

■ Prepaid Services for new Generation Mobile Network

Industry

Mobile Communications

Business Challenge

Prepaid Billing for 3G Mobile Service Offerings

Technology Solution

HP OpenView Internet Usage Manager

HP Opencall

Enterprise Hardware Platform

HP Servers based on Intel® architecture

SOLUTION ARCHITECTS



Meeting New Market Demands

Prepaid mobile services for 3G networks enable telcos to sign up new users by utilizing the latest in converged billing technologies. Tariffing, another name for prepaid services, means mobile users who don't want credit based billing, or for whom it is not available, can take full advantage of the newest mobile services and technologies by prepaying.

The worldwide mobile communications market is exploding, and 50 percent of subscribers are expected to use prepaid billing in 2003. Prepaid services are driving mobile communications into emerging markets such as South America, Eastern Europe, Asia, and Africa where subscribers with tight budgets want to control and monitor their expenses closely. In these fast growing regions, the demand for prepaid billing is 90 percent to 95 percent at initial sign-up.

In countries where mobile adoption is already high, prepaid options allow credit challenged and lower-income consumers to participate. It is very popular with first time users such as teenagers who are also early adopters of new services including Short Message Service (SMS) and games.

As the lowest risk financial option for new service subscribers, prepaid billing may emerge as the preferred billing method for Internet telephony and streaming video services. It is an application that is well-suited to the Intel server platform with its availability, reliability, and serviceability. Customers of prepaid mobile phone services expect to be able to check their credit balance, top up their accounts, and access billing information at any time of day. Service providers therefore need a hardware platform that is agile, versatile and capable of large-scale expansion to accommodate the huge market growth projected. The Intel® Xeon™ processor family meets these requirements while at the same time offering industry leading price/performance and cost of ownership.

The Business Challenge

Making new services pay

Today's mobile phone market continues to experience growth in bandwidth, subscribers, and competition creating a very challenging environment. Subscriber needs are constantly changing, so suppliers and service providers need to offer them the right thing at the right time. IT infrastructure must support the rapid implementation of new IP-based services and charge appropriately for them. Today's market requires the ability rapidly to deploy innovative services and make them profitable by charging subscribers in ways that accurately reflect service value and service delivery costs.

These needs are tailor-made for the Intel Xeon server platform which is easily adaptable to changing business demands. It has the flexibility to scale accurately for optimum performance and return on investment.

A wider choice of flexible billing options to bill for voice, data and content services is needed beyond flat rate tariffs.

To meet the demands of new generation customers the mobile operator's network must support:

- Content based billing
- 2.5G and 3G mobile services
- Prepaid billing as a growth booster
- Timely availability of new services
- Integration with legacy voice systems

Users want fast and responsive:

- Call setup and service delivery
- Refill of account balances in real-time
- Viewable account balance meter changes during activities
- Self-service lookup account, refills and usage

Seamless interactions:

- Parallel execution of services for voice and data
- Use of 3G services for account payments
- No session breaks during account refill and interactions
 - Pre-configured customer refill preference
 - Refill of accounts while on a call without break

Choice of Pricing and Payment:

- Multiple rating per customer, per service, time of day, etc.
- Variable discount for every rating
- Allow one, two or multiple billing instances
- Postpaid during business hours, and private pre-paid outside

Solution Overview

Providers need cost effective technology to implement prepaid billing for 2.5G and 3G mobile services. Intel architecture-based systems, with their conformance to open industry standards, offer a high-level of price performance and extensive customer choice.

This mobile prepaid services solution enables rating of transactions, and access control to mobile services, all in real time. It allows efficient billing of different services in very different ways based on complex pricing plans. The pre-integrated components for service providers can be tailored to enable 3G mobile services anywhere in the world.

Services can be billed in standard or creative ways. Operators are able to create prepaid pricing for anything that can be measured:

- kilobytes
- voice/time units
- pay-per-view clips
- game "ammunition"
- any application level function

Customer interactions are processed, and the subscriber's balance is updated in real time. If the subscriber account goes to zero, appropriate actions are taken instantly. For mobile service, this can include stopping communication, removing access to fee based/value added services, or allowing only access to free services and refilling the account.

Complicated backend components work together seamlessly and automatically with no interactive user interface required

HP's prepaid mobile services solution for 3G networks is specifically intended for mobile service providers adding non-voice services to their voice offering. Typically, voice infrastructure does not collect IP events, so data/IP mediation is required as well as real time tracking of available credit. HP's Internet Usage Manager (IUM) and Opencall products accomplish these tasks. By adding a specialized IP billing rater alongside the existing voice billing system, the solution enables telco operators quickly to bring new products and services to market. It is complementary to existing voice billing systems so next-generation services can be launched without replacing older systems.

Technology

HP's IP billing and tariffing solution runs on HP Proliant servers using Intel Xeon architecture and the Microsoft* Windows 2000 Server* operating system in parallel with legacy billing systems. The Xeon platform, with its innovative NetBurst™ microarchitecture and Hyper Threading technology, drives increased performance. This enhances the user's experience and provides headroom for growth.

HP's Internet Usage Manager mediation platform collects billable events and interfaces with the rating/billing system. HP Opencall Intelligent Network (IN) service platform provides telephony access control to service control points and layer 7 HTTP filtering access control.

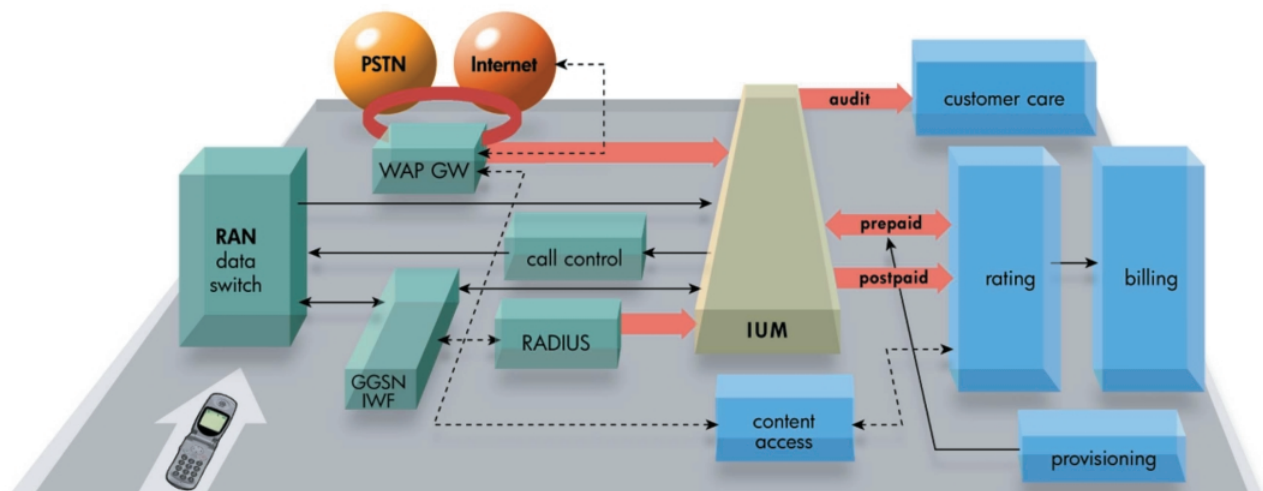
This rating and billing solution can be easily integrated with any high performance rating and billing system, such as Infranet from Portal Software, without throwing away existing infrastructure. It was designed help telcos migrate their existing systems to meet the billing requirements of today's mobile communications networks.

How businesses collect information

HP OpenView Internet Usage Manager (IUM) is scalable back-end software that performs convergent mediation and usage management. Like the Intel server platform, IUM is extremely flexible, enabling it to fit into existing infrastructure and processes, improving investment returns and minimizing risk. IUM mediation can be deployed for wireline and wireless networks to support voice and data services with prepaid and post-paid billing models.

IUM is the critical link between service delivery infrastructure and business support systems. It collects, aggregates, and correlates usage information throughout the network and services infrastructure, and presents the formatted data to usage-based billing and capacity management systems.

Analyzing subscribers' behavior becomes possible with the rich data from IUM. Strategic marketing programs and profitable value-add services can be based on the analysis of continuously collected data about user activities.



HP Opencall

Enabling call setup, control and breakdown, Opencall is in HP's Netaction family of products. It has more than 1,000 installations in 50 countries worldwide. Opencall is the world's leading SS7 software stack, and the number one software for service control points and short message service (SMS) centers.

Enabling the communications industry to harness the convergence of the Internet with the world of voice communication, Opencall is backed by HP's Telecom Critical Support as a carrier grade product.

Optimized for high-end HP Proliant servers using affordable Intel architecture with its unparalleled cost advantages and HP Surestore storage systems, the mobile prepaid billing solution is designed to match the most demanding requirements of service providers. A solution stack is implemented in the joint HP Intel Solution Center which has a track record in innovative and pioneering implementations. Customer deployments are conducted through the experienced capabilities of HP Consulting.

Target Market and Customer

The mobile prepaid services solution is designed to meet the billing requirements necessary to move mobile operators into the next generation of the mobile phone. It is especially intended for mobile service providers adding non-voice services to their existing voice offering. Any mobile operator moving to 3G capabilities will want this solution in order to capture the value of its evolving prepaid services.

Regions and countries where mobile phone penetration was previously limited are now the fastest growing markets which require this capability. Forecasts suggest that in 2003 half of all subscribers will use prepaid billing. Any telco or mobile operator that does not have IP billing and a prepaid infrastructure in place could become non-competitive. Thanks to HP and the Intel platform they now have a highly cost-effective and straightforward solution with the potential for large-scale growth.

Case Studies/Proof Points

A working mobile prepaid services solution is installed at the HP Intel Solution Center. The fact that the solution stack uses the highly scalable and future-proof Intel Xeon processor server platform ensures that although initially implemented for approximately one million users, it can be extended to fit large telcos.

The solution stack consists of HP servers based on state-of-the-art Intel architecture, HP software and the Portal Infranet billing system. It has been tested in live interactions between users, the system and billing. A prepaid balance is normally held in the billing system. Simultaneously the balance is held in the Opencall SCP (service control point), demonstrating flexibility to deliver billing in different ways depending on a service provider's preference.

Customer Value Proposition

Mobile operators in business today do not have to throw away legacy systems or infrastructure, and can quickly start offering new services. The new tariffing system, which is based on open industry-standard Intel based hardware, will integrate into mature environments, and run parallel. This allows for immediate access to new markets for current voice operators. Migrating legacy systems into the future becomes a controlled stable process rather than rushing to a fork-lift rollover.

New revenue opportunities become available to operators, especially in countries such as Italy where 90 percent of new users choose prepaid. Some operators in the UK and Sweden have an even higher percentage. Prepaid is the primary growth booster for all service providers in Latin America and the Far East.

HP's 3G mobile prepaid data solution has broad appeal to mobile virtual network operators (MVNOs) thanks to real time processing of call detail records (CDRs) for content and simultaneously assuring sufficient credit for the transaction.

Using HP Proliant servers based on Intel architecture with its industry leading price-performance can save up to 50 percent of the server hardware costs without compromising performance or stability.

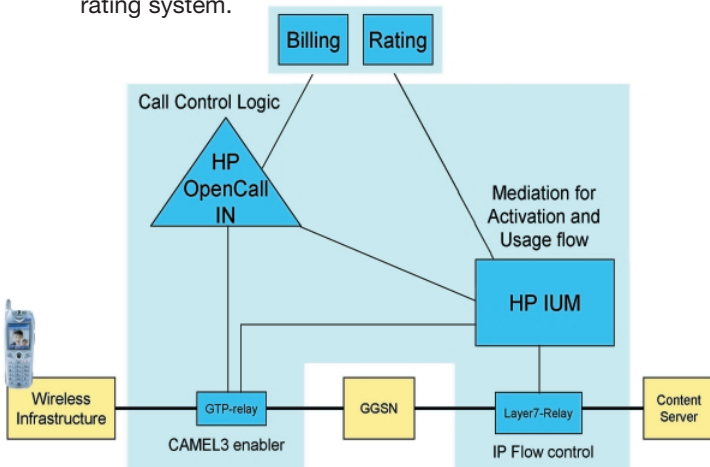
What it means to company officers:

- **CEO:** Prepaid converged billing systems will bring new growth to mobile service operators by allowing immediate access to new markets through contemporary services and flexible payment plans.
- **CTO:** New converged functions are only available to technology companies which implement an infrastructure that supports prepaid and post-paid IP billing.
- **CFO:** Overall purchase costs are reduced, and systems upgrade costs can be spread into the future since this solution preserves legacy investment by working in parallel with existing systems. Company revenues should increase by gaining new customer segments which want only prepay options. In addition to reducing accounts receivables and bad credit issues the whole billing process will be simpler and customers happier.
- **IT Mgr:** The combination of HP and Intel, with its reliable and manageable systems, makes prepaid billing an easy to implement solution. It is pre-tested and scalable for any environment, and fits very well into existing infrastructure allowing immediate access to new capabilities without throwing away older systems. No fork-lift upgrades.

Logical/Functional Diagram

HP's 3G mobile prepaid architecture is a back-end environment where different modules automatically pass information in real time. The system is very technical and does not interface directly to the user, instead passing necessary information to other systems which are customer facing. There are four main components (indicated in green):

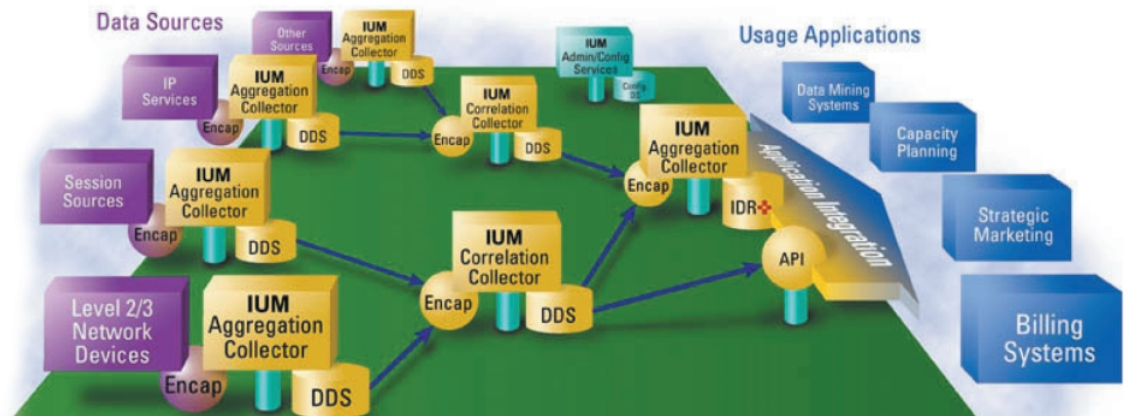
- GTP-Relay (GPRS Tunneling Protocol): Responsible for capturing the GPRS (General Packet Radio Services) traffic between the wireless infrastructure and the GGSN (Gateway GPRS Support Node), it can trigger and manage Camel 3-like messages to control the usage of the GPRS network based on volume.
- Layer7-Relay: Capturing IP traffic and usage data between the GGSN and the IP network (WAP, content server, etc.) it controls IP usage for every service. This is the component which blocks a specific service for one specific user if needed.
- HP Opencall IN (Intelligent Network) implements call control logic. This is the necessary glue between the GTP relay, the billing system, activation layer and IP mediation (Layer7-Relay and HP IUM).
- HP IUM is as a real time mediation platform in two ways:
 - Manages activation and the close interaction between HP Opencall, GTP-Relay and Layer7-Relay platforms
 - Manages the usage data flow from Layer7-Relay to the rating system.



Functional Features:

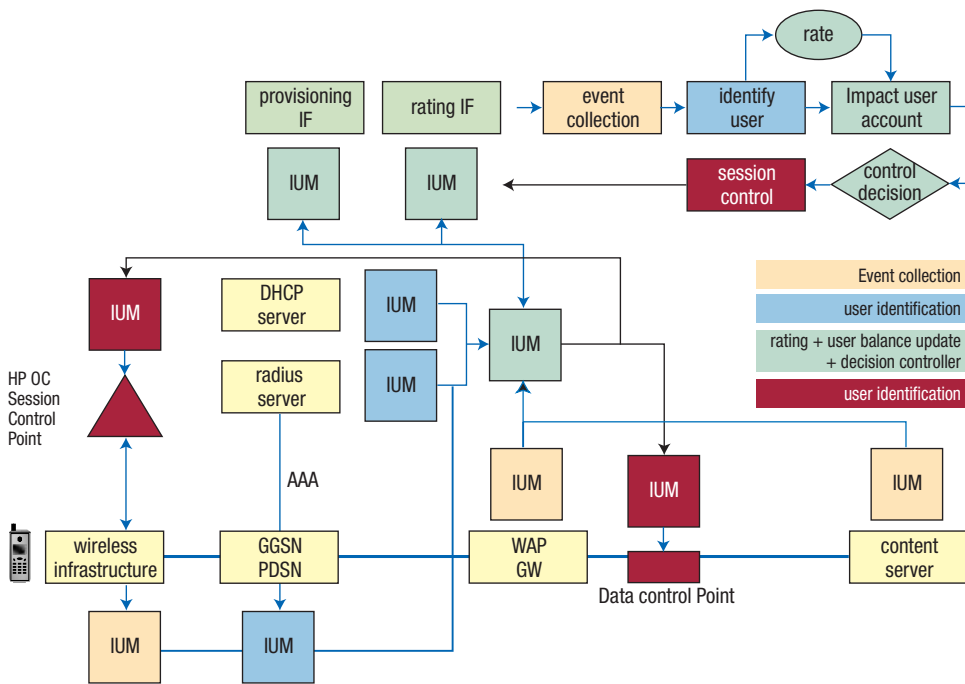
- Multi-service feature allows the simultaneous delivery of multiple services from a single prepaid account.
- Multi-channel feature makes it possible to charge for services both by value and by volume. In addition, a 'hot-billing' channel can be used to charge the prepaid account when no real time interaction is feasible.
- Prepaid account management, where all channels interface, is central to the billing system. Prepaid account reservation is fragmented to enable simultaneous reservation through multiple channels and multiple services.
- Signaling protocols control the network elements include INAP, MAP, CAP-2, CAP-3. An adaptation layer, permitting easy integration of the specific versions implemented with the network elements (MSC, SGSN, WMSC), is included in the protocol stack. Other network equipment can be controlled as it supports IN (Intelligent Network) -triggers.
- Fully integrated interactions between the Opencall-IN (Intelligent Network) and prepaid account management allow the rating mechanisms to use metrics such as minutes, Kbytes, or any provider defined metrics.
- Mediation is defined as a separate component that can be re-used by other applications. HP Internet Usage Manager is also used with a billing system (e.g. Portal Infranet) to implement hot-billing.
- Self-care functions are delivered through the Web and WAP for cover account lookup, balance, recent usage, recent refills, account modification, and smooth refill.
- Post-paid convergence by allowing credit on the account, coupled with post-paid billing functions such as bill generation and follow up.
- Scalability of all components including HP OpenCall, a billing system, and all integration modules, will allow the solution to easily fit into the largest possible environments.

HP OpenView IUM processes multiples streams to capture data from different sources. Data is consolidated, integrated and delivered to business support systems.



Both GPRS and CDMA solutions can be supported with this model, while classical call control is provided by the MSC and SCP. In a data network various infrastructure components can provide useful information that IUM processes to define the progress of use against a prepaid account

IUM's architectural view of prepaid data breaks each user request into six aspects. These are shown color coded in the following diagram top right.



- The SCP relays the authorization messages and the disconnection instructions between the billing system and the handset.
- HP IUM (Internet Usage Manager) collects and processes the content usage records, and distributes the records to the billing system in real time.
- When end users start a GPRS session, or when they enter a WAP/Web area, which requires an additional credit control, an authentication/authorization request is generated by the network or the service platform and sent to HP Opencall Intelligent Network (IN), which forwards it to the billing system.

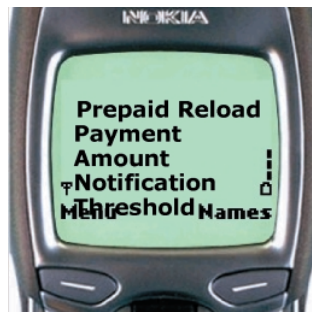
an authentication/authorization request is generated by the network or the service platform and sent to HP Opencall Intelligent Network (IN), which forwards it to the billing system.

- The billing system replies with a positive or negative authorization message according to the end user's account information. The service is then authorized or forbidden on the end user's handset.
- This usage information is generated by the different application servers, collected, processed and provided in real time to the billing system by HP IUM.
- The billing/rating system rates this usage information in real time and adjusts the end-user's balance accordingly.

User Experience

What the end user sees:

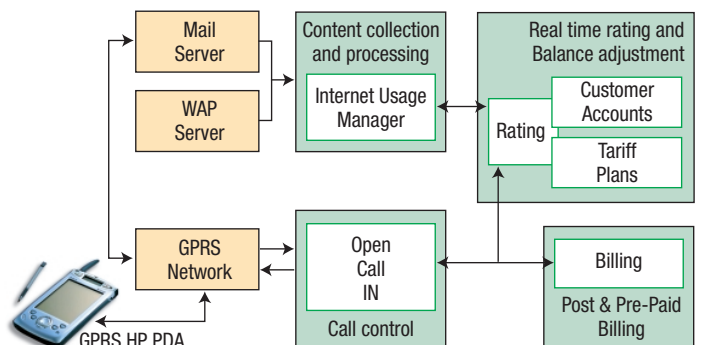
The user interface for subscribers is presented on their mobile phone or PDA. Interaction is accomplished through prompts and customized user interfaces delivered from the Mobile Knowledge Worker servers. All background activities occur automatically. Below is a sample of the automated interactions that occur to keep the user's experience simple:



How it works:

- An HP GPRS personal digital assistant (PDA) allows the end user to access the content applications via WAP/Web interfaces. The GPRS network, which hosts the handset, exchanges Camel (Customized Applications for Mobile Network Enhanced Logic) 3-like messages with HP Opencall SCP (service control point).

When the end user's balance becomes null or reaches a threshold, the billing system triggers a disconnection message to the HP OC Intelligent Network platform. The message is forwarded to the network layer or the service layer which, then, disconnects the end user or prevents him or her from using the service again.

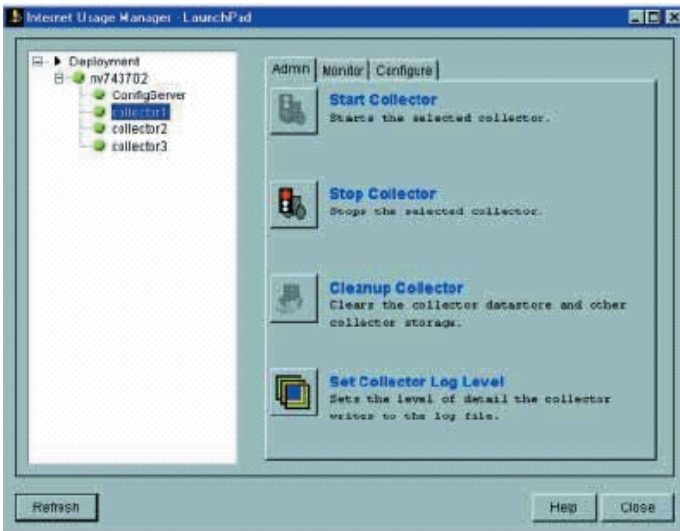


Interface for the administrator:

The HP IUM Launchpad is a one-stop configuration, administration, and monitoring tool that makes operating IUM easy and provides the CSRs with all detailed information concerning the customer usage behavior.

HP's Internet Usage Manager acts as the mediation layer between the data gathering function and the customer management system including bill preparation, usage and transactional statistics for data analysis, and operational data associated with inter-provider data flows that will require reconciliation between the organizations

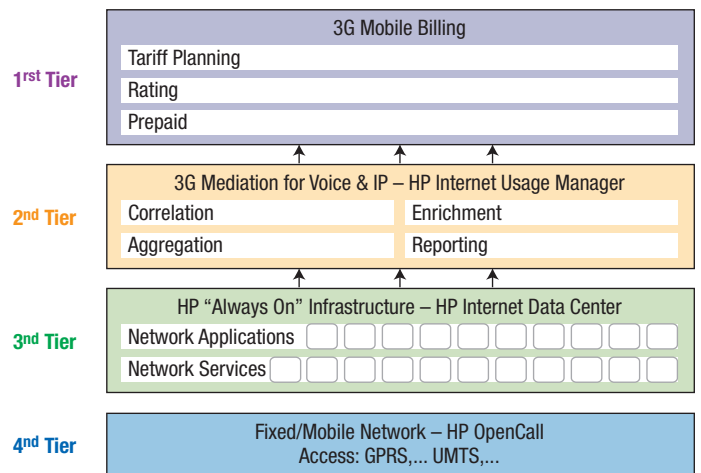
With Launchpad, CSRs are able to monitor usage patterns and assist customers with detailed information. Moreover they can offer customers personalized services such as more cost effective pricing plans or payment methods and additional services based on the customers' usage history.



Software Stack Diagram

HP's prepaid mobile services solutions incorporate best-in-class HP software products HP IUM and HP Opencall, as well as billing software from industry-leading partners, plus network equipment and wireless technology from a host of leading providers.

This system addresses prepaid content requirement in a pragmatic way. Legacy systems can run in parallel, while the new software stack of Opencall and IUM will control all new and old services. Prepaid balances can be held by the existing Opencall platform or by the billing system. Everything from the legacy to new converged systems can be seamlessly integrated to provide a single customer view.



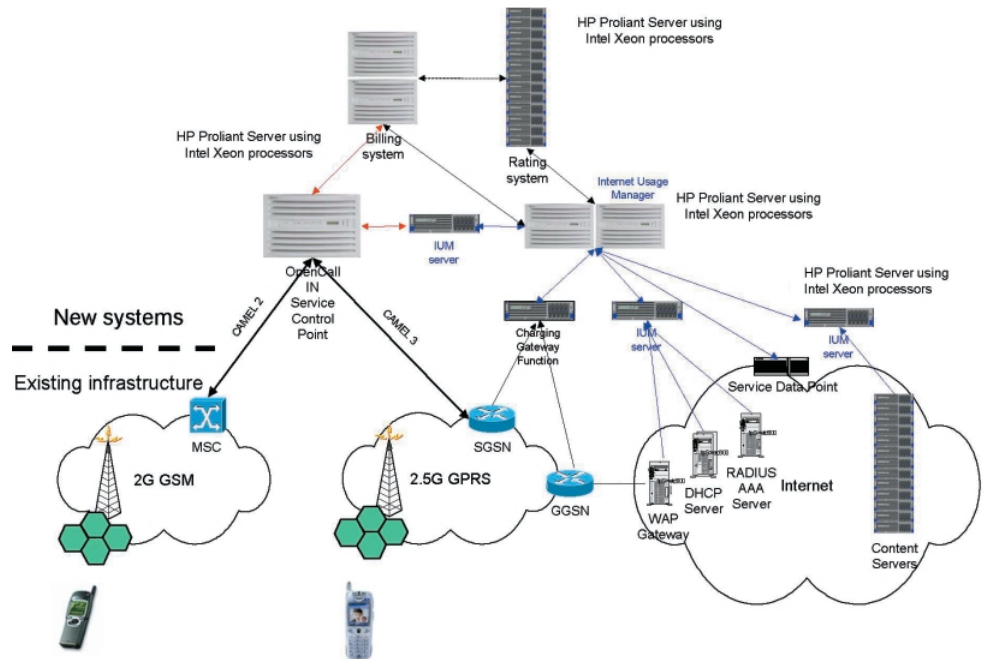
How the software interacts:

- event-based mediation provides a streaming infrastructure between IUM collectors and implements aggregation in near real time. It easily integrates with network data sources and also with rating, provisioning, control, and audit systems.
- event-based correlation integrates usage events with account details, so revenue leakage is reduced by pre-rating even high-volume, low-value items "on-the-fly." For example, you can pre-rate WAP decks as a mobile user moves from one deck to another.
- pre-rating and session control monitors thresholds, and provide alerts as thresholds are crossed. The solution can provide control feedback to service control points(SCPs) and data control points, too. It even integrates with IP data flow control points.
- both prepaid and post-paid billing models support for real time event handling, and interactivity with AAA, SCPs, and other critical processes required for prepaid data services. Concurrently Internet Usage Manager continues to handle traditional post-paid billing mediation as well.

- low-impact implementation — You can easily implement this solution, with low impact on existing systems and with minimal risk to content rating. You can use existing prepaid cards, your current deployed switch network, and your present billing system. The fact that the system is based on the industry standard Intel architecture based server platform reinforces this ease of integration. And, as new technologies emerge, you can upgrade incrementally. If you already have an IP-based solution, implementation is even easier, with very little change needed to the network.
- call content and bearer audit trail linkages help easily to track joint revenue flows.
- accommodation for a variety of systems, whether a switch is using RADIUS* accounting, SS7, Call Detail Records*, or any other accounting system, you get accurate accounting information quickly.
- multiple billing options to base billing on the provided services, such as the number of e-mails sent or the security level. Alternatively billing can be on a per-use basis, depending on the number of SMS messages or voice call duration. Invoices can be generated based on a combination of user and service variables, such as teleconferencing or video-on-demand, WAP activity or IP flow.
- content awareness help to maximize choice among various strategies for implementing prepaid content billing. For example, SGSN Camel (Customized Applications for Mobile Network Enhanced Logic) control is not content-aware, but the IUM based Prepaid Data solution is compatible with Camel (Customized Applications for Mobile Network Enhanced Logic) while independent of it, letting you assess any content without affecting operations.

Physical Systems Network Diagram

In this solution stack there are ten HP servers based on the Intel Xeon processor – the platform comprising more than 80 percent of all servers in use today. HP has used Intel architecture to deliver a scalable infrastructure to service providers for today's, and tomorrow's needs. Standard network equipment and wireless technology integrate smoothly into the physical architecture. HP's XP storage systems are used to meet the enormous demands for storing usage data typically generated by prepaid content billing.



The Intelligent Network platform (SCP), using Camel 2, is interfaced to the 2G GSM network through the Mobile Switching Center (MSC). It is interfaced to the 2.5G GPRS network, through the Serving GPRS Support Node (SGSN), using Camel 3.

The Gateway GPRS Support Node is working as a router between the GPRS network and the Internet. Both SGSN and GGSN are sending usage information to the mediation system (IUM) through the Charging Gateway Function (CGF).

- Getting all this information in real time, IUM can answer the following questions: What user session? (multiple sessions) Who's the user? (IP vs IMSI/MSISDN) What? (volume/hits/...) When, for how long? (time) Where? (mobility).

After correlation and aggregation of this information with the information coming from the content servers, IUM provides the usage information to the rating/billing system that rates it in real time and adjusts the end user's balance accordingly.

Summary

HP's mobile prepaid billing solution for 3G networks, which is based on Intel's reliable, available and serviceable Xeon processor family, meets the needs of mobile service providers adding non-voice services to their voice offering. Typically, voice mediation does not collect IP events, HP's Openview Internet Usage Manager (IUM) and Opencall can bring the needed functionality to legacy environments. By adding a specialized IP billing rater alongside the existing voice billing system, the complete solution enables the delivery of new products and services without replacing the entire voice billing system. Use of the Intel platform for the mobile prepaid billing solution also ensures price/performance and a high level of scalability.

How To Engage

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