine the skill set required, detail the steps involved, and estimate the amount of time required to develop, test, and deploy the new plan. Not all products support migrating subscribers to new plans.

Table 2 summarizes some key issues to evaluate.

Table 2. Key Issues for Price Plans and Promotions

Price Plans and Promotions	Key Issues to Evaluate
1.	How easy is it to create or change a rate plan? Does it require programming?
2.	Is there a Graphical User Interface (GUI) suitable for non-IS employees?
3.	Does the system provide logging and test tools to debug price and promotion plans?
4.	Can the customer service representatives modify existing accounts to select a new plan or promotion? Can subscribers modify their own accounts?
5.	How are charges, credits, discounts and usage applied to the subscriber's account (e.g. weekly, monthly, quarterly, etc.)?

3.3 Registration and Authentication

A major question for the ISP is where do I store subscriber information? Many options are available to the ISP. The small ISPs may tend to use RADIUS pointing to a flat file or the operating system password file. As the number of subscribers grow, better methods exist to store registered information and reduce authentication response-time. These methods include using RADIUS connected to an LDAP directory server, or databases like SQL or Oracle.

Your number of subscribers, predicted growth and authentication response-time will help to determine the best method of storing your registration data. LDAP is designed for many reads and fast access allowing it to work well with RADIUS. Information stored in LDAP can be as simple as the account username and password.

The data requirements for billing can be totally different. In addition to the account username, the billing system database must keep account history, credit card number, and the billing address. The more information you know about the subscriber the better you can market and sell additional services to that subscriber. A database is better suited to handle large volumes of information. In addition tools like data mining and fraud detection can play a major role in increasing the ISPs revenue and reducing risk.

ISPs generally have separate databases for authentication and billing. Keeping both databases synchronized will require customizing the provisioning modules. Some products like Netscape's Mission Control and Microsoft's Internet Explorer Administration Kit (IEAK) will allow the ISP to develop their own auto-provisioning kits. These kits can be put on to a floppy or CD-ROM and mailed to potential subscribers.

Several integrated ISP products use a central repository for user information. For example, Netscape servers use the Netscape Directory Server, and Microsoft's MCIS product uses the membership database based on SQL server. Neither of these products includes a billing package. Several billing vendors plan to support the suites and will integrate with them in the future.

Table 3 summarizes some key issues to evaluate.

Table 3. Key Issues for Registration and Authentication

Registration and Authentication	Key Issues to Evaluate
1.	Is registration Web-based and can subscribers access registration online?
2.	Does the product support credit card checking in batch or real-time? Which credit card clearinghouses are supported?
3.	Does the product support and enforce session control on subscribers? For example session parameters like IP address, DNS address, idle timeout, session limit and data filters.
4.	What authentication protocols does the product support, for example RADUS, TACACS, etc.?
5.	Can the subscriber create, maintain and monitor sub-accounts?

3.4 Bill Production and Accounts Receivable

Producing accurate bills or invoices increases customer satisfaction. Most people realize from personal experience the dissatisfaction of receiving an inaccurate bill.

Another issue is actually billing the subscriber and tracking revenue. How many of your subscribers would pay, if they did not receive a bill? Many vendor products allow ISPs to bill subscriber in multiple ways. The common ways are via standard mail invoice, electronic mail invoice, prepay, and the most common, credit card charges.

Bill production is usually a batch process that is very compute intensive. Very large ISPs run bill production daily. If you authenticate subscribers against the same database, bill production can greatly impact authentication response time especially if you're also real-time rating. Look for billing architecture's that can scale easily to increase performance.

Table 4 summarizes some key issues to evaluate.

Table 4. Key Issues for Bill Production and Accounts Receivable

Bill Production and Accounts Receivable	Key Issues to Evaluate
1.	Can the system compute your bill using multiple formats for different products or services?
2.	Can charges be posted to a master account for a group or corporate account?
3.	Can certain products be charged to a master account with additional charges being posted directly to the subscribers account?
4.	Can the customer determine the billing frequency or the bill format? Several organization's including the federal government has defined invoice and billing requirement.
5.	Does the system help manage cash flow and collections? Is there an interface to an external accounts receivable system?

3.5 Customer Care

Customer care is usually treated as a separate solution. Most ISP billing solutions focus on provisioning subscribers and/or providing Application Programming Interface (APIs) to integrate into customer care solutions. There is usually an overlap of basic functionality but most billing systems do not address trouble ticketing, knowledge databases, workflow, asset management, escalation features, or complete logging of all modifications.

Providing help desk support to subscribers is extremely costly. Many ISPs and billing solution vendors are supporting customer self care applications. Customer self care allows the subscribers access to their account records. Customer self-care applications are usually Web-based and integrate directly into the billing database. Subscribers can change their mailing address, passwords, pricing plan, payment details and often view billing and usage statements online.

Customer self care greatly reduces ISP support costs, support calls, and it also empowers the subscriber to manage their account and sub-accounts.

Table 5 summarizes some key issues to evaluate.

Table 5. Key Issues for Customer Care

Customer Care	Key Issues to evaluate
1.	Is the customer care interface Web-based and can it be accessed from anywhere over the Internet?
2.	Can the Customer Support Representatives (CSRs) access, change and monitor all account information?
3.	Does the system allow the CSRs to view and navigate up and down the account hierarchy?
4.	Does the system provide layered security of critical information? For example, only senior-level CSRs have direct access to view or change credit card information. Junior level CSRs can perform account adjustments but can not access full credit card details.
5.	Does the system produce an audit log of CSR and customer self care changes?

3.6 Generating Reports

All businesses require reporting. Reporting monitors the health of your business. It is essential that your billing solution include a module to generate standard and customized reports. Your reports should be able to tell you about your subscribers, billing and usage.

Effective marketing and promotion campaigns require proper reporting to measure results. Increase your revenue by knowing your business, your customers and how to market products to each segment. The proper analysis can give you a competitive edge and at the same time reduce churn.

Table 6 summarizes some key issues to evaluate.

Table 6. Key Issues for Generating Reports

Generating Reports	Key Issues to Evaluate
1.	Does the system include standard and ad-hoc reporting?
2.	Does the system interface with third party report writers like crystal reports?
3.	What is required to customize reports? Is there a reporting language or query interface?
4.	What reports and built-in? Are there detailed reports for subscribers (active, inactive, churn rate), for billing (errors, credit cards, posted credits & debits, prepay) and for usage (historical, current, by product or service)?
5.	How much history data can be processed and what is the effect of reporting on performance?

3.7 External Systems Communication

Integrating legacy systems and complementary applications will require Application Programmer Interfaces (APIs). The APIs will determine the level of integration possible. It is important that the billing vendor offer a complete and well-documented API set.

Table 7 summarizes some key issues to evaluate.

Table 7. Key Issues for External Systems Communication

External Systems Communication	Key Issues to Evaluate
1.	What standard languages do the APIs support? (e.g. Perl, C, C++, Java, COM, etc.)
2.	Does the system support convergent billing, i.e. the processing of other billing system records to produce a single bill?
3.	Is the billing system object-oriented, allowing integrators the ability to more easily customize the solution?
4.	Find out if another customer or system integrator has developed a similar solution. Can the billing vendor provide a list of existing applications that have been integrated into their system? (e.g. Accounts receivable, credit card clearinghouse, taxation, other databases, etc.)
5.	What training is available for the APIs? Does sample code and detailed examples exist?

3.8 Internationalization

The Internet community is global in scope and knows no boundaries. Many ISPs are growing into new geographies and requiring localization. A well-designed billing system will have APIs to support localization efforts.

Table 8 summarizes some key issues to evaluate.

Table 8. Key Issues for Internationalization

Internationalization	Key Issues to Evaluate
1.	Does the system support multiple languages? Is it easy to add new languages? Does it support double-byte character languages?
2.	Does the system support multiple currencies including the Euro? Can subscribers pay in any currency? Can the system do currency conversion? Few systems have the ability to modify the currency attribute of existing subscriber accounts.
3.	Does the system support multiple date and currency formats?
4.	Does the system support international taxation and franchise tax?
5.	Can reports be generated in multiple languages? Can accounts be provisioned in multiple languages? Does the system support full use of international character sets?

4 Selecting a Vendor

Research the vendor you are about to partner with. If you plan to have a long-term investment in their product, it's best to know up front if they have staying power. Billing vendors range from two person shops to several hundred employees. Ask about the company, its employees and its current customers. When small companies start to grow, they have a tendency to focus on their large customers, and may lack the resources to provide all of its customers with the proper support.

Vendors and their products vary in scope, skill set, size and direction. It is unlikely that you will find a product to meet all your needs. Plan on customizing your solution. Several vendors provide their software with no services, while others provide a less complete product with integration services to complete it. Understanding the vendor's percentage of licensed product revenue verse integration services revenue. This will help you to understand the amount of customization required.

Look for references. Vendors with good products and services will have valid references. Take the time to contact these references. Remember your success will depend on the vendor's commitment, credibility and capabilities. The proper partnership can often lead to a successful implementation for all parties involved.

Compaq has teamed up with several large and small billing vendors to deploy solutions. Listed in Table 9 are several of those vendors. Pricing billing solutions is always relative to location, competition and the business situation. In the chart below, one dollar sign ($) symbolizes relatively inexpensive software; more dollar signs ($$$) symbolizes more expensive software. Associated with the increased costs is an increase in product functionality. Customization and implementation costs can also vary greatly from several thousand dollars to millions of dollars.

Table 9. Compaq Billing Partners

Company Name	Product Name	Relative Costs	Operating System
Boardtown Corporation www.boardtown.com	Platypus	$	WNT
Billing Concepts Inc. www.expansion.com	TotalBill, InstantReg	$ - $$	WNT, Tru64 UNIX
Inovaware Corporation www.isppower.com	PRISM	$ - $$	WNT, Tru64 UNIX
Lucent Technologies Software Products Group www.kenan.com/content/solutions/index.htm	Arbor/BP	$$$	Tru64 UNIX
Portal Software Inc. www.portal.com	Infranet	$$ - $$$	WNT, (UNIX)[1]
Rodopi Billing Software www.rodopi.com	Rodopi	$	WNT
Convergys Corporation www.convergys.com/	Customer Care & Billing	$$ - $$$	Tru64 UNIX

[1] Supports only Sun Solaris and HP-UX UNIX. Does not support Tru64 UNIX.

5 Summary

Selecting a billing package requires a deep understanding or your long-term business goals, your existing and future ISP environment, and how to map billing functionality into your infrastructure. No matter which product you select, you must count on customizing it.

Since most products contain some type of API, vendors have the tendency to state that their product can perform any function. It just requires programming. It is in your best interest to understand what is actually in the product and what needs to be customized. If you must customize components, figure out the scope of work and the required skill set. Do not customize the product in such a way that you are locked into that version and cannot upgrade.

Developing a feature check list and product acceptance test is strongly recommended. It will help in deploying your solution from a functionality and performance perspective. Ask for qualified references. Many of the larger vendors will reference the same customers. Understand how the product is being used and the number of subscribers using it. Question the reference regarding the product, the implementation, and the vendor's level of expertise and support.

6 For More Information

Invest time in researching the proper solution for your situation. Time to market is always critical especially in the Internet market, but selecting the wrong infrastructure products can cripple your business. Listed below are additional resources that can provide you with more information.

6.1 Resources

6.1.1 White Papers

Lucent Technologies Software Products Group (formerly Kenan Systems Corporation) produced a white paper called *Reducing the Risk: Guidelines to Choosing Your Billing System*. It is located at http://www.kenan.com/content/compinfo/whitepapers/index.htm.

6.1.2 Magazines

- *Billing World Magazine* located at http://www.billingworld.com is published by TeleStrategies, Inc.
- Internet World located at http://www.internetworld.com/ is published by Internet World Media.
- Tele.com located at http://www.teledotcom.com/ is published by CMP Media Inc.

6.1.3 Industry-Related Trade Shows

- ISPCON - http://ispcon.internet.com/
- World Telecom - http://www.itu.int/telecom-wt99/index.html
- IIR Telecoms & Technology London - http://www.iir-conferences.com

6.1.4 Websites

ISP Ventures offers a complete site of ISP related information including a list of dozens of ISP billing products located at http://www.isp-resource.com/accounting.shtml. You can also subscribe to a weekly e-mail journal at subscribe@isp-resource.com.

6.2 Glossary

Term	Definition
API	Application Programming Interface
CSR	Customer Service Representative
DNS	Domain Name System
GUI	Graphical User Interface
IEAK	Internet Explorer Administration Kit
ISP	Internet Service Provider
LDAP	Lightweight Directory Access Protocol (RFC1777)
MCIS	Microsoft Commercial Internet System
RADIUS	Remote Authentication Dial-In User Service (RFC2138, RFC2139)
RFC	Request For Comment
SQL	Structured Query Language
TACACS	Terminal Access Controller Access Control System (RFC1492)
VOIP	Voice Over Internet Protocol