Billing/Settlement Platform "InfoBilling BrobCom" for VoIP and Data Services

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Abstract

This article provides an overview of InfoBilling BrobCom, a fully integrated billing and settlement platform that generates aggregate billing records for VoIP, VPN, and other services by collecting and correlating call detail records derived from distributed call control equipment, RADIUS authentication servers, and other network elements.

1. Billing system for VoIP

Accompanying the penetration of ADSL (Asynchronous Digital Subscriber Lines) and the growing number of always-on and broadband Internet connections, we have seen growing demand for content and data delivery, VoIP (Voice over Internet Protocol), and other Internet-based services, which has fueled demand for a comprehensive IP billing system. Providing VoIP services requires interoperability between the legacy public switched telephone network (PSTN) and IP-based networks, so a viable billing/settlement platform must be fully aware of this interoperability and be capable of using the same billing records as the PSTN.

2. Overview of InfoBilling BrobCom

As illustrated in Fig. 1, InfoBilling BrobCom collects call detail records (CDRs) and logs from RADIUS (Remote Authentication Dial-In User Service) servers and other servers providing services, from call agents (CAs) and gatekeepers (GKs) that control calls by the H.323 and Session Initiation Protocol (SIP) [1] used by VoIP, and from gateways (GWs) that provide an interface between PSTN and IP-based networks. InfoBilling BrobCom takes these various records and consolidates them into an aggregate billing record. The user responsible for the charges is identified by a user ID corresponding to the user's authentication ID employed by RADIUS and other authentication servers. In VoIP, it is essential to clearly distinguish the parties making and receiving the call, so an E.164 telephone number is used in addition to the authentication ID. This corresponds to an ordinary telephone number or to a 050 number used by VoIP. In situations where the SIP protocol is used, a SIP-URL is employed in addition to the user ID and the E.164 telephone number.

The platform permits charges to be set and calculated for a full range of user call parameters and calling destinations including different calling routes, different time zones, or, in the case of VoIP, different quality of service (QoS) requirements. The platform also calculates VoIP charges with awareness of interconnectivity to the PSTN.

Beyond the ability to calculate metered charges for data services based on connection time or quantity of data, the platform is also able to calculate discounts without violating service level agreements (SLAs). The calculated charges are billed to the party making the call, and, after details of the call have been generated and any applicable discounts factored in, billing information is output.

3. InfoBilling BrobCom Architecture

The InfoBilling BrobCom platform collects CDRs

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and logs from call agents and servers, and uses this data as the basis of billing. In the PSTN, one can see from Fig. 2 that call data is output by switches based on SS7 (Signaling System no. 7). The output items and data format are largely fixed because they are based on a uniform standard.

In the same figure one can see that IP-based networks are quite different, because they are based on call agents, servers, and assorted other network elements that are very different. A viable billing architecture must therefore be flexible and robust enough to accommodate the collection of different kinds of billing records, the addition or modification of billing parties, and the collection of records based on a range of different proprietary protocols and formats.

To achieve this robustness, an IP mediation-based architecture has been adopted for the InfoBilling BrobCom platform, as illustrated in Fig. 3. This system (i) collects CDRs and logs from call agents and various service-providing servers, (ii) converts these

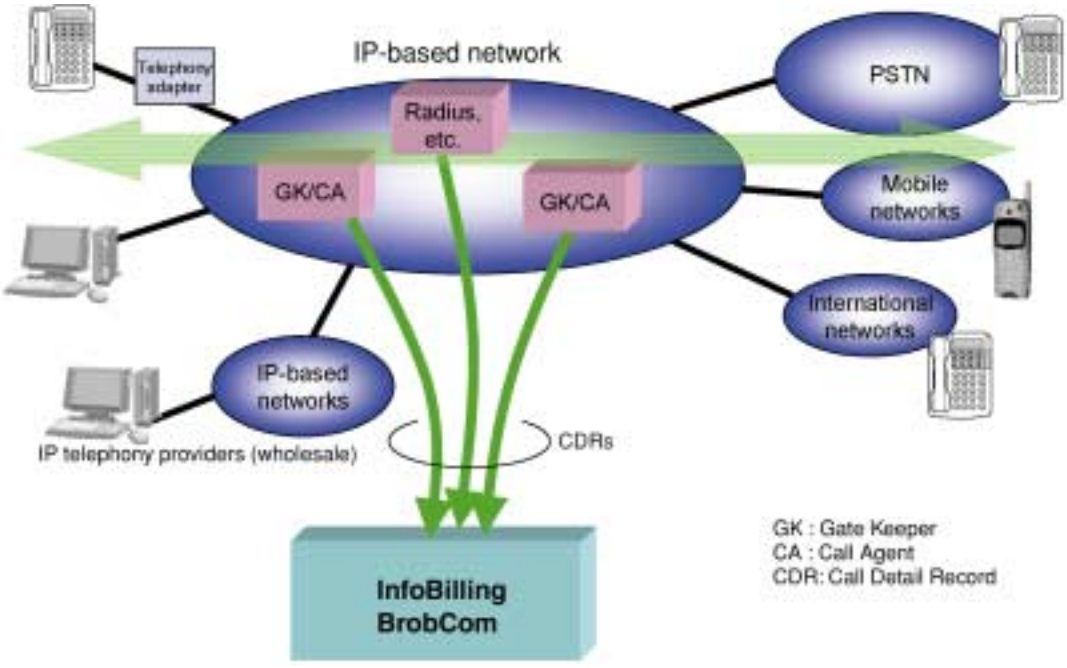

Fig. 1. InfoBilling BrobCom Service Overview.

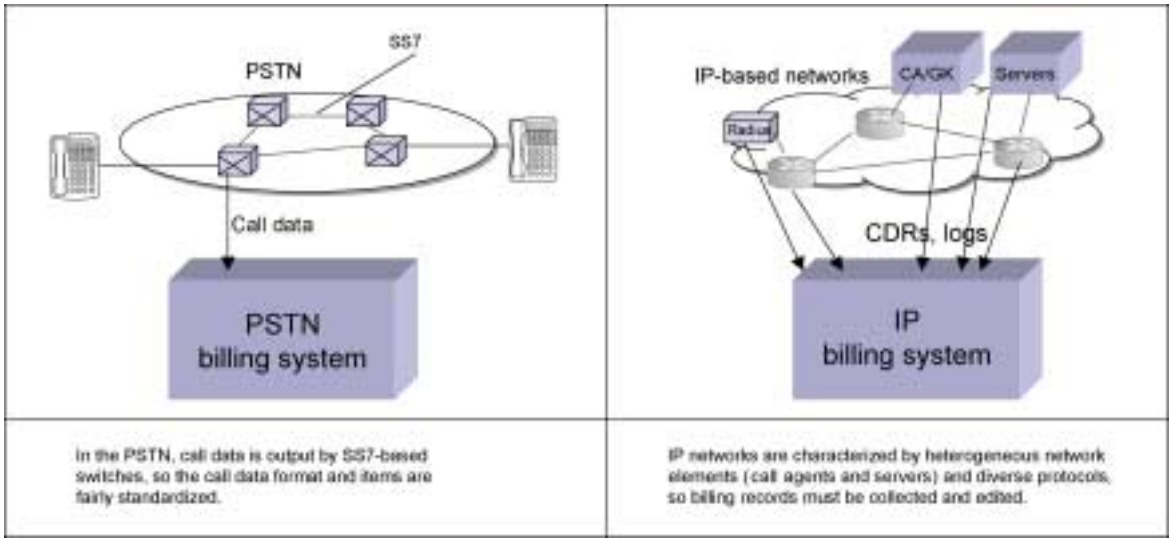

Fig. 2. Scheme for collecting billing data across PSTN and IP networks.

records to a standardized format, (iii) edits the records (correlating, merging and splitting) to make them useful for billing purposes, (iv) aggregates the records, and finally (v) produces a single service detail record. These processes are done by the billing application.

4. InfoBilling BrobCom Functions

As illustrated in Fig. 4, InfoBilling BrobCom col-

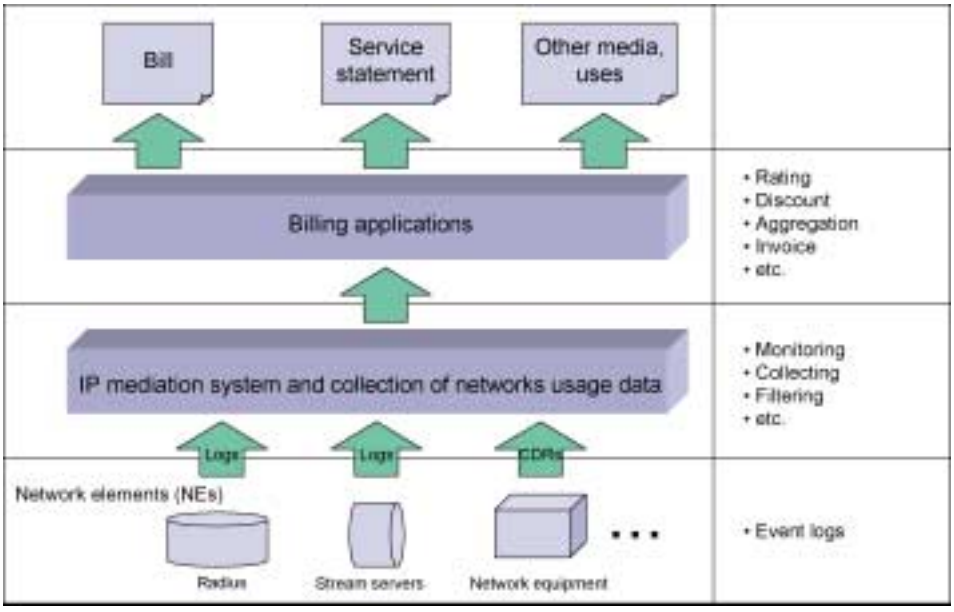

Fig. 3. IP Mediation-based billing platform architecture.

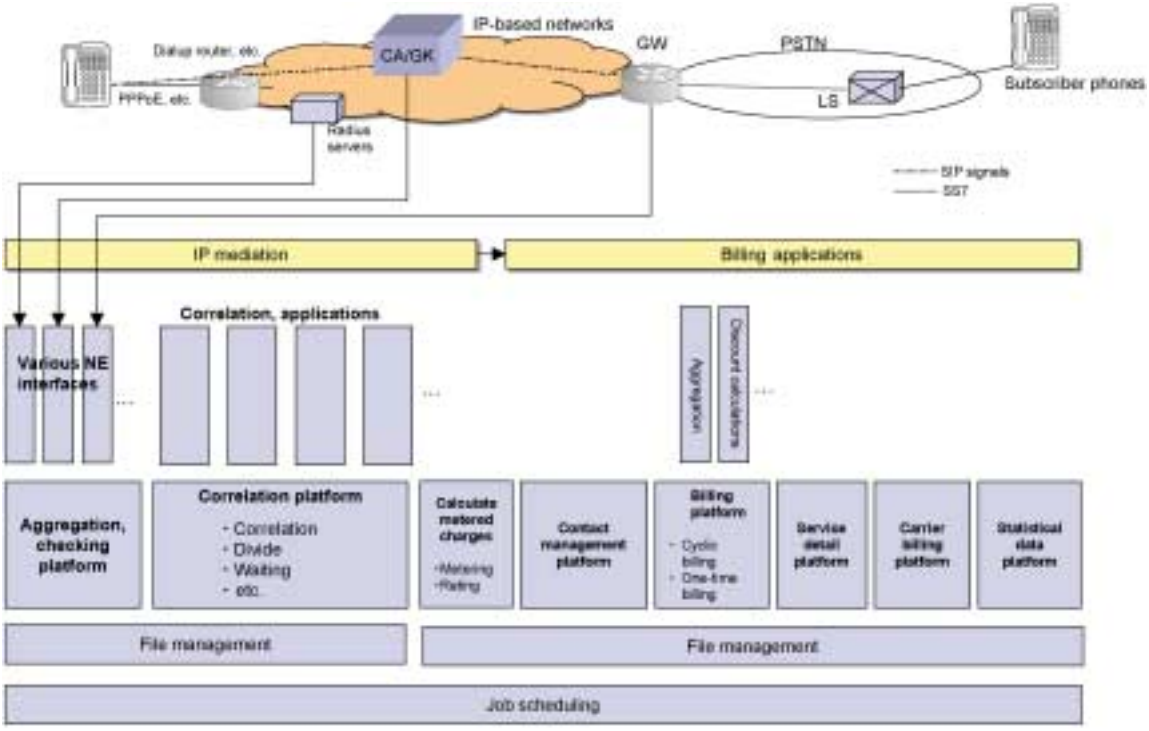

Fig. 4. InfoBilling BrobCom architecture.

lects CDRs from call agents and servers, calculates charges, and outputs the service details and billing information to the billing system, which is based on contract data input from the service order processing system. Let us next examine the functions and roles of the InfoBilling BrobCom platform in greater detail.

IP mediation functions

A diverse range of different kinds of call agents and servers are distributed across IP-based networks, and, because these networks are implemented to exploit the advantages and unique features of these various network elements, the output format, the output items, and the output timing of CDRs and logs will vary from one network element to the next. Furthermore, the billing information is not confined to a single CDR or log, so multiple CDR and logs must be collected and aggregated. In Fig. 4, for example, VoIP data is collected from call agents while PSTN SS7 data is collected from the gateway. The IP mediation system collects the required usage information from the various network elements (call agents and servers), and produces a single billing record by absorbing different output formats and timing variations.

By matching the protocols and formats of the various call agents and servers, the IP mediation function collects CDRs and logs from the network elements, and analyzes the content of this usage data. Since the mediation function must correlate data from various network elements to collect all the information needed in order to generate an aggregate billing record, it must verify the arrival of related CDRs coming in from network elements having different timing parameters. Once it has confirmed that all the relevant CDRs have arrived, the mediation function merges or splits the CDRs as required to produce an aggregate billing record for the service associated with one call.

The mediation function not only collects the necessary usage information from distributed network elements to bill for VoIP services, but also, considering that VoIP communication involves interworking between the PSTN and IP-based networks, is capable of generating an aggregate billing record based on usage information derived from IP-based networks and from the PSTN. Detailed billing records can thus be produced for all kinds of service-level calls where interworking between the PSTN and IP-based networks is involved.

In the case of RADIUS and VPN services, billing records are generated based on the connection time and call amount for one call: information that is derived from logs coming from the server.

A notable feature of the IP mediation function is that its aggregation capability and most of its other functions can be simply modified by changing the values of settings, so the system can be flexibly adapted to any combination or number of call agents, servers, and other network elements in the IP network, and can therefore easily accommodate network expansion.

Rating function

Charges are calculated from a tariff based on the aggregate billing record generated by the IP mediation function. The tariff has different rates for different call durations, time zones, distances, voice quality, and so on, and the rate is set based on these various incremental units.

Service detail platform functions

Based on the calculated metered charges, the user's usage is output in the form of a detailed call record.

Cyclic and one-time billing functions (Billing Platform)

In addition to calculating ratings, InfoBilling BrobCom can also generate cyclic billing (whether basic charges are billed or not), and one-time billing such as for maintenance or installation work. The cyclic billing function calculates charges on a per-diem basis and features a per-diem policy engine that can be flexibly set to accommodate any company's policy.

Invoice processing function

An aggregate billing is generated based on the

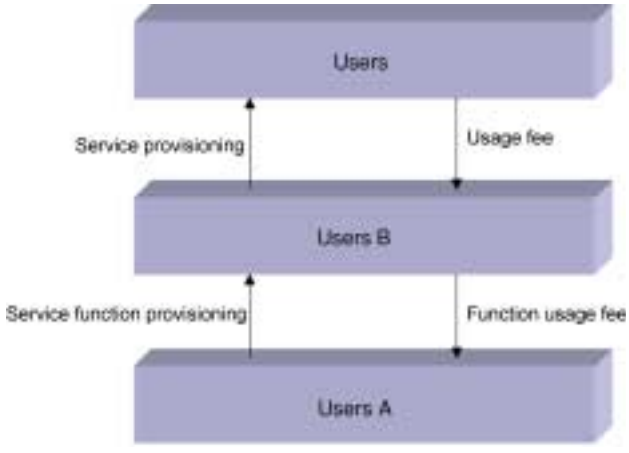

Fig. 5. Business-to-Business-to-Customer (B2B2C) model.

metered, cyclic, and one-time charge results. Various discounts can also be factored in based on contractual information from the service order processing system. A discount calculation associated with a new plan can also be added on very easily. After the billing records have been totaled and applicable discounts applied, the records are output for invoicing.

Finally, InfoBilling BrobCom also features the ability to bill other providers at wholesale rates for services that they extend to their own contractual customers based on a B2B2C (business-to-business-to-customer) model, as shown in Fig. 5.

5. Conclusion

Up to now billing and settlement platforms have been based on the fundamental framework of voice and data services, but future platforms will accommodate advanced usage-based billing and advanced communication applications.

References

[1] IETF, "SIP: Session Initiation Protocol," RFC3261, 2002.
[2] Oscar VasQuez, "Billing For IP Services Remains A Challenge," Business Communication Review, pp. 31-37, Dec.1999.

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