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## Executive overview

The world of VoIP is adopting SIP signaling. More and more VoIP Service Providers are upgrading their current signaling networks to SIP signaling or deploy new SIP-based signaling networks. Deploying prepaid services using SIP signaling requires centralized control platforms, built from the start with high scalability to support current and future service requirements. Service Providers require integrated solutions for prepaid services, including everything from full SIP call control and IVR functionality to advanced rating, billing and CSR functions.

By adding the MINDBill SIP Application Server to its industry-proven MINDBill Billing & Customer Care system, MIND CTI provides a powerful solution for prepaid services in a SIP network.

The solution is perfectly suited for fast deployment of advanced call control based services in SIP networks, including phone-to-phone, PC-to-phone and PC-to-PC services. Service applications for prepaid VoIP services are included and ready for deployment, while new applications can be developed and deployed on the same platform in the future. By using the latest Java technology, outstanding flexibility is achieved, enabling the solution to support a wide variety of hardware platforms. The solution can be scaled up as your network and business grow and it supports full redundancy and automatic fail-over for maximum reliability.

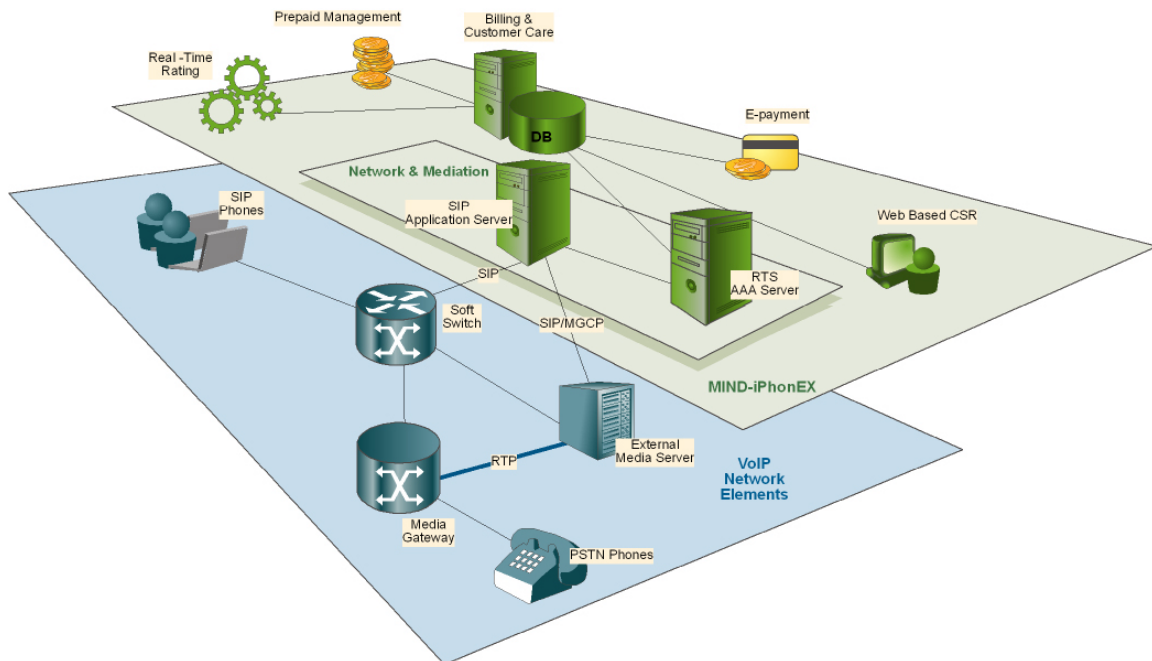
The advantages of the MINDBill SIP Application Server solution for VoIP service providers are:

- Fast deployment of prepaid services in their existing SIP VoIP networks, without the need to buy or integrate any other 3<sup>rd</sup>-party equipment.
- Seamless interoperability with leading SIP VoIP equipment vendors, enabling either a proxy or a re-direct mode of operation.
- Providing prepaid services for both: permanently registered subscribers and casual calling card owners.
- Providing IVR-based services in both native and foreign languages with flexible per-subscriber / per-service language selection options.
- Generating and managing permanent subscriber accounts, calling card batches and voucher batches.
- Defining flexible multi-dimensional rating schemes, discounts and promotions.
- Service creation environment - enabling development and deployment of new call control based services on the same platform (e.g. postpaid calling card, conferencing, voice mail).
- Scale up and extend the platform as the business and network grow to generate more revenue with minimal investment.

- Monitor and manage the platform and its components in real-time, quickly discover and fix problems, and generate detailed reports on network and service usage.

## Solution architecture

The MINDBill solution for prepaid services in SIP VoIP networks is built upon several components. These industry proven components are responsible for call control, IVR, AAA, rating, CSR and management functions, and span across core network, mediation/OSS and BSS domains. The SIP Application Server connects directly to a SoftSwitch or any other call routing network element.



**Figure 1: The MINDBill SIP Prepaid Services Solution Architecture**

By utilizing a SIP Back-To-Back User Agent - B2BUA architecture, the MINDBill SIP Application Server interacts in the SIP network and provides full call control functionality. It includes an internal IVR function for media detection and prompts, and alternatively provides a connection to external Media Server(s). For real-time AAA, rating and billing functions the MINDBill SIP Application Server interfaces with the MINDBill Real-Time Server. The MINDBill Operations Management System provides monitoring and management tools.

Upon receiving an incoming call initiation requests, known as SIP INVITE messages, the flexible MINDBill SIP Application Server is capable of executing pre-defined service applications. Each application can use any of the underlying components and interfaces (i.e. SIP call control, IVR, external Media Server interface, AAA interface, timer management functions and other basic functions). The application determines the actual call flow from the moment the incoming SIP INVITE message is received to the moment the caller is disconnected from the MINDBill SIP Application Server.

The two main prepaid service applications are: zero-stage dialing (no IVR prompts) and IVR-based dialing (single or dual stages). Each service application is customizable by setting various configuration parameters. Using the SIP Application Server service creation environment, these parameters provide customization of e.g. the default language prompts, calling card number length or whether or not a certain prompt should be played.

Whenever a service is invoked (by a SIP INVITE message), a set of rules is applied on the incoming message to determine which service application should be executed and which parameter settings should be used. The rules are fully customizable and allow definition of e.g. special access numbers, blocked CLIs and authorized SIP network elements.

Multiple MINDBill SIP Application Servers can be deployed using N+1 configuration for load-sharing and automatic fail-over. All the servers in such a group share all the configuration settings, run the same service applications and share the state of the on-going calls, so that no calls will be lost on fail-over. Load-balancing between the servers can be implemented either by the SIP network elements connected to the MINDBill SIP Application Servers or by deploying an external SIP Proxy Server with load-balancing function. It is also possible to run different services over multiple server groups.

**The MINDBill SIP B2BUA** is an integrated part of the MINDBill SIP Application Server. It is based on the latest SIP standards and implements full 3<sup>rd</sup>-party call control functionality. It is able to bridge any media and any codec using SDP and provides up to 1000 concurrent calls per dual-CPU SUN server. The MINDBill SIP B2BUA supports SIP early media, SIP UPDATE method and mid-call DTMF detection using SIP SUBSCRIBE-NOTIFY methods or SIP INFO method.

**The MINDBill Internal IVR** is an integrated part of the MINDBill SIP Application Server. It supports multi-lingual prompt playback using language-specific number logic. The IVR supports DTMF detection and collection using IETF RFC 2833 for entering user codes ID's, passwords and destination information. Furthermore, the IVR provides voice recording and voice mixing support for conferencing and other. Using an external SIP Media Server, it is possible to extend and scale up the IVR functionality to support any given network provider

**The MINDBill Real-Time Server** provides a full set of real-time AAA functions, including subscriber authentication (by CLI or calling card PIN and password), call authorization based on subscriber balance and dialed number, reverse rating according to flexible multi-dimensional rating schemes and subscriber balance management. Advanced rating features such as rounding of call duration, call setup charge, minimal/maximal charge, minimal/maximal duration, stepped and tiered rates, special discounts and many more are fully supported. The MINDBill Real-Time Server blocks the subscriber accounts during calls in progress, which prevents usage of the same account simultaneously. It is also possible to completely block an account after a certain (configurable) number of authentication attempts failure. The MINDBill Real-Time Server also supports additional advanced features such as changing of calling card passwords and re-charging of prepaid accounts from vouchers and credit cards.

Using an N+1 configuration the MINDBill Real-Time Server can be deployed for a full load sharing and automatic fail-over support. The MINDBill SIP Application Server

implements a Load-balancing mechanism between the servers. Therefore, if one of the servers fails, no data will be lost, since all subscriber-related data is stored in the central MINDBill Oracle Database.

**The MINDBill Oracle Database** stores all network and service configuration, tariffs and subscriber and calling card data. The database can be deployed using SUN cluster technology for maximum scalability and reliability.

**The MINDBill Management and CSR tools** enable the service provider to configure the network, the services and the tariffs, and manage subscribers, calling cards and vouchers, including calling card and voucher batch generation and management. Most of the management and CSR tools are based on web technology and can be accessed securely from any web browser.

## **MINDBill prepaid service application features**

MINDBill includes service applications for zero-stage direct dialing services without IVR, single-stage dialing services with IVR (for registered prepaid subscribers) and dual-stage dialing services with IVR (for prepaid calling cards).

The '*Zero-Stage dialing*' Prepaid service application includes the following features:

- Direct service access by dialing the destination number directly.
- Automatic subscriber authentication according to Calling Line Identification - CLI.
- Call authorization per subscriber according to the current account balance and the destination number.
- Toll free calls with optional time limit even when the balance is zero.
- Automatic call cut-off when the balance expires.
- Invocation of SIP error responses for call failures due to e.g. no authorization, not enough money, busy, no answer, etc. These responses can be translated to special tones or announcements if an announcement server is installed in the SIP signaling path.

The '*Single stage dialing*' Prepaid service application includes the following features:

- Access to the service by dialing a special access number.
- Multi-lingual announcements - language may be assigned per subscriber, per special access number or by playing a language selection menu.
- Caller authentication by CLI (for registered prepaid subscribers) or by PIN and password (for prepaid calling cards).
- Configurable number of failed caller authentication attempts before the caller is disconnected.

- Optional actions menu - allows the caller to choose whether to make a call, recharge their account or calling card or change calling card password.
- Call authorization per subscriber or calling card according to the current balance and the dialed number.
- Configurable number of failed call authorization attempts before the caller is disconnected.
- Toll free calls with optional time limit even when the account balance is zero.
- Current balance and time-left for the call prompts (configurable).
- Mid-call warning - during the call a time left prompt is invoked. The threshold is configurable.
- Long pound disconnect - by pressing the long pound key (e.g. "##") the caller is able to end the call with the callee without being disconnected from the service. Using this service the caller can originate another call, recharge the account or calling card, or change their calling card password. No re-authentication is required in this case.
- IVR return - In any case of call completion, except when the caller disconnects the call, the caller remains connected to the service and is able to make another call or perform any other action supported by the service application without re-authentication.
- Account or calling card recharge from voucher- by transferring money from another account or calling card, or from a credit card.
- Calling card password change - with optional new password playback.

## Summary

The MINDBill solution for prepaid services in SIP VoIP networks is based on the industry-proven MINDBill Billing & Customer Care system with the addition of the MINDBill SIP Application Server. This fully integrated solution provides all the functionality required to deploy prepaid services in SIP VoIP networks quickly and efficiently. The solution can be easily scaled up as your business and network grow and guarantees high availability based on automatic fail-over mechanisms implemented in all of its critical components.

The various components of the solution include a full SIP B2BUA interoperable with VoIP equipment from the leading vendors, an internal IVR function extensible by connecting to an external Media Server, a AAA server with an enhanced rating engine and web-based tools for configuring and monitoring the network, services and rates, and managing subscribers and calling cards.

The solution includes easily customizable service applications for zero-stage dialing and IVR based dialing out-of-the-box. New service applications can be developed and deployed on the same platform in the future by using a GUI-based Service Creation Environment (currently under development).