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Executive summary

Service providers are more eager than ever to deploy prepaid systems. The ability to offer a fraud free, high margin solution that always associates with high customer satisfaction makes prepaid services a dominant force in the telecom arena.

In the next couple of years prepaid will evolve from its current well-known prepaid Voice application – the prepaid calling card – into prepaid for triple play, meaning that Voice, Data and Video shall all be prepaid enabled. Such a shift will allow customers the ability to maintain control over their budgets and will be a critical factor for customer acceptance of such advanced services.

Enabling triple play services with a real-time architecture presents new challenges for the prepaid solution. Working and maintaining simultaneous sessions, providing advanced call control features and providing customized IVR capabilities are all part of tomorrow's prepaid platform.

In order to reduce total cost of ownership, the need for a turnkey prepaid solution that can work side by side with the existing billing systems and to seamlessly operate in hybrid networks becomes a must.

MINDBill Prepaid Platform

As a prepaid pioneer, the MINDBill Prepaid Platform is a scalable and redundant platform already interoperable with the Voice, Data and Video market leaders. The MINDBill Prepaid Platform with its feature richness and its ability to operate in different networks (Mobile/3G, VoIP, Data and Wireline) is the solution of choice for more than 50 Service providers worldwide.

Platform features

The MINDBill prepaid solution includes voice service applications for zero-stage direct dialing services without IVR, zero-stage direct dialing services with IVR for unsuccessful call announcements and an IVR-based Top-up application.

The 'Zero-Stage' direct dialing prepaid service includes the following features:

- Direct Dial service access by dialing the destination number directly.
- Automatic subscriber authentication based on Calling Line Identification – CLI.
- Call authorization based on balance and destination per subscriber.
- Automatic call cut-off when balance depletes.
- Emergency and Toll free calls support – even when balance is zero.
- A configurable balance depletion warning prompt playback support.
- Automatic redirection to the Top-up server – on call setup, if no sufficient balance is left, it is possible to automatically redirect the call to the Top-up server.

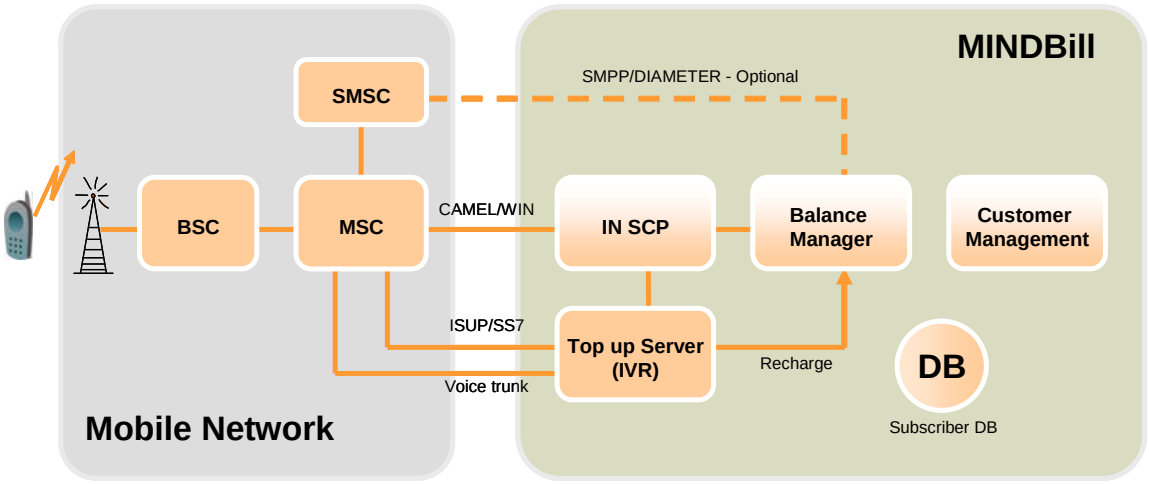
The IVR Top-up service application includes the following features:

- Access to the service by dialing an access number from the mobile network and from outside the mobile network using a fixed line.
- Caller authentication by CLI within the mobile network or by PIN and password when calling from outside the network.
- Multi-lingual announcements – language may be assigned per subscriber, per special access number or by playing a language selection menu.
- Configurable number of failed PIN insertion or authentication attempts before the call is disconnected.
- Optional actions menu – allows the caller to choose whether to recharge their prepaid account or change their prepaid account password.
- Current balance prompts (configurable).
- Account or calling card recharge from voucher – by transferring money from another account or calling card, or from a credit card.
- Prepaid account password change – with optional new password playback.

- Customize IVR flows according to the service provider request.

The MINDBill Prepaid IN Solution

The MINDBill solution for prepaid services in mobile networks is built upon several components. These industry proven components are responsible for the prepaid application call control (IN SCP), IVR, AAA, rating and charging, CSR and management functions and span across core network, mediation/OSS and BSS domains. The MINDBill IN SCP connects directly to a network MSC (The SSP function).



The MINDBill Prepaid IN Solution diagram

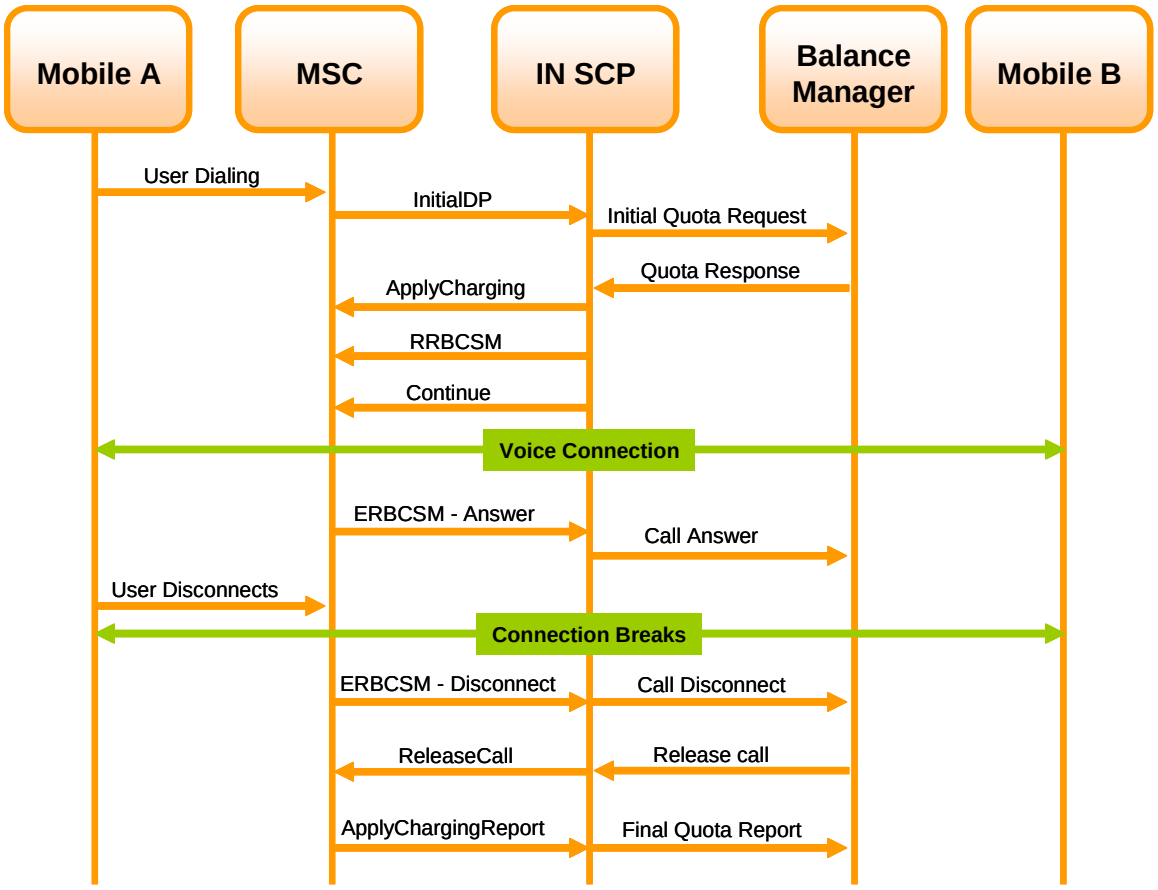
The MINDBill solution includes a possible IVR for voice announcements and for the top-up application. The IVR requires an ISUP/SS7 connection and a direct voice link to the network MSC. The IVR is controlled by the IN SCP, where the actual top-up application resides and the required connection to the subscriber database is.

The MINDBill IN SCP supports receiving quota requests from other application servers such as SMSC using the IN protocol. If such integration is not available, the solution offers an optional direct API to the system Balance Manager using either SMPP/IP, DIAMETER or RADIUS for quota allocation.

The IN Prepaid call flows

Scenario 1: Direct Dial Call with Normal Termination

The common IN prepaid call is a direct dial call. The following scenario illustrates the flow of a direct dial mobile call that is normally terminated by the mobile user.



Direct Dial Call with Normal Termination

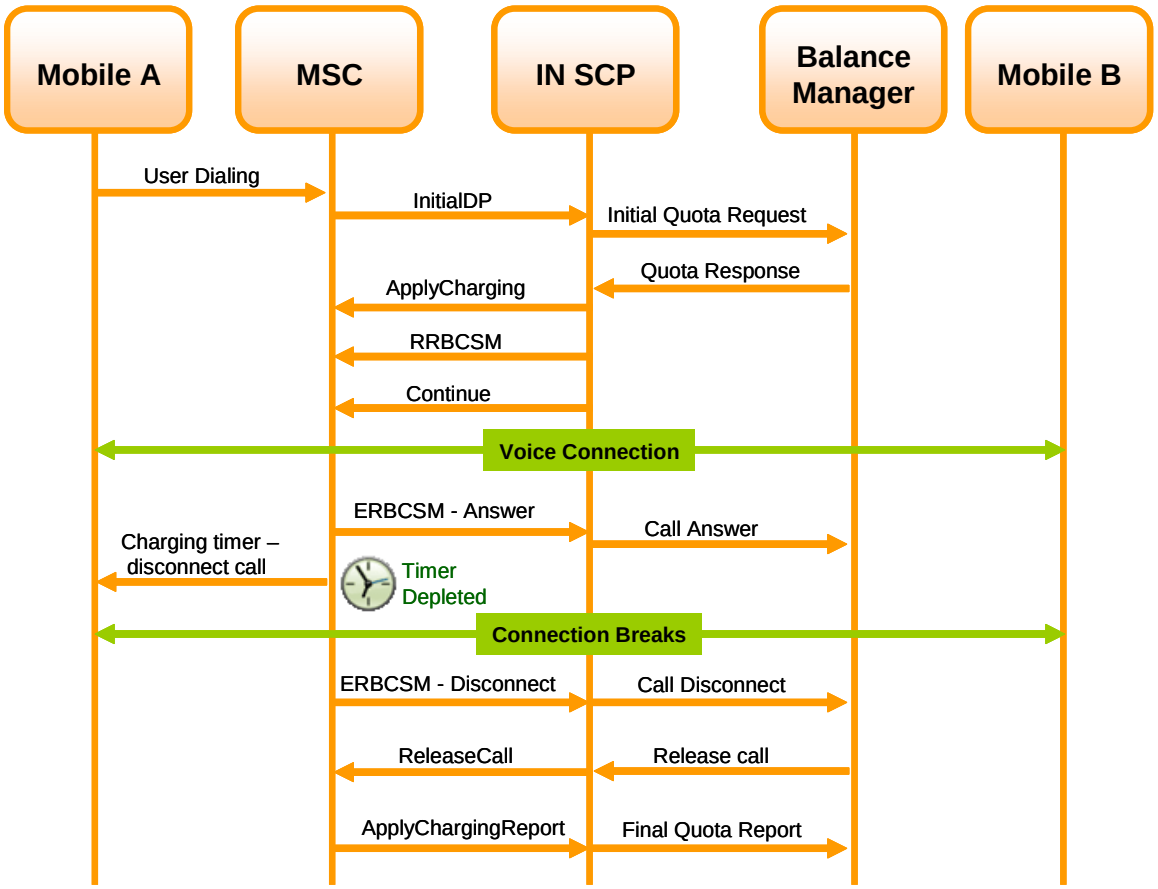
The above flow describes a basic direct dial call scenario with normal call termination:

1. Mobile A starts a new call by dialing Mobile B
2. The MSC sends an InitialDP (Initial Detection Point) event, which notifies the IN SCP of the new call.
3. The IN SCP processes the request and sends an initial quota request to the Balance Manager. After authorizing the user, the BM grants the available duration quota for the call to the IN SCP.
4. Then, the IN SCP sends 3 IN messages to the MSC:
    a. ApplyCharging – Setting up the call timer.
    b. RRBCSM – Requesting the MSC to inform the IN SCP of an ANSWER or DISCONNECT events.
    c. Continue – Directs the MSC to continue call processing and connect the call.
5. Next, Mobile A is connected to Mobile B.

6. Once the connection is made, an event report (for the ANSWER event) is sent to the IN SCP.
7. The IN SCP passes the event information to the Balance Manager for preventing any potential revenue leakage.
8. When the call is disconnected, a new event report is sent to the IN SCP.
9. The IN SCP passes this event information to the Balance Manager, which in turn instructs to release the call.
10. Once the call is released, a new ApplyChargingReport is sent to the IN SCP, which contains full time usage data on the call.
11. The information is sent to the Balance Manager for accurate and final call charging.

Scenario 2: Direct Dial Call with Balance Depletion

The common IN prepaid call is a direct dial call. The following scenario illustrates the flow of a direct dial mobile call that is disconnected due to balance depletion.



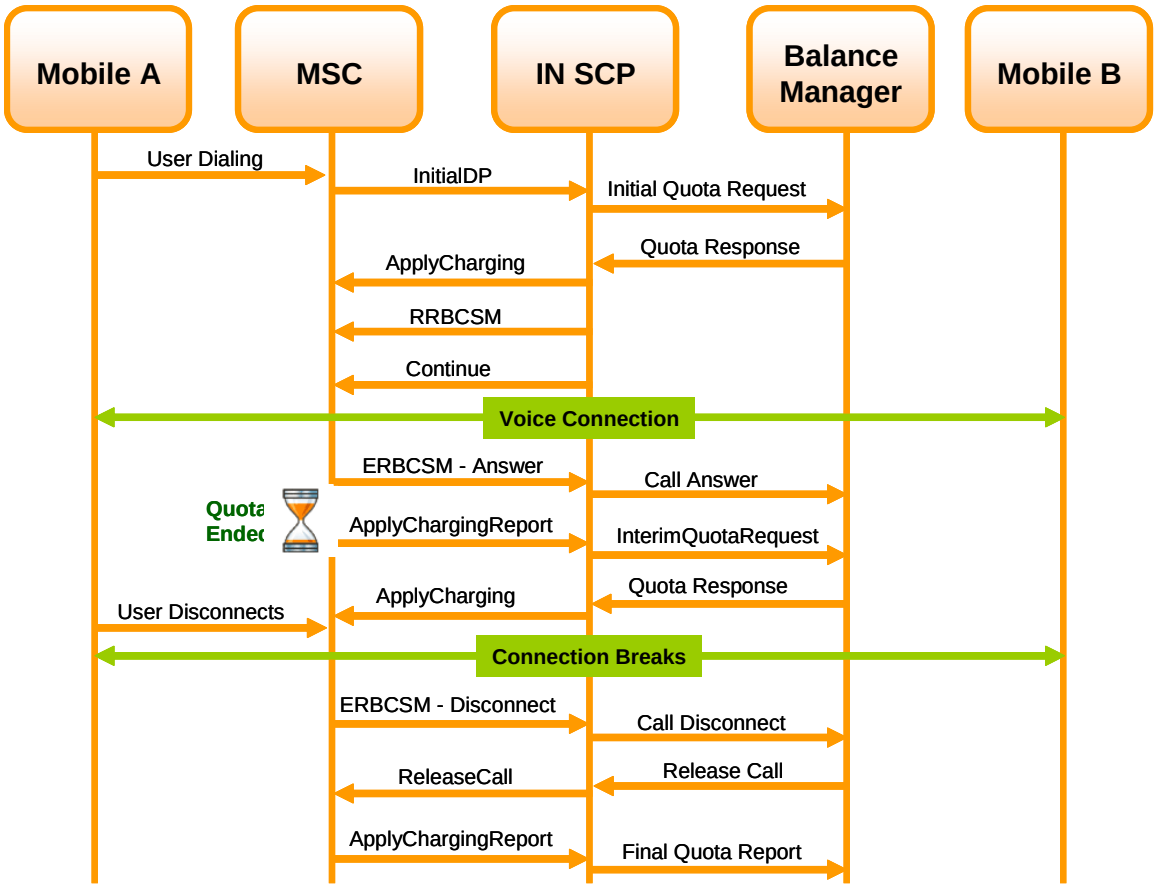
Direct Dial Call with Balance Depletion

The above flow describes a basic direct dial call scenario with normal call termination:

1. Mobile A starts a new call by dialing Mobile B.
2. The MSC sends an InitialDP (Initial Detection Point) event, which notifies the IN SCP of the new call.
3. The IN SCP processes the request and sends an initial quota request to the Balance Manager. After authorizing the user, the BM grants the available duration quota for the call to the IN SCP.
4. Then, the IN SCP sends 3 IN messages to the MSC:
    a. ApplyCharging – Setting up the call timer.
    b. RRBCSM – Requesting the MSC to inform the IN SCP of an ANSWER or DISCONNECT events.
    c. Continue – Directs the MSC to continue call processing and connect the call.
5. Next, Mobile A is connected to Mobile B.
6. Once the connection is made, an event report (for ANSWER event) is sent to the IN SCP.
7. The IN SCP passes the event information to the Balance Manager for preventing any potential revenue leakage.
8. When the timer depletes, the MSC disconnects the call. Then, a new event report is sent to the IN SCP.
9. The IN SCP passes this event information to the Balance Manager, which in turn instructs to release the call.
10. Once the call is released, a new ApplyChargingReport is sent to the IN SCP, which contains full time usage data on the call.
11. The information is sent to the Balance Manager for accurate and final call charging.

Scenario 3: Direct Dial Call with Recurring Quota Allocation

The common IN prepaid call is a direct dial call. The following scenario illustrates the flow of a direct dial mobile call with a recurring quota allocation procedure. After a couple of quota allocations, the call is normally terminated by the mobile user.



Direct Dial Call with Recurring Quota Allocation

The above flow describes direct dial mobile call with a recurring quota allocation procedure:

1. Mobile A starts a new call by dialing Mobile B.
2. The MSC sends an InitialDP (Initial Detection Point) event, which notifies the IN SCP of the new call.
3. The IN SCP processes the request and sends an initial quota request to the Balance Manager. After authorizing the user, the BM grants the available duration quota for the call to the IN SCP.
4. Then, the IN SCP sends 3 IN messages to the MSC:
    a. ApplyCharging –Setting up the call timer for the initial call duration.
    b. RRBCSM – Requesting the MSC to inform the IN SCP of an ANSWER or DISCONNECT events.
    c. Continue – Directs the MSC to continue call processing and connect the call.
5. Next, Mobile A is connected to Mobile B.

6. Once the connection is made, an event report (for ANSWER event) is sent to the IN SCP.
7. The IN SCP passes the event information to the Balance Manager for preventing any potential revenue leakage.
8. Based on the initial RRBCSM setting, when the timer is about to deplete, the MSC will send an event report to the IN SCP.
9. The IN SCP processes the request and sends an interim quota request to the Balance Manager. The BM grants the available subsequent duration quota for the call to the IN SCP.
10. The IN SCP sends an additional ApplyCharging request to the MSC, which sustains the call for the additional duration granted.
11. When the user disconnects the call, the MSC sends a new event report to the IN SCP.
12. The IN SCP passes this event information to the Balance Manager, which in turn instructs to release the call.
13. Once the call is released, a new ApplyChargingReport is sent to the IN SCP, which contains full time usage data on the call.
14. The information is sent to the Balance Manager for accurate and final call charging.

The MINDBill Prepaid Platform components

MINDBill IN Service Control Point ("SCP")

The IN SCP is used for proving prepaid support for IN based networks. The IN SCP supports both CAMEL and WIN and it is capable of integrating into GSM and CDMA based networks. The IN SCP includes a GUI based service creation tool used for designing the supported services. Currently, it supports direct dial calls with built in IVR announcements, roaming call scenarios, SMS and Mobile GPRS sessions.

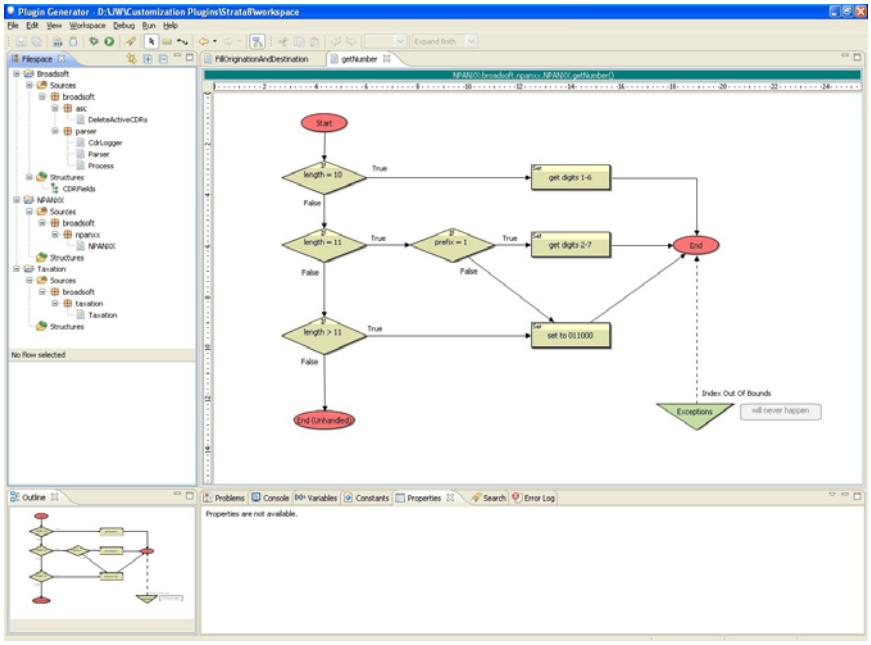
The IN SCP hardware highlights:

- Supports traffic rates up to several thousand TCAP transactions per second.
- Supports both low-speed SS7 links and high-speed, 2 Mbps Q.703, SS7 links configurable on a per-link basis.
- Supports SIGTRAN M3UA and SUA protocols.
- Based on a 2U carrier-grade server – Provides carrier-grade qualities that prevent revenue loss.
- Supports ITU-T, ETSI/3GPP and ANSI, including local variants for France, China, and UK.
- Supports resilient system architectures and multiple point codes.

MINDBill IVR

The MINDBill IVR is an integrated part of the MINDBill solution. This DSP-based IVR is capable of collecting and playing DTMF, prompt playback, barging in, voice recording and more. The IVR application provides all of the required features for setting up a prepaid solution, including a top-up service and warning prompts playback features:

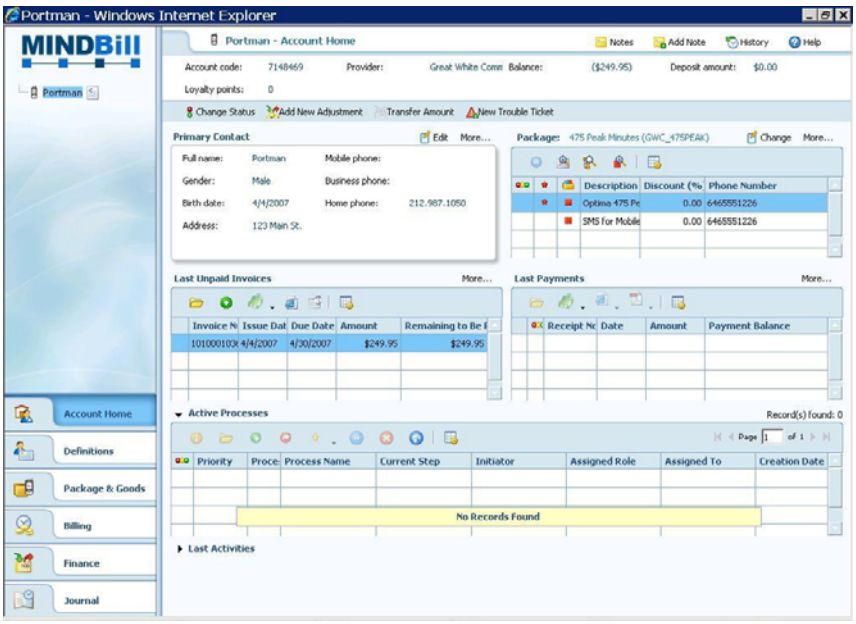
- It supports multi-lingual prompt playback using language-specific number logic.
- Route incoming calls by automatically identifying the number the caller dialed. This is also known as the Dialed Number Identification Service (DNIS).
- Includes DTMF detection and generation – for caller authentication, password change, Voucher PIN insertion and menu selection.
- Supports both E1 and T1 trunks.
- Supports a wide range of PSTN protocols including ISDN and ISUP.
- GUI-based IVR flow creation environment – customizing the IVR flows according to the service provider's request is an option.



The IN application and IVR flow graphical creation environment

The MINDBill Management and CSR tools

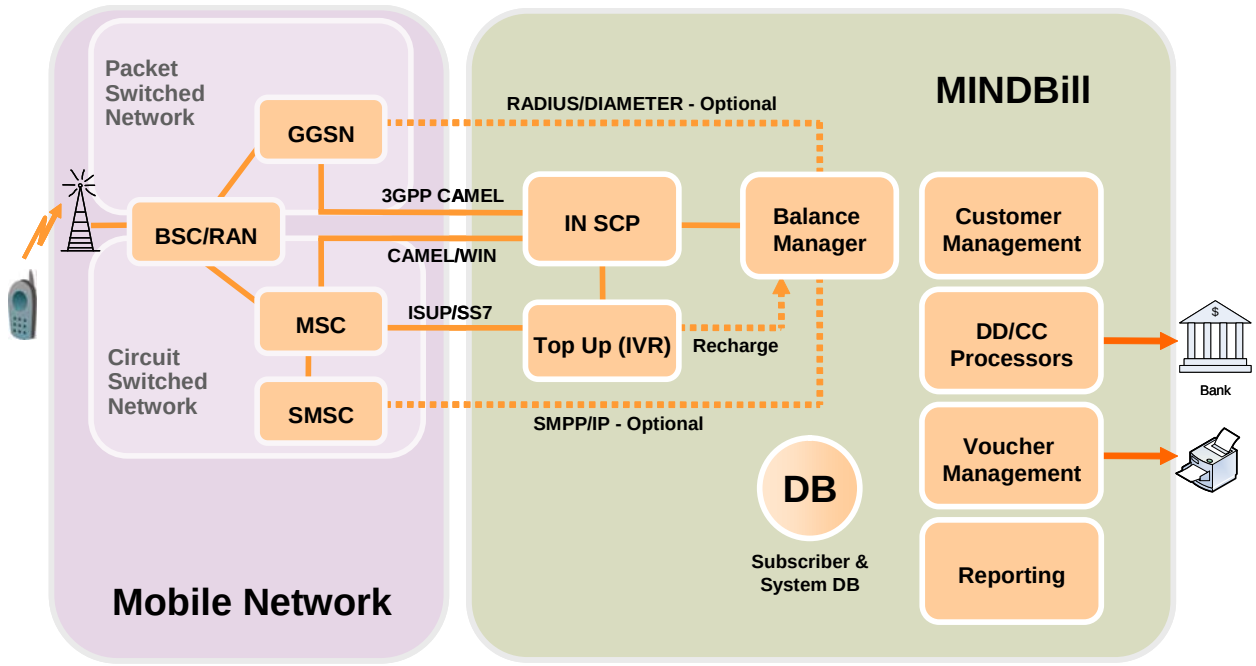
The CSR module enables the service provider to configure the network, the services and the tariffs and manage subscribers, calling cards and vouchers, including calling cards and vouchers batch generation and management. Most of the management and CSR tools are based on Web technology and can be accessed securely from any Web browser.



The MINDBill Web-based CSR account management module

The MINDBill Comprehensive Prepaid Solution

The comprehensive prepaid solution is aimed for a multi-play service environment, where possible multiple services can be used by prepaid subscribers and even simultaneously. The MINDBill solution supports quota allocation for the circuit switched voice network using either ITU/ESTI CAMEL for the GSM infrastructure or ANSI/WIN for the CDMA infrastructure. Furthermore, it provides 3GPP CAMEL support for the packet data network via the IN SCP or, alternatively, it elaborates a direct DIAMETER (3GPP and IETF complaint) or RADIUS (3GPP2 and IETF) API to the Balance Manager for quota allocation and final session charging.



The MINDBill Comprehensive prepaid solution diagram

The MINDBill IN SCP supports receiving quota requests from other application servers such as SMSC using the IN protocol. If such integration is not available, the solution offers an optional direct API to the system Balance Manager using either SMPP/IP, DIAMETER or RADIUS for quota allocation.

MINDBill Prepaid Account Management

The MINDBill prepaid accounts can be either anonymous or registered accounts. The prepaid accounts receive service only for an amount that was paid before any usage. The system keeps track of the usage in real time, reducing the account balance accordingly. When the balance depletes, the account status is automatically changed to *suspended* and service is instantly disabled. In order to continue using the service, the customer must recharge their account. Recharging the account can be done by using either vouchers or credit cards.

Voucher Management

Vouchers are scratch cards or coupons generated by the MINDBill system that can be used to recharge only prepaid accounts. The Vouchers are created in lots (batches) and have a face value and expiration dates. They do not represent a consuming customer and they are considered as a payment method. The subscriber can use the Top-up service to recharge their account by entering the voucher PIN number.

Vouchers can be distributed by agents, re-sellers and call shops. When distributed by agents and resellers, the MINDBill system can generate the required commission for the

agent. The agents' commission can be calculated either according to one of the rating types or according to any defined combination. The agent's commission can be a combination of fixed amount per invoice, fixed amount per call, fixed amount per minute, or percentage.

Account hierarchy

By enabling accounts hierarchy, the MINDBill system caters for a wide range of Enterprise, SME and Residential markets unique offerings. Using an account hierarchy, not only large enterprises, but also families can be given a billable structure such as a S*ingle Family Wallet* where, for example, the upper-level account, the parent account, is the billable re-charging entity and the descendants are granted with a partial limited credit out of it.

The MINDBill well-structured system of accounts provides two major advantages:

- Rating and billing of services may be distributed within and between the layers of the hierarchy.
- Rules can be defined at any level of the hierarchy and applied to lower levels.

As for enterprises, this powerful tool of defining the services offered to each level of the structure enables setting up a structure where upper levels may pay for all or only certain services used by its sub-accounts, or even split a single service charge.
For example, a department will be charged for up to $100 of the monthly cell phone charge of an employee. If the employee's cell phone charge exceeds $100, the employee will be charged for the excess amount.

MINDBill Balance Management

The MINDBill Balance Manager enables service providers to manage simultaneously multiple prepaid services for a single subscriber. The services can be traditional voice, simple data transmission (basic Internet access), rich content, video streaming, MMS, gaming, and others. For example, in 2.5G and 3G mobile networks, the subscriber may download a video clip, read an e-mail message and have a phone call, all at the same time, using a single prepaid balance.

The Balance Management highlights:

- Multiple allocations for concurrent services
- Real-time update of account balance
- Incorporates rating and reverse rating for accurate quota allocation
- Possible quota units: Currency, Time and Volume
- Provides two levels of quota settings:
    - Service Quota – configurable per service

    - Low balance quota – a small size quota for higher effectiveness
- Automatic detection of unused quota chunks

MINDBill Rating engine

Real-Time Rating

The MINDBill Rating Engine is a comprehensive, real-time solution that increases customer loyalty by giving Service Providers the ability to implement value added services and respond to the customers' needs quickly. Authentication, Authorization and Accounting (AAA) actions are all handled in real-time, enabling the Service Providers to offer prepaid services, which increase revenues and reduce risks. In addition, customers are able to get up-to-the-minute account details.

Flexible Rating

MINDBill offers a flexible and powerful rating engine allowing *Service Providers* to offer an unlimited number of service rating schemes and billing plans. Providers can set different tariffs for individual customers and customer groups and offer customers various service bundles. International providers can define rates in different currencies using the multi-currency and multi-time zone functionality. MINDBill enables the assigning of special rates for special days, time-of-day, etc., that can further refine the basic tariffs. A tariff is a pre-packaged set of charges and rating instructions. There are three main types of charges that build up to the whole tariff of a service:

- Setup (one-time) charges – charged once at service activation.
- Recurring (periodic) charges (RC) – charged every pre-defined period.
- Usage-based charges – charged on the actual service usage. The customer can be charged either for the total usage per billing period or per session, based on defined rules regarding the duration and timeframe of the session. Dropping rates are enabled – stepped and tiered. Rating can be based on different metrics, such as the amount of data transferred, number of items accessed or hosted, QoS (Quality of Service), type of application, etc.

There are also the discounts and surcharges which are assigned to a tariff. Discounts can be defined based on a variety of criteria, e.g. the total volume, total duration, locality and others. The MINDBill Rating Engine enables the *Service Provider* to offer promotion packages, discounts, volume discount and special rates, e.g. reducing the rates for the first period of service activity.

Summary

The MINDBill solution for IN prepaid services in mobile networks is based on the industry-proven MINDBill Billing & Customer Care system, with the addition of the MINDBill IN SCP Server. This fully integrated solution provides all the functionality required to quickly and efficiently deploy prepaid services in mobile circuit switched and packet switched networks. This proven solution has been successfully tested to interoperate with leading vendors and it 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.

When operators choose MINDBill, they get a solution with a proven track record, vendor partnerships that enable ongoing interoperability, real-time functionality, scalability and high availability, Web-enabled customer care and an experienced technical support team.